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THE WORLD OF ENERGY HARVESTING



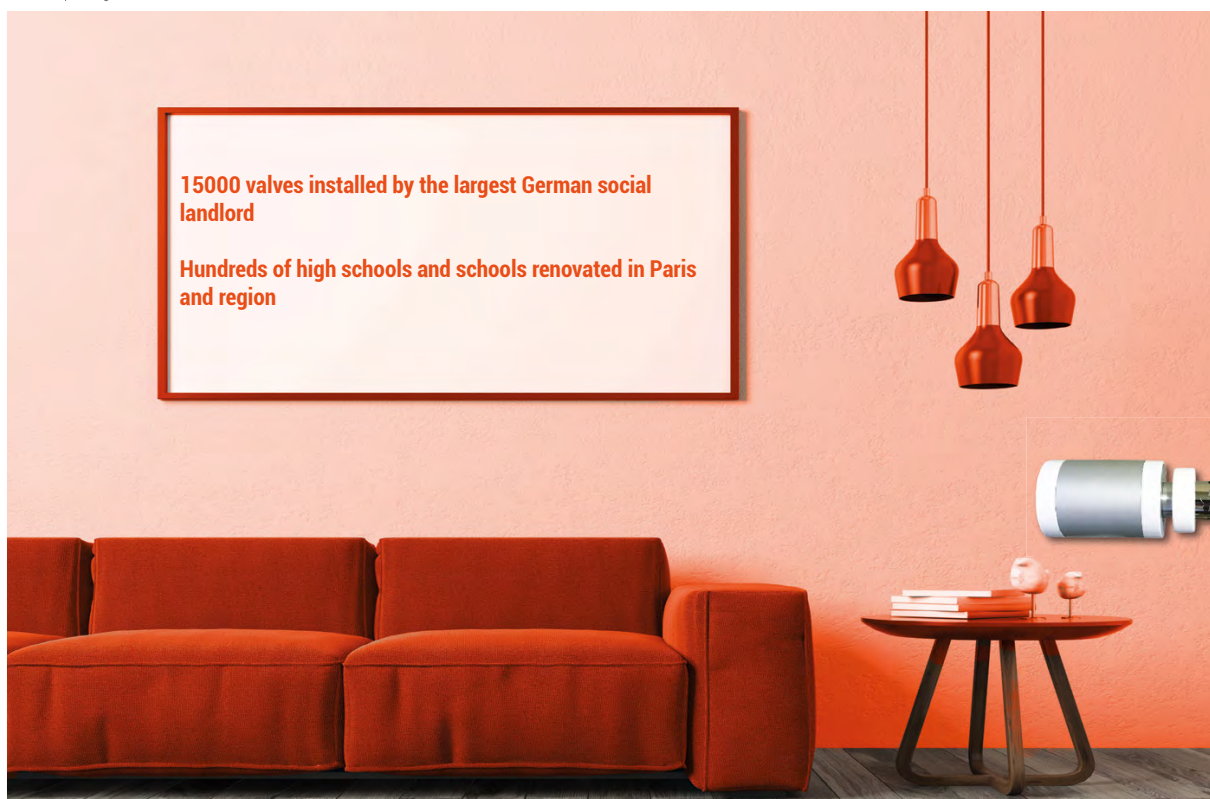
## Energy Harvesting Fundamental for the Internet of Things

Predictive Maintenance for Digital Buildings and Industrial  
Plants – Early Detection of Imminent Breakdowns

Piepenbrock – Smart Buildings for Efficient Processes



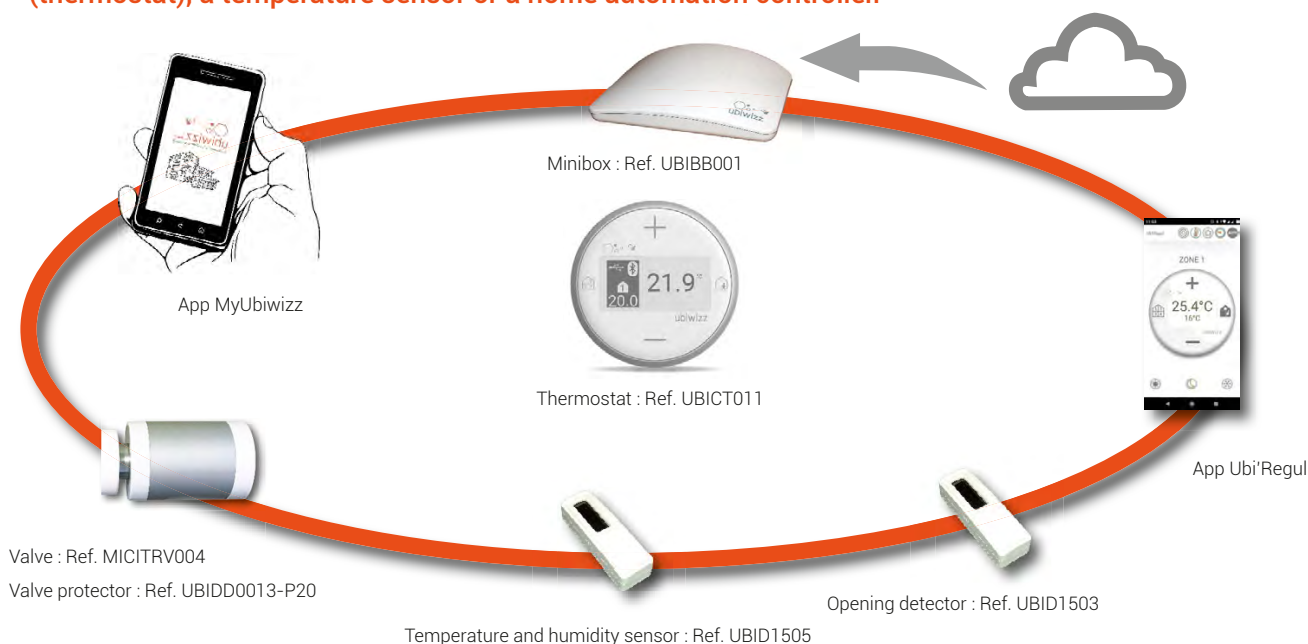
# 30% savings on your bill



## The only heating ecosystem with wireless and battery-less thermostatic valve

Works with a thermostat or compatible controller (box or gateway).  
Installations equipped with opening sensors and / or presence detectors achieved energy savings of over 30%.

Perfectly autonomous in energy, you simply associate the valve with a temperature controller (thermostat), a temperature sensor or a home automation controller.





## Dear readers,

Every Friday, schoolchildren all over Europe go out into the streets and demonstrate for our environment, warning us to go easy on the Earth's resources. Even the political discourse is focusing on the climate once again, driven by the electoral successes of ecologically focused parties. However, some people are indeed also becoming increasingly aware of the fact that there can be no economic growth or stable social structures if our world runs off the rails.

Sustainability. This concept topped the agenda approximately ten years ago, when oil shortages were increasing, energy costs were rising rapidly and implementing and investing in renewable energy was being massively promoted. Investments in control systems – in both buildings and industrial plants – quickly become economically profitable when the energy cost savings pay for the installed technology in just a few months. But what about today's energy costs, which are currently relatively low?

At EnOcean, we have been using renewable energy for just under 18 years as power plants for our self-powered wireless sensors and switches. The ECO 200 kinetic converter is our windmill, while solar cells with energy stores ensure an uninterrupted supply of power from daylight. Our company's claim of high innovative strength and the need for energy harvesting systems, which dates back to 2001, is still true today: "the power of unused energy." The market environment with increasing digitalization, widespread acceptance of wireless systems and new business models for energy harvesting systems underscore our success story.

We achieve sustainability when we implement technologies that consume as few resources as possible and use them to make homes, buildings and installations more efficient. This means minimizing energy consumption by automatically lowering the temperature and turning the lights off when no one is in the room or completely rationalizing the space when it isn't needed! Digitalization with self-powered sensors that supply the necessary raw data makes all this possible. Less copper and PVC in the walls (without cables) and energy harvesting provide additional plus points where sustainability is concerned.

By including new service models, security, added comfort, time savings and other factors in economic feasibility considerations, you will determine that investing in smart, sustainable IoT solutions is already paying off today – for us over the short term and even more for the generations to come.

In this issue, you will discover the sustainability potential that is hidden in your building or home. Fascinating project reports, innovative products and bylined articles provide insight into the world of energy harvesting.

Enjoy the magazine!



Andreas Schneider  
Managing Director, EnOcean GmbH



## Editorial

**Energy Harvesting - Fundamental for the Internet of Things**

Leading article: Predictive Maintenance for digital buildings and industrial plants – early detection of imminent breakdowns

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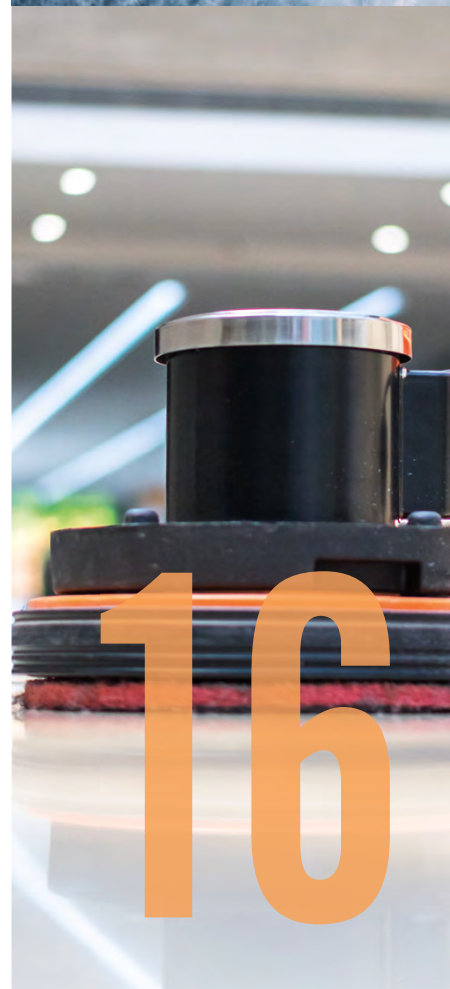
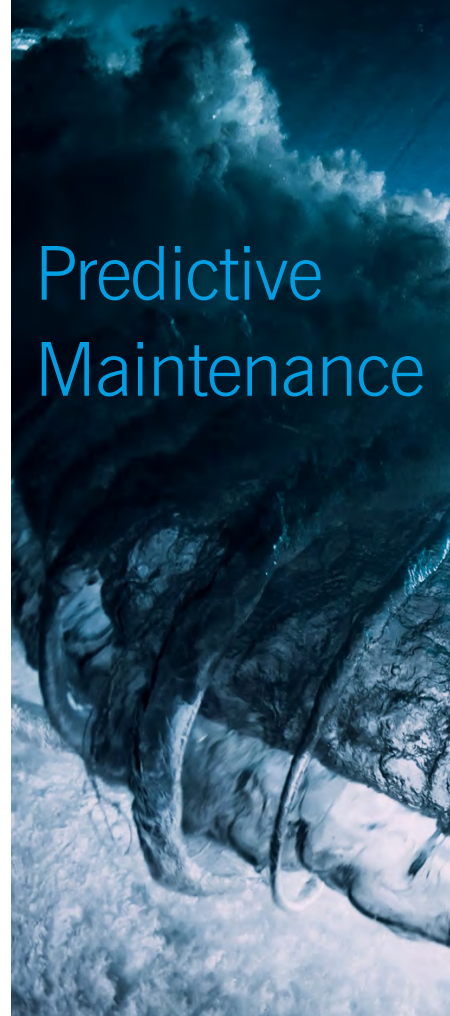
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# Predictive Maintenance





