

# LED Lighting

**Technical Guide 2019**

How to Control and Protect LED Lighting Circuits?

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Life Is On

**Schneider**  
Electric

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As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.

## Purpose of the document

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This document contains all the knowledge of Schneider Electric around LED Lighting technology. It is built for our professional customers to be used as a reference document, to be shared with newcomers on your field, to be spread around your engineering teams in order to help you raise the optimum architectures. Our engineers are working every day to provide smart solutions to a constantly evolving world.

For other lighting technology such as incandescent, fluorescent, please consult our Lighting Technical Guide 2019:

How to Control and Protect Lighting Circuits? - [A9GT15E](#)

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solution



# 1. Energy challenges for our planet



Energy consumption and energy costs have been on the rise during the last 25 years.

- World energy consumption has risen 45 % since 1980, and it is predicted that by the year 2100, global energy consumption will reach 27.3 gigatons more than three times the current energy consumption level.
- At minimum, energy consumption, including electricity and other sources, will double in the next 40 years. Electricity will double by 2030. At the same time, climate specialists tell us we should divide emissions by 2 to avoid serious climatic changes.
- There are not enough readily available energy sources to meet the expected growth in demand and new sources and infrastructure will not be ready in time.
- Fossil fuels cause pollution, which is damaging to the health of people, plants and animals, also lead to climate change that has the potential to disrupt weather patterns, bringing droughts and floods to new areas with consequential hardship for inhabitants.

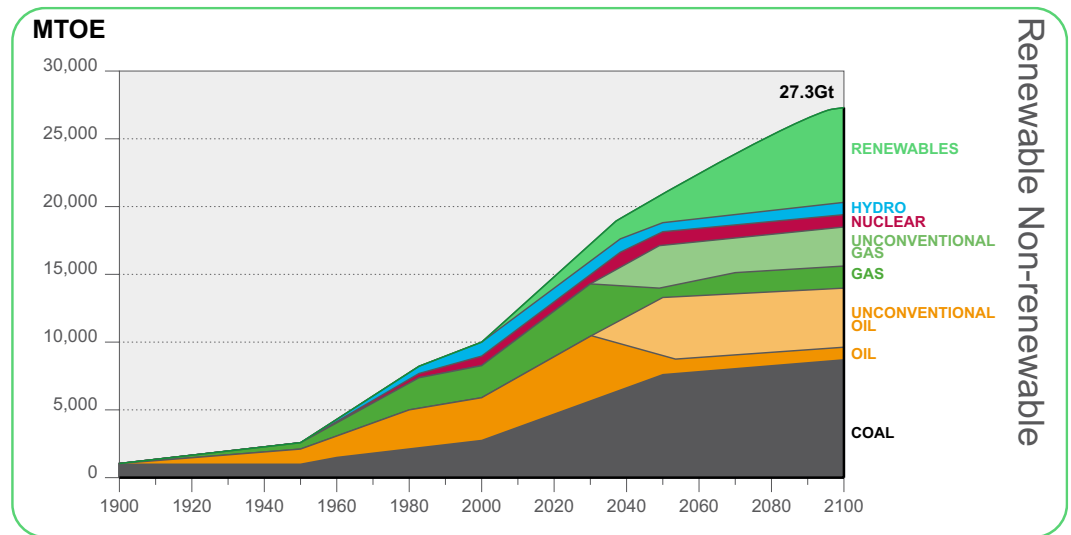


Figure 1. Global Primary Energy Consumption

We can't allow energy demand to continue to rise unchecked – the impact on our security, costs and planet don't allow that.

The world needs to do more, with less.

We can't wait for new technologies to clean up generation and meet increased demand, and we don't have to, because energy efficiency solutions are available now, and they work!





# 1. Energy challenges for our planet

So, if the energy efficiency is the answer, where should we focus?



The biggest part of our energy consumption is where we live, work, shop and study. Energy efficiency is not a onetime project; it's a continuous cycle. And that's good, because it means we can approach the problem gradually and phase our actions according to our available budget. Four simple steps to an energy efficient program are:

- Audit and measure by energy audits and energy meters
- Fix the basics by low consumption devices and equipment, power quality and reliability issues
- Automate by building, motor, lighting and home control systems
- Monitor and improve by energy management software and remote monitoring systems

