ISSUE 5 | 2021

ESYWORLD

NEWS FROM THE WORLD OF AUTOMATION AND LIGHTING

FLEXIBLE GROUP LIGHTING

WHY DECENTRALISED DIGITAL LIGHT CONTROL IN THE WORKPLACE IS THE FUTURE

MOTION, DETECTION, STANDARDS!

SENSNORM PRESIDENT OLAF RIEBENSTEIN ON THE NEW STANDARDISED MEASUREMENT METHOD FOR PIR SENSORS

ATMOSPHERIC STOREYS

HOW THE KIEL SCIENCE PARK FITS OUT ITS BUILDINGS TO IMPROVE QUALITY OF LIFE AND ENERGY EFFICIENCY

WELCOME

Dear readers,

Norms and standards may seem quite tedious to some, but their value is not to be underestimated. They provide clarity, facilitate the international movement of goods and improve people's quality of life in all areas.

Recent examples include the new sensNORM for the standardised measurement of PIR sensors – or the DALI-2 enhanced industry standard: Thanks to cross-manufacturer interoperability, managers can now combine the best products and deliver cross-room, decentralised and, above all, innovative light control at any workplace with ESYLUX presence detectors. Find out just how easy it is and much more besides in our latest issue of ESYWORLD!

Enjoy

Mareks Peters

Chairman and CEO, ESYLUX

TOPICS

FLEXIBLE GROUP LIGHTING

WHY DECENTRALISED DIGITAL LIGHT CONTROL IN THE WORKPLACE IS THE FUTURE

DALI 2®

BENEFITS OF THE DALI-2 DIGITAL STANDARD AT A GLANCE

- Internationally established open industry standard
- Cross-manufacturer interoperability
- Individual addressing and control:
  - up to 64 operating devices, 64 control and input devices
  - up to 16 groups
  - up to 16 scenes
- Software reconfiguration with no hardware modification
- Bidirectional communication with status feedback
- Robust bus communication with collision detection
- Can be used as a sub-system (e.g. with KNX)
- Optimal dimming of LED lighting
- Installation with less work and lower material costs:
  - Only one single cable for all devices (including control cable and power supply)
  - Existing wiring can often still be used
  - Cables can be arranged in line, star or tree topologies
  - Polarity-free wiring
  - Groups are established via software without any wiring requirements

SMART AND POWERFUL

Individual control with up to 16 scenes, simple reconfiguration using software and now support for cross-manufacturer interoperability: Anyone looking to offer their customers something more than just ON/OFF will inevitably embrace the DALI-2 industry standard. It offers unrivalled flexibility for offices, educational institutions and medical facilities – and now, you no longer need a laptop for configuration.

No two trends are alike. There are fast-moving fashion trends, slightly longer consumer trends or sociocultural trends lasting 10 to 15 years. And then there are megatrends. These have a long-term impact and run for several decades or more. Megatrends include the current trend towards a more flexible world of work. This now substantially influences the planning and use of the right building technology.

Signs of this increasing flexibility include state-of-the-art working time models or switching between working from home and the conventional office. The conventional office itself now needs to cope with frequent changes in room usage depending on time and situation. Changes in room usage demand changes in lighting, especially when light groups have to be divided up differently. But rewiring everything every time is simply not an option.

MODIFY THE SOFTWARE, NOT THE HARDWARE

The DALI industry standard provides a solution to this problem that goes well beyond the possibilities of analogue technologies. Grouping and the subsequent reconfiguration are done simply by using software. The end user benefits from flexible light management with up to 16 scenes. If presence detectors are built into the system, they provide far better quality of life and energy efficiency than would be possible using a simple switching mechanism. This may be achieved with presence- and daylight-dependent constant lighting control or pleasant automatic basic lighting in corridors, for example.

There are two reasons why many have not yet deployed DALI. Firstly, many vendors' solutions are proprietary and incompatible with solutions from other vendors. Secondly, while using software to configure the lights sounds wonderfully simple in theory, many lighting specialists are not used to dragging a laptop around the construction site. ▶

Simple configuration with the ESY-App: the decentralised multi-room DALI-2 solutions from ESYLUX. ▶

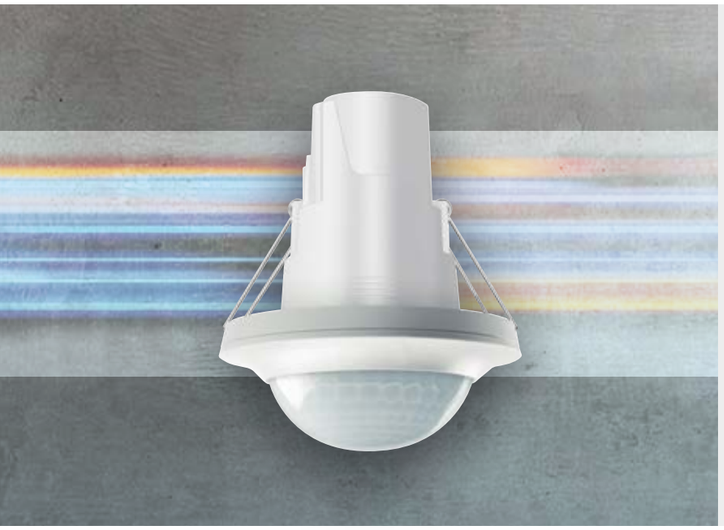
Download Bluetooth control for Android and iOS free of charge

Download on the App Store · GET IT ON Google Play

ESY CONTROL

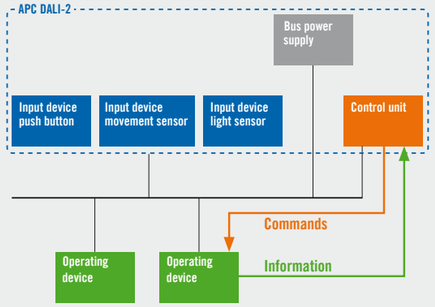
ADDITIONAL BENEFITS FOR YOU AND YOUR CUSTOMERS WITH DECENTRALISED DALI-2 SOLUTIONS FROM ESYLUX:

- **Cross-room control of up to 16 groups using APC presence detectors with extensive functional advantages**
- **Optimum lighting conditions with maximum energy efficiency thanks to intelligent light control**
- **Low system costs with simple integration of cost-effective BMS detectors**
- **No switch cabinet components/planning adjustments**
- **Simple manual override with conventional 230 V buttons**
- **Additional channel for presence-dependent switching of HVAC or supplementary lighting, for example**
- **Simple commissioning and configuration by smartphone (no tablet, no PC, no special software)**
- **Up to 90 % faster documentation by automatically saving all project settings via app**



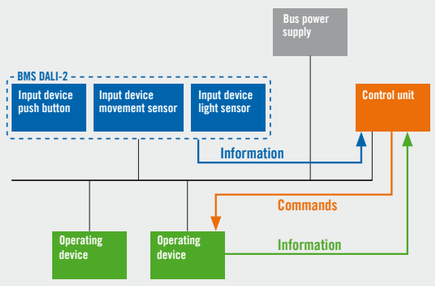
CONTROLLING APC PRESENCE DETECTORS (APC: application controller = control unit)

Bus communication – APC presence detector



BMS PRESENCE DETECTORS AS INPUT DEVICES (BMS: Building Management System)

Bus communication – BMS presence detector



APC PRESENCE DETECTORS PROVIDING DECENTRALISED CONTROL

However, the situation has changed radically. The further development of DALI-2 now guarantees cross-manufacturer interoperability with suitably certified devices. And installers or planners no longer need a laptop for the configuration: They can simply use their smartphone or tablet – providing it is a DALI-2 system with ESYLUX APC and BMS presence detectors. APC? BMS? The explanation couldn't be simpler.

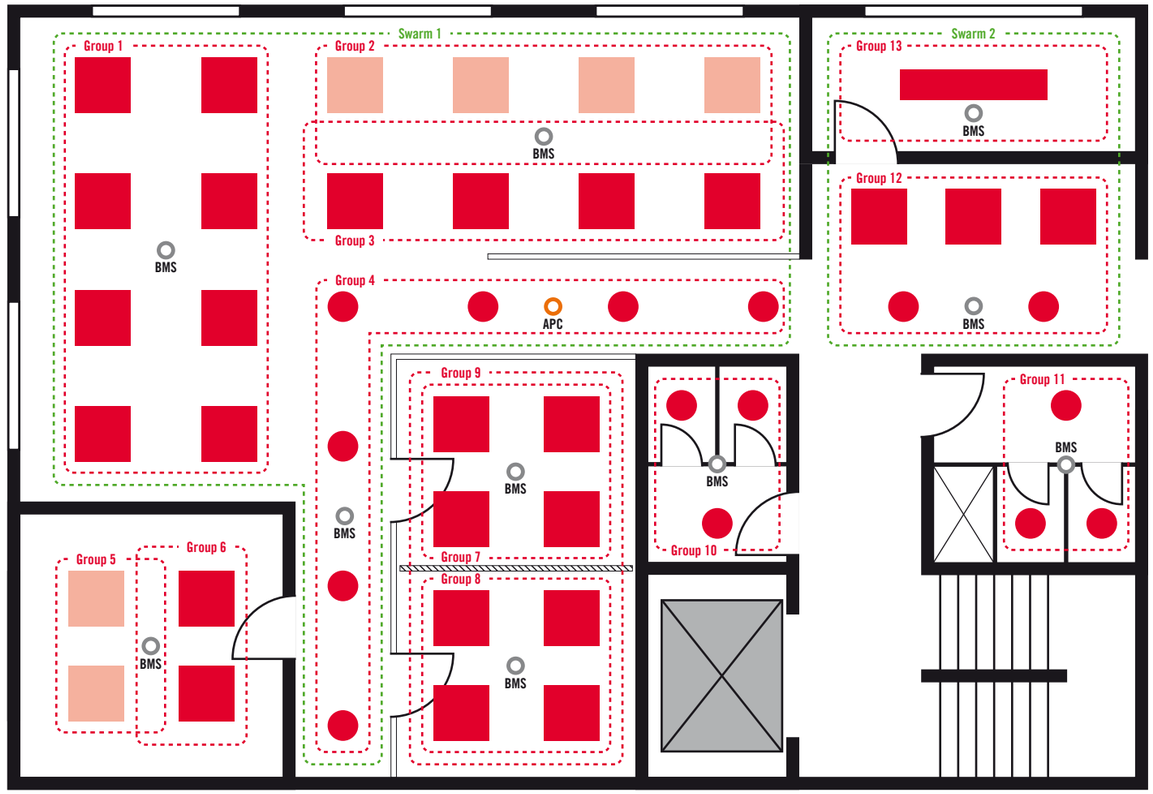
APC stands for application controller, i.e. the control unit for DALI-2. An ESYLUX APC presence detector features this kind of control unit as well as an integrated DALI-2 bus power supply. These components turn it into an intelligent interface for a system, supporting independent, decentralised, cross-room control of up to 16 groups without any control cabinet components whatsoever. The detector also has presence and light sensors, making planning and installation much simpler by bundling all components in a single housing.

