
KNX
SMART LIGHTING
EKINEX

**“Smart Lighting is that lighting that reacts intelligently to changing people’s needs and environmental conditions.”**



# Smart Lighting

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In this way, it has become possible to monitor and control light sources, adapting the operation of individual lamps or entire lighting systems to suit actual needs, taking into account environmental conditions and individual requirements. This has gone hand in hand with the increasing use of Building Automation systems, of which lighting is one of the main functions, both in the residential, tertiary and industrial sectors: light is one of the factors that contributes most to the comfort of the occupants and at the same time represents one of the main uses of electrical energy.

What does a Smart Lighting solution offer in comparison with a conventional system? Smart lighting does not just “light up” - in other words, enable basic visual tasks - but actively reacts to internal and external environmental conditions, user behaviour and the changing needs of contemporary buildings, taking into account the emotional and biological aspects that lighting influences in human beings, without ever ignoring energy efficiency targets. Last but not least - given its native ability to communicate - Smart Lighting is best integrated with the other technical systems of a Smart Building and, in particular, with the building automation system.

Alongside the technical developments, the awareness of the great opportunities offered by lighting has grown among both end users and professionals, such as designers, architects and clients: no longer just switching on and off, but flexible and high-performance control, geared to the needs that may differ for each building and each user. For this reason too, it is estimated that the global Smart Lighting market will grow from $13.4 billion in 2020 to over $30 billion by 2025*, with a compound annual growth rate (CAGR) of 18%. The main factors that are driving market growth are: the transition to LED light sources, the pervasiveness of intelligent control systems, the spread of Smart Buildings and the increasing focus on energy saving. Smart Lighting ultimately means getting more value out of a building function that is always there, but most of the time is not exploited for its great potential.

*) Smart Lighting Report 2020, MarketsandMarkets Research Private Ltd

# INTRODUCTION

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**“Artificial lighting shapes the character and personality of rooms and plays a key role in influencing people’s psychological and physical well-being.”**

Torre al Guado (PG) - By courtesy of Stefano Dall’Osso

# The light that dialogues

From the very beginning, our life is a rhythmic swing between darkness and light, which makes existence surprising: inside and outside us. Man, with his intelligence, uses this combination to make his days more pleasant and more productive.
It can be argued that light is able to snatch the life behind it out of the darkness and make it visible for all to see. This is the main purpose of a Lighting Designer, to play with light and shadow, to bring life out of something lifeless. In fact, light allows us to see, but it is not enough to simply switch on lamps to ensure that an activity is carried out properly. Each moment, each instant, requires different lighting, appropriate to the environment and the precise instant we are living.

Artificial light, besides changing the visual perception of spaces and volumes, transforms the character and personality of environments and, according to recent scientific studies, plays a crucial role in influencing man’s psychophysical wellbeing, modifying his state of mind and his perception of comfort.
As a result, one of the most extraordinary skills a Lighting Designer must have is the ability to “shape” an environment made up of static elements. Current living trends highlight the need to adapt the lighting atmosphere to the user’s needs as they change throughout the day. This adaption is possible thanks to the union between light and the management and control systems, bringing lighting to the current meaning of Smart Lighting and moving the role of the Lighting Designer to “director” at the service of personal well-being.

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Stefano Dall’Osso, in his work activities, deals with Lighting Design (consultancy, design and direction of works on lighting systems), Industrial Design (conception, design, engineering, prototyping and supervision of tests on lighting equipment), LM&CS (consultancy, design and programming of light management and control systems), Art Direction (consultancy for strategic and operational marketing for companies in the lighting sector), as well as teaching in the academic field and seminars and meetings-debates on the subject of light. The multidisciplinary working group has several locations: the main one in Paradiso, Switzerland, in Italy, Malta and the United Arab Emirates. It is a member of IALD, IESNA, APIL and is a professional accredited by “Q Light” from Cielo Buio.

| Lighting | Scenarios | | | | |
|---|---|---|---|---|---|
| | WEEKDAY | SERVICE | HOLIDAYS | CELEBRATION | VISITS |
| direct nave | 100% | 75% | 100% | 100% | 50% |
| direct presbytery | 100% | 75% | 100% | 100% | 50% |
| direct choir | 100% | 50% | 50% | 100% | 50% |
| direct transept | 100% | 50% | 50% | 100% | 50% |
| indirect nave | 0% | 50% | 100% | 100% | 50% |
| indirect choir | 0% | 50% | 100% | 100% | 50% |
| indirect transept | 0% | 50% | 100% | 100% | 50% |
| altar accent | 0% | 75% | 100% | 100% | 50% |
| altar-piece accent | 0% | 50% | 50% | 100% | 100% |
| painting accent | 0% | 0% | 50% | 100% | 100% |
| choir altarpiece accent | 0% | 50% | 50% | 100% | 100% |
| high altar 1 accent | 100% | 50% | 100% | 100% | 50% |
| altar accent major 2 | 0% | 50% | 100% | 100% | 50% |
| ambo accent | 0% | 100% | 100% | 100% | 50% |
| spandrels | 0% | 0% | 50% | 100% | 50% |
| cupola | 0% | 50% | 50% | 100% | 50% |
| lantern | 0% | 0% | 50% | 100% | 50% |
| indirect chapels | 0% | 50% | 50% | 100% | 50% |
| chapel shovel accent | 100% | 50% | 50% | 100% | 100% |

Collegiate Church of Saints Peter and Stephen in Bellinzona (CH) - By courtesy of Stefano Dall'Osso



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# Architecture and light

The Collegiate Church of Saints Peter and Stephen in Bellinzona, an important religious building dating back to the 15th century, is a structure with a highly religious and symbolic value, but also an artistic and architectural one, given the presence of valuable works of art inside. The lighting project takes into account and enhances all these aspects: on the one hand the lighting systems do not interfere with the architectonical beauty of the church, but at the same time they highlight its most important artistic elements with the use of light.

The lighting techniques adopted are:
- **direct lighting** (over the nave);
- **indirect lighting** (towards the vault);
- **accent lighting** (used to enhance architectural details).

SERVICE SCENARIO

WEEKDAY SCENARIO

FESTIVE SCENARIO

SOLEMNITY SCENARIO

Moreover, to give depth and dimension to the side chapels, an indirect light element was used, towards the vault, and a direct light component towards the frescoes, paintings and statues inside. The lighting fixtures were then grouped together and divided into various lighting scenes: service, weekday, festive, ceremonial and guided tours.

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**“The only truly open and inter-operational global standard for home and building automation.”**

# The KNX standard

Great developments in the field of home and building automation were made possible especially thanks to an open, modular and interoperable standard like KNX. KNX is a standard characterized by full compliance with the CEI EN 50090 standard for Home and Building Electronic Systems (HBES). The twenty-year presence on the market of this standard offers the best guarantee in terms of reliability and consolidation of the technology used. The openness of the standard and that of the KNX Association, on the other hand, ensure availability of products in the long run and a constant development, both in terms of technology and offering of products, functions and applications. For customers, the variety and availability of KNX products is unparalleled in other areas of technology, and the openness of the system means maximum freedom of choice, avoiding the disadvantageous dependence on a single manufacturer.

Thanks to the modularity of the system, the system can be expanded over time, starting with a basic configuration and adding more functions later.

Achievable savings with the adoption of the KNX system for Home & Building control:

- **40% over shutters control**
- **50% over individual ambient control**
- **60% over ambient lighting control**
- **60% over ventilation control**

The native interoperability of KNX products is fundamental to technicians, as it allows to design a system by always choosing the most suitable technical options, reducing compromise and ties caused by isolated systems which do not converse with one another. Moreover, the system offers new professional opportunities to designers and system integrators, making it possible to receive a consistent and high-level technical training and become certified KNX Partners.

**The KNX standard is fully compliant CEI EN 50090 standard for HBES (Home and Building Electronic Systems)**

# NEW PARADIGMS

# Indoor space quality

VISUAL COMFORT

The legislative and regulatory framework concerning building design has evolved significantly since the early 2000s. The European Union has drawn attention to the fact that buildings are responsible for 40% of final energy consumption - and 75% of them are still energy inefficient - requiring member states to make a major efficiency recovery through mandatory enforcement directives. On the other hand, this action must not be to the disadvantage of the comfort and well-being of building occupants, also in view of the high proportion of time spent indoors.


Source: BPIE

### IEQ - Indoor Environmental Quality

In recent years, the concept of "indoor environmental quality" (or IEQ) has become established, a global approach with four dimensions:

- **thermo-hygrometric comfort;**
- **air quality;**
- **visual comfort;**
- **acoustic comfort.**

Several scientific studies have shown that indoor environmental quality has a direct effect on the comfort, health, well-being and productivity of a building's users.

**Productivity impact of building-related elements (source: BPIE)**

| Element | Impact on productivity | Context |
|---|---|---|
| Illumination | 7% to 26% improvement in the learning process in environments with high levels of daylight compared to those with low levels of daylight | Schools |
| | Improvement of the learning process by approx. 20% with additional access to daylight (via skylight) compared to rooms without daylight | |
| | 30% increase in reading speed thanks to activating cold light | |
| | 30% increase in concentration thanks to biologically optimised light | |
| | reduction of the average length of stay (hospitalisation) between 16% and 41% in rooms with a high daylight level | Hospitals |
| Air quality and lighting | Significant progress in cognitive functioning with improved air quality and lighting conditions | Offices |

### Visual comfort

To allow people to carry out visual tasks safely, efficiently and accurately the lighting function must be correctly designed. The basic requirements are:

- **adequate lighting to ensure safety and movement;**
- **conditions to facilitate visual performance and colour perception;**
- **acceptable visual comfort for those using the space.**

The criteria to be adopted will of course vary according to the activities to be carried out in a certain environment, but must in any case ensure comfortable visual conditions. By "visual comfort" we mean a condition of subjective visual well-being induced by the lighting environment, as indicated by the UNI EN 12665 standard. In providing the condition of visual comfort, the design of the lighting environment must consider two factors:

- **visual performance;**
- **environmental pleasantness.**

Visual performance is defined by the speed and accuracy with which the task is carried out, which is why the illuminance and brightness in the environment and on the reference level are crucial, but other factors such as the size of the visual task and the distance from the eyes also come into play. However, there is also a subjective element, represented by the visual capabilities of the individual person. The pleasantness of the environment reflects the general sensation perceived in an environment and is therefore influenced by various factors such as the spatial and functional characteristics of the environment, the person's preferences, attitudes and psychological aspects and the different contributions made by natural and artificial light.

### High-quality environments, lower costs

The largest cost in today's organisations is generally the staff and consists of salaries, health care contributions and induced social costs: surprisingly it can be up to ten times higher than the cost of workstations. Poor quality environments lead to more frequent absences, which cause a cost increase under the heading 'staff'. In minor cases, these are temporary illnesses and indispositions, but if neglected, they can lead to more serious consequences. Sick Building Syndrome (SBS) is not uncommon. In this case, specific illnesses cannot be identified, but people do suffer from conditions that appear to be related to their time in the building and which tend to disappear when they leave.

**Typical operating costs in an office building**



### Investment value

A building with a high quality interior not only has a positive effect on the people who spend time in it, but can also be a good investment. According to recent research, there are at least three benefits:

- **Increased building value**: An excellent indoor environment translates into a value up to 8% higher than a standard building and the 'price premium' that the market is willing to recognise will increase in the coming years;
- **a higher rental income** for the whole or parts of the building of 5-10% more;
- **a higher occupancy rate** (around 10%) of the working environment.

(source: REHVA Journal)

**Global establishment**

Globally, the use of LEDs has increased considerably in recent years, from a market share of 5% in 2013 to almost half of sales in 2019, with an increasing share of integrated LED luminaires. Very quickly, LEDs have become the leading light source, a dynamic accelerated in EU countries by the gradual banning of other low efficiency sources such as incandescent and halogen lamps. The establishment of LEDs has also been facilitated by the continuous fall in prices, thanks to economies of scale generated by very high sales volumes: it is estimated that 38 billion LED-based products have been sold in just five years. In 2019, international LED sales reached a historic milestone of more than 10 billion units of light sources (lamps, tubes, modules) and luminaires.



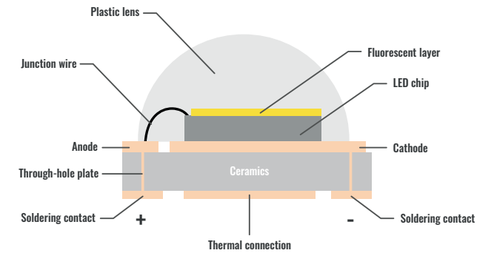
# LED-Technology

THE REVOLUTION IN LIGHT SOURCES

LEDs (light emitting diodes) are the light source of the present and the future. They are characterised by their very small size, high efficiency, long life and ease of control in terms of intensity, shade and colour. They also offer power, low consumption, flexibility of use; unlike discharge lamps, they can be switched on and off hot and are able to emit full brightness immediately after switching on; all characteristics that make them suitable for a very wide range of lighting applications.

**Innovative technology**

Although they radiate light in the same way as conventional light sources, LEDs have little in common with familiar lamps such as incandescent or gas discharge lamps. They are electronic chips made up of adjacent layers of special semiconductor components. When an electric current flows through them, LEDs emit light radiation in a process known as ‘electroluminescence’. The luminous efficiency benefits from the fact that the emission takes place in the 180-degree range; moreover, in LED modules, light radiation is emitted in one direction, while thermal radiation is scattered in the opposite direction.

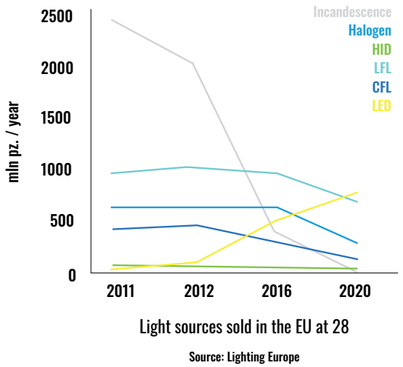



**OLEDs appear on the horizon**

While LEDs are point-shaped light sources, OLED (organic light-emitting diode) technology offers a further innovation through its flat light sources. This makes it possible - as with a building material - to incorporate extremely thin OLED layers into other components, opening up completely new ways of developing displays and luminaires. Already used in designer lighting fixtures, it is estimated that OLEDs will also be increasingly used for large-area lighting in the coming years, thanks to their distinctive characteristics: they provide uniform light with high colour rendering and virtually glare-free; full light output is immediate; dimming is easy by varying the operating current; and there is maximum flexibility in colour control. Last but not least, OLEDs are environmentally friendly as they contain no mercury or other harmful substances and are fully recyclable.

### Efficiency as the decisive factor

From an already better track record than other technologies, the efficiency of LEDs has improved further in recent years. Depending on the model, LEDs available on the residential market have an efficacy of more than 100 lumens per watt, and since 2010 the average efficiency of LEDs has improved by 6-8 lm/W per year. There are countries where the efficacy of LEDs available for residential use already ranges from 110 lm/W to 130 lm/W; to meet the ambitious Sustainable Development Scenario (SDS) targets, manufacturers are already committed to achieving values of 160 lm/W by 2030. To understand the improvements being made, the effectiveness of compact fluorescent lamps is around 60 lm/W and that of halogen lamps is below 20 lm/W; incandescent lamps dissipate most of their energy in heat, which explains why they were the first to be banned from the EU market (source: IEA).



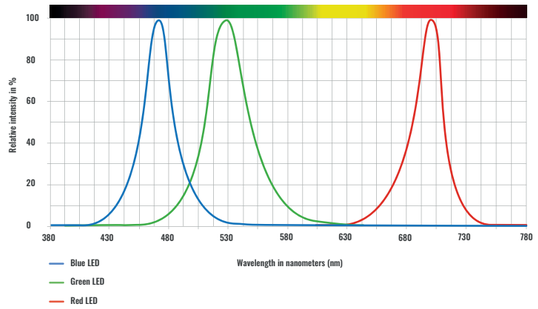

Light sources sold in the EU at 28

Source: Lighting Europe

### Colour variation and light colour

A revolutionary feature is that LEDs can produce any colour of light, unlike conventional light sources. LEDs come in various colours depending on the type of semiconductor used, which determines the dominant wavelength and therefore the colour of the light emitted. Moreover, depending on the composition and wavelength of the dominant colour, the white light emitted by an LED can take on different tones. If there is a high proportion of blue tones in the spectrum, the light is perceived as cold white; the higher the proportion of long-wave colours, the 'warmer' the light appears. IEC EN 12464-1 gives a numerical reference to the different shades of light which are classified according to their 'colour temperature', expressed in degrees Kelvin (K). As a general rule: the higher the colour temperature, the colder the light. A distinction is made between:

- **warm white:** temperature below 3,300 Kelvin;
- **neutral white:** temperature between 3,300 and 5,300 Kelvin;
- **daylight white / cool white:** temperature above 5,300 Kelvin.




### Control advantages

LED luminaires also offer features that alter traditional control and monitoring processes. In the case of automatic presence-dependent control in office environments, for example, the switch-off delay of fluorescent tube luminaires cannot be too short: a value of at least 15-20 minutes avoids too frequent switching that would damage the tubes. The advent of LED luminaires makes it possible to shorten the switch-off delay considerably, without any negative effects on the life of the light sources.

### Dimmable LED Luminaires

In order to make dimming possible, LED luminaires must be designed accordingly. Dimmable LED drivers and LED sources can be identified by the appropriate symbols.


### Colour rendering ratio

The colour rendering value (generally referred to as $R_a$) depends mainly on the spectral composition of the artificial light and assesses how well the lighting reproduces natural colours compared to a reference light source. Values of Ra = 100 denote very good colour rendering: modern LED sources are characterised by very good values.





### Single Lighting Regulation

In December 2019, the EU Regulation 2019/2020 came into force, integrating into a single text - the Single Lighting Regulation - all the elements of the Ecodesign legislation concerning lighting products that until then had been covered by different Regulations (EC 244/2009, EC 245/2009 and EU 1194/2012). The new criteria will come into force on 1 September 2021 and the previous Regulations will be repealed. The main objective of the Regulation is simplification to make the legislation easier to apply and to verify by national authorities. Taking into account the ongoing transition to LED technology, the aim is to have durable and innovative products in Europe that can be repaired and replaced by light sources.

Art. 4 looks at the issue of removal of light sources and lighting units separate power supply by defining characteristics such as:

- **replaceable** without permanent damage to the container;
- **accessibility** for verification purposes;
- **removability** at the end of its useful life.

It is precisely the evolution towards LED technology that has made it necessary to clarify certain definitions:

- **Light source'** is the electrical component that emits light or, for non-incandescent light sources, is adjusted to emit light (or both). Not to be considered as light sources are LED chips, LED dies or LED packages; products containing one or more light sources which can be removed for testing purposes; parts which emitting light contained in a light source from which it cannot be removed for verification as a light source;
- **Containing product'** includes one or more separate light source(s) or ballast(s), or both. This is the case, for example, with luminaires which can be dismantled for the purpose of separate light source verification or with household appliances containing one light source. However, if a container product cannot be disassembled to check the light source and the separate ballast unit, it is considered to be a light source;
- **Control gear'** is a device, physically integrated in the light source or not, which converts the mains power supply into the electrical format required by the light source. This may include transforming the supply and trigger voltage, limiting the operating and preheating current, preventing cold start, correcting the power factor and/or reducing radio interference.

With the entry into force of the Single Light Regulation, other light sources are being phased out, in particular:

- **from 1 September 2021,** halogen lamps with an R7s cap with an output of more than 2,700 lm;
- **from 1 September 2023,** 18, 36 and 58W fluorescent tubes with G13 lamp caps and halogen lamps with G9, G4 and GY6.35 caps.

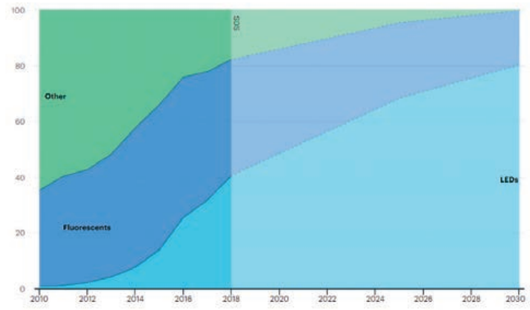
The measure also includes higher efficiency thresholds for LED sources and the introduction of requirements to limit flickering of light sources.

### Lifespan and durability

For LED (and OLED) light sources, the EU Regulation 2019/2020 defines 'lifetime' as L70B50, i.e. the number of hours between the start of use and the time when for 50 % of the light source population the output has gradually decreased to less than 70 % of the initial luminous flux. From 1 September 2021 the service life must be indicated on the source itself.

### Situation and perspectives

The last few years have seen a great evolution in the field of light sources. The European Directive 2005/32/EC and the subsequent Commission Regulation EC After more than 100 years on the market, this meant the retirement of incandescent technology and to a large extent also of halogen technology, a necessary step for sources that dissipated most of the energy used in heat and converted only a small part of it into light radiation.

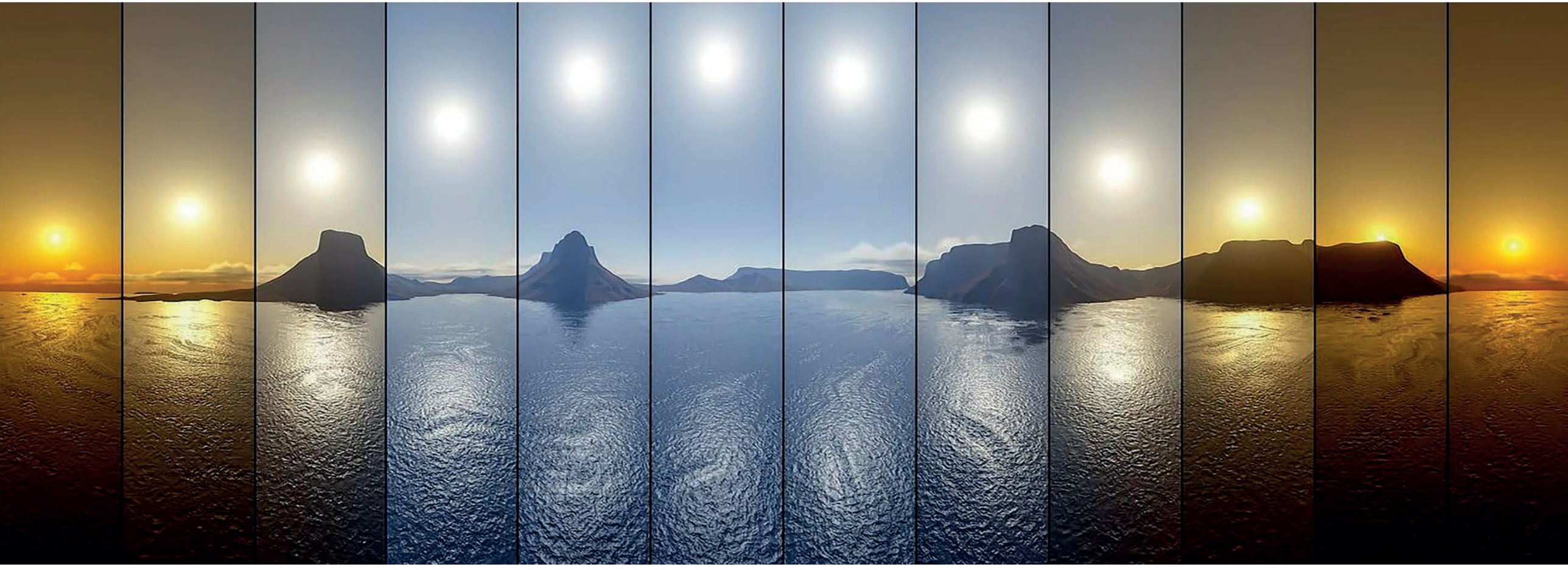



Sales by source type in the 2010-2030 sustainable development scenario (source: IEA)

This decision has resulted in an estimated 32 million tonnes of CO2 emission reduction for EU countries and energy bill savings of around €11 billion; it has also been calculated that, by 2020, the reduction in electricity consumption would be 80 billion KWh, equivalent to the total needs of 23 million European households, and the annual production of twenty 500 MW power plants. In the field of technical lighting for large buildings, the transition is also underway; in its sustainable development scenario, the IEA estimates that by 2030 LED technology will account for around 80% of the market, with fluorescent sources accounting for around 20% of the total.

### References

Commission Regulation (EU) 2019/2020 of 1 October 2019 establishing ecodesign requirements for light sources and separate ballasts pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulations (EC) No 244/2009, (EC) No 245/2009 and (EU) No 1194/2012



# Human Centric Lighting (HCL)

THE NEW DESIGN PARADIGM

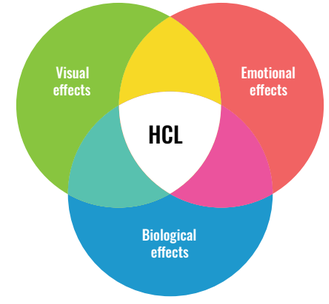
In today's society people spend most of their time inside buildings, on average more than 90 %. In confined spaces there is often not much natural light available and artificial lighting remains on for many hours, so we can lose contact with the dynamic pattern of daylight due to the constant level of artificial lighting. What are the consequences for the body? Lack of daylight during the day tends to change the functioning of the internal clock and alter the phases of sleep and wakefulness to a greater or lesser extent with a negative effect on chronobiological rhythms and, in extreme cases, cause health problems.

**The effect of lighting on humans**

For a long time, the main objective of lighting was to satisfy the visual needs of human beings: in environments with insufficient natural light, simple and obvious actions such as seeing and being seen, identifying obstacles, reading or distinguishing colours are possible thanks to artificial lighting. In recent years there has been a focus on the need to reduce energy consumption in buildings and the resulting emissions of pollutant and climate-altering gases. For this reason, the revolution caused by the advent of LED sources has been appreciated above all from the point of view of the gain in energy efficiency: less attention has been paid to the great potential for control and new applications that this technology offers. At the same time, it became clear that light also has other relevant effects on human beings besides the purely visual one: biological effects and emotional effects. It is common experience that light is not neutral when considering aspects of everyday life such as mood or the waking and sleeping cycle. But a decisive step in demonstrating that circadian rhythms are correlated with light conditions was taken in 2001, with the scientific discovery of the presence of a third photoreceptor in the human eye alongside those already known: rods and cones.

**Light and the internal clock**

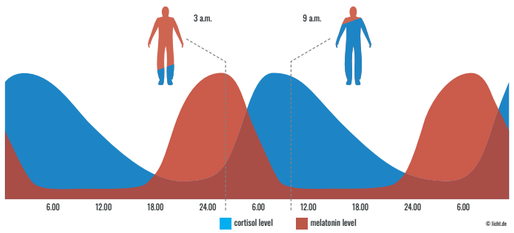
Over hundreds of thousands of years, the body has adapted to the alternation of day and night. In humans, it is natural light that synchronises the internal clock, which plays a key role in controlling not only the daily waking and sleeping phases, but also the heart rate, blood pressure and mood. To this end, the body naturally produces hormones such as cortisol and melatonin, which are counter-cyclical. Early in the morning, the production of cortisol - also known as the 'stress hormone' - begins, which has a stimulating effect on many functions in the body and promotes awakening, activation and concentration. Without an increase in cortisol levels, it would be difficult to get up in the morning and much more difficult to carry out daily activities. After peaking around 9 a.m., its level in the blood steadily decreases throughout the day. Melatonin production, on the other hand, begins in the late afternoon. Known as the 'sleep hormone', it slows down the body's functions and lowers activity levels to facilitate sleep. Melatonin levels are already high at midnight and reach their peak around 3am: the first light of day stops their production.




Source: Licht.de

## The answer: HCL lighting control

For people who spend a lot of time in buildings with little or no daylight, it would be ideal to have a system that could light with daylight-like dynamics. Today, technology makes this relatively easy, thanks to the convergence of the LED revolution, intelligent control and advanced, higher performance luminaires. This makes it possible to create lighting systems that better support circadian rhythms, aiding concentration, improving mood and well-being and preventing sleep disorders. This is the revolutionary concept of HCL or Human Centric Lighting: providing high-quality light in the required quantity at all times, while always focusing on the individual needs and well-being of people.



