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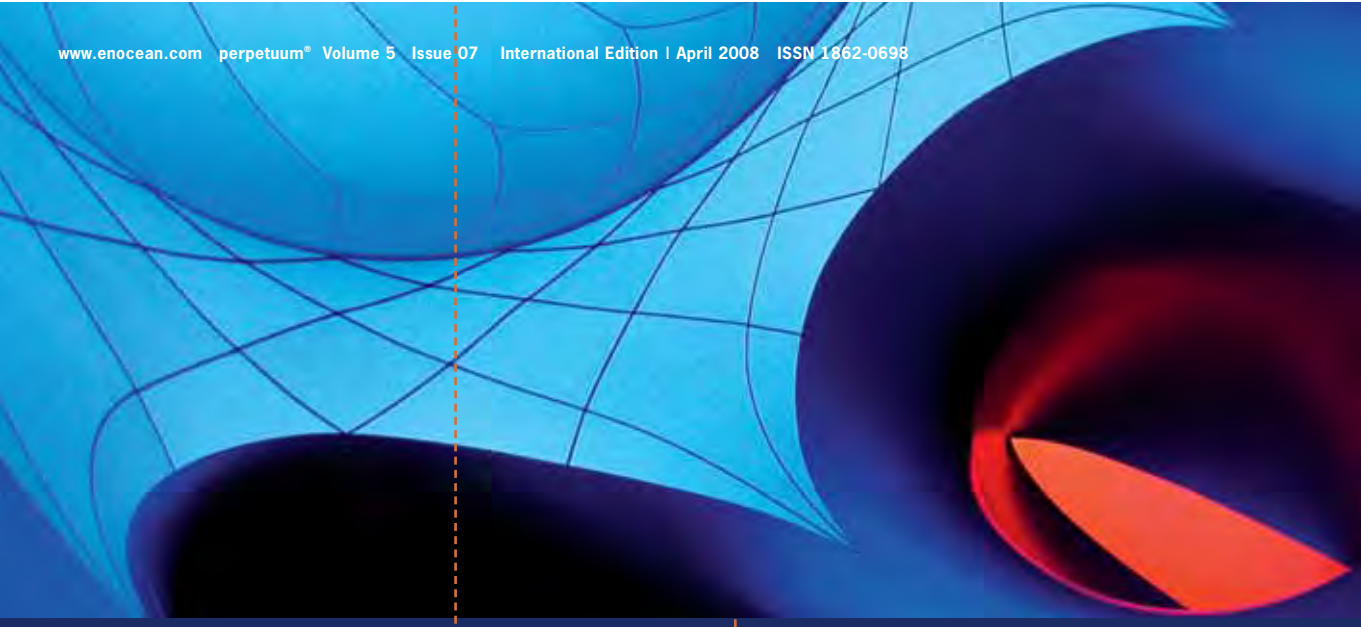

ENABLED BY ENOCEAN

perpetuum®

MAINTENANCE-FREE WIRELESS SWITCHES & SENSORS

07

INTERNATIONAL EDITION

REVOLUTIONARY
EnOcean bidirectional

INNOVATIVE
315 MHz product family is coming to the Americas

ENABLED BY ENOCEAN
Torre Espacio: Optimally managed for optimal savings

NETWORKED
EnOcean Alliance

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+++ **NEWS** +++ EnOcean easyfit wins Innovation Award in bronze across all categories at Batimat 2007 international building exhibition in Paris +++ **NEWS** +++ EnOcean wireless sensors among BuildingGreen Top-10 Products for 2007 +++ **NEWS** +++ "Best innovation in green product or service" among Working Buildings Week awards 2007 +++

Building Automation 

Industrial Building 

Refers to all applications 

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Dear readers,

The cost of energy continues to increase, the oil price has hit more than 100 dollars per barrel, and nearly every day we're confronted with devastating news in the media. Is everything so terrible? Really everything? What about considering new business opportunities instead of complaining?

It's a known fact that building automation saves about 30% of energy by intelligently controlling light, heating or air-conditioning. Nonetheless, automation is still regarded as a luxury and only goes into a fraction of new building projects – almost entirely functional buildings.

So what does it take to be successful in this sector? To begin with, the customer must be convinced of the technical maturity of the solution. I reckon – 25 years after introduction of the first automation systems – that this point has been taken care of.

Cabling was always a big obstacle in the case of renovation and refits. This situation is also very much improved since the introduction of self-powered wireless sensors to the EnOcean standard. Cabling is reduced by as much as 70%.

And finally the major obstacle: the solution has to be economical. And that depends to a large degree on alteration costs and energy savings. Statistically seen, an office building in Europe is completely altered every seven years. That used to mean recabling all sensors (switches, thermostats, etc). Here the use of self-powered wireless sensors cuts costs by more than 80%.

The biggest argument is the energy savings. As the price of oil increases, the time for an investment to pay off reduces to between two and four years. When you can show that it's below three years, the probability of selling your product takes a sharp upturn.

Major trends today contribute to a change of thinking. HVAC is usually automated separately from lighting control. But increasingly powerful computers or controllers and communication networks mean that it's no longer necessary. Shared systems reduce the cost of first-time installation and simplify system upkeep for the operator of a building.

The introduction of energy performance certification in Germany, for instance, will create greater transparency – many tenants will realize the poor energy efficiency of their rented property, and be more receptive for investment in automation when it's time for the next alteration or renovation.

Markus Brehler,
CEO and Founder, EnOcean GmbH

ENOCEAN BIDIRECTIONAL

Many might think – wrongly as it happens – that self-powered wireless sensor technology is only unidirectional. In fact the EnOcean standard goes a whole lot further than established, batteryless and unidirectional technology. Bidirectional system components are already being used for reliable wireless supply and in multifunctional gateway solutions. Soon we will see bidirectional sensors without batteries, such as interior home sensors with a display. Even actuators without cables and batteries are possible. Here you can read how this will work.

By Armin Anders, Head of Product Marketing, EnOcean GmbH

CLASSIC UNIDIRECTIONAL WIRELESS TRANSMISSION

This is optimal for simple switch applications, and also for sensors of slow processes. When a light switch is operated for instance, the response must be very fast otherwise the user thinks something is wrong – they press the switch again and, unintentionally, turn the light off.

Unidirectional transmission of a wireless signal – redundantly repeated three times in a short space of time the EnOcean way – produces the same security as alternative bidirectional transmission. Typical bidirectional systems also stop repeating after three unsuccessful attempts. Because then, at the latest, the probability is very high that the signal is not arriving. The receiver may no longer be within range for example.

In the case of sensors for slow processes, such as those for room temperature, the periodically transmitted life telegram produces extra security. If a single transmission is fully disturbed, the measured figure is transmitted with the next cyclic life signal and appropriately processed.

The combination of spontaneously transmitted unidirectional telegrams with redundant repetition and a periodic life telegram for sensors consequently leads to optimal security with extremely fast response times.

EnOcean SMART ACK enables self-powered wireless sensors with display and data return channel.

WIRELESS COVERAGE IN BUILDINGS

Extensive investigations have shown that in typical home building, and in commercial buildings within a fire compartment, wireless transmission from sensor to receiver should not have to cover any significant distance.

That makes repeaters the ideal approach in a building – plug & play installation without any learning procedure and the availability of redundant wireless routes without bothersome switchover time are the advantages of repeaters when it comes to extending radio range. The requirements are essential in particular for mobile wireless nodes such as remote controls – a concept that EnOcean calls SMART ROUTING.

EnOcean wireless telegrams are extremely short, so a number of repeaters can be installed in a building without significantly increasing collision rate, i.e. interference through signals transmitted on the same frequency.

BIDIRECTIONAL WIRELESS TRANSMISSION

Bidirectional wireless components are basically nothing new for EnOcean. Repeaters receive weak wireless telegrams and retransmit them with the original transmitting power to increase the range. In the meantime there are also a number of bidirectional wireless gateways that both collect the signals of sensors and drive wireless actuators. Wireless gateways create connectivity of EnOcean with established building automation systems like EIB/KNX, LON, TCP/IP, BACnet and DALI.

BIDIRECTIONAL SELF-POWERED WIRELESS SENSORS – SMART ACK

Other applications require some form of checkback on the sensor. The state of a window may have to be indicated on a room sensor for example, or the reception/control center may want to reset a room sensor when a guest checks out of a hotel. Perhaps a sensor should have a display on which a centrally determined figure like the current time is to be shown.

This calls for bidirectional transmission. The wireless sensor sends its measured figures as in unidirectional transmission, but in this case only once. Instead of the second redundant transmission the sensor gets a signal back from the receiver to acknowledge reception, this also containing the required data. In terms of energy it is irrelevant whether the sensor transmits a second time or receives instead in the same time. This

Bidirectional SMART ACK enables self-powered wireless actuators that harvest their energy from the surroundings.

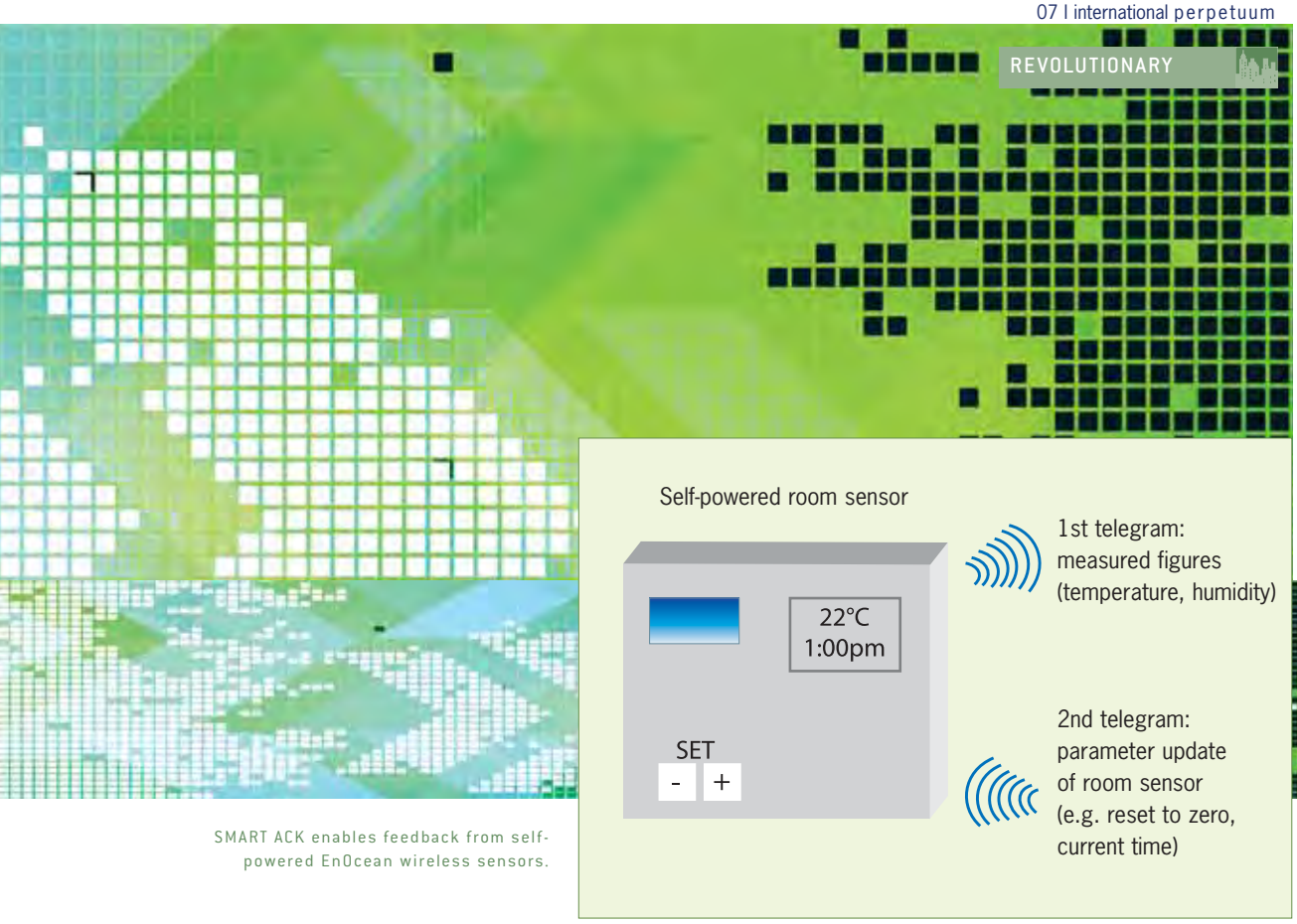
principle – SMART ACK – enables self-powered wireless sensors that work bidirectionally. Of course the self-powered wireless sensor needs a device that can both transmit and receive: an appropriate sensor module with transceiver functionality named STM 300 is currently being developed.

WIRELESS ACTUATORS WITHOUT BATTERIES – ANOTHER RESULT OF SMART ACK

Remotely controlled actuators usually need a cable on which the controlled power supply is fed to it. But there are also uncabled, i.e. wireless, solutions, controlled by radio signals and powered by batteries. A heating valve needs quite a lot of energy for adjustment, so its batteries will have to be replaced every year on average. Battery-powered wireless solutions are consequently only suitable for small, local installations in the private sector.

The name EnOcean stands for self-powering, i.e. no batteries. The energy needed is drawn from the process itself or the environment. So what could be better in the case of heating than to harvest the energy from the heat given off by a radiator? What makes this possible is a socalled Peltier element (named after Jean Peltier, 1785-1845), an electronic component that produces a difference in temperature when current flows through it. Conversely it is possible to produce electric current by creating a temperature difference between the two sides of the component (Seebeck effect, thermogenerator).

The actuator consists of the motor for valve control and the electronic circuitry to receive the control signals and drive the motor. Both the motor and the wireless receiver need a relatively large amount of energy to operate. A basic premise of EnOcean technology is to operate energy-consuming components on average for only a very short time, and otherwise always to cut them out. A permanently running wakeup timer is designed to be ultra-low-power, and wakes up the processor from time to time. The latter inquires through the wireless transmitter of a central point whether there is a requirement for action. The actuator receives the answer in a precisely defined time slot. Possibly the valve will be speedily adjusted, and then the actuator drops back into its energy-saving sleep for a certain time. The total energy requirement of the actuator is very small as



SMART ACK enables feedback from self-powered EnOcean wireless sensors.

long as the sleep phases dominate on average. The principle of communication between a self-powered actuator and a central point is identical to the bidirectional wireless communication SMART ACK, described above, between a central point and a self-powered sensor.

BIDIRECTIONAL SYSTEM ARCHITECTURE – DOLPHIN

The concepts named here are part of the sophisticated EnOcean system architecture called DOLPHIN, which is now being successively expanded. Numerous new functions will be presented, maintaining full downward compatibility with EnOcean units and systems already on the market. DOLPHIN is a flexible, open-ended hardware and software architecture, especially intended to meet the more demanding requirements of building engineering – for energy saving, enhanced convenience and security, for access control and metering of various kinds of consumption data.

The hardware core of DOLPHIN is a single chip, currently under development, with integrated microprocessor, extensive periphery, application-programmable memory and the entire ultra-low-power management for self-powered wireless sensors – an enormous step towards reducing energy consumption compared to all existing solutions. Based on the DOLPHIN chip, cost-attractive plug & play modules are currently being developed for straightforward startup and system integration.