◀ ESYLUX APC presence detectors unite the key device categories of IEC 62386 in a single device and directly control the operating devices. BMS presence detectors combine all key input devices in accordance with the DALI-2 standard, thus also simplifying planning and installation.

SUPPLEMENTARY BMS PRESENCE DETECTORS AS INPUT DEVICES

An APC presence detector, however, measures presence and brightness only in its own room zone. It requires support to provide individual control in all other zones. This comes in the shape of BMS presence detectors as input devices (BMS = Building Management System). Their sole task is to send information on presence and brightness in their area to the APC presence detector. The planning example below shows what such a combination of controlling APC and supplementary BMS presence detectors in a section of a building might look like.

Commissioning this kind of system is designed to be just as simple as this basic concept. Unlike rival solutions, this system is ready for use immediately with the factory settings once wired up: The APC presence detector initially treats all operating devices as a common group and controls them in uniform broadcast mode. The ESYLUX developers also came up with a very practical idea for the subsequent process of forming individual groups. ▶

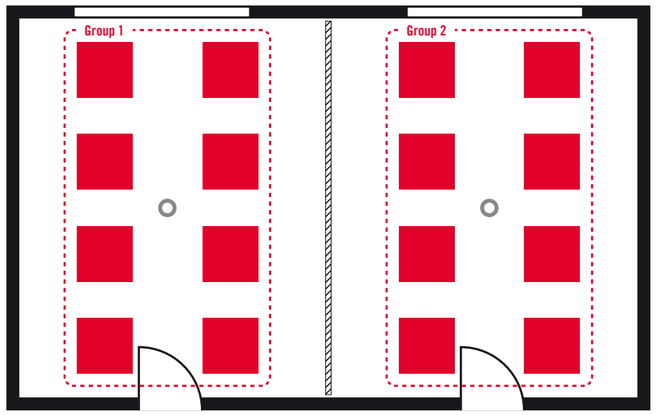


An APC presence detector controls up to 16 groups (in planning example 13) on a cross-room and decentralised basis. Since it only detects presence and measures brightness in its own room zone, it is supported by BMS presence detectors as input devices in all other zones. ▲

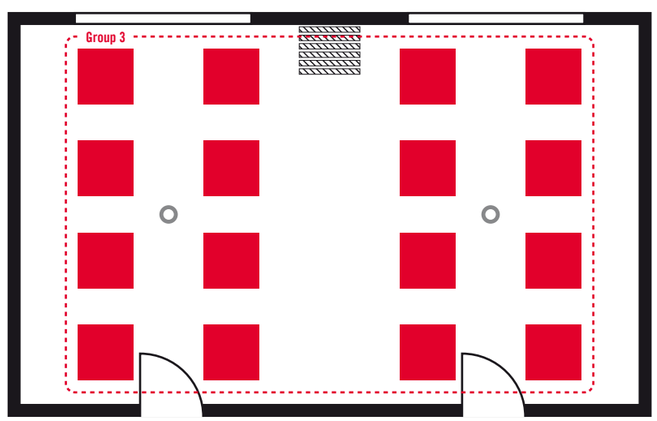
SIMPLE FLASHING FOR SIMPLE GROUPING

Once the single addresses have been assigned randomly to the devices, you are then faced with the very tricky question of how to tell which device on the ceiling belongs to which device icon in the app. To provide a solution, the developers utilised the integrated LEDs built into the operating devices and the presence detectors. Each addressed device on the ceiling simply flashes briefly when the device icon is pressed in the app. This makes grouping the devices fast and easy.

The ability to switch groups flexibly is one particularly striking example of the functions that subsequently allow users to customise the system. It underlines the advantages of digital control and shows how the APC presence detectors allow changes of room usage. This may be needed in a conference room with several zones that require different levels of lighting in certain situations. Or in a classroom where the lighting near the blackboard is switched off during a presentation, but the lights in the rest of the room stay on.



◀ Scenario 1: A closed partition divides a room into two halves. The lights in both room halves are assigned to group 1 or group 2. The presence detectors provide independent, individual light control in both groups.



◀ Scenario 2: All lights and presence detectors in the room are also assigned to group 3 that is still inactive in scenario 1.

Opening the partition activates group 3 via the presence detector's push button input while deactivating the previous groups 1 and 2. This results in uniform, harmonious light control throughout the room.

Lights
Presence detectors

◀ Modern room concepts often rely on flexible usage. One example: movable partitions that can be opened and closed depending on the work situation.

FLEXIBLE GROUP SWITCHING

You may think that such problems could simply be solved with scenes. But standard scenes have a downside with DALI: They override the automation and terminate the light control! In most cases, this is not what you want. After all, it is simply a matter of changing the brightness in one zone. You could also do that by modifying the brightness setpoint. And when the APC presence detector switches off the light in one room zone, it should of course still control the lights in the other zones.

That is where the notion of flexible group switching comes into its own. All lights and presence detectors in a room or area are simultaneously simply allocated to several groups using the ESY-App. Depending on the situation, one of up to three switches – connected to one of the push button inputs on the APC presence detector – activates a different group scenario. The trigger may be pushing a light switch or opening and closing a partition.

ALTERNATIVE GROUPS FOR THE SAME DEVICES

Scenario 1 and 2 show this configuration. A movable partition divides a large office space into two halves and is open or closed depending on the work situation. BMS presence detectors are placed in both halves and send the results of their presence detection and brightness measurement to the system's controlling APC presence detector. With a closed partition, the APC presence detector provides individual light control in both areas on this basis. With an open partition, it simply calculates an average of both light measurements – thus ensuring uniformly harmonious light control throughout the room. ■

Flexible switching of groups impressively underlines the advantages of digital control, but it is just one example. Page 34 includes an overview of all functions of the new APC10 and APC20 detectors. Further detailed information on the DALI solutions from ESYLUX can also be found in the document *DALI-2 Concept & Functions* in the service section on the ESYLUX website.

MOTION, DETECTION, STANDARDS!

SENSNORM PRESIDENT OLAF RIEBENSTEIN ON THE NEW STANDARDISED MEASUREMENT METHOD FOR PIR SENSORS

For many years, manufacturers of presence and motion detectors have been using their own method to determine the fields of detection of their PIR sensors. Thanks to sensNORM, an association of leading manufacturers have now created the basis for a uniform approach while substantially influencing IEC 63180, which was developed in parallel. Olaf Riebenstein, President of sensNORM and a manager at ESYLUX, discusses the background and content.

▲ High tech uncovered: an ATMO presence detector with the lens removed and circuit board visible. In the middle is the PIR sensor.

Mr Riebenstein, aren't standards just a bit boring?

There are definitely people that say standards are boring. They find them dry and struggle to understand the text. But there are also lots of people who love these kinds of things. These include people sitting on standardisation committees. They just love it. Making sure to choose their words carefully. It is important for the wording to be as unambiguous as possible and not to generate any questions. All of which is exciting. And that's why a standard is anything but boring for me. It's fun.

A few years ago, the leading manufacturers of presence and motion detectors got together and have now defined a long-awaited measurement and testing methodology for devices in the shape of sensNORM.
What was the co-operation like?

Well, initially it's a bit strange to suddenly find yourself sitting around a table with your competitors, slowly getting to know each other better. At first, everyone's trying to get a feel for each other. Over time you bond and find common objectives. And ultimately, we got on so well that we now all work together constructively and so far have also managed to meet our objectives.

At ESYLUX, Olaf Riebenstein heads up the Serial Product Support and Technical Editing departments and has been involved in standardisation work at a national and international level since joining the company over 16 years ago. He became President at sensNORM three years ago and has been an executive board member from the outset. At the same time, he is actively involved in the drafting of IEC 63180. As an ICT electronics expert, his origins lie in safety technology.

sensNORM focuses on motion detection using passive infrared technology, or PIR for short. This is the most commonly used technology by far. What are the characteristics of this technology?

PIR technology uses piezoelectric semiconductor crystals. These detect temperature changes in their environment and respond to the body heat of moving people. Another characteristic feature of presence or motion detectors with PIR technology is the lens. It focuses the infrared rays from people who are moving in the field of detection onto the sensors behind the lens. Seen from the outside, the lens structure resembles a honeycomb. These honeycombs divide up a detector's field of detection into several sectors. ▶

How exactly is motion detected?

Motion is only detected once it crosses over the boundary between two such sectors and a difference in heat is produced. The focal length of the lens means the sectors grow as the distance to the detector increases. But as the distance increases, you also need greater motion to cross over a sector boundary. Hence the field of detection is divided up into various sections for needs-based planning. In the outer area, the detector only reliably identifies tangential walking motion. This means motion that runs diagonally in relation to the detector. Further inside, you have a connecting area where the detector also detects radial walking motion running head-on.

METAS, the Swiss metrology institute, is now home to the first independent test laboratory where manufacturers can have their devices tested in accordance with sensNORM. Could you describe the structure and process of the measurement method used there, and explain the content of the standard?

sensNORM has defined and stipulated a measurement method that runs fully automatically. We have defined a test dummy to simulate a real person in the test. It's got legs, a body and a head. The precise individual measurements are specified in the standard.