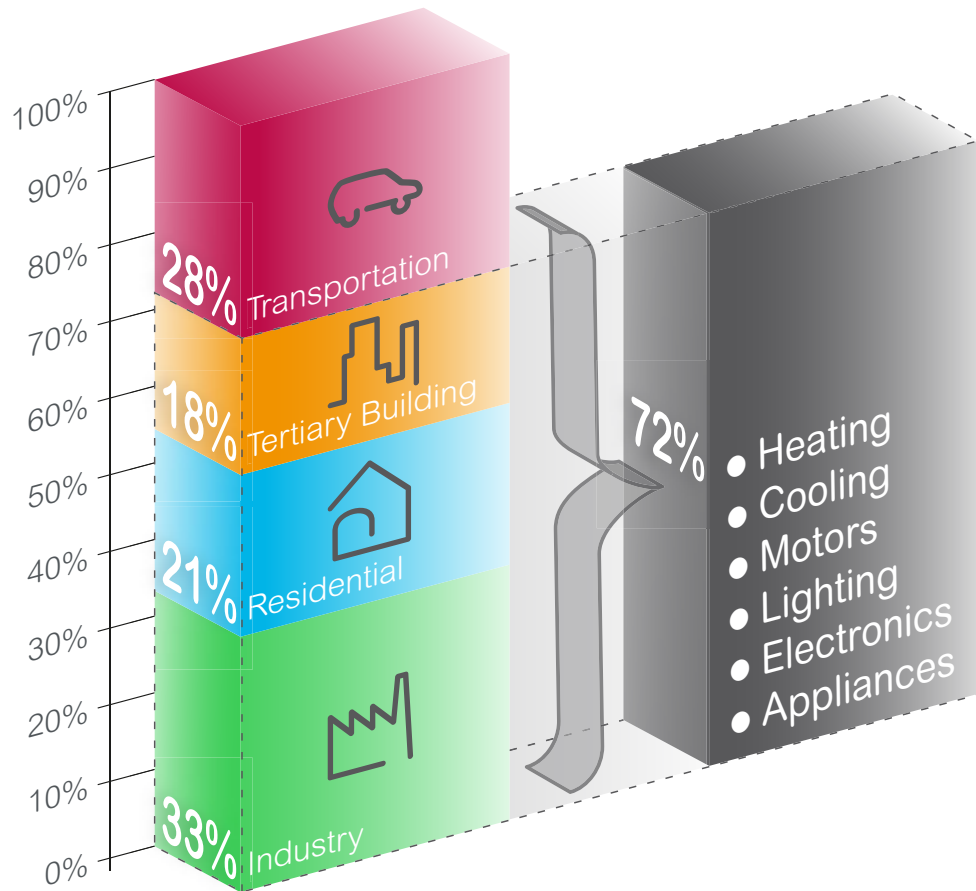


Figure 2. Energy use split



Figure 3. Energy Home-to-Power Plant ratio



Schneider Electric accepted these challenges and we can help you.



## 2. How to take action

A

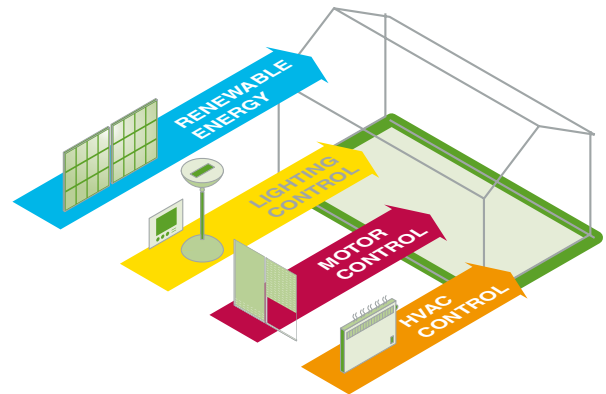
### Think, act and save

The challenge is about reducing energy consumption, energy costs and pollutant emissions. Also, saving energy in all sectors. Schneider Electric's mission is to be the global specialist in energy management. We do this by:

- Delivering active energy efficiency products and comprehensive energy management solutions
- As energy manager, we offer metering, monitoring, control solutions and cost optimization services
- As energy expert, we offer consultative services, technical and behavioral energy action plans and implementation services

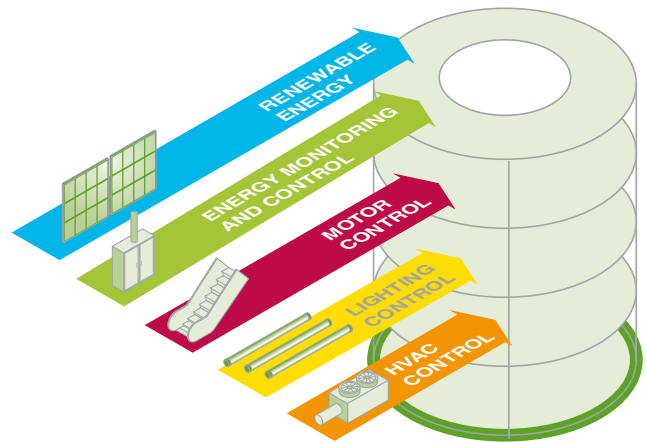
#### Solutions for residential and small buildings

Up to  
**40 % savings**



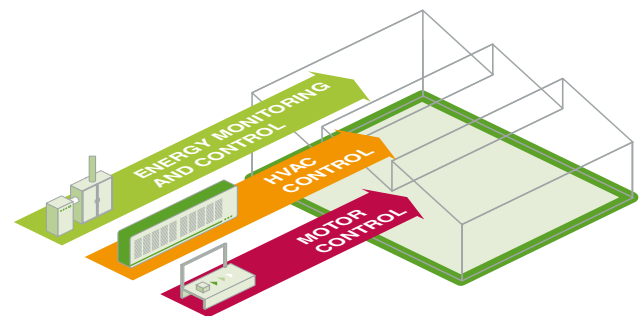
#### Solutions for medium and large buildings

Up to  
**30 % savings**



#### Solutions for industry and infrastructure

Up to  
**20 % savings**



Schneider Electric offers for each market its own energy efficient solutions!



### 3. LED opportunity for lighting



#### LED technology: great prospects to meet the challenges of energy efficiency.

The LED technology, introduced only a few years ago for functional lighting applications, has gradually become established and offers very significant prospects for progress, especially in "smart" control.

The European Commission considers that LED lamps are the sustainable alternative solution to achieve energy saving objectives in the lighting sector.

The prohibition of incandescent light bulbs has boosted new energy-efficient lamp technologies such as compact fluorescent and LED lamps.

This is a major step forward, the first lighting technology suitable for all fields of application (residential, service sector buildings, infrastructures, etc.) providing great energy efficiency and smart management capability.

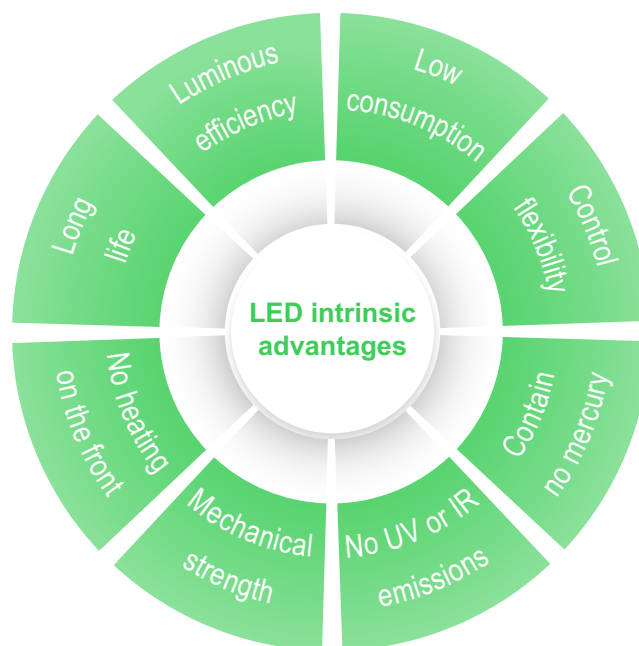


Figure 4. LED advantages

#### Constraints to be overcome by manufacturers and installers

- Potentially very significant current peaks at power up.
- Harmonic pollution generation.
- Overheating at the connection level.
- Radiation in the blue spectrum.
- Blinking when switched off.