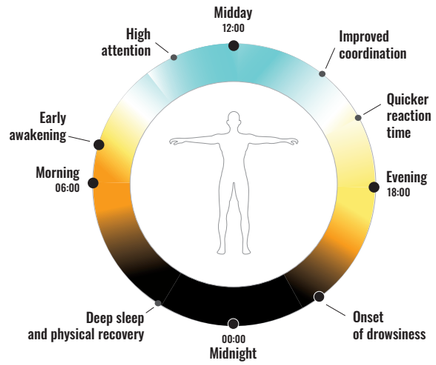

## The components of HCL control

Three components are required to implement lighting control that follows circadian rhythms:

- **light sources adjustable in intensity and with the possibility of varying the shade of white light emitted;**
- **an intelligent control system to support the function;**
- **luminaires with light emission over a wide area, possibly with direct and indirect components.**

LED sources have made this much easier than in the past: they are able to emit different shades of white light and the intensity of their output can be easily controlled by digital systems. In addition, more and more luminaires have versions with independently switchable direct and indirect light components. In this way, over the course of the day, it is possible to gradually vary the colour temperature from cold white in the morning to neutral tones closer to daylight in the evening. This allows the colour temperature to gradually change from cool white in the morning to neutral tones closer to daylight in the middle of the day - and then to warm white in the evening, while at the same time reducing the emitted intensity and making greater use of the indirect component.

This management of artificial light has a positive biological effect, as it tends to stabilise the day-night rhythm of human beings. The Ekinex control system uses open, interoperable KNX technology with sensors, actuators and a supervisory system that work in coordination not only with each other, but also with the other technical systems in the building. In order to take account of the fact that light has different effects at different times of day, the astronomical clock integrated into the Delégo control system makes it possible to reproduce the course of daylight dynamically throughout the year, gradually switching from one lighting scenario to the next.




Source: Lighting Europe

Easy interfacing to the DALI standard also means that almost any requirement can be met. Without the intelligence built into every Ekinex device, it would be very difficult to translate the objectives of an HCL control into reality. A few examples? At home, people often get up when the alarm clock goes off at a time that does not correspond exactly to their individual rhythm. For a more natural and less traumatic awakening, a gradual increase in artificial light can be envisaged. When moving to the kitchen to have breakfast, increased brightness and a colour tone closer to natural light - with a high blue light component - stimulates and has an activating effect on the body; at the same time wall-mounted luminaires are also switched on for a more even distribution of brightness. In the workplace, light supports people's visual tasks to the best of its ability; correct illuminance and glare-free light as prescribed by legislation are essential prerequisites, but a white light colour with a tendency to cool helps to maintain cognitive performance and concentration over a longer period of time.

**Biological (non-visual) effects of Human Centric Lighting**

| | Impact | Definition | Examples |
|---|---|---|---|
| Feeling | Mood | Emotional state describing the positive or negative disposition that is influenced by personality traits, sleep, (social) context and behaviour. | Affective state, depression prevention, anxiety prevention |
| | Energy | Bringing the body and mind into a state of general wakefulness and activity readiness. | Increased level of activation, vitality |
| | Relax | The emotional state of reduced tension and emotional pressure, while feeling at ease. | Reduced activation level, reduced stress |
| Operativity | Attention spam | The state of active attention due to high sensory awareness | Increased concentration, vigilance, accident and error prevention |
| | | Mental performance including working memory, language production and comprehension, learning, reasoning, problem solving, complex response, decision making | Improvement of memory, learning, creativity, motivation |
| Salute | Sleep/wake cycle | A stable 24-hour rhythm of rest and activity, controlled by an individual's biological clock, is essential for optimised functioning during the day and for a good night's rest to promote sound health. | Disease/disorder prevention, treatment and mitigation (dementia, SAD, ADHD, schizophrenia, sleep disorders), social jetlag, chronomedication, improved healing environments |

1. ADHD: Attention Deficit Hyperactivity Disorder, SAD: Seasonal Affective Disorder, DSPD: Delayed Sleep-Phase Disorder - Fonte: WG Light for Life, A.T. Kearne


**More productivity at work by following the circadian rhythm**

In 2016, the Amsterdam offices of CBRE, a global real estate consulting firm, hosted a multidisciplinary study on how the work environment affects the health and well-being of employees. A section of the offices was equipped with a biodynamic lighting control system and a research team, coordinated by the University of Twente, studied the reactions of 120 people over a seven-month period. The lighting control was set up to reproduce the natural light coming from the sun in order to support the circadian rhythm of the body: the focus was therefore on cold light tones in the middle of the day, to stimulate attention and concentration, and on warm light tones at the end of the afternoon, to promote relaxation at the end of the working day. The results of the study exceeded all expectations and confirmed that light has a great impact on people's well-being and performance: after just one month, 71% of participants felt more energetic, 76% happier and 50% healthier; productivity increased by 12%.

(fonte: www.cbre.com)

# Daylighting

## OPTIMUM USE OF DAYLIGHT

Daylighting is an up-to-date design discipline that promotes greater use of daylight in buildings. The basic objective is to position transparent surfaces (such as windows, skylights or continuous glazing) and interior reflective surfaces appropriately so that natural light can provide effective illumination throughout the day. While an essential part of daylighting undoubtedly relates to the planning of the building site and the architectural design of the building envelope, it should not be underestimated that coordination with two key functions of building automation systems such as artificial lighting and shading is also essential for its effectiveness.

**Natural light as a resource**

Daylight is the combination of direct and indirect light from the sun throughout the day: of all the solar energy received at the earth's surface, 40% is visible radiation. The interiors of buildings need light to carry out various activities and the natural component is a very important resource that can have beneficial effects on people and the energy balance. Recognising this, the EN 17037 standard was published in 2019 to promote the wider use of natural light - defined as that 'visible part of global solar radiation' - for indoor lighting. The standard provides information on how to use this light component to provide illumination and limit glare, while also defining principles for calculation and verification and taking into account the typical variability of natural light throughout the day and year. The standard applies to rooms which are regularly occupied by people for long periods, except in particular cases where natural light is incompatible with the nature and task of the work being performed.



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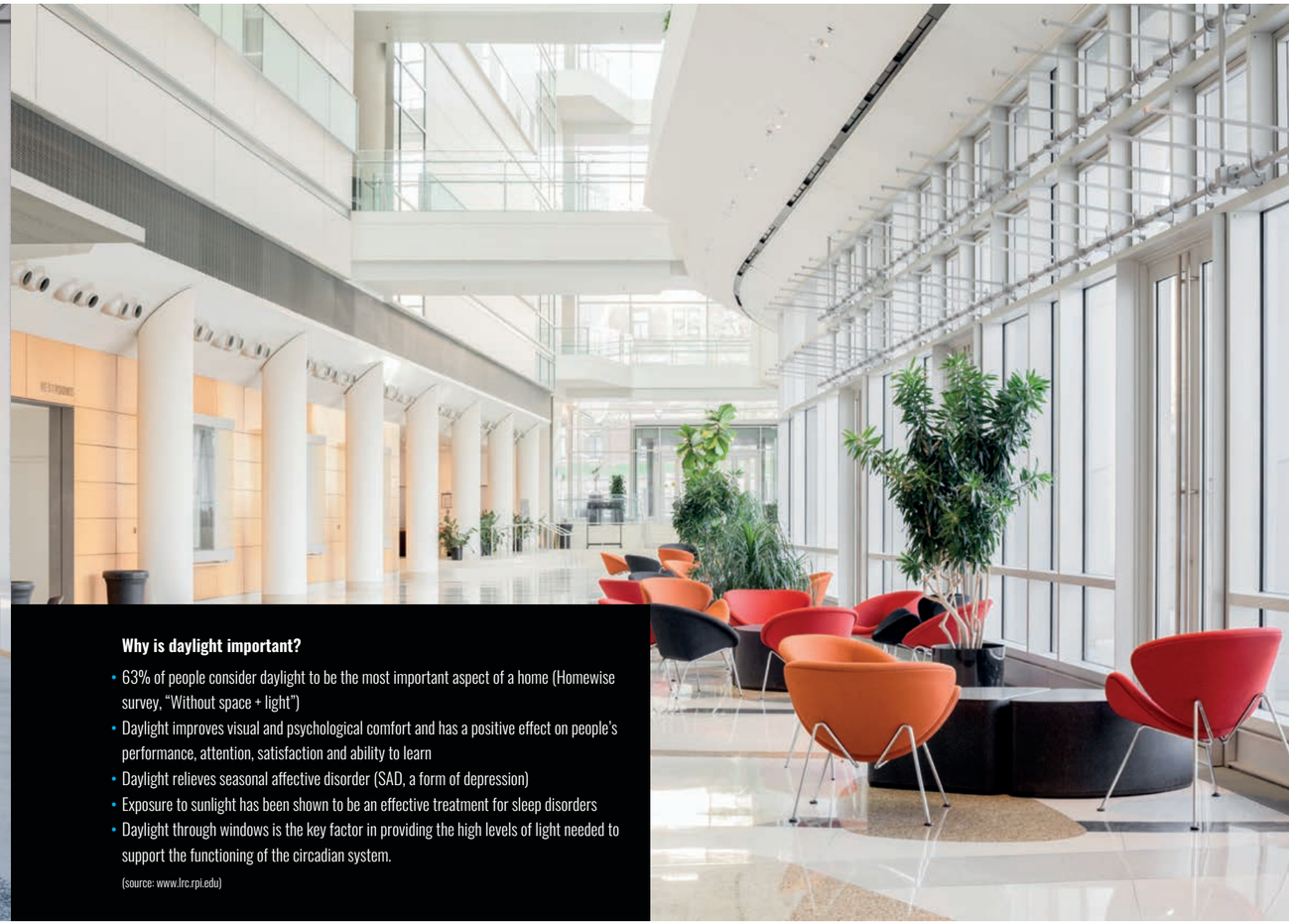


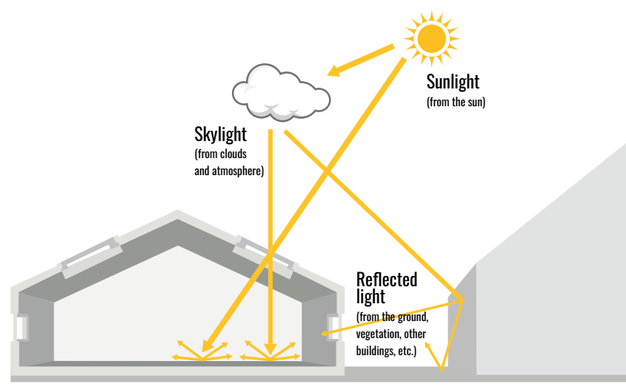
**Why is daylight important?**

- 63% of people consider daylight to be the most important aspect of a home (Homewise survey, "Without space + light")
- Daylight improves visual and psychological comfort and has a positive effect on people's performance, attention, satisfaction and ability to learn
- Daylight relieves seasonal affective disorder (SAD, a form of depression)
- Exposure to sunlight has been shown to be an effective treatment for sleep disorders
- Daylight through windows is the key factor in providing the high levels of light needed to support the functioning of the circadian system.

(source: www.lrc.rpi.edu)

UNI EN 17037 standard defines the fundamental contributions of daylighting as:

- **The external view.** Openings not only provide natural light, but also allow occupants visual contact with the area surrounding the building. This is seen as a positive factor in reducing the fatigue associated with long periods in the confined environment, providing an opportunity to relax and relieve excessive concentration;
- **Protection from glare.** When there is direct sunlight, viewing outdoors can cause glare, a negative phenomenon caused by areas that have a much higher luminance than the eyes have adapted to in the indoor environment. To reduce this risk, shading devices should be provided;
- **Exposure to sunlight.** This factor is of great importance in the quality of the indoor environment and contributes to the well-being of the occupants, especially in buildings such as hospitals, homes or school buildings. The use of shading devices can reduce possible thermal and visual discomfort.

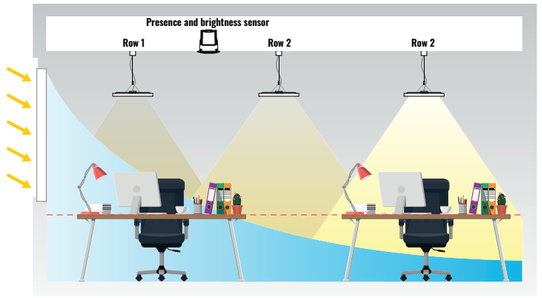


**Limits to the use of daylight**

Where permitted by the building envelope, natural light can be the primary source of daylight during the middle of the day for most of the year, through openings in vertical (doors, windows, glazing) and horizontal (skylights) surfaces.

But the availability of natural light outdoors is typically very variable, depending for example on the time of day, weather conditions and time of year. Latitude also plays an important role: in the capitals of the European Union, the average annual hours of daylight available range from 3,600 in Valletta to 1,550 in Brussels and 3,150 in Rome. Although the positive effects of daylight on human beings have been scientifically proven, it is important to ensure that it is glare-free and respects the privacy of the occupants.

Finally, in the summer season, thermal loads - generated in the interior by direct sunlight passing through the glass surfaces - must be limited to avoid wasting energy through excessive use of air conditioning. Because of these limitations, in real buildings the level of illuminance needed for good comfort cannot be achieved by natural light alone, but always comes from an intelligent combination of natural and artificial light.






ekinex | SMART LIGHTING

# Smart lighting

UNLIMITED POSSIBILITIES

**PRESENCE / MOVEMENT DETECTION**
Automatically switches luminaires or groups of luminaires on and off depending on the presence or movement of people in the detection area; switching off can be delayed by an adjustable delay. Can be used with ceiling-mounted (360° range) or wall-mounted (180° range) devices.

**GROUPING**
Groups of luminaires are created to be controlled together. When leaving a room, area or building, all luminaires can be switched off in a single action. By reprogramming, the lighting system adapts dynamically over time to the spatial reconfiguration of individual rooms or entire zones, without having to intervene on the physical connections.

**SUPERVISION (DELÉGO)**
Allows from mobile devices, such as smartphones and tablets, from touch-panels, or from PCs all the operations normally carried out by control devices: switching on/off, dimming and colour control. In addition, it allows easy monitoring and, thanks to logical functions, time schedules and integrated voice control, greatly expands the possibilities of the home automation system.

**SCENARIOS**
It is possible to create lighting scenarios that reflect the individual preferences of users at different times of room use, combining direct and indirect light, basic and accent lighting, ceiling mounted luminaires, floor and wall luminaires. Lighting can also be incorporated into more complex scenarios that include other building functions.



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**VOICE CONTROL**
Delégo supervision, in combination with the Ekinex cloud, offers the possibility of controlling the lighting via the voice assistants integrated in the home speakers, simply by saying the action to be performed: for example, “switch on the light”, “switch off the light”, “set the light to 50%”. Other actions are also possible, such as requesting a status or recalling a scenario.

**SWITCHING ON AND OFF**
On/off control is the basis of every lighting system: it can be done by a pushbutton, a touch-display or a smartphone app. It can be controlled via a pushbutton, a touch-display or a smartphone app. Thanks to the possibility of grouping, a virtually unlimited number of luminaires can be controlled in parallel from a single point. Each button has LEDs that can be used as status feedback or orientation light.

**DIMMERATION**
Dimming continuously adjusts the light intensity emitted by the light sources. In this way, the desired brightness level in the room can be achieved at all times, either by manual selection at the push of a button or automatically controlled by sensors. To increase visual comfort, ramps for increasing and/or decreasing (fading) the light intensity can be set.

**HOURLY PROGRAMMES**
Automatically switches luminaires on and off individually or in groups according to predefined schedule. Automatically calls up scenarios in which automatically call up scenarios in which statuses or values relating to the lighting function are entered. Thanks to logical functions, switching on can be linked to the simultaneous occurrence of timer consent and the actual presence of people in the room.

**ANTI-PANIC FUNCTION**
All indoor and/or outdoor luminaires are switched on simultaneously from a single point in a house - e.g. a button in the bedroom - as a deterrent in the event of unwanted presence in the vicinity of the building. The same control can also move roller shutters or activate outdoor video recording.

**ORIENTATION LIGHTS**
LEDs integrated in Ekinex pushbuttons and other compact luminaires, such as step lamps, can function as an orientation aid in the home in the evening and at night when the main lighting is switched off. It is ideal for signalling stairways or showing the way to the bathroom and for drawing attention to possible sources of danger.

# Smart lighting

ILLIMITATE POSSIBILITÀ

**LOGICAL FUNCTIONS**
With the logic functions provided by many Ekinex devices and Delégo supervision, different conditions can be linked together to optimise the operation of the lighting function.

**INTERFACING WITH OTHER STANDARDS**
Dedicated gateways acting as protocol converters make it easy to interface Ekinex with DALI and DMX512, two popular standards in the lighting world. Commands can be sent to the DALI ballasts from Ekinex pushbuttons, receiving status feedback and lamp failure alerts to be displayed on the building supervision.

**COORDINATION WITH OTHER TECHNICAL INSTALLATIONS**
Lighting is managed in coordination with the building's various technical systems, such as heating or blinds, thanks to the fact that Ekinex is developed using the open, interoperable KNX standard. The Ekinex is developed using the open, interoperable KNX standard. In this way, the goals of comfort and energy saving are no longer alternative, but can be achieved simultaneously.



EKINEX | SMART LIGHTING

**OPERATING TIME MONITORING**
Counting the operating hours of a luminaire or group of luminaires makes it possible to signal via the bus and to represent routine and preventive maintenance requirements in the building supervision. This minimises system downtime and ensures maximum continuity of service for the installation.

**PRESENCE SIMULATION**
The switching on and off of indoor and outdoor lighting at the usual times is automatically replicated even in the absence of the homeowners as an intrusion deterrent. The function can be combined with others, such as the movement of roller shutters.

**VARIATION OF LIGHT COLOUR**
Controlling the colour temperature of the light sources incorporated in the luminaires makes it possible to obtain a warmer or cooler tone of light at will. In this way, it is possible to achieve a dynamic control of the HCL (Human Centric Lighting) type, varying the type of light throughout the day in harmony with people's circadian rhythms.

**LOAD CONTROL AND CONSUMPTION MONITORING**
The measurement of energy consumption or current absorption makes it possible to graphically display the trend over time and to include the lighting function in a process of dynamic control of the loads that can be automatically deactivated and reactivated when an alarm threshold is exceeded, according to a preset priority that can be subsequently modified by the end user.

**COLOUR CONTROL**
Controlling the colour (in RGB or HSV mode) emitted by the sources built into the luminaires allows you to create unique and personalised lighting effects and atmospheres.

**DAYLIGHTING**
Artificial lighting is controlled so that available daylight is integrated only where and when required. This control has the advantage of not wasting energy unnecessarily, prolonging the life of light sources and providing occupants with greater comfort and well-being due to the beneficial effects of daylight on the human body.

# Workplace lighting

NORMATIVE AND LEGISLATIVE REQUIREMENTS

**UNI EN 12464-1**

The UNI EN 12464-1 standard deals with the issue of how to provide adequate and appropriate lighting for people who carry out visual tasks in the performance of their work. In particular, the standard specifies what the lighting requirements are for people - with normal visual capacity and working at indoor workstations - that correspond to the needs of visual comfort and visual performance. The standard considers all customary visual tasks, with a particular focus on those performed at workstations with display screen equipment. An important aspect of the EN 12464-1 standard is to consider the combination of quantitative and qualitative aspects, while emphasising the importance of light for people's health and well-being. The standard also highlights a highly topical issue: people receive positive stimuli and perceive greater well-being when lighting conditions can be varied over time not only in terms of illuminance and luminance distribution, but also in terms of the colour temperature range.

**Location and workstation**

The standard takes up and adapts already recognised definitions:

- the workplace is intended to house workstations on the premises of the undertaking and/or establishment and any other place of work within the area of the undertaking and/or establishment to which the worker has access in the course of his work (Directive 89/654/EEC);
- the workstation is the combination and spatial arrangement of the work equipment, surrounded by the work environment under the conditions imposed by the work tasks (EN ISO 6385:2004).

A number of parameters contribute to the characterisation of the lighting environment such as:

- luminance distribution;
- illuminance;
- directionality of light and illumination of the interior space;
- light variability (levels and colour);
- colour rendering and colour appearance of light;
- glare;
- flicker.

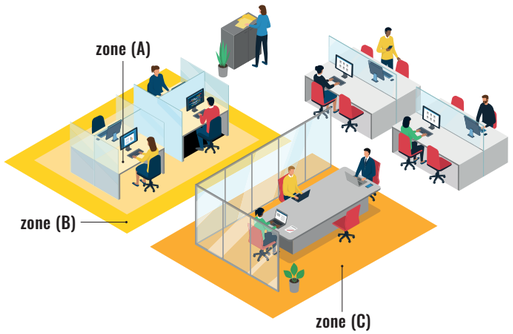
**Illuminance in the area of the visual task**

Illuminance is a basic requirement for perceiving the visual task and performing it quickly, safely and comfortably; it is a quantitative parameter representing the light power density per unit area. We speak more precisely of "average maintained illuminance" values; this term refers to the minimum illuminance value that can be measured when the installation requires maintenance due to the decay of the luminous flux. In fact, due to the reduction of the emission of the sources or to the dirt accumulated on the surfaces of reflectors or refractors, the flux is reduced over time compared to the initial value (new system).

**Luminous flux and illuminance**

"Luminous flux" ($\Phi_v$), or light output, is a measure of the perceived power of light. It differs from "radiant flux" ($\Phi_e$), which measures the total power of the emitted light, in that it takes into account the sensitivity of the human eye to different wavelengths of light. The characteristic luminous flux, on the other hand, is the initial value of the flux of a lamp or luminaire declared by the manufacturer (or seller) with reference to specific conditions. The luminous flux is measured in lumen (lm).

The "illuminance" ($E_v$) at a point on a surface is the ratio of the luminous flux incident on an element of the surface containing the point to the area of the element. Illuminance is measured in lux ($lx = lm \times m^{-2}$).




The standard lays down precise requirements for the illuminance of the workstation and the surrounding area. In particular, the following are defined:

- a zone **(A)** within which the task is carried out (task zone);
- a band **(B)** surrounding the task zone within the field of vision (immediate surrounding zone). A band of at least 0,5 m around the task area shall be considered;
- a zone **(C)** adjacent to the immediate surrounding area (background zone). A band of at least 3 m is considered adjacent to the immediate surrounding area.

| Illuminance of visual task area [lx] | Minimum illuminance of surrounding area [lx] | Illuminance of the background area [lx] |
|---|---|---|
| ≥ 750 | 500 | > 500 / 3 |
| 500 | 300 | > 300 / 3 |
| 300 | 200 | > 200 / 3 |
| ≤ 200 | Same illuminance as the visual task area | Illumination of the visual task area / 3 |

To avoid visual fatigue and discomfort, illuminance should not vary too much from the area of the work task to the immediate surrounding area. For this reason, the illuminance of the surrounding area must be related to that of the area where the work task is carried out; the values recommended by the standard are given in the table. The background area itself must meet minimum illuminance levels, particularly in environments without daylight.

### Glare

When there are surfaces with high luminance gradients within the field of vision, glare is perceived, a visual sensation that generates fatigue and visual discomfort. While glare due to an internal light source can be avoided by appropriate shading of the lighting fixture, glazed surfaces (doors, windows, skylights) subject to direct sunlight are screened with movable shading devices such as blinds, shutters or Venetian blinds; for coordinated operation, they should be controlled by the same building automation system that controls the lighting.



### Colour

When talking about the colour of light, the standard considers two parameters:

- the colour temperature ($T_{cp}$);
- the colour rendering index ($R_a$).

| Color Appearance | Proximate color temperature $T_{cp}$ |
|---|---|
| Warm | less than 3,300 K |
| Intermediate | between 3,300 K and 5,300 K |
| Cold | greater than 5,300 K |

While the appearance of daylight typically varies over the course of the day, the appearance of artificial light is determined by the choice of light source; here we enter the field of psychological research, aesthetic evaluation and the relationship with other choices made for the environment such as the level of illuminance, the colour of walls or furniture. The emergence of LED light sources and digital control systems offers new opportunities for artificial light: while until a few years ago the choice of source was limited to the colour temperature until it was replaced, there are LED sources that allow this to be changed.

### Law 626 and Legislative Decree 81/08

While the UNI EN 12464-1 standard provides lighting designers with useful indications to achieve maximum visual comfort and the best visual performance in all safety for people working in working environments, the provisions to be compulsorily observed with reference to the health and safety of workers are the subject of legal provisions. The reference in Italy has long been Law 626 of 1994, which considered lighting in Article 10 “Natural and artificial lighting of workplaces”. Following the approval of the delegated law 123, Law 626 was replaced by Legislative Decree 81, which led to a simplification of the regulations by creating a single text on safety at work.

### References

CEI EN 12464-1 Light and lighting - Lighting of workplaces - Part 1: Indoor workplaces
Legislative Decree no. 81 of 9 April 2008, Consolidated text on health and safety at work, implementation of Article 1 of Law no. 123 of 3 August 2007 on the protection of health and safety in the workplace.

**Colour temperature**

Colour temperature is an intuitive concept nowadays even for final users who buy LED lamps for home appliances as a retrofit to traditional incandescent or compact fluorescent lamps with standard E27 or E14 socket: the value (expressed in Kelvin degrees) is indicated on the packaging together with a qualitative description such as ‘cold light’, ‘neutral light’ or ‘warm light’. In more rigorous terms, the colour temperature is a parameter obtained by comparing it with the luminous variation that occurs when heating a black body: as the temperature increases, the light emission of the body gradually changes from red to orange, to yellow, to white, to blue-white. The colour temperature of a light source is therefore defined as the temperature at which the colour of the black body corresponds exactly to that of the light source.

# EKINEX SOLUTIONS

# The Ekinex controls

TECHNOLOGY MEETS DESIGN

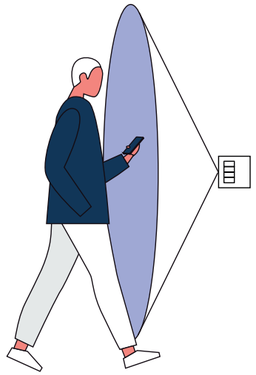
Ekinex products are developed and manufactured in Italy. Thanks to a qualified and competent team, Ekinex has created a product that represents the essence of Made in Italy design, attention to detail, state-of-the-art technology and innovation. Designed for a global market, Ekinex products are an expression of the new Italian tradition that combines attention to craftsmanship in product manufacture and high levels of technology. Ekinex promotes the idea of an Italian design that is not merely an aesthetic exercise, but includes, as basic elements, ease of use, immediate understanding of function and the balanced and intelligent application of technology. Technology makes life easier, design makes it more enjoyable.

**The 20venti series**

The 20venti series of wall-mounted controls offers decidedly innovative contents, thanks to the backlighting of the buttons by means of RGB LEDs and the proximity sensor. The integrated LEDs are freely programmable; in addition to the usual functions of status indication or night orientation light, the colour setting enables new applications and more intuitive and immediate use by the end user - a feature that is enhanced by the additional possibility of customising the individual keys with text and symbols.

**The integrated proximity sensor opens up new possibilities.**

Thanks to a PIR component that is completely invisible from the outside, the aesthetics remain unchanged; however, the button is able to detect the passage of people in the immediate vicinity of the luminaire (short-range detection) and initiate bus functions according to individual requirements: from the simplest, such as activating the backlighting of the button itself or changing the light intensity, to the most complex, such as calling up sequences or scenarios, through to switching on individual luminaires or groups of luminaires. Activating the backlighting only when necessary allows the button to be freely positioned without fear of disturbing effects when resting at night.  The detection can also be received via bus from other Ekinex devices. As with other Ekinex control series, the 20venti buttons have an integrated temperature sensor and can also function as a room thermostat for a room or an entire zone in a building.



**Geometric shapes and balances**

The aesthetic style of a product that furnishes, with clean and essential lines, exact and harmonious volumes. The concept stems from the idea of transforming an everyday object into a pleasant piece of furniture. A design that is not an end in itself, but empathetic: beautiful, yes, but functional and intuitive.



# 4/8-fold pushbutton with backlit text/symbols and proximity sensor 20venti series

WALL-MOUNT DEVICES

**Description**

The Ekinex® 20venti series 4/8-fold pushbutton is used for on/off control of utility devices, dimming of luminaires, control of motorized drives for roller shutters or other programmable control functions. Thanks to the integrated temperature sensor, the button can act as a temperature controller for a room or zone. RGB LED for each rocker. The switch has an integrated KNX bus communication module and is designed for installation in a flush-mounted wall box.

**Main features**

- 4/8 fold version (possibility to configure up to 4 or 8 independent functions)
- RGB LED for each freely programmable rocker
- Integrated temperature sensor
- Integrated proximity sensor
- Room thermostat function
- Plastic casing
- Connection to bus line with KNX terminal block
- Wall-mounting installation on round or square wall box
- IP20 protection degree (installed)

**Technical data**

- 30 Vdc power supply by KNX bus

**Products included**

Delivery includes a terminal block for connection to the bus, a metal support for installation onto round or square mounting box (fixing holes 60 mm apart), a plastic adapter and two pairs of fixing screws.