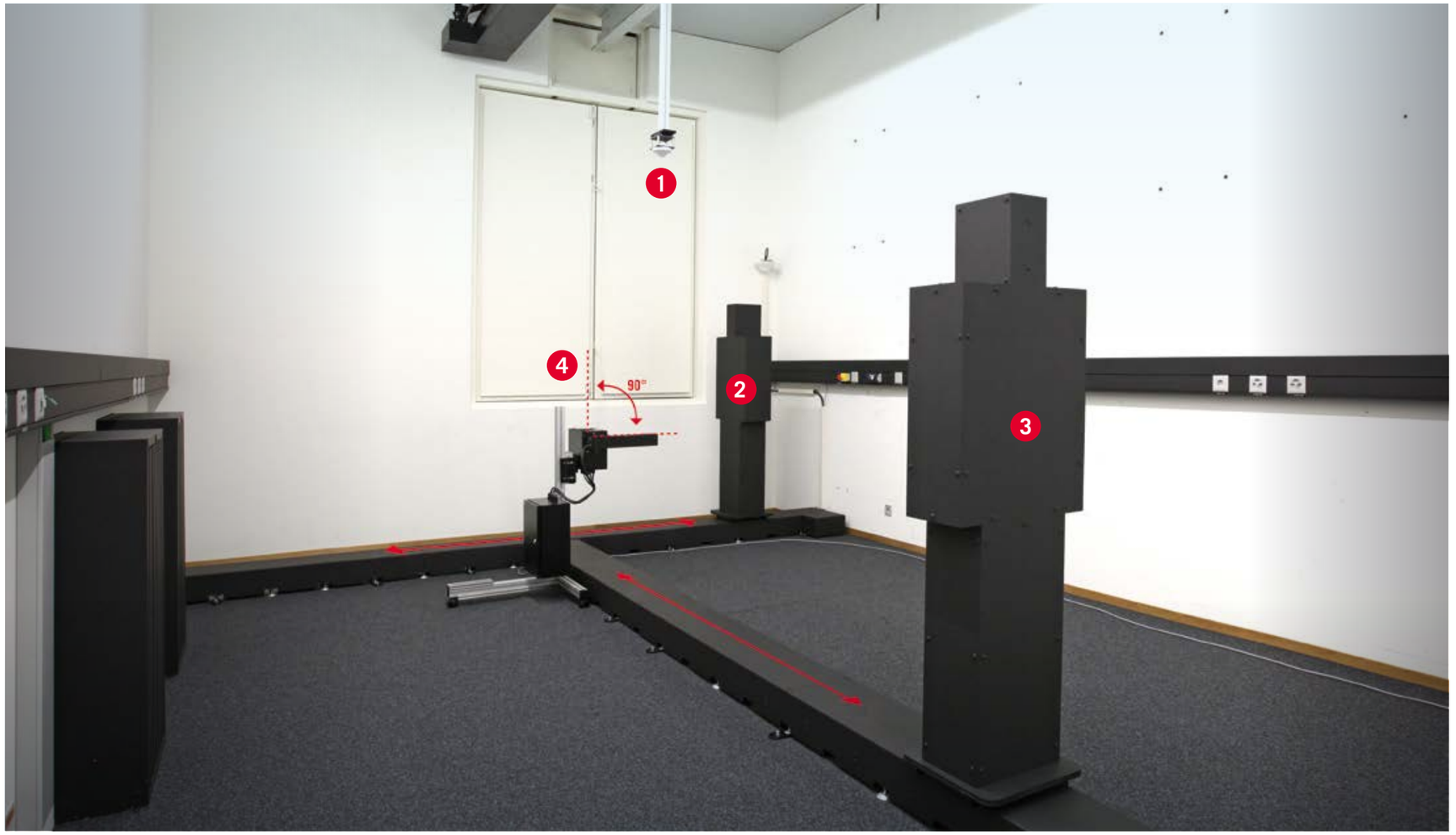
What material is it made of?

Aluminium. It is coated on the outside with black paint. And inside, various heating plates are attached to these aluminium panels. The dummy's temperature is then adjusted using electronics and temperature sensors and controlled to keep it constant during the measurement. It must always be above the temperature of the test room. The difference in Kelvin is specified exactly and corresponds to the average difference in practice.

And what does the dummy do during the measurement?

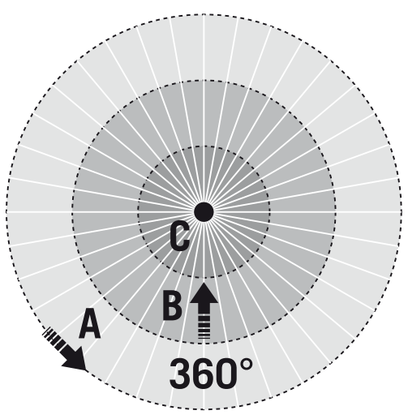
Two identically sized dummies are mounted onto two different rails in the test room. The detector being tested is fixed on a rotating platform. The measurement starts by scanning the exterior area, which means the tangential motion at 90° to the detector radius. The first dummy moves on its rail from right to left diagonally in relation to the motion detector, and then back again. The speed, acceleration and deceleration are determined. If the detector is not triggered at the start, the measurement distance between the dummy and detector is gradually reduced. Once something is detected, this walking movement is repeated.

For a positive result, the dummy must be moved three times in total in one direction and three times in the other direction, with the detector being triggered at least twice in each direction. Only then can we say this range is triggered. A similar process is used with radial motion. The only difference is the direction. The second dummy moves on its rail towards the detector until the detector is triggered. It goes through the whole process three times. Then the average is taken of the three values and documented as the measurement result.



1. Ceiling-mounted presence detector with 360°-field of detection
2. Test dummy for tangential measurement
3. Test dummy for radial measurement
4. Test arm for presence measurement

In the test laboratory run by METAS, the Swiss metrology institute, two dummies and a test arm simulate large and small human movements. The detector being tested is mounted on a rotating platform. The room is optimised to ensure constant environmental conditions, especially with regard to temperature. ▲



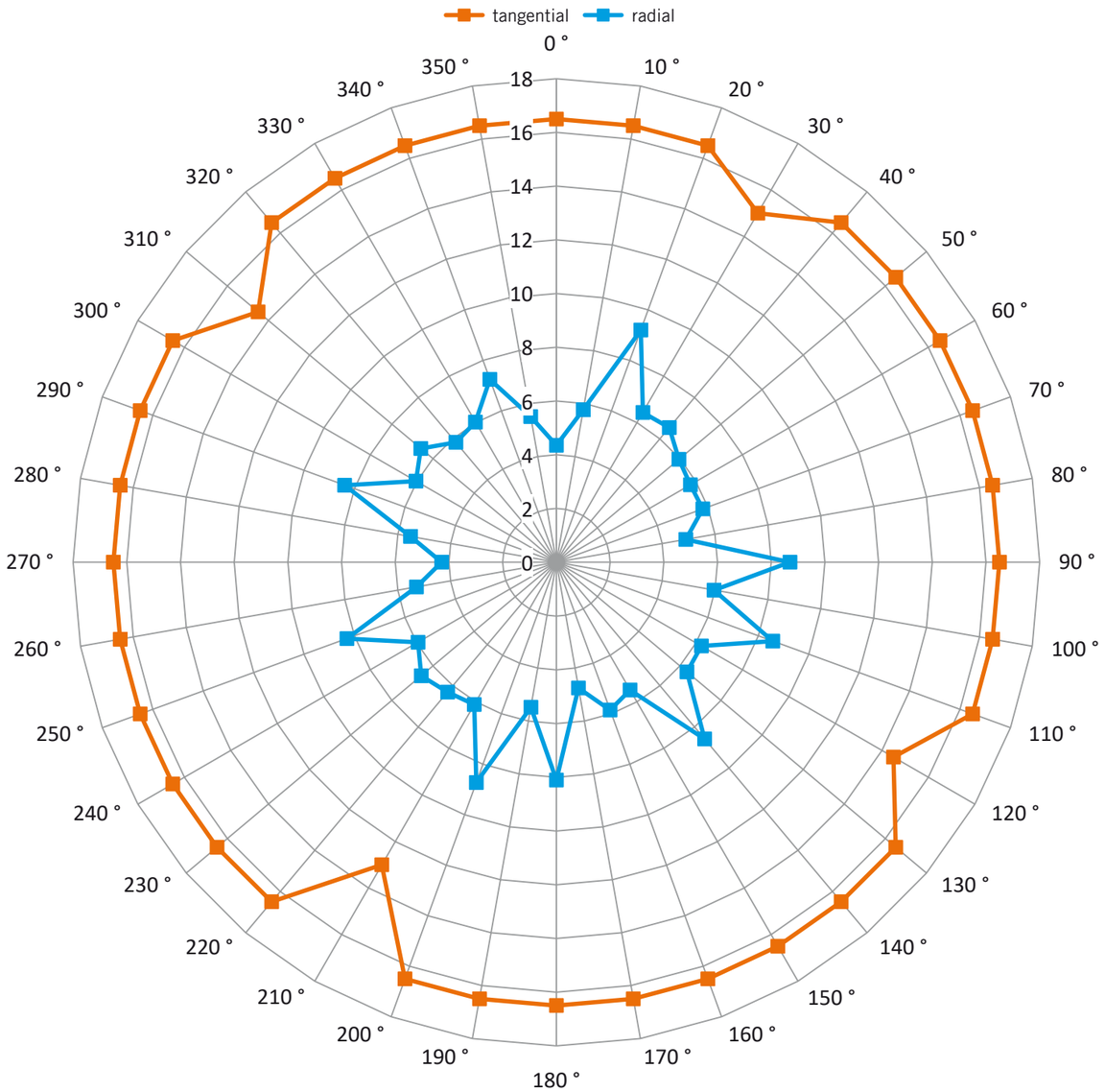
For needs-based planning, the field of detection of presence and motion detectors is divided up into several sections. In the outer area **(A)**, the detector detects tangential walking movements running diagonally to it. Further inside, it also detects radial walking movements coming towards it head-on **(B)**. In addition, presence detectors detect micromotion in their presence area **(C)**. ▶

And why is the presence or motion detector mounted on a rotating platform?

Depending on what lens geometry you use for the PIR sensors, the range may vary in certain cases in a detector's individual lines of sight. With tangential motion, the ranges don't vary that much, whereas variations are fairly common in the case of radial motion. That's why we rotate the detector 10 degrees after each measurement, both with tangential and radial motion. That's the easiest way to do it.

The sensNORM sets out very precisely the requirements for environmental conditions. The room should be big enough, for instance.

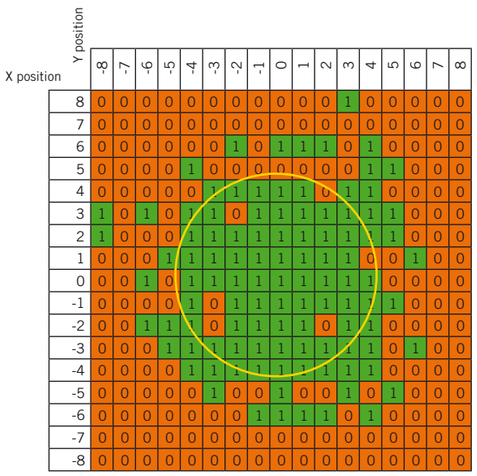
It's all about the distances. Where you've designed and built the test room well, as at METAS, the size is irrelevant. The problem only occurs if you have a motion detector that has a range of 40 metres in diameter, for example. For that I'd need a room that is at least 20 metres long. For rooms that don't meet these requirements, we have specifically scaled and recalibrated the test dummy. As a result, we have defined a 50 % dummy and a 20 % dummy. These then allow larger ranges to be mapped in rooms that are actually too small. ▶



◀ This is what the raw data looks like after the measurement In this case, with a presence detector with a 32-metre tangential and 11-metre radial detection range as an example.

sensNORM also includes precise specifications for ambient temperature.

The difference between the temperature of the dummy and its environment must be as realistic and as constant as possible so that we also have reproducible results. I could theoretically use a sports hall. It just needs to be kept at the right temperature with no draughts. The measurement result must not be distorted by external influences. If external sources of interference mean that I introduce thermal radiation in the infrared region into the measurement room, then the measurement results won't be reliable. Strong daylight and direct sunlight must be avoided too. The same applies to the walls.



The test arm is moved within a grid to measure the presence area. The yellow circle shows the idealised line that subsequently facilitates needs-based planning. A maximum 15 % of the measurement results within the circle can fail to trigger a response. ▲

What do you mean exactly?

Let's say theoretically you have a wall which surface temperature is not homogeneous because there is a heater fitted to it every three metres. If the dummy passes through this area, the detector sees the dummy's temperature in relation to whatever is behind the dummy. If this difference changes simply because the temperature of the walls isn't homogeneous, this substantially affects the measurement results.