#### Lamps of the low-consumption compact fluorescent and halogen type remain less expensive but have weak points compared with LEDs

- Warm-up time before nominal illumination.
- Scintillating light.
- Colors of inferior quality.
- Use of mercury.
- Shorter lifetime.



All the forecasting studies performed by various market players confirm a complete substitution for conventional lighting sources on the 2025-2030 horizon !



# A - General information about LED lighting

## 4. LED technology principles

A

- Many countries have taken the decision to gradually phase out the most "energy-hungry" lamps.
- EU countries are not the only ones to have decided to ban incandescent lamps. Brazil, Venezuela, Australia, Cuba, Argentina, Russia, Canada, the United States, etc. have done likewise.
- In Europe it is the 2005/32 directive called Energy Using Products (EuP) which specifies phasing out of the least efficient lamps and led to the production of Regulations 244/2009 and 245/2009.

Standard	Year	Disappearance
European Regulation 244/2009	2013	Incandescent lamps > 25 W
	2017	2-pin compact fluorescent lamps
	2018	Eco-halogen lamps
	2018	All lamps having an energy efficiency other than "A"
European Regulation 245/2009	2010	T8 halophosphate tubes
	2012	T10 and T12 tubes of Ra < 80
	2015	High-pressure mercury vapor lamps
	2017	High-pressure sodium vapor lamps to replace mercury vapor lamps
	2017	Metal-iodine lamps < 405 W, the least efficient
	2017	Ferromagnetic ballasts for class B1 and B2 fluorescent lamps

European Regulation 244/2009: ecodesign requirements for non-directional household lamps.

European Regulation 245/2009: ecodesign requirements for fluorescent lamps without integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps.

### General characteristics

**LED** means Light Emitting Diode.

A LED is a diode type semiconductor which emits visible electromagnetic radiation when a current passes through it.

The entity formed by the LED, its substrate and a primary optical unit is called the **LED component**. This LED component provides protection for the semiconductor and dissipates the heat generated.

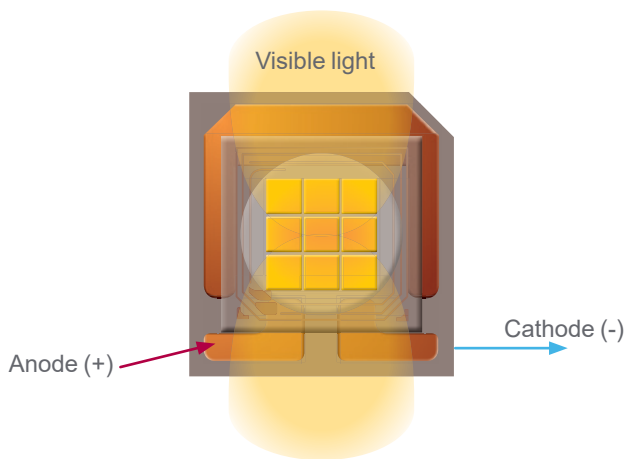
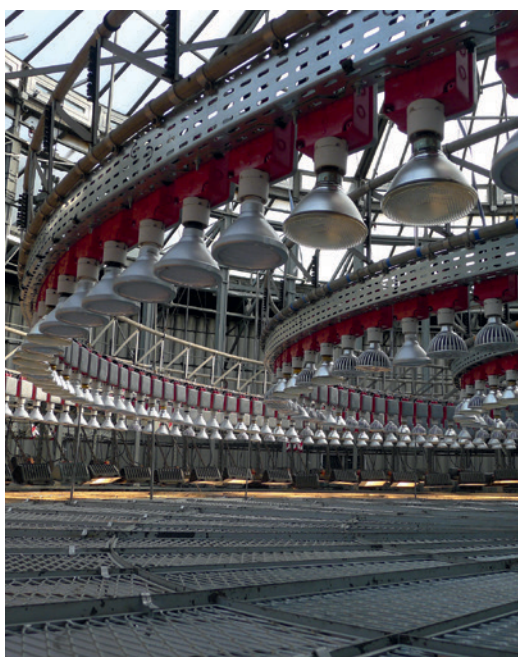


Figure 5. Light Emitting Diode (LED)

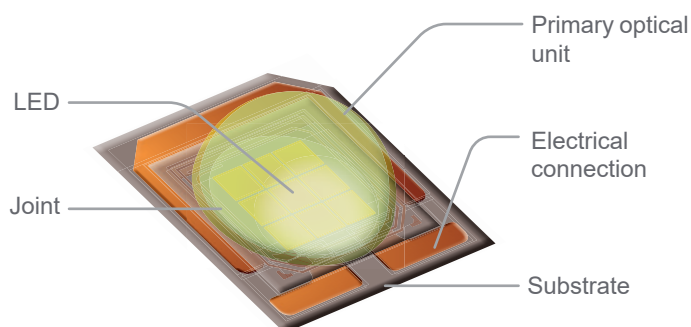


Figure 6. LED component



## A - General information about LED lighting

### 4. LED technology principles

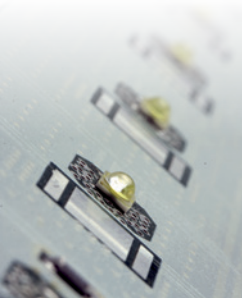


Figure 7. Printed circuit board with pre-fitted LEDs

- It is also possible to obtain from LED suppliers **printed circuit boards** on which several LED components are already mounted.
- The **LED module** is the assembly of one or more LED components with optical, mechanical and thermal elements.
- A **driver** is an electronic device which can convert the electric power of a low-voltage AC electrical network into electric power appropriate for the LED luminaire (direct voltage and current). The driver may be external or integrated into the luminaire. A driver can power one or more luminaires.
- A **LED luminaire** is a complete system consisting of a LED module, a housing, an optical reflector, wiring, connectors, joints and a heat dissipation system (heat sink or fan).