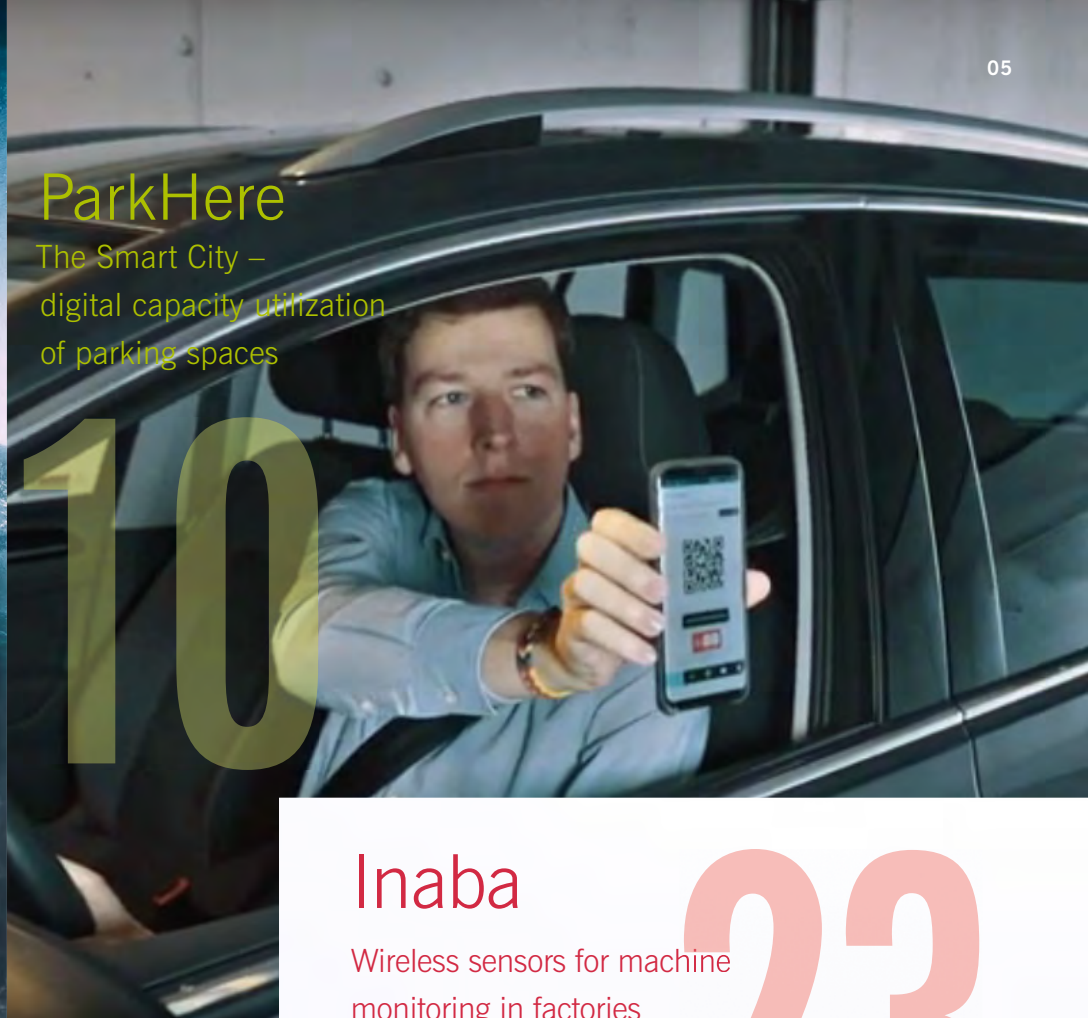
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Predictive Maintenance  
for digital buildings  
and industrial plants –  
early detection of  
imminent breakdowns

ParkHere

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Inaba

Wireless sensors for machine  
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Piepenbrock

Smart buildings for efficient processes





# Predictive Maintenance

for digital buildings and industrial plants – early detection of imminent breakdowns

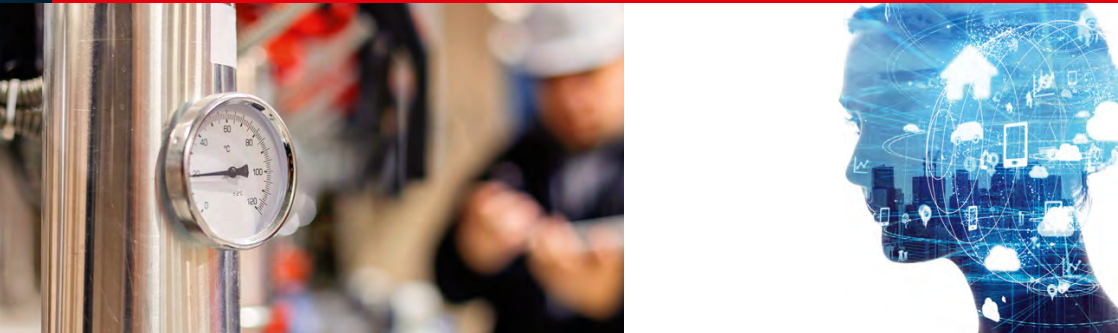


Temperature sensors monitor pumps, brakes, transmissions, motors and cooling units





In classic building automation installations, sensors have been reliably controlling shading systems and light controllers as well as heating, ventilation and air-conditioning systems (HVAC) for many years, based on the detected data. Linked with the Internet of Things (IoT), today's sensors not only supply data but also form nothing less than the basis for digitalizing buildings and technical installations. By Armin Anders, Vice President Business Development, EnOcean GmbH



The raw data from the sensors is supplied via a gateway to the cloud, where it is visualized for further analysis

Whereas companies were initially concerned mainly with optimizing their processes with IoT projects, today they also focus on developing new business models. Facility management is a good example of this. In addition to pure building management activities, some facility management companies are already offering new digital services, thanks to the IoT. Wireless and maintenance-free sensors network the building and provide a digital, 360-degree view to make room utilization and cleaning transparent, for example, and to adapt these functions to actual demand. With its sensors, EnOcean supplies the raw data for the necessary analyses on cloud-based platforms. Along with this development, the demand-oriented predictive maintenance concept is capturing the attention of facility managers.

### What is predictive maintenance?

Motors and machines of all types and sizes form the heart of buildings and industrial

plants. Without them, everything would grind to a halt. The heating system and elevators would no longer run, the cooling system in a data center would fail, and production would temporarily come to a standstill. That's why facility managers and plant operators have long been experimenting with ways to optimize technical installations economically and with maximum effect – that is, with as few breakdowns as possible.

New technological developments, including those in the area of sensors, place the predictive maintenance concept at the top of the agenda. Although this approach is not really anything new, the current state of the art now makes it ready for widespread use with a positive cost/benefit ratio.

The so-called predictive maintenance approach detects the condition of machines based on sensors, links it with historic data or standard values and derives predictions

for possible failure from this information. Predictive maintenance saves money by preventing (unnecessary) standstills and production losses ahead of time. As a result, regularly set service intervals (preventive maintenance) or worst cases – namely, ad-hoc repairs during a failure – can be avoided. Data-based, predictive maintenance also makes it possible to plan spare parts deliveries and the deployment of service technicians in keeping with demand.

### Interoperable components

In predictive maintenance, many components must interact perfectly in order to calculate the best possible time for service. The basic requirement is to collect data with sensors. In real time, they supply the information needed to evaluate the current condition and identify future trends. This includes, for example, deviations from standard values and characteristics in relation to temperature, humidity or vibration.



Sensors measure the fill level of a container by “counting” the pump operations, detecting each current pulse that triggers a pump operation



Sensors measure the temperature at the cables of a fan



Wireless, maintenance-free sensors network the building or industrial plant and provide a digital, 360-degree view

### Possible application scenarios

- Temperature sensors on control cabinets in data centers raise the alarm when an overheating situation, and thus a breakdown, is imminent.
- Sensors measure the temperature at the cables of a fan to determine how long the motor will continue to run, based on the current characteristic.
- Humidity sensors in boiler rooms monitor water leaks.
- Temperature sensors monitor pumps, brakes, transmissions, motors and cooling units.

- Differential pressure sensors measure the condition of filters.
- Sensors measure the fill level of a container by “counting” the pump operations, detecting each current pulse that triggers a pump operation.

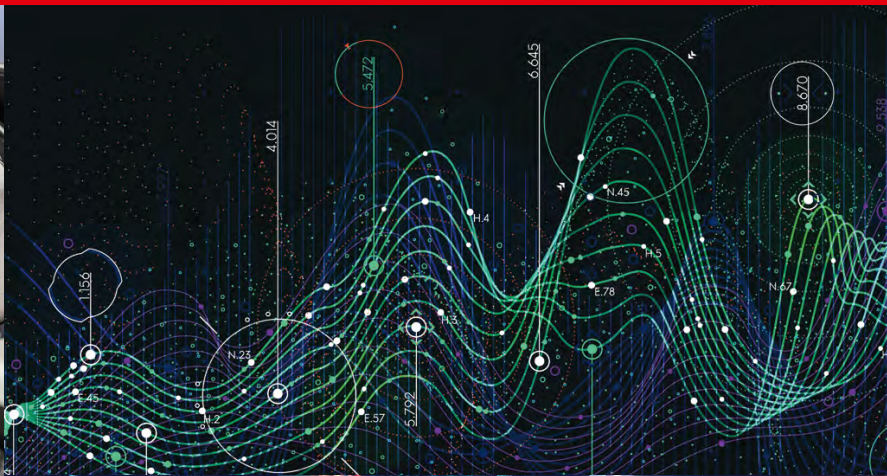
The raw data from the sensors is supplied via a gateway to the cloud, where it is visualized for further analysis. Using the digital twin of the building or industrial plant thus created, the technical facility management team determines which products demonstrate features of an imminent breakdown.

### Saving money with self-powered wireless sensors

Surveys show that many companies cite lack of data as a stumbling block when it comes to IoT projects such as predictive maintenance. The fact is, this data is available within the companies and just has to be collected and made usable. Of course, this process must also remain within defined cost parameters.

Radio-based sensors are an excellent option for collecting data, particularly in existing buildings and industrial plants. They elimi-





Predictive maintenance saves money by preventing (unnecessary) standstills and production losses ahead of time



nate the need for expensive retrofits, a cost that is due primarily to running cables in ceilings and walls. The wireless sensors can also be flexibly mounted on built-in technical installations, even in locations that are not easily accessible.

In some cases, hundreds to thousands of sensors are needed, depending on the project size. This makes self powered wireless sensors that use energy harvesting technology and obtain their energy directly from their surroundings a sensible choice. The EnOcean sensors, for example, use small

solar cells, kinetic energy or temperature differences to transmit the data to the cloud wirelessly. There are no follow-up costs resulting from the need to regularly replace the batteries.

### Finding the right partner

IoT projects are generally complex, although there is an increasing trend toward standardization. In some cases, ready-made IoT packages are already available from various collaborating manufacturers. When hardware and software manufacturers, system integrators and cloud service providers work

together, the customer reaps significant benefits. The EnOcean Alliance acts as a nucleus for such endeavors. An ecosystem of more than 400 partners has formed within the Alliance that can successfully implement IoT projects such as predictive maintenance. Long-lasting partnerships and certified, open standards and interfaces ensure the interoperability of the different products and solutions and thus contribute to project success.

[www.enocean.com](http://www.enocean.com)





# The Smart City – digital capacity utilization of parking spaces

Inner-city motorists have to expect long delays when looking for a parking spot, especially during rush hour, since these spaces are often rare and difficult to find. The Smart City concept of the the Munich, Germany-based, high-tech startup ParkHere includes a smart solution to make the process of parking a lot more convenient. By Tom Maier, Head of Digital Business Solutions and Development, ParkHere



The ParkHere solution makes it possible to provide parking spots for more employees or tenants without enlarging their existing parking area. The key is to significantly increase capacity utilization – ideally to nearly 100 percent.

### Smart access management

What's required is a smart access management system for the parking spaces of an underground garage or parking lot. In the standard configuration, ParkHere installs a terminal in front of the barrier gate and identifies the cars as they enter and leave the parking space by automatically scanning the license plates. Having the collected data combined in the booking app provided by ParkHere allows employees or residents to benefit from a dynamic parking space assignment system.

Users can reserve a parking spot in advance for a particular period of time via the app. The ParkHere terminal then runs an authen-

energy it needs directly from its surroundings, using the energy harvesting technology from EnOcean. This means that there is no need to supply power externally or change any batteries.

### More revenue through better capacity utilization

A parking garage operator can bill the occupancy time based on use and thus map it digitally within the booking app. The operator gains access to real-time information and forecasts relating to occupancy via a web-based dashboard. Reservations for guests, visitors or special users can also be made via the dashboard.

The added value compared to conventional barrier gates with a point of sale system includes a significant improvement in parking space capacity utilization and the generation of additional income by renting space to third parties.

With the aid of the ParkHere reservation system, Telefónica stopped permanently linking an employee to a specific parking space. The assignment of spots to long-term renters, short-term parkers and visitors has now been automated and stored with user-defined logic.

In practice, this means significant improvements. A Telefónica employee can conveniently reserve a parking space for a desired period of time from home, using the employee app. There is no line at the entrance to the underground garage even during rush hours, since only the license plate is scanned or employees authenticate themselves with a QR code.

Thanks to the app's accurate navigation function, users no longer need to spend time searching for a suitable parking space. Moreover, Telefónica gains detailed insight into the real-time occupancy of the underground garage at all times via the included



tication procedure each time the user drives in and out of the parking space. The app also helps the driver navigate to the next available parking spot.

### Floor-mounted sensors

In order for the web-based dashboard to report the current occupancy of parking spaces in real time, wireless sensors are either glued onto, milled into or embedded in the floor. These self-powered ground sensors reliably and precisely detect the occupancy level of parking spots. The sensor operates without batteries and generates the

### "Employee parking" project for Telefónica

Telefónica was looking for a solution that would make parking spot searches more efficient for its employees. Although the parking spaces were almost always in short supply at its office in Munich, the parking lot of its Uptown Tower was rarely completely full. One reason was that employees were permanently assigned personalized numbers for their parking spots, which meant that there was no way to flexibly free up these spots if the employee was on a business trip, out sick or working from home.

dashboard and can spontaneously reserve spots – for example, for guests.

The ParkHere reservation system has enabled Telefónica to increase its parking space capacity utilization by more than 30 percent. Waiting lists and searching for a parking space at the start of the workday are now things of the past.