Apart from the full-body dummy, there's also a motorised test arm in the laboratory. What's it for?

This is designed specifically for presence measurement. Unlike with motion detectors, presence detectors also include an interior presence area, in addition to the tangential and radial areas. Here, they detect even the tiniest movements. The test arm simulates a person's forearm while sitting at a desk. Normally, the forearm is horizontal, pointing in the direction of the detector. Then it is moved vertically upwards by 90° before returning straight back to the horizontal start position. This is done three times and then we calculate the average. After each individual measurement, the test arm is moved within a stipulated grid in the supposed presence area of the particular detector.

The results are also displayed graphically once all the measurements are complete. In the subsequent communication with the customer, these results always have very uniform shapes. But given the direction-dependent measurement deviations you mentioned earlier, that probably doesn't correspond to reality.

The round fields of detection you see in the planning and communication documentation are measurement results that have been rounded according to a certain rule. As I mentioned, the measurement results can normally deviate wildly in certain cases. But the planner cannot do anything with this raw data. That's why we've created a rule that displays this raw data in an idealised form. This data is then displayed in geometric basic shapes, such as a circle.

What is the rule?

Only 15 % of trigger results may be shorter than the specified idealised line. If I have a circle for a ceiling detector with a field of detection of 360°, which I have measured with tangential and radial measurements every 10 degrees, or 36 times in all, only 15 % of these 36 measurements may be within the idealised circle. With the presence area, the presentation is slightly different due to the grid. In this case, 15 % is the maximum figure for all the measurement results that are not triggered within the idealised presence area.

In parallel with sensNORM, the international IEC 63180 has also emerged as a standard for measuring PIR sensors. That is slightly surprising and initially seems problematic. Are they related at all?

Absolutely. The sensNORM group helped shape and substantially influence the wording of the IEC standard from the start. Two people from the sensNORM group were also in the IEC standard working group and collaborated in the drafting process.

How do the two standards differ?

The biggest difference is that the IEC allows a walking test with a real person as an alternative to the automated test, while sensNORM does not. There are people that walk a bit faster and people that walk a bit slower. That means my measurement results are different. That's why as the people involved in sensNORM we believe that a walking test with humans doesn't provide reliable measurement results. sensNORM measurements are automatic only. So it doesn't matter who measures which detector and when. The results are always reproducible. ▶

"The place where Switzerland is at its most accurate" – METAS sees itself as shouldering this responsibility. Its 21 specialist departments cover acoustics and vibration through to DC and low frequency, as well as radiometry and photometry. ▲

And why does the IEC differ in this regard?

The IEC version is the lowest common denominator that we could reach in the committee. Those of us involved in sensNORM set out more stringent requirements, but didn't always manage to get them through in the global forum. You normally just have manufacturers sitting on these kinds of standardisation committees. Nonetheless, they do believe that you must use these standards in countries without the financial resources of major industrialised nations. The kind of automatic measuring device we defined can be very expensive. And countries with limited resources are supposed to apply this standard too. We wanted to be able to say to them: OK, this is a standard that you can use, and all you need to do to take the measurements is walk. You just need to make sure that you walk at a constant pace.

Are there any other differences?

On some important issues, sensNORM placed more emphasis on reliability and the relevance of the values to practical applications. But for the IEC, it was more important that the measurements were as inexpensive as possible and restricted to the essentials. With tangential detection, we decided that at least two out of the three back and forth motions of the dummy had to trigger a detection. As such, we measured an area where you can say that the probability of being detected there is very, very high. But you might also find that triggers occur at even greater distances.

In the IEC, one trigger is sufficient, with only two back and forth motions altogether. There's a different way of thinking behind it. The measurements are taken so that you determine the greatest possible distance. In our view, that has less relevance to what happens in practice. With sensNORM, you get a result with a shorter range but this result is considerably more reliable. With IEC, you get a greater range, but you're not sure at all if the detector also spots you effectively if you are even closer to it. It might be that it doesn't spot you at all.

As such, our measurement method is more suitable for practical applications and easier for the planner to use. It's no use for planners knowing that the detector scans 40 metres in the best-case scenario when they want to cover a much smaller space and know for sure that a response is triggered in 20 metres. Why should I care how far the detector can scan? I want it to work reliably where I need it.

The measuring facility at METAS is programmed so that you can use both test methods there. But your answer to the question of whether I as a manufacturer should have my sensors tested according to sensNORM or the IEC standard should be unequivocal.

ESYLUX supports sensNORM and its detectors can of course measure according to this standard. The detector is pre-conditioned before the measurements. Before taking any measurements, this means that the detector is checked to see whether it is triggered erroneously with extreme temperature ranges. This test is much more difficult to pass with sensNORM than according to the IEC's simple requirements.

The detectors are tested twice with sensNORM. Once with the minimum temperature specified by the manufacturer and once with the maximum possible temperature. The detector must not be triggered erroneously within 24 hours. However, the IEC only tests one temperature: the normal room temperature. And the duration is only 12 hours. So the quality requirements are much easier to meet with the IEC. That's why good manufacturers test their detectors according to sensNORM.

Looking back for a moment, what did you find most interesting about your involvement with the standards?

The most interesting thing was working in the international standardisation group because I got to meet lots of interesting people that also have different ways of thinking about measurement methods. It's exciting getting to know people and their different perspectives and mindsets at an international level, being able to travel to other countries and ultimately working together as a team to come up with a joint result despite all the differences.

Mr Riebenstein, many thanks for sharing these interesting insights. ■

sens)))NORM

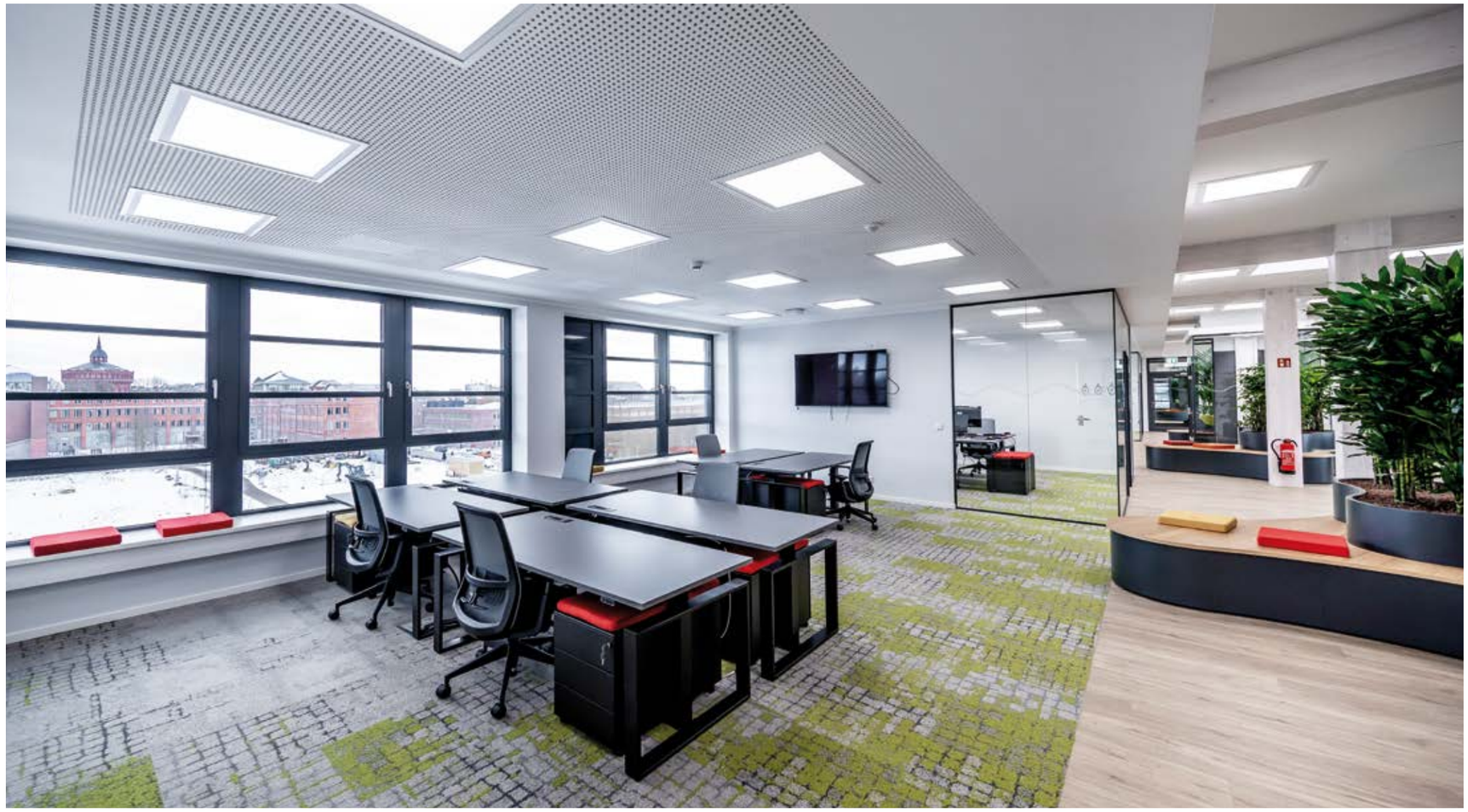
Further information on sensNORM is available at www.sensnorm.com. Visit www.metas.ch for a detailed description of all departments and work groups at METAS. Both websites feature a video illustrating the test laboratory and the measurement processes.

ATMOSPHERIC STOREYS

By adding another floor to the three-storey brick building in the Kiel Science Park, office spaces with state-of-the-art building technology were created. A KNX-based building automation system with intelligent light and ventilation control with ESYLUX presence detectors improves quality of life and energy efficiency. Employees also benefit from the flicker-free human centric lighting – provided by CELINE recessed lights with plug-and-play installation.

From beach volleyball to a boules court and shower facilities, a healthy work-life balance is a key element of the Kiel Science Park, a community of some 100 companies with over 1600 employees. The park is right beside the University of Kiel and offers the businesses located there the opportunity to exchange scientific knowledge, to take part in cross-topic and cross-organisational learning, and to experience a culture of innovation. This site is where knowledge work, skills and quality of life intersect. There is also a daycare centre and restaurants for employees. ►

In the attic of the building, a KNX building automation system controlled by ATMO presence detectors ensures optimal light and indoor climate. ▶



RED BRICK ON THE OUTSIDE, STATE-OF-THE-ART BUILDING TECHNOLOGY ON THE INSIDE

The names of the buildings themselves pay homage to the particular role of technology in the Science Park. These include the Hermann-Kobold-Haus, named after the German astronomer, or the Konrad-Zuse-Haus, which is dedicated to the inventor of the first computer. Many of the buildings date from the mid-20th century and were fitted out with state-of-the-art building technology after being gutted – to also help the companies based on the site to recruit new specialist staff.