Comprehensive DOLPHIN software libraries will enable very easy programming of applications in a high-level language on the basis of model programs. So the user will have no worries concerning interoperable wireless communication for instance, ID administration, energy management, data encryption, repeating or even routing. The user can simply link the given function macros in their program, which is later saved in the DOLPHIN hardware. Development tools will be available, specially matched to the chores of startup, programming and system integration.

INNOVATIVE

RoHS COMPLIANT 2002/95/EC

OVERVIEW OF ENOCEAN 868 MHZ MODULES FOR GENERAL APPLICATIONS

MODULES & COMPONENTS

PTM 200 – THE ULTRATHIN MINIATURIZED SWITCH MODULE

- Maintenance-free powering by finger pressure
- Optionally 1 or 2 rockers or up to 4 pushbuttons
- Dimensions 40 x 40 x 11.2 mm
- Actuating travel 1.8 mm
- Actuating force approx. 7 N

ECO 100 – ENERGY CONVERTER FOR LINEAR MOVEMENT

- Qualified for powering PTM 230
- Voltage approx. 5 V at 19 µF
- Dimensions 33 x 22 x 11 mm
- Actuating travel approx. 2 mm
- Actuating force approx. 2 N

PTM 230 – RADIO TRANSMITTER MODULE

- 2 digital inputs
- Dimensions: 20 x 25 x 6 mm
- Operation with ECO 100 or external energy source

STM 110 – THE SENSOR MODULE

- Maintenance-free sensor module
- Powered by mini-solar cell, 13 x 35 mm
- Dimensions 21 x 40 x 9 mm
- Operates for several days in total darkness
- Periodic presence signals
- 3 A/D converter inputs
- 4 digital inputs
- Replaces STM 100

RCM 110/120 – THE RECEIVER MODULES

- Wireless receiver module and actuator control module for receiving and decoding EnOcean wireless transmitter signals
- Dimensions 18 x 42 x 5.5 mm
- 5 Vdc voltage supply
- 25 mA current consumption
- Basic functions: switch, blinds control, dimming and serial interface for bus systems (RS232)
- Simple teaching of up to 30 wireless transmitters
- Memory function (for light and blinds scenes)

TCM 110/120/130 – ENOCEAN BIDIRECTIONAL

- 5 Vdc voltage supply
- 33 mA current consumption
- Dimensions 24 x 42 x 5 mm

TCM 110: Single- and two-level repeater for EnOcean wireless telegrams
TCM 120: Bidirectional wireless
- Serial interface
- Modem functionality
TCM 130: Software API for TCM 120 module
- Programmable in C
- Bidirectional radio
- Bidirectional serial interface
- Single- and two-level repeater functionality
- Power saving modes
- 4 D/A inputs, 4 digital outputs

OEM PRODUCTS

PTM 250 ENOCEAN EASYFIT – UNIVERSAL SWITCH INSERT

- Surface mounting without casing
- Switch program frame flat on the wall
- Compatible with following designs with 55 x 55 mm rocker:
  - BERKER S1, B1, B3, B7 glass
  - GIRA Standard 55, E2, Event, Esprit
  - JUNG A500, Aplus
  - MERTEN M-Smart, M-Arc, M-Plan
- Single or serial rocker
- Colours: white, aluminium, anthracite, structured, high-gloss pure white

STM 250 – WINDOW/DOOR CONTACT

- Maintenance-free powering by daylight
- Operates for several days in total darkness
- Immediate signal transmission as soon as window closes or opens, triggered by window magnet
- Periodic life signal
- Contact monitor (110 x 19 mm, height 15 mm) attachable to all frame profiles

RCM 250/255 – UNIVERSAL SINGLE-CHANNEL SWITCH ACTUATOR

EnOcean easyfit switch actuator for wireless switching of very different 230 V (RCM 250)/110 V (RCM 255) loads, e.g. incandescent lamps, high-volt halogen lamps or low-power motors. Up to 30 EnOcean PTM wireless switches or up to 2 EnOcean STM 250 wireless window contacts can be teached. Simple connection of the line voltage and load by screw terminals.

ACCESSORIES

EPM 100 LEVEL METER / EPM 200 RADIO TEST SET

EPM 100 LEVEL METER: The electrician's installation tool for EnOcean wireless components – for range analysis and simple detection of signal quality and sources of interference.

EPM 200 RADIO TEST SET contains EPM 100 and PTM 250 EnOcean easyfit switch.

EVA 100 EVALUATION KIT

TEST BOARD for simple startup of EnOcean wireless modules.

EVA 120 EVALUATION KIT

TEST BOARD for quick start up with STM 110.

ECT 100 EVALUATION KIT

NEW!

THERMAL ENERGY HARVESTER ECT 100 EVALUATION KIT
EnOcean has developed a thermal energy harvester that is able to power wireless sensor nodes from temperature differences of only a few Kelvin.

INNOVATIVE

RoHS COMPLIANT 2002/95/EC

OVERVIEW OF ENOCEAN 315 MHZ MODULES FOR GENERAL APPLICATIONS

MODULES

PTM 200C – THE ULTRATHIN MINIATURIZED SWITCH MODULE

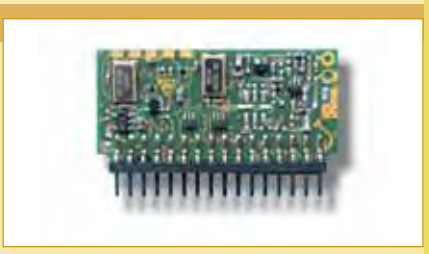
- Maintenance-free powering by finger pressure
- Optionally 1 or 2 rockers or up to 4 pushbuttons
- Dimensions 40 x 40 x 11.2 mm
- Actuating travel 1.8 mm
- Actuating force approx. 7 N

STM 110C – THE SENSOR MODULE

- Maintenance-free sensor module
- Powered by mini-solar cell, 13 x 35 mm
- Dimensions 21 x 40 x 9 mm
- Operates for several days in total darkness
- Periodic presence signals
- 3 A/D converter inputs
- 4 digital inputs
- Replaces STM 100

TCM 200C/220C – THE TRANSCEIVER MODULE

- Bidirectional Transceiver modules
- 5 V (TCM 200C) / 3 V (TCM 220C) supply voltage
- Basic functions: receiver with serial interface, integrated repeater
- Programmable in C using software API
- 6 digital or analog inputs, 5 digital outputs
- Dimensions 18 x 36.6 x 5 mm



ACCESSORIES

EPM 100C – LEVEL METER

The electrician's installation tool for EnOcean wireless components – for range analysis and simple detection of signal quality and sources of interference.

EDK 100C – DEVELOPER KIT

Developer kit for quick startup with EnOcean wireless modules PTM 200C, TCM 200C, and STM 110C, including API software for TCM 200C.

INNOVATIVE

315 MHZ PRODUCT FAMILY IS COMING TO THE AMERICAS

Uncongested operating frequency ideally suited for North American building control systems.

By Bob Eckery, Marcom Manager North America, EnOcean Inc.

To keep pace with the North American demand for high-performance wireless controls that operate on low-power, EnOcean has engineered and released its family of 315 MHz radio modules. The transceivers (TCM 200C/210C) and transmitters (STM 110C, PTM 200C/240C) combine EnOcean's proven self-powered technologies with the reliability and performance attributed to the 315 MHz operating frequency. Product development was driven by two key factors:

- EnOcean's ability to extract high performance from low-power sources (self-powered wireless controls).
- The merits of 315 MHz wireless communications (uncongested air waves that sustain reliable radio performance).

Easy-to-use development tools, such as the EnOcean wireless development kit (EDK 100C) and signal strength indicator (EPM 100C), are also available.

When choosing a band for a wireless sensor network, key criteria are power management, network reliability, and network density. Many system integrators are tempted to choose the 2.4 GHz band because it is the most globally accepted. However, its popularity carries

Performance	**Range**	Laws of physics dictate that 315 MHz radio signals penetrate materials and overcome attenuation better than higher frequencies (900 MHz, 2.4 GHz, etc.). When other range variables are held equal, 315 MHz modules can yield up to four times the range of 2.4 GHz modules.
	Baud rate	When compared to ZigBee's 250 kbps data rate, EnOcean's 125 kbps throughput rate enables a 29% range advantage.
Reliability	**Interference immunity level**	**Radio interference.** The 315 MHz band is less crowded than unrestricted ISM bands. 2.4 GHz systems share air waves and do battle with high-powered transmissions originating from pervasive devices such as Wi-Fi routers, VoIP phones, microwave ovens and Bluetooth units. When high- and low-power transmissions compete on the same frequency, higher power outputs always win. EnOcean-enabled sensor networks operate using less crowded air waves. **Solid material interference.** Laws of physics dictate that low frequencies penetrate through solid materials better than high frequencies. A 315 MHz radio signal can penetrate more walls, ceilings and furniture than can a 2.4 GHz signal.
	FCC-friendly	**Limited power output.** FCC regulations limit both duty cycle and transmit power output on the 315 MHz band. The stipulation causes fewer transmissions and subsequently less potential for interference (collisions). **Short RF packets.** FCC stipulations require that short RF packets be sent on the 315 MHz air waves. This is ideal for sensor networks and allows for higher node counts. **Data streaming.** The 315 MHz band does not allow the transmission of continuous data without gaps. Less data in the air means less potential for interference. **Energy-to-range ratio.** Because of EnOcean's expertise energy harvesting, 315 MHz communications are ideally suited for EnOcean-enabled devices. Integrators will experience an optimal balance between performance and power.

Features unique to 315 MHz wireless communications

2.4 GHz networks have become congested with competing radio signals (ZigBee, Bluetooth, Wi-Fi, microwave ovens, etc.). The less crowded 315 MHz frequency yields longer range and is better suited for low-power sensor networks.

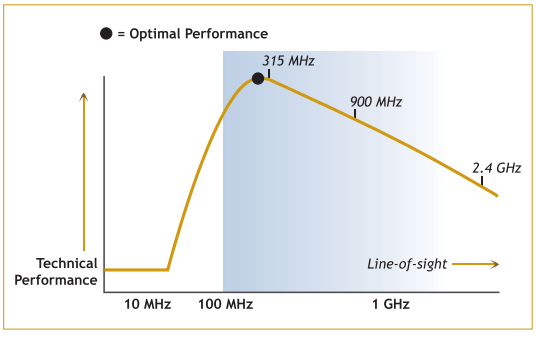
$$\text{Range} = \sqrt[N]{\frac{P_T G_T \lambda^2}{P_R F_M 16\pi^2}}$$

λ = wavelength, N = propagation law [N = 2 for RF line-of-sight, N = 4 for urban], PT = transmit power, GT = total antenna gain, PR = receiver sensitivity, FM = fading margin

with it a cost. Increasing demand on the band results in deteriorating performance and requires complicated RF protocols to overcome interference.

PERFORMANCE

Range and signal propagation. Contrary to popular belief, higher frequency does not equate to longer range. The opposite is true. When other range variables are held equal, 315 MHz RF modules yield proportionally longer range.



Wavelength is an important factor in range calculations. When other variables are held equal, longer wavelengths yield longer range and are better able to carry data through obstacles such as walls, ceilings and furniture. The Friis formula is used to calculate maximum range for a wireless link and wavelength is an important variable in the equation.

Baud rate. Another factor that affects range is throughput data rate. Once again, bigger is not better. The range of ZigBee and other 2.4 GHz biproducts is adversely affected by the IEEE stipulated 250 kbps data rate. Conversely, EnOcean modules communicate at 125 kbps. By halving the data rate of ZigBee, EnOcean modules gain an advantage of 29% more range.

RELIABILITY

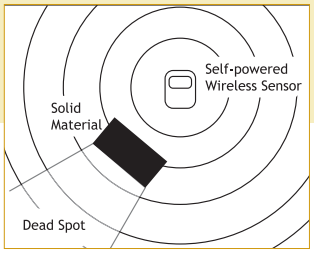
Reliable radio communications are measured in terms of transmit power output, receiver sensitivity, antenna gain and the RF link's ability to withstand interference. In indoor/urban environments, competing radio waves and solid materials present formidable negative effects on communications. Low-frequency radio signals are best able to carry data through both forms of interference.

Radio interference. The 315 MHz operating frequency is less crowded than the unrestricted ISM bands used for building automation. 2.4 GHz systems, in particular, are susceptible to a wide spectrum of competing radio transmissions. Regulations governing 2.4 GHz communications allow high-power radios to transmit continuously and high-powered 2.4 GHz devices are everywhere! These devices introduce formidable interference into adjacent 2.4 GHz systems. Typical sensor modules output between approx. 1 to 10 mW of power. This is only 0.1 to 1.0 percent of the power allowed by the FCC in the 2.4 GHz bands. This means that if a sensor is attempting to transmit at the same time as one of the competing radios, there is high probability of interference and failed transmission..

802.11b/g, Wi-Fi (4 W power output)	WLAN, access points/routers, notebook computers, VoIP networks, mobile phones, etc
Bluetooth (100 mW)	Mobile phones, notebook computers, earpieces, PC peripherals, car devices, etc
802.15.4 / ZigBee (1 W)	Data radios
Non-communication devices	Microwave ovens (approx. 100 mW)

Competing 2.4 GHz RF protocols

Solid material interference. When planning a wireless control system, path loss is an important negative factor in the equation. Path loss can be viewed as the physical obstructions that inhibit range. 315 MHz signals are better able to carry data through obstacles, such as walls, ceilings and furniture, than higher frequencies. Physical obstructions range from glass (which causes a minimal approx. 0.5 dB path loss) and reinforced concrete (depending on its thickness, can cause more than 35 dB of path loss). Once again, laws of physics favor lower operating frequencies. Due to their ability to penetrate solid materials, 315 MHz communications are less affected by "dead spots"..



FCC-FRIENDLY

EnOcean's vision has always featured RF modules that can deliver reliable radiocommunications using extremely low amounts of power. Due to the many FCC stipulations that govern 315 MHz data communications, only a company like EnOcean is adequately positioned to take advantage of the uncongested 315 MHz air waves.

SUMMARY

Extracting high performance from low power is EnOcean's specialty. Now that EnOcean modules also support 315 MHz communications, system integrators can experience unprecedented performance and reliability in addition to the freedoms inherent to EnOcean's self-powered wireless technologies. Manufacturers, builders and building owners are no longer confined by the limits imposed by crowded air waves and power-hungry RF protocols.

Data collision/ collision avoidance	When multiple transmitters operate on the same radio frequency, there is a risk that two RF data packets will be transmitted simultaneously. When two or more of these RF signals overlap, each signal is corrupted and information is lost.
	The collision probability of EnOcean radio packets is extremely small because the time duration (of the radio signals) is short (approx. 1 ms). Conventional. Conventional radio transmission durations are longer. For example, a ZigBee radio takes 15 to 30 ms to complete a transmission/ACK cycle. The probability of a collision is therefore 15 to 30 times greater. Data collisions are further reduced by the operating frequency itself. Because of FCC regulations, fewer RF packets are permitted to be transmitted, and there is less potential for collisions.
Multipath interference	Multipath is interference that is caused when the reflection and re-radiation of a radio signal causes a strong three-dimensional standing wave pattern. Randomly placed receivers have relatively high probability of being placed in a "null spot", i.e. a location where signal cancellations can occur due to signals arriving at the same destination at the same time.
	The chances of the multipath problem having an adverse affect on transmissions are greatly reduced in EnOcean-enabled 315 MHz networks. FCC stipulations restrict the number of transmissions in the air.
Power requirements	Extracting high performance from low power is EnOcean's specialty. The FCC stipulates limits on the amount of power that can be transmitted on 315 MHz radio waves. Current state-of-the-art ZigBee transceivers require hundreds of millijoules per second (depending on the range required). EnOcean RF modules can transmit reliable transmissions using minimal power.