Smart office buildings –

# Controlling space utilization intelligently and according to demand

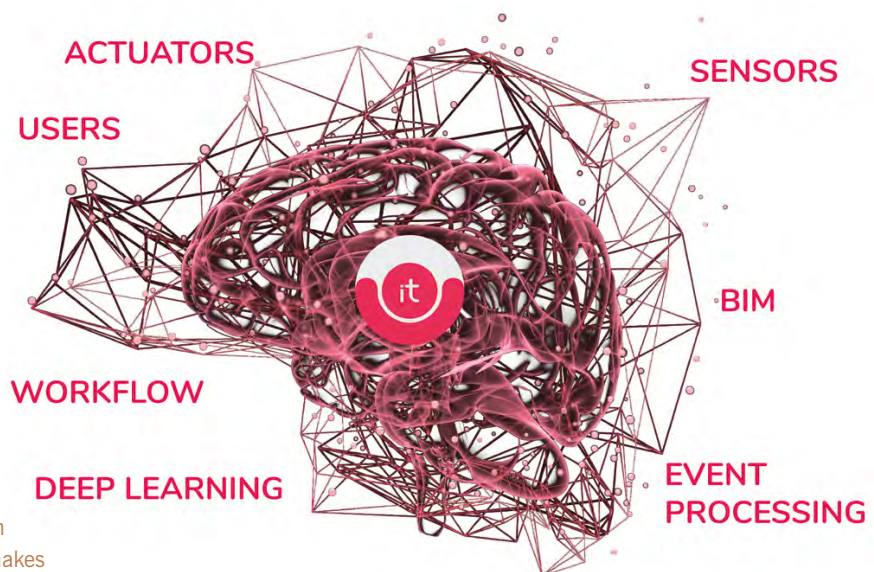
An efficient and effective use of space is often standard practice in new office buildings, thanks to digitalization. When it comes to retrofitting existing buildings, a wireless and battery-free solution is a very smart approach. By Florian Schiebl, Chief Operating Officer, Thing-it

Making workplaces more flexible significantly improves efficiency in the use of space. Up to 40 percent of the workplaces are not in continuous use, as confirmed by the Bürokosten Report. If a fixed unused workplace measuring an average of 20 square meters is eliminated by using modern office concepts, the office operator will save up to 12,000 euros additionally per year.

**Live data from sensors is key**  
Intelligent linking of existing or retrofitted building technology with a self-learning control platform in the cloud offers the greatest sustainability potential for operating existing properties. For example, light, temperature and air quality can be automatically adapted to the particular room booking and on-demand use.







Sensors deliver hard facts that help determine and understand changes in work patterns around the clock. This makes it possible to quickly modify the room strategy to lower real estate costs and provide an ideal workspace for different teams and situations. The sensor-based knowledge also helps bring operating processes in line with demand. Cleaning and maintenance processes, for example, become more flexible and are adapted to the actual degree to which a room is used.

### Technical requirements

EnOcean-based, self-powered wireless sensors and actuators can be installed without much effort and supply their room data to a self-learning, cloud-based “brain” from Thing Technologies via a smart gateway virtually and in real time. The Thing-it digitalization platform is a central, flexible and hardware-independent control system for smart buildings.

[www.thing-it.com](http://www.thing-it.com)

**Networked brain – Thing-it** is an autonomous, self-learning “brain” that automates all actions via predefined processes and orchestrates the interaction between people and buildings through mobile apps

### New work environments at M.O.O.CON

For more than 26 years, the M.O.O.CON corporate consulting firm has been a leader in the area of sustainable buildings, processes and work environments that create a distinctive identity. The work area of the company's two locations in Frankfurt am Main and Vienna, which comes to just under 1,000 square meters, underwent a radical reorientation and now embodies the status quo of digital, identity-creating work environments.

The multi-space concept allows for activity-based working with the ability to book items such as rooms, desks, boxes, etc. at any time according to demand and as needed for the targeted activity.

### Networked with a mobile app

Retrofittable sensors continuously detect employee use patterns in order to optimize the work environment in terms of productivity as well as the needs of the employees. The Thing-it mobile app connects users with the office and with each other. Employees know at all times which rooms or work areas can be booked via the Smart Office app and where their colleagues are currently located.

The app provides important and useful room-specific information and allows shortfalls in the office to be reported quickly and easily. Usage and booking data is displayed transparently and in a well-organized manner, facilitating an active space management system. By linking everything from plan data and static information about equipment to operating instructions and active motion data, the app provides users with access to relevant data at all times despite the small space and a pared-down digital twin.

### App as control center

Thanks to the empirical usage data, office managers can dynamically ask for the rooms to be cleaned as needed, have problems systematically resolved and ensure a balanced use of rooms.

They can notify colleagues of actions in the office centrally at any time via dedicated chat channels or distribute job assignments for the facility management team via the mobile app. The next step will be to integrate the access and room control systems into the Smart Office app in order to make the smartphone an even more central assistant for identity-creating work environments.



# Digital

The Internet of Things (IoT) is transforming the way people live and work. Beyond the smart devices you use every day, IoT is revolutionizing the way companies do business, enabling them to become faster, smarter, safer and more efficient.

By Thomas Frahler, Business Lead Internet of Things, Microsoft

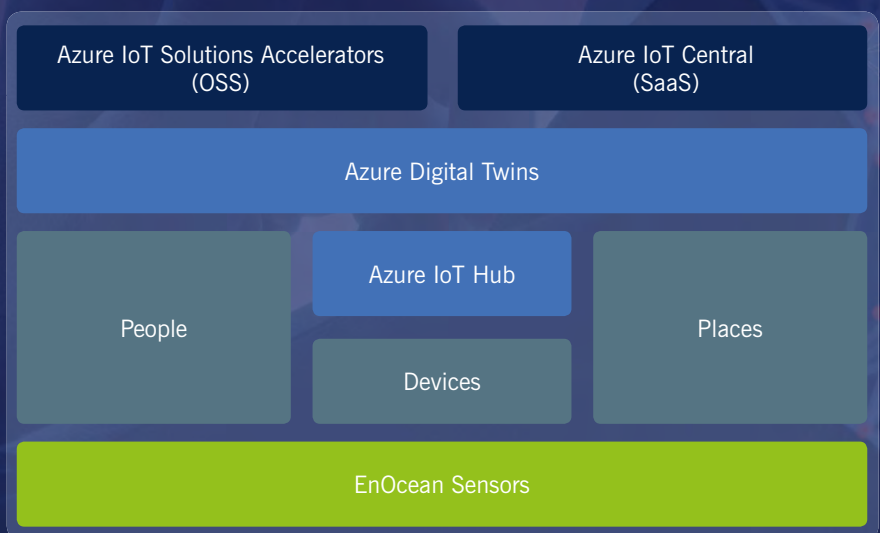
Microsoft has been at the forefront of IoT with innovative solutions such as Azure Digital Twins. Azure Digital Twins is an IoT service that creates comprehensive models of the physical environment. It can create spatial intelligence graphs to model the relationships and interactions between people, spaces and devices such as sensors.

With Azure Digital Twins, you can query data from a physical space rather than from many disparate sensors. This service helps you build reusable, highly scalable, spatially aware experiences that link streaming data across the digital and physical world.

## Solutions that benefit from a Digital Twin

A solution such as Azure Digital Twins is useful for representing the physical world and its many relationships. It simplifies IoT modeling, data processing, event handling and device tracking. Consider just a few of the following scenarios across several industries. They benefit from its use to:

- Show a property management company the occupancy levels of a space over time in order to glean insights about the best ways to configure its office building.
- Trigger work order tickets for a mobile app. Use it to dispatch security guards and schedule janitorial and other services in a retail space or sports venue.



Azure Digital Twins uses Azure IoT Hub to connect the IoT devices and sensors that keep everything up to date with the physical world. The following diagram shows how Azure Digital Twins relates to other Azure IoT services.



# Twins

## in the IoT

- Show building occupants which rooms are occupied in a building in real time. Then help occupants reserve work spaces that fit their needs.
- Track where assets are located within a space.
- Optimize electric vehicle charging by modeling user preferences and energy-grid constraints.

Products with EnOcean-based technology, like maintenance-free wireless sensors, make it possible to capture valuable data in the physical world, transfer it in real time to an IoT cloud platform via an IoT gateway and analyze it there. Using Azure Digital Twins, users can thus connect their sensor data to many powerful Azure services.

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<https://azure.microsoft.com/>

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**Sources:**

<https://docs.microsoft.com/en-us/azure/digital-twins/about-digital-twins>  
<https://azure.microsoft.com/mediahandler/files/resourcefiles/iot-signals/iot-Signals-Microsoft-072019.pdf>

### Microsoft joins EnOcean Alliance

As a new promoter member of the EnOcean Alliance, Microsoft encourages innovation and standardization in intelligent building control and actively shapes the future of the international consortium.

“IoT brings us huge opportunities to improve all of our lives, including comfort, security, energy efficiency and cost savings. To do this in buildings, we need to digitalize building spaces in order to provide the necessary data as well as powerful AI analytic and representation tools. Thus, I see this as a perfect marriage, with EnOcean wireless and maintenance-free, interoperable sensors from multi-vendors providing the necessary data and Microsoft offering the perfect platform solutions to analyze and optimize our buildings,” says Graham Martin, Chairman and CEO of the EnOcean Alliance.

Tested in-house – smart services from Piepenbrock

# Smart buildings for efficient processes

Detect and eliminate faults in an installation at an early stage, automatically adapt the room climate or clean rooms as needed depending on their use – all this is made possible by smart services. Self-powered sensors make services and client properties smarter, thereby optimizing processes and workflows. That's why the Piepenbrock Group is actively working in the area of smart services, specifically when it comes to using the Internet of Things (IoT) in an integrated facility management system. By Erdal Sancar, Branch Manager, Facility and Energy Management, Piepenbrock

## Service center pilot project

Piepenbrock conducted a pilot project in its service center in Osnabrück, Germany, using different sensors and actuators in conference rooms, break rooms, offices and restrooms. Based on this project, the service provider's customers and guests can experience smart services in action at any time. The company primarily uses sensors and actuators that obtain their energy from their immediate surroundings through the energy harvesting technology from EnOcean. For example, all it takes is a press of a switch to transmit a wireless telegram.

These sensors and actuators serve different purposes. For example, they control lighting systems, blinds, air conditioning and heating installations as well as projectors. They



also measure how often rooms are frequented, the temperature, the air quality and the fill level of soap and towel dispensers in the restrooms.

## Examples of IoT-based scenarios

**Restrooms:** A sensor on the soap dispenser determines, for example, the fill level and sends an automatic notification to the responsible janitorial staff member as soon as the threshold value is exceeded. This



allows the soap to be refilled as needed and increases user satisfaction.

A door contact sensor determines how often the restrooms are frequented and prompts the janitorial staff to clean the room

as needed according to the same pattern when a threshold value is exceeded.

**Conference rooms:** The conference rooms are also cleaned depending on how often they are frequented. Motion sensors with a special algorithm installed in the room supply the necessary data. The networked devices in the conference room can also be controlled via an app on a tablet or a smartphone, based on preprogrammed scenarios.





Thus, the projector automatically starts up in “Presentation” mode while the blinds are simultaneously lowered. The lighting is also adapted to the scenarios, switching the lights on if the room is being used for a meeting or turning them off for presentations.

#### **Analysis in the cloud**

All raw data supplied by the sensors and actuators is combined in the cloud and made usable via a software solution, thus enabling in-depth analyses of ways to fur-

ther optimize services and increase efficiency. In other application scenarios, sensors can, for example, detect whether proactive maintenance of technical equipment is necessary.

In addition to the solutions described, service providers such as Piepenbrock can also manage conference rooms, room bookings or building security via the new smart services. This also includes optimizing the management of parking spaces in parking lots based on sensor data.

#### **Preliminary conclusions from the pilot project**

Sensors help make the building smarter and services more user-oriented. Resources can thus be better planned and used, which saves time and money. At the same time, this type of service provision ensures higher customer satisfaction by increasing the quality of service and, at the same time, helping to preserve the value of the real estate.



EnOcean-based sensors can easily be placed in every room or even at every desk, enabling each employee to adjust their own working environment to their comfort levels.

photo: Sauter

# Employee wellness

## Sensors help to optimize working environments

As early as 2012, experts such as Mark Jewell<sup>2</sup> were providing concrete examples indicating that if employees are in a comfortable environment, they are 15 percent more effective and are absent up to 15 percent less often. More recently, Harvard Business Review<sup>3</sup> reported similar results, putting a figure of \$6,500 per employee per year benefit to companies, compared to a figure of \$40 per employee per year to install building automation. IBM's Dr. Claire Penny<sup>4</sup> estimates the cost of work stress-related illnesses in the UK at 6 billion pounds per year.





The Internet of Things (IoT) is ubiquitous. According to current estimates<sup>1</sup>, the number of connected devices is projected to amount to 75.44 billion worldwide by 2025, a fivefold increase over ten years. The real added value of the IoT lies in collecting, analyzing and using data – for example, to optimize working environments.

By Graham Martin, Chairman & CEO, EnOcean Alliance

### Sensors help to optimize working environments

It therefore comes as no surprise that multiple leading companies are investing huge sums in creating comfortable (and creative) environments for their employees, including building automation systems to monitor and control key parameters such as temperature, humidity, air quality and light levels.

This requires exact data from every room or area of the building. For example, intelligent lighting control can be used to generate continuous lighting that increases or decreases over the course of the day. The necessary data comes primarily from sensors which are the key to building automation and IoT applications.

### Wireless is a must

How can this data be made easily available in our existing or new buildings? Pulling cables and maintaining batteries are both prohibitive due to costs, disruption and environmental considerations. That's why energy harvesting-based, wireless sensors have become the choice of the building and data service community. If such sensors are combined with a building automation (gateway) and moved to the cloud, raw data can be accessed from anywhere. This sensor-driven, real-time connection between real locations and their digital twin helps to analyze and improve workplace situations.