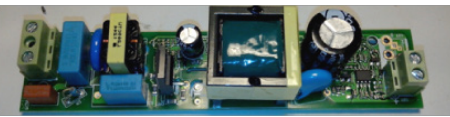


Figure 8. LED Driver

One technology for all lighting applications

- LED lamps are the best lighting solution for buildings application
- LED lamps are already recommended in standards for traffic lights, public lighting, decoration...
- They are gaining ground in residential and small building markets, and are widely used in dimming.



Figure 9. LED module



Figure 10. LED luminaire

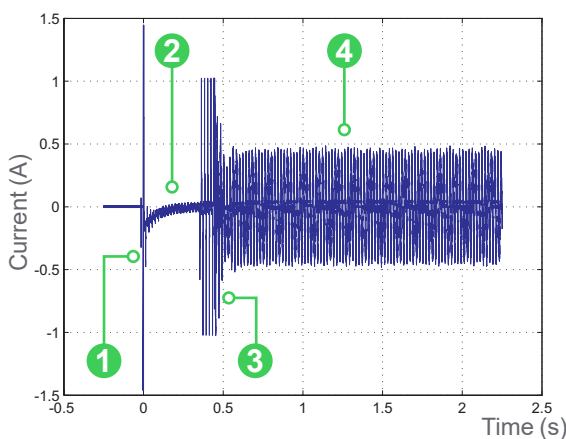


Figure 11. Current Vs time - LED luminaire starting

#### LED lighting technology: Electrical characteristics

At power up, a variable current is demanded by the luminaires during the first second, and the current stabilizes as soon as rated operating conditions are reached.

For luminaire starting, three transient states have been identified:

- State 1: inrush current.
- State 2: driver starting.
- State 3: powering the LED load.

The state 4 corresponds to steady-state operating conditions.

These states are numbered on Figure 11.





## 5. LED impact on electrical distribution

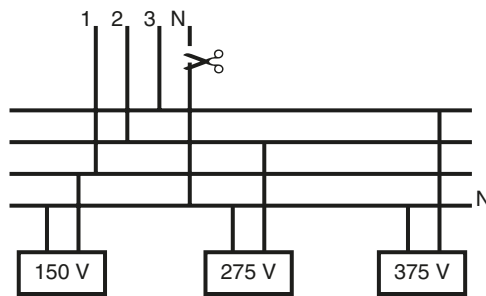


### The LED harmonics

In a three-phase network, the harmonic currents of each phase will add up in the neutral conductor. A potential risk is to obtain in the neutral conductor a current greater than that of the phases. This permanent current will be more important and likely to exceed the limits according to:

- The rate of harmonic current reinjection of the loads is high
- The phases imbalance level is important
- The phases have a high load rate given the caliber of the circuit

The potential consequences result in a faster degradation of the neutral pole of the 4-pole switchgear with a risk of accidental overvoltage which can damage the installation.



	Voltages (V) between phases and Neutral:	
	in normal use	after disconnecting the Neutral
V1	230	150
V2	230	275
V3	230	375

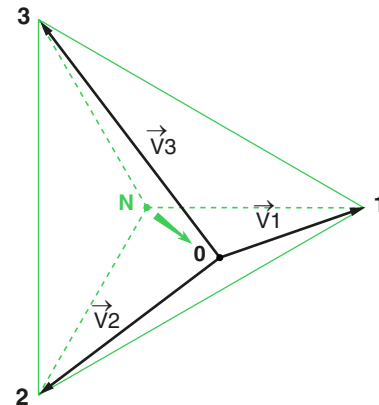


Figure 12. Consequences of disconnecting an evenly balanced Neutral conductor only in an installation when the single-phase loads are unevenly balanced.



### What happens at the end of life of a contactor?

As contactors repeatedly perform open-to-close cycles, the individual metal contacts of each pole are progressively etched and eroded from electrical arcing and heat. This deterioration determines the service life of a contactor. At the end of life, failure typically occurs when a set of contacts:

- No longer makes contact, causing the circuit to remain always open. This is usually the result of a combination of chemical pollution and harsh temperature.
- Creates permanent bonds, causing the circuit to remain always closed. This is the result of small parts of metal being ripped from the contacts causing the surface area to be reduced and triggering increased heat to bond the contacts.

Typically, the poles on each side of a contactor are susceptible to faster degradation, including the neutral pole. This is a critical risk for loads. In a 3-phase system, if the neutral contact fails it will cause an open neutral condition that can produce up to 400 Vac between phases.

If you are using a standard 4-pole contactor to control a group of single-phase loads, 400 Vac can cause sensitive loads to fail. LED and compact fluorescent lighting loads are especially sensitive to overvoltage. But so are other electronic loads, including smartphone chargers, computers, TVs, and fridges.

In addition, the startup current for LED luminaires can be very large. And tests have shown that lighting system can generate significant levels of harmonics in addition to the fundamentals signal. These conditions, in a 3 phase system, can put further stress on the contactor's neutral pole.



# 5. LED impact on electrical distribution



**Solution 1&2**

## Schneider Electric has the solution

Acti9 ICT 3P+N Contactor with desynchronized Neutral Pole technology is designed to:

- Control a group of single-phase loads such as LED lighting luminaires
- Help extend operational lifespan and protect loads from neutral break issues
- Allow plug and play connectivity.