Complementary relationship between 315 MHz RF modules and FCC regulations

INNOVATIVE

Wireless systems offer maximum flexibility and much more convenience, as well as involving less investment in planning, compared to their wired counterparts. Less cabling and faster installation mean less cost. Self-powered wireless transmitters do away with maintenance and service. Building practice has shown reliability of wireless transmissions to be excellent.

By Armin Anders, Head of Product Marketing, EnOcean GmbH

INTEGRATING WIRELESS SYSTEMS IN BUILDING ENGINEERING

PART 1: RELIABILITY IN BUILDING PRACTICE

TECHNICAL MEASURES FOR RELIABLE TELEGRAM TRANSMISSION

Transmission reliability proof against interference from other transmitters is possible by operating in a frequency band that is not overcrowded, and through multiple transmission of redundant wireless telegrams. In a larger installation, hundreds of transmitters should be able to work within one radio cell. The transmitted telegrams must be extremely short to prevent collision between a system's own telegrams.

These are the requirements that the EnOcean wireless standard is developed for. In the 868 MHz frequency band used in Europe, regulations only allow short transmitted pulses and no continuous emissions. A single telegram only occupies the wireless channel for one thousandth of a second. Together with the three randomly timed repetitions, this consequently presents maximum security against collision with transmissions from the same system and others too.

A basic factor is the reliability of the system components themselves. The system failure rate as a result of poor batteries increases dramatically with the number of batteries used. So self-powering is a must in larger installations. This is achieved through high-efficiency energy converters in the transmitter. They are able to harvest minimal amounts of energy from their surroundings – from finger pressure, light, temperature differences or vibration.

WHAT TO OBSERVE IN WIRELESS PLANNING

What is in most cases essential for transmission reliability is that an installation should have sufficient reserve signal strength. Wireless transmitters must produce enough power to pass through a number of lightweight or even brick walls. Extra transmission range is important for common changes in the surroundings like the addition of another wall, and unforeseen circumstances like shadowing by persons or interference to the radio waves caused by reflection.

The range indoors of a typical 868 MHz wireless system is about 30 meters. The material and the number of walls to be penetrated, as well as the incident angle of a transmitted signal on a wall – this all plays a major role. The effective wall thickness alters with the angle, and thus the signal attenuation. In this way a wall or ceiling that a signal penetrates at a very flat angle can become thick. Metal, fire walls, elevator shafts, staircases and supply areas should be regarded as shielding or partitioning.

WIRELESS PLANNING IN COMMERCIAL BUILDING

In this case wireless range and thus radio cells are usually limited by fire walls. Inside fire protection sectors you increasingly find flexible lightweight wall constructions or glass dividing walls, which in most cases exhibit low attenuation and thus good radio properties. Two

Photo above left: wireless sensors.
Photo above right: solar powering of presence detectors does away with maintenance (photo: Omnio).

Material	Attenuation
Lightweight wall construction, glass uncoated	0 to 10%
Brick, pressboard	5 to 35%
Reinforced concrete	10 to 90%
Metal, aluminum lamination	90 to 100%

Table: Typical attenuation of different materials

installation architectures are common: automation systems (TCP/IP, LON, EIB, DALI, etc) or direct driving of actuators. Typically one or two centrally located wireless gateways to the automation system bus are adequate for complete coverage of a fire protection sector. When actuators are driven direct, it is not usually necessary to overcome long wireless links (single room installation). Unfavorable conditions can be improved by repositioning wireless gateways or using a repeater.

WIRELESS PLANNING IN RESIDENTIAL BUILDING

For applications restricted to one or two rooms, like when retrofitting a switch or sunblind, the direct wireless range of good systems is sufficient. In applications that go right through the house, you have to differentiate as follows:

A larger accommodation unit upwards of three rooms (flats, row houses and single-family homes up to 400 sqm) is best fitted with a repeater – where is not critical, as long as it is central like in the middle of the middle floor. Repeaters should be designed so that in an extreme case of ceiling reinforcement or some other kind of partitioning a second repeater can be retrofitted in series (two-level repeater). Using more than two repeaters per wireless section is contra-productive because, apart from the lack of any benefit, costs increase and also the number of possible telegram collisions.

Multi-family houses and apartment blocks need a separate wireless system for each dwelling unit. A wireless gateway can be used for a superordinate link to an established automation system (EIB, LON, etc).

EXPERIENCE IN BUILDING PRACTICE

50,000 sqm in size, the corporate headquarters of Bosch-Siemens in Munich was, in 2003, the first large building to go into use with self-powered wireless technology. Four years later a lot of practical experience has been gathered. Other examples that followed are the headquarters of SAP in Walldorf, UNIQA in Vienna, Nestlé in Paris, the IBM office in Zurich, the Semper Opera House in Dresden and, currently nearing completion, the Torre Espacio in Madrid. The latter, with its 55 floors, is the world's highest building with wireless technology throughout – 4,200 wireless switches control its lights and blinds. More than 10,000 buildings already evidence the reliability of self-powered wireless systems in building practice and their growing popularity.

ENABLED BY ENOCEAN

TORRE ESPACIO: OPTIMALLY MANAGED FOR OPTIMAL SAVINGS

LUXMATE Professional lighting management controls daylight and artificial lighting.

Four office blocks – Cuatro Torres – are currently thrusting up into the sky above Madrid. The impressive towers are breaking all height records in Spain, but are also fascinating through their very different architecture.

By Kerstin Schitthelm, PR Manager, Zumtobel Lighting GmbH

Torre Espacio, created by renowned architects Pei Cobb and Reid Fenwick, is fascinating for its futuristic form – a square base turning up through an ellipse. At 223 meters the second highest tower in Madrid, it offers breath-taking views over the city. But not only this is impressive, inside too there is much to admire. Developers and architects placed great emphasis on flexibility of the interior plus very high user-friendliness. The LUXMATE Professional lighting management system from Zumtobel achieves a perfect balance. The system comprising more than 150 different modules allows customized adaptation to any and all requirements for building management.

EFFICIENT DAYLIGHT-DEPENDENT CONTROL OF ARTIFICIAL LIGHTING AND BLINDS

The TLM daylight sensor is used in Torre Espacio to achieve efficient control of artificial lighting and blinds governed by daylight. All luminaires and blinds are controlled on the basis of geographic data and the altitude of the sun at different times of the year. The daylight sensor on the roof determines the prevailing outdoor light, direct and diffuse sunlight, its direction and daytime intensity. The necessary illumination is derived from these data, allowing also for the degree of transmission of the windows. Manual intervention to control luminaires and blinds is still possible at any time.

OPTIMAL FLEXIBILITY IN ROOM ARRANGEMENT

Most of the floor space will be rented, so flexible room configuration and the possibility of conversion without excessive installation effort are major requirements. LUXMATE Professional is the perfect answer here. The individually addressed luminaires can be regrouped to create different lighting scenarios just as needed. For even more flexibility in interior arrangement, more than 4,200 of the latest EnOcean wireless switches were used. The advanced technology allows uncabled and batteryless control of luminaires by wireless sensors.

With more than 13,500 addressable luminaires and 4,500 blinds, this is one of the largest LUXMATE Professional lighting management systems implemented to date. Parallel to graphical visualization by LUXMATE GO, all luminaires and blinds are linked to central building services management by BACnet. And in addition to the daylight control the system produces fascinating illumination of the façade during the night, making Torre Espacio a new landmark on the Madrid skyline.

The office tower is due for completion in August 2008. Zumtobel is submitting the project for the DALI Award, which goes to particularly innovative use of the digital addressable lighting interface.

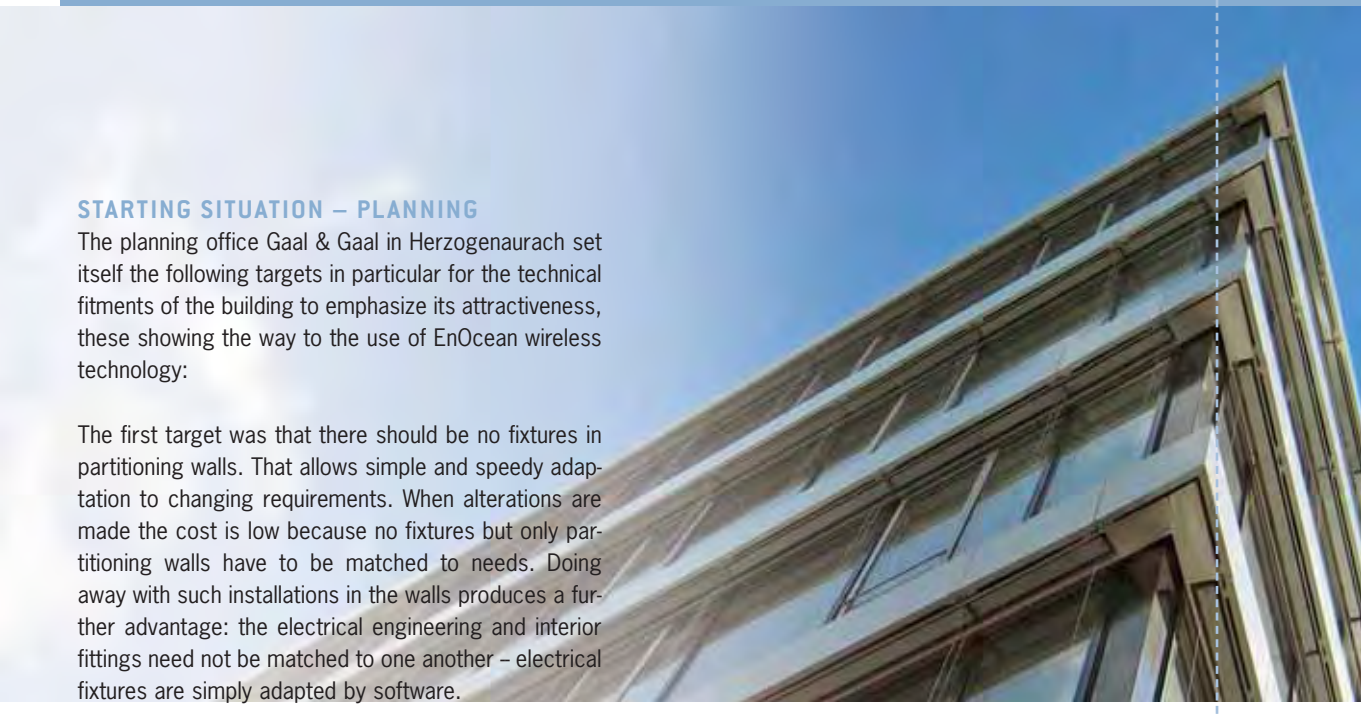
www.zumtobel.com

ENABLED BY ENOCEAN

PREMINO II: SELF-POWERED WIRELESS IN BUILDING AUTOMATION

Premino is the name of two commercial premises in Munich, each of 11,000 square meters. The space serves as offices, service centers, showcases and demonstration rooms. Prestigious tenants like Hugo Boss, Joop and VIVEON subsequently moved in. The second building was finished in the fall 2007. All operating facets of Premino II use EnOcean technology.

By Marcus Trojan, Sales Building Automation, EnOcean GmbH



STARTING SITUATION – PLANNING

The planning office Gaal & Gaal in Herzogenaurach set itself the following targets in particular for the technical fitments of the building to emphasize its attractiveness, these showing the way to the use of EnOcean wireless technology:

The first target was that there should be no fixtures in partitioning walls. That allows simple and speedy adaptation to changing requirements. When alterations are made the cost is low because no fixtures but only partitioning walls have to be matched to needs. Doing away with such installations in the walls produces a further advantage: the electrical engineering and interior fittings need not be matched to one another – electrical fixtures are simply adapted by software.

The second target was implementation of intelligent automation to cut operating costs. This calls for a variety of inputs from sensors. Because that allows control of lighting and heating to properly match demand and thus save energy and expense. Intelligent automation also means extra comfort and convenience, which top the list for many tenants.

A third target was the expandable structure of the automation plus availability of a broad selection of interoperable products. Expandability and interoperability are a must so that automation can be adapted simply and at any time to a different operating framework.

INFRASTRUCTURE

First the infrastructure was created to supply energy and information. Lines were laid to the electric loads, i.e. luminaires, sunblinds, floor tanks and actuators of heating radiators. The loads were connected by power lines to the submain distributors. This was accompanied by Ethernet cabling of a total of 150 system distributors (room controllers) at decentralized locations in the building. An input line was also needed for each antenna. These substitute all input lines of switches and sensors, doing away with all digital and analog inputs for automation.

Photo above: The striking quadrangle style is esthetically appealing and creates an upscale ambience.
Photo right: The even positioning of antennas enables area-wide use of radio signals.

This was followed by laying of the outgoing circuits. These include the DALI (digital addressable lighting interface) lines, the control lines for the actuators of the heating and integrated ceiling cooling, and the line of the motor for the sun screen. It only has to be routed once because it allows every single luminaire in the system to be addressed uniquely and newly as needed. Parallel to the laying of input and output lines, 70 antennas were sited in the area of the building.

No fixed configuration of the rooms was necessary up to this point, and from here on the whole floor area offered full flexibility in how it was used. Once the room arrangement had been decided upon with the tenants, the walls were put in, the paintwork was completed and the floors were laid.

IMPLEMENTATION

Installation of the wireless switches and sensors could be left till last, because it was a job that involved no dirt and disturbance of course. The application-specific software was developed from a standard software suite. First the wireless switches and sensors were linked to the automation, i.e. their telegram names were assigned either by operating the switch or direct entry to the software. The telegrams, in other words the switches and sensors, could then be allocated their respective functions. For example, EnOcean telegram 1013hc2 was declared as a room temperature sensor and allocated to radiators 7, 8 and 9. Each wireless switch or sensor has its own unalterable 32-bit ID, also containing information about the nature of the transmitter. After that the individual wishes of the user were imported into the automation setup. Together with system settings – +/-3 Kelvin for example as a limit to room temperature adjustment by the user – these produced demand-based scenarios for energy supply.

The complete startup was performed from a PC tied to the automation. No kind of intervention in the physical installation was necessary at any point. The simplicity of the fundamental logical structures and the highly manageable graphical interface enabled straightforward handover of basic automation processes to in-house staff.

OPERATION

In normal operation the tenant realizes neither that automatically controlled shutters influence room temperature and that heat sensors detect it to drive integrated ceiling cooling or heating, nor that 1100 wireless modules are busy collecting and processing data 24 hours a day.

Lighting can be switched and dimmed wirelessly just as wished. For this purpose the EnOcean easyfit wireless switch can be fitted to any surface. Grouped lighting effects are easily created at any time straight from the PC. In the Premino building the EnOcean easyfit is also used to control shutters.

For temperature control a solar-powered room temperature sensor in EnOcean technology detects the deviation from a given figure at regular set intervals (> 15 s). Only if the figure deviates is the information sent to the automation, where it is used to control radiators and integrated ceiling cooling. The user can match the room temperature to individual requirements within preprogrammed limits.

Solar-powered wireless window contacts from EnOcean – like the room temperature sensors integrating ultracaps to enable operation in complete darkness for as long as 70 hours – detect the opening of windows and reduce heating in that area, or even cut it out entirely. The heating does not come on again until windows are closed or room temperature sensors detect a lower chill limit.