The latest example is the "Einsteineins" building, where a full and mezzanine floor were added to the three storeys of the Science Park. The architects designed the resulting spaces with around 1200 m^2 of floor space using drywall based on the open-space concept. Zones with team working spaces alternate with meeting rooms, quiet work zones and telephone cubicles. Glass partitions support the open-space geometry and ensure eye contact at all times. A KNX building automation system provides the ultimate in comfort coupled with energy efficiency.

MULTI-SENSOR PRESENCE DETECTOR FOR INTELLIGENT ROOM AUTOMATION

ATMO presence detectors from ESYLUX act as compact intelligent control units for this system. Unlike usual presence detectors, they have temperature, humidity and air quality sensors built into a single device along with presence and light sensors. "Customers are often amazed that they don't necessarily need multiple individual sensors in the room", explains electrical engineer Jan-Phillipp Wriedt, Head of Building Technology at dc Services GmbH, which specialises in planning, installing, programming and commissioning intelligent building control systems in the commercial sector. "You should therefore specify the synergies of the ATMO right from the planning stage".

The multisensory presence detector makes optimum use of the multi-disciplinary principle of the KNX bus. On the basis of its temperature measurement, it controls the underfloor heating system. It uses an actuator to open the skylights in the roof automatically where necessary thanks to its air quality measurement based on volatile organic compounds. In the telephone cubicles, it activates the ventilation when fresh air is required and activates the air conditioning in the meeting rooms on the mezzanine floor. "And using switchable sockets", adds Wriedt, "air purification appliances can also be integrated easily".

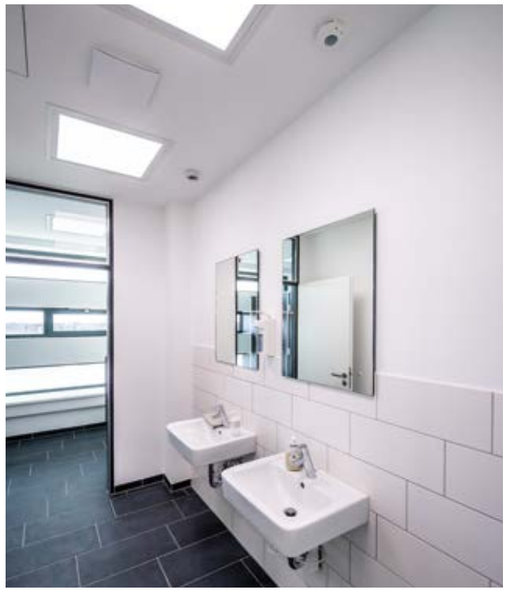
PRESENCE SIGNAL HELPS ENERGY EFFICIENCY

The presence detection from the detector provides another important benefit in operation. It automatically switches on all the devices, but also reliably switches them off to save energy if the rooms are no longer occupied. If a room is empty, it automatically lowers the blinds in summer to prevent the sun overheating the room – which the air conditioning would then have to cool down again later, consuming power in the process.

The DALI controller for the LED lighting in the rooms, which is integrated into the KNX system via a gateway, also switches the ATMO presence detector depending on presence. Using its light sensors, the detector ensures daylight-based constant lighting control where people are present, thus ensuring the right level of illuminance in the workplace. Experience shows that users often forget to switch off appliances, so it does this automatically while also optimally exploiting the long service life of the LEDs. ▶

◀ When the projector is switched on in the presentation room, a presentation mode automatically switches off the light near to the screen and lowers the blinds.

Human Centric Lighting provides lighting sequences similar to daylight in all areas. Implemented with CELINE recessed lights, it is installed quickly and easily using plug-and-play. ▲



◀ In sanitary facilities too, the ATMO presence detector improves air quality.

TIME-SAVING PLUG-AND-PLAY INSTALLATION

One special feature of the connectors had previously substantially accelerated the installation process: The variants of the CELINE recessed lights used here come with RJ45 sockets. The system could therefore be wired almost completely using plug-and-play thanks to compatible driver sets with RJ45 plugs on one side and WINSTA connectors from WAGO on the other – a compelling argument at a time when electrical installers have to contend with high workloads.

"It's only a matter of time before pluggable solutions are in widespread use in the German market", says Jan-Phillipp Wriedt with certainty. He adds that this practice is already common in other European countries such as France, the Netherlands or Scandinavia, due not least to the growing shortage of trained personnel. Thanks to plug-and-play, Wriedt claims that anyone could wire up the lights without any electrical engineering knowledge. "At our company, it was the drywall specialists", says Wriedt. "They installed the ceiling panels and recessed lights into the acoustic ceiling and at the same time plugged in the connections according to our wiring diagram. That was it". ■

Discover all the advantages of the ATMO presence detector on the ESYLUX website at www.esylux.com/atmo

HUMAN CENTRIC LIGHTING WITH SCENE OVERRIDE

For the lighting itself, dc Services opted for human centric lighting, the state-of-the-art variant: lighting sequences similar to daylight that dynamically and automatically change the brightness and light colour. This increases vitality and well-being, stimulates concentration, and improves health too as you get a better night's sleep. "You're not as tired after work", confirms Alexander von Dewitz, site manager of the IT service provider REWE Systems, who, along with his team, benefits from the innovative lighting.

The human centric lighting uses recessed lights in the CELINE series from ESYLUX with Tunable White. "The decisive factors in this respect were the superb LED quality, the very low flicker factor and effective glare suppression", explains Wriedt. Users can override the automation in their zone at any time by pressing a button and can select three predefined scenes: An inspiration mode activates dimmed warm white light, a concentration mode bright, cold white light, and a presentation mode automatically switches off the light near to the screen and lowers the blinds when the projector is switched on in the presentation room.

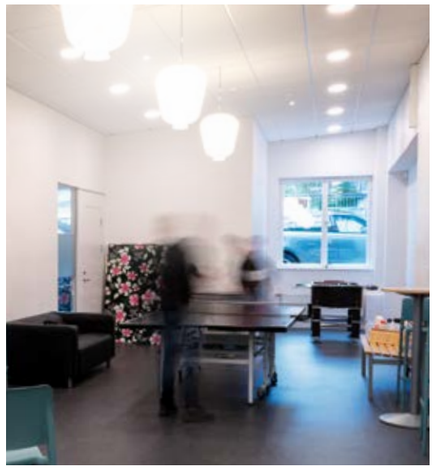
Telephone cubicles offer employees a retreat at any time. ▲

On the mezzanine floor, a roof terrace and kitchenette provide a place to relax during breaks. ▲

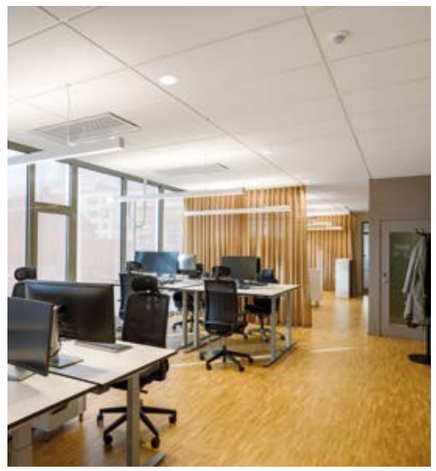
IDEAL LIGHT FOR CHEFS AT THE GRILLSKA GYMNASIET

Grillska Gymnasiet in the Liljeholmen district of Stockholm is no ordinary secondary school – it teaches the next generation of Swedish chefs! Around 600 pupils have a choice of courses to prepare them for university, apprenticeships or employment, while also benefiting from an extensive range of sporting activities. They also regularly cook for interested visitors who dine in the school's own restaurant.

Driven by an ambition to achieve optimal energy efficiency, the school's management team has opted to use automation and lighting solutions from ESYLUX: Light systems featuring ESYLUX Light Control and IP54-protected CELINE lights with presence- and daylight-dependent constant light control provide optimal working light in the kitchens. Ventilation and whiteboard lighting in the classrooms is integrated into the light systems via DALI actuators and is controlled fully or semi-automatically. DUO-DALI presence detectors control ELSA-2 downlights in corridors, lounge areas and stairwells. ■



SWARM FUNCTION FOR ENGINEERS FROM REJLERS



Rejlers is one of the largest engineering consultancy firms in the Nordic region. It employs more than 2400 staff to develop solutions in technical fields such as energy, industry, infrastructure, property and telecommunications for customers in Sweden, Finland, Norway and the United Arab Emirates. At the same time, the company aims to chart a sustainably oriented path on the road to a fossil-free society.

To make its new headquarters in Stockholm as energy efficient as possible, the company opted to use LED-based DALI lights and presence-dependent and daylight-dependent light control via intelligent automation solutions from ESYLUX. Stylish white FLAT presence detectors have been fitted in meeting rooms. SMARTDRIVER control units and presence detectors from the ESYLUX ELC light systems control the lighting in the conference rooms, while networked groups and the swarm function provide flicker-free and comfortable lighting in open-plan offices. ■

BROADCAST FOR IT PROFESSIONALS

SERVICE PROVIDER MÄRZ OPTS FOR DALI AUTOMATION AND LED LIGHTING FROM ESYLUX

The März company building near Hamburg: ALVA bollard lights with integrated DALI motion detector control light groups in broadcast mode around the building and provide a pleasant orientation light where necessary. ▼

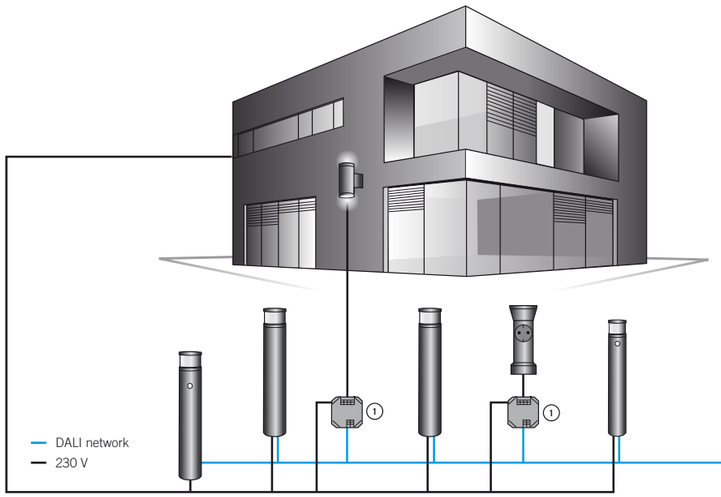
The IT service provider März took the construction of its company building near Hamburg as an opportunity to completely modernise its working environment. Flicker-free LED lighting and intelligent, sensor-based light control from ESYLUX improve quality of life and reduce energy consumption. An ELC light system with energy-efficient Human Centric Lighting is used in the offices.

In 1982, when the PC and Internet were still in their infancy, engineering graduate Harald März set up an IT company, demonstrating his true feel for the future. Today, almost 40 years on, the Internet is the world's centralised information and communications platform – and März Internet Services AG is one of Germany's largest full-range IT service providers. Their pledge reads "*IT, die läuft*" ("IT that runs").