**Accessories**

The following accessories are available to be ordered separately:

- 4 or 8 rectangular 30 x 15 mm plastic rockers with or without backlit text/symbol;
- square plate of the Deep and Surface series with 30 x 60 mm or 60 x 60 mm window.

**Versions**

| Code | Rockers |
|---|---|
| EK-E20-TP-4TS-P | 4 left with backlit text/symbols |
| EK-E20-TP-4TD-P | 4 right with backlit text/symbols |
| EK-E20-TP-8T-P | 8 with backlit text/symbols |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**



ekinex | SMART LIGHTING



# 4/8-fold pushbutton with led 20venti series

WALL-MOUNT DEVICES

**Description**

The Ekinex® 20venti series 4/8-fold pushbutton is used for on/off control of utility devices, dimming of luminaires, control of motorized drives for roller shutters or other programmable control functions. Thanks to the integrated temperature sensor, the button can act as a temperature controller for a room or zone. RGB LED for each rocker. The switch has an integrated KNX bus communication module and is designed for installation in a flush-mounted wall box.

**Main features**

- 4/8 fold version (possibility to configure up to 4 or 8 independent functions)
- RGB LED for each freely programmable rocker
- Integrated temperature sensor
- Room thermostat function
- Plastic casing
- Connection to bus line with KNX terminal block
- Wall-mounting installation on round or square wall box
- IP20 protection degree (installed)

**Technical data**

- 30 Vdc power supply by KNX bus
- Current consumption from bus < 17 mA

**Products included**

Delivery includes a terminal block for connection to the bus, a metal support for installation onto round or square mounting box (fixing holes 60 mm apart), a plastic adapter and two pairs of fixing screws.

**Accessories**

The following accessories are available to be ordered separately:

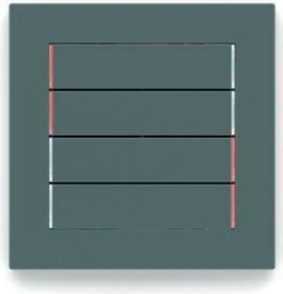
- 4 or 8 rectangular 30 x 15 mm plastic rockers with or without backlit led
- square plate of the Deep and Surface series with 30 x 60 mm or 60 x 60 mm window

**Versions**

| Code | Rockers |
|---|---|
| EK-E20-TP-4LS | 4 left with led |
| EK-E20-TP-4LD | 4 right with led |
| EK-E20-TP-8L | 8 with led |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**



# 4-fold pushbutton and room thermostat - 71 series

WALL-MOUNT DEVICES

**Description**

The 4-fold pushbutton of Ekinex® 71 series commands loads on/off switching, controls the dimming of lighting devices, controls motor drives for shutters or executes any other programmable command and control function. Thanks to the integrated temperature sensor, the pushbutton can work as a thermostat for a room or a zone. The LED can be chosen in the colour combinations blue / green or white / red. The device integrates a KNX bus communication module and is intended for mounting onto a wall mounting box; it is powered by a SELV voltage directly from the KNX bus and does not require any auxiliary power supply.

**Main features**

- 4-fold (possibility to configure up to 8 independent functions)
- 4 freely programmable LED for each channel
- 2 colour combination available for the LED (blue / green or red / white)
- Room thermostat function
- Integrated temperature sensor
- Plastic casing
- Connection to bus line with KNX terminal block
- Frontal programming pushbutton and LED
- Wall-mounting installation on round or square wall box
- IP20 protection degree (installed)
- Weight 70 g (with mounting support)

**Technical data**

- 30 Vdc power supply by KNX bus
- Current consumption from bus < 15 mA

**Products included**

Delivery includes a terminal block for connection to the bus, a metal support for installation onto round or square mounting box (fixing holes 60 mm apart), a plastic adapter and two pairs of fixing screws.

**Accessories**

The following accessories are available to be ordered separately:

- set of 1 square rocker, 2 vertical rectangular rockers, 4 square rockers or 4 horizontal rectangular rockers;
- square frame of Form (page 131) or Flank series;
- square plate with 60 x 60 mm window.

**Versions**

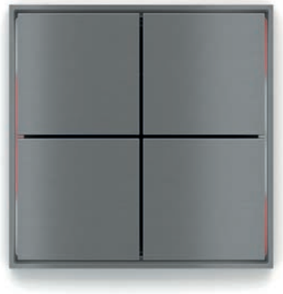
| Code | LED Colours | Mounting | Side profile |
|---|---|---|---|
| EK-E12-TP | blue / green | with square frame of Form or Flank series | - |
| EK-E12-TP-RW | red / white | | |
| EK-E12-TP-BG-NF | blue / green | without frame ('NF series) | black |
| EK-E12-TP-RW-NF | red / white | | |
| EK-E12-TP-BG-NFW | blue / green | | white |
| EK-E12-TP-RW-NFW | red / white | | |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**







# 4-fold pushbutton and room thermostat - FF series

WALL-MOUNT DEVICES

**Descrizione**

**Description**

The 4-fold pushbutton of Ekinex® FF series commands loads on/off switching, controls the dimming of lighting devices, controls motor drives for shutters or executes any other programmable command and control function. Thanks to the integrated temperature sensor, the pushbutton can work as a thermostat for a room or a zone. The LEDs can be chosen in the colour combinations blue / green or white / red. The device integrates a KNX bus communication module and is intended for mounting onto a wall mounting box; it is supplied by a SELV voltage directly from the KNX bus and does not require any auxiliary power supply.

**Main features**

- 4-fold (possibility to configure up to 8 independent functions)
- 4 freely programmable LEDs for each channel
- 2 colour combination available for the LEDs (blue/green or red/white)
- Integrated temperature sensor
- Room thermostat function
- Plastic casing
- Wall-mounting installation on round or square wall box
- Connection to bus line with KNX terminal block
- Frontal programming pushbutton and LED
- IP20 protection degree (installed)
- Weight 80 g (with mounting support)

**Technical data**

- 30 Vdc power supply through KNX bus
- Current consumption from bus < 15 mA

**Products included**

Delivery includes a terminal block for connection to the bus, a metal support for installation onto round or square mounting box (fixing holes 60 mm apart) and two pairs of fixing screws.

**Accessories**

The following accessories are available to be ordered separately:

- square or rectangular rockers;
- square frame of Form or Flank series.

**Versions**

| Code | LED Colours | Mounting | Side profile |
|---|---|---|---|
| EK-ED2-TP | blue / green | with square frame of Form or Flank series | black |
| EK-ED2-TP-RW | red / white | | |
| EK-ED2-TP-BG-NF | blue / green | without frame ('NF series) | |
| EK-ED2-TP-RW-NF | red / white | | |
| EK-ED2-TP-BG-NFW | blue / green | | white |
| EK-ED2-TP-RW-NFW | red / white | | |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

# Colour solutions

* ON REQUEST
The range finishes shown on the left are the result of a company stylistic choice. Additional finishes in Fenix NTM® and metal are also available upon request (non-standard processes may be subject to limitation).

## METAL HT

**CRO Chrome**
**Plates**
20venti
FF
71
**Rockers**
FF
71

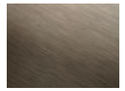
**CBM Black Metal**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**COP Copper coming soon**
**Plates**
20venti
FF
71
**Rockers**
FF
71

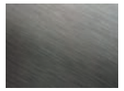
**CHA Champagne coming soon**
**Plates**
20venti
FF
71
**Rockers**
FF
71

## METAL (BRUSHED)

**GBQ Aluminium Brushed finishing**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti
FF
71
**Rockers**
FF
71



**GBR Nickel Brushed finishing**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti
FF
71
**Rockers**
FF
71



**GBS Titanium Brushed finishing**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti
FF
71
**Rockers**
FF
71

**GBU Carbon Brushed finishing**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti
FF
71
**Rockers**
FF
71

**GBB Brass Brushed finishing**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti
FF
71
**Rockers**
FF
71

## PLASTIC



**GAA White**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
20venti
FF

**GAE Intense black RAL 9005**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
20venti
FF

**GAG Silver metallic plastic**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
20venti
FF

## PLASTIC ON REQUEST



**GAB Ice white* Soft-touch finish**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
FF
71

**GAC Fire white***
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
20venti
FF - 71

**GAD Fire white* Soft-touch finish**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
FF
71

**GAF Intense black* Soft-touch RAL 9005**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
FF
71

**GAI Hematite* metallic plastic**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
20venti
FF - 71

**GAL Graphite* metallic plastic**
**Frames**
FF-71 Form
FF-71 Flank
**Plates**
20venti Deep
FF 'NF and Deep
71 'NF and Deep
**Rockers**
20venti
FF - 71

## FENIX NTM®



**FBM White Malè**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**FBL Beige Luxor**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**FCO Beaver Ottawa**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**FGE Grey Efeso**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**FGL Grey London**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**FGB Grey Bromine**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**FVC Green Commodore**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**FCC Cocoa Orinoco**
**Plates**
20venti
FF
71
**Rockers**
FF
71

**FNI Black Ingo**
**Plates**
20venti
FF
71
**Rockers**
FF
71





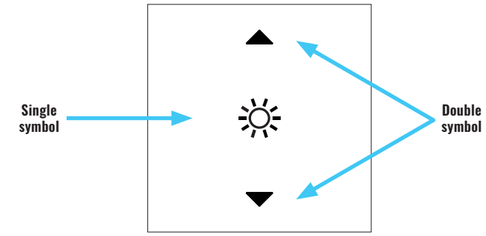
# Symbols for rockers customization

Rockers for devices of 20venti, FF and 71 series can be customized with symbols as shown in the library at page 146-149. Upon request, it is also possible to customize rockers with symbols and text provided by the customer.

### Square rockers

**Single symbol**
The single symbol is reproduced in the middle area of the square button, centred vertically and horizontally.

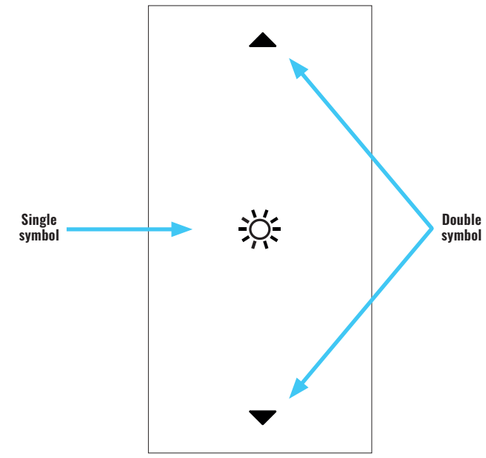
**Double symbol**
The double symbol is reproduced in the upper and lower areas of the square key, centred horizontally.




### Vertical rectangular rockers

**Single symbol**
The single symbol is reproduced in the middle area of the rectangular key, centred vertically and horizontally.

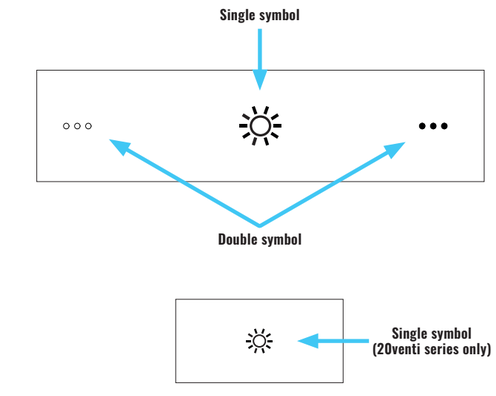
**Double symbol**
The double symbol is reproduced in the upper and lower areas of the rectangular key, centred horizontally.



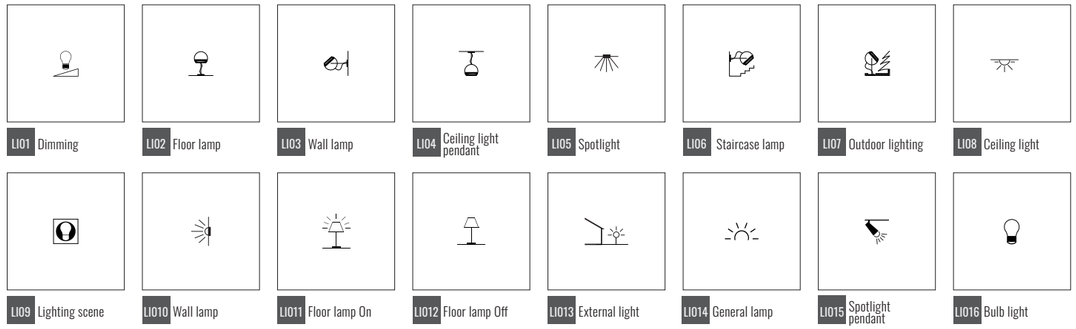

### Horizontal rectangular rockers

**Single symbol**
The single symbol is reproduced in the central area of the rectangular key, centred vertically and horizontally.

**Double symbol**
The double symbol is reproduced in the side areas (right and left) of the rectangular button, centred vertically.

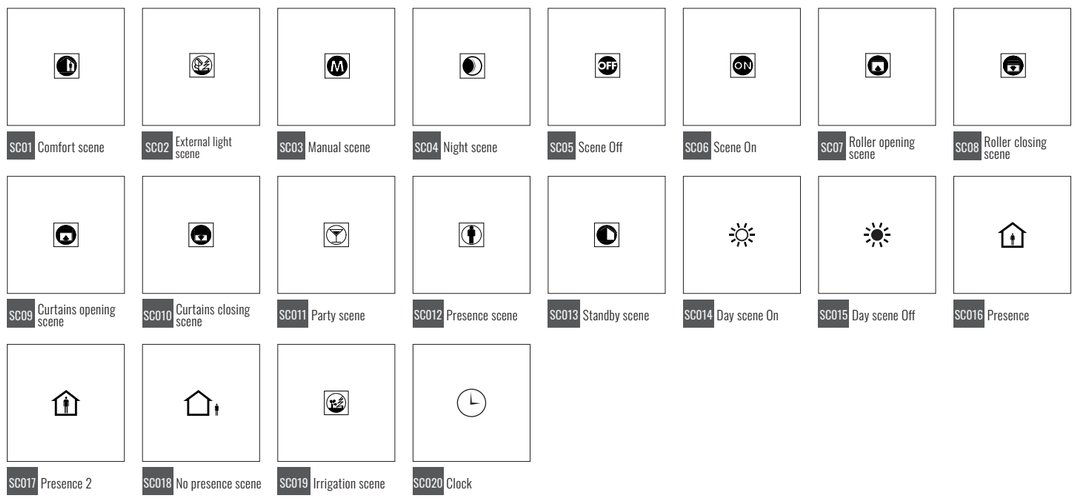


# Lighting



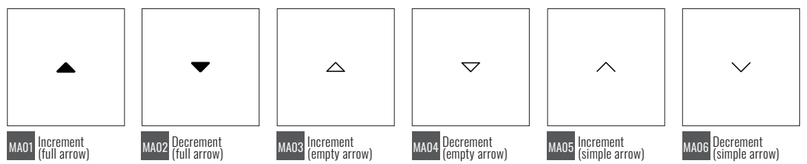
LI01 Dimming
LI02 Floor lamp
LI03 Wall lamp
LI04 Ceiling light pendant
LI05 Spotlight
LI06 Staircase lamp
LI07 Outdoor lighting
LI08 Ceiling light
LI09 Lighting scene
LI010 Wall lamp
LI011 Floor lamp On
LI012 Floor lamp Off
LI013 External light
LI014 General lamp
LI015 Spotlight pendant
LI016 Bulb light

# Scene



SC01 Comfort scene
SC02 External light scene
SC03 Manual scene
SC04 Night scene
SC05 Scene Off
SC06 Scene On
SC07 Roller opening scene
SC08 Roller closing scene
SC09 Curtains opening scene
SC010 Curtains closing scene
SC011 Party scene
SC012 Presence scene
SC013 Standby scene
SC014 Day scene On
SC015 Day scene Off
SC016 Presence
SC017 Presence 2
SC018 No presence scene
SC019 Irrigation scene
SC020 Clock

# Marker



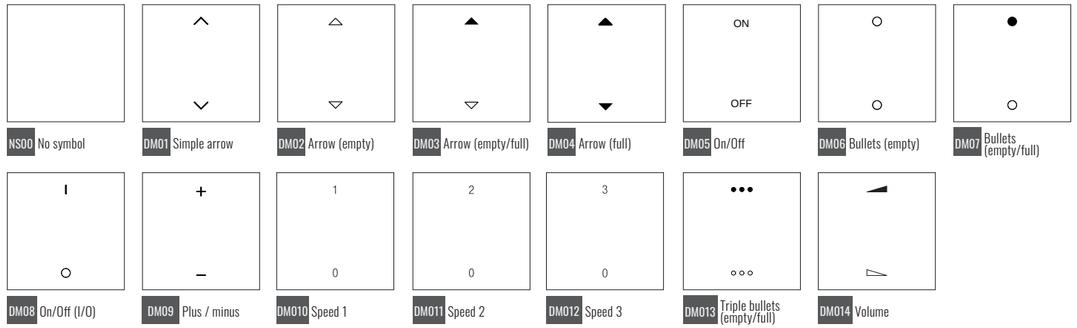
MA01 Increment (full arrow)
MA02 Decrement (full arrow)
MA03 Increment (empty arrow)
MA04 Decrement (empty arrow)
MA05 Increment (simple arrow)
MA06 Decrement (simple arrow)

Many other symbols are available in the Ekinex standard library: please refer to the latest version of the Technical Catalogue for information.
Other symbols can be produced on request, subject to checking compatibility of symbol size and file format.

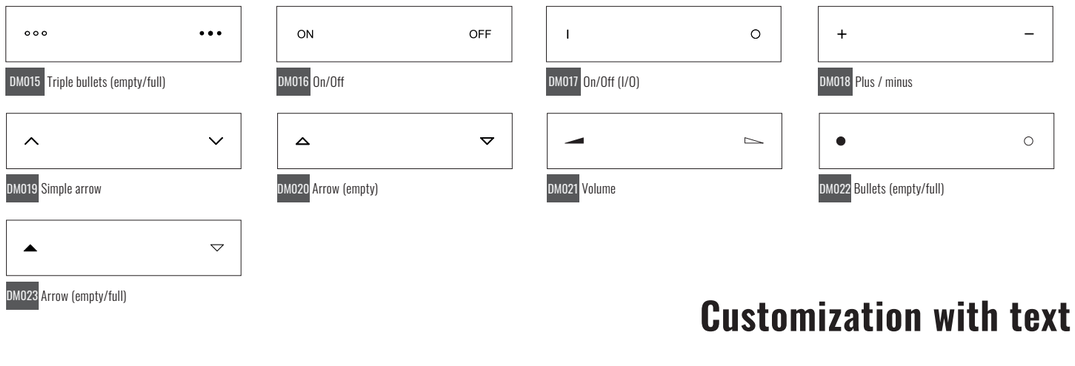




# Double symbols




NS00 No symbol
DM01 Simple arrow
DM02 Arrow (empty)
DM03 Arrow (empty/full)
DM04 Arrow (full)
DM05 On/Off
DM06 Bullets (empty)
DM07 Bullets (empty/full)
DM08 On/Off (I/O)
DM09 Plus / minus
DM010 Speed 1
DM011 Speed 2
DM012 Speed 3
DM013 Triple bullets (empty/full)
DM014 Volume




DM015 Triple bullets (empty/full)
DM016 On/Off
DM017 On/Off (I/O)
DM018 Plus / minus
DM019 Simple arrow
DM020 Arrow (empty)
DM021 Volume
DM022 Bullets (empty/full)
DM023 Arrow (empty/full)

# Customization with text

Square buttons can be customised with texts in the upper, middle and lower areas.
The texts must be indicated when ordering the material.


Text added to upper area only (max 12 characters)
Text added to lower area only (max. 12 characters)
Text added to both upper and lower areas (max. 12 chars each)
Text added to central area only (1 or 2 lines, max. 12 chars each)


Text placed in the lower and upper zones (max. 12 characters each)
Text placed in the middle zone (1 or 2 lines, max. 12 characters each)

The horizontal rectangular keys can be customised by using texts in the middle area.


Text placed in middle zone (1 or 2 rows, max. 12 characters each)
Middle text (1 row, max. 12 characters) 20venti series

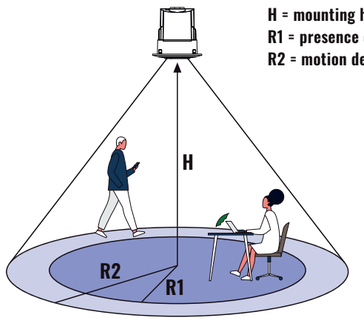
# Presence detection and movement

AUTOMATIC CONTROL

Movement and presence detection is widely used to create a series of automations not only in the lighting field, but also for heating, air conditioning, ventilation, air renewal and other building functions for which manual or timed control alone proves to be inefficient from an energy point of view or uncomfortable for the end user.
For lighting, it proves to be a simple and effective control method that can be an alternative or complement to manual control, with positive effects on comfort of use, energy savings - and consequently on the containment of polluting emissions - on the extension of the useful life of light sources and other electronic components of the luminaires.

**Movement and presence**

There is no single definition that distinguishes presence sensors from motion sensors; two fairly common criteria take into account the application to be implemented and the detection capability of the device.
Motion detection is generally required in those environments where there is little or no natural light and lighting is needed for a limited period of time: these may typically be passageways such as corridors or stairwells, underground passages, common parts of basements, access to warehouses or garages; but also pedestrian routes outside the building during the evening and night hours.
Presence detection is used in environments where there is ample availability of daylight and activities are carried out for extended periods, with the possibility of interruption at times that cannot be defined in advance, and therefore unsuitable for management with a timer: for example, work and production environments, classrooms, meeting rooms or transit areas where there is plenty of daylight.
Compared to simple motion detectors, presence detectors have a higher resolution lens and are able to detect even small movements in a limited area of the detection field: for example, the operation of a mouse or keyboard by a person sitting at their workstation.




**H = mounting height**
**R1 = presence detection range**
**R2 = motion detection range**

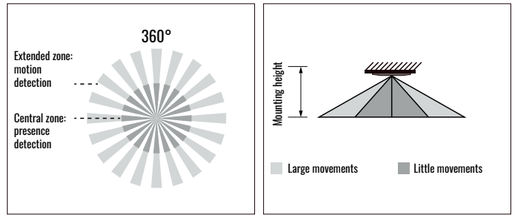
**Passive Infra-Red Technology**

For building automation applications, most motion and occupancy sensors use passive infrared (PIR) technology, which uses the thermal radiation naturally emitted by the human body. Sensors based on this technology do not emit electromagnetic radiation, but only detect changes in thermal radiation that occur within their detection range: this is the reason for the “passive” attribute given to this type of sensors.

## Detection field

The shape of the detection field of presence sensors is typically 180° (semi-circular) or 360° (circular); the former is characteristic of wall-mounted sensors, the latter of ceiling-mounted sensors. The detection capability and accuracy of a presence sensor is influenced by several factors:

- the amplitude and speed of movement;
- the temperature difference between the person and the environment;
- the direction of movement (tangential or radial to the detection area);
- the distance of the sensor from the moving person.

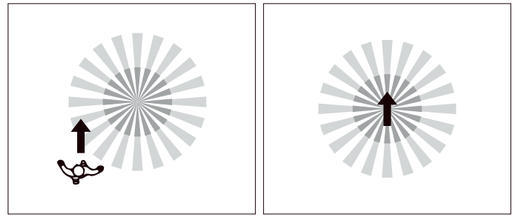






**Tangential direction:** high sensitivity due to the crossing of several detection sectors

**Radial direction:** lower sensitivity for crossing fewer detection sectors



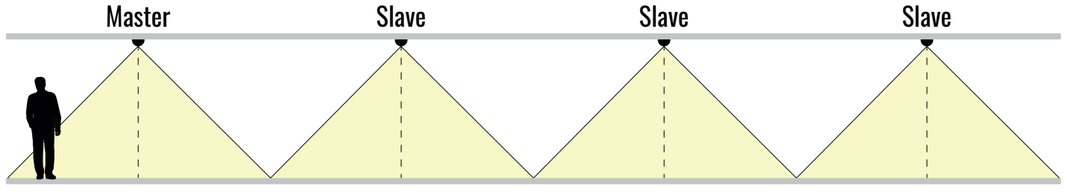
The size of the detection area is determined by two values in the technical documentation of the devices: the smaller value refers to the central area where even small movements are sufficient for detection, the larger value refers to the larger area where larger movements are necessary. The detection area of a presence sensor can however be extended by configuring a presence sensor as a 'master' device and one or more sensors of the same type as 'slave' devices.

## Automatic or semi-automatic operation

The presence sensors can be configured for automatic or semi-automatic operation:

- in automatic operation the lighting is switched on and off according to the presence or absence of movement in the detection field and/or according to the level of daylight measured in the room;
- in semi-automatic operation, the lighting is automatically switched off in the absence of movement and/or in the event of sufficient daylight; it is always switched on manually by means of a bus button, an App on a smartphone or a voice command. With this mode of operation it is possible to achieve greater energy savings than with automatic operation.

In some applications the stand-by function is useful: when no movement is detected for a fixed period of time (corresponding to the stand-by time), the lighting can be adjusted to a lower intensity level; if no further movement is detected, the lighting is automatically switched off, once the stand-by time has expired.








## Constant brightness control

A brightness sensor integrated in the luminaires enables constant brightness control in combination with luminaires equipped with dimmable sources.

## Switch-off delay

The switch-off delay is set during the sensor configuration phase and is the time interval between the last movement detected (or the achievement of a pre-set daylight threshold) and the actual switch-off of the lighting. Values between 10 seconds and 20 minutes are quite frequent; however, this parameter depends not only on the application to be implemented and the intended use of the environment, but also on the available light sources. Just think of the case of those corridors of office buildings crossed with such a frequency that presence sensors configured with a delay of 15 minutes never turn off the lights throughout the day; in the case of fluorescent sources a delay time of less than 15 minutes is generally not used because of both the long on time and the shortening of the useful life, while in the case of LED sources a delay of a couple of minutes can be achieved without problems.

As an example of how:

- passages with low crossing frequency, such as corridors in basements or cloakrooms: 5 to 15 minutes;
- passages with a high frequency of crossings, such as main corridors, stairwells or lift landings: 1 to 2 minutes. Here the light source is decisive: delay times of 1 minute only make sense in combination with LED technology;
- main rooms, such as offices or classrooms: 5 minutes (with LED lamps) to 15 minutes (with fluorescent lamps)

## Automatic control in standards

Appendix K of UNI CEN/TR 15193-2 defines automatic lighting controls activated by sensors that react to occupancy (presence and movement) and light level. With regard to occupancy, a distinction is made between absence detection and presence detection which correspond to different ways of configuring presence sensors, as shown in the table below.

| **Automatic control according to occupancy (source: UNI CEN/TR 15193-2)** | | | | **Sensors of Ekinex presence** |
|---|---|---|---|---|
| **Technique of detection** | **Switching On** | **Switching Off** | **Estimated savings (compared to manual control)** | **Mode of** |
| Absence detection | Manual | Automatic | approx. 35% | Semi-automatic |
| Presence detection | Automatic | Automatic | approx. 30% | Automatic |

## Daylight harvesting and constant illuminance control

A distinction is made between two requirements for light level control: daylight harvesting and constant illuminance. A prerequisite for both is adjustable luminaires. In the first case, the required illumination is provided totally or partially by daylight during most of the occupancy period and artificial lighting has a simple daylight supplementing role. The estimated energy saving compared to purely manual control is around 60%. In the second case, the artificial lighting adjusts the luminous flux to maintain the required illuminance in order to compensate for performance degradation over time. This type of control offers energy savings of around 15% compared to purely manual control.

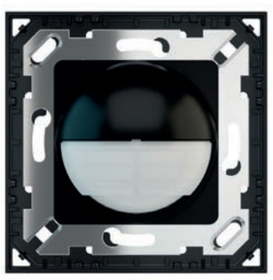
Ekinex combined sensors, capable of detecting both presence and light level, can combine the different control conditions required by the standard and provide savings of up to 75% compared to purely manual control.

## Multifunctional use of sensors

The availability of several independent lighting control channels is particularly useful for rooms with multiple luminaires with different functions, e.g. basic/orientation lighting and main/accent lighting.
In building automation, however, it is frequently necessary to control several technical systems - in addition to lighting alone - in the same rooms or areas. A typical example is heating, cooling and ventilation functions: to take into account the particularities of controlling these systems, which differ from lighting, presence sensors usually offer one or more channels specifically dedicated to the automatic control of HVAC functions. In addition, an alarm channel can activate or deactivate a load or a group of loads according to the number of movements (trigger events) detected in a certain time interval.
In this way, a single presence sensor can be used multifunctionally for lighting, HVAC and alarm signalling with advantages in terms of convenience, ease of connection and aesthetics, thanks to the installation of just one device in the room.