RESULTS

The use of EnOcean wireless technology in Premino II has enabled tenants to create their own flexible room arrangement. The planning effort was reduced because decisions and dispositions for future use could be left until much later than in conventional installations, and no harmonization was necessary between different operating facets of the building. The much reduced number of cabled connections cut the time and cost of installation. The use of energy converters instead of batteries is reducing the system error rate since startup to virtually zero. Maintenance costs are done away with entirely, and there is less waste disposal to burden the

Photo left: Switches and temperature sensors are placed optimally according to requirements of the customers.

Photo below: Switches and temperature sensors with EnOcean technology.

environment. Management of the automated scenario by inhouse staff since startup by the system integrator is straightforward and involves minimal effort. Online access is also possible at any time. Recent building alterations, as expected, only affected the electrical installation at software level. There was no need to open the ceilings to alter the switch groups.

A building of this kind, with installations automated by EnOcean technology, becomes much more attractive and economical in that its energy consumption is easily matched to the actual energy demand of the users. Current experience with heat regulation shows an energy saving per one degree centigrade that is higher than the educated guess of six percent. The situation with air-conditioning is very similar. The Energy Certificate for Non-residential Buildings, expected to come in mid-2009, will naturally mean increased interest by purchasers and tenants in low operating costs.

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INTELLIGENT HEATING CONTROL CUTS HOSPITAL ENERGY COSTS

Today more than 40 percent of primary energy is consumed in buildings, most of it for lighting and heating purposes. This kind of consumption needs to be reduced to lessen the burden on the environment. High energy costs are also a reason for urgent action, which is why the whole subject is increasingly becoming a political issue. The current German energy saving directive, for instance, now stipulates an energy performance certificate for "major refurbishment". Furthermore, as of July 1, 2008 the socalled energy pass will be introduced, intended as an incentive for renovation and modernization aimed at cutting energy consumption, initially in the case of residential buildings . However, current political developments indicate that it will be expanded to other categories of building.

By Andreas Schneider, Executive VP, EnOcean GmbH

SITUATION ANALYSIS AT MEDICLIN

Compared to private households, the energy efficiency problem can be especially critical in public facilities and businesses. Within a household's four walls the fact that everyone pays for their own energy is powerful motivation for cost and consumption awareness. This kind of motivation is lacking in schools, hospitals and residential homes, for instance, where windows can be left open while radiators are turned up, and other similar situations. Such was the case with MediClin, one of the largest providers of private health services in Germany.

An analysis of the running costs of 30 MediClin hospital facilities showed that heating accounted for two percent of overall costs. This relation indicated that it was worthwhile taking advantage of every possible opportunity to save.

Facility manager Franz Ebert decided to take a personal look at the energy losses that result in a ventilating and heating scenario. He found that substantial savings were indeed possible, but realized at the same time that MediClin could only accept a solution that involved low-cost investment. This ruled out conventional solutions, involving either large-scale cabling or high maintenance costs. The cabling raises the cost of the investment, and maintenance eats away at the hoped for savings.

THE SMART WIRELESS WAY

MediClin opted for wireless sensor technology from EnOcean, especially because of its ability to automatically shut off a radiator when a window is opened. In this scenario, EnOcean's STM 250 wireless window contact is coupled with the radiator valve. The window

Photo left and below: MediClin's clinic in Müritz saves energy through intelligent heating control.

Photo below: Oventrop DynaTemp 100/16 router.

contact is wirelessly connected to an Oventrop DynaTemp 100/16 router that is wired to the radiator valve so the system consequently closes if a window is left open. As an alternative to such window contacts there are now also window handles with EnOcean technology available. These draw their energy from the turning of the handle, and control a radiator valve according to the position of a window.

IMPLEMENTATION AT MEDICLIN

Müritz was the first MediClin clinic to be fitted with the system. One wireless receiver was centrally positioned to create the best possible connection to all 16 rooms along with minimal investment in used products. Installation contractors used EnOcean's EPM 100 wireless test set, a simple and reliable solution to determine the correct positioning of window contacts and receivers. Wireless repeaters were added to ensure propagation over longer stretches or in the presence of obstacles like concrete walls. The solar-powered EnOcean window contacts were adhered to the window frames. The wiring of the new radiator valves to the DynaTemp 100/16 router went smoothly and, to allow central control, the installation was linked to the clinic's LAN network.

The final step was connection of the window contacts to the radiator valves. The wireless sensors were assigned by their 32-bit ID. This was achieved by putting the system into a teach mode and then actuating the window sensors. The whole process ended with a test of the system and its individual components.

RESULTS

Facility manager Ebert conducted a full-scale comparative test of two heating subroutes, one with and one without window contacts. It demonstrated savings of approximately 800 kWh per room and year or, to put it another way, about 100 liters of heating oil, 70 euros or 270 kg CO2. Installation in over 200 rooms produces an annual saving of around 15,000 euros.

EnOcean's wireless solution also reduced the installation effort to a minimum. The rooms were back in use after a very short time. The Müritz clinic can expect a return on its investment in less than three years. Another three clinics have moved over to EnOcean technology in the meantime.

A welcome and by no means insignificant side-effect of EnOcean wireless sensor technology, in addition to the smaller burden on the environment through less consumption of energy, is that it reduces the generation of problem waste in the form of spent batteries. The application spectrum of EnOcean technology spans virtually every aspect of building automation. The technology is establishing itself as a standard, creating a foundation for biological construction systems, and presenting the key to smart green buildings.

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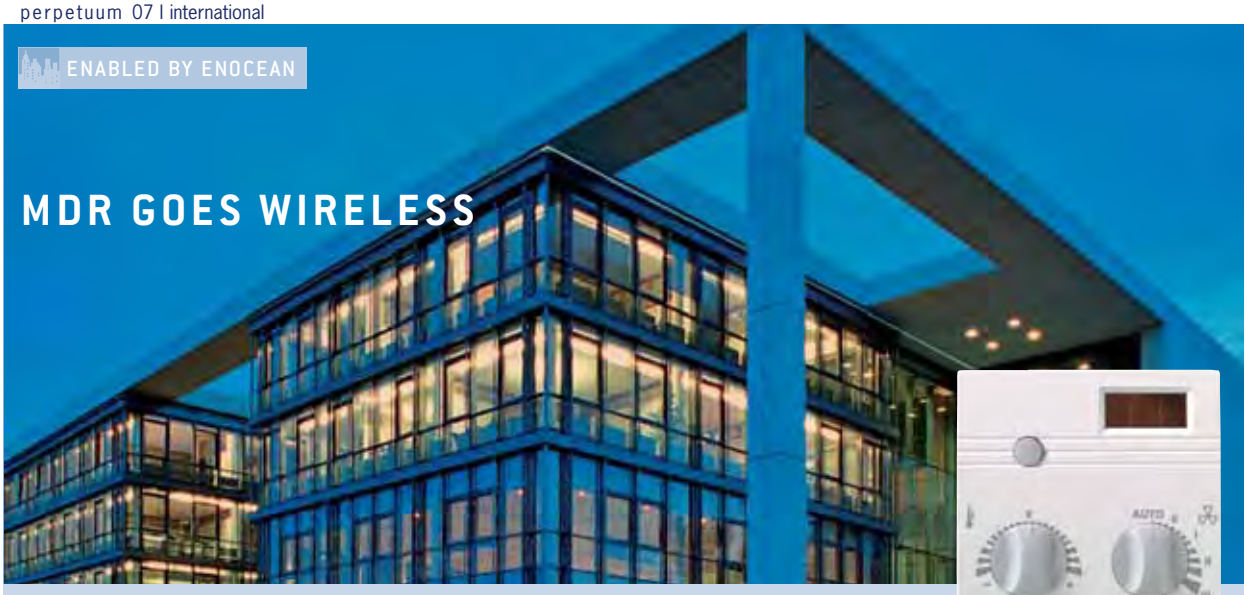
MDR GOES WIRELESS



Climatic conditions in the regional broadcasting studios of the MDR in the German state of Thuringia were optimized using the EasySens wireless system from Thermokon. Producing radio, television and online services from Thuringia is the job of the some 240 employees and freelancers of the MDR studios. This includes a full sound broadcast selection and eight TV programs. The MDR is one of Germany's publicly financed broadcasters.
By Lars Assmann, Sales Technician, Thermokon Sensortechnik GmbH

The bright, modern and transparent building of glass and steel stands in the west of Erfurt – 95 meters long and 15 meters high. Its clear structure means high flexibility for the organization within it. The architectural concept expresses clear functionality: editorial behind the glass – extrovert, studios within the building – introvert, the light axis as an internal transformer, as space for communication – the building as a processor.

MODERN AND NEW BUT NOT YET OPTIMAL

Everything well thought-out and intelligently solved – so it seemed at the beginning. But once the building went into use it became evident that climate control of the open-plan office by air circulation cooling units was not the right answer. Control was governed by one room temperature sensor. However, the large windows in the roof meant that in summer there were repeated build-dups of thermal load. And cold air in the region of the outlets of the cooling units created drafts, while there was inadequate cooling in other regions.

RETROFIT ROOM SENSORS WITH ENOCEAN TECHNOLOGY

So obviously a remedy was needed. But the nature of the open-plan office meant it would have to be wireless, and it should not disturb the MDR's ongoing operations while it was being installed. Conventional underplaster cabling was out of the question because of the facing concrete and the large glass surfaces. Yet another problem was that zones could not be firmly defined in planning – it had to be possible to alter the location of room sensors. Plus, these had to satisfy the EMC requirements of the MDR because of the studio and editing facilities in the immediate vicinity. The way in which it works and the low level of emissions convinced the MDR of EnOcean wireless technology – in the transmitters and receivers of the EasySens system from Thermokon. A wireless-to-EIB/KNX gateway was selected as a link to the existent building services management system.

FLEXIBILITY THAT PAYS

The following flexible but cost-attractive solution – enabled by EnOcean wireless technology – was chosen for the project:

1. Installation of two zone controls each with three room sensors and one setpoint setter.
2. Use of the roof windows for natural ventilation (dissipation of thermal load).
3. Use of contacts on the roof windows to disable ventilation and climate control.

Simple implementation of these measures substantially improved climatic conditions in the open-plan office. The wireless technology meant that it was carried out with no appreciable disturbance to users in the building, and without restricting broadcast operations in any way. Wireless installation of the Thermokon EasySens system and the flexibility of sensor placement were indispensable for the success of the solution, which has been operating faultlessly for more than two years.

www.thermokon.de

PUSHING GREEN INTO THE BLACK

Self-powered wireless controls build financial cases for green buildings.

By Bob Eckery, Marcom Manager North America, EnOcean Inc.

THE PROFITABLE SIDE OF INTELLIGENT GREEN BUILDINGS

In building automation, the word "green" often connotes "high cost"; and while green solutions have typically been good for the environment, they have not always been good for business. However, the fiduciary cases for implementing automation systems are becoming stronger. Early adopters of environmental-friendly designs have effectively paid a premium that paved the way for today's more cost-effective solutions.

This article explores the use of self-powered wireless controls for HVAC&R, monitoring and lighting control systems. Self-powered sensors, monitors and switches have been installed in over 10,000 buildings worldwide and are having positive effects on the economy and the environment. Take for example the hotel renovation project charted below. The proposed system is forecasted to reduce a hotel's energy consumption by 40% and offset the initial investment in less than four years. In this application, an EnOcean-enabled self-powered wireless key card switch is used to reduce the amount of energy wasted on cooling, heating and powering unoccupied hotel rooms.

The calculations used to arrive at these amounts are detailed in "Case Study 1". The credit column does not include other tangible credit amounts such as dollars gained through LEED points.

THE OPPORTUNITY

Energy inefficient buildings are easy to spot. Less evident, however, are cost-effective means that can stop the propagation of energy waste. A building owner can easily document a building's faults and then ask the contractor to propose an energy efficient solution. The building owner then must weigh the benefits of modernizing the building versus their own fiduciary goals. Building owners often elect to continue to feed an energy-hungry building more power rather than pay the cost of installing a new system.

Fortunately, green technologies have matured. Thanks to innovative engineering and premiums paid by early adapters, contractors can now present simple, cost-effective and field-tested solutions to prospective clients. Products such as peel-and-stick sensors simplify and expedite system integration; while providing the building owner a wireless sensor network that yields greater control of building space and more efficient power consumption. Case studies show that after a reliable wireless sensor network is put into place, energy consumption can be reduced up to 40 percent. And, over time, building owners recoup the initial cost of installation.

Several groups benefit from the maturation of green controls. Building owners will spend less money powering their buildings. Contractors and architects will have

	Credits (based on 40% reduction in energy consumption)	**Debits**	**Balance**
System installation	–	- $ 75,000	- $ 75,000
Year 1	+ $ 19,045	–	- $ 55,000
Year 2	+ $ 19,045	–	- $ 36,910
Year 3	+ $ 19,045	–	- $ 17,865
Year 4	+ $ 19,045	–	+ $ 1,180
Year 5	+ $ 19,045	–	+ $ 20,225
Year 6 - 20	+ $ 285,675	–	+ $ 305,900

Credit/debit table: projected costs and savings by installing green controls in a 200-room hotel

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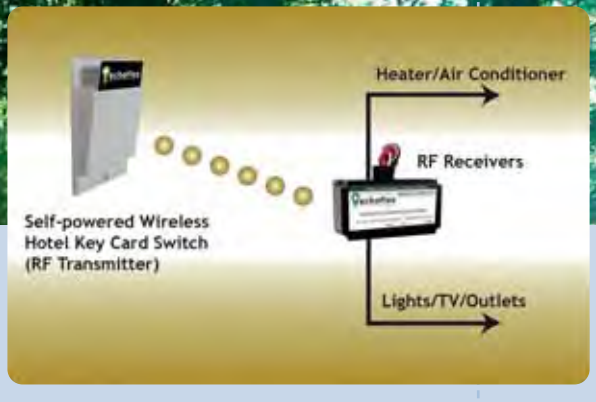
Conserving power in unoccupied hotel rooms

Installation
- 200 hotel rooms
- $ 375/room

Savings
- $ 19,045/year*

Payback period
- Estimated 3.75 years

* Based on energy cost of $ 0.0986/kWh (US average), 70% occupancy, 70% of guests leave heaters/AC, TV and three 60 W lights on 5 hours/day



more contracts and more options to offer building owners. Building tenants will have greater control of their building space.

SELF-POWERED WIRELESS HVAC&R, MONITORING AND LIGHTING CONTROLS

Self-powered wireless networks are anchored by EnOcean-enabled sensors and switches. The sensors and switches can power themselves because they house energy harvesters (micro power generators that convert environmental energy, such as light or mechanical power, into useful radio transmissions). When coupled with a wireless module, EnOcean's energy harvester enables sensors and switches to be self-powered. Self-powered means battery and wire-free. The absence of wires simplifies installations because installers do not run wires through walls. The absence of batteries simplifies network maintenance and saves money and natural resources over time. Once programmed and installed, the controls operate battery and maintenance-free for the life of the control (typically 20+ years). Installers and facility managers can affix the controls wherever they want, which is particularly beneficial in building renovations and retrofits.

Virtually any sensor can become a self-powered wireless control when integrated with an EnOcean wireless module and energy harvester. Motion, CO2, humidity, light, temperature and window sensors are currently in production and available through various distributors and manufacturers.