Companies such as Microsoft and IBM have recently joined our technology Alliance as

promoter members along with further giants such as NTT Communications, Tencent and Softbank, which are also offering IoT solutions for smart buildings based on interoperable EnOcean radio standard. In addition, many "traditional" building automation providers have added data analysis and cloud services to their standard offerings. It isn't just the energy harvesting aspect driving this success. The large, multi-vendor, interoperable product ecosystem and ease of installation and operation are also helping to fuel this growth. Thus the investment in an EnOcean-based building automation system becomes an obvious "no-brainer."

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[www.enocean-alliance.org](http://www.enocean-alliance.org)

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# IoT and visualization in buildings

Many thousands of devices are currently connected to the IoT and the number is increasing. These devices generate huge volumes of data whose information has to be captured, filtered, processed and analyzed in a timely manner in order to fulfill its purpose in the IoT. That's why WinShine has developed a solution for collecting data and visualizing IoT applications. By Marketing Department, Nanjing WinShine

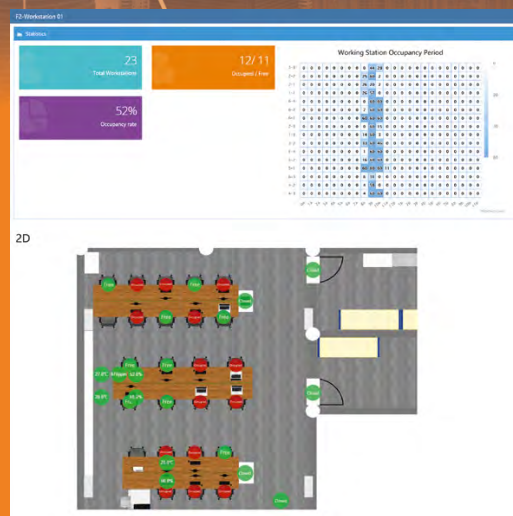
Network Technology

Basically, data visualization is the visual representation of common tables or spatial data. IoT-based data visualization can support companies in intelligent real-time data analysis.

The **visualization of environmental quality** includes not only temperature and humidity, but also air quality. WinShine's battery-free temperature and humidity sensors and air

quality sensors based on the EnOcean protocol (such as CO<sub>2</sub>, CO, PM, etc.) can display the environmental status in real time. The platform visualizes real-time data, trends and other information for analysis.

The **visualization of space occupation** allows building managers to monitor space resources at all times and analyze costs and benefits in order to adjust and plan the space accordingly.



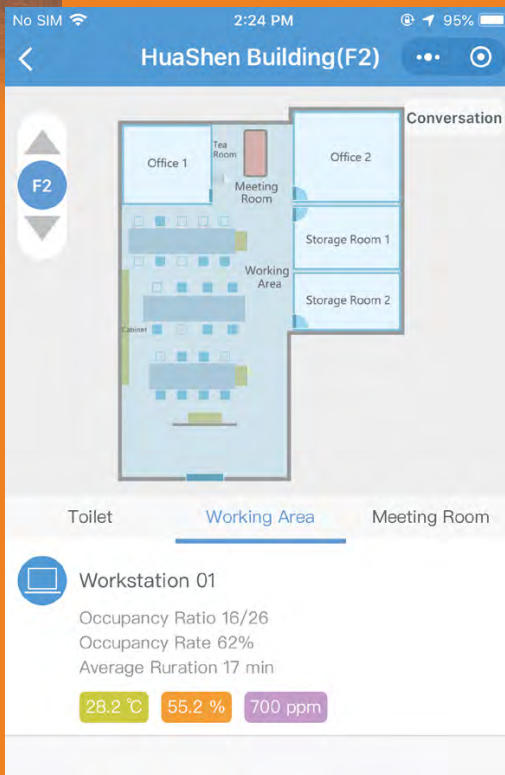
- With a seat occupancy sensor based on the EnOcean protocol, the occupancy status of the station can be displayed in real time. Office or building managers can see the seating arrangement in 2D or 3D, occupancy status and time, a heat map and a trend graph.
- By using solar-powered occupancy sensors and personnel density sensors based on the EnOcean protocol in combination



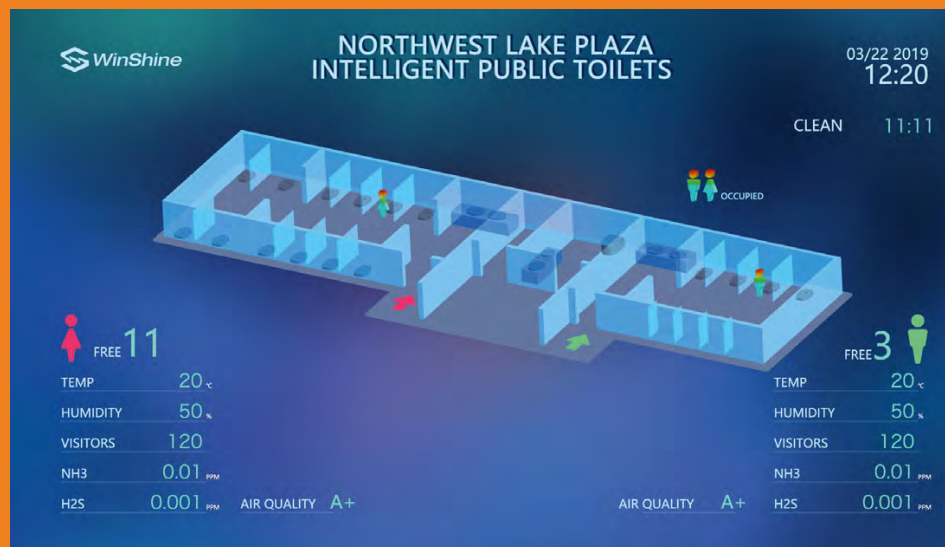
with visualization solutions, the occupancy status and time as well as the occupancy rate can be visualized. This is helpful, for example, when booking conference rooms.

- Wireless door and NH3/H2S sensors based on the EnOcean protocol record data on air quality and the number of visitors as well as whether, for example, a restroom stall is free or occupied. The information is displayed on a guide screen outside the restroom.

**Asset Visualization Management** allows assets to be managed using RFID technology and 3D modeling. Locations, inventories, status, environment, alarms and other information is displayed visually.



Left: Management platform  
Above: Easy IoT applet Reserve App



Above: Guide screen  
Below: "Find toilet" app

When **visualizing energy consumption**, monitoring points are defined for each trunk cable in the building. Each electricity meter reports consumption and temperature data to the cloud platform at regular intervals via the intelligent gateway.

For **security and navigation in buildings**, EnOcean-based smoke detectors and cable temperature sensors are used for the following tasks:

- Smoke, cable temperature and overcurrent detection
- Fire alarm systems
- Visual display of detection points and status
- Alarm information

With the beginning of the 5G era, ultra-bandwidth, high reliability, low latency and massive access will bring even greater market opportunities for the IoT industry. WinShine's visualization solution will interoperate and link with countless IoT devices, receiving their data and displaying relationships between objects and states in 3D.

[www.win-shine.com](http://www.win-shine.com)



# Direct display

## of data from battery-free and wireless sensors

The Japanese company TOPPAN Printing has developed an Electronic Paper Display (EPD) to add display functionality to sensors and enhance the usability of EnOcean products. By Kai Tomohiro, Manager of EPD Business, TOPPAN Printing



Segment design of standard-format EPD



Prototype EPD for temperature sensor

Table below: Displayable sensor data

Numeric	<ul style="list-style-type: none"> <li>4 digits</li> </ul>
Unit	<ul style="list-style-type: none"> <li>Temperature (°C, F)</li> <li>Humidity</li> <li>CO<sub>2</sub>-Level</li> <li>Signal Level</li> </ul>
Mode Icon	<ul style="list-style-type: none"> <li>Temperature</li> <li>Humidity</li> <li>CO<sub>2</sub> (Ventilation)</li> <li>Heat</li> <li>Cool</li> <li>Battery Level</li> </ul>

Sensor data from various EnOcean sensors can be remotely acquired via the cloud. However, adding a display to the sensor itself allows prompt confirmation of status, thus supporting on-site decision making at the sensor's location without relying on a smartphone or PC to retrieve the data.

TOPPAN has developed a prototype EPD and driving circuit board that adds an EPD to an STM431J sensor.

In addition to temperature, TOPPAN is currently developing a standard-format EPD that can display humidity, CO<sub>2</sub> level etc., and can visualize the data recorded by various EnOcean sensors such as STM330.

### Data check in the greenhouse

When monitoring agricultural products in a greenhouse, for example, you can check growth status against temperature and humidity at a glance, without removing your gloves, in order to determine if your settings are adequate.

Also, if a large number of workers can recognize that the visualized CO<sub>2</sub> concentration is consistently high in a certain office area, it facilitates the decision to repair the HVAC in order to improve the working environment.

### Tailored EPD displays

TOPPAN will supply samples of this standard-format EPD and driving circuit board that connect to your sensor. It is also possible to develop custom designed EPD that are tailored to individual needs.

TOPPAN plans to collaborate with EnOcean Alliance equipment manufacturer members, applying ultra-low power segmented EPD technology to advance the state of visualizing IoT information.

<http://www.toppan.com/en/denshipaper/>



# Wireless sensors for machine monitoring in factories

Inaba Denki Sangyo has incorporated EnOcean wireless technology by developing a wireless sensor attached to a signal lamp that sends the following information: light on / blinking / light off. With this device, it's possible to view the condition of machines in factories and determine whether they are working smoothly. By Motoshi Hosoi, Manager Industrial Machinery Division, Electronic Devices, Inaba Denki Sangyo

## The characteristics of the Signal Watcher

The Signal Watcher is attached to the signal lamp on the outside of the machines in a factory. It was developed as a sensor that collects information from the machine based on the status of the light signals.

When it comes to factory facilities like universal machines, leased machines and inspection machines that need calibration, it is very difficult for users to coordinate reconfiguration or manage operation.

This is where Inaba comes in, with a sensor that can be easily attached later on without having to reconfigure existing facilities. According to this concept, the target device is electrically isolated and can be attached to the machine later on. This is possible because the device is battery-less, wireless

and maintenance-free. The device runs solely on solar power which is enough to keep the device running. EnOcean technology was essential for this energy harvesting solution. A backup battery in the device enables it to run for years, even in spaces without any light.

## Retrofit design

The Signal Watcher is intended not only for signal lamp manufacturers, but can also be used for retrofit designs. Existing signal lamps vary in terms of diameter and speakers on the upper surface, which is why Inaba has designed a mount that can easily be attached to construction types where attachment is normally difficult.

For unobstructed visibility and functionality and to keep the weight to a minimum, the device is miniaturized and its color is



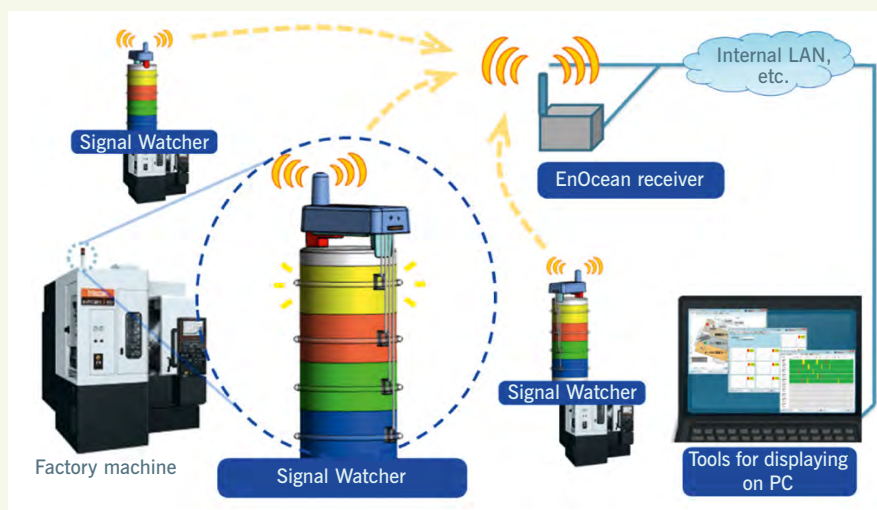
matched to that of the signal lamp. The dimensions of the light-detecting component are also minimized. In order to optimize the design stage, Inaba is implementing a retrofit design (patent pending).

## IoT approach for factory facilities

In the future, Inaba will also be adopting EnOcean solutions for machines that will support the visualization of facilities within a factory. In addition, Inaba will continue to support customers and companies with IoT projects.

The development team is currently working on a general-purpose gateway that can be used as an interface to higher-level systems, as well as on the connection to FA peripheral equipment and the link to HMI (Human Machine Interface) display tools. In the future, Inaba is also planning to supply products for implementing the IoT in factory facilities.