## Normative references

UNI EN 15193-1 Energy performance of buildings - Energy requirements for lighting - Part 1: Specifications, module M9
UNI CEN/TR 15193-2 Energy performance of buildings - Energy requirements for lighting - Part 2: Explanation and justification of EN 15193-1, module M9



# Movement sensor

WALL-MOUNT DEVICES

**Description**

The motion sensor Ekinex® EK-SN2-TP is used to detect the passage and standing of persons in a semicircular detection area. It is ideally suited for use in corridors, passage areas, toilets, stairwells, lift landings and generally environments with occasional occupancy. The device has dedicated channels for controlling lighting, HVAC equipment and alarms. Movement/presence detection is carried out by PIR (passive infrared) sensors: a sensor also allows the measurement of ambient brightness. The operating mode is semi-automatic or fully automatic. The device has an integrated KNX bus communication module and is designed for mounting in a flush-mounted wall box; it is powered via the KNX bus and does not require an auxiliary power supply. does not require an auxiliary power supply.

**Main features**

- Semi-automatic or fully automatic operation
- Two independent light control channels
- Two independent HVAC control channels
- One alarm channel
- An additional device can be used as a slave for any of the channels
- 200° detection range
- Adjustable sensitivity (4 levels)

**Technical data**

- Rated voltage: 21-30 VDC supplied by KNX bus
- Current consumption (on KNX bus): max. 10 mA (operation) / 5 mA (standby)
- Sensing range: 200° semicircular (maskable), up to 9 m distance at 1.5 m mounting height
- Light measurement range: 10..2000 Lux
- Plastic housing, lens and mount
- Safety standards: IEC 61000-6-1 / IEC 61000-6-3 / EN 55014 / EN 50491

**Environmental Conditions**

- Operating temperature: - 20... + 45 ° C
- Relative humidity: 95% non-condensing
- Environmental protection: IP20
- Switching, display and detection elements

**The device is equipped with:**

- (on the front side) a programming button
- (visible through the lens), a blue programming LED, a red
- red signal LED, a PIR sensor, a brightness sensor and an IR receiver.

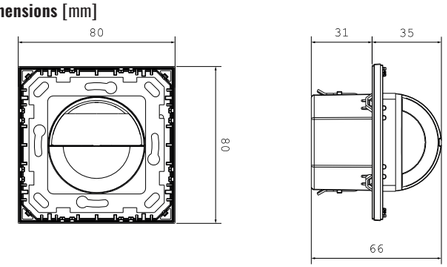
**Accessories**

- The following accessories are available to be ordered separately:
- square frame Form or Flank version
- square plate with 50 x 50 mm window
- a plastic adapter

EK-SN2-TP-GAA

EK-SN2-TP-GAE

**Dimensions** [mm]




**Order information**

| Code | Lens colour | Package |
|---|---|---|
| EK-SN2-TP-GAA | white | 1 pcs. |
| EK-SN2-TP-GAE | black | |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**



EKINEX | SMART LIGHTING

# Ceiling mounted presence sensor

WALL-MOUNT DEVICES

**Description**

The Ekinex® presence sensor EK-DF2-TP is a ceiling flush mount Passive Infrared (PIR) motion detector, for the detection of movement and presence of people in indoor spaces with a coverage area of 360°. The detection area can be extended using other sensors configured as slave devices. An integrated light sensor, combined with the motion detector, can manage light switching depending on brightness level as well as presence. The device has two distinct output channels for lighting, with independent parameters; the operation can be automatic or semi automatic. The device is also capable of maintaining a constant brightness level in the room by controlling a dimmable light source. All of the above parameters can be set by the user either through ETS or by means of a dedicated IR remote during installation. The device has two additional HVAC channels, which act in a similar way as the Light Control channels but without the standby time and light level dependence. An additional alarm channel can switch the load on or off depending on the number of trigger events (movements) detected in a time frame of configurable duration

**Main features**

- Semi-automatic or fully automatic operation
- Two independent Light control channels
- Two independent HVAC control channels
- One alarm channel
- An additional device can be used as slave for any of the channels
- Detection span of 360°, sectors can be masked through optical shields
- Adjustable Sensitivity, with “Walk test” to verify detection range
- Parameters can be set from ETS or through an IR remote

**Technical data**

- Rated voltage: 24 Vdc (21 - 30 Vdc) supplied by KNX bus
- Current consumption (on KNX bus): max 10 mA (operation) / 5 mA (Standby)
- Detection range: 360° circular (maskable), **up to 9 m diameter at 2.5 m mounting height**
- Light measurement range: 10..2000 Lux
- Housing, lens and frame in plastic material
- Safety standards: IEC 61000-6-1 / IEC 61000-6-3 / EN55014 / EN 50491

**Environmental conditions**

- Operating temperature: - 20 ... + 40°C
- Relative humidity: 95% not condensing
- Environmental protection: IP20

**Switching, display and detection elements**

The device is equipped with:

- on the rear side, a programming pushbutton
- visible through the plastic lens, a blue programming LED, a red signalling LED, a PIR sensor, a brightness sensor and an IR receiver

**Accessories**

The following accessories are available to be ordered separately:

- IR Remote Controller - EK-QR6-IR and support for protruding mounting - EK-QS3

**Versions**

| Code |
|---|
| EK-DF2-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

EK-DF2-TP EK-QR6-IR

# Ceiling mounted presence sensor

WALL-MOUNT DEVICES

**Description**

The Ekinex® presence sensor EK-DG2-TP is a ceiling flush mount Passive Infrared (PIR) motion detector, for the detection of movement and presence of people in indoor spaces with a coverage area of 360°. The detection area can be extended using other sensors configured as slave devices. An integrated light sensor, combined with the motion detector, can manage light switching depending on brightness level as well as presence. The device has two distinct output channels for lighting, with independent parameters; the operation can be automatic or semi automatic. The device is also capable of maintaining a constant brightness level in the room by controlling a dimmable light source. All of the above parameters can be set by the user either through ETS or by means of a dedicated IR remote during installation. The device has two additional HVAC channels, which act in a similar way as the Light Control channels but without the standby time and light level dependence. An additional alarm channel can switch the load on or off depending on the number of trigger events (movements) detected in a time frame of configurable duration.

**Main features**

- Semi-automatic or fully automatic operation
- Two independent Light control channels
- Two independent HVAC control channels
- One alarm channel
- An additional device can be used as slave for any of the channels
- Detection span of 360°, sectors can be masked through optical shields
- Adjustable Sensitivity, with “Walk test” to verify detection range
- Parameters can be set from ETS or through an IR remote

**Technical data**

- Rated voltage: 24 Vdc (21 - 30 Vdc) supplied by KNX bus
- Current consumption (on KNX bus): max 10 mA (operation) / 5 mA (Standby)
- Detection range: 360° circular (maskable), **up to 12 m diameter at 2.5 m mounting height**
- Light measurement range: 10..2000 Lux
- Housing, lens and frame in plastic material
- Safety standards: IEC 61000-6-1 / IEC 61000-6-3 / EN55014 / EN 50491

**Environmental conditions**

- Operating temperature: - 20 ... + 40°C
- Relative humidity: 95% not condensing
- Environmental protection: IP20

**Switching, display and detection elements**

The device is equipped with:

- on the rear side, a programming pushbutton
- visible through the plastic lens, a blue programming LED, a red signalling LED, a PIR sensor, a brightness sensor and an IR receiver

**Accessories**

The following accessories are available to be ordered separately:

- IR Remote Controller - EK-QR6-IR and support for protruding mounting - EK-QS3

**Versions**

| Code |
|---|
| EK-DG2-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

EK-DG2-TP EK-QR6-IR





# Presence sensor for outdoor mounting

WALL-MOUNT DEVICES

**Description**

The Ekinex® EK-DH4-TP presence sensor is an infrared motion detector passive (PIR) for outdoor ceiling or wall mounting, for motion and presence detection of people in outdoor spaces with a 360° coverage area. The detection area can be extended using other sensors configured as slave devices. One integrated light sensor, combined with the motion detector, can manage the ignition of light according to brightness level and presence. The device has two channels of separate output for lighting, with independent parameters; the operation can be automatic or semi-automatic. All the above listed parameters can be set by the user via ETS or via a dedicated IR remote control during installation. The device has two additional HVAC channels, which act similarly to brightness control channels, but without the standby time function and light level dependency. One additional alarm channel can activate or deactivate the load depending on the number of trigger events (movements) detected in a configurable time interval.

**Main features**

- Semi-automatic or fully automatic operation
- Two independent light control channels
- Two independent HVAC control channels
- An alarm channel
- An additional device can be used as a slave for any of the channels
- Detection range of 360° (180° on the wall), sectors can be masked through optic screens
- Adjustable sensitivity, with "Walk test" to verify the detection radius
- Parameters can be set by ETS or via an IR remote control.

**Technical data**

- Rated voltage: 24 VDC (21-30 VDC) supplied by KNX bus
- Current consumption (on KNX bus): max. 10 mA (operation) / 5 mA (standby)
- Sensing range: 360° circular (masking), **up to 32 m diameter at 2.5 m mounting height**
- Light measuring range: 10..2000 Lux
- Housing, lens and frame in plastic material
- Safety standards: IEC 61000-6-1 / IEC 61000-6-3 / EN 55014 / EN 50491

- **Environmental conditions**
- Operating temperature: - 20 ... + 40°C
- Relative humidity: 95% not condensing
- Environmental protection: IP20

**Switching, display and detection elements**

The device is equipped with:

- on the rear side, a programming pushbutton
- visible through the plastic lens, a blue programming LED, a red signalling LED, a PIR sensor, a brightness sensor and an IR receiver

**Accessories**

The following accessories are available to be ordered separately:

- IR Remote Controller - EK-QR6-IR

**Versions**

| Code |
|---|
| EK-DH4-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

EK-DH4-TP EK-QR6-IR

# DIN rail modules

SWITCHBOARD PRODUCTS

Ekinex offers a wide range of solutions for controlling and monitoring the lighting function. The modular products are installed in switchboards, switchboards and electrical distribution cabinets on standard 35 mm profile rails according to CEI EN 60715. In addition to devices that communicate directly with the KNX protocol, DALI-KNX and DMX-KNX gateways greatly expand the possibilities of the system, thanks to the protocol conversion that enables digital communication between KNX and the two standards. Actuators, dimmers, gateways and inputs - in combination with the Delégo series of commands, controls, sensors and supervision - create a truly integrated lighting management system that makes it possible, for example, to:

- switch luminaires on and off, individually or in groups;
- control luminaires manually or automatically;
- vary the light intensity emitted by the sources;
- set the colour and decide the shade of white light (warm/cold);
- call up lighting scenarios, controlling direct and indirect components and basic and accent lighting;
- make use of daylight;
- adjusting light to people's biological rhythms ...

... and much more, depending on individual wishes and needs.


# 8-fold binary input

INPUTS

**Description**

The Ekinex® EK-CA1-TP binary input has 8 independent input channels for connecting to the KNX bus commands and sensors of traditional type, having potential-free contacts. Thanks to the binary input, it is possible to command and control bus functions with standard switches, pushbuttons or sensors (not natively communicating with the KNX bus) or binary signals made available by other devices. The query voltage of input channels is produced within the device. The device integrates a KNX bus communication module and is realized for mounting on a standard 35 mm DIN-rail. The device is supplied by the KNX bus and does not require auxiliary power supply.

**Main features**

- Plastic casing
- Frontal programming pushbutton and LED
- Membrane keyboard with LED's for status indication
- Connection to bus line with KNX terminal block
- Connection of inputs with screw terminals
- Installation on 35 mm rail (according to EN 60715)
- 4 modular units (1 MU = 18 mm)
- IP20 protection degree (installed device)

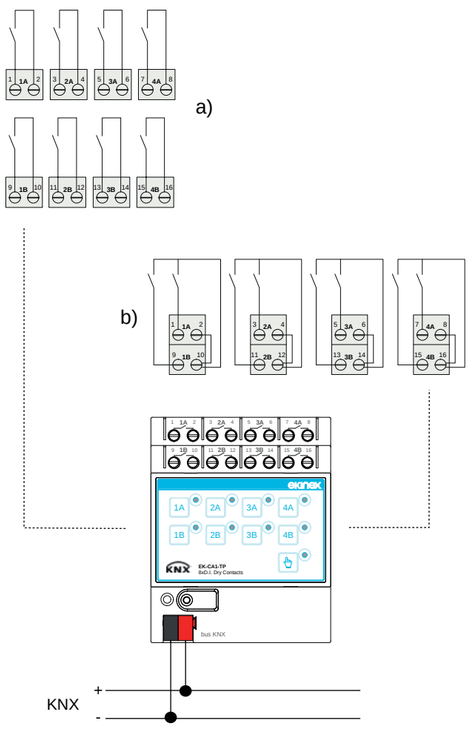
**Technical data**

Power supply
- Voltage 30 Vdc by KNX bus
- Current consumption from bus < 13 mA
- Power on bus 320 mW

Inputs
- Number: 8
- Query voltage: < 11 V
- Query current: < 5 mA

**Products included**

Delivery includes a terminal block for connection to the bus.




a) Connection of conventional switches, pushbuttons or presence sensors (on/off)
b) Connection of conventional double pushbuttons (dimming)

**Versions**

| Code |
|---|
| EK-CA1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**







# Universal interface 2 (4) IN, 2 (4) OUT

UNIVERSAL INTERFACES

**Description**

The Ekinex® universal interface is a KNX device which can be used as input and/or output module. The device is equipped with:
- 2 or 4 inputs to connect the KNX bus to switches, pushbuttons or classic sensors (normally not communicating on the KNX bus) or any binary signals from other devices, in order to control KNX bus functions;
- 2 or 4 control outputs for low consumption LEDs.

The voltage for polling the inputs is supplied within the device. The device integrates a KNX bus communication module and is realized for flush-mounting or for mounting on a standard 35 mm DIN-rail. The device is powered by the KNX bus and does not require auxiliary power supply.

**Main features**

- Plastic casing
- Programming pushbutton and LED on the case
- Connection to bus line with KNX terminal block
- Screw terminal blocks for connecting inputs and outputs
- IP20 protection degree (installed device)

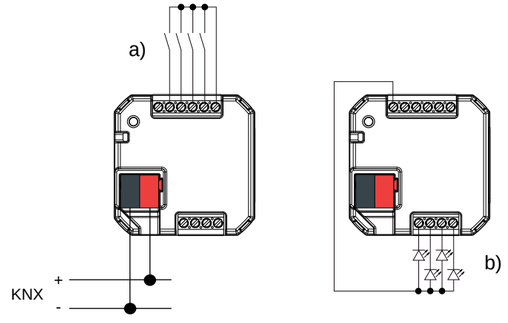
Power supply
- 30 Vdc power supply by KNX bus
- Current consumption from bus < 10 mA

**Products included**

Delivery includes a terminal block for connection to the bus.

**Accessories**

Support for mounting on a standard 35 mm DIN-rail (code EK-SMG-35) and spring for snapping on the back of Ekinex® wall-mount devices (code EK-MAR-...) to be ordered separately.




a) Connection of conventional switches, pushbuttons or presence sensors (on/off)
b) Connection of conventional double pushbuttons (dimming)

**Versions**

| Code | Inputs / Outputs |
|---|---|
| EK-CC2-TP | 2 IN / 2 OUT |
| EK-CD2-TP | 4 IN / 4 OUT |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

EK-CC2-TP EK-CD2-TP

# Input/output module for office applications

I/O MODULES

**Description**

The Ekinex® EK-HU1-TP module allows to manage all functions of an office or a open-space zone: lighting, temperature control, shades and input/output indications. The device is equipped with membrane keys for manual control and status indication LEDs; a pushbutton allows to switch mode from automatic to manual and vice versa. The device integrates a KNX bus communication module and is intended for mounting on a 35 mm standard DIN-rail. It is supplied by the KNX bus; in order to be operational it also requires a 230 Vac voltage.

**Main features**

- Plastic casing
- Frontal programming pushbutton and LED
- Membrane keypad with LED indication of the input status
- Pushbutton for automatic/manual mode switch
- Connection to bus line with KNX terminal block
- Screw terminal blocks for connecting inputs, outputs and 230 Vac power supply
- 3K5 climatic and 3M2 mechanic classification (according to EN 50491-2)
- Overvoltage class III (according to EN 60664-1)
- Pollution level 2 (according to IEC 60664-1)
- Mounting on 35 mm standard DIN-rail (according to EN 60715)
- 8 modular units (1 UM = 18 mm)
- Protection degree IP20 (device installed)

**Technical data**

Power supply

- Load power supply 230 Vac 50/60 Hz;
- Power supply (electronics) 30 Vdc via KNX bus;
- Current consumption by bus < 10 mA;
- Power on bus < 240 mW.

Inputs

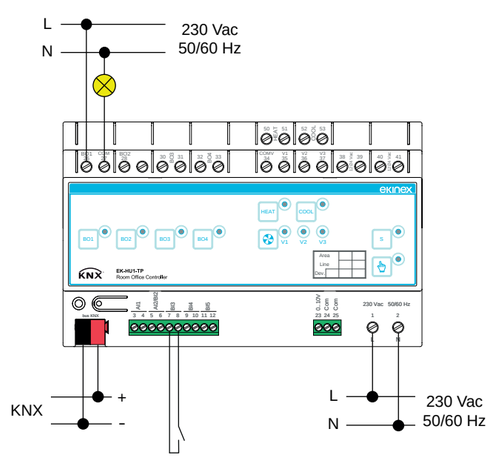
- 1 analog for NTC temperature sensor (thermostat function);
- 4 digital

Outputs

- 10 digital of which:
  - 3 general purpose
  - 2 (paired) for blind or shade control
  - 5 fancoil: 3 for fan speed (3 speeds) and 2 for controlling electrothermal actuators on hot/cold valves
- 1 analog 0-10V for fan speed control

**Products included**

Delivery includes a terminal block for connection to the bus.




Connection to a DI input of a conventional control (not KNX) for ON/OFF of an individual luminaire or luminaire group

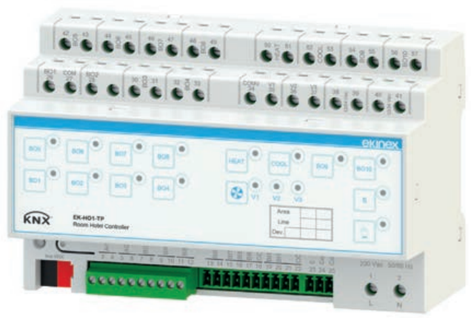
| Versions |
|---|
| **Code** |
| EK-HU1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**







# Input/output module for hotel applications

I/O MODULES

**Description**

The Ekinex® EK-HO1-TP module allows to manage all functions of a hotel room: lighting, temperature control, shades and input/output indications. The device is equipped with membrane keys for manual control and status indication LEDs; a pushbutton allows to switch mode from automatic to manual and vice versa. The device integrates a KNX bus communication module and is intended for mounting on a 35 mm standard DIN-rail. It is supplied by the KNX bus; in order to be operational it also requires a 230 Vac voltage.

**Main features**

- Plastic casing
- Frontal programming pushbutton and LED
- Membrane keypad with LED indication of the input status
- Pushbutton for automatic/manual mode switch
- Connection to bus line with KNX terminal block
- Screw terminal blocks for connecting inputs, outputs and 230 Vac power supply
- 3K5 climatic and 3M2 mechanic classification (according to EN 50491-2)
- Overvoltage class III (according to EN 60664-1)
- Pollution level 2 (according to IEC 60664-1)
- Mounting on 35 mm standard DIN-rail (according to EN 60715)
- 8 modular units (1 UM = 18 mm)
- Protection degree IP20 (device installed)

**Technical data**

Power supply

- Load power supply 230 Vac 50/60 Hz; electrical lock 12-24 V
- Power supply (electronics) 30 Vdc via KNX bus
- Current consumption by bus < 10 mA
- Power on bus < 240 mW

Inputs

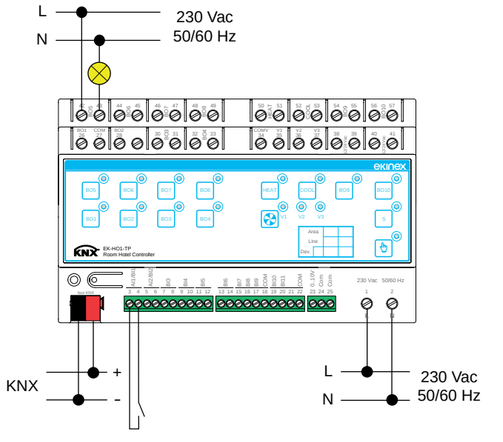
- 1 analog for NTC temperature sensor (thermostat function)
- 1 configurable as analog or digital
- 10 digital of which:
  - 4 general purpose
  - 2 door or window opening contact
  - 1 pushbutton with pulling call for assistance/emergency
  - 1 badge contact
  - 2 pushbuttons «Do not disturb» e «Please make room»

Outputs

- 15 digital of which:
  - 3 general purpose
  - 3 for indications: «guest in the room», «room assigned», busy room or emergency»
  - 2 (paired) for blind or shade control
  - 1 for courtesy light control
  - 5 for fancoil: 3 for fan speed (3 speeds) and 2 for controlling electrothermal actuators on hot/cold valves
  - 1 digital room contactor and auxiliaries
- 1 powered at 12/24 Vac for controlling an electric lock
- 1 analog 0-10 V for fan speed control

**Products included**

Delivery includes a terminal block for connection to the bus.




Connection to an input (configured as DI) of a conventional control (not KNX) for ON/OFF of an individual luminaire or group of luminaires

| Versions |
|---|
| **Code** |
| EK-HO1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

# 8-fold binary output/ 4-fold blind actuator

ACTUATORS

## Description

The Ekinex® EK-FE1-TP binary output / blind actuator allows to command 8 groups of loads or control 4 drives for motorised blinds independently. The device is fitted with membrane pushbuttons for manual command (even in the absence of bus power) and LED's for status indication; a pushbutton allows to switch between automatic and manual operation modes. The device integrates a KNX bus communication module and is realized for mounting on a standard 35 mm DIN-rail. The device is supplied by the KNX bus and requires an additional 230 Vac power supply to operate.

## Main features

- Plastic casing
- Frontal programming pushbutton and LED
- Membrane keyboard with LED's for status indication
- Pushbutton for switching operating mode (normal / programming)
- Connection to bus line with KNX terminal block
- Connection of outputs and 230 Vac power supply with screw terminals
- Overvoltage class III (according to EN 60664-1)
- Classification climatic 3K5 and mechanical 3M2 (according to EN 50491-2)
- Pollution degree 2 (according to IEC 60664-1)
- Installation on 35 mm rail (according to EN 60715)
- 4 modular units (1 MU = 18 mm)
- IP20 protection degree (installed device)

## Technical data

Power supply

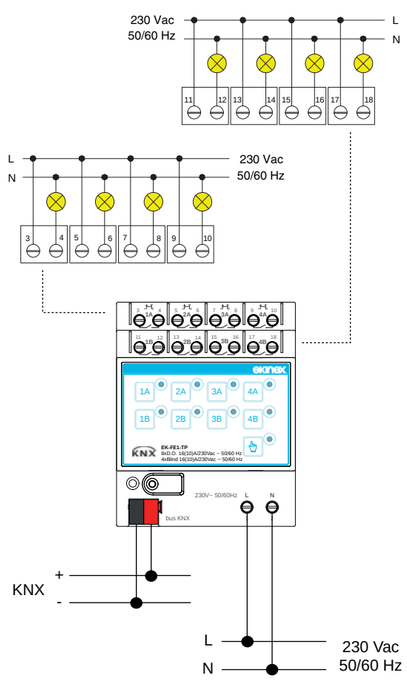
- Voltage auxiliary 100-230 Vac 50/60 Hz
- Voltage control section 30 Vdc by KNX bus
- Current consumption from bus < 10 mA
- Power on bus < 240 mW

Uscite

- Number: 8 or 4 independent channels (depending on device use)
- Nominal voltage ($U_n$): 230 Vac
- Nominal current ($I_n$): max 16 (10) A
- Max. switched power: max 4000 VA

## Products included

Delivery includes a terminal block for connection to the bus.



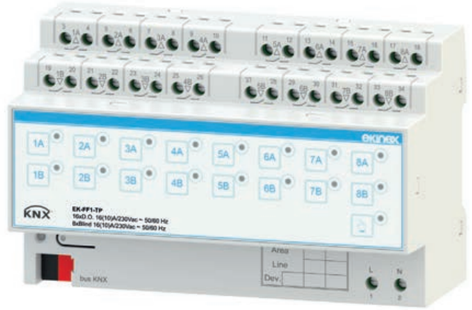

| Versions |
|---|
| **Code** |
| EK-FE1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**







# 16-fold binary output/ 8-fold blind actuator

ACTUATORS

## Description

The Ekinex® EK-FF1-TP binary output / blind actuator allows to command 16 groups of loads or control 8 drives for motorised blinds independently. The device is fitted with membrane pushbuttons for manual command (even in the absence of bus power) and LED's for status indication; a pushbutton allows to switch between automatic and manual operation modes. The device integrates a KNX bus communication module and is realized for mounting on a standard 35 mm DIN-rail. The device is supplied by the KNX bus and requires an additional 230 Vac power supply to operate.

## Main features

- Plastic casing
- Frontal programming pushbutton and LED
- Membrane keyboard with LED's for status indication
- Pushbutton for switching operating mode (normal / programming)
- Connection to bus line with KNX terminal block
- Connection of outputs and 230 Vac power supply with screw terminals
- Overvoltage class III (according to EN 60664-1)
- Classification climatic 3K5 and mechanical 3M2 (according to EN 50491-2)
- Pollution degree 2 (according to IEC 60664-1)
- Installation on 35 mm rail (according to EN 60715)
- 8 modular units (1 MU = 18 mm)
- IP20 protection degree (installed device)

## Technical data

Power supply

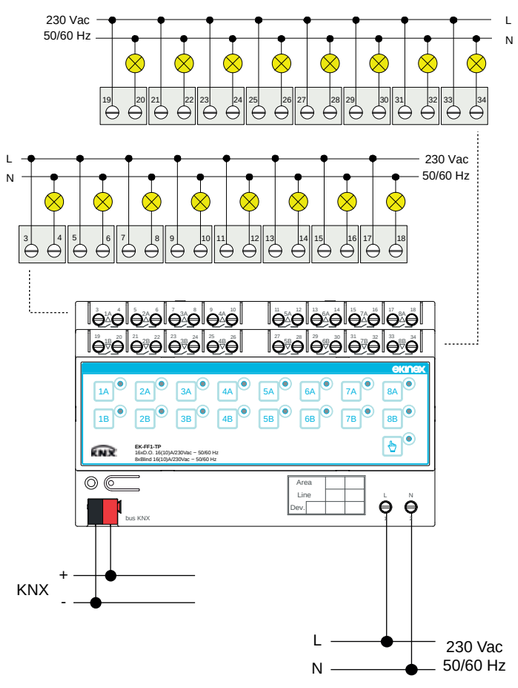
- Voltage auxiliary 100-230 Vac 50/60 Hz
- Voltage control section 30 Vdc by KNX bus
- Current consumption from bus < 10 mA
- Power on bus < 240 mW

Outputs

- Number: 16 or 8 independent channels (depending on device use)
- Nominal voltage ($U_n$): 230 Vac
- Nominal current ($I_n$): max 16 (10) A
- Max. switched power: max 4000 VA

## Products included

Delivery includes a terminal block for connection to the bus.




| Versions |
|---|
| **Code** |
| EK-FF1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

# Light adjustment

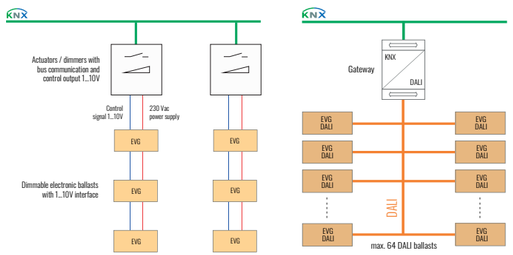
DIMMER

**Dimming**

The lighting system is designed to provide the maximum required illumination, although in many situations this is not actually necessary. Alongside quantity, a higher quality of light is increasingly appreciated; for this, it is necessary to overcome the traditional concept of control which only allows switching on and off. The light intensity emitted by the lighting fixtures can be controlled thanks to dimming, individually or in groups, and this can satisfy different needs: for example, greater visual comfort, providing exactly the amount of light needed where and when required. In other cases, dimming is useful when there is great availability of natural light that can be exploited, reducing the component of artificial light. Where non-negligible power requirements or long turn-on/ turn-off times are at stake, the brightness control is also effectively used to save energy and extend the useful life of light sources and electronic components: this is the typical case, for example, of office environments or production areas.