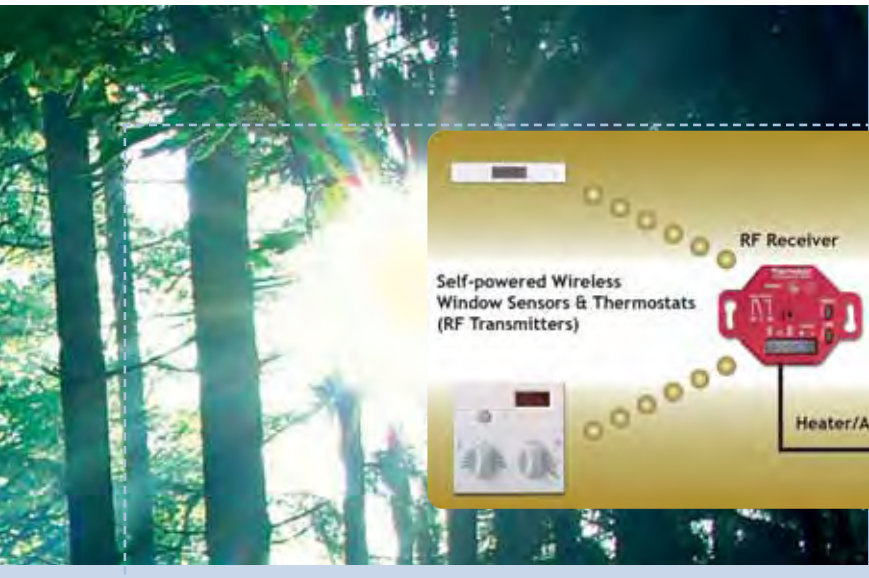
CASE STUDY 1 – HOTEL RENOVATION THAT STOPS UNOCCUPIED ROOM ENERGY CONSUMPTION

A contractor is currently pitching a self-powered wireless system to a hotel owner in Orlando, Florida. The renovation promises to reduce the amount of energy the hotel consumes and to satisfy the following requirements:

- Reduce energy consumption in unoccupied rooms.
- Avoid reliance upon batteries.
- Maintain and improve hotel guests' experiences.
- Install the sensors and switches in a non-invasive manner. In other words, the hotel had to stay open for business during installations.

The contractor is proposing to install self-powered wireless hotel key switches in each room. The key card switch is an EnOcean-enabled wireless transmitter recently developed by Echoflex Solutions. The key switch operates without batteries and solves the problem of energy wasted on heating, cooling and lighting in unoccupied hotel rooms.

The self-powered wireless key card switch performs as a master switch. When a guest enters a room, they insert their hotel key into a lighted dock. When the key card is inserted, a radio signal is transmitted that enables the room's lights, electronics, heater and air conditioner. When the key card is removed from its dock, another radio signal is sent that, after allowing the guest 10 minutes to depart, disables the room's powered amenities. In the scenario cited here, the hotel



College dormitory renovation

Installation
- 1,560 sensors and switches
- $ 300/room

Savings
- 40% reduction in energy consumption

Payback period
- 3.5 years (estimated)

Source: study carried out by IFE Krefeld

owner will make back the initial installation cost in 3.75 years and then pocket nearly $310,000 in net profits during the lifetime of the self-powered wireless sensors and switches (based on 20 years of maintenance-free operation).

The following outlines how the savings of $ 19,045/year was figured:

1. Calculate the amount of power one hotel room consumes in one hour. In this case, the sum of energy consumption per room was 1,080 W.
   1,080 W = 750 W (heater/air-conditioner) + 180 W (three 60 W light bulbs) + 150 W (TV).
2. Now multiply the following variables: power usage (in kW); number of rooms; number of hours each room is left unoccupied; hotel occupancy percentage; percentage of guests that leave utilities on when they are not in the room; cost of electricity; number of days in a year.

After multiplying the variables, the potential energy saving for one year is $ 19,045.
$ 19,045 = 1.08 kW x 200 rooms x 5 hours x 70% occupancy x 70% of guests leave utilities on when not there x $ 0.0986/kWh x 365 days.

CASE STUDY 2 – HVAC CONTROLS IN A NEW ZEALAND COLLEGE DORMITORY

In 2006, New Zealand's University of Canterbury modernized older dormitory buildings by installing a self-powered wireless control system. The installation satisfied the following requirements:

- Reduce energy consumption and utility spending.
- Avoid reliance upon batteries.
- The installation of sensors cannot be invasive (building closures to be kept to a minimum).

The solution, in this case, was to install self-powered wireless window sensors (solar-powered magnetic contacts), thermostats and heating/air-conditioning controllers in each room. The window sensors monitored the open/closed status of each room's windows. When a window is closed and a room is below a specified temperature, the heating unit turns on automatically. If either the temperature becomes too warm or a window is opened while the heating unit is on, the heating unit is automatically turned off. The system was installed without endeavoring time-consumptive labors, such as wiring or chiseling conduits.

SUMMARY

Installing a self-powered wireless network requires some clairvoyance. If an integrator can see beyond the glare of initial installation costs, the longterm gains outweigh the risk – both for the environment and for business. Contractors and building owners now have access to products that protect the environment, preserve natural resources and stimulate economic growth. The benefits of self-powered wireless solutions also stretch beyond the scope outlined in these case studies. No attempt was made to attach a monetary value to other tangibles, such as the costs of battery replacement. The green solutions cited in this article are not only good for the environment; self-powered wireless controls are also good for business.

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ENOCEAN ALLIANCE
"NO WIRES. NO BATTERIES. NO LIMITS."
THE STANDARD FOR SUSTAINABLE BUILDINGS

The ability to combine multiple products from various suppliers knowing that they will be simple to install and will interoperate within the same system is not only a dream for building systems integrators, specifiers, consultants, installers, end-users and others alike – but a necessity in today's environment where it is generally accepted that industry standards are required to enable mass-market adoption and acceptance. Wireless standards such as Bluetooth TM or WiFiTM (WLAN) have created such an environment in the mobile phone and computing worlds; in wired building automation LONWorksTM is one example of an interoperable standard.

By Graham Martin, Founder of EnOcean Alliance

In wireless home and building monitoring and control there have been many attempts and claims to success, but only one technology has actually achieved the true standardization goals of multiple OEMs and hundreds of interoperable products already available, deployed and proven – EnOcean.

EnOcean wireless technology is already firmly established in building systems, simply through the unique interoperability of the products, e.g. through standardized sensor profiles. A portfolio of more than 250 products creates this interoperability between the different operating facets of a building, with the promise of unlimited flexibility and uncomplicated planning. Worldwide implementation of EnOcean technology in tens of thousands of buildings has already made it an industry standard, on a par with EIB/KNX or LON. To further develop EnOcean wireless technology and ultimately see it become a formal international standard, we are now entering the next phase, foundation of the EnOcean Alliance.

THE ENOCEAN ALLIANCE

A group of key companies across Europe and North America are currently forming the EnOcean Alliance as a non-profit, mutual benefit corporation which has the formal purpose of:

- establishing EnOcean wireless technology as the wireless standard for sustainable buildings,
- helping to bring about the existence of a broad range of interoperable wireless monitoring and controlling products for use in and around residential, commercial and industrial buildings and to promote global trade in such products,
- initially developing the specifications for the interoperability of the sensor profiles for the wireless products operating in unlicensed frequency bands and subsequently to apply for ratification as an international standard of the appropriate standardization committee.

The Alliance will formally be launched at the light+building show in Frankfurt in April with a significant follow-up North American event at the LIGHTFAIR in Las Vegas in May. The majority of current OEM EnOcean technology product providers as well as additional major international companies developing with the technology have already given their commitment to the Alliance along with suppliers to the eco-system. The Alliance will be formed and managed by Global Inventures – a Californian company with a subsidiary in Germany who have successfully implemented and managed multiple global alliances over the past 15 years.

The Alliance will have three membership classes:

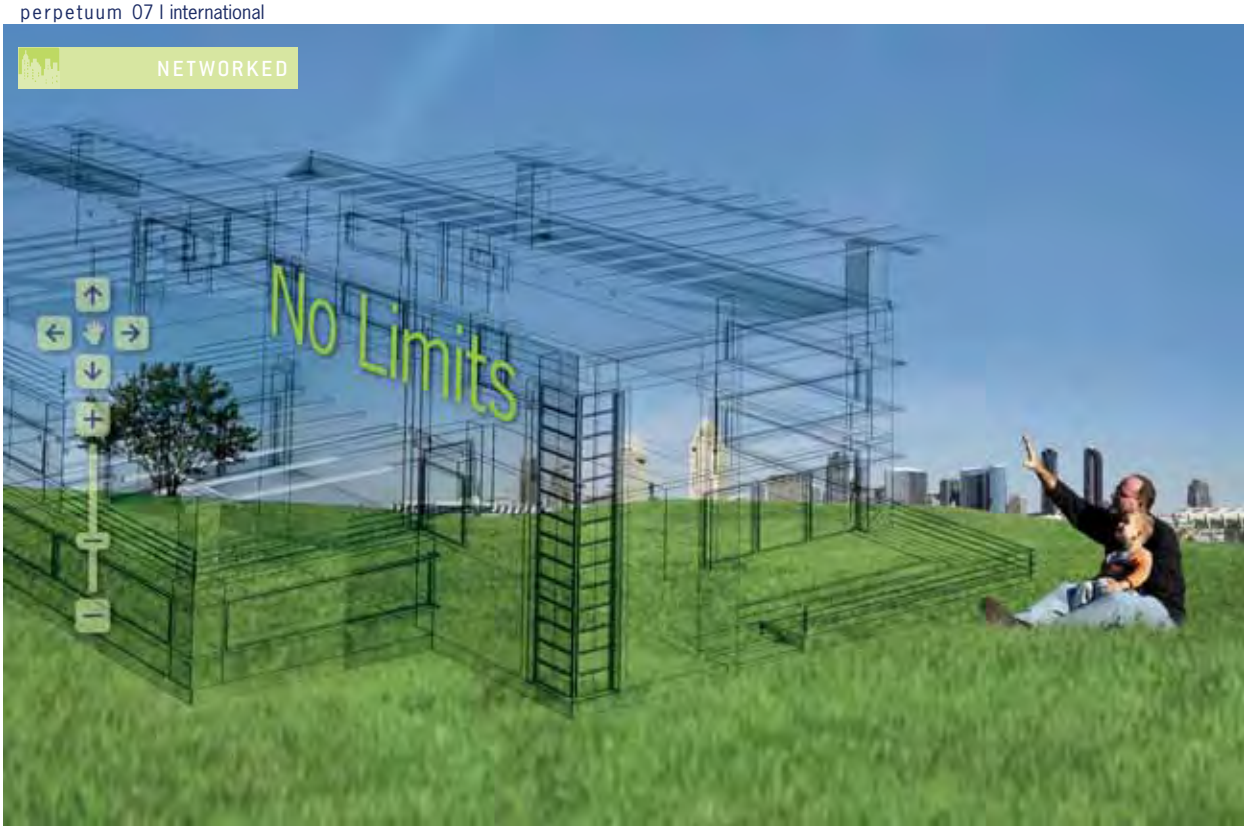
- **Promoters -** innovative and key players who will lead, define and drive the Alliance.
- **Participants -** companies and suppliers providing product and services using the Alliance technology.
- **Associate Members -** building professionals, academics, smaller distribution partners, etc interested in the technology, advancements, examples, training, etc.

WHY ENOCEAN TECHNOLOGY?

Why have EnOcean partners managed to deliver and prove through tens of thousands of successful installations where others have stumbled and fallen? I believe the key lies in the fact that EnOcean and its partners talked to and listened to the requirements, the fears, the opportunities and challenges of building professionals. EnOcean and its partners have spent the last years providing real solutions which are optimized for the task in hand and that solve real challenges to provide innovative, effective solutions for sustainable buildings under the motto:

No Wires

Across the world there is now an awareness and acceptance of the necessity to reduce the amount of energy consumption in buildings, which accounts for around 40% of the total. To achieve this goal it is necessary to be able to monitor and control individual rooms or areas within buildings, for example to establish occupancy status, temperature and humidity, the status of windows and doors, and light intensity (sunlight, electric light). The only effective way to achieve this is to implement low-power wireless monitoring and control – ideal for both new buildings and retrofits, saving miles of cables, installation time



and cost as well as noise and dirt caused by pulling cables or opening walls.

No Batteries

EnOcean Alliance partners believe that no-one really wants a whole bunch of battery operated systems in and around their homes and buildings when this can be easily avoided. Batteries need changing every few months to few years. Empty batteries can cause system failures, frustrations and even danger – not to mention the environmentally unfriendly issue of battery disposal. Especially in a commercial building with many thousands of nodes it is a nightmare just thinking about this responsibility – let alone the cost of actually performing the task of regular battery maintenance. Batteries may be initially cheap but maintaining and replacing them is not.

No Limits

Having virtually no restrictions on where the sensors or switches can be mounted provides the user with an almost unlimited flexibility not only in initial placement but also during renovation – from the simple movement of some furniture to a complete refurbishment.

BENEFITS OF THE ENOCEAN ALLIANCE

The EnOcean Alliance offers many advantages to architects, systems integrators and planners, to facility managers and building owners. The use of future-oriented EnOcean technology means unlimited flexibility allowing simple, speedy and cost-attractive adaptation to changing requirements. Building professionals profit from the availability of a broad-based, interoperable selection of products to combine in any way. Lighting control on demand, for example, and regulation of the temperature in single rooms, made possible by EnOcean technology, means large energy and thus cost savings.

EnOcean technology and the Alliance are already the leaders and will be the the longterm winner in complete solutions for home, building and industry wireless monitoring and controlling for more comfort, safety and energy efficiency. We invite you cordially to join the winning team to our mutual benefit. “No Wires. No Batteries. No Limits.” – The Standard for Sustainable Buildings.

If you are interested in more information about or in joining the EnOcean Alliance, visit

www.enocean-alliance.org

LIGHTFAIR INTERNATIONAL
The future. Illuminated.

OVERVIEW OF INTEGRATION PARTNERS (OEMS) USING ENOCEAN TECHNOLOGY

enocean®

Overview of Products "Enabled by EnOcean": www.enocean.com/products

AD HOC ELECTRONICS
AIITECH
AQUALISA
b-b
BALLUFF
BECKHOFF
Lk-electronic
BootUp GmbH
BSC
BRINK
bticino
CER
CIAG ...wirtschaftlich warmes Wasser.
DISTECH CONTROLS
Dux by SCHLEGEL
easyTED
energy conservation - home and office
Techoflex
Eltako ELECTRONICS
Green. Smart. Wireless. enocean
ERCO
FLEXtron
FunkTechnik
GTE
HAUTAU
Helios
HGI mbH
HOPPE
HSC
INGLAS
intellihome
IP-SYMCON
LCN Gebäudeleittechnik in Perfektion
jäger DIREKT
kieback&peter Technologie für Gebäude-Automation
ME TECHNICS
MK
MSR
niko Illuminating ideas.
nova.D:sign
OSRAM
oventrop
PEHA
PHOENIX CONTACT
record
REGENT
REGULVAR
SAUTER
SCHUNK
SERVODAN
SIEMENS
LICHT
spega
SPITTLER
.steute
STUHL REGELSYSTEME
TCS
televic
thermokon Sensortechnik GmbH
ubi free
UHLEMANN
VICOS
VIPA art of automation
WAGO
Waldmann ENGINEER OF LIGHT.
warema
wieland Elektrische Verbindungen
W&T
ZUMTOBEL

UNIVERSAL ENOCEAN-TO-LON GATEWAY INTEGRATES WIRELESS SENSORS AND CONTROLLERS

Service-free, self-powered wireless technology from EnOcean is finding its way into an increasing number of applications in building automation. EnOcean wireless sensors and controllers are easily integrated into a local operating network (LON) by an all-purpose coupling module from Wieland Electric.