A

Schneider Electric cares about the products we make, over their entire lifespan. That's why we have introduced the 3P+N contactor with reinforced neutral pole. As part of the Acti9 ICT contactor range, this innovation is designed to bring robustness to the control of 3-phase loads or single-phase loads requiring group control, see Figure 13.

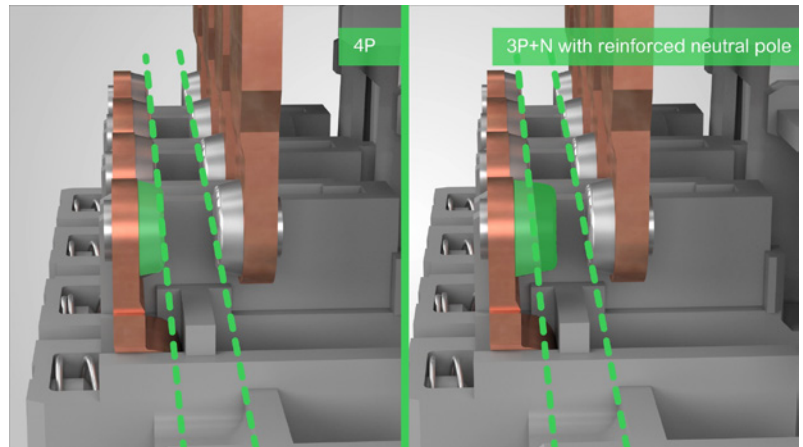


Figure 13. The neutral pole chip is reinforced, as compared to a standard 4P contactor.

By desynchronizing the neutral conductor, the unique 3P+N contactor allows improved performance and reduced risks (failure, degradation) for applications such as LED lighting. The reinforced contacts will keep the neutral circuit operating more reliably for a longer life cycle. This will help avoid a neutral break condition, protecting your LED lighting or other sensitive loads, see Figure 14.

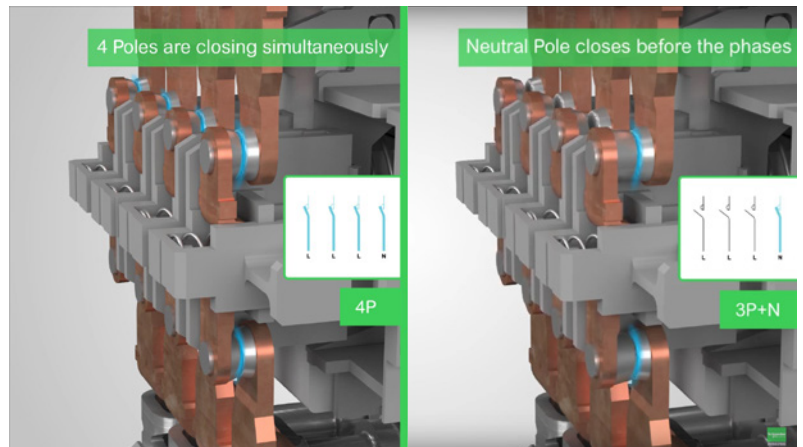
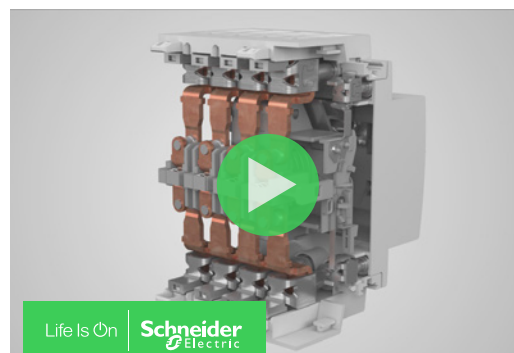


Figure 14. On the 3P+N product, the Neutral pole will close before the phases and open after them.



Application solution  
iCT 3P+N  
CA9SS090E



# 5. LED impact on electrical distribution



## The LED high inrush current

At switching on, the inrush current of the LED is so high, it can reach 250 times the nominal current. For this reason, the protective devices such as circuit breaker will trip directly following a circuit closure.

- When switching on and the voltage angle at this time is 0°, the inrush current is not so high, and as a result the circuit breaker does not trip and the LED lights normally.
- When switching on and the voltage angle at this time is 90°, the inrush current is so high, and as a result the circuit breaker could trip and the LED lights does not turn on.