[www.e-inaba.ne.jp/signal-watcher/](http://www.e-inaba.ne.jp/signal-watcher/)



Leppäkosken Sähkö:

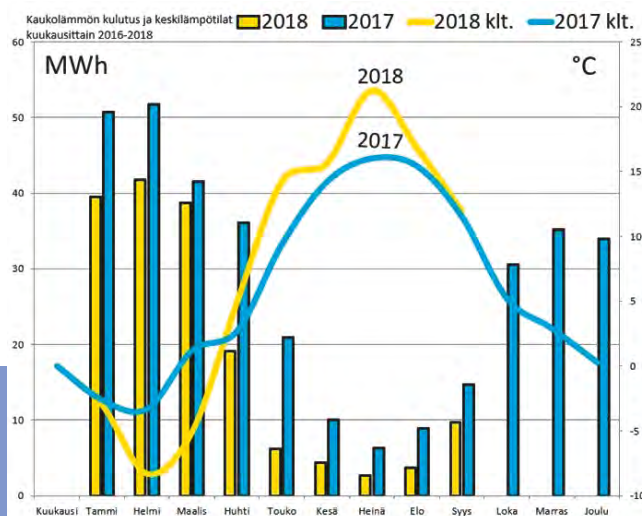
# A year of solar energy and energy savings

Thanks to the use of solar energy, the replacement of heat exchangers and intelligent heating control using Micropelt actuators, the total energy consumption of the office building of the energy company Leppäkosken Sähkö in Finland has been reduced by almost 30 percent. By Fritz Volkert, CEO, Micropelt





Energy consumption of the Leppäkosken office building in 2018 compared to 2017. MWh according to the scale on the left, average temperatures in °C marked with lines according to the scale on the right.



The Leppäkosken Sähkö Group is a versatile energy company supplying electricity, district heating, natural gas, steam, compressed air and treated water.

Multiple solar collectors and solar thermal panels were deployed on the office building in Ikaalinen in autumn 2017. The exceptional cold at the beginning of the year and the warm and sunny summer created the ideal conditions for the versatile testing and control of the solar and smart thermostat system.

### Solar-heated district heating in abundance

From the end of April to the end of August, most of the office building's heating and hot water was produced by solar thermal energy. The total amount of useful heat produced – about 23 MWh – corresponds to just over 8 percent of the annual heat demand of the office building. Only part of the solar thermal heat was utilized for the property's own needs. In the spring and summer, all surplus solar heat was fed into the Ikaalinen district heating network.

The 5.7 kW electrical solar panel system integrated into the property's electricity network and its 7.2 kWh electrical storage

(battery) enable a technically efficient and flexible utilization of photovoltaic and spot electricity: Solar energy is utilized or the battery is discharged when spot electricity is expensive. The electrical storage is charged when the mains electricity price is cheap or with the solar power produced.

The final result of the Leppäkosken photovoltaic project was the development of a modern, versatile and fully automated photovoltaic and battery system that responds to the market price of electricity.

### New heat exchangers for more energy efficiency

As part of improving the energy efficiency of the property, the 20-year-old heat exchangers were also renewed. At the beginning of the year, the company also replaced all the manual radiator thermostats (around 50 units) of the water heating system in the office building with Micropelt's MVA004 remote-controlled, smart thermostats. Based on the experiences from winter, spring, summer and early autumn, the

smart thermostat surpassed all expectations in terms of reliability and controllability. Room and room-temperature control accuracy were excellent.

### Temperature difference generates electrical energy

These self-powered actuators offer several advantages. Thanks to the built-in thermoelectric generator (TEG) for power generation, this actuator requires neither cables nor batteries. The intelligent MVA004 thermostat generates its electrical energy from the temperature difference between hot water and circulating room air.

Communication between the radiator actuator and room controller/controller or a Building Management Software (BMS) is via EnOcean's standardized radio protocol. The intelligent thermostat is suitable for most water circulation heating systems and for large buildings in particular.

[www.micropelt.com](http://www.micropelt.com)

# Residential complexes

## in Prenzlauer Berg, Berlin

The residential complexes around Ostseeplatz in the Berlin borough of Prenzlauer Berg consist of six four-story apartment buildings with a total of 224 units. Until 2015, every apartment was equipped with gas heating systems on each floor or on the exterior wall. However, the maintenance and repair costs of this solution were extremely high. For this reason, a planning office was commissioned by the "Zentrum" eG residential cooperative to investigate a variety of supply systems that offered alternative and future-oriented solutions in terms of energy consumption and cost. By Uwe

Asbach, Managing Director, Riedel Automatisierungstechnik



The smart RIEcon WohnungsManager digitalizes the smallest unit of a smart building: the apartment. With the integrated individual room control, the system significantly lowers consumption costs. Residents can control all functions via the 7-inch touch display.

### Lower costs, higher efficiency

After thoroughly evaluating all the options, the residential cooperative chose to install a combined heat and power (CHP) unit with a parallel gas heating system.

The CHP unit and peak load boiler were installed in a central location for the supply area and have since provided thermal energy for heating and hot water to all homes via a district heating network.

### Smart living with RIEcon SmartBuilding

Thanks to the decentralized RIEcon energy management system, use profiles and default settings defined by the residents are aggregated for each room or apartment and the heating curve of the central heating system is continuously optimized.

For this purpose, the installed WohnungsManager (Home Manager) system communicates with all connected technical installations via cables or EnOcean wireless technology, which is a particularly interesting approach for existing buildings.





In 2015, Dr. Riedel Automatisierungstechnik installed the decentralized RIEcon SmartBuilding energy management system in the residential complex around Ostseeplatz.



For example, if the integrated EnOcean temperature sensor measures the room temperature in one apartment and senses that it deviates from the defined setpoint, WohnungsManager forwards the command to regulate the temperature to the wireless radiator valves of the heating system.

Since the system “knows” the heating requirements received from the apartments and compares them to the measured temperature, it can forecast the heat demand for the coming hours based on weather data. In some circumstances, the boiler capacity is, for example, reassessed based on the aggregated data. In this way, the artificial intelligence stored in the system makes heating regulation energy- and resource-efficient.

[www.riedel-at.de](http://www.riedel-at.de)

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Together with his business partner, Reinhard Hecker, Axel Muth has meticulously renovated listed “model homes” in Eppingen/Weststadt. Using the Zuhause (Home) platform, they have created the oldest smart building in the region – built in 1870. By Jan Frederik Harsen, Managing Director, ZP Zuhause Plattform GmbH





# Smart building system in a listed building

For more than 25 years, Axel Muth and his team have specialized in services relating to all aspects of real estate in the greater Eppingen area. As property developers, the team members offer their customers modern, state-of-the-art condominiums. Since 2018, they have been relying on the smart building system of the Zuhause platform in new buildings and in renovating old ones. Innovations are nothing new to the experienced property developers. "Back in the day, we were the first people in the region to install floor heating systems and heat pumps. Today we are the first to implement smart buildings."

## More than just a video intercom

In this smart building system, classic video terminals in the apartment are replaced by gateways belonging to the Zuhause platform. This WohnungsAdapter (Home Adapter) offers a series of additional functions. In addition to the video intercom, another important component is the digital access system, which reduces the risk and cost of lost keys for the main entrance and side doors.

Smoke detector and leak sensors that can be maintained remotely provide a comprehensive alarm system. The smart heat controller gives residents individual room control and time profiles as well as an absence mode, in which the heat is automatically lowered. Residents can also see their consumption values in real time. In addition, they can personalize their condominium even further with different added-value options and, for example, integrate blinds control into the system.

## Self-powered sensors and actuators

Because the Zuhause platform is entirely wireless, no data cables are laid inside the apartments. In addition to the wireless M-Bus (OMS) standard, the EnOcean wireless standard in particular is used for the metering technology. In new buildings, the use of wireless systems minimizes planning work. This approach is precisely what makes such installations possible in existing buildings, because no cables need to be laid. The self-powered EnOcean sensors and actuators are also ideally suited to the property management business in order to avoid new maintenance costs due to a smart building.

[www.zuhause-plattform.de](http://www.zuhause-plattform.de)





Whether it's an airport, shopping mall, residential complex with underground parking or office complex, whether it's a new or existing building, EnOcean radio field measurement makes your building ready for EnOcean.

Radio field measurement from LAE Engineering provides a detailed display of the quality of wireless coverage for each floor and room, thus making shadows caused by damping materials such as reinforced concrete walls visible. By Steffen Eiternick, EnOcean

Radio Field Measurement Team, LAE Engineering

## With LAE Engineering Ready for EnOcean



The aim of the LAE service is to speed up commissioning and save on rework. Professional radio field measurement shows where reliable radio coverage – and thus contact with all actuators and sensors with EnOcean radio technology – is available in a

building. Planners can use the results to determine where additional receivers/antennas are needed. If the results of the measurement are “full radio coverage,” customers can be sure that their building is ready for EnOcean. There is no need to remount sensors and switches.

### Verified measurement protocol as result

While still in the office, LAE checks the positioning of the planned radio radii in the floor plan. The LAE team takes shadows caused by damping materials such as reinforced concrete walls into account and includes the positions of sensors, actuators and gateways. As part of the actual on-site measurement, LAE measures and records the radio field coverage in reality. The result is a verified measurement protocol that represents radio coverage.



With radio field measurement, LAE avoids delays in the planning and construction phases. This procedure ensures compatibility and correct dimensioning.

[www.LAE.eu](http://www.LAE.eu)



# New smart repeater triples wireless sensor signal range

Pressac Communications, a UK manufacturer of smart sensor technology, has launched a wireless, low-energy repeater to triple the wireless range of EnOcean-enabled sensors over greater distances or where obstructions occur within buildings. By Jamie Burbidge, Digital Solutions Product Manager, Pressac Communications

The Pressac smart repeater is a cost-effective way to increase a sensor's range. It receives messages from EnOcean devices and then retransmits them wirelessly to any number of selected devices. It can extend the EnOcean wireless range from 30 meters up to 90 meters inside a building, depending on the configuration and the building.

Standard RF range for EnOcean devices is 300 meters within the line of sight (LoS). Once a device is installed inside a building, this may be reduced, depending on the building materials used. Using a repeater can double or, if two repeaters are used, potentially triple the distance of the signal, thus offering a low-cost way to extend the range of

devices and collect data from a wider area within a building.

The EnOcean-compliant repeater is mains powered via 5V USB and is compatible with EnOcean products. It also has an option for selective repeating, letting you choose which sensors to repeat in order to minimize unnecessary data being transmitted.

Many other repeaters simply repeat every message they receive, which then causes issues with too many messages being needlessly retransmitted. The smart repeater doesn't have this problem because it's designed with the ability to select which devices are repeated.

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[www.pressac.com](http://www.pressac.com)

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Pressac's new Smart Repeater can potentially triple radio frequency range



# Dynamic locking sensor



In just a few seconds, the sensor can be easily installed in the groove of the sash of any new or old window with two locking pieces that plug into the ends of the sensor housing. It is unobtrusive and nearly invisible when the window is closed.

## How can the sensor operate without any energy input?

The sensor has three main parts: a torsion spring, an energy generating component and a radio microcontroller.

When the sash is closed or opened, a torsion spring is activated and actuates the power generator operating on the principle of electromagnetic induction. The variation in the magnetic field of a coil – caused, for

example, by a magnet – produces an electric current.

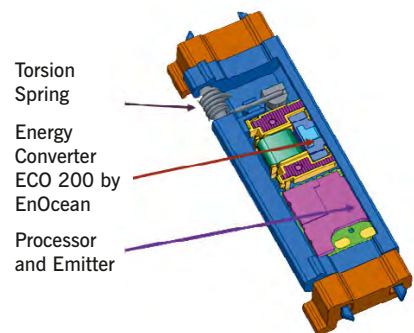
The small amount of energy generated is sufficient to power a processor and an emitter using the very low energy consuming radio protocol EnOcean.

## Simple to start up

The gateway interface – which must, of course, be compatible with the EnOcean protocol – indicates whether a device has been added. Each time the window is closed or opened, the information is sent to the gateway which transfers the data to a

In everyday life, it can be important to know if a window is open or closed, whether for security or energy management reasons. There are already some solutions available but most of them require wiring. This can be somewhat tricky, especially when it comes to modifying existing windows. Other devices operate with a battery, which requires regular maintenance in terms of replacement. That's why Hydro Building Systems (HBS), provider of aluminum solutions for building, is launching the Dynamic Locking Sensor (DLS), a wireless and energy self-sufficient sensor. By Patrick

Lahbib, Director of Innovation, Hydro Building Systems



Building Management System (BMS) or an alarm system. The user can choose to be notified via an application on a smartphone.

[www.hydro.com](http://www.hydro.com)



# More comfort in a smart building with Zigbee 3.0

ubisys has integrated the latest generation of EnOcean's self-powered switch module for Zigbee Green Power in its platform for home and building automation. This solution allows implementing a variety of convenient controls in residential and commercial buildings.

By Arasch Honarbacht, Managing Director,  
ubisys technologies

The self-powered PTM 216Z switch module from EnOcean is the first battery-free switch module that meets the criteria of the new generic switch standard in Zigbee Green Power. The ubisys smart building platform is already in use at Vivawest Wohnen GmbH and in projects of the Swedish lighting manufacturer Nokalux.

## Flexible solution for residential and commercial buildings

Vivawest Wohnen GmbH, one of the largest residential providers in North Rhine-Westphalia, is already using the Zigbee solution from ubisys with self-powered switches in retrofit projects and new buildings in the Bochum residential quarter Hermannshöhe.