ENOCEAN-TO-LON GATEWAY GESIS LON R-56/0 (RC)

The EnOcean-to-LON gateway gesis LON R-56/0 (RC) integrates EnOcean wireless sensors into the LON bus and translates its data into standard network variables. It is able to manage up to 56 EnOcean wireless channels with a maximum of 170 transmitters. All available EnOcean profiles (as of July 2007) are implemented in the application. So all current EnOcean sensors and controllers using EnOcean profiles can be selected direct in the cost-free LNS plug-in. All configuration settings are saved and managed in an LNS (LonWorks Network Service) database. LonMark conformity ensures interoperability between various devices. That does away with the bother of parameterization to decode telegrams. This also applies to the compliant room controllers, supplying data on up to four EnOcean wireless channels.

Wireless channels can be learned independently of LON startup by operating keys and address switches direct on the gateway. So assignments of sensors or controllers can be altered at any time on site and without requiring in-depth LON knowledge.

The LON is provided with parameterized wireless channels through socalled standard network variables. Standard network variable types (SNVTs) are default variable types for network communication. Virtually all physical values used in automation tasks are standardized, ensuring that network nodes from different manufacturers can communicate with one another.

Sensor values are converted with configurable range and adjustable resolution into the appropriate SNVTs and transmitted. Wireless switches can be parameterized by the Switch (3200) LonMark profile; they can be used to control lighting, sunblinds, scenarios or presence. Room controllers can be selected and used direct according to their given functionality.

The EnOcean-to-LON gateway from Wieland Electric is available for DIN rail mounting and, as an addition to the modular gesis LON RM device series, for installation in flatpack gesis RAN distribution boxes only 55 mm in height.

www.wieland-electric.com
www.gesis.com

SELF-POWERED WIRELESS KEY CARD SWITCH

Energy inefficiency in buildings is relatively easy to spot, but less evident are the solutions to remedy rampant wastage of energy. The installation of what are called green products is often costly and invasive, forcing building owners to weigh benefits to the environment against their own fiduciary goals. Enter the self-powered PTM265-KCA, an EnOcean-enabled wireless transmitter recently developed by Echoflex. This hotel key card switch operates without batteries, and provides a solution aimed at reducing the amount of energy wasted on lighting, heating and cooling unoccupied hotel rooms.

By Shawn Pedersen, Echoflex Solutions Inc.

ENOCEAN-ENABLED TRANSMITTER BUILDS FINANCIAL CASE FOR GREEN CONTROLS

In hotel management the self-powered wireless key card switch can act as a master switch, automatically disabling lights and plugs each time a hotel guest leaves their room. When the key card switch is removed from its dock, the same radio signal can also be used to alert an HVAC&R system that the room is unoccupied. Each time the key card switch is inserted into or removed from its dock, a radio signal is sent to a wireless receiver that controls how power is used in the room.

GOOD FOR THE ENVIRONMENT, GOOD FOR BUSINESS

By ensuring that lights, plugs, heaters and/or air conditioners go "green" when a room is left unoccupied, the key card switch is clearly good for the environment. But is it good for business too?

Take the following scenario of 100 unoccupied hotel rooms somewhere in the USA:

- A single 60-W light bulb costs $ 18/year to power (when on 8 hours/day, based on US average cost of $ 0.0986/kWh).
- A total of 400 light bulbs consuming energy (four left on in each of the 100 rooms, 8 hours/day).
- So the hotel pays $ 7200/year to illuminate unoccupied rooms (400 light bulbs x $ 18).

Benefits not factored – because lights are on less often, fewer bulbs will require replacement. Added controls for heating and air conditioning would also dramatically subtract from energy use and add to profits.

The self-powered wireless key switch does take some foresight however. It is estimated that the building owner's payback comes after three to five years. Once smaller electricity bills have offset the initial cost of the installation, the solution will continue to save money – keeping owner, shareholders and board members happy. In the scenario cited above the hotel owner would make back the installation cost in four years, and then pocket $ 144,000 in net profits over the following 20 years.

ENOCEAN-ENABLED KEY CARD COMPLIES WITH CALIFORNIA TITLE 24

The solution is fueled by an energy harvesting technology developed by EnOcean. EnOcean-enabled control products help designers and architects comply with California Title 24 requirements. The controls qualify for LEED points.

www.echoflexsolutions.com

NETWORKED

SENSOLUX® SOLAR PRESENCE DETECTOR DOES WITHOUT CABLING AND BATTERIES FOR LIGHTING CONVENIENCE AND ENERGY EFFICIENCY

Modern, autonomous lighting controls offer maximum flexibility and convenience. With the new service-free, solar-powered SENSOLUX® presence detector it is possible to implement environment-friendly control of lighting in functional and private building to match needs, governed by the presence of users and occupants. The simplest installation or retrofit is a sustainable way to save energy. SENSOLUX® sets new standards in planning, cutting the cost of cabling, plastering and painting through its wireless, batteryless principle.

By Fritz Liechti, Director, Flextron AG and
Werner Petritz, Director, PEHA GmbH & Co. KG

SENSOLUX® solar presence detector

HOW THE SOLAR PRESENCE DETECTOR WORKS

The SENSOLUX® presence detector derives its energy from the very latest indoor solar cells. When its energy accumulator is charged it is quite capable of working for a number of days in complete darkness. The detector registers the presence of persons and measures the momentary light value. Using the EnOcean protocol it sends these data wirelessly to the matching SENSOLUX® switching actuator EC. Each switching actuator can manage a maximum of eight presence detectors and eight wireless switches (Easyclick) with EnOcean wireless technology. The necessary parameters are set on the two-channel switching actuator. This can individually control two rows of luminaires. In large projects the SENSOLUX® presence detector is also easily integrated into building services management. Optionally it comes with a pair of alkaline (AAA) batteries for use in rooms (e.g. toilets) without daylight. Their service life is 8 to 10 years.

FUNCTIONAL VARIETY

In its fully automatic mode the SENSOLUX® detects persons entering a room, and turns on the lighting (or other facilities) through the switching actuator. As soon as the last person has left a room, the lighting is turned off with an adjustable follow-on time. It is also turned off once a given light value (daylight control) is reached. But the user can also turn the lighting on and off at will by wireless or conventional switches. In semiautomatic mode the lighting is always turned on by the user – and off by the presence detector. In both modes it is possible to set the parameters follow-on time, light value, daylight or twilight. To standard the devices come as fully automatic with daylight measurement.

PLANNING AND INSTALLATION MADE EASY

Putting wired presence detectors in the right place can be quite difficult in the planning phase. The SENSOLUX®, operating wirelessly, is highly flexible and enables optimal positioning. The ideal location above the main area of detection also offers the best PIR detection. If rooms are to be put to a different use or enlarged, presence detectors can be repositioned in two to three minutes without disturbance to occupants through dust or noise.

OPTIMAL FOR COMMERCIAL AND RESIDENTIAL BUILDING

The SENSOLUX® system is especially suitable for functional buildings with offices, training rooms and conference rooms, as well as for general floor space. In private building its primary use will be in detached houses. To expand existing installations, the two-channel switching actuator may be used even without presence detectors to integrate wireless switches with wired switches. This is a common application where electrical installations need simple addition of extra switching points (Easyclick).

SENSOLUX® was developed by Hardmeier Electronics AG (www.hardmeier-electronics.ch). It is sold in Switzerland through Flextron AG and in the EU through PEHA GmbH & Co. KG.

www.flextron.ch www.peha.de www.sensolux.ch

RATIO CONTROL SIMPLIFIES BUILDING AUTOMATION

For the first time, at the recent light+building show, Omnio AG demonstrated its intuitively operated Ratio Control PC software for the Ratio wireless bus system. Quite easily, using a computer mouse, even the most complex solutions for building automation can be configured, programmed and visualized for the user. Possibilities range from a customized sunblind system through programmable time switch functions to simulation of presence during vacation or remote alarming.

By Christian Genter, Managing Director, Omnio AG

To date the programming and modification of building automation was a very complex matter, calling for a considerable amount of expertise on the part of a building planner or electrician. It usually takes several days of training if you want to understand the logic of an EIB/KNX bus system for example. Omnio AG has now presented an intuitively operated PC program for its Ratio wireless bus system. It means a revolutionary step forward in simplifying the planning, implementation and maintenance of a building automation solution.

The nucleus of the Ratio Control software, run under Windows XP, Vista or a power-saving, ultra-compact miniature PC with embedded Windows XP, is a freely configurable building presentation in which single rooms or whole floors can quite simply be created as virtual file cards and individually named by mouse click. If wished, any file card can be backed by a plan graphic, a 3D view or even a digital photo – BMP, GIF or JPG files can optionally be imported. In the next step the required operating elements (rockers, window contacts, temperature sensors, etc) and actuators (underplaster dimmers, shutter controls, multiple DIN rail modules, etc) are clicked in a components catalog and dragged and dropped to the required place in the file card graphic. For each element, also named as wished, there are very different visualization options.

Extra to this, logic elements can be defined for the single floors – anything is possible, from presence simulation or scene definition through a timer or stepping switch to shading, watering or daylight control. In a network view it is subsequently possible to define or modify, again intuitively by mouse, the necessary logic links between sensors and actuators. Of course, Ratio Control also enables you to configure turn-off delays, temperature-dependent functions, and lots more.

The elements embedded in the system are immediately functional, and can be thoroughly tested virtually in a simulation mode. If the planned network satisfies the user requirements or specifications, Ratio Control helps the planner or installer to generate equipment lists for the different rooms and functionally assorted block lists of the system components needed for the solution. Finally Ratio Control even simplifies the teach-in and learning of all readied wireless components enabled by EnOcean technology.

The many possibilities of Ratio Control are best illustrated by a few examples. Presence simulation closes the shutters in the evening and produces light randomly in different rooms. Next day the shutters are opened again. A sunblind solution automatically darkens rooms by electric blinds as a function of the sun (time of the day and year) and light intensity. If a wind gets up, all blinds are raised for safety reasons. A watering system manages the watering of plants and also doses the amount of water as a function of the weather. An additionally connected monitor shows at a glance, when you leave the house, whether any windows have been left open, and automatically lowers room temperature. Finally, Ratio Control can even be operated on the Internet through a remote desktop link, and also enables you to integrate alarming in the system so that an email, SMS or phone call is sent if window contacts are triggered for instance.

LAST ONE TO GO TURNS OFF THE LIGHTS? INTELLIGENT ENERGY SAVING MADE EASY

The DALI MULTI 3 light controller from OSRAM with miniaturized sensors and intuitive operation by EnOcean wireless technology.

By Rainer Wrenger, Business Development Manager, OSRAM GmbH

The most efficient lighting solutions today in terms of energy consumption are based on dimmable electronic control gear (ECG) for T5 (16 mm diameter) fluorescent lamps, controlled as a function of daylight and combined with a presence function. Such an application is simply implemented with the new DALI MULTI 3 from OSRAM. A variety of functions make the easily installed system – whether a single luminaire, a lighting group or open-plan office solution – a versatile energy saver. Multisensors are available for ceiling or luminaire installation. The ceiling version is one of the smallest on the market, its minimal dimensions in no way disrupting the impression of the ceiling.

FOCUS ON USE – SIMPLEST OPERATION BY ENOCEAN WIRELESS SWITCHES

When needed, artificial light produced by fluorescent lamps is added to the daylight, and the illuminance tracks automatically. Groups of lights are driven singly as a function of room depth to achieve maximum energy efficiency.

Simple operation by a standard switch means that the user can set the illuminance at any time to suit individual taste. Double clicking on the switch saves the setting, which is maintained by daylight-dependent track-ing. This ease of operation can also be implemented with self-powered EnOcean wireless switches for flexible room arrangements or conversion at a later date.

Miniaturized combined sensor (light and presence) only 50 mm in diameter.

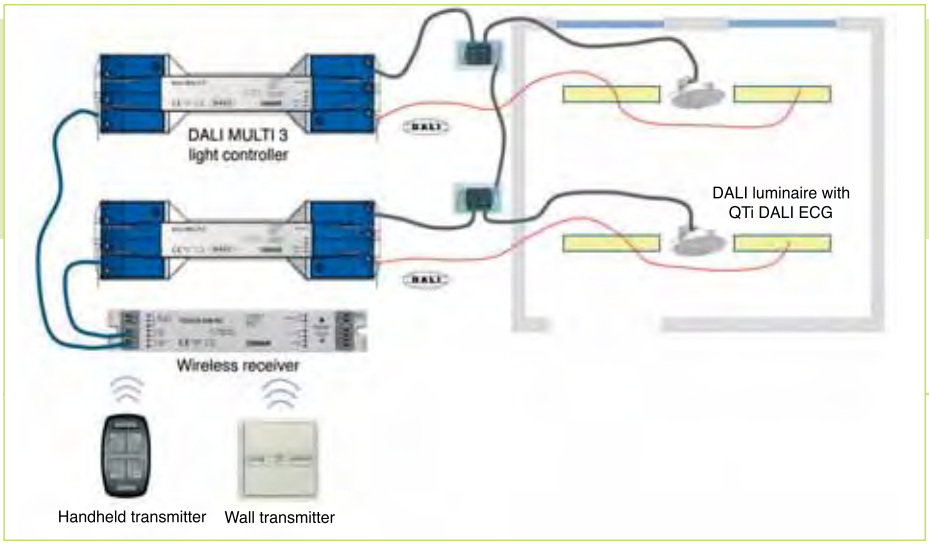
Here a wireless receiver is added to the system, installed in the intermediate ceiling in an extra casing. For operation there is a wireless wall transmitter or the new self-powered remote control.

QTI DALI ECG
FOR MAXIMUM ENERGY EFFICIENCY

The optimal system addition to the DALI MULTI 3 light controller is the QTi DALI ECG from OSRAM, integrated in luminaire solutions by leading suppliers. This is the only dimmable ECG on the market with a cutoff function for preheating of the fluorescent coil between 80 and 100% dimming. Combined with the optimized module design, luminaires with QTi DALI inside create more efficient solutions than a conventional DALI ECG.

The DALI MULTI 3 light controller plus wireless receiver can also be implemented with plug-in installation technology from Wieland or Wago.

www.osram.com/ecg-lms



DALI MULTI 3 system with central presence detection and operation by self-powered wireless switches in EnOcean technology for dual-axis group office (QTi DALI inside).

PENDANT AND FREE-STANDING LUMINAIRES FROM SPITTLER WITH ENOCEAN TECHNOLOGY

Spittler of Goslar presented pendant and free-standing luminaires with integrated EnOcean technology at the recent light+building show.

The receiver module comes as an accessory for the SL 624/SL 730 luminaire series, enabling operation and dimming by EnOcean wireless switches.

These self-powered wireless switches offer many advantages:

- fully independent placement of luminaires,
- random combination of luminaires,
- simple operation from a workplace,
- freedom of room arrangement.

www.spittler.com

INNOVATIVE WINDOW FITTINGS FOR MULTIFUNCTIONAL BENEFITS

Window open, heating off – controlled by a wall switch or remotely. HAUTAU and EnOcean showed innovative actuator and control technology at this year's fensterbau/frontale exhibition in Nuremberg to demonstrate how their energy-saving solutions can work together. At the HAUTAU booth there was a real-life home simulation consisting of a living room and kitchen. The visitor could see that it was only possible to turn on the extractor hood if a window was open. Adequate incoming air is what is important here, as prescribed for example in the ordinance on fireplaces that is already in force in many parts of Germany. So if you open a window or a glass door in a HAUTAU domestic scenario, the heating goes off and you can turn on the extractor hood – and all with EnOcean technology.