One of März's eight German branches is located in Ahrensburg in the Hamburg Metropolitan Region in northern Germany. At this branch, around 30 employees support customers with IT infrastructure projects, system solutions and software development. The offices are located in a new, modern building, with working conditions and energy efficiency being prime considerations during its construction.

DALI BOLLARD LIGHTS CONTROL THE OUTDOOR LIGHTING

For the lighting, managing director and engineering graduate Fritz Walter opted for LED-based lighting and intelligent, digital control using presence and motion detectors, both implemented by ESYLUX. The robust ALVA bollard lights with integrated DALI motion detector are protected against sea air and provide the right light at the right time around the building. Each of the lights controls a group of other, sensorless DALI bollard lights in broadcast mode as well as the up-/downlights on the facade using DALI actuators. ▶



ALVA up-/downlights are also integrated into groups using DALI actuators (1). ▲

Large windows and glass partitions deflect the daylight right into the centre of the building at März, creating an open feel. ▲

Inside the new building, large glass partitions deflect the daylight right into the middle of the building. In the entrance area and corridors, DALI presence detectors control downlights from the STINA series, which are known for their glare-free light. The presence detectors do not abruptly switch on the light, but gently increase the brightness of the lights via the DALI bus so that it is easy on the eye. "The light is very relaxing", says Nicolai Ehrengut, a business administrator trainee in IT system management.

HYGIENIC SWITCHING WITHOUT SWITCHES

Take a look at the walls and you'll notice light switches are nowhere to be seen. "We've dispensed with switches throughout the building", explains Fritz Walter. That's something staff appreciate: "It's great that the lights throughout the company come on themselves", says Ehrengut. And he's also aware that this switch-free configuration improves hygiene. "Touching the light switches in the toilet several times a day that ten other people have used before is not nice".

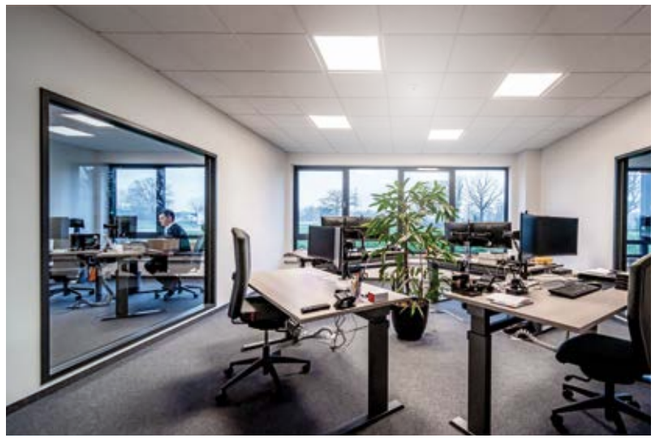
SYMBI™ LOGIC

Light systems with ESYLUX Light Control ELC technology help to boost well-being in the offices with a combination of LED recessed lights, control units and intelligent presence detectors. All components were simply connected during installation using plug-and-play and were ready to use immediately with the factory settings without having to be programmed. Employees in the company benefit from energy-efficient human centric lighting with the SymbiLogic technology from ESYLUX.

HUMAN CENTRIC LIGHTING ENHANCES VITALITY AND HEALTH

SymbiLogic improves vitality, motivation and concentration by using brightness and colour sequences similar to daylight, while also promoting a restful night's sleep by stabilising the circadian rhythm. "You become much fitter", says Fritz Walter. "You get the feeling that the light is helping you". The technology promotes energy-efficient implementation thanks to switching depending on presence and adaptive, daylight-dependent HCL light control. As such, the artificial light doesn't have to be on at full power during the day. "Automation is extremely beneficial for energy efficiency", is how Nicolai Ehrengut sums it up. ■

Glare-free STINA downlights provide lighting in the corridors – in broadcast mode controlled by COMPACT series DALI presence detectors. ▼



Light systems with ESYLUX Light Control provide energy-efficient human centric lighting in the office spaces thanks to adaptive HCL light control. ▲

CROSS-ROOM CONTROL

THE DALI-2 PRESENCE DETECTORS COMPACT APC10 AND APC20

For intelligent automation in accordance with the DALI-2 upgraded industry standard, ESYLUX is unveiling new APC10 and APC20 presence detectors in its COMPACT series. With integrated control unit and bus power supply, they control up to 16 light groups for independent, decentralised, cross-room light control. The end-user benefits from a large range of flexible functions.

With the interoperability of devices from different manufacturers, DALI-2 has established itself as the future-proof industry standard for light control. The APC10 and APC20 presence detectors in the COMPACT series make it easy to implement intelligent, decentralised automation of DALI-2 systems across rooms – and with no need for a building management system or switch cabinet components.

COMPACT APC10
expected to be available end of October 2021

COMPACT APC20
expected to be available from early 2022

INTEGRATED APPLICATION CONTROLLER FOR UP TO 16 GROUPS

Thanks to an integrated DALI-2 control unit (APC = Application Controller) and bus power supply, they reduce the planning and installation overhead. They enable individual presence- and daylight-dependent constant lighting control of up to 16 lighting groups, thus exploiting the full potential of DALI-2. BMS presence detectors from ESYLUX can also be used as input devices. Thanks to a large range of functions, the system can also be easily customised to individual and complex room situations.

SPECIAL FUNCTIONS ADD VALUE: FLEXIBLE SWITCHING OF GROUPS OR LIGHT CONTROL WITH OFFSET

One example is the flexible switching of groups that maintain optimal lighting conditions at each desk despite changing room use (see page 6 ff.). Another example is light control with offset, which provides energy-efficient gradation in rooms with windows on just one side even with a single controlling presence detector. Thanks to afterglow or an orientation light, the detectors can provide pleasant basic lighting in rooms and corridors in the event of short or long absences. An integrated 16 A relay can be used to switch HVAC or supplementary lighting. The APC20 variants also improve comfort in group or open-plan offices using a swarm function. ►

Thanks to the integrated, bidirectional Bluetooth interface of the detectors, the ESY-App or smartphone can be used to configure the device simply. ▲

SIMPLY OVERRIDE WITH THE 230 V BUTTON

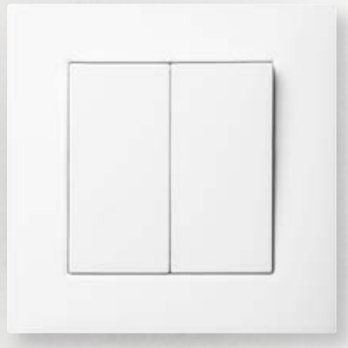
The APC presence detectors have four inputs for conventional 230 V buttons to provide a manual override – individually or with 16 configurable scenes. Previously installed buttons can still be used; there is no need to use costly DALI buttons. Another special feature is dimming with setpoint adjustment, which enables the user to simultaneously adjust the brightness setpoint of the light control temporarily or permanently through manual dimming. Automation can continue to run energy-efficiently despite the override (see figure on the right).

WITH TIMER CONTROL AND CENTRAL FUNCTIONS

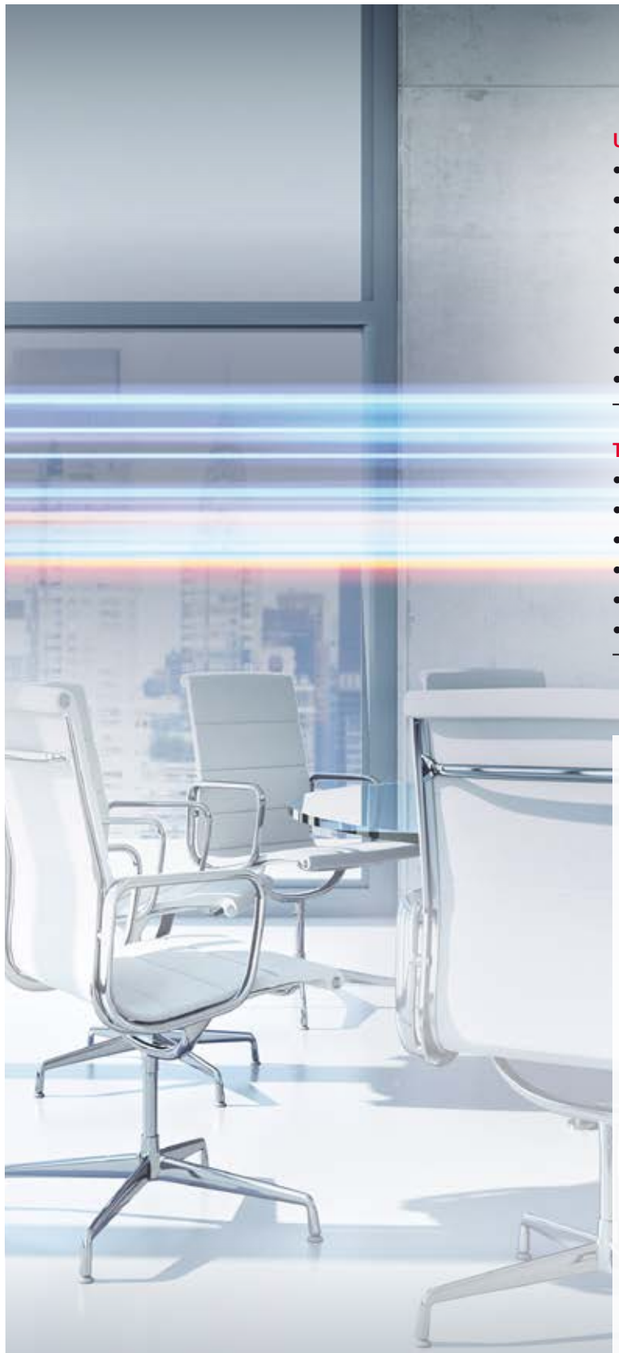
Timer control often supports needs-based automation, so the APC20 variants also support modification of functions and parameters depending on the weekday and time. This way, the brightness setpoint, for instance, can be modified, the orientation light activated, or an energy-saving power cut-off for DALI drivers initiated depending on the time. With the operating modes, the APC20 presence detectors also support a twilight switch and stairwell light mode. The central functions also facilitate the uniform control of several or all groups.

A DALI-2 system with APC presence detectors from ESYLUX can be easily started with factory settings in broadcast mode. Thanks to the integrated, bidirectional Bluetooth interface of the detectors, a simple configuration can then be carried out directly via the ESY-App and smartphone. Bidirectional functionality also allows devices to be read out, while the ESY-APP enables documentation and management of configured projects, for example as a PDF report.