Dr. Rainer Fuchs, Head of Strategy at Vivawest Wohnen GmbH: "As an innovative housing company, we did not just want to merely talk about the smart home of the future. Together with ubisys, the smart home will become a reality in rented multi-floor residential buildings in the second half of 2019. In advance, we tested three apartments in Essen with the ubisys smart home system to verify its use in existing properties.

Both sides have learned a lot, especially with regard to mapping the processes of a smart apartment's rental and management. The battery-free EnOcean switches enabled us to provide tenants with scenarios such as 'all lights off' or 'coming home' in the apartments' entrance area with minimal effort



using maintenance-free switches. For us, the latter is an inestimable advantage for long-term management."

## Lighting know-how from Sweden

The Swedish company Nokalux develops and produces luminaires for the Nordic market. With its own sheet metal and plastic processing plants, it controls the entire production chain and can therefore react very flexibly to new developments.

"At Nokalux, we had an opportunity to test the ubisys gateway and the EnOcean switch in connection with new wireless sensors from Signify in the commercial lighting space," says Håkan Jordanson, Technical Manager at Nokalux. "The system was easy to set up and group, making it usable by average end customers. They remain in full

control of their project. We see this as a nice fit for small offices and schools, with the clear potential to scale to large deployments later on."

Commercial properties, including offices, warehouses and production halls as well as hotels, schools, hospitals and other public buildings, also benefit from the extensive range of solutions that can be implemented using Zigbee components from ubisys and EnOcean – with or without connection to the cloud, whether decentralized and locally mounted or centrally managed and globally connected. The solution is easily scalable and usable worldwide, thanks to the license-free 2.4 GHz band.

[www.ubisys.de](http://www.ubisys.de)  
[www.smarthome-store.de](http://www.smarthome-store.de)



# Shining Light on the



One of the jets in the hangar at  
Wings Over the Rockies



# Impossible

The United States Air Force has a saying: “We do the impossible every day.” To showcase this incredible Air Force technology and history, the Wings Over the Rockies Air and Space Museum in Denver, Colorado provides a 182,000 square foot hanger facility filled with aircrafts, space vehicles, uniforms and memorabilia on display. Recently Energy Harness Corporation (EHC), a lighting manufacturer and nation-wide lighting distributor, upgraded the facility to modern LED lighting utilizing a self-powered wireless control system based on EnOcean energy harvesting technology. By Nicholas Lynch, Marketing Representative, Energy Harness Corporation

## LED Lighting

When the time came to upgrade lights in the main hangar, main expo center and exterior of the building, the Energy Harness team was able to successfully handle the project from start to finish. EHC lighting consultants worked with museum staff to select the most efficient Energy Harness LED products for this upgrade, and the installation team replaced the facility's outdated fixtures in a productive and timely manner.

Along with circular high bays, wall packs, flood lights and interior flat panel lights, EHC also installed wireless controls that enable the museum to adjust the light levels across the facility. The flexibility and control of the new LED fixtures provides the perfect

lighting for all aspects of what this museum has to offer. They also use about 60 percent less energy than the originally installed, traditional lighting and will save the museum over 31,000 US dollars per year. Consequently, the upgrade will pay for itself in just 26 months.

## Monitoring and Adjusting the Brightness

The converted airplane hangar has large windows which allow a great deal of natural light to shine inside the museum. This means that the lights do not always need to be powered at full brightness. To be even more energy efficient, Energy Harness teamed up with EnOcean to provide both “wireless dimming controls” and a “daylight

harvesting system”. This system measures the amount of daylight in the facility and automatically adjusts the brightness of the light fixtures to their desired strength. This feature will save the museum time and money by automatically monitoring and adjusting the brightness as needed.

The LED lighting upgrade is a huge benefit to the museum. Being selected to upgrade a facility of such significance was a meaningful opportunity for Energy Harness Corporation and EnOcean. Thanks to them, this extraordinary museum will be able to shine light on the impossible for many years to come.

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[www.energyharness.com](http://www.energyharness.com)

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# Improving hospital logistics with IoT

Not knowing where things are can be inconvenient at best. In hospitals, not having wheelchairs, beds and infusion pumps available at the right time can impede the required daily care. University Medical Center Utrecht (UMC) initiated the pilot project UFOund to tackle this problem in a user experience center. By Bastiaan de Groot, CEO, Ingy



First they tagged their equipment and connected it to a mesh network. Then they gave nurses and technical staff real-time information about the whereabouts of equipment. Better yet, they can “beep” whatever they need with the push of a button.

Having installed network “anchors” and tracking tags, they can freely experiment with moving beds and pumps around and check various setups for accuracy and robustness without interfering with daily hospital logistics. Among other things, UMC’s novel IoT-based approach toward tracking & tracing and smart lighting has caught the attention of the worldwide medical community.

**IoT playground at the hospital**  
Finding the right IoT technology for project UFOund was no easy feat. There are ample technologies to choose from. A suitable method might be using active – battery-





powered – tags that send a signal to a mesh network. By measuring the distance between the tag and a minimum of three nodes, a person can calculate the exact position using triangulation.

### Vast ecosystem

One of the results is a robust mesh network that uses Wirepas for communication between network nodes. This network technology is self-organizing and thus always up and running. It also uses very little energy in the process.

Different nodes in this setup include mobile tags and sensors for monitoring environmental factors such as temperature and CO<sub>2</sub> as well as fixed anchor nodes that automatically connect with one another.

### Smart lighting and switches

One of the potential challenges in mesh networking is the large number of nodes that

need to be installed and the power requirements that come along with it. However – as Sytze Terpstra from smart lighting provider Ingy explain explains – in the case of the UFOund project, another novel idea provided a scalable solution that would not only address power requirements but would also fully support future IoT applications.

### LED lighting infrastructure as backbone

Ingy configured all the smart LED lighting fixtures as anchor nodes. These are the fixed ceiling nodes that together form the mesh network via which the battery-powered mobile tags communicate their positions. Not only is this solution no more expensive than the normal LED lighting upgrade that was planned anyway to save on energy costs, but it also takes care of all the power restrictions.

Being mains-powered, the lighting provides a very low latency network which in turn enables the possibility of easily extending the amount of IoT applications that run on top of it.

### No external power required

One of these applications is the integration of wireless switches from EnOcean on a BLE basis. The beauty of these switches is that no power is required at all thanks to energy harvesting technology. The energy induced by pressing the button is enough to switch the light or make a “call” for assistance, a bed, or whatever function is needed.

As an added bonus, the lighting offers extra functionality such as daylight compensation, smart grouping and lighting plans based on presence or personal preferences. The presence sensor provides occupancy data that is processed and displayed in an IoT platform portal, which also captures environmental sensor data such as air quality.

Whether or not IoT projects such as UFOund will see a UMC wide rollout is up to the board to decide. The playground findings will soon be up for review.

# Human-centric lighting in nursing homes

Human-centric lighting (HCL) applies the interplay between natural light and its biological effect into all interior spaces, brings daylight to the building and supplements it with artificial light with the right brightness and color temperature for every situation.\* By Michael Lehzen, CEO, Deuta Controls

## Facts at a glance

- Automatic or situational/occupancy-dependent light switching
- Manual override or individual light scenes, e.g. for medical rounds or patient care
- Biologically active light depending on the time of day
- Plug & play solution that works even without a bus system and is therefore suitable for modernization work during operation

## Effect in the healthcare sector

Cool white light with a high light intensity of up to 1,600 lux has an energizing effect in the morning and promotes awake phases. In the evening, warm light colors below 3,300 Kelvin and reduced brightness put the body in the right mood for the night. Since people perceive light subconsciously, circadian lighting is as suitable for normal patient rooms as it is for intensive care wards and recovery rooms.

## HCL in the Stockach nursing home

The secured dementia wards of the Sonnenhalde Nursing Home in Stockach, Germany, are designed to meet the specific needs of dementia patients. The rooms are fully open and clearly organized. An inviting and comfortable ambiance, along with special attention to demand-based and situa-



tional lighting, supplements a cozy atmosphere and the safety of the residents.

## Integrated functions

The automatically controlled daylight progression with adjustable light color is of prime importance. At the technical level, DALI DT8 and integrated EnOcean Dali controllers are used, which do not require a bus cable.

## Additional functions:

- Medical rounds function for nursing staff via a self-powered remote control. The automatic function can thus be temporarily overridden in each room. Pressing "Rounds" on the remote control sets the dim level to 100 percent at 6,500 K. Afterward, the light level is returned to automatic mode either manually or via timer control.

\*Source: Licht.de

Left: The panels built into the recreation room allow the color temperature to be adjusted in a range from 3,000 to 6,000 K.





Top: Cool white light with high illuminance of up to 1,600 lux has an activating effect in the morning and stimulates the waking phases.

Bottom: A light control system for different scenes was implemented in the movie theater of the nursing home in Stockach.

- Manual adjustment of color temperature and/or dim level
- Automatically controlled daylight progression currently for 14 tunable white LED surface-mounted ceiling luminaires (DALI DT8) in seven patient rooms
- Ceiling diffuser at the luminaire, each only 230 V AC, no bus cable available
- An EnOcean DALI controller is integrated into the mounting frame of each individual lamp
- Wireless, cyclical transmission of color temperature (2,700 to 6,000 K) and dim level (0 to 100 percent) from a VL-700 BASE 1 central control unit via EnOcean

Each room has two wall-mounted wireless transmitters for switching the room lighting,

which were implemented without any means of changing the dim level and color temperature.

The number of supporting points in the central control unit can be flexibly and intuitively modified as needed. Twelve 24-hour supporting points are currently available (for dim levels and color temperature). The automatic calculation of the present values is based on the system time. The configuration can be conveniently accessed via WLAN and a web server function on a tablet or service laptop.

### Lighting conditions in the nursing home's movie theater

The nursing home had one more special objective in addition to lighting the patient rooms: When a movie is shown in the home's theater, four of the twelve hall luminaires also need to be dimmed independently

of the rest of the hallway to avoid glare in the theater. In this case, a conventional approach would have meant significant costs for a wired solution.

An EnOcean DALI controller was therefore integrated into the mounting frames of each individual luminaire. Wireless switches in the room now allow the "Theater" and "Automatic" as well as "All off" scenes to be selected.

**"Theater" scene:** Dims the room light and assigned hall luminaires to a 5 percent dim level; motion sensors for the hall luminaires are passive.

**"Automatic" scene:** Room light at 100 percent, motion sensors in the hall for all hall luminaires are (re)activated.

**"All off" scene:** Room light is turned off.

[www.deuta-controls.net](http://www.deuta-controls.net)  
[www.eiko-europe.de/en](http://www.eiko-europe.de/en)

# Turn on the lights with an accessible click

A self-powered EnOcean switch controls the LED light on HEWI tilting mirrors via Bluetooth

HEWI offers its new LED Plus tilting mirror with a self-powered EnOcean wireless switch. It meets HEWI's high standards for accessible, retrofittable solutions, thanks to maintenance-free energy harvesting technology and flexible positioning.

By Christiane Strathaus, Product Management, HEWI

HEWI, a global supplier of hardware and sanitary systems, has combined its latest LED Plus tilting mirror with a self-powered EnOcean wireless switch as an innovative solution for the bathroom. Users can thus control the LED light via Bluetooth with a single click for flexible and individual placement. The maintenance-free and wireless switch fits perfectly into HEWI's product strategy for accessible and easily retrofittable solutions.

## A tilting mirror with individual light functions

Tilting mirrors are used primarily in renovations of existing buildings. Their tilt mecha-

nism makes them especially suitable in assisted living situations for seniors or people with limited mobility. To increase user comfort even further, HEWI has added integrated lighting to its new Series 801 tilting mirrors. Users can flexibly adjust the light on the mirror according to their individual needs. In addition to the steplessly adjustable light temperature from warm white to cool white (3,000 to 6,500 Kelvin), the light intensity can also be dimmed. The self-powered EnOcean switch does it all.

## Control via the Casambi network

The LED Plus version of the tilting mirror integrates a Drees control unit with a Casambi

module. This module receives and processes the Bluetooth signal from the self-powered EnOcean switch whenever the pushbutton is pressed. The switch is connected to the control unit and also trained to it ex works, so that the user can begin using it immediately after mounting the mirror. If a Casambi network already exists, or if the user would like to control the mirror from the Casambi app, the app can be downloaded free of charge and used to control the mirror lighting – in addition to the switch.

[www.hewi.com](http://www.hewi.com)



# Behind the scenes at a Spa

The well-known Prättschli winter sports hotel reigns supreme high above the Swiss ski resort of Arosa. During the course of modernization work, an alpine spa was added whose lighting, shading and room heating functions are controlled via the Omnio wireless bus system. By Beat Zbinden, Product

Manager Omnio, AWAG Elektrotechnik AG

The 650 square-meter wellness and beauty area of Hotel Prättschli in Arosa was completely redesigned. It has been outfitted with a wellness pool, a steam bath, a sauna and a relaxation room with a view of the surrounding mountains. A gym with highly efficient equipment is also available.

## Preconfigured scenes

The designers decided to do without a local means of control and instead have the entire system controlled centrally from the utility room, using EnOcean wireless switches. The different operating states, such as "day mode," "reduced day mode," "night mode," "cleaning" and "off" are configured as scenes and can be comfortably selected at the press of a button.

The lights are controlled with a DALI controller that has an EnOcean interface, while the universal Omnio REG switch actuators are used for the outdoor lighting, the stylish pendulum lamps and special devices, such as illuminated shower heads and display cabinets.