**Traditional techniques**

Leading edge phase dimmers reduce the current flow that feeds the load; for a long time this technique has been used for the dimming of incandescent and halogen lamps. For this purpose, the power supply wiring of the lamps is used; due to the ban imposed on these sources by many countries (in the EU starting from the Commission Regulation 244/2009), this type of dimming has rapidly decreased in importance. The 1... 10V analog interface represented another very common technique in combination with fluorescent tubes and dimmable electronic ballasts (EVG) equipped with the appropriate interface. In this case, the reactor supplies the control voltage which can be modified by means of a regulation device based on the variation of the electrical resistance; for this purpose, a separate additional electrical connection is required, while the switching on and off takes place through the connection of the 230 Vac power supply network.




The arrival of bus systems for building automation has made it possible to use actuators / dimmers, with dedicated 1 ... 10V control outputs, and to connect them to the network for group controls, lighting scenarios and coordinated operation with other functions. The diffusion of digital communication interfaces on board of the lighting bodies - in particular those with DALI standard - is reducing the use of the 1 ... 10V dimming technique.

**Hue and colour adjustments**

LED lamps have quickly become the most popular light sources on the market; they offer a number of adjustment which previously were difficult to realize, such as such as warm / cool white light and color control. Applications that reproduce the variation in colour temperature typical of natural light in indoor environments, such as HCL control, have become possible at very affordable costs. There is a difference in control between the modes:

- **DIM TO WARM**: with the "dim to warm" control the colour of the light becomes warmer as the brightness is reduced;
- **TUNABLE WHITE**: With the "tunable white" control the brightness and colour of the light are set separately.

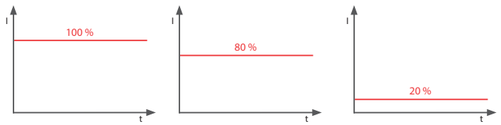
**Special features of LED sources**

From a technical point of view, LEDs are ideal to dimming, a feature that is not true for all light sources, as in the case of discharge lamps. However, there are different types of LED sources such as:

- LED lamps without integrated driver;
- LED lamps with integrated driver and 230 Vac mains voltage power supply;
- LED lamps with integrated driver, very low voltage power supply (12 / 24V).

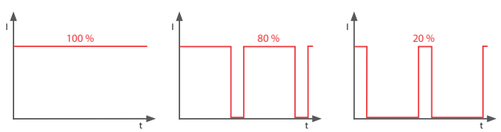
Only some of the most common control systems are automatically suitable for dimming LED lamps: to define the most suitable solution, it is therefore always necessary to check in advance the compatibility between sources and control devices.

Analog LED dimming




The LED sources can be dimmed either by analog dimming by adjusting the current or by using the PWM technique (pulse-width modulation). In the latter case, the current flow through the LED is interrupted rhythmically with a certain frequency. The greater the intervals between the current delivery phases, the lower the actual and average current through the LED and therefore the perceived brightness. PWM frequencies higher than 300 Hz are not perceptible to the human eye and therefore no flickering is noticeable, despite a modulation in progress.

PWM LED dimming








# 2-fold dimming actuator

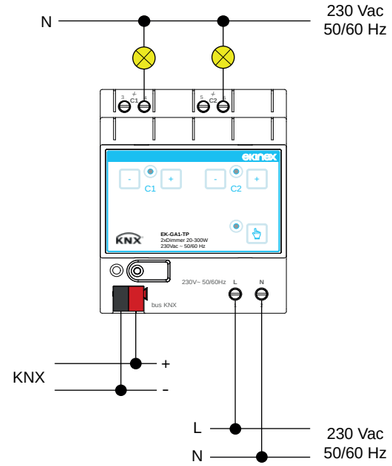
DIMMERS


**Description**

The Ekinex® EK-GA1-TP dimming actuator allows to command and regulate the light intensity of 2 groups of lighting devices. The device is suitable for the control of resistive, inductive and capacitive loads powered with 230 Vac. Different types of loads can be connected to different channels. The device is fitted with membrane pushbuttons for manual command and LEDs for status indication: a pushbutton allows the switching between automatic or manual operation modes. The device integrates a KNX bus communication module and is realised for mounting on a standard 35 mm DIN-rail. The device is powered by the KNX bus and requires an additional 230 Vac power supply to operate the loads.

**Main features**

- Plastic casing
- Frontal programming pushbutton and LED
- Membrane keyboard with LEDs for status indication of outputs
- Pushbutton for switching operating mode (normal / programming)
- Connection to bus line with KNX terminal block
- Connection of outputs and 230 Vac power supply with screw terminals
- Installation on 35 mm rail (according to EN 60715)
- 4 modular units (1 MU = 18 mm)
- IP20 protection degree (installed device)




**Technical data**

Power supply

- Voltage (loads): 230 Vac 50/60 Hz
- Voltage (electronics): 30 Vdc by KNX bus
- Current consumption from bus: < 13 mA
- Max. power from bus: 320 mW

Outputs

- Number: 2
- Max. controlled power: 300 W
- Min. controlled power: 10 W

**Products included**

Delivery includes a terminal block for connection to the bus.

| Versions |
|---|
| **Code** |
| EK-GA1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

# 4-fold RGBW LED dimmer

DIMMERS

**Description**

The Ekinex® EK-GC1-TP 4-fold RGBW LED dimmer allows to regulate independently the light intensity emitted by 4 LED strips at 12/24 Vdc or, alternatively, to regulate the light intensity and the colour emitted by a RGB or RGBW LED strip. The device is suitable for use with LED strips powered at constant voltage. The selection of the colour can be made optionally in HSV or RGB mode. Scenarios, predefined sequences, sequence repetition and random functions are available; the dimming speed and the holding time are programmable. The device is fitted with membrane pushbuttons for manual command and LEDs for status indication; a pushbutton allows the switching between automatic or manual operation modes. The device integrates a KNX bus communication module and is realised for mounting on a standard 35 mm DIN-rail. The device is powered by the KNX bus and requires an additional 12...30 Vdc to supply the controlled loads.

**Main features**

- Plastic casing
- Frontal programming pushbutton and LED
- Membrane keyboard with LEDs for status indication of outputs
- Pushbutton for switching operating mode (normal / programming)
- CH pushbutton for individual or simultaneous channels control
- HSV / RGB pushbutton colour control mode
- Auxiliary dry contact to disconnect load power supply during standby
- Connection to bus line with KNX terminal block
- Connection of outputs and 12-30 Vdc power supply with screw terminals
- Installation on 35 mm rail (according to EN 60715)
- 4 modular units (1 MU = 18 mm)
- IP20 protection degree (installed device)

**Technical data**

Power supply

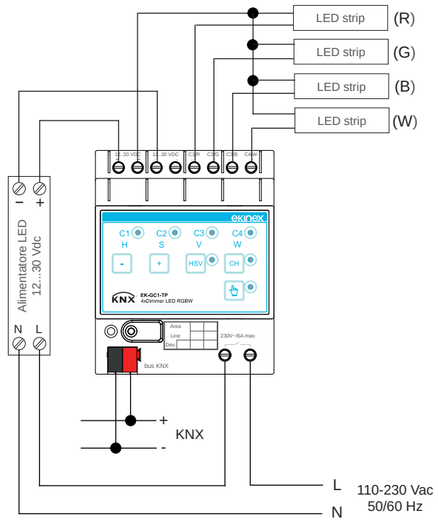
- Voltage (strip LED): max 30 Vdc, 16 A
- Voltage (control): 30 Vdc by KNX bus

Outputs

- Number: 4
- Load current for each channel: 4 A

**Products included**

Delivery includes a terminal block for connection to the bus.




| Type of load | Description | Link |
|---|---|---|
| | White / Monochrome independent, up to 4 loads (up to 4A each) | |
| | Dynamic white, up to 2 channels (up to 4A per output) | |
| | RGBW, 1 channel | |
| | 1 RGB channel + 1 independent monochrome channel | |

**Versions**

| Code |
|---|
| EK-GC1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**





# 4-fold 0-10 V actuator

DIMMERS

**Description**

The Ekinex® 4-fold 0-10 V actuator EK-GF1-TP can be used as 0-10 V control output device or, alternatively, for controlling dimmerable LED power supply units. When used for LED controlling, the selection of the colour can be made optionally in HSV or RGB mode. Scenarios, predefined sequences, sequence repetition and random functions are available; the dimming speed and the holding time are programmable. The device is fitted with membrane pushbuttons for manual command and LEDs for status indication; a pushbutton allows the switching between automatic or manual operation modes. The device integrates a KNX bus communication module and is realised for mounting on a standard 35 mm DIN-rail. The device is powered by the KNX bus.

**Main features**

- Plastic casing
- Frontal programming pushbutton and LED
- Membrane keyboard with LEDs for status indication of outputs
- Pushbutton for switching operating mode (normal / programming)
- CH pushbutton for individual or simultaneous channels control
- HSV / RGB pushbutton colour control mode
- Connection to bus line with KNX terminal block
- Connection of outputs with screw terminals
- Installation on 35 mm rail (according to EN 60715)
- 4 modular units (1 MU = 18 mm)
- IP20 protection degree (installed device)

**Technical data**

Power supply

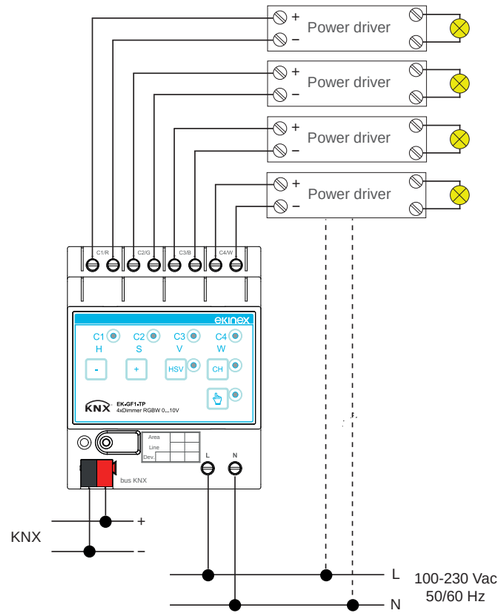
- Voltage (control): 30 Vdc by KNX bus
- Rated output stage supply voltage: 230Vac, max 6W

Outputs

- Number: 4
- Range: 0-10 V or 1-10V
- Max. current for each channel: 50 mA

**Products included**

Delivery includes a terminal block for connection to the bus.




**Versions**

| Code |
|---|
| EK-GF1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

# DALI

DALI, acronym for Digital Addressable Lighting Interface, is a communication protocol developed specifically for digital lighting control and allows the creation of robust, scalable and flexible systems. The main functions include the switching on / off of lighting devices (single or in groups), the dimming and the recall of lighting scenarios.

DALI, DALI-2, the DALI logos and DALI-2 are registered trademarks in several countries for the exclusive use of DiiA (Digital Illumination Interface Alliance).

**Origins and evolution**

DALI was originally developed by a group of leading lighting manufacturers as a standard interface to enable digital control, configuration and interrogation of electronic ballasts for fluorescent tubes, replacing traditional 0-10V or 1-10V analog control. Made public for the first time at the end of the 90s, DALI has evolved and established itself and in a few years has become a standard protocol in the lighting sector and has been included in the international standard IEC 62386. As a result, long-term compatibility between manufacturers is ensured and the standard has become a guarantee for future developments. DALI-2 represents the most recent version of the protocol, aimed at greater functionality and interoperability of the devices: to take this into account, in 2014 IEC updated the standard.

**System philosophy**

Similarly to KNX, DALI is a distributed intelligence system: each DALI device can exchange coded information thanks to a standardized digital interface, a common communication protocol and a shared transmission medium (bus). However, DALI is a master / slave system, unlike KNX whose communication is typically peer-to-peer. In other words, on DALI the communication initiative is assigned exclusively to the master device, while the slaves merely respond to the query received from the master.

**Connectivity, topology and power supply**

A two-wire cable (recommended 1.5 mm2, 15 AWG) is sufficient to power the electronics and data transmission; it is not necessary to follow the polarity of the wires (+/-), unlike systems with 0-10 V or 1-10 V control. The maximum distance between two DALI devices is 300 m, while the system topology is free: linear and star connections can be combined, but looping must be avoided. Each DALI system requires a bus power supply that can be provided by a dedicated device or by another device connected to the bus; when DALI is interfaced to KNX the power supply is provided by the KNX / DALI Gateway EK-BG1-TP that typically supplies 16 V (range: 9.5 V ... 22.5 V).

**Addressing and grouping**

A single DALI bus system provides 64 addresses for ballasts and 64 addresses for controllers. Similarly to KNX, DALI devices can also be programmed to operate in groups. This offers great flexibility, since the lighting system can be reconfigured through a simple software reprogramming, without the need to physically change the wiring. The grouping of devices includes:

- 16 groups for the reactors; each device can be a member of any combination of the 16 groups;
- 32 groups for controllers; each device can be a member of any combination of the 32 groups;
- 32 groups for input device instances; each instance can be a member of up to 3 of these groups.

**Commands and scenarios**

The different types of DALI commands allow the control, configuration and interrogation of the various devices:

- control commands: turn the lighting on or off, initiate fading at a certain brightness level or recall light scenario;
- configuration commands: modify the fading time or change the brightness level stored in a scenario;
- interrogation commands: request the current brightness level or the presence of a lamp failure.

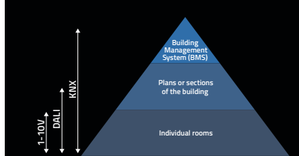
The commands can be addressed to single devices, to groups of devices or broadcast indiscriminately to all devices, making communication efficient. Scenarios generally contain a brightness level; alternatively, they can be set to “ignore”. When a scenario is recalled, the output goes to the stored brightness level or has no effect if “ignore” has been set. Each reactor has 16 scenarios. A single GO TO SCENE command instructs all lighting fixtures or any combination of fixtures to go to predefined brightness levels.

**References**

CEI EN 62386 Addressable digital interface for lighting

**Interfacing between KNX and DALI systems**

The DALI system can be easily interfaced through a gateway to the KNX system - which performs the numerous and complex building automation functions in a coordinated way - becoming a sub-system specifically dedicated to the lighting function. The digital nature of DALI allows two-way communication between devices, so that each DALI device can indicate a fault or respond to a query about its status: the status feedback, for example, can signal a faulty lamp and be transmitted to the KNX supervision via the KNX / DALI gateway.








# Gateway DALI - KNX

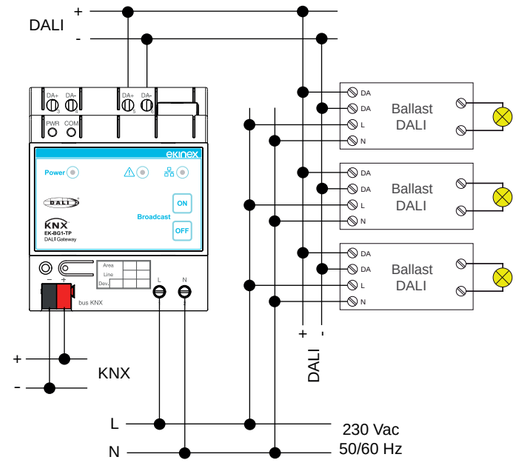
GATEWAY

**Description**

The Ekinex® DALI - KNX Gateway allows the control of the devices present in a DALI network from a KNX TP network. The device has an integrated KNX bus communication module and integrates the power supply stage for the DALI bus. **DALI2 version available with firmware update 2.5.**

**Main features**

- Connection to the KNX bus line with standard KNX terminal block
- Plastic casing
- Installation on 35 mm rail (according to EN 60715)
- 4 modular units (1 MU = 18 mm)
- IP20 protection degree (installed device)



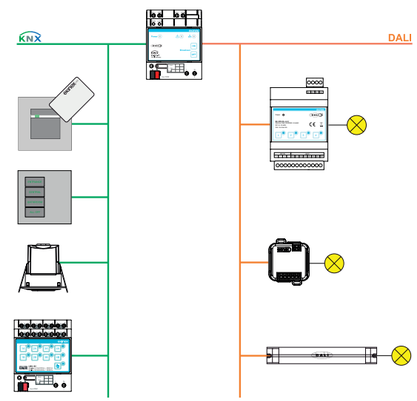

DALI functions

- Control of up to 64 DALI devices in up to 16 groups
- Up to 16 light Scenes
- Broadcast function
- Individual, group or central addressing
- Suitable for operation in emergency lighting systems
- Readout of DALI device status via KNX (e.g. brightness or device error)

Configuration

- Application program for ETS v.5 for the configuration of the KNX functions of the device
- PC application program for the configuration of the device and of DALI appliances

- Connections
- KNX port with standard connector
- Screw terminals (doubled) for the DALI bus
- Ethernet port (IEEE 802.3), RJ45 connector, category 5E cable (or higher)




**Technical data**

- Device power supply: 230 Vac
- Power supply output for the DALI bus: 12 VDC 250mA

**Products included**

The delivery includes the device and terminal blocks to connect to the KNX bus.

| Versions |
|---|
| **Code** |
| EK-BG1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**


# DALI Dimmer 12/48 Vdc

DALI DIMMERS

**Description**

The DALI-2 1-channel dimmer EK-GD2-DL-1-LV allows the brightness control of low voltage LED sources from 12 to 48Vdc by means of PWM dimming. DALI-2 bus input reference IEC 62386. The 2-channel DALI-2 dimmer EK-GD2-DL-2-LV allows the control of brightness and colour temperature of low-voltage LED sources from 12 to 48Vdc by means of PWM dimming. Dynamic white temperature control TW DALI DT8, 2 independent channels (2 DALI addresses) or a single DALI DT6 channel. Functions can be set by means of a selector switch. Bus input DALI-2 reference IEC 62386.

**Main features**

- Plastic housing
- Free-standing device for installation in junction boxes or walls
- Mounting on 35 mm profile rail (using special bracket code included)
- IP10 degree of protection (device installed)

**Functions**

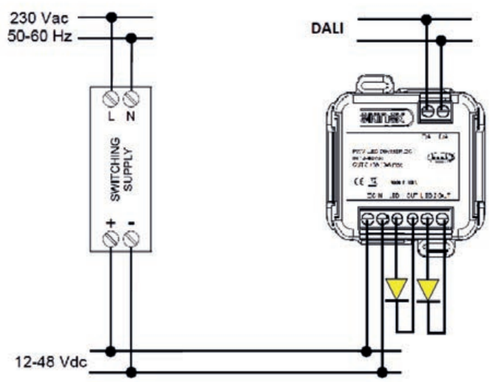
- Memory function settable by DALI
- Dimming up to complete switch-off (dim-to-dark)
- Minimum brightness level: 0.1%
- PWM modulation flicker free (2000 Hz)
- DALI-settable dimming curve: linear or logarithmic
- Switch-on and switch-off times settable by DALI
- Optimised output curve

**Connections**

- Screw terminals for DALI bus, control, power supply and LED source
- Max. connection length between dimmer-driver and control < 10 m

**Technical data**

- Device power supply: 10.8 Vdc (min)... 52.8 Vdc (max)
- Max. power: 240W
- Control: BUS DALI or local button




**Order information**

| Code | Channels | Packaging |
|---|---|---|
| EK-GD2-DL-1-LV | 1 | 1 pcs. |
| EK-GD2-DL-2-LV | 2 | |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

1 CHANNEL 2 CHANNELS






# DALI Dimmer 90-230V~ 50/60Hz

DALI DIMMERS

**Description**

The single-channel phase cut dimmer EK-GD2-DL-1-HV allows the brightness control of LED and halogen sources with a voltage of 90-230 Vac 50/60Hz for up to 220Watts. Input Bus DALI-2 reference IEC 62386 standard.

**Main features**

- Plastic housing
- Device for free installation in junction boxes or wall
- Mounting on 35 mm profile rail (by means of code holder included)
- IP10 degree of protection (device installed)

**Functions**

- Dimming up to complete switch-off (dim-to-dark)
- Minimum brightness level: 1%
- Optimised output curve

**Connections**

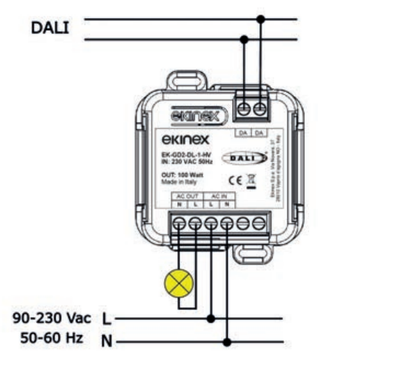
- Screw terminals for DALI bus, control, power supply and LED source

**Technical data**

- Single-channel dimmer with phase-cut output
- Supply range: 90-230 Vac 50/60Hz
- Maximum output power 230W
- Control inputs: DALI bus
- Maximum resistive load 1A.
- For electronic and/or LED loads the power is halved
- Conductor diameter 12-30 AWG (0.05-2.5 mmq)
- Storage temperature Min: -40°C Max: 60°C

**Note**

For electronic loads and/or electronic LEDs consider maximum power halved from nominal value.




**Order information**

| Code | Channels | Packaging |
|---|---|---|
| EK-GD2-DL-1-HV | 1 | 1 pcs. |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**


# DALI Dimmer 12/48Vdc 4 canali

DALI DIMMERS

**Description**

The 4-channel DALI-2 dimmer allows control of brightness, temperature and RGBW colour of low-voltage LED sources. Power supply from 12 to 48Vdc, PWM dimming. Compliant with the new FLICKER-FREE standard. Input Bus DALI-2 reference IEC 62386 standard.

**Main features**

- Plastic housing
- Device with 4 modular units
- IP20 degree of protection (device installed)

**Functions**

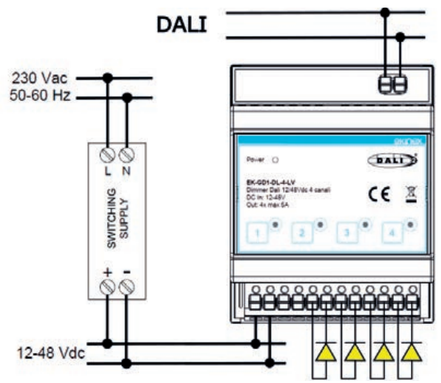
- Memory function
- Brightness adjustment until complete switch-off (dim-to-dark)
- Minimum brightness level: 0.1% (1% in push)
- PWM modulation with settable frequency (300/600/1200/2000Hz)
- Settable dimming curve: linear / quadratic / exponential
- Smooth switching on and off
- Optimised output curve

**Connections**

- Dip-switch for setting operating mode, frequency dimming connections
- Spring terminals for easy application

**Technical data**

- Device power supply: 10.8 Vdc (min)... 52.8 Vdc (max)
- Power consumption (at 40°C): 480 Watts total
- Dali absorption 1.53mA




**Order information**

| Code | Channels |
|---|---|
| EK-GD1-DL-4-LV | 4 |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**






# DALI Dimmer 90-230V~ 50/60Hz 4 canali

DALI DIMMERS

**Description**

The 4-channel DALI-2 dimmer allows brightness control of LED and halogen sources with voltage 90-230 Vac 50/60Hz for up to 200Watts on 4 channels each. Input Bus DALI-2 reference IEC 62386 standard.

**Main features**

- Plastic housing
- Device with 4 modular units
- Mounting on 35 mm profile rail (according to EN 60715)
- IP20 degree of protection (device installed)

**Functions**

- Memory function, fade time, minimum and maximum level settable via DALI software
- Dimming up to complete switch-off (dim-to-dark)
- Minimum brightness level: 0.1%
- Dimming curve: linear / logarithmic settable by DALI
- Electronic short-circuit and overload protection

**Connections**

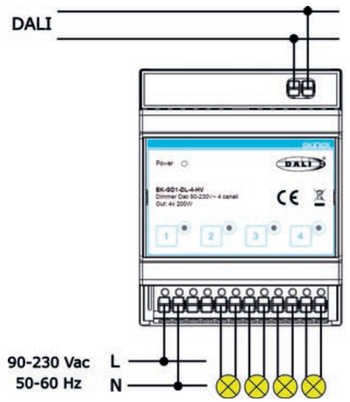
Spring terminals for easy application

**Technical data**

- 4-channel dimmer with phase cut output
- Power supply range: 90-230 Vac 50/60Hz
- Maximum power output 200W per channel
- For electronic loads and/or electronic LEDs the power is halved
- Conductor diameter 12-30 AWG (0.05-2.5 mmq)
- Storage temperature Min: -40°C Max: 60°C

**Note**

For electronic loads and/or electronic LEDs consider maximum power halved from nominal value.




**Order information**

| Code | Channels |
|---|---|
| EK-GD1-DL-4-HV | 4 |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

# DMX512

DIGITAL MULTIPLEX

DMX, acronym for Digital Multiplex, is a communication protocol for lighting control, developed as digital transmission method for data between controllers and controlled devices, including dimmers and related equipment. This standard is oriented to guarantee interoperability both for communication and mechanics among controllers from different manufacturers.

**Origin and evolution**

USITT (United States Institute of Theatre Technology) develops and promotes a wide range of technologic standards for theatric and show-business industry. Among those, in 1986 USITT has developed DMX512 as standard protocol for lighting control. In 1988 USITT has transferred the maintenance of the protocol to ESTA (Entertainment Services and Technology Association), a non-lucrative category association representing the entertainment industry of technology. In 2004, ANSI (American National Standards Institute) approved the DMX512 standard and subsequently other related rules. The standard is constantly reviewed and updated along with the progress of technology: the devices which are compliant to the 2008 release are marked with the DMX512-A notation in order to distinguish them from those developed according to the previous releases. Although developed and acknowledged in the US only, DMX512 is spread worldwide.

**Standard characteristics**

DMX512 is based on a serial asynchronous 8-bit protocol composed by an uncompressed byte stream which is produced by a standard universal asynchronous receiver-transmitter (UART); the '512' suffix refers to the maximum number of addresses configurable in a DMX field, called "DMX universe". If two DMX devices connected to a universe have the same address, they are controlled in parallel.

The transmission medium is normally (although not exclusively) a twin couple conductor, with each couple acting as data connection. If necessary, repeaters can be used in order to overcome the length limit of a DMX network. The connection of the devices is carried out with 5-pole XLR connectors or by physically connect the terminal blocks. The data on the primary connection is sent in packets up to 513 slots; the first slot is composed by a starting code which defines the information on the subsequent slots of the packet. Interoperability among standard compliant devices is mostly due to the use of the NULL START code by the transmitting devices.

**Fields of application**

DMX512 is not a general-purpose lighting standard: both device designers and standard users use DMX512 for a limited range of applications, mostly for entertainment industry when a central direction console needs to control the scenic lighting composed by a big number of lights and effects, and for the scenic illumination of historic buildings. Other standards are more suitable for other uses: for example, DMX512 cannot support a network designed to transmit sound and scenic actuators on the same transmission medium as lights.

**Rules reference**

ANSI E1.11 - Entertainment Technology USITT DMX512-A - Asynchronous Serial Digital Data Transmission Standard for Controlling Lighting Equipment and Accessories
ANSI E1.20 - Entertainment Technology RDM - Remote Device Management over USITT DMX512
ANSI E1.17 - Entertainment Technology ACN – Architecture for Control Networks (Multipurpose Network Control Protocol Suite)



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# Gateway DMX - KNX

GATEWAY

**Description**

The Ekinex® DMX - KNX Gateway performs a protocol conversion between a serial RS485 DMX and a KNX TP network. The device works as DMX master. The device integrates a KNX bus communication module and it is suitable for mounting on a 35 mm DIN rail; it requires an auxiliary power supply.

**Main features**

- Plastic casing
- Connection to bus line with KNX terminal block
- Installation on 35 mm rail (according to EN 60715)
- 4 modular units (1 MU = 18 mm)
- IP20 protection degree (installed device)
- Weight 145 g

**Technical data**

- Power supply: 8...24 Vac or 12...35 Vdc
- Absorption at 24 Vdc: 3,5 VA

**Communication**

KNX side

- KNX TP (Twisted Pair) communication port electrically isolated from power supply
- 1440-byte volatile support "KNX image" memory buffer

DMX side

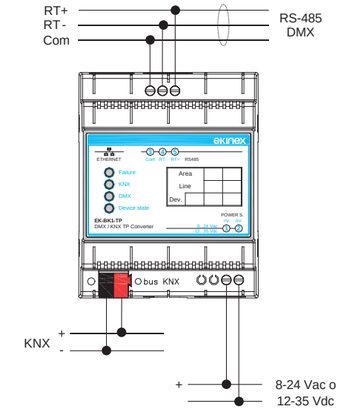
- RS485 serial communication port, electrically isolated from power supply, 120 ohm termination resistance pluggable by a 1-way microswitch
- DMX master communication
- Baud rate 250 kbaud
- Device addressing from 0 to 512
- 1-byte register writing on max 512 DMX devices

Configuration

- Ethernet communication port (IEEE 802.3), RJ45 connector, minimum cable category: 5E

**Products included**

The delivery includes the device and terminal blocks to connect to the KNX bus.




| Versions |
|---|
| **Code** |
| EK-BK1-TP |

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

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# Delégo

## SUPERVISION

Delégo is a system for the supervision and control of a KNX home automation system. Developed with web-oriented technologies, it has a uniform interface with high graphical impact on every platform, both desktop (PC) and mobile (Apple iOS and Android devices), with both local and remote connection. The system consists of a compact server (based on Linux operating system) to be installed in an electrical box: the device connects directly to the KNX bus via twisted pair; the connection to the home router is made via the Ethernet port on your local network (LAN). The user can interact with the system either by means of mobile devices, or with one or more fixed stations, by means of Delégo panel a touch-panel with elegant and minimal design, for wall installation, connected via Ethernet port on its local network (LAN).