The APC presence detectors are available with detection ranges of 8, 24 or 32 m in diameter. Installation in the ceiling uses a standard drill bit with a diameter of 68 mm. ■



APC presence detectors from ESYLUX offer four inputs for conventional 230 V buttons. This means that previously installed buttons can still be used. ▲



COMPACT APC20

COMPACT APC10

UP TO 16 LIGHT GROUPS

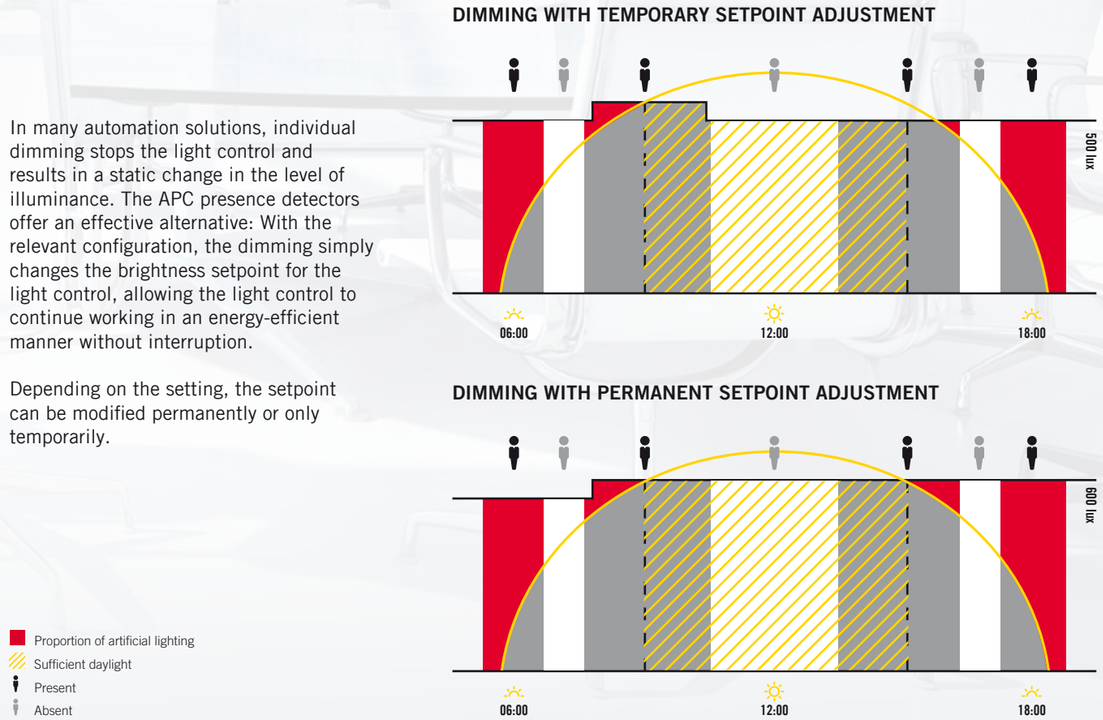
- Individual control of up to 16 groups
- Fully automatic system, semi-automatic system, manual override (16 scenes)
- Presence- and daylight-dependent constant lighting control
- Group control with offset supported
- Manual adjustment of brightness setpoint
- Basic lighting with afterglow and orientation light
- Flexible switching of groups
- Switching of HVAC and 230 V lights

TIME FUNCTIONS

- Weekday- and time-dependent control
- Twilight switch
- Stairwell light function
- Power cut-off for DALI drivers
- Swarm function
- Central functions

In many automation solutions, individual dimming stops the light control and results in a static change in the level of illuminance. The APC presence detectors offer an effective alternative: With the relevant configuration, the dimming simply changes the brightness setpoint for the light control, allowing the light control to continue working in an energy-efficient manner without interruption.

Depending on the setting, the setpoint can be modified permanently or only temporarily.



SMART INPUT IN EACH ZONE

NEW BMS PRESENCE DETECTORS FOR DALI-2 FROM THE FLAT AND COMPACT MINI SERIES

FLAT SERIES

- Integrated presence and light sensors
- Flat, stylish design (round or square)
- One potential-free input for conventional buttons
- Detection range of Ø 8 m

Expected to be available from 15.10.2021

COMPACT MINI SERIES

- Integrated presence and light sensors
- Ultra-compact design for unobtrusive operation
- Detection range of Ø 8 m

Expected to be available from 15.12.2021

ESYLUX has developed new input devices for intelligent DALI-2 automation with its BMS presence detectors from the FLAT and COMPACT MINI series. During operation, they transmit the measurement results of their motion detection and light sensor technology to the relevant control unit in the DALI system. Their flat and incredibly small design make them especially suitable for installation in rooms with complex architectural features.

Light control in accordance with the DALI international industry standard makes for simple planning and installation. ESYLUX has developed new BMS presence detectors from the FLAT and COMPACT MINI series to offer project managers an intelligent automation solution for spaces with sophisticated design features.

SENSORS FOR INTELLIGENT LIGHT CONTROL

The presence detectors use motion detection and light sensor technology that has been used successfully for many years with different interfaces. But here's what sets them apart: With the slim FLAT series offering an installation height of just 6 mm and the especially small design of the COMPACT MINI series, both variants offer a more discreet look.

The BMS presence detectors act as input devices and transmit the results of their presence detection and light measurements to the relevant system's control unit. This may be an APC presence detector from ESYLUX with an integrated control unit or a building automation system from a third-party manufacturer with a DALI-2 interface.

FLAT WITH DIFFERENT DESIGN VARIANTS

The new FLAT presence detectors also feature an input for standard 230 V buttons, meaning that existing buttons can easily be used with the new devices. The detector outputs the button commands as DALI-2 commands, which can be freely assigned to the relevant group. Both series offer the choice of square or round devices, with glass covers available as an accessory. An L (large) variant is available for installation in large cavity wall boxes or for flush surface mounting with COMPACT series surface-mounted boxes.

The FLAT detectors and the new COMPACT MINI series detectors offer a total field of detection of 8 metres in diameter. ■

The BMS presence detectors from the COMPACT series are available as an alternative. With two potential-free inputs for conventional buttons and detection ranges of Ø 8, 24 or 32 m. ▶

WELL-PROTECTED EFFICIENCY

PRESENCE AND MOTION DETECTORS IN THE BASIC SERIES WITH IP54

BASIC WITH IP54
expected to be available from mid-November 2021

New presence and motion detectors in the BASIC series with the IP54 protection type now provide an entry-level solution to intelligent light control even at locations with adverse environmental influences. With zero-cross switching to safeguard relays, they are ideally protected against the high in-rush currents of LEDs. The push button input facilitates semi-automatic operation where required.

ESYLUX has specially developed the BASIC series presence and motion detectors as a standout choice for energy-efficient light control in cost-sensitive projects in particular. As an entry-level solution for on-demand building automation, they support simple motion- and daylight-dependent switching of lighting

PROTECTION TYPE FOR SANITARY FACILITIES OR INTENSIVE CLEANING

ESYLUX has added variants with the IP54 protection type to the series to ensure the detectors can also use their sensors at locations with adverse environmental influences. This makes it easier, for instance, to use these devices in sanitary facilities in offices, educational institutions and medical facilities. And the devices are also effectively protected against the ingress of substances where devices are cleaned with water.

ZERO-CROSS SWITCHING FOR LED LIGHTS

The new BASIC variants have a field of detection of 8 or 24 m in diameter and can be combined using parallel wiring. They also offer a short-pulse mode for automatic stairwell lights, and a push button input supports a semi-automatic mode where necessary. As more and more building owners are switching to LED lighting, the relay on the detectors is also protected by zero-cross switching against the high in-rush currents of this illuminant.

All new versions are designed for ceiling flush mounting, but they are also suitable for recessed mounting using the appropriate accessories and are ready for use with factory settings. The parameters can be changed for the remotely controlled variants using the REMOTE CONTROL MDi/PDi or ESY-Pen and ESY-App. The ESY-App also supports mobile configuration management and documentation. The versions without remote control can be parametrised using controls on the housing. ■

SLIMLINE INTELLIGENCE

THE ALVA 700/100 MD DALI BOLLARD LIGHTS

ESYLUX is extending its ALVA series with slimline LED bollard lights with integrated DALI motion detector. They have a circumference of 100 mm, can control an entire light group depending on motion and daylight or act as a dimmed orientation light. The robust, dirt-repellent aluminium housings are protected against salty sea air across the entire series.

As well as coming in a robust design, the key tasks of modern outdoor lighting are to offer safety, orientation and a sophisticated appearance in an energy-efficient way. ESYLUX now offers a superbly stylish option with intelligent light control thanks to slimline ALVA bollard lights with integrated DALI motion detector.

LIGHT GROUP CONTROL WITH DALI BROADCAST

They measure 100 mm in diameter and are 700 mm tall. With the motion detector, they can control an entire light group depending on motion and daylight, such as sensorless ALVA bollard lights with the same design. Other bollard lights with motion detector can also be integrated into a group so that these can respond to motion in different areas. The detector also switches conventional lights using the additionally available DALI actuator from ESYLUX.

OPTIONAL ORIENTATION LIGHT

DALI broadcast is used to control a group. In twilight switch mode, the detector can also switch them on depending on motion as an alternative where there is insufficient daylight. At times when no motion is detected, it can provide a dimmed orientation light where required. It is ready for use immediately with factory settings and can then be parametrised individually using the PDi DALI remote control or with ESY-Pen and ESY-App.

The new anthracite-coloured bollard lights are available in 3000 K or 4000 K and with opal or transparent diffuser surface. Their LEDs are covered and arranged in a dazzle-free configuration. The shock-resistance rating is IK09 and the protection class IP65. The surface is powder-coated and protected against salty sea air. The lights are also resistant to chemical solvents, making it easy to remove graffiti and any stubborn dirt. ■

ALVA 700/100 MD DALI BOLLARD LIGHTS

- **Protected against sea air and dirt-resistant**
- **Integrated DALI motion detector with orientation light and twilight switch function**
- **Energy-efficient control of other lights and switch actuators using DALI actuators from ESYLUX**

Expected to be available from 01.11.2021!

NEWSFLASH

CERTIFIED ENVIRONMENTALLY FRIENDLY

Intelligent automation and lighting solutions from ESYLUX improve building energy efficiency on a daily basis, conserving natural resources. However, environmentally friendly conduct is also paramount in our day-to-day operations: ESYLUX is now certified to ISO 14001 – a globally recognised standard that defines requirements for effective environmental management in a company.

ISO 14001:2015 examines all environmental aspects in a company, evaluates them and provides incentives for the continuous improvement of the existing management process. It ensures, among other things, that the company monitors and fulfils all legal obligations relating to environmental management, such as those in the areas of waste disposal, environmental protection or water protection. In the area of waste alone, it is necessary to consider more than 20 different laws and regulations. ■


DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

ESYLUX
ESYLUX GmbH
An der Strusbek 40, 22926 Ahrensburg, Germany

has been found to conform to the Environmental Management System standard:
ISO 14001:2015

This certificate is valid for the following scope:
Design, organization of production as well as distribution of electrotechnical products (presence detectors, motion detectors, lighting, twilight switches, umcharge detectors, emergency lights, intelligent living)

IAF

ESYLUX WITH NEW PACKAGING DESIGN

Well-designed packaging facilitates quick, easy identification and assignment of products. That is why ESYLUX has radically overhauled its packaging concept. In future, the packaging will feature an image of the relevant product in the correct colour, along with symbols on the front that provide an overview of the most important features.