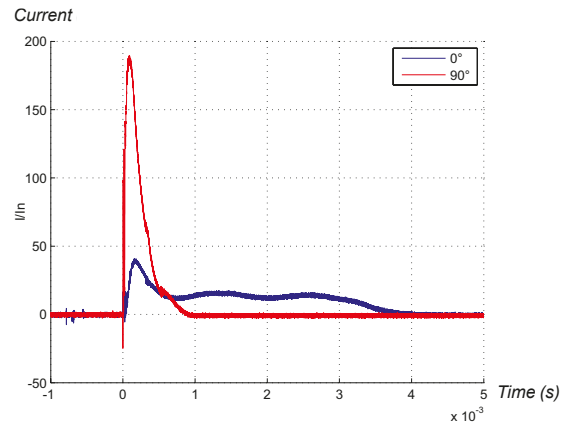


Figure 15. Current at switching on depending on voltage angle

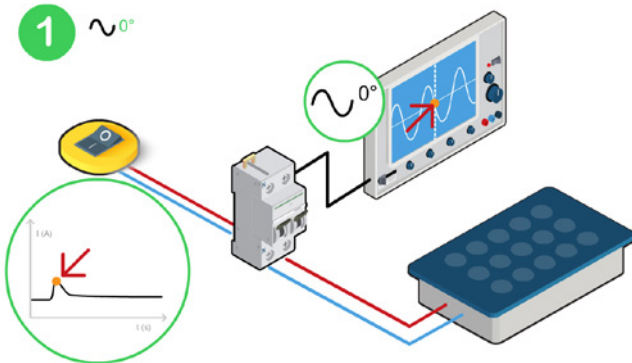


Figure 16. Low inrush current when switching on and the voltage angle is 0°

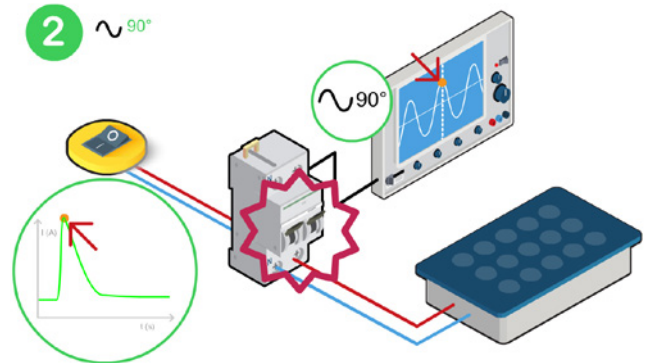


Figure 17. High inrush current when switching on and the voltage angle is 90°

## Solution 3

### Acti9 iCT+ and Acti9 iTL+

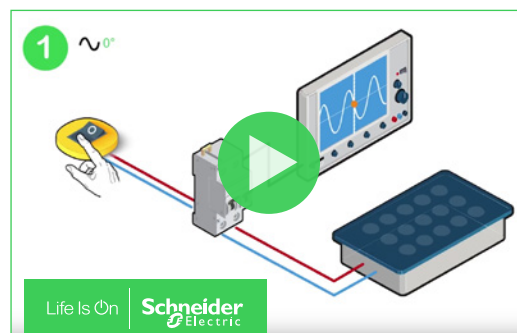
Of course, the ideal solution is not to increase the rating of the circuit breaker, nor to change its curve as before 10 ms, the factory settings can vary, nor to decrease the number of LEDs per circuit, but the solution is to use electronic devices having a zero-crossing voltage trigger property such as iCT+ and iTL+ to control the switching operation.



Acti9 iCT+



Acti9 iTL+



Application solution  
Hypermarket  
CA9SS011E

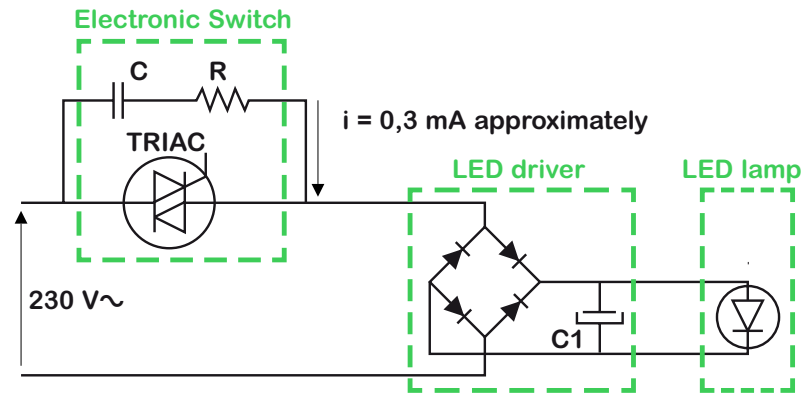


## 5. LED impact on electrical distribution



### The LED blinking when switched off

The LED blinking appears when using electronic devices to control the luminaires. When the switch composed of TRIAC opens, the lamp will switch off, but flashes will occur from time to time. These flashes are due to the presence of the RC circuit (snubber) in parallel with the TRIAC as shown in the figure below, so a current will flow through this snubber.

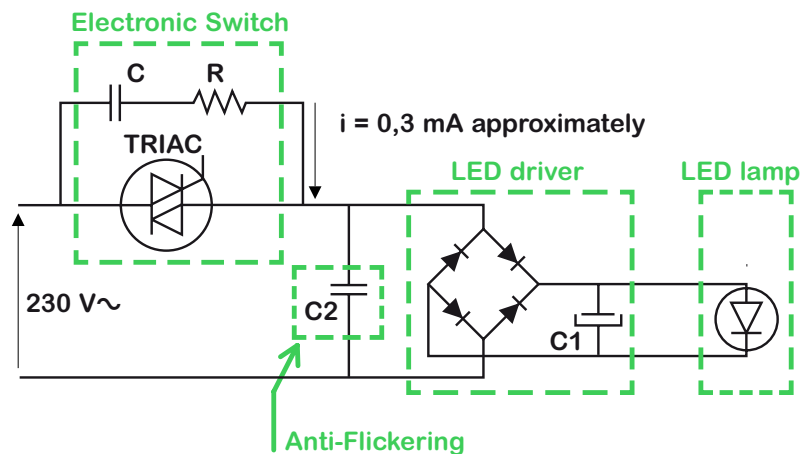


This current will load the capacity C1, and as a result the lamp will light up until the capacity C1 discharges. This will repeat as long as the switch is open, and as a result the flashing of the LED.

**Note:** This phenomenon is also observed if the control is done by an electromechanical switch wired with two long wires (> 20 meters).



### Anti-Flickering device



The solution is to put an anti-flickering device available on the market (impedance C2 equal to 47 nF) in parallel with the lamp to decrease the flowing current.

## 6. Recommendations for electrical devices

A

### The risk related to circuit breaker selection

The choice of circuit breaker characteristics depends on the nature of the load powered. The rating depends on the cross section of the cables to be protected and the curves are chosen according to the loads' inrush current. When switching on LED luminaires, very significant inrush currents occur up to 250 times the nominal current according to the type of driver for a very short time (< 1 msec). Normative curves according to the "standard" (curves as defined in IEC 60898-1<sup>[1]</sup> and IEC 60947-2<sup>[2]</sup>) used for circuit breaker certifications (which characterize fault currents of a duration exceeding 10 ms) give the circuit breakers' tripping threshold for currents maintained for 10 ms or more. For transient currents of duration less than 10 ms, no normalized curve exists. The peak value of the total current at switching on depends on the energizing time, the number of luminaires forming the lighting circuit, and the short-circuit power and architecture of the network.