The Delégo supervision system is characterized by a simple and at the same time extremely complete configuration, thanks to the direct import of the ETS project file. The functional definition of the various imported domotic objects and the correspondence with a rich and customizable set of controls (widgets) for the user, is also very straightforward.

The renewed interface is simple and intuitive and allows the user to interact with the home automation system of his smarthome through the use of different devices, with absolute uniformity of use. The app allows you to remotely control lights, climate, automatisms, audio/video equipment, shutters and more with a simple touch, from a single device and from anywhere in the building reached by the Wi-Fi network, or remotely via web connection.

# Graphic interface

SUPERVISION

The graphic interface can be used with both an app for tablets and smartphones (supported operating systems: Apple iOS and Android) and a desktop PC. All devices allow to interface with the previously configured server in order to control and display all functions of the automation system. The app, which is accessible from mobile devices (smartphone and tablets) is designed to logically show the areas or the services of the building. The supervision with a desktop PC also allows to display a synoptic: this way, it is possible to link all available services to the environment map according to their physical position.

**AREA VISUALIZATION**

The app presents itself with a list of configured areas, each one identified by an image loaded into the configurator during commissioning.
For each area set through the web configurator (for example: living room, bedroom, kitchen) the user can choose to switch the lights on or off, modify the thermostat settings and so on for all the available functions.
The navigation among the different configured areas is very simple, all it takes is a touch of the display.

**SERVICE VISUALIZATION**

The visualization for each area can be filtered thanks to a toolbar which easily allows to select the single available services:

- **Lighting;**
- **Climate control;**
- **Shades or motorized actuators;**
- **Scenes.**

The app can be extended with the functions available in the compatible video-surveillance, anti-intrusion and audio-video systems, all integrated in the Delégo server.



ekinex | SMART LIGHTING

# Lighting with Delégo

SUPERVISION

Delégo, through its visual interface available on fixed devices (PC and Mac), tablets and smartphones and dedicated touch-panels, allows easy and complete control of the lighting function. Each luminaire can be managed individually or be part of one or more groups or scenarios, making the system fully flexible to individual needs. The control possibilities:

**Switching on and off**
The On/Off function is associated, including status indication, with the switching on (On) and switching off (Off) of the controlled lamp. All this can be integrated into the scenarios and the scheduled time slots that the user wishes to define.

**Adjustment (dimming)**
With the dimmer function it is possible to regulate the brightness of the lamps, with an indication of their status. By dragging the pointer on the graphic component, you can adjust the light intensity from the lowest to the highest level.

**RGB (light colour)**
This function enables the management of RGB(W) coloured lights: It is possible to select the colour range and define interactively which colour the RGB light should take on, set the luminaire brightness level and store one or more favourite colours, which can be recalled at any time.

**Mixing RGB and RGBW colors**
In lighting, the mixing of primary colors red, green and blue is generally indicated with the acronym RGB. This function is particularly suitable to add a dynamic of chromatic variation to decorative lighting. When a white light is added, the acronym is RGBW.


Control directly the on/off lights' type by tapping on the status icon. Likewise, dimmed and RGB terminals' type, can be switched on and off directly from this menu.


Set the light intensity manually or select a preselected set-up. By accessing the schedule slider, it is possible to create/modify the time slots on a weekly basis, setting the desired dimming percentage for each slot.


Adjust the desired light colour by acting on the circular colour palette: the colours on the circumference of the palette have maximum saturation, whereas moving towards the centre they have lower levels of saturation. Set the brightness using the selector in the outer circular frame.



Each operation can be integrated into the scenarios and time schedules that the user wishes to define.

**Multi-plant and multi-user access**

With Delégo, it is possible to control the lighting and other functions of several buildings or residential units via the same app, thanks to multi-plant access. Delégo also allows access with an "administrator" or "user" profile (multi-user access) for each building or individual dwelling unit; several users can be configured in the server and, if necessary, different viewing and access rights for the various functions can be defined.

**Navigation**

Navigation with Delégo is very flexible and has two different modes:

- **by areas and rooms:** in this case, the building is represented logically with a subdivision into floors (areas) and rooms: the floor and the room of interest are accessed and from there the function is selected (lighting, climate, motors, scenarios, multimedia, etc.). For devices with a larger display area, such as tablets and PCs, a graphic map and synoptic representation is also available to show the actual location of the controls in the building;

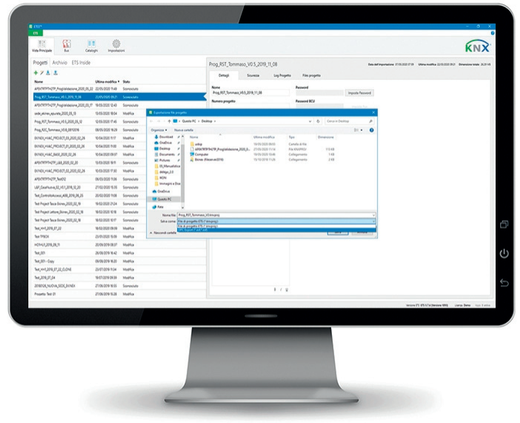
- **by functions:** using the toolbar located at the bottom of the graphical Home page, you can directly access all the controls of a specific function.

**Connection to the Ekinex system**

Normally the connection of the Delégo server to the Ekinex system is made via bus cable; if required, it is also possible to supervise the Ekinex system via the home or company network. A prerequisite for this type of connection is the presence of an IP router (EK-BC1-TP) on the Ekinex system and the appropriate communication configuration.

**Import from ETS (Engineering Tool Software)**

Easy import of ETS projects during the configuration activity via the Delégo server menu.



# Delégo server

SUPERVISION

**Description**

Web supervisor for home and building automation systems based on the KNX system. It allows to manage the functions present in the building through any type of device (PC/MAC, touch-PC, smartphone, tablet) as long as it is equipped with a web browser, both locally and remotely through internet. Customizable graphics suitable for any context and application, optimized for visualization on different fixed and mobile platforms. Simplified and fast configuration of KNX functions. Possibility to realize scenarios, time sequences, logics, conditions, operations mathematics, temporal planning through simple graphical tools and intuitive; reporting events and alarms on screen or via email. Configuration online or offiine via free downloadable PDF tool; does not require programming or HTML skills for supervision customization. Interfacing with other communication technologies and protocols by enabling additional modules.

**Main features**

- **Dimensions:** 90.5 x 62 x 36 mm
  2 DIN modules
- **Power supply** 12 - 24 VDC
  Plug-in terminal provided
- **Absorption** 240mA at 24V
- **Connections** LAN (RJ45)
  KNX (standard red-black connector)
  RS485 (terminal supplied)
  USB
- **LED** Power
  Service / Reset
- **Degree of protection** IP 20 (according to EN 60529)
- **Insulation class** II (according to EN 60335-1)
- **Operating temperature** +0°C ... +40°C
- **Storage temperature** 10°C ... +70°C

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**

**Order information - Licenses**

| Code | Composition | License version | KNX Addresses | Scenarios | Logics/Thresholds | Environments | Loads | Cameras |
|---|---|---|---|---|---|---|---|---|
| EK-DEL-SRV-BAS-TP | Delégo server | BASIC | 400 | 100 | 100 | Unlimited | Unlimited | Unlimited |
| EK-DEL-UPGR-BA | Upgrade License | ADVANCED | 1200 | 100 | 100 | Unlimited | Unlimited | Unlimited |
| EK-DEL-UPGR-BP | | PREMIUM | 2500 | 100 | 100 | Unlimited | Unlimited | Unlimited |
| EK-DEL-VOIP | Voucher | Voucher to enable the module IP video intercom | | | | | | |
| EK-DEL-INTRDET | Voucher | Voucher to enable the module Intrusion detection | | | | | | |
| EK-DEL-MODBUS | Voucher | Voucher to enable the module Modbus (> 30 registers) | | | | | | |



ekinex | SMART LIGHTING

# Delégo panel

SUPERVISION

**Descrizione**

The Delégo panel provides control of all building automation functions in combination with the Delégo Server EK-DEL-SRV-... It is available in two versions with a 5" and 8" capacitive display and is completed by a black frame.

**Main features**

- **Overall dimensions (mm)** 81 x 132 x 14 (5") - 224 x 149 x 16 (8")
- **Wall-mounting box (5")** 2M wall-mounting box (Ex: Bticino mod. 502E)
  Round box diameter 60 (Ex: Gewiss mod. 24232)
  3M wall-mounting box (e.g. BTicino mod. 503E) (*)
- **Wall-mounting box (8")** Bticino mod. 16204
- **Orientation** Portrait 5" or Landscape 8"
- **Power supply** Power Over Ethernet (POE)
- **Typology** LCD HD IPS 5" - LCD HD IPS 8"
- **Resolution** 1280 x 720
- **Colours** 16.7 million colours (true colour)
- **Brightness** 400 nits
- **Touch screen** Capacitive with multi-touch & gestures support
- **Speakers** High definition with built-in 2W amplifier
- **Microphone** Integrated high resolution with echo canceling
- **Gyroscope** Automatic orientation detection
- **Proximity** Integrated proximity detection
- **Brightness** Integrated ambient light sensor
- **Connectivity** LAN 100baseT
- **Certifications** CE / FCC class B / FCC part15 / ROHS / WEEE
- **Operating System** Android 6

Possibility of customization through aluminium frame (5" version only)

**Versions**

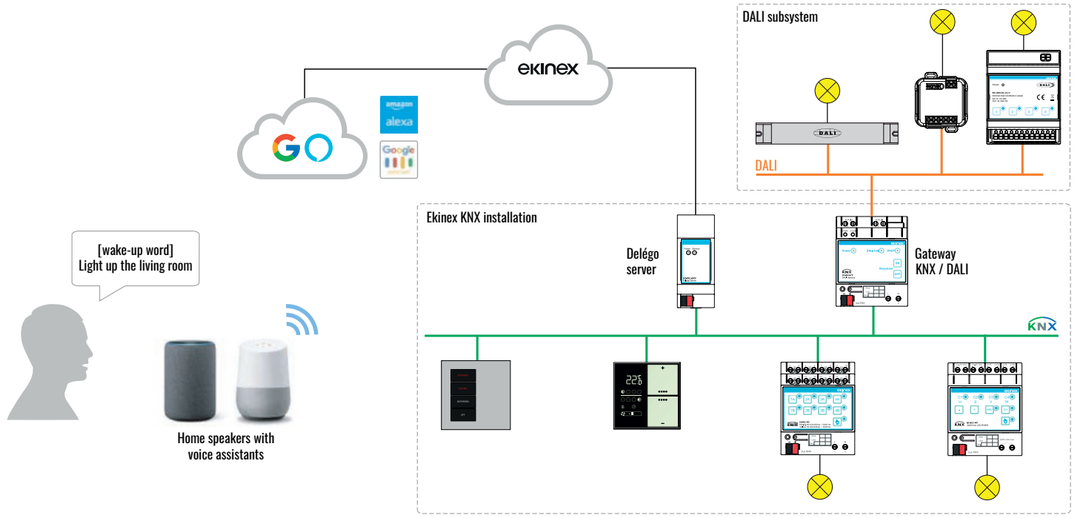
| Code | Composition |
|---|---|
| EK-DEL-5PAN | Delégo panel 5" - black panel |
| EK-DEL-8PAN | Delégo panel 8" - black panel |
| EK-DEL-5FR-... | Aluminium frame for 5" Delégo panel |

(*) Box 503 must be mounted with the same orientation as the device.

**Documentation**

For more information see the technical documentation, download from **www.ekinex.com**






**Voice control**

Combined with the Ekinex cloud service, Delégo allows control of the lighting system by voice commands from Amazon and Google home speakers equipped with voice assistants. Simple voice prompts allow you to perform commands and controls, query luminaire status and initiate complete scenarios:

- **"[wake-up word], light up living room";**
- **"[wake-up word], set living room light at 70%";**
- **"[wake-up word], increase living room light by 20%".**

Thanks to dedicated skills, you can bring the most commonly used functions, appropriately marked in Delégo, back into your voice assistant to be controlled by voice. Delégo server does not communicate directly with the voice assistants installed in different environments, but provides a cloud-to-cloud interaction with Amazon and Google voice services respectively. The voice command given and collected by the voice assistant is processed by Amazon or Google services, and passed to the Ekinex cloud, so that the command is forwarded to the Delégo server. A similar path is followed for information requests: in this case, the server informs the cloud with the updated status of the functions, and from there, the information is sent to the voice assistants, who synthesise it by voice.

**Logical functions**

Delégo's logic functions significantly expand the possibilities for controlling the lighting system, as a powerful graphical function block development environment is integrated into the configuration web server, allowing advanced logic to be created. A complete library of pre-packaged function blocks is provided, which can be dragged and dropped into the graphical environment and linked with variables and states acquired from the field via the KNX bus; the programs created are automatically translated into scripts in the Lua language and executed as independent tasks in the background on the server. The created programs are automatically translated into Lua language and executed as independent tasks in the background on the server. The tasks can react to events (change of state or value of KNX communication objects) or execute logics cyclically; the environment also has a simulator to test and fine-tune the created programs, before running them with the automation system. The library of functional blocks includes:

- **combinatorial logic blocks** (AND, OR, XOR, NOT);
- **scenario and sequence blocks;**
- **gates** (selectors, bistable T, RS and D elements, latch);
- **comparison operators;**
- **mathematical operators;**
- **counters;**
- **timers and triggers;**
- **astronomical clock** (calculation of solar altitude and azimuth of a site characterised by its geographical coordinates).

**Timetable programmes**

Delégo makes it possible to plan the behaviour of all the graphic components visible on the graphical pages Environments and Functions over time on a weekly basis: the server sends commands at the selected time, even when the building is not in use, completely automatically. In the desktop display environments and with the App for mobile devices, the user can create, edit and delete time programs to have complete control of the lighting system: a practical graphic component with coloured bands indicates the different intervention times. For each programme, the user can enter the desired status change events at the set time, which correspond to predefined characteristics of all visible graphic components. In the case of lighting, for example:

- **on/off lights:** switching on and off;
- **dimmed lights:** switching on, switching off and adjusting light intensity.

The event can be activated on the desired days of the week and periods of absence or holidays can be excluded; the time schedule can be temporarily suspended at any time.

# FIELDS OF APPLICATION

# Residential buildings

FIELDS OF APPLICATION

When a house is built or renewed, many different aspects need to be taken into consideration, starting with the shell, going through the technical plants up and ending with outdoor and indoor finishings. Often, the decisions about the lighting system are taken at the very end: this can be a mistake, because a poor illumination reflects on the other choices too, thus impacting the overall quality of the work done. Nowadays, smart lighting solutions are at hand and can significantly improve the quality of the time spent in the house itself. Therefore, it's important from the very beginning to consider the needs and the objectives that must be achieved by the lighting system: it's the light that guarantees the functionality of the environments and creates the right home atmosphere.

**Digital and smart**

Digitalization and spreading of networks in houses are also changing the way lighting is controlled. Meanwhile, final users are more and more aware of the benefic effects of a good illumination. Light is not just about seeing: the smart control puts people at the center of attention and aims at offering unprecedented levels of comfort and well-being. The control experience is enormously wide now: the starting point is always a manual wall command that today can also control intensity, tonality and color. Touch screens offer even more possibilities: thanks to the fact that building automations systems support wi-fi, it is possible not only to use mobile devices, but also integrate voice control through home speakers with vocal assistant, which are nowadays very common in a lot of houses.

**Dynamic, personal, multishaped**

With all the possibilities offered by Smart Lighting, it would be reductive to only switch lights on and off. For who spends a lot of time at home, dynamic control – allowed today by smart devices – can positively affect bio-rhythms, help stabilize the sleep/wake cycle, create energy and increase good mood: this allows to be more active during the day, improving at the same time the quality of night sleep.

Smart lighting is also paramount to give a personal touch to the house. In fact, every final user has their own needs. This means that both indoor and outdoor environments require a thorough analysis considering not only the destination of use but also the residents' desires.

In this case, smart also means versatile. Home environments need a basic component that basically sheds a uniform light, often coming from an indirect source, to easily orientate, and a direct component to highlight a specific area. Illuminating well defined zones is very useful to perform various activities under the correct light: for example reading, working, watching television, talking or eating. Today, we can also go beyond that: smart lighting generates well-being and serenity, welcomes, reassures and can donate to the house an extraordinary atmosphere.

**Scalability**
Scalability, a typical feature of Ekinex building control system, allows to start with a basic configuration, both in terms of functionalities and devices, which can be later expanded according to individual needs as well as economic possibilities. The investment is rapidly repaid and it's protected through time. Thanks to the native support and interoperability of KNX standard, the system is able to integrate also future functions not yet available during the first configuration.

# Application example

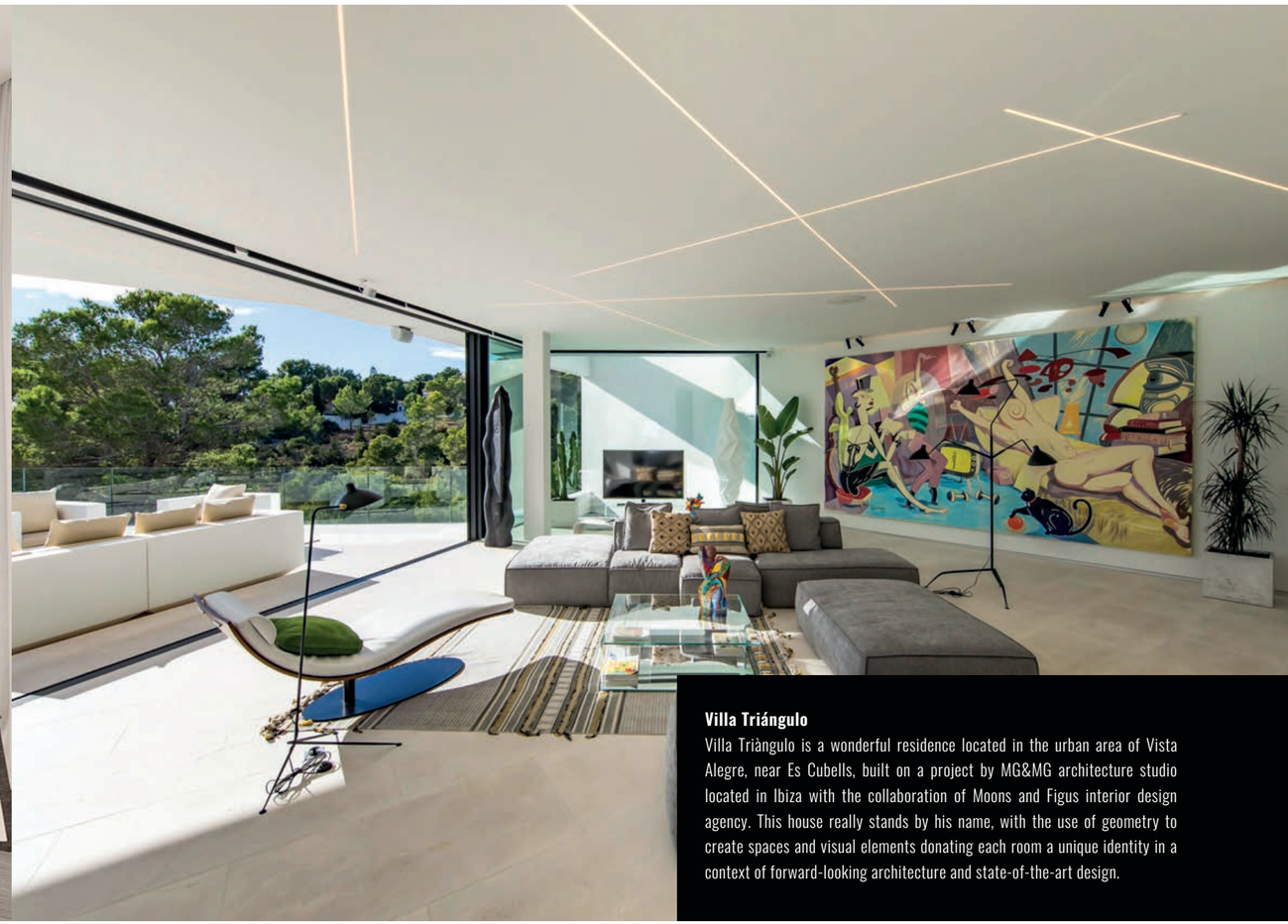
RESIDENTIAL

Lighting control and monitoring can be carried out by the Delégo supervision: the server EK-DEL-SRV **(A)** can be connected via IP to one or more Delégo touch panels **(B)** or via wi-fi to mobile devices such as smartphones **(3)** or tablets with the app installed. Delégo also allows to integrate voice commands through home speakers with vocal assistant **(4)**. Traditional manual commands can also be used in parallel, like for example a 20venti series pushbutton **(D)**; thanks to the proximity sensor, it is possible to detect the passage of people near the device, activating backlight or other bus functions.

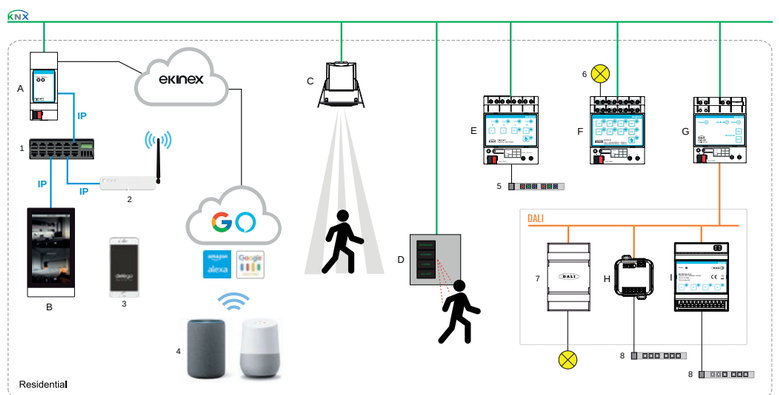
In order to perform a real presence detection, the sensor EK-DF2-TP **(C)** is used. Monochromatic and RGB leds strips can be controlled with the dimmer EK-GC1-TP **(E)**, undimmable lighting devices with actuator EK-FE1-TP **(F)**. Moreover, the gateway EK-BG1-TP **(G)** allows to control DALI dimmers **(H, I)** and other various devices equipped with DALI digital reactors **(7)**. Combination of commands and controls can be easily grouped in scenes and recalled with a single touch from the Delégo supervision.



ekinex | SMART LIGHTING



**Villa Triángulo**
Villa Triàngulo is a wonderful residence located in the urban area of Vista Alegre, near Es Cubells, built on a project by MG&MG architecture studio located in Ibiza with the collaboration of Moons and Figus interior design agency. This house really stands by his name, with the use of geometry to create spaces and visual elements donating each room a unique identity in a context of forward-looking architecture and state-of-the-art design.




**Ekinex devices**

- A) Delégo server EK-DEL-SRV-...
- B) Touch panel Delégo (5" o 8")
- C) Presence sensor EK-DF2-TP
- D) Pushbutton 20venti series
- E) LED dimmer RGBW EK-GC1-TP
- F) Binary output / shutter actuator EK-FE1-TP
- G) Gateway KNX-DALI EK-BG1-TP
- H) Dimmer DALI EK-GD1-DL-1-LV
- I) Dimmer DALI EK-GD1-DL-4-LV

**Other components**

- 1) Switch
- 2) Access point LAN Wi-Fi
- 3) Smartphone with Delégo supervision
- 4) Home speaker with vocal assistant
- 5) Led strip RGBW
- 6) Undimmable device
- 7) Reactor with DALI interface
- 8) Monochromatic led strip

# Accommodation facilities

FIELDS OF APPLICATION

No buildings have more diverse and complex needs than accommodation facilities, and this is due to a series of reasons related to their function and goals for which they are built and managed. Each facility has unique needs related to the kind of accommodation provided: for tourists, work or study; for shorter or longer periods; for local or international customers; for seasonality. Some of these structures are made by a single building, others by a group of buildings, some of them with different uses. Besides the zones for individual use, like rooms, there are environments open to the public like halls, bars, restaurants or conference halls. More and more structures are nowadays equipped with swimming pools, spas, fitness areas and wellness centers. It is not to be forgotten that these facilities are also working environments and comprehend offices, technical rooms and zones reserved for the staff.

**Lighting and accommodation facilities**

Lighting plays a very important role in accommodation facilities. Whether it is about a work trip, a meeting, a family vacation or other occasions, staying in a hotel should be a special experience and light is paramount in order to spend some pleasant time in an indoor environment.

Outdoor illumination plays an important role too: especially during evenings and nights, the hotel should be spotted even from a great distance, since guests usually live somewhere else and are not familiar with the premises. When approaching the hotel, the guest then needs to be safely guided to the entrance, which must be easily recognized. In case of history significant buildings, outdoor illumination allows to focus on the most relevant details of the building, thus creating an exclusive and immersive atmosphere; in some cases, a proper use of colored lights can create a very unique scenic effect.

**The role of control**

In all lighting situations, it is the design that determines the fundamental choices, such as shapes and dimensions of the devices, light sources, color temperatures, distribution between direct and indirect components and between basic and spot lightings. Without and performant and flexible control system, however, the result might not be as good as expected. Ekinex versatility, together with the growing possibilities of led sources, allows to manage illumination in a truly smart way and to realize tailor-made solutions in order to answer to all the complex and diverse needs of an accommodation facility, which by definition includes a wide range of environments different in size and destination of use. Automatic control, scene recalling, exploiting of natural light, dynamic lighting: a system such as Ekinex's allows to always have the right illumination at the right time and place, and with the proper intensity. The control of the lighting devices can be carried out directly, by means of Ekinex commands, sensors, outputs and dimming actuators, or indirectly by interfacing with a DALI system via the proper gateway.

**CasaFantini**

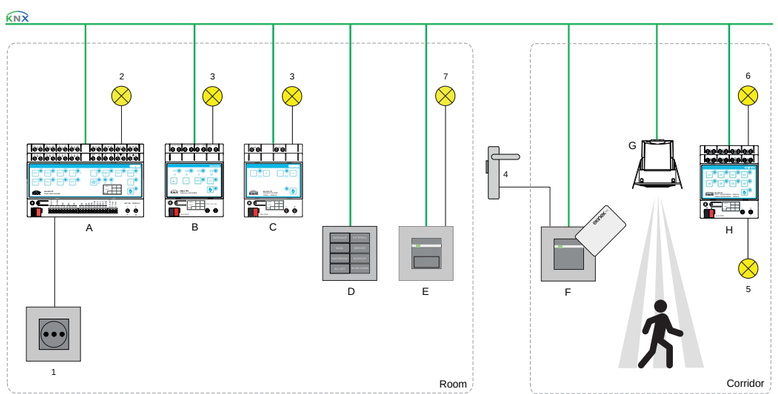
A kitchen, a living room and a bunch of rooms. CasaFantini is not just a hotel, it is a place where you can find your personal space and enjoy some time off to discover yourself again. This is the intuition of Piero Lissoni, known architect from Milano, which has given form to Daniela Fantini's idea and her strong connection with her native land, on the border between sky and water. Living in a place filled with history walking towards the future, refurbishing an old building made of rocks and wood by adding a new structure where the glass elements do not hide but highlight the architectural context, an example of complete fusion between history and state-of-the-art technology. An exclusive residence, but with the gates of the original building, well-known to the community, open to the families of Pella. Ekinex products are perfectly integrated in its environments, a contemporary design carved in precious materials.