This is not only for the sake of ordinances of course, but also energy saving. Which justified HAUTAU's motto for the show "Energy, safety and convenience – the multifunctional benefits of HAUTAU window fittings".

www.hautau.de

NETWORKED

CANADIAN OEM REGULVAR OFFERS WORLD'S FIRST ENOCEAN-TO-BACNET GATEWAY

RUBI from EnOcean's new Canadian OEM Regulvar is a multi-protocol and multi-network gateway allowing realtime data transfer between various trademarks of digital controllers under different networks and protocols. RUBI is above all a BACnet network manager. It was developed to simplify communication between equipment, controllers or control systems using different protocols in building automation or engineering (HVAC).

An obstacle that long hindered the exchange of data – incompatible communication protocols – has now been done away with. RUBI makes it possible for equipment and system operators to seamlessly integrate various pieces of equipment foreign to a BACnet network. All third-party pieces of equipment active in a system are easily represented on a BACnet network as if they were standard BACnet equipment.

RUBI is a BACnet device, more precisely a BACnet application-specific controller (BASC) compliant with 1352004 ANSI/ASHRAE standard. It communicates over Ethernet and MS TP BACnet networks and can also be used as a router between the two. It makes it possible to integrate any number of devices seamlessly in a network (multi-instancing). Each third-party device on the network is considered as a fully fledged device with its own points, so an operator perceives them as BACnet equipment. RUBI integrates EnOcean products into BACnet to centralize control of this new green wireless network.

www.regulvar.com

NETWORKED

SWITCHES BY MK

MK Electric will incorporate EnOcean's self-powered wireless sensors into the wiring devices product portfolio of its popular Logic Plus, Decorative and Masterseal ranges. These new additions provide a wireless switch option, affording control and potential energy-saving solutions to MK customers in the UK. As well as creating a product that is easy to install, the total life cost of the installation can be dramatically decreased, offering a more sustainable and flexible solution to many of today's commercial challenges.

www.mkelectric.co.uk

NEW VAV CONTROLLER FROM DISTECH CONTROLS

The ECC-VAVS product line lends itself to a multitude of applications – control of baseboards, duct heaters/cooling, fans, multi-stage heaters, floating valve actuators, lights, etc. Designed to control one floating valve, two on/off valves or two duct heater stages, it is a cost-effective solution for installations that require minimal use of inputs and outputs, such as internal building zones. The ECC-VAVS-W with an onboard wireless receiver supports a variety of wireless, batteryless sensors, switches and other devices. These peripherals are easy to install, highly adaptable and set no limitations to the building materials they can be mounted on.

www.distech-controls.com

SAUTER WITH ENOCEAN TECHNOLOGY

Sauter, a leading provider of solutions for building management and automation, also presented products with integrated EnOcean technology during its launch of the new Sauter EY-modulo series at the 2008 light+building show. An extensive selection of room control units and automation stations is due to follow in the course of the year.

www.sauter-bc.com

THE LATEST MANUFACTURERS OF PRODUCTS ENABLED BY ENOCEAN

Dux - Georg Schlegel GmbH (bus technology), ERCO Leuchten GmbH (luminaires), HAUTAU GmbH (window fittings), HGI Heger GmbH (building automation), HSC Regelungstechnik GmbH (instrumentation and control), INGLAS GmbH (object supervision), ISSENDORF Mikroelektronik GmbH (LCN building automation), Regulvar Inc. (HVAC, BACnet systems), Sauter AG (instrumentation and control), SIMON & SCHELLE GmbH (luminaires), spega Spelsberg GmbH (building automation), SPLITTLER GmbH (lighting engineering), UBI FREE (switches), Vicos GmbH (design house), Herbert Waldmann GmbH (luminaires)

VISIONARY

ENERGY HARVESTING – KEY TECHNOLOGY FOR DISTRIBUTED EMBEDDED MICROSYSTEMS

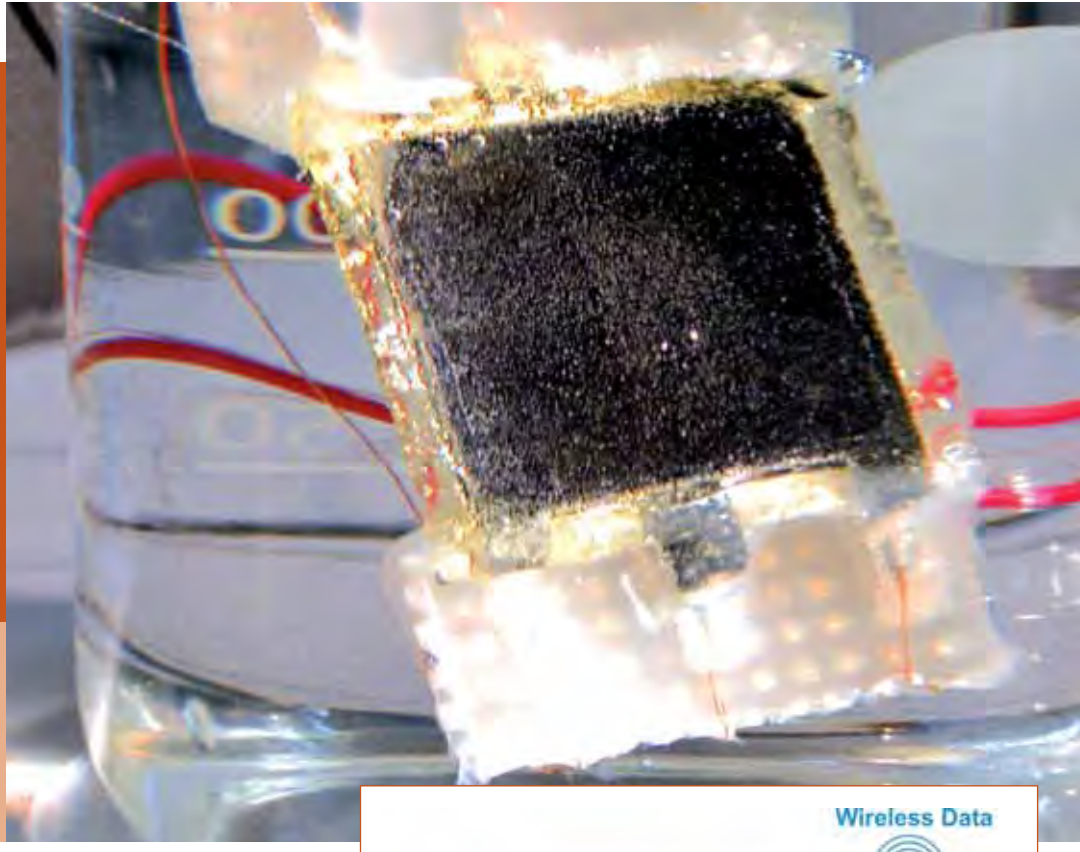
Without doubt we are living today – irreversibly – in an information society that is networked to a high degree. Not only the Internet is mutating into a wireless worldwide information system, the number of distributed embedded systems in production, building, medical, safety or automotive engineering is also growing fast. Here too, as in the worldwide web, there is a trend toward wireless-based systems because they promise flexibility of expansion and mobility. But the network nodes are powered for the most part by cable.

By Prof. Dr. Peter Woias, speaker of the DFG Research Training Groupl "Micro Energy Harvesting", Department of Microsystems Engineering (IMTEK), Laboratory for Design of Microsystems, Albert-Ludwig-University Freiburg

These cable networks, whether in factories, buildings or vehicles, are susceptible to interference, heavy and expensive, have to be laid, extended and maintained by hand. Batteries are a rare alternative – temperature, vibration or corrosion restrict their use technically, maintenance and disposal when they are wasted are the economical drawbacks. So the pressing issue is how to solve the energy problem of distributed embedded systems faced with their growing complexity and prevalence.

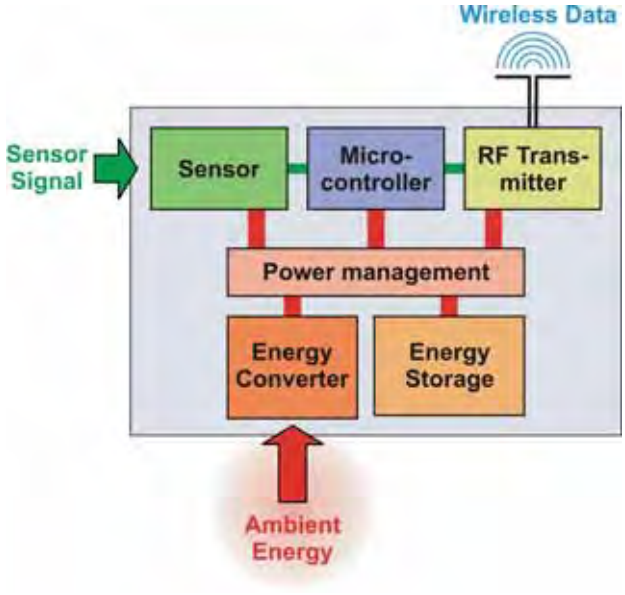
ENERGY FROM THE SURROUNDINGS

Energy harvesting is the catch phrase for an entirely new concept of reliably supplying energy to distributed systems – preferably small, robust and low-power microsystems – without using cables or batteries. Basically this technology works by the principles of biological energy systems: the required electrical energy is harvested from the immediate surroundings. Mechanical energy from vibration, sound or fluid flow, for example, can be won by piezoelectric, electromagnetic or capacitive generators, thermal energy by



thermoelectric transducers, energy from light by solar cells, and chemical binding energy by bio fuel cells. The electrical energy is collected in a means of storage, and rationed by intelligent management so that the system node reliably fulfills its task.

The resulting vision of an energy-autonomous embedded system is fascinating. The system nodes supply themselves with energy, cable networks and battery changes are done away with. They work in places that to date were poorly or not at all accessible. Examples are the inside of automobile tires, artificial limbs and implants, high-voltage lines or building façades. A distributed system is simply expanded by adding new nodes. Hybrid combinations of cabled and energy-autonomous components allow both high data rates and systems with a wide local distribution.

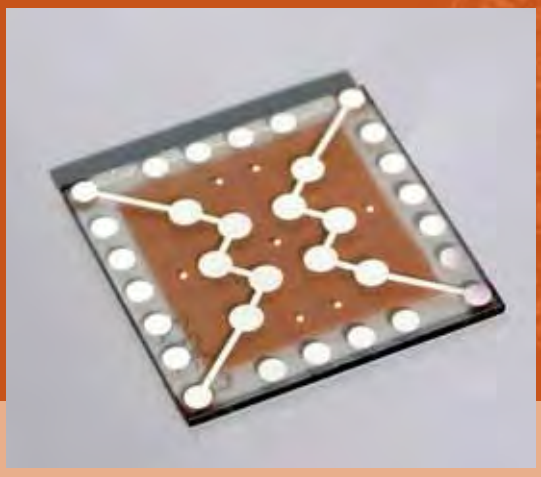


Principle of energy harvesting.

ENERGY HARVESTING FOR NEW PRODUCT CONCEPTS

This "tapping" of ambient energy also shows the way to new product concepts: conceivable are alarm signalers that derive their energy from the disturbances they monitor, medical supervision systems that are powered by the heat and movement of our bodies, smart pills that win energy from chemical processes in the digestive tract, or energy-autonomous MP3 players.

The vision can be carried on even further. Biological systems, the natural models of energy harvesting, generally work by a principle of "function follows energy". This way of thinking takes us to revolutionary new, biologically inspired embedded systems that lead a "technical life" in their surroundings. Their design and their operating concept are made "livable", analogous to biological principles, to maintain the function when the available energy and data vary. Like biological orga-



Examples of energy harvesting technology: piezo generator, organic solar cell, thermal electric converter, glucose cell.

nisms they match their activity to the energy, use different energy sources, know their own resources, and make efficient use of them. This radical change to energy- and data-adaptive design principles promises beyond energy autonomy a dramatic enhancement in the operating reliability of embedded systems, and in turn opens up entirely new perspectives.

ENERGY HARVESTING – A KEYNOTE THEME OF SPONSORED RESEARCH

The visions spoken of here set ambitious goals and call for multifaceted and multidisciplinary research efforts to create new materials for extra-high-efficiency energy transducers and storage mechanisms for example, energy-saving ultra-low-power microelectronics, or energy-efficient software algorithms and control strategies.

In Europe the first steps have been taken. In Freiburg, since October 2006, our DFG-funded research training group "Micro Energy Harvesting" has been working on innovative technologies and concepts related to energy conversion, storage and management, also with a generous support from EnOcean GmbH. The German Ministry of Education and Research recently looked in depth at the subject of development and application of energy harvesting. The current EU framework program also points to energy harvesting as a keynote theme of sponsored research.

Energy harvesting is at present one of the most prominent future technologies for embedded systems. The large relevance of this new energy technology for the distributed embedded microsystems of today and tomorrow is indisputable. The next fascinating issue is whether and when we start to make use of further successful principles of nature for the microsystems of the day after tomorrow.

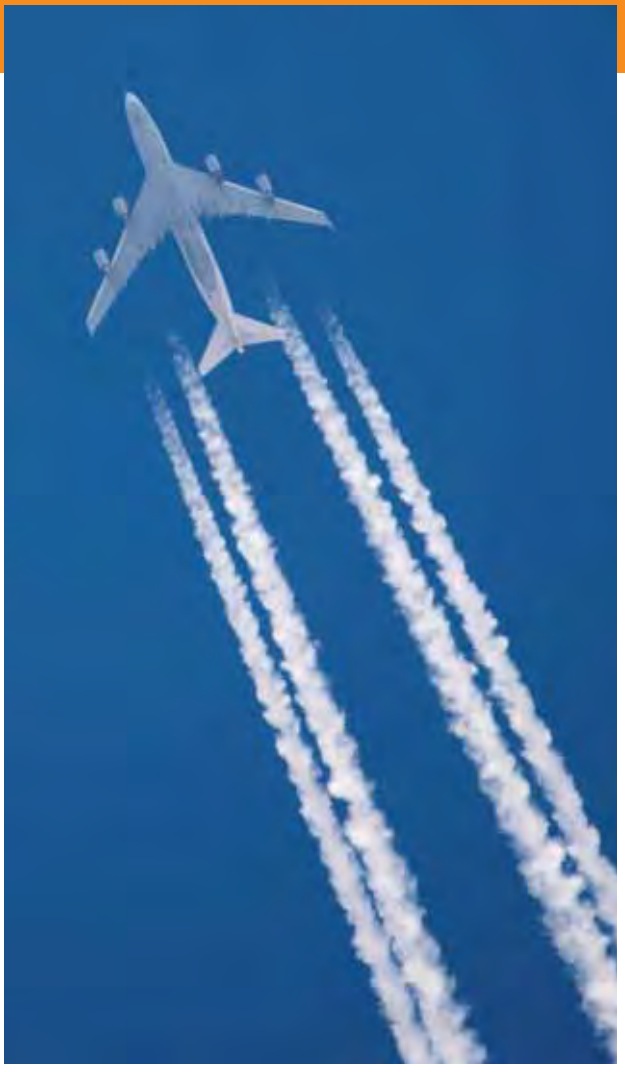
www.imtek.de

UNPLUGGED

THE WEB SITE FOR A GOOD CONSCIENCE

Have you already planned your vacation? Are you flying somewhere, maybe a long way away? Then you might visit this web site first and enter where you are going. Perhaps the results will persuade you to travel by rail, ship or car instead, or to travel somewhere else entirely. After all, you want to spend your vacation with a good conscience. And if there is no alternative, or you are in general prepared to compensate for the emissions you produce, atmosfair offers the possibility of soothing your conscience and at the same time doing something good for the world's climate.