#### Recommendations

In order to address this risk an appropriate choice of the circuit breaker (rating, curve) must be done during the design phase of installation, according to the recommendations given by the manufacturer.

Another option, very useful in the case of replacing conventional lighting by LED lighting on existing large installation, is to implement a remote control including zero crossing function in place of standard device. That will limit the total inrush current in the order of 4 to 5.

### The risk relating to Earth leakage protection device

The leakage current is at maximum for switching on at the voltage peak.

The frequency of this transient current is high (about 100 kHz). For switching on at zero voltage, the leakage current is practically zero.

#### Recommendations

The permanent earth leakage current at 50 Hz is generally less than 1 mA for a luminaire. Given that lighting circuits are protected by earth leakage protection devices of 300 mA rating in commercial application, a large number of luminaires can be installed downstream of a protective device. For a frequency of 100 kHz, the non hazardous leakage current is hardly detected by the earth leakage protection devices.

### The risk for remote control device

The standardized categories of use (according to IEC 60947-4-1<sup>[3]</sup> and IEC 61095<sup>[4]</sup>) stipulate the current values that the contactor must establish or cut off. These depend on the nature of the load controlled and the conditions under which circuit (closing and breaking) is performed. Only lighting loads employing conventional technologies are covered by this standard, and no test is required to certify contactors for controlling luminaires that employ LED technology.

For switchgear and control gear, the main constraints of the LED lighting technology are the high transient currents which can generate premature wear of contact pad materials.

#### Recommendations with standard contactors or impulse relays

Contactor and impulse relay deratings given by manufacturers must be taken in account in the design phase in order to obtain the right coordination level with LED lighting. That performance will determine the maintain of the electrical endurance and lifetime given by manufacturers.

### The risk of overvoltages

As illustrated in earlier sections, switching on a lighting circuit causes a transient state which is manifested by a significant overcurrent.

This overcurrent is accompanied by a strong voltage fluctuation applied to the load terminals connected to the same circuit.

These voltage fluctuations can be detrimental to correct operation of sensitive loads (micro-computers, temperature controllers, etc.).

#### Recommendations

It is advisable to separate the power supply for these sensitive loads from the lighting circuit power supply. The installation of protective devices such as "surge arrester" type is recommended for exposed installations such as public lighting, lighting for car park, or industrial facilities.

[1] IEC 60898-1: Electrical accessories – Circuit breakers for overcurrent protection for household and similar installations.

[2] IEC 60947-2: Low-voltage switchgear and controlgear - Part 2: Circuit breakers.

[3] IEC 60947-4-1: Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters.

[4] IEC 61095: Electromechanical contactors for household and similar purposes.





## 7. FAQ

A

### When using LED lamps, why is the circuit breaker sometimes tripping ?

The LED lamps generates a high inrush current for a several microseconds, it can reach 250 times the nominal current. This high current will cause the tripping of the miniature circuit breaker (MCB), due to the magnetic protection part.

### When using LED lamps, why does the circuit breaker not always trip?

There are several reasons:

- The light is being switched on when the voltage is close to the 0 degree.
- The factory settings of MCBs allow a high peak of current during the first ms.
- Some LED lamps have a higher peak than others, but the LED manufacturers don't take this as a parameter. So, in some cases the LED lamps do not cause the tripping of the breaker

### After the event of circuit breaker tripping, is it possible to reclose the circuit breaker ? Will it switch on the lights ?

LED lamps are equipped with capacitors. These small electronic components can stock power even on a very short amount of time (before the MCB tripped). Then you'll need less power to fully charge the capacitor to switch on the lights. That is why after 1 or multiple manual attempts to reclose the MCB, the LED lamps will switch on.

### Why is there a higher inrush current for LED lamps while they are known for being low-consumption loads?

This is a characteristic of the embedded electronic technology in the LED lamp:

- Inrush current is very high and very brief due to the charging of big storage capacitor included in the supply
- Then, LED lamps consumption remains very low due to the high efficiency of the LED technology.

### In a three-phase network, why do we have a potential risk of neutral break?

In a three-phase network, the harmonic currents of each phase will add up in the neutral conductor. A potential risk is to obtain in the neutral conductor a current greater than that of the phases.

This permanent current will be more important and likely to exceed the limits according to:

- The rate of harmonic current reinjection of the loads is high
- The phases imbalance level is important
- The phases have a high load rate given the caliber of the circuit

The potential consequences result in a faster degradation of the neutral pole of the 4-pole switchgear with a risk of accidental overvoltage which can damage the installation.

### What happens at the end of life of a contactor?

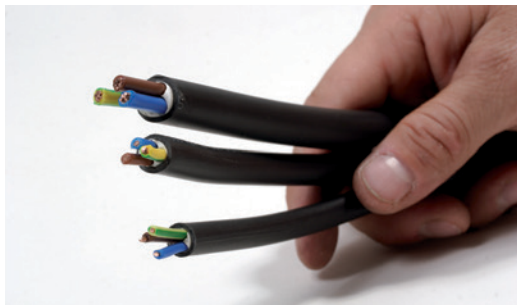
As contactors repeatedly perform open-to-close cycles, the individual metal contacts of each pole are progressively etched and eroded from electrical arcing and heat. This deterioration determines the service life of a contactor. At the end of life, failure typically occurs when a set of contacts:

- No longer makes contact, causing the circuit to remain always open. This is usually the result of a combination of chemical pollution and harsh temperature.
- Creates permanent bonds, causing the circuit to remain always closed. This is the result of small parts of metal being ripped from the contacts causing the surface area to be reduced and triggering increased heat to bond the contacts.