**Ekinex devices**

A) Hotel module EK-HO1-TP
B) LED dimmer RGBW EK-GC1-TP
C) Universal dimmer EK-GA1-TP
D) Ekinex pushbutton (20venti Series)
E) Card holder EK-TH2-TP
F) Card reader EK-TR2-TP
G) Presence sensor EK-DF2-TP
H) Binary output EK-FE1-TP

**Other components**

1) Controlled switch (for example: floor lamp)
2) Undimmable devices
3) Dimmable devices
4) Door electrical lock
5) Basic lighting
6) General lighting
7) Courtesy light (entrance)








**Lighting requirements for public places**

| Type of zone, task or activity | $E_m$ [lx] | $UGR_L$ | $U_o$ | $R_a$ | Requisiti specifici |
|---|---|---|---|---|---|
| Reception desk, cashier, concierge | 300 | 22 | 0,60 | 80 | - |
| Kitchen | 500 | 22 | 0,60 | 80 | There should be a buffer zone between kitchen and restaurant |
| Restaurant, lunch room, banquet hall | - | - | - | 80 | The lighting should be designed to create a proper atmosphere |
| Self-service restaurants | 200 | 22 | 0,40 | 80 | - |
| Buffet | 300 | 22 | 0,60 | 80 | - |
| Conference rooms | 500 | 19 | 0,60 | 80 | The lights should be dimmable |
| Hallways | 100 | 25 | 0,40 | 80 | At nighttime, lower levels are acceptable |

$E_m$ [lx] = Average illumination maintained on the URGL reference plan
$UGR_L$ = Unified glare index, maximum limit
$U_o$ = Minimum uniformity of lighting on the reference surface
$R_a$ = Minimum color rendering

(source: UNI EN 12464-1:2011, Prospect 5.29)

The UNI EN 12464-1 normative (lights and illumination – illumination on workplaces) takes into account that places open to the public like hotels and restaurants are not meant for guests only, but they are also workplaces that need to meet a series of lighting requirements.

Many environments, each one with its own needs and destination of use: this is the reason of the complexity of the lighting function in accommodation facilities.

### Entrance, hall, reception

Entrance and hall are like the calling card of an accommodation facility; on one side, they determine the first impression on the customers-guests, on the other side they must guide them without hesitation towards the check-in/check-out zone. It is not to be neglected that the reception area is by all means a workstation; therefore, all horizontal surfaces need to be properly illuminated in order to avoid visual fatigue. A special attention must also go to the vertical surfaces, which must be made visible to highlight the presence of messages or useful information. The potential dimmer control in these areas allows to exploit the availability of natural light and to properly dim the light during nighttime.

### Restaurant and bar

In the zones open to the public the keywords are hospitality and pleasantness. If those environments are used all day long, it is possible to take into consideration a control which changes the white light tone: an intermediate tone in the morning and in the central hours of the day makes room to a warmer tone in the evening, in order to encourage relax and socialization.

### Application example: a hotel room

In the hallway, the basic illumination **(5)** is constantly on, in absence of natural light, to prevent the guests from being in the dark when exiting their room. The general illumination control **(6)** is automatic only when the sensor EK-DF2-TP **(G)** detects people in motion; the shutdown then happens with a configurable delay.
When the card reader EK-TR2-TP **(F)** enables the access to the room, the courtesy light at the entrance **(7)** is automatically switched on. The subsequent insertion of the card in the card holder EK-TH2-TP **(E)** can activate one or more lighting devices. The hotel module EK-HO1-TP **(A)** is equipped with relay outputs for the on/off command of lighting devices or derivation sockets **(1)** to connect mobile appliances such as a floor lamp or a bedside light. The control of all devices can be also carried out manually by one or more pushbuttons **(D)**. If lighting devices with dimmable sources are present, it is possible to use the universal dimmer EK-GA1-TP **(B)** or the RGBW LED dimmer EK-GC1-TP **(C)** depending on the light source.

In the buffet area and on the tables, it is important to obtain a high chromatic rendering in order not to alter the food color.

### Wellness and relax area, spa

We are talking about environments more and more widespread in those accommodation facilities that require a thorough study of lighting, thus contributing in a decisive way to the quality perception of the guest. In these cases, it is possible to fully exploit the potential of the modern technology: the control of light intensity, white tone and color helps reaching a perfect psychological and physical well-being, facilitates relax and donate exclusivity to the experience.

### Garage

In passage environments and parking lots, a proper illumination is paramount to make those areas absolutely safe for all guests of the accommodation facility, especially for first-time customers. Light helps people to easily walk through those spaces and facilitates the view of moving and parked vehicles, obstacles and potential dangers. Automatic control by means of presence sensors, in these cases, is the ideal solution: it avoids searching for the command point and makes it easier to move when holding a luggage.

### Bedroom and bathroom: peculiarities in planning illumination

- Conciliate functionality and aesthetics in the guest's personal space
- Consider all the different uses of the environment: work, relax, rest
- Properly model quantity and quality of lights
- Differentiate general (widespread) from highlight (localized) illumination
- Make automation discrete, leaving well-being and comfort in a central position
- Offer a simple and intuitive control, easily spotted
- Assure the immediate recognition of the action that needs to be done on the manual commands
- Contrast the claustrophobic sensation in absence of natural light (bathroom, entrance)
- Guarantee safety during nighttime

# Commercial

FIELDS OF APPLICATION

In recent years, digitalization has revolutionized the nature and organization of office work: today, also the realization of the technical plants of a building is changing in a profound way. It is the case of the illumination: a control based on the most recent digital technologies is able to offer a performance unthinkable in the past, and takes into account not only the visual, but also the emotional and the biological point of view. In many cases, lighting can express a new company culture, focusing on people and their needs, thus creating the best work conditions. It is not hard to understand the reasons: employees and their know-how represent the most important asset for a company and, at the same time, the most relevant cost. Those who invest in the health and well-being of their own employees will see the advantages in a surprisingly short time. In fact, a good illumination makes it easier to focus and reduces fatigue, thus increasing well-being and productivity. But it is not limited to that: it also respects the people's biological rhythm, it regulates according to the personal needs, inspires individual creativity: in short, it contributes to a high-quality environment.

**Illumination as a design tool**

In a world where most people in the developed countries are employed in activities based on information and knowledge, the office becomes a meeting point, a place to exchange information and ideas, of communication and creativity. A place evolving through time to keep track of the constant organizational changes. An optimal design of the workplace plays a key role, combining technical, economical and social aspects: illumination is at the center of this process. Light becomes the tool par excellence in designing environments, like furniture or acoustics: it should come as a surprise, because first of all light creates atmosphere.

**More possibilities**

Traditional lighting systems are characterized by a complete immobility and are not able to fulfill the requirements of commercial buildings: devices constantly switched on in unoccupied environments, lights fully on of off without intermediate situations, always the same color temperature of the light sources until their replacement, necessity to modify the wiring in case of space reconfiguration are only a few examples of that. Only flexible and smart systems can embrace the changes of both work organization and architectonic spaces, adapting through time with the dynamicity that traditional system cannot offer. Light designers can then exploit natural light, adapting in a creative way different tones of light and color, devising lighting scenes and so much more, while owners and managers can take advantage of a more efficient use of energy and offer the best possible conditions to the occupants.


**Murr Elektronik**
In the Italian headquarter of Murr Elektronik, German multinational company leader in connection and system engineering sectors, the lighting control with devices equipped with LED sources has been realized with the Ekinex system, both directly with KNX devices and through an interface to the DALI subsystem. All buildings in the “Energy Park” in Vimercate, where Murr headquarter is located, have obtained the LEED platinum sustainability certification.

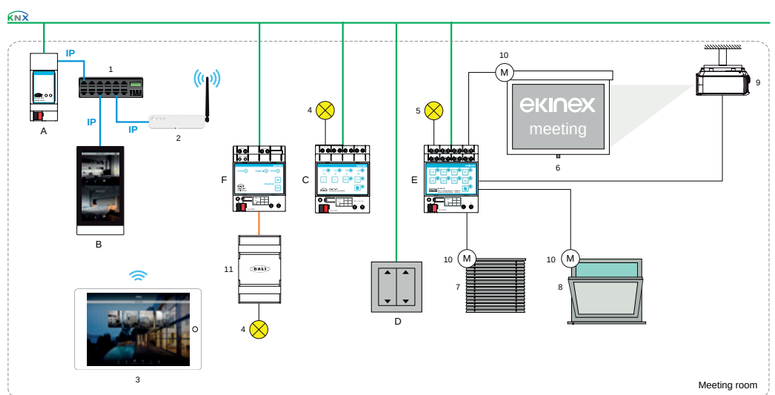
**Application example: the meeting room**

Meeting rooms are important parts of all offices and company headquarters; a single environment but many possibilities of use such as meetings, presentations, workshops, conferences or trainings. In meeting rooms, besides illumination there are other functions such as climate and shade control, as well as multimedia technologies; in these cases, flexibility and interoperability of the automation system become key factors. Coordinated control of multiple functions must be simple and immediately understandable also to people without technical knowledge, without relying on any staff intervention. In these environments, lighting control is particularly important to create an ideal atmosphere for each different situation of use; it must always be comfortable, but also customized based on the current activity. In fact, according to the different moments, it becomes necessary to make the attendees focus or relax, or direct the attention on the speaker or the screen.

Lighting control and monitoring can be carried out by the Delégo supervision; the server EK-DEL-SRV **(A)** can be connected to a Delégo touch panel **(B)** installed near the speaker’s pulpit and a mobile device such as a tablet **(3)**. Traditional manual commands can also be used in parallel, like for example a pushbutton (D) to control shades in proximity of doors and windows.
Undimmable lighting devices with actuator EK-FE1-TP **(5)** or devices equipped with dimmable LED sources **(4)** can be controlled through the RGBW LED dimmer EK-GC1-TP **(C)**. Moreover, the gateway EK-BG1-TP **(G)** allows to control DALI dimmers **(H, I)** and other various devices equipped with DALI digital reactors **(11)**. Combination of commands and controls can be easily grouped in scenes and recalled with a single touch from the Delégo supervision: this allows, for example, to coordinate the command of the lights **(4,5)**, the projector **(9)**, the screen **(6)** and the shades **(7)** in order for the natural light to be allowed in or shielded during the presentation.



ekinex | SMART LIGHTING




**Ekinex devices**

- A) Delégo server EK-DEL-SRV-...
- B) Touch panel Delégo (5” o 8”)
- C) LED dimmer RGBW EK-GC1-TP
- D) Ekinex pushbutton (Serie 71)
- E) Binary output / shutter actuator EK-FE1-TP
- F) Gateway KNX-DALI EK-BG1-TP

**Other components**

- 1) Switch
- 2) Access point LAN Wi-Fi
- 3) Tablet with Delégo supervision
- 4) Dimmable LED devices
- 5) Undimmable devices
- 6) Projector screen
- 7) Shades, shutters, curtains
- 8) Motorized window
- 9) Projector
- 10) Motorized actuator
- 11) DALI reactor

# INSIGHTS

# Energy efficiency

SOURCES, DEVICES, PLANTS

The search for the maximum energy efficiency is not just motivated by the necessity of cost reduction, but also by the duty of a more sustainable use of resource, in order to fight climate changes. In this picture, it is to be considered that illumination is responsible for about 15% of the total consumption of energy on a world scale (IEA), therefore its contribution is not neglectable.
The efficiency of a lighting system relies on many factors. Lately, a lot of progress has been made in optimizing the devices' optics, as well in the control electronics and in the transition towards high efficiency lighting sources. This has set the stage, nowadays, to have performant and efficient lighting devices. But if these devices are not controlled by a proper control system, the potential of energy saving is not fully exploited and the risk of spoiling part of the investment to have a truly efficient lighting system is very high.

### Energy efficiency of sources and devices

The efficiency of a light source is the ratio between the emitted light stream and the power dissipated by the source: it is measured in lumen per Watt (lm/W). Usually, it is specified whether this value also includes the dissipated power of the associated circuit: for example, the power supply or, generally speaking, all the components needed for the electric operation. The table below reports the efficiency values for the most common light sources, where some of them are present just as a useful reference to understand the progress that has been made in recent years, since they are no longer on the European market.

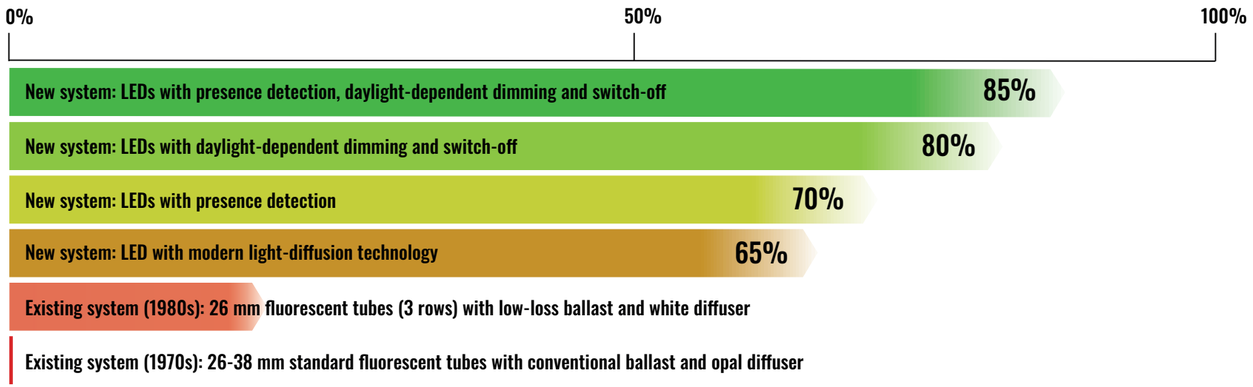
| Efficiency of light sources (examples) | [lm/W] |
|---|---|
| Filament lamp* | 10 ... 15 |
| Halogen lamp* | 15 ... 25 |
| Compact fluorescent lamp | 60 ... 100 |
| High pressure mercury vapor lamp | 40 ... 55 |
| High pressure sodium vapor lamp | 100 ... 150 |
| Metal halide lamp | 60 ... 100 |
| Low pressure sodium vapor LED lamp | 150 ... 200 |
| LED | 60 ... 140 ... > 200 |

*) Sources no longer on the European market

The efficiency of the lighting devices is the ratio between the light stream emitted by the device and the total absorbed power: it does not only take into account the power absorbed by the light source(s), but also the power absorbed by the associated circuits: it is measured in lumen per Watt (lm/W) as well.

### Energy efficiency of the plant

When the entire lighting plant is considered, there are other relevant elements to consider, because the control system becomes part of the equation. In this case, the intelligence integrated into all Ekinex devices can become a key factor to meet the overall energy efficiency goal. Like for other building functions, manual commands **(a)** are paramount because they allow single devices or groups to be switched on and off with a simple gesture and also display the status of unseen appliances, thanks to integrated LEDs, but they alone are not able to ensure a high energy efficiency. In some kinds of buildings and plants, adding a timer **(b)** can save some energy, thanks to the definition of operation time slots. With an automatic command depending on the presence or motion of people inside the detection field of related sensors **(c)**, the energy saving increases. If this command is paired with the exploitation of natural light in order to reduce the artificial light, the amount of energy saved can increase sensibly, thank to the detection of available daylight **(d)**.

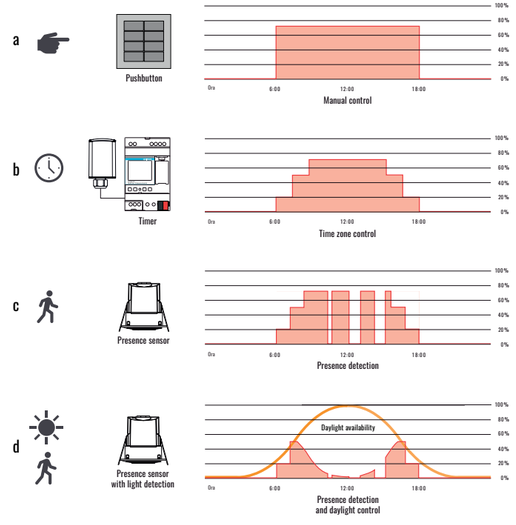



### Illumination energy performance

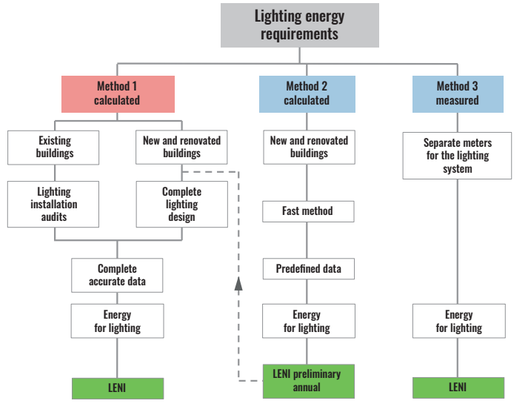
The UNI EN 15193-1 standard presents a way to evaluate the energy performance of the general lighting system in residential and non-residential buildings; it applies to newly constructed, existing or renewed buildings. Compared to its first 2008 edition, the revision published in 2017 also includes residential buildings. To evaluate the performance, the standard foresees three options:

- the "complete" method, when the lighting system was designed. This is an accurate calculation, being based on the design itself;
- the "rapid calculation" method, when the design has not been performed yet. It provides a rough estimate aimed at the preliminary design calculations, also using predetermined values written in the standard's appendix;
- the "direct measurement" method, which is based on the measured data of energy consumption and is also useful to verify the values obtained from calculations: it can be used only once the building has been commissioned and occupied. This method can also be linked to the building management system (BMS).

The importance and the actuality of the standard is due to the fact that it has been added to the EPB series of standards (Energy Performance Building), developed to harmonize at a European level the method used to evaluate the energy efficiency of a building, in order to achieve coherence, uniqueness and transparency.




Reduction in energy consumption for lighting depending on the type of control adopted




The three methods for evaluating the energy required for lighting (UNI EN 15193-1)

The LENI calculation considers the efficiency improvement offered by an advanced control system with three corrective coefficients in the formula:

- the constant illumination dependency factor $F_C$;
- the occupation dependency factor $F_O$;
- the daylight dependency factor $F_D$.

**LENI indicator**

In order to evaluate the energy performance of a building's lighting system, the UNI EN 15193-1 standard defines the LENI (Lighting Energy Numeric Indicator). LENI is calculated correlating the total annual energy (W) needed to light the whole building with the total floor area (A) of the building itself. If a only a sector is considered (such as a zone or an environment) the partial indicator $LENI_{sub}$ is used, which is obtained as follows:

$$LENI = \{F_C \bullet (Pj/1000) \bullet F_O\,[(t_D \cdot F_D) + t_N]\} + 1{,}0 + 1{,}5\ [\text{kWh/m}^2\ \text{year}]$$

where:
$P_j$ is the power density of the area [W/m²]
$t_D$ is the daylight period of the area [h]
$t_N$ is the period of absence of daylight of the area [h]

while 1,0 and 1,5 are constant numbers representing the standby energy density respectively for emergency lighting devices batteries and commands.

LENI is expressed in kWh/(m² anno), a measuring unit which nowadays is familiar even to non-experts, since it has been chosen to indicate the energy performance of all buildings; for example, it is used in the APE, an energy performance certificate which is mandatory in Italy in any real estate negotiation.

### The importance of advanced control

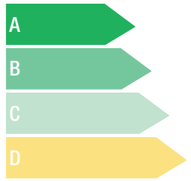
Besides the increase in efficiency brought by a control based on presence and/or daylight, the possibility of regulation gives another important advantage. The lighting system is indeed properly oversized ("Maintenance Factor") in order to account for the natural decay over time of sources and other factors reducing light efficiency, such as dust settling on the light surfaces or the reduced reflecting capacity of walls. Having an advanced control system allows to compensate during the plant lifecycle in order to guarantee the minimum level of illumination defined in the project. Thanks to the possibility of adjusting the emitted light intensity, oversizing the system does not cause neither more consumptions nor illumination levels far superior to those foreseen in the project.

### Standard references

UNI EN 15193-1 Building energy performance – Energy requirements for lighting – Part 1: Specifications, Module M9
CEN/TR 15193-2 Building energy performance – Energy requirements for lighting – Part 2: Explanation and justification of standard UNI EN 15193-1, module M9

# Energy efficiency

BUILDING




Those buildings constructed or renewed according to the most recent legal requirements offer a remarkable potential of increasing energy efficiency, but in order to fully embrace it, it is necessary to optimize the operation of all technical plants: this is what building automation system do. These systems feature advanced functions in order to regulate all technical plants present in the building itself such as heating, cooling, ventilation and air conditioning, hot water production, sun shades and lighting. According to standard UNI EN 15232, while designing it is possible to evaluate how much energy it is possible to save based on the various levels of automation systems that can be selected, thus placing the building in one of the four defined efficiency classes: from class A (the most efficient) to D (less efficient). The standard was first published back to 2007, but was later updated in 2012 and 2017; in 2017, the guide CEI 205-18 for the use of the standard was also published. Among the functions affecting the building energy performance there is also lighting, both singularly and in combination with sun shade control and HVAC functions (heating, cooling, ventilation). Lighting corresponds to category M9 in the modular EPB standard structure for the building technical plants. Efficiency classes refer to the fundamental concepts of BAC and TBM:

**BAC (Building Automation Control)**: is a set of products, software and technical services aimed at performing automatic adjustment, monitoring and optimization, human intervention and management, in order to allow all plants to achieve a high level of energy efficiency which is both safe and economic;
**TBM (Technical Building Management)**: is a process or a set of processes and services related to building management, operation and technical services, through the inter-relations between different disciplines and activities.

The definition of the four energy efficiency classes include:
**Class A:** corresponds to high performance BACs and TBM functions
**Class B:** corresponds to advanced BACs and some TBM specific functions
**Class C:** corresponds to standard BACs
**Class D:** corresponds to non-efficient BACs. Class D buildings should be retrofitted. New buildings should not be built using these systems.

**Minimum efficiency class**
The June 25th 2015 inter-ministerial decree ("Minimum requirements") requires, for non-residential buildings, a minimum automation level corresponding to energy efficiency Class B, in compliance with standard UNI EN 15232 for control, regulation and management of building technologies and thermal plants (BACS). In order to match Class B, at least the automation functions regarding lighting have to be implemented (see Table B in the following page); moreover, all devices must be able to communicate with building control system.

**Bac efficiency factors**
The BAC efficiency factor method ($f_{BAC}$) was added to the standard in order to quickly and easily estimate how much automation, regulation and management functions can affect the energy performance of a building. Because of this, this method is especially useful in the first stages of the building design, when a lot of detailed information are not yet available. To this end, the standard provides a table with the BAC efficiency factors, even separately for thermal ($f_{BAC,\ th}$) and electrical ($f_{BAC,\ el}$). consumptions. These are indexes based on a large number of simulations, obtained by comparing the annual consumptions of a reference environment for different levels of automation.
Generally speaking, in a building electrical energy is divided in uses related to lighting (L) and electrical auxiliaries (aux). Factors may vary depending on the building topology (residential or commercial) and destination of use (offices, schools, etc.). Factors for the reference efficiency class (C) are conventionally set to 1; moving towards higher energy efficiency classes (B and A) always leads to lower $f_{BAC}$ factor values and, consequently, to a better energy performance.

| Building | | BAC efficiency factors for lighting ($f_{BAC,\ el,\ L}$) | | | |
|---|---|---|---|---|---|
| | | D | C (reference) | B | A |
| | | Not efficient | Standard | Advanced | High energy efficiency |
| Non-residential | Offices | 1,1 | 1 | 0,85 | 0,72 |
| | Reading rooms | 1,1 | | 0,88 | 0,76 |
| | Schools | 1,1 | | 0,88 | 0,76 |
| | Hospitals | 1,2 | | 1 | 1 |
| | Hotels | 1,1 | | 0,88 | 0,76 |
| | Restaurants | 1,1 | | 1 | 1 |
| | Commercial | 1,1 | | 1 | 1 |
| Residential | Single houses | 1,08 | | 0,93 | 0,92 |
| | Apartments | | | | |
| | Other types | | | | |

In case of office environments, for example, moving from Class C to Class A corresponds to a 28% of energy saved, while for a residential building the same change in class means a 8% of energy saved.

**Normative and legislative references**
UNI EN 15232-1:2017 Energy performance of buildings - Part 1: Impact of automation, control and technical management of buildings
CEI 205-18:2017 Guide for the use of EN 15232 - Classification of automation systems of technical installations in buildings, identification of functional diagrams, estimation of the contributions of these systems to the reduction of energy consumption
Interministerial Decree of 26 June 2015 - Adaptation of national guidelines for the energy certification of buildings.



EKINEX | SMART LIGHTING

| | | | ENERGY EFFICIENCY CLASSES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residential | | | | Non-residential | | | |
| | | | D | C | B | A | D | C | B | A |
| **5** | **LIGHTING CONTROL** | | | | | | | | | |
| **5.1** | **Presence control (M9.5)** | | | | | | | | | |
| | **0** | Manual ON/OFF switch | | | | | | | | |
| | **1** | Manual ON/OFF switch + automatic gradual extinction | | | | | | | | |
| | **2** | Automatic detection (automatic switch ON) | | | | | | | | |
| | **3** | Automatic detection (manual switch ON) | | | | | | | | |
| **5.2** | **Daylight control** | | | | | | | | | |
| | **0** | Manual (centralized) | | | | | | | | |
| | **1** | Manual (for each environment/zone) | | | | | | | | |
| | **2** | Automatic switching | | | | | | | | |
| | **3** | Automatic dimming | | | | | | | | |
| **6** | **SUN SHADE CONTROL** | | | | | | | | | |
| **6.1** | **Sun shade control (M2.5/M2.8/M9-5)** | | | | | | | | | |
| | **0** | Completely manual | | | | | | | | |
| | **1** | Motorized with manual actuator | | | | | | | | |
| | **2** | Motorized with automatic actuator | | | | | | | | |
| | **3** | Combined light/shutter/HVAC control | | | | | | | | |

Source: UNI EN 15232-1 Building energy performance – Part 1: effects of building automation, control and technical management – Modules M10-4,5,6,7,8,9,10Extract regarding BAC functions for lighting control (point 5) and sun shade control (point 6).

# Building intelligence indicator (SRI)

LIGHTING IN SMART BUILDINGS


In recent years, the interest in building control and automation systems has increased considerably: now they are considered by guidelines and standards as a fundamental element to achieve the ambitious energy efficiency objectives of the European Union, while maintaining a high level of comfort in all situations.

### EPBD Directive

The energy efficiency and performance of buildings has been the focus of attention of planners, builders and end customers since the EPBD was published in 2002. When EU countries implemented the first version of the directive, numerical indicators were defined that allowed buildings to be classified according to their energy performance: in the energy performance certificate (APE) in use in Italy, for example, it is necessary to indicate the energy requirement in kilowatt-hours per square metre and year. In 2010 there was a first revision of the Directive and eight years later a second one was published. The revision published in 2018 introduces for the first time an 'intelligence of the building' indicator, which is an important factor in the deployment of smart technologies in buildings; for the world of home and building automation, this latest version is therefore particularly significant, as one of the objectives is to actively promote the widespread use of these systems.

### The SRI indicator objective

The main objective of the SRI indicator is to raise awareness of the benefits to be gained from the use of smart technologies and ITC (Information and Communication Technology) in buildings, motivating people to accelerate investment in these technologies as much as possible, particularly from an energy perspective.

### Intelligent readiness indicator

The indicator introduced by the Directive is very important to provide the most concise information to all stakeholders: planners, investors, end-users, managers and service providers. The indicator makes it possible to assess the ability of buildings (or individual building units) to adapt their operation to the needs of their occupants - optimising energy efficiency and overall performance - and to adapt their operation in response to signals from the grid in a way that maximises energy flexibility. The directive emphasises that 'the building intelligence readiness indicator should raise awareness among owners and occupants of the value of building automation and electronic monitoring of technical building systems, and should reassure occupants of the real savings of these new improved functionalities. The use of the system to assess the intelligence readiness of buildings should be optional for Member States."

### What does 'intelligent readiness' mean?

The three key-functions of 'intelligent readiness' of a building can be summarised as follows:

- ability to ensure the energy efficiency and operation of the building by adjusting its energy consumption (e.g. through the use of energy from renewable sources);
- ability to adapt operation to the needs of end-users, paying attention to ease of use, maintenance of comfortable climatic conditions and the ability to adequately inform about energy consumption;
- flexibility of overall electricity demand, including the ability to participate actively and passively in demand and to take account of grid conditions (in demand-response mode), e.g. through flexibility and load-shifting capabilities.

For end-users, owners and investors, the SRI indicator provides information on the services that the building provides; having reliable information on the intelligence of the building (and its potential improvements) can positively guide their investment decisions. For end users in particular, the transition to smarter buildings brings multiple benefits, including higher energy efficiency and better health, well-being and comfort. Facility managers are also affected by the indicator, as they will be called upon to manage smart systems and can influence investment decisions. There are also positive impacts for various service providers, including grid operators, manufacturers of technical building systems, design and engineering companies and many others. The indicator allows them to position their service offerings, providing a neutral and common framework in which the capacity of their intelligent services can be directly compared to that of their competitors, including the non-smart technology-based services of more traditional operators.