## Smart shading

The Omnio venetian blind actuators are distributed locally within the particular blind boxes, which greatly simplifies the installation work. A single ring feeder in the outer facade supplies electricity to all blind motors. To prevent the south-facing rooms from overheating in summer, the blinds move into a defined shading position when the sunlight is too intense, controlled by the Omnio weather station.

Due to the size of the spa area and the strong signal attenuation of the special glass used for the window facade, communication takes place via a total of five RS485 gateways. These gateways are interconnected via proven, bidirectional Omnio E-Bridge technology.

[www.omnio.ch](http://www.omnio.ch)







# The house that's built smart from the start



The alarming scale of the housing shortfall in urban areas worldwide means we need to build houses more quickly and at lower cost than ever. New builds also need to embody the intelligence to suit modern lifestyles, from millennials' always-connected automation to cognitive homes for an ageing population. Fortunately, the combination of modular factory construction, flexible smart-home ecosystems and energy harvesting wireless technology is ready to meet the challenges. By John Corbett, Sales Director Northern EU and Middle East,

EnOcean



Modular buildings are based on a combination of building technologies known as “Modern Methods of Construction” (MMC). Typical elements include the use of panelized systems and volumetric elements such as roof and floor cassettes, pre-cast concrete foundation assemblies, pre-formed wiring looms, mechanical engineering composites along with innovative techniques such as tunnel form or thin-joint block work.

### Modular housing concept

Already popular in Europe, the UK is using MMC to build prefabricated, fully fitted, modular homes that can be loaded onto trucks for delivery across the country. Factory building onsite assembly allows houses to be completed in days instead of months, and at significantly lower cost.

need to be wired-in, instead sending a wireless signal to the receiver in or near the light or DIN rail fitting. Furthermore, there is no need to use batteries – and no need to replace them – saving all the inconvenience and environmental harm that battery replacement can cause.

### Wide range of applications

Such devices enable a wide range of applications. Lighting and home entertainment are obvious candidates for battery-free switches. As well as controlling light levels and color, self-powered switches can also be used for controlling sound system volume or window shading.

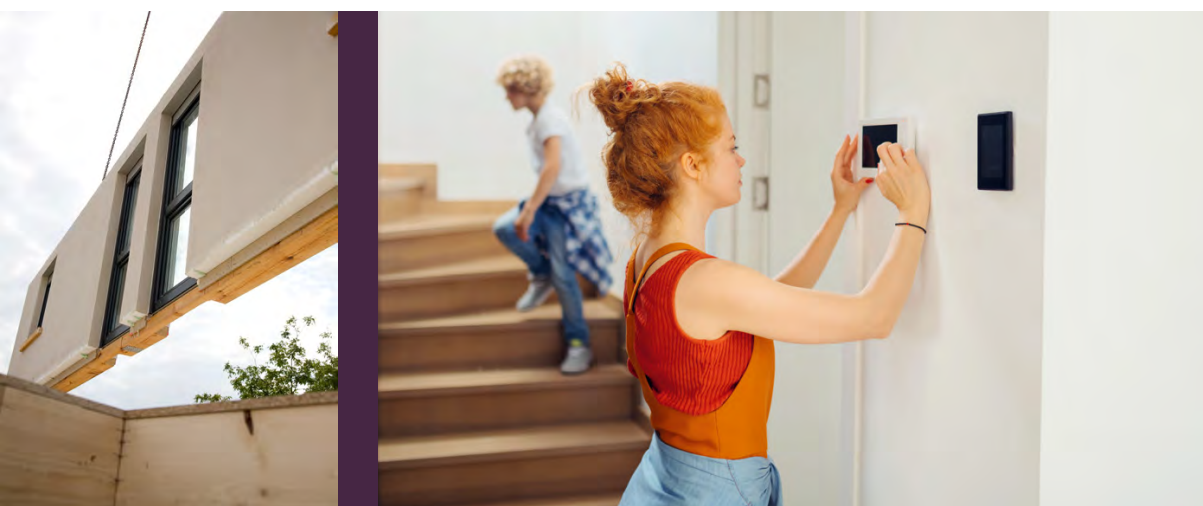
A key application for smart homes is an “all off/all on” switch which allows turning off/on

buildings, with short encrypted messages sent via the international EnOcean wireless standard.

There are also self-powered devices integrating EnOcean's energy harvesting technology that communicate directly with lights via Bluetooth® or Zigbee.

### From smart homes to intelligent ones

Now that energy harvesting wireless sensors can gather data in the home, it is not a great leap to communicate the information, aggregate it and perform useful analyses. Bringing data together via the Internet of Things (IoT) enables a holistic approach, using artificial intelligence (AI) to track patterns of occupancy and activities in the modular home.



The only solution to meet the housing shortage is modular housing based on factory automation principles. It's a solution that dovetails perfectly with home automation using wireless and battery-free energy harvesting controls and sensors.

Affordable and sustainable modular homes are more than boxes to live in. A combination of innovative product technology and good design puts the focus back on safety, security, comfort and the lifestyle needs of the owner.

### Automation built in

A common requirement is to place lighting switches and dimmers where they are most convenient. Powered by the kinetic energy harvested from the switch operation itself, these can be placed anywhere. They don't

all non-essential electrical consumables when leaving the home or returning.

Energy harvesting technology also enables other applications such as intruder alarms, smart heating control, flood detection or CO<sub>2</sub> check.

### Several radio standards supported

Most energy harvesting sensors, switches and other self-powered devices communicate over distances of up to 30 meters in

With exciting technologies like energy harvesting wireless devices, modern factory-built homes are set not only to meet house-building targets but improve our way of living in them as well.

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[www.enocean.com](http://www.enocean.com)

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# Battery-free EnOcean push-buttons in Feller designs

The future belongs to intelligent buildings interoperability. Feller AG has been a member of the EnOcean Alliance since 2018 and has now launched the first battery-free pushbuttons in Swiss EDIZIOdue design.

By Niko Ryhänen, Future Offer Senior Manager, Feller AG



## A variety of colors thanks to EDIZIOdue design

The pushbutton can be seamlessly integrated into existing EDIZIOdue designs, with a range of twelve colors to choose from. In order to achieve an even more exclusive design, the pushbuttons can be combined with fifteen high-quality frames of the finest materials – including glass, chromium steel or brass.

## Customer-specific labelling

Another design element is individual labelling which makes the pushbuttons even more user-friendly. Professional customers can easily label the Feller EnOcean wireless pushbuttons according to customer requirements using a labelling tool.



Feller AG has launched the battery-free Feller EnOcean pushbutton in EDIZIOdue design, extending the company's own Connected Home ecosystem.

## Easy to integrate

Thanks to the open EnOcean protocol the Feller EnOcean pushbuttons can be integrated into various systems, such as Feller's logic controller fellerLYnk and KNX, to form a system solution.

Feller EnOcean pushbuttons are also perfect for retrofits. An existing Feller installation can be easily updated with Feller EnOcean pushbuttons without new flush-mounted wall boxes. This makes integration fast and easy.

## Smart Light Control for Philips Hue

Along with the EnOcean pushbuttons, Feller AG has also launched Smart Light Control by Feller for the operation of the smart LED lighting ecosystem Philips Hue by Signify. With these two new battery-free pushbuttons, Feller is constantly expanding and developing its Connected Home ecosystem.

[www.feller.ch/hue](http://www.feller.ch/hue)





Lighting technology

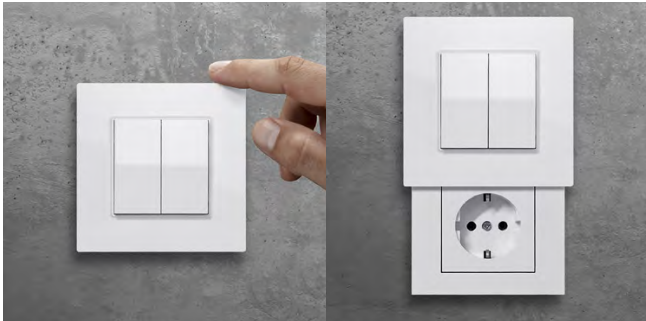
# The hidden socket

## with a Friends of Hue switch

Modern lighting systems no longer merely allow light to be switched but also to be controlled. The most comfortable way to do this today is by radio – without any cables. Builders can thus replace conventionally wired light switches with modern, multifunctional wireless ones during renovations. This allows cables that are no longer needed for switching lights to be freed up for other functions. But what to do with the now unused cables? By Gerald Gummert, OEM Manager, TCS AG

### The hidden socket

The “hidden socket” was developed precisely for this evolutionary step away from wired technology to wireless systems. The patented product combines a self-powered wireless light switch based on EnOcean technology with a normal socket. It is currently already available for the Philips Hue lighting system.



The hidden socket opens automatically in response to light finger pressure.

### Benefits for the user

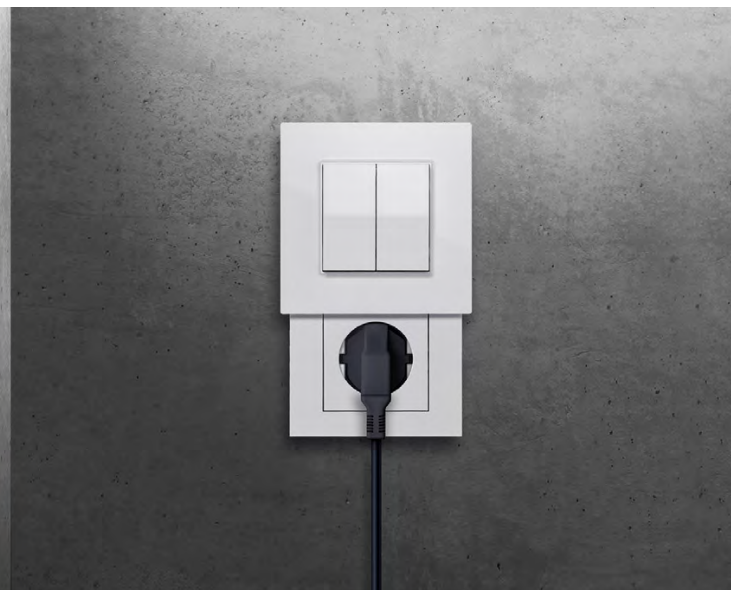
When mounting the hidden socket on the flush-mounted box of an existing conventional light switch, the free cables are used for an additional socket. The wireless light switch can be freely configured with switching and control functions of the Hue system. It has a movable bearing that covers the socket, which is used only temporarily. A modern wireless light switch thus helps solve a widespread problem: not enough power outlets. When installing additional sockets, no structural changes need to be made for the most common cabling types.

The hidden socket is available with several European outlet types. Additional versions with a charging function for mobile devices and lockable service outlets are being planned.

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[www.dieversteckdose.de/hidden-socket/](http://www.dieversteckdose.de/hidden-socket/)

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# Retrofitting buildings with voice assistants makes them smarter

Speech is the natural means of communication between people, so it's no wonder that voice assistants such as Google Assistant are enjoying increasing popularity worldwide. BAB Technologie offers Google Assistant Integration for its APP MODULE, a solution for controlling smart homes and buildings that is easy to install even as a retrofit. By Günther Ohland, GO Redaktionsbüro

Many people, especially elderly homeowners, dream of the day when they can simply use voice commands to tell their house or apartment what to do. The desire for more comfortable living is just as good a motivation as the desire for an operating aid to assist with physical limitations. Instead of flipping a switch on the wall, all you need to do is say, "Hello Google, lower the blinds in the living room," thanks to the voice assistant. Of course, the voice assistant can't do this all on its own. It also needs an electric blind drive, associated control electronics and a smart home system.

## The technological backbone

With its APP MODULE and APP MARKET applications, BAB Technologie now offers the right solution for new installations as well as retrofits of existing smart homes. APP MODULE – a rail-mounted element – works not only with EnOcean components but also with KNX and many IP-based components. As a result, actuators, dimmers, roller/venetian blinds, temperatures, LED colors and color temperatures can be controlled via voice commands even in

long-standing buildings with building automation based on EnOcean technology or KNX.

## Light switches and voice assistants as a future-oriented duo

A voice command system will not replace the light switch, because even visitors need to be able to get their bearings without any technological barriers. However, locally operating lights and venetian blinds or calling up light scenes on a smart phone makes less and less sense, thanks to voice assistants. Just the ability to add voice assistant control to existing systems has met with a great deal of interest on the part of many homeowners.





# Pilot wire

## heaters are turning smart

Those who heat their rooms efficiently in winter can save enormous costs. The new Pilot Wire Heating Module from NodOn with EnOcean technology comes at just the right time. By Coralie Feillault, Marketing & Communications Project Manager, NodOn

### Wire it and it will transform a pilot wire heater into a smart heater

It can transform any pilot wire heater into a smart heater. With its six modes – comfort, comfort -1°C, comfort -2°C, eco, no frost, stop – users can automatically or remotely change and adjust the temperature in a room. The Pilot Wire Heating Module uses the latest EnOcean technology and features and can be controlled via an EnOcean remote, sensor or home automation gateway. Smart but invisible, the module is wired behind the pilot wire heater grommet. It is invisibly and easily installed in the wall and doesn't require any construction work.