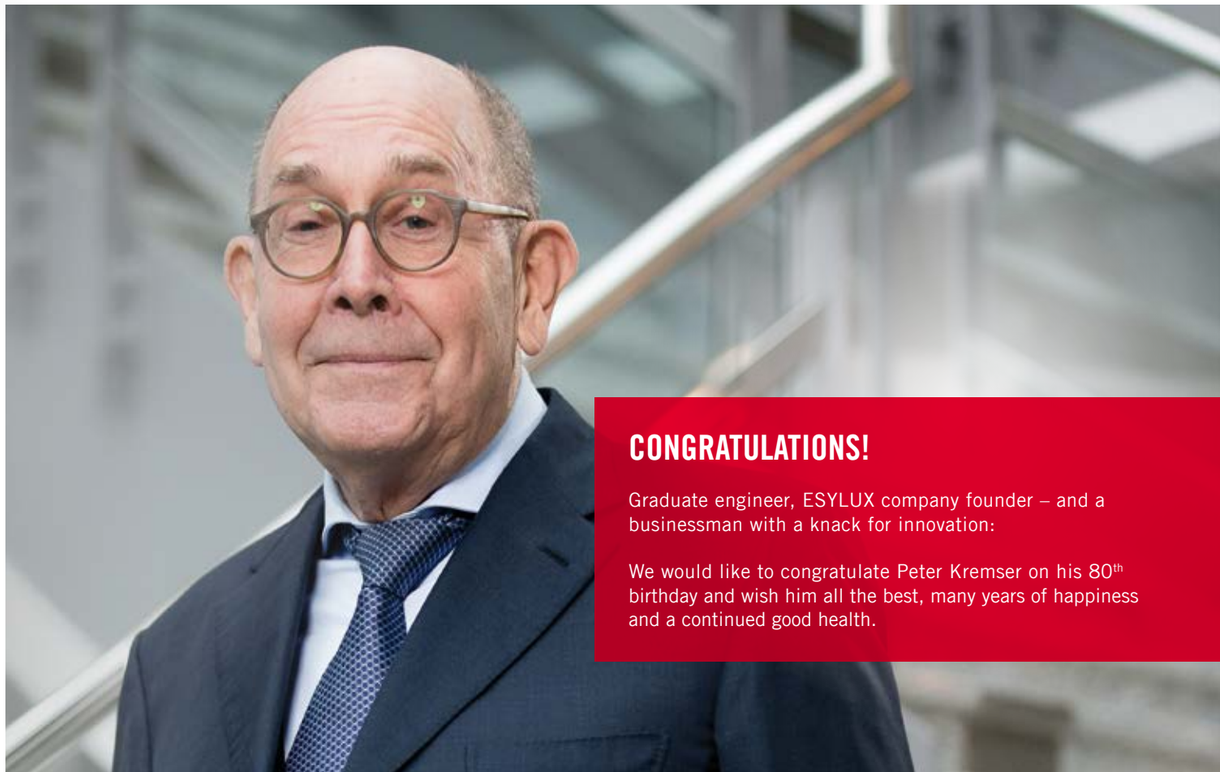
In the area of automation, this includes a depiction of the total field of detection or the recommended installation height. For the lighting, features may include information on luminous efficacy and glare rating, as well as additional labelling in accordance with the Ecodesign Directive. The ESYLUX packaging will now be continually standardised for each series according to the new design concept and go on show at the point of sale in electrical wholesalers. ■

The new packaging design, using the DEFENSOR outdoor motion sensor as an example. A QR link takes customers straight to the relevant product range on the ESYLUX website. ▶

DIRECT GRANT FOR ENERGY-EFFICIENT NON-RESIDENTIAL BUILDINGS

The *Bundesförderung für effiziente Gebäude* (Federal Funding for Efficient Buildings – BEG) is providing fresh impetus to the funding of energy-efficient buildings in Germany. Importantly, it applies not just to residential, but also to non-residential buildings. In the past, companies simply had the option of a low-interest loan from KfW with repayment subsidies, but owners of non-residential buildings can now receive funding in the form of a direct grant. This may be a compelling proposition for small and medium-sized enterprises in particular.

In addition, the European Commission has deemed all BEG funding guidelines for individual measures, residential buildings and non-residential buildings to be non-aid. Grant applications therefore no longer need to include any details regarding aid as defined in EU law. Energy modernisation with intelligent automation and light solutions from ESYLUX has therefore become an even simpler and more worthwhile option. ■



CONGRATULATIONS!

Graduate engineer, ESYLUX company founder – and a businessman with a knack for innovation:

We would like to congratulate Peter Kremser on his 80th birthday and wish him all the best, many years of happiness and a continued good health.

TOUCHPOINTS

ESYSHOW | 24/7/365
ON THE ESYLUX HOMEPAGE

Normally, you would expect to find here our announcement for Light + Building next year – but a lot of things have changed since COVID-19. The ongoing pandemic means that the trade fair will be less international and will have a more limited reach than usual, so we have made the decision once not to attend Light + Building in 2022.

We will of course be showcasing our innovations, nonetheless. For instance, we would like to warmly invite you to our all-new ESYSHOW: From 1 March 2022, you will be able to discover all our new products and realistic 3D product models in a digital environment around the clock.

And our sales experts will be happy to present all of our innovations to you in person.
Talk to your local ESYLUX expert to arrange a meeting.

ESYWORLD editorial information

Publisher:
ESYLUX GmbH
An der Strusbek 40
22926 Ahrensburg, Germany
Telephone +49 (0) 4102 88880-0
www.esylux.com

Editorial team:
Christian Schöps, ESYLUX
(Editor in chief)

Graphic design:
ESYLUX

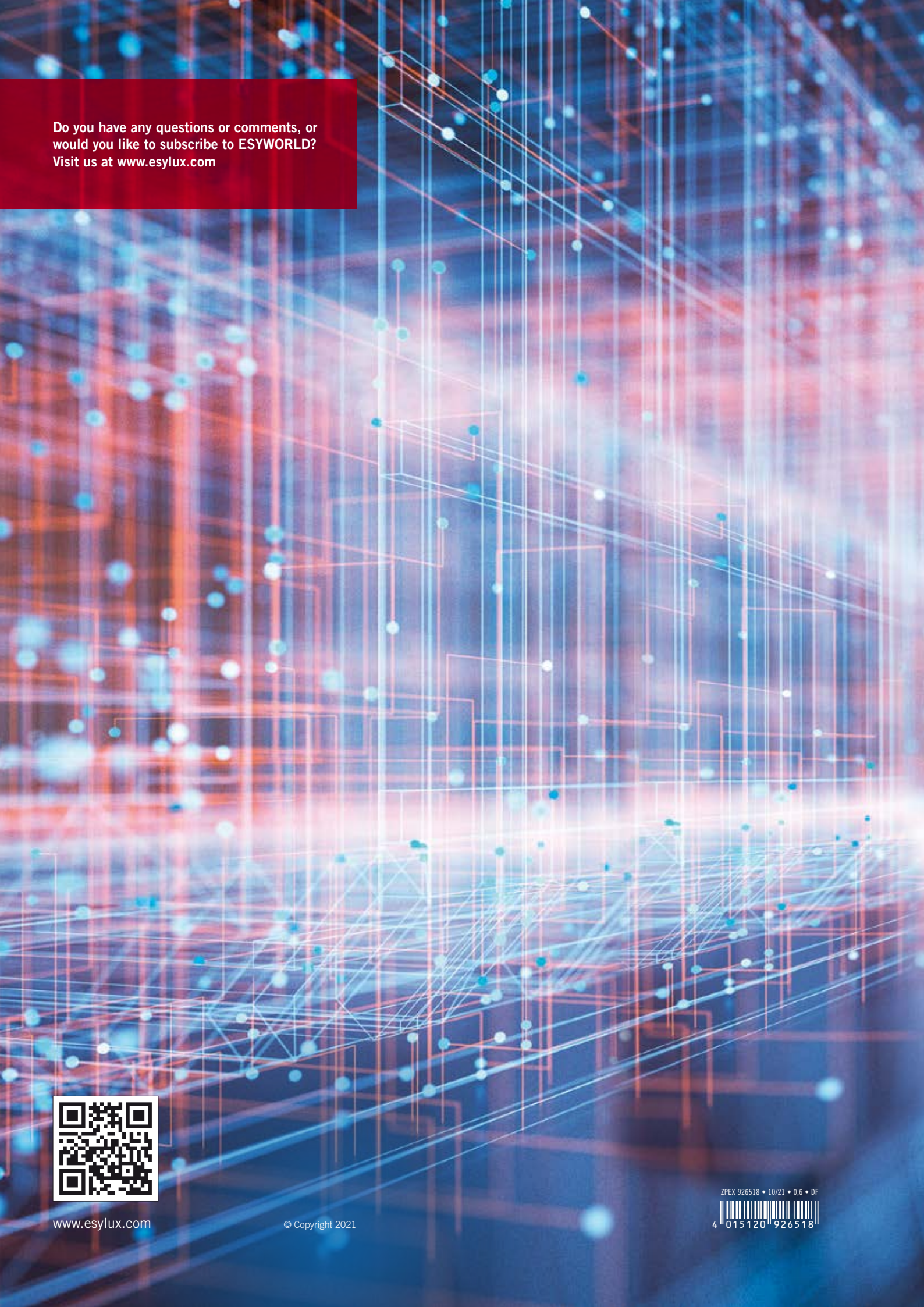
Picture credits:
Fotolia: 121887057, 125641111, 69040059,
iStock: 1076482942, 1311334958,
960995532, 845649686, 1153645385,
1148098441, 1148098433
Shutterstock: 128921369
Getty Images: 620930599

Reference: Kiel Science Park
Reference: Grillska
Reference: Rejlers
Reference: März

PERFORMANCE FOR SIMPLICITY

ESYLUX develops, manufactures and sells intelligent automation and lighting solutions for improved quality of life and energy efficiency in office buildings, educational institutions and health care facilities. People's requirements and needs are central to what we do. To satisfy these requirements, we use our experience in electronics and automation to develop products such as LED-based systems for energy-efficient, biologically effective lighting. Our perspective ranges from the complete automation and illumination of individual rooms through to networking and integration into building-wide systems. Given the often complex requirements that we are faced with, we place particular importance on easy operation of our product solutions.

We work with wholesalers, installers, electrical planners, lighting planners and architects as both customers and partners who place their trust in our extensive market experience dating back 50 years and in the personal technical advice from our experts. Furthermore, we meet the highest quality standards in our research, development and production at our German location in Ahrensburg. Our sales organisation is global: ESYLUX operates in collaboration with experienced trading partners and is represented by numerous subsidiaries in Europe, Asia and Oceania.



Do you have any questions or comments, or would you like to subscribe to ESYWORLD? Visit us at www.esylux.com

www.esylux.com

ZPEX 926518 • 10/21 • 0,6 • DF
4 015120 926518