### Indicator definition

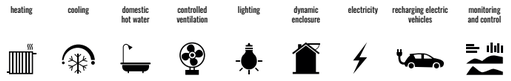
In its usual guiding function, the EU directive describes the priority objectives, but does not go into detail, which has to take into account a number of technical factors and requires specific expertise. To this end, the European Commission commissioned a study by a consortium including VITO, Waide Strategic Efficiency, Ecofys and OFFIS. The methodology developed is based on the assessment of the "intelligent services" that are present in a building. These services are realised through one or more intelligent technologies and are defined in a neutral way, e.g. as the "ability to control the power emitted by artificial lighting".





### Sectors

Nine domains ("domains") have been defined, such as heating, lighting or electric vehicle charging, to which an additional sector ("miscellaneous") can be added, which may include services that are not currently within the scope or are not mature enough to be included.




The sector includes a catalogue of services (54 for the expert approach, 27 for the simplified approach); 2 to 5 levels of functionality are defined for each service. A higher level of functionality reflects a more intelligent use of the service, which generally translates into an advantage for building users or the electricity grid compared to a lower level of functionality. The level of functionality implemented has a different impact on a number of factors: e.g. energy savings, improved comfort or flexibility towards the grid.

### Impact criteria

Seven distinct impact categories were considered in the study. In the final SRI indicator, the impact criteria may evolve further - for example towards a simpler set - to facilitate their use and use for reporting purposes. Addressing this multiplicity of sectors and impacts, an assessment method involving the assignment of weightings (weights) was proposed for the calculation of the indicator to reflect the contribution of the various sectors and impacts in determining an overall aggregate score.


The result of the evaluation can be presented in various ways*:

- as an overall score (e.g. a dimensionless number);
- as a relative score in percentage terms (e.g. indicating that a building reaches 65% of its intelligence potential);
- as a classification (e.g. a 'B' class label).

*) Source: 2017/SEB/R/1610684, study carried out under the authority of the European Commission (DG Energy).

### The role of lighting in sri indicator

When talkin The SRI indicator objective g about lighting functions, one can go from the simple execution of a "manual on/off switch" to more effective controls such as "automatic on/off switch based on daylight presence" or even "automatic dimming based on daylight presence". For example, in the table below you can find the impact points for each service:

- **Lighting-1:** presence-based control for indoor lighting;
- **Lighting-2:** artificial lighting power control based on daylight presence.

### References

May 30th 2018 UE directive 2018/844 of the European Parliament and Cabinet modifying directive 2010/31/UE about building energy performance and directive 2012/27/UE on energy efficiency

Final report on the technical support to the development of a smart readiness indicator for buildings, June 2020, European Commission.

| Code | Service | Service group: artificial lighting control | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Lighting-1a** | **Presence-based control for indoor lighting** | | | | | | | |
| | | **Impacts** | | | | | | |
| | **Functionality level** | Energy saving on the spot | Electrical net-work flexibility and storage | Comfort | Convenience | Well-being and health | Maintenance and fault prediction | Information to residents |
| Level 0 | On/off manual switch | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Level 1 | On/off manual switch + additional switching off signal | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| Level 2 | Automatic detection (automatic on / automatic or dimmed off) | 2 | 0 | 2 | 2 | 0 | 0 | 0 |
| Level 3 | Automatic detection (manual on / automatic or dimmed off) | 3 | 0 | 2 | 2 | 0 | 0 | 0 |

| Code | Service | Service group: Artificial lighting power control based on daylight presence | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Lighting-2** | **Artificial lighting power control based on daylight presence** | | | | | | | |
| | | **Impacts** | | | | | | |
| | **Functionality level** | Energy saving on the spot | Electrical net-work flexibility and storage | Comfort | Convenience | Well-being and health | Maintenance and fault prediction | Information to residents |
| Level 0 | Manual (centralized) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Level 1 | Manual (for each environment/zone) | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| Level 2 | Automatic switching | 2 | 0 | 1 | 1 | 1 | 0 | 0 |
| Level 3 | Automatic dimming | 3 | 0 | 2 | 2 | 2 | 0 | 0 |
| Level 4 | Automatic dimming, including scenario-based light control (dynamic and adaptive lighting scenarios are set during time intervals, e.g. in terms of illuminance level, correlated colour temperature and the possibility to change the light distribution within the space according to e.g. design, human needs, visual tasks) | 3 | 0 | 3 | 3 | 3 | 0 | 0 |

Source: "Support for setting up a Smart Readiness Indicator for buildings and related impact assessment" study, attachment D, add. June 2020, European Commission

# Sustainability

LIGHTING AND SUSTAINABILITY CERTIFICATION

The “sustainability” concept, very common nowadays in most sectors, was defined for the first time in the paper “Our common future” (a.k.a. Brundtland report) published in 1987 by the World Commission on Environment and Development (WCED). “Sustainable development” stands for a process capable of “fulfilling the needs of the current population without preventing future generation from fulfilling their own”. In this regard, sustainability must guarantee compatibility between development and environmental protection.

**Objective: sustainable development**

The “Sustainable Development Goals” (SDG) are a collection of seventeen global objectives set by United Nations (UN) in September 2015 to end poverty, protect the planet and assure prosperity for all by 2030. Buildings are great resource consumers, so they also need to be subject to the sustainability principles: according to the analysis of the World Green Building Council, green buildings significantly contribute to nine out of seventeen sustainability goals.


**Sustainability certifications**

To be able to state that a building is sustainable, being constructed according to the “green building” principles, acquires a true meaning only once that a third-party accredited institution can certificate that the building is compliant with a series of sustainability criteria. For this reason, over the years a number of certification patterns applied on a voluntary basis have been developed, such as LEED, BREEAM, DGNB System or Green Star. A building design subject to sustainability certification can earn point in different categories: for example, location and transport, site, hydraulic efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation and many others. Based on the number of credits earned, the design is awarded with one of evaluation levels foreseen by the certification pattern. From now on, the LEED (Leadership in Energy and Environmental Design) certification pattern, developed by USGBC (United States Green Building Council) is taken as reference, being the most widespread protocol worldwide.

**Sustainable lighting**

LEED defines the sustainability of the lighting function in two credit categories:

- sustainable sites (category SS - Sustainable Site) with reference to the reduction of light pollution;
- indoor environment quality (category EQ - Environmental Quality) with regard to the control of interior lighting and the use of daylight (‘daylighting’).

**Reducing light pollution**

This credit is worth 1 point and is part of the “Sustainable Sites” category which has been defined to ensure that the natural environment in which the building is set is valued and respected at every stage of the process: from design through construction to management. Credits in this category reward projects that recognise that a building cannot exist in isolation from the context in which it is constructed and that the environmental integrity of this context must be preserved. The aim of the credit is to increase visual access to the vault of heaven, improving visibility at night and reducing the negative impacts of urban development on animals and people. In order to limit the light pollution produced by the building and obtain the LEED credit, the Ekinex control and automation system can intervene on the lighting and shading functions in different ways:

- by controlling individual or grouped luminaires installed inside or outside the building according to the presence or movement of people;
- controlling internal and/or external shading devices (such as curtains, blinds or Venetian blinds) to limit light emission to the outside where it is essential to switch on the lighting in the evenings and at night;
- controlling electrochromic glass;
- grouping luminaires in appropriate scenarios;
- scheduling lighting ON/OFF with timers or astronomical clocks.



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**Sustainability and building automation with knx**

In order to earn a sustainability certification, a very important role is played by the building automation control systems. The study “KNX for LEED”, developed by Jesús Arias García and Miguel Ángel Jiménez Ibiricu and published in 2013, shows that using a KNX-based system like Ekinex can contribute to earn up to 54 credits out of 110, which is the maximum amount foreseen by the LEED certification pattern. The 80% of the credits contributed by KNX relates to three categories: energy and atmosphere, indoor environmental quality and hydraulic efficiency.


To achieve this credit, however, no additional devices are required over and above those already provided for a modern lighting and shading control system; the same Ekinex devices can be used in a multifunctional way to achieve different objectives over a twenty-four hour period such as:

- high visual comfort and maximum energy savings during the day;
- the limitation of light pollution at night.

**Indoor lighting**

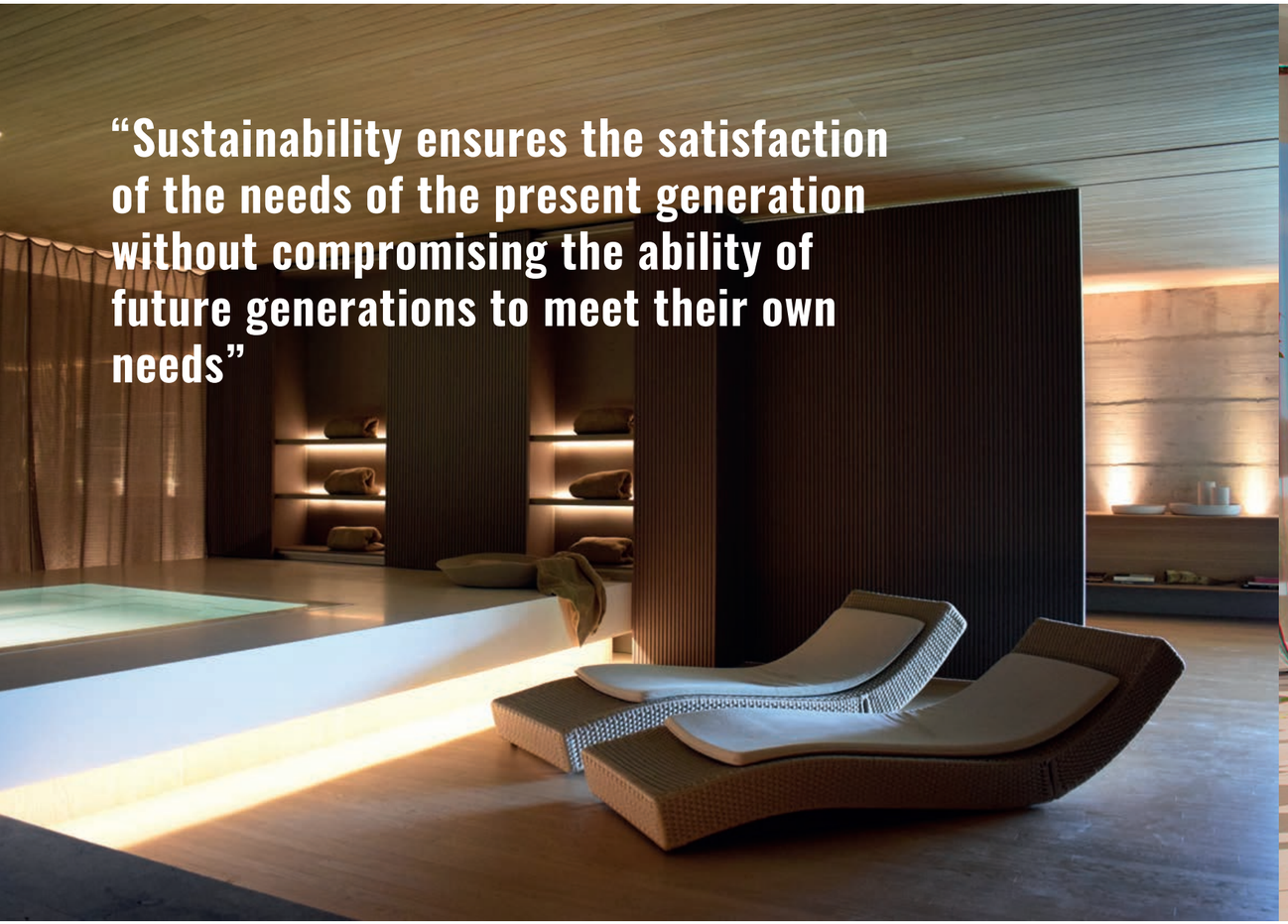
This credit can be worth 1 or 2 points and is part of the indoor Environmental Quality (EQ) category, which deals with design strategies and environmental factors – such as air quality, visual and acoustic comfort and control of the surrounding environment – positively influencing the way people work and live. The idea behind is to give the residents full control of the lighting function, guaranteeing a high light quality and increasing at the same time comfort, well-being and productivity.

In order to do that, at least one of the following options needs to be achieved:

- Lighting control;
- Light quality.

In lighting control, the plant needs to be prepared so that at least 90% of the occupied spaces is equipped with an individual control system allowing residents to adjust illumination based on their activity and personal preferences, with at least three lighting levels (or scenes): typically, these levels are off, on and intermediate. Intermediate level is a value between 30% and 70% of the maximum level, daylight excluded.
For all common areas with multiple residents, other requirements need to be met:

- To realize a multizone control system allowing residents to adjust lights based on the group’s needs and preferences, with at least three lighting levels (off, on and intermediate)
- To separately control the illumination of walls or screens used for presentations or projections
- To place the lighting manual commands in the same environment of the controlled equipments.



“Sustainability ensures the satisfaction of the needs of the present generation without compromising the ability of future generations to meet their own needs”

In the field of light quality, in order to gain one point, it is necessary to achieve at least four of a series of nine strategies concerning lighting design, specified by LEED. In the operating phase, these strategies must be supported by the control and automation system. To achieve the goals of full control exercised by occupants and high-quality light (gaining LEED credits), Ekinex control and automation system offers significant benefits:

- a wide range of solutions for individual command and control: multifunction bus pushbuttons with status feedback, wall-mounted touch displays, apps to allow control from mobile devices such as tablets and smartphones, voice control thanks to home assistants
- environmental sensors (presence sensors, movement sensors and brightness sensors), for manual/automatic control pairing;
- multi-channel actuators and dimmers for switching (on/off) and continuous control of light intensity (dimming) emitted by light sources, including the choice among different shades (warm light/cold light) and colors;
- scenes to coordinate the light with other technical building systems, such as HVAC and shading;
- integration of DALI as a subsystem specifically dedicated to lighting functions by a dedicated gateway.

**Natural light**

This credit is worth 1-3 points. As well as interior lighting, it belongs to the category Indoor Environmental Quality (EQ). The aim is to put in communication the building occupants with the outside, to strengthen the circadian rhythms and to reduce the use of artificial lighting, while allowing natural light penetration and outside view.



EKINEX | SMART LIGHTING


**LEED requirements for Retail and Healthcare**

The Retail requirements are to provide individual lighting controls for at least 90% of the individual occupant spaces in office and administrative areas.
In sales areas, requirements are to provide controls that can reduce the ambient light levels to a midlevel (30% to 70% of the maximum illumination level not including daylight contributions).
The Healthcare requirements are to provide individual lighting controls for at least 90% of individual occupant spaces in staff areas.
For at least 90% of patient positions, requirements are to provide lighting controls that are readily accessible from the patient’s bed.

Due to the presence of large glazed surfaces, LEED requirements for obtaining the credit require that glare control be provided by manual or automatic devices in all regularly occupied spaces, keeping manual adjustments a priority.

EKINEX control and automation system helps:

- integrating natural light only where and when actually needed by switching on/off or dimming the lighting fixtures;
- selectively turning off the light in rooms where human presence is not detected;
- simulating the natural course of daylight, in terms of intensity and color temperature, in rooms with little or no natural light;
- controlling shading devices (such as curtains, shutters and venetian blinds), in order to avoid glare.

The presence of EKINEX sensors, which are able to detect both human presence and brightness, allows to reduce the number of devices to be installed in a room to a minimum. The presence detection function can be used by other technical building systems, such as the heating, cooling and ventilation. In addition to what concerns lighting control and shading, there is a credit for quality views. It is worth 1-2 points and it belongs to the category Indoor Environmental Quality (EQ) and it requires a direct line of sight to the outdoors via vision glazing for 75% of all regularly occupied floor area.

**References**

LEED v4 for Building Design and Construction.
Any intellectual property and the rights referred to LEED rating system belong to USGBC.

# Comfort

LIGHTING AND ENVIRONMENTAL WELL-BEING CERTIFICATION

Indoor environmental quality and sustainability are often focused on infrastructures, such as buildings and their technical systems. However, nowadays particular attention is also paid to health and psychophysical well-being that people experience when they are indoors. The guiding principle is that the building represents more than a simple container. It is a place where most of life takes place for family reasons, for work, for study, for leisure, for the supply of goods and services and much more.
In this sense, it became clear that indoor living conditions have a significant impact on health. If environments are designed with environmental well-being in mind, people thrive: they are more productive, calm and have a positive attitude. For a few years, the certifications centered on the building plant system have been accompanied by schemes aimed at environmental well-being, with characteristics that are no longer only of a strictly technical nature, but also and above all biological and emotional ones.

**WELL protocol**

WELL is currently the main reference for comfort certification referred to buildings, interior spaces and entire communities. It can be considered a real global standard for its diffusion in dozens of countries. WELL focuses on the ways in which buildings and in general everything contained therein can improve comfort, guide towards better choices and improve people's health and well-being. Released in 2014, WELL was developed by the International WELL Building Institute™ and it integrates scientific and medical research and literature on environmental health, behavioral factors, health outcomes and demographic risk factors. In its definition, WELL refers to existing standards and to the best practice guidelines established by governmental and professional organizations. WELL is designed to be applied in a coordinated way with the main sustainability certification schemes.

**Concepts, features, parts**

With regard to comfort building certification, every project has to be developed in ten "concepts": air, water, light, nourishment, movement, thermal comfort, sound, materials, mind and community.

Each concept is comprised of features with distinct health intents and each feature can be composed of one or more "parts". Features are either preconditions or optimizations:

- preconditions define the fundamental components of a project and they are mandatory for certification;
- optimizations are optional pathways for projects and their achievement allows to obtain valid points for the overall score which can reach a maximum of 110 points.

**"Light" concept**

Light is one of the ten WELL concepts: it promotes exposure to light and aims to create lighting environments that are optimal not only for visual but also for mental and biological health. In addition to facilitating vision, light affects the human body in non-visual ways. Humans have internal clocks that synchronize physiological functions on a roughly 24-hour cycle called the circadian rhythm. In doing this, the body reacts to a series of external stimuli that align the physiological functions: light is the most important of these stimuli, always keeping the body's internal clock synchronized.

**The EML metric**

WELL adopts an alternative metric to measure the biological effects of light on humans, called "EML" (from Equivalent Melanopic Lux). Unlike the traditional measurement in lux, the EML index takes as its reference the ipRGC photoreceptors, which are the intrinsically photosensitive retinal ganglion cells, non-image forming. The reason is in the particular nature of these photoreceptors: through them, in fact, lights of high frequency and intensity promote alertness, while the lack of this stimulus signals the body to reduce energy expenditure and prepare for rest. During Performance Verification, EML is measured on the vertical plane at eye level of the occupant.

**Circadian lighting**

Recognizing that the circadian rhythm is of extreme importance for the human being, WELL defines its synchronization in features 54 and P3.

<u>54 Feature: Circadian lighting design</u>

This WELL feature is divided into four parts and focuses on health aspects, setting a minimum threshold for the intensity of light. Part 1 concerns the light intensity for work areas and at least one of the following requirements must be met:

- at least 200 equivalent melanopic lux (EML)* is present at 75% or more of workstations. This level of light can include daylight and is present at least between 9 am and 1 pm every day of the year;
- for all workstations, artificial lighting provides a constant illuminance of at least 150 EML*.





**WELL Building Standard - Features and Parts of "Light" concept (WELL, Q4 – 2020 version)**

| Nr. | Feature | Parts |
|---|---|---|
| 53 | Visual lighting design | 1: Visual Acuity for Focus, 2: Brightness Management Strategies: 3: Commercial Kitchen Lighting: 4: Visual Acuity in Living Environments: 5: Visual Acuity for Learning: 6: Visual Acuity for Dining |
| 54 | Circadian lighting design | 1: Melanopic Light Intensity for Work Areas: 2: Melanopic Light Intensity in Living Environments: 3: Melanopic Light Intensity in Breakrooms: 4: Melanopic Light Intensity in Learning Areas |
| 55 | Electric light glare control | 1: Lamp Shielding: 2: Glare Minimization |
| 56 | Solar glare control | 1: View Window Shading: 2: Daylight Management |
| 57 | Low-glare workstation design | 1: Glare Avoidance |
| 58 | Color quality | 1: Color Rendering Index |
| 59 | Surface design | 1: Working and Learning Area Surface Reflectivity: 2: Bedroom Wall and Ceiling Lightness: 3: Living Space Wall and Ceiling Lightness |
| 60 | Automated shading and dimming | 1: Automated Sunlight Control: 2: Responsive Light Control |
| 61 | Right to light (View out) | 1: Lease Depth: 2: Window Access |
| 62 | Daylight modeling | 1: Healthy Sunlight Exposure |
| 63 | Daylight fenestration | 1: Window Sizes for Working and Learning Spaces: 2: Window Transmittance in Working and Learning Areas: 3: Uniform Color Transmittance: 4: Window Sizes for Living Spaces |
| P2 | Light at night | 1: Window Light Elimination: 2: Electric Light Elimination: 3: Safe Nighttime Navigation Lighting |
| P3 | Circadian emulation | 1: Circadian Lighting: 2: Dawn Simulation |

Part 2 concerns light intensity in living environments and it requires that in all bedrooms, bathrooms, and rooms with windows, one or more fixtures provide the following:

- during the day, 200 or more EML as measured facing the wall in the center of the room. The lights may be dimmed in the presence of daylight, but are able to independently achieve these levels;
- evening lights provide not more than 50 EML as measured 0.76 m above the finished floor.

Part 3 concerns the light intensity in breakrooms, where employees spend their breaks, which must provide a constant average of at least 250 EML*. The lights may be dimmed in the presence of daylight, but are able to independently achieve these levels.

Part 4 concerns light intensity in learning areas, in which:

- for early education, elementary, middle and high schools and adult education for students primarily under 25 years of age, at least 125 EML* is present at 75% or more of desks. This light level must be present for at least 4 hours per day for every day of the year;
- ambient lights must provide maintained illuminance* of EML greater than or equal to the lux recommendations indicated in Table 3 of IES-ANSI RP-3-13 Standard, following the age group category most appropriate for the population serviced by the school.

<u>P3 Feature: Circadian emulation</u>

This WELL feature includes two parts expressly dedicated to residential buildings and aims to provide light which has intensity and spectrum similar to that of the daily changes of sunlight. In part 1 (circadian lighting) it is required that in all bedrooms, bathrooms, and residential rooms with windows, the lighting system:

- allows users to set a "bed time" and a "wake time".
- provides a maintained average of at least 250 EML, if lights are turned on in the interval spanning "wake time" and 2 hours before "bed time";
- provides a maintained average of 50 EML or less, if lights are turned on in the interval spanning 2 hours before "bed time" and "wake time".

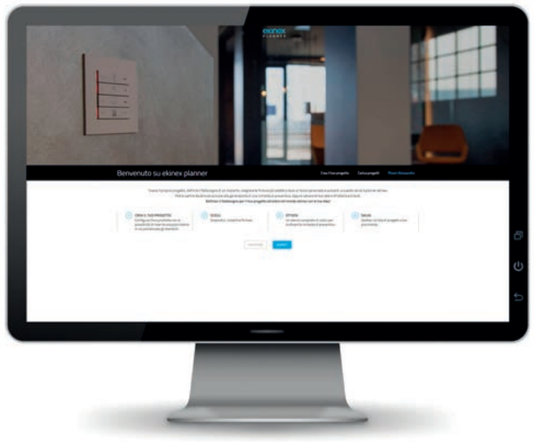
In part 2 (dawn simulation), it is required that in all bedrooms, the lighting system:

- allows users to set a "wake time";
- gradually increases light from 0 to at least 250 EML over the course of 15 minutes or longer.

*) As measured on the vertical plane facing forward at surfaces 1.2 m [4 ft] above finished floor.

**Lighting and shading coordination**

WELL also requires glare control with the aim of minimizing visual discomfort that can be caused by both daylight and artificial light. For shielding from solar radiation, the use of window shading devices is required in rooms that are regularly occupied. The control can be done manually by the users or automatically by the building automation system.The fulfillment of the requirement depends on the use of smart automation, based on openness and interoperability, which provides for coordination between the lighting and shading functions of the environments. In fact, in the presence of sufficient natural light, it is sensible to turn off or dim the artificial lighting for energy and environmental considerations.




# Planner

TOOLS

**Description**
PLANNER is a configuration software made available on its website from Ekinex®. This tool, from the easy to use and driven, allows the end user and the designer to identify products that are perfectly suited to the needs of the project. With PLANNER you can also choose and test different combinations of buttons and civil series finishes to get closer as possible to the desired result. PLANNER allows you to fill out a simple list of devices to be used or they can be placed in a preview of a user-uploaded file, in order to recreate the actual conditions of the future installation. Finally, the software allows you to create a database of your projects with the ability to retrieve and modify projects at all times. When you finish using PLANNER allows you the chance to ask Ekinex® the best trade offer to the list of materials in your project.

**Use in 4 steps**
1) From the Ekinex® site, reach PLANNER by following this link: **planner.ekinex.com/en/**. At this point you can decide whether or not to insert a map (jpeg, gif, png, pdf image format); in any case you will be asked to give a name to your project, so that you can identify it later.

2) PLANNER guides you on the page where you can find a list of products and create a list of devices to be installed in the system. All the wall-mount devices and DIN-Rail mount modules can be placed on the image of the plan if previously inserted.

3) PLANNER gives you the ability to export and manage the list of chosen devices, to be able to control the features chosen.

4) By clicking on “save changes”, you will save the positions and changes made. You can also print the project and export the list of products in pdf format.

**Offer request**
Planner is a great business tool. You can request this offer and conditions for devices of your project directly in the “PROJECT CONFIGURATION” by clicking on “request a quotation”. The network of Ekinex® will contact you and will answer quickly and with the best offer for your project.

For further information contact: **sales@ekinex.com**



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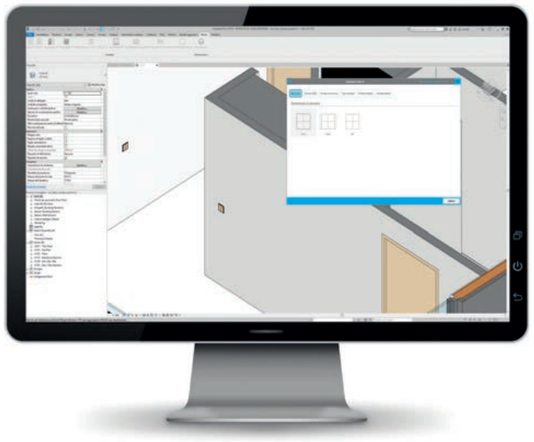

# BIM

TOOLS

**Description**
BIM stands for Building Information Modeling and indicates a methodology aimed at optimizing and managing the design and construction of a building.

The BIM is therefore used mainly in the construction sector to promote a working method that involves the generation of a building model that can also manage the data of the entire life cycle through multi-dimensional virtual models generated digitally by means of specific software.

A BIM can contain any information about the building and its parts. The most commonly collected information is geometry, technical and mechanical data, electrical data, material specifications, financial, energy and environmental assessments.

**What are the benefits of bim in home automation and construction?**
The role of BIM in the construction industry is to support collaboration between the different actors involved (designers, builders, architects, clients) and integrate the design and simulation processes into a single model that can manage all phases of the life cycle of the building.

The main benefit of adopting the BIM methodology is the 3D representation during the design phase, which speeds up processes, reduces delivery times and allows errors and inaccuracies to be detected first. The greater efficiency in sharing information and a more precise control over all the processes involved, also make it possible to contain costs and schedule in advance maintenance operations.

The fields of BIM related to technology allow the management of complex projects such as home automation and the willingness of the customer to control the building. During the design phase it is already possible to simulate the integration of the different systems and the control of the possible scenarios in a 3D environment, giving all the professionals involved the opportunity to work together without data or process conflicts.

**Software**
The BIM library is available in Autodesk Revit® format, by installing our **Ekinex BIM Content Creator software**, a real advanced configurator of the product range that will be enriched with future updates and expansions.

For further information:
**ekinex.com/en/bim/library-wall-mount.html**

**Smart Lighting brochure - July 2022**
The technical information in this catalogue is for guidance only. The company reserves the right to make changes without prior notice.

The diagrams show examples of the use of Ekinex KNX devices. The diagrams use simplified symbols and only show the relevant system components for control and automation with Ekinex devices. Qualified professionals should be consulted for the planning, installation and commissioning of the Ekinex system.

Refer to the relevant technical documentation for the installation, connection and commissioning of Ekinex devices.

For availability of Ekinex products in different markets, please contact the sales department (commerciale@ekinex.com).

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