### 6 modes for user comfort and energy savings

Connect it to a smart ecosystem and it will adapt itself to the situation. Paired with an EnOcean door window sensor or a motion sensor, the Pilot Wire Heating Module is perfect for saving energy and avoiding heat loss in homes, offices, schools and more. Its mode will change from eco to comfort when a person enters a room, or from comfort to eco when a window is suddenly opened.

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<https://nodon.fr/en/>

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#UpgradeYourHome:

# JÄGER DIREKT's **new** service to upgrade your home with **no renovation work**

Under the hashtag #UpgradeYourHome, JÄGER DIREKT is offering smart home users a new comprehensive service. It is specifically designed for home owners and Apple users who want to choose the easiest way to create a smart home and turn their house into an Apple HomeKit™ home. The highlight of this service is that, for a fixed price, the system can be upgraded without any renovations in just one day.

By Christoph, Klee, Marketing Director, JÄGER DIREKT

The package solutions offer increased security, comfort and energy efficiency at home and are based on OPUS greenNet. This means JÄGER DIREKT is the first and so far only company on the market to sell a range of flush-mounted switches with “Works with Apple

HomeKit” certification and based on the EnOcean wireless standard. The OPUS SmartHome Gateway connects the networking protocol to Apple HomeKit. The EnOcean wireless technology enables devices to be controlled wirelessly from wall transmitters that can be freely positioned.

The system, which grows flexibly and entirely according to the needs of each homeowner, has also impressed experts. In May 2019, SmartHome Initiative Deutschland presented OPUS greenNet with the SmartHome Deutschland Award 2019 in the “Best Product” category.

As part of the new service, JÄGER DIREKT will do all the heavy lifting for homeowners and Apple users. Once users contact them, the company from Hesse in Central Germany will find planning partners and smart home designers to check the initial state of the wiring at their home, create a customized plan and perform the required upgrade at a guaranteed fixed price.

[www.myOPUS.eu](http://www.myOPUS.eu)







Open Lab Smart Home — Vimar focuses on

# interoperability

“Open Lab Smart Home. Living in the future with the smart objects of today” is the name of a project initiated by the IoT LAB of Milan Polytechnic University. The goal is to show how important the interoperability of different technologies and smart devices is for the growing smart home market. By Alessandro Ravagnin,

Systems Marketing Manager, Vimar

Vimar took part in the project with enthusiasm, providing a number of smart devices for the project – in particular, the wireless switches for controlling the wireless Philips Hue lamps, based on energy harvesting technology from EnOcean.

The wireless switches are the perfect interpretation of the philosophy underlying the Open Lab Smart Home project, overcoming one of the main obstacles of smart home technologies: the interoperability of devices from different manufacturers.

The Vimar wireless switches operate perfectly with all the products of the main players in the lighting design sector, enabling the direct control – also via app – of smart lamps.

Thanks to the wide range of design options that perfectly match the Eikon, Arké and Plana series in terms of personalized shapes, materials and colors, the wireless switches blend harmoniously into any living area.

The wireless switches can be placed almost anywhere – even on glass or wood – and offer maximum installation flexibility with no need for masonry work and without having to repaint walls. This is because they don't require any cables. The signal is transmitted via radio and the switches generate the required energy by simply pressing a button. This means that even batteries are unnecessary, so there is no need to replace or dispose of them.

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[www.vimar.com](http://www.vimar.com)

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# Pop the corks – celebrating the 10-year partnership between Katek and EnOcean

In looking back on the early days of collaboration between the two companies, one thing becomes clear: Their shared journey has been on a rapid upward trajectory for the past ten years. This is reason enough for a small celebration at the Grassau factory in Chiemgau, Bavaria. By Andreas Kreckl, Head of Manufacturing, EnOcean

The Bavarian backdrop with its mountain panorama is in stark contrast to the Katek Group's international orientation. With what are now 12 locations and approximately 2,300 employees, Katek is one of Europe's leading electronics service providers. Its range of services covers the entire lifecycle of electric assemblies and devices, from development and prototyping to material and project management, from electronics production, box-build, testing technology and logistics to after-sales service. Katek has now been manufacturing EnOcean products in its production halls for ten years.

## Made in Europe

EnOcean relies primarily on Germany as its production site. Along with quality standards, the company's proximity to its customers is a crucial factor. With Katek by its side, EnOcean can focus on individual customer requirements and produce, for example, everything from individually packaged modules to rollstock, with a daily output of 10,000 units. A higher degree of

automation offsets higher labor costs, while the consistent adherence to project deadlines and schedules also saves money.

In addition to its manufacturing operations in Grassau, Katek also produces EnOcean products in Hungary. This is the best way to head off sales peaks and enables EnOcean to respond extremely flexibly to different customer requirements. The second manufacturing plant is also designed to protect against the risk of downtimes in its German counterpart.

## Turning two into five

Although Katek initially focused its manufacturing operations on two radio frequencies







for EnOcean sensors for Europe and the United States, today the company offers five frequencies, including Bluetooth® and Zigbee. In keeping with EnOcean's market success, the manufactured product families have multiplied, and the number of units has tripled in absolute terms.

### White label products

In addition to its classic module business, EnOcean has increasingly been developing white label products in recent years, such as solar-operated presence detectors and window contacts.

Manufacturing these end products represented a milestone in the collaborative relationship between the two companies, because a completely new production line was needed to reliably manufacture the products in the customary quality. This resulted in new testing and assembly concepts as well as packaging solutions.

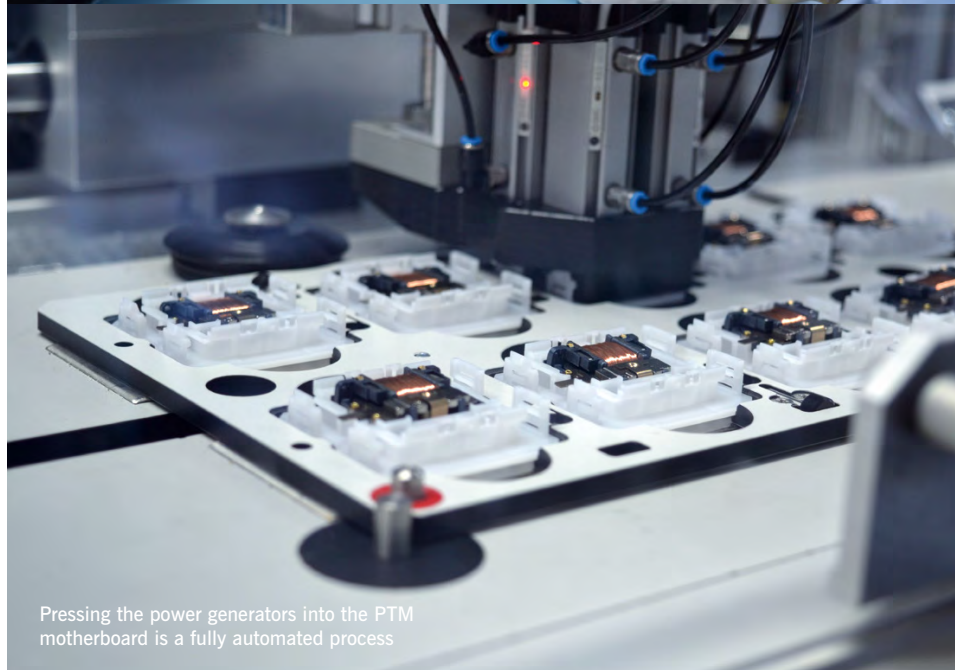
### Partners for every eventuality

In the future, Katek and EnOcean's collaborative efforts will be even more focused on supply chain management (SCM). Katek already provides warehousing and shipping services in addition to manufacturing. As part of their design-to-manufacturing and design-to-test methods, Katek and EnOcean are already working on early product development to meet project targets. They will focus even more attention on this collaboration in the future in order to design production lines accordingly.

[www.katek-group.com](http://www.katek-group.com)  
[www.enocean.com](http://www.enocean.com)



The PTM switch module is the heart of any self-powered switch. On the production line, the individual stations are linked via a conveyor belt.



Pressing the power generators into the PTM motherboard is a fully automated process



The final steps prior to testing: pressing the pre-assembled motherboard with the cap

# EnOcean products



Bluetooth®



zigbee

EnOcean offers maintenance-free wireless sensor solutions for self-powered applications in the Internet of Things that are used for building and industrial automation, smart homes and LED lighting control.

868 MHz products:

EnOcean for Europe and other countries adopting R&TTE/RED specification

902 MHz products:

EnOcean for North America adopting FCC/IC specification

928 MHz products:

EnOcean for Japan adopting ARIB specification



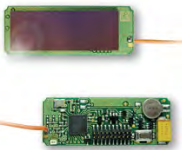












2.4 GHz products:

for Bluetooth® and Zigbee networks (worldwide)

Energy harvesting wireless modules  
for maintenance-free sensor solutions



## EnOcean

				
				
Energy converter	For battery-free wireless switches	For energy harvesting wireless sensors	For controllers and actuators	Tools
				

Finished products for wireless and self-powered IoT and lighting systems

## EASYFIT

by EnOcean

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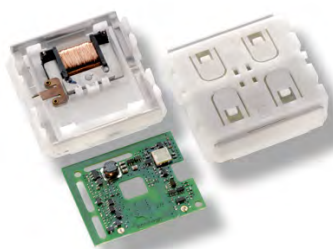
# Curtain up!

## The next product generation takes center stage

By Matthias Kassner, Vice President Product Marketing, EnOcean

### Self-powered PTM switch module now comes with NFC and encryption

With the PTM 210 switch module, EnOcean has established an industry standard that is at the heart of every self-powered switch.



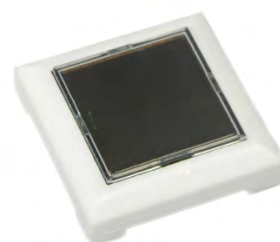
The new generation of PTM switch modules for the EnOcean wireless standard meets the latest security standards of the EnOcean Alliance and also integrates an NFC (near-field communication) interface. This means that self-powered switches can be commissioned even faster and more easily in the future with the aid of NFC readers as well as NFC-enabled smartphones or tablets.

The new switch module is remarkable for its cutting-edge security features, which can be activated and configured from an app without necessitating the removal of the module from the switch housing. Even already installed switches can be configured via the app.

The new features don't change the successful PTM form factor in any way. They continue to fit all common switch designs for the self-powered control of smart homes or buildings. The new PTM is expected to be launched by the end of 2019.

### New multisensors for the IoT and building automation

Based on the PTM, EnOcean has developed new solar-powered and maintenance-free sensor modules that have the same form factor as the PTM switch module, including the standardized mounting interfaces and the NFC interface.



The new sensors can be used in many different ways for typical building automation tasks including, for example, detecting temperature and humidity or measuring light intensity. They can also supply information on the current internal energy level and provide details about the light available to the solar cell.

In addition, there will be a module version with an integrated acceleration sensor for IoT applications that can incorporate almost unlimited digital assets into the Internet of Things by acting as an "activity tracker."

The sensor modules obtain the energy they need from the integrated solar cell and can remain active for up to four days even without a power supply, thanks to an energy store.

The new solar module family will support the EnOcean wireless standard as well as Bluetooth® and will be available in early 2020.

[www.enocean.com](http://www.enocean.com)

# EnOcean with new salespeople

Three in one go – this was the motto of EnOcean's sales team expansion in 2019. By Andreas Schneider, Managing Director, EnOcean



In the United States, **Dennis Fairfield** is joining the East Coast sales team. With his many years of expertise in control and networking, he will drive EnOcean's rapidly growing IoT business forward.

**Simon Johnson** has also recently come on board. Together with John Corbett, he covers the United Kingdom. In particular, the ongoing boom in modular and prefabricated homes, and their integrated smart systems



are cranking up the demand for self-powered wireless switches and energy-autonomous sensors.



For the first time, EnOcean has a sales manager on its team who focuses on the Nordic countries. **Niels Ernst** handles EnOcean business in Denmark, Sweden, Norway and Finland. The region offers excellent market opportunities. High payroll and energy costs along with enormous innovation potential are ideal requirements for maintenance-free and self-powered EnOcean products.

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## MASTHEAD

perpetuum – the innovative magazine for customers and partners of EnOcean GmbH  
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Published by: EnOcean GmbH, Munich,  
Andreas Schneider, CEO  
Edited by: EnOcean GmbH, Veronika Bliem,  
Communications Manager, [veronika.bliem@enocean.com](mailto:veronika.bliem@enocean.com)

Concept and design  
[artcollin Kommunikationsdesign](http://artcollin.com), [www.artcollin.de](http://www.artcollin.de)

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Nadine Kernchen (for EIKO-Europe GmbH 2019): p38-39 common room, hospital room, theater,  
Rajo Knobloch: p26-27  
Sauter: p18 (EnOcean-based sensor)

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Frequency: Semi-annually  
Reader's service: [perpetuum@enocean.com](mailto:perpetuum@enocean.com),  
Phone: +49 89 6734 689 0

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The Deutsche Nationalbibliothek has archived the electronic publication "perpetuum international edition" which is now permanently available on the archive server of the Deutsche Nationalbibliothek +++ ISSN 1862-0698

perpetuum 1 | 2020 (German & English)  
appears in March 2020  
Editorial deadline: November 2019



# Overview of the EnOcean Alliance members

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... and more than 200 associate members



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ViSENS



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