By Sabine Quinten, Sales Team Assistant, EnOcean GmbH



The results from the emissions calculator for the vacation trips I have planned this year (South Korea and Ireland) dampen any excitement I have in advance, because they alone put me at more than twice an environmentally friendly emissions figure:

	kg CO_2
My flights	6,780
Climate compatible budget of 1 person in 1 year	3,000
1 year driving a car (middle-class model, 12,000 km)	2,000
Total emissions of an Indian	900
Refrigerator, 1 year	100

EMISSIONS CALCULATOR FOR BALANCED ENERGY BUDGET AND CLIMATE PROTECTION

So what do I do? Forget where I wanted to go on vacation or travel by ship and rail instead? That is hardly an alternative given the distances involved and the length of my annual vacation. And I am also visiting friends and family, so I can hardly change my arrangements. Climatically optimized travel is not possible, but atmosfair proposes a deal: contributing 158 euros to support a climate protection project, e.g. solar-powered kitchens in India. I can conclude everything on the web site. It is estimated that 23 euros are currently needed to compensate one ton of CO_2 through climate protection projects in developing countries. Certification and administration costs are also covered.

It makes it easy to travel in an environmentally compatible way or, better said, help balance the climate if you have no other choice. And you are made more aware of how CO_2 emissions are part of our lives but that we can do something about it. If you are interested in your own vacation emissions budget, visit

www.atmosfair.com

OUR NEW EMPLOYEES

DIRECTOR TECHNICAL SOLUTIONS, ENOCEAN INC.

Volker Koenig is Director Technical Solutions for North America. In this role he applies his broad background in building automation and control systems to facilitate best possible application integration of EnOcean products. He works closely with product management to assure application and market requirements are met for ongoing and future EnOcean product developments.

Volker has 24 years' experience in systems engineering and is an expert in control networks. His technical expertise is balanced with strong strategic thinking, market and customer orientation. Before joining the EnOcean team he served as director of research & development and CTO at Distech Controls, a North-American manufacturer of building control systems.

Email: volker.koenig@enocean.com

APPLICATIONS ENGINEERING MANAGER, ENOCEAN INC.

Eugene You has extensive experience in RF, switch-mode power supplies and industrial automation. At Kennecott Utah Copper he invented a self-powered, wireless electrolytic refining cell monitoring system employing more than 1000 network nodes. This revolutionized the monitoring of electrolytic refining and electrowinning. The technology was subsequently commercialized by Finland-based Autotec, a leading technology provider for the mining industry. Eugene then became chief architect in development of the Trulite KH4 integrated fuel cell system. Eugene holds masters degrees in electrical engineering and automation from the University of Utah and South China University of Technology.

Email: eugene.you@enocean.com

MARCOM MANAGER NORTH AMERICA, ENOCEAN INC.

Bob Eckery joined EnOcean in January 2008 to help establish the EnOcean brand name in terms that resonate with North-American audiences.

Bob is responsible for finding the words, images and communication avenues that best pronounce the benefits of self-powered wireless solutions to OEM manufacturers, building developers and end-users. He will keep the EnOcean name visible through marketing vehicles such as public relations, Internet and trade show promotion. Bob brings 14 years of experience in promoting technology solutions; the last six years were dedicated to the promotion of wireless solutions while managing at Digi International and Ad Hoc Electronics.

Email: bob.eckery@enocean.com

INNOVATION MANAGER, ENOCEAN GMBH

Markus Kreitmair joined EnOcean's product marketing team in February 2008. In the newly created role of innovation manager he is responsible among other things for assessing new product ideas and coordinating sponsored research projects. After graduating in electrical engineering, Markus became a software developer at Siemens. He subsequently held various positions driving the development of innovative products in the mobile phone industry. These included product manager of the first Java GSM phone SL45i, director of the Siemens mobile phone developer program, and product line manager of hosting services.

Email: markus.kreitmair@enocean.com

INQUISITIVE

ENOCEAN BUYER'S GUIDE

Because of frequent inquiries about where to obtain EnOcean products, here is some assistance in finding the right sales outlet fast. Basically the market breaks down into three target groups:

1. MANUFACTURER / OEM
These manufacture end-products in large numbers based on or including EnOcean wireless modules.
Contact: **local EnOcean distributors – see page 49 in this issue.**

2. INSTALLER / FACILITY MANAGER
These need end-products using EnOcean technology for installation/operation in buildings.
Contact: **electrical wholesalers or manufacturers direct (depending on marketing policy)**

3. END-USER
In most cases these want to use end-products enabled by EnOcean in their own homes (frequently DIY customers).
Contact: **retailers, installers, Internet shops (e.g. www.enoceanshop.co.uk)**

Further information: **www.enocean.com/distributor**

ENOCEAN DISTRIBUTOR AWARDS

Distributors make a major contribution to the success of EnOcean, in many cases with applications engineering in addition to selling EnOcean modules. For the first time EnOcean made awards to its distributors in two categories for their achievements in 2007.

ABACUS GROUP IS "DISTRIBUTOR OF THE YEAR 2007"

The Abacus Group receives the award for the best sales results of all 29 international distributors.

PYRECAP OF FRANCE IS THE "SHOOTING STAR"

The French distributor Pyrecap receives the award for the best growth in sales compared to one year earlier.

RECENT AWARDS

Self-powered wireless sensor technology from EnOcean wins four awards within six months.

ENOCEAN EASYFIT RECEIVES BATIMAT INNOVATION AWARD IN BRONZE

EnOcean's easyfit wireless, batteryless switch won the Batimat Innovation Award in Bronze across all categories at Batimat 2007, the international building exhibition staged in Paris. The award demonstrates EnOcean's increasing international recognition as the standard for wireless technology in intelligent green buildings. The 17th Innovation Competition was organized as part of Batimat 2007, aiming to highlight the most innovative products in the construction sector. This year a total of 188 entries were submitted and 23 prizes were awarded.

ENOCEAN WIRELESS SENSORS SELECTED BUILDINGGREEN TOP-10 PRODUCT FOR 2007

Energy-harvesting-powered wireless sensors from EnOcean were voted a BuildingGreen 2007 Top-10 Green Building Product by the editors of Environmental Building News and GreenSpec®. This annual award recognizes the most innovative and exciting green building products added to the GreenSpec® Directory during the past year or covered in Environmental Building News.

100% DESIGN LONDON AWARD

EnOcean's wireless switch recently won the "Building Product Innovation Award" at the 100% Design London Awards in association with property developer Londonewcastle (Earls Court, London, 21 September 2007). The device beat nine other products nominated for the award, which was judged by a panel of high-profile architects, services and structural engineers. The judges were looking for innovation, intelligent use of materials and technology, and evidence of how the product improves the construction process.

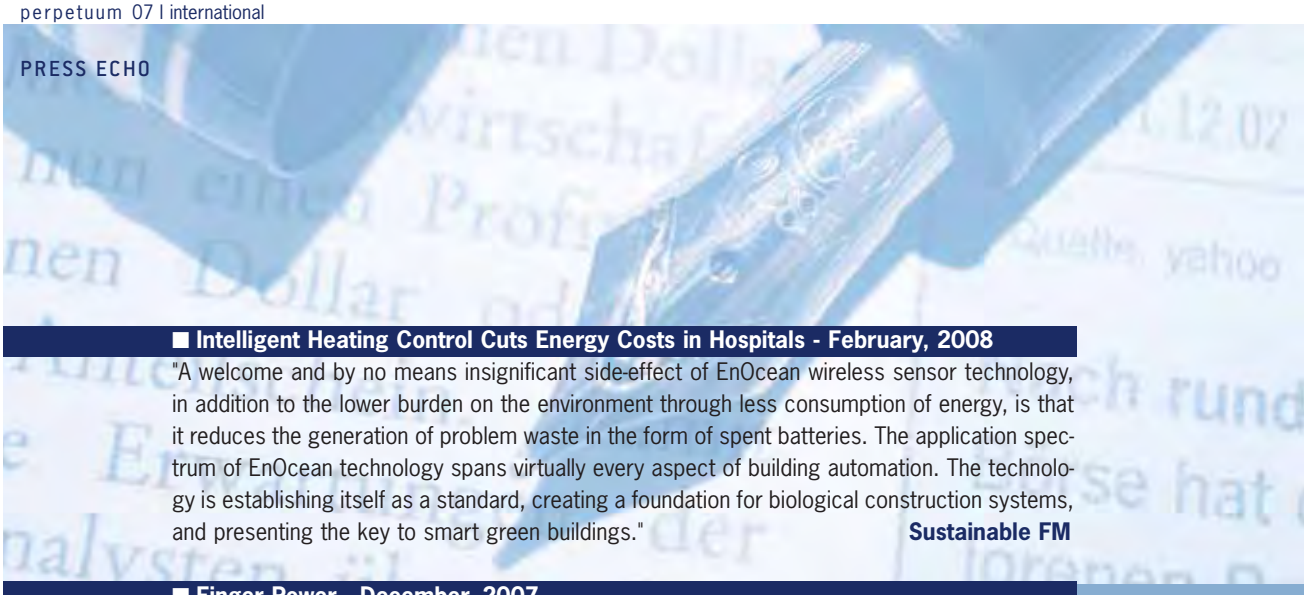
WORKING BUILDINGS WEEK – BEST INNOVATION IN GREEN PRODUCT OR SERVICE

EnOcean's wireless, batteryless switch technology won the "Best innovation in green product or service" award among the Working Buildings Week Innovation Awards 2007.

ENOCEAN IS THE STANDARD FOR SUSTAINABLE BUILDINGS

In the words of EnOcean's CEO Markus Brehler: "We're naturally very proud to have received these prestigious awards, which recognize strongly the contribution that EnOcean technology can make to running sustainable development. A growing number of building designers and operators are focusing on this issue from both an environmental and an economical perspective. And this is leading to rapidly increasing international interest in our technology and the products that our partners have brought to market as the standard for intelligent green buildings."

PRESS ECHO



■ Intelligent Heating Control Cuts Energy Costs in Hospitals - February, 2008

"A welcome and by no means insignificant side-effect of EnOcean wireless sensor technology, in addition to the lower burden on the environment through less consumption of energy, is that it reduces the generation of problem waste in the form of spent batteries. The application spectrum of EnOcean technology spans virtually every aspect of building automation. The technology is establishing itself as a standard, creating a foundation for biological construction systems, and presenting the key to smart green buildings."

Sustainable FM

■ Finger Power - December, 2007

"Intelligent automation is the key to a major reduction of the energy consumed by a building- It also enables flexible room arrangement, because when almost inevitable changes are required, no recabling is necessary.[…] Even when planning glass dividing walls, an architect no longer has to dispense with the usual light switches and shutter switches next to a door or passage."

Architecture Plus

■ Harvest Time - December, 2007

"EnOcean grabbed my attention with their 'energy harvesting' switch. The mythical 'stick on the wall' light switch always comes up in any conversations about embedded wireless and home automation. EnOcean makes it reality and takes it one step further by getting rid of the battery along with the wires. […] For now, it's mainly a matter of convenience and reliability (no battery issues), but ultimately on a grander scale, it's about capturing energy that we can no longer afford to waste."

Circuit Cellar No. 209

■ BuildingGreen Announces 2007 Top-10 Green Building Products - November 9, 2007

"It's green because it offers: Reduced material use, equipment that conserves energy or manages loads, improved light quality. Developed by German engineering giant Siemens and spun off as a separate company, EnOcean has engineered radio-frequency communication to use just one-tenth the power of most such controllers and figured out how to power these devices by harvesting ambient energy - including mechanical energy from operating a light switch or photovoltaic energy from lighting in a room. This enables the controllers to operate without batteries, thus saving the materials, energy, and waste from battery manufacturing and disposal."

www.aia.org

■ EnOcean scoops green tech award at Working Buildings Week - October 17, 2007

"EnOcean's wireless, batteryless switch technology won the 'Best innovation in green product or service' award in The Working Buildings Week Innovation Awards 2007 - its second major design award in as many months. […] EnOcean's wireless switch also recently won the 'Building Product Innovation Award' at the 100% Design London Awards."

www.tmcnet.co

■ Wireless conversion - October 12, 2007

"EnOcean GmbH offers electro-dynamic energy converters that are linked wirelessly to power switches: thus the switch can be placed anywhere in a room, without wires that connect it to the power grid and without a battery. […] Besides wireless light switches, EnOcean produces thermo and solar energy harvesters."

www.eetasia.com

Green. Smart. Wireless.
enocean®

AUSTRIA
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Georg Strasser — georg.strasser@unitronic.de

BELGIUM
Alcom electronics nv/sa — **www.alcom.be**
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TURKEY
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Zafer Sahin — zafer.sahin@ekom-ltd.com

UNITED KINGDOM
MODULES
TDC – Member of Abacus Group — **www.tdc.co.uk**
Simon Taylor — web.sales@tdc.co.uk

END-PRODUCTS
EnOceanShop (UK) — **www.enoceanshop.co.uk**
Also available at RS Components

USA
EnOcean Inc. — **www.enocean.com**
Jim O'Callaghan — jim.ocallaghan@enocean.com

Ad Hoc Electronics — **www.adhocelectronics.com**
Jan Finlinson — sales@adhocelectronics.com

EVENTS

APRIL

April 22-25, 2008: Hannover Fair 2008, Hannover, Germany
See EnOcean partners
www.hannovermesse.de

MAY

May 28-30, 2008: LIGHTFAIR 2008, Las Vegas/NV, USA
See EnOcean at booth 1481
www.lightfair.com

JUNE

June 9-11, 2008: Realcomm, San Diego/CA, USA
See EnOcean
www.realcomm.com/sandiego.htm

SEPTEMBER

September 23-25, 2008: RF & Hyper Europe, Paris, France
See EnOcean partner Pyrecap
www.rfhyper.com

OCTOBER

October 8-9, 2008: M&E The building services event, London, UK
See EnOcean
www.buildingservicesevent.com

NOVEMBER

November 11-14, 2008: electronica, Munich, Germany
See EnOcean
www.electronica.de

November 18-20, 2008: Greenbuild Expo, Boston/MA, USA
See EnOcean
www.greenbuildexpo.org

thermokon®
Sensortechnik GmbH

enocean alliance
PROMOTER

› SRC-ADO

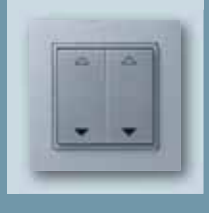
Bridge between EasySens and the building control technology

By means of analogue and digital outputs
the universal receiver is connecting
EasySens wireless sensors with a conventional DDC.

SR07P
Room Operating Panel

SR65
Outdoor Temperature Sensor

4x 0-10V
(individually configurable)



Wireless Switch Insert
Light/Blind

SR-MDS
Ceiling Multi Sensor

2x relay
or
4x relay
(individually configurable)

SR04PST
Room Operating Panel

SRW01
Window/Door Contact

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