# 1. Cables and busbars



## Principle for selection

- The electrical power connections have the role of transporting energy from the electrical switchboard to the lighting loads.
- They can be formed of cables or prefabricated busbar trunking.
- Where large areas have to be lit, they comprise a main circuit and branch circuits to the luminaires.
- Their selection depends on various constraints:
  - safety (insulation, little overheating, mechanical strength, etc.),
  - efficiency (limited voltage drop, etc.),
  - installation environment (location, installation procedure, temperature, etc.),
  - investment cost.

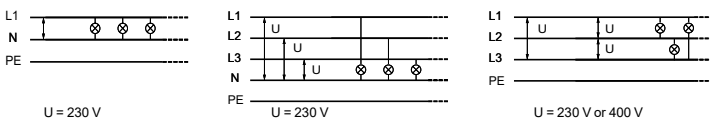
B

## Cable cross section dimensioning factors

### Rated current of circuits

- The total circuit power must be analyzed and calculated:
  - lamp power consumption,
  - any lamp ballast or transformer losses.
- Depending on the type of load and any compensation, a power factor must be applied. A poor power factor, for example, can double the current flowing through the circuits.
- For electrical connection dimensioning, one should allow for the fact that the lamps consume 1.5 to 2 times their rated current:
  - at end of life for all lamps,
  - during the long starting phase for high-intensity discharge lamps.

### Single-phase or three-phase distribution with or without neutral



In most buildings used for tertiary or commercial purposes, the lighting system is distributed via a single-phase circuit. To optimize the cabling, especially for high-power applications over large areas, three-phase distribution is sometimes used: 230 V between phase and neutral or between phases, or 400 V between phases for high-power lamps (2000 W).

### Installation procedure

Buried or otherwise, on cable trays or embedded, etc.

### Mutual interference in the case of adjacent circuits

### Type of insulating material

### Ambient temperature

1% to 2% derating per °C above the nominal temperature.

### Loaded neutral correction factor

In the case of three-phase circuits supplying discharge lamps with electronic ballasts, harmonic currents of the third order and multiples of three are generated. They flow through the phase conductors and combine in the neutral cable, possibly causing an overload. The circuit must therefore be sized according to this harmonic content.

### Derating factors to prevent overheating of electrical connections

### Length of electrical connections

The cable resistance causes a voltage drop proportional to the cable length and the current. It can cause malfunctions when the lamps are switched on or reduce the luminosity in steady state. The length of the circuits and the distributed power require an appropriate cable cross section.

### Conductive material

Copper is less resistive but more expensive than aluminum. The use of aluminum is reserved for high-current electrical connections.

### Conductor cross section

Cables: fast dimensioning  
▶ page 19



### Usual values

- Power output per phase of a lighting circuit:
  - common values: 0.3 to 0.8 kW,
  - maximum values:
    - 110 V: up to 1 kW,
    - 220 to 240 V: up to 2.2 kW.
- Power factor: > 0.92 (compensated circuit or electronic ballast).
- Maximum permissible voltage drop ( $\Delta U$ ) in steady state:
  - 3% for circuits of less than 100 m,
  - 3.5% tolerated above 200 m.
- Cable cross section:
  - most commonly (< 20 m): 1.5 or 2.5 mm<sup>2</sup>,
  - very long (> 50 m) high-power circuit, to limit voltage drops: 4 to 6 mm<sup>2</sup>, or even 10 mm<sup>2</sup> (> 100 m).





# 1. Cables and busbars

## Prefabricated busbar trunking

These systems meet the needs of all applications in commercial, tertiary and industrial buildings.

Canalis: fast dimensioning  
▶ page 22



### Advantages in every stage in the life of a building

#### Design

- Simplified electrical circuit diagram.
- Direct selection of the model according to the type and number of lamps.
- Direct correspondence between the circuit breaker rating and that of the duct.
- Guaranteed performance irrespective of the installation (in accordance with the IEC 604279-2 standard).
- Suitable for all environments: IP55 standard.
- Protects the environment: RoHS.
- No halogen: releases no toxic fumes in case of fire.

#### Implementation

- Ease of installation: no risk of wiring error.
- Can be installed by unskilled personnel (connection by connectors, polarizing, etc.).
- Reduction in worksite time, control of completion times.
- Prefabricated, pretested: operates immediately on commissioning.

#### Operation and maintenance

- Quality of contacts of clamp type active conductors.
- Long service life, maintenance-free (up to 50 years).
- Continuity of service and safety: servicing can be performed on live lines.
- Significant reduction in radiated electromagnetic fields.

#### Changes in the building

- Modular, hence dismantlable and reusable.
- Refitting of premises and their light fittings facilitated by the branch connections available at regular intervals.
- Legibility of the installation for servicing operations and upgrades.

		Canalis KBA	Canalis KBB
Installation	Type	Rigid	Very rigid
	Installation procedure	● Suspended (installation spacing up to 3 m)	● Suspended (installation spacing up to 5 m)
Luminaire attachment to the duct		Yes	Yes
Power circuits	Quantity	1	1 or 2
	Type	● Single-phase ● Three-phase	● Single-phase ● Three-phase ● Single-phase + single-phase ● Single-phase + three-phase ● Three-phase + three-phase
Single-phase: 2 conductors + PE Three-phase: 4 conductors + PE			
Lighting control circuit (0-10 V, Dali)		Optional	Optional
Rating		25 or 40 A	25 or 40 A
Protection by fuses		With tap-off KBC 16DCF..	With tap-off KBC 16DCF..
Tap-off spacing		0.5 - 1 - 1.5 m	0.5 - 1 - 1.5 m

Type of electrical connections	Cables	Canalis busbar trunking

Criteria to be taken into account for selection		
Installation procedure (generating possible overheating)	■	
Mutual interference in the case of adjacent circuits	■	
Ambient temperature	■	■
Type of electric insulating material	■	
Loaded neutral correction factor (three-phase circuit with high harmonic distortion factor)	■	■
Conductive material	■	
Length of electrical connection	■	■
Rated current of circuits	■	■ Simplified selection according to the type of lamp
Halogen-free material	■	■

B



## 2. Circuit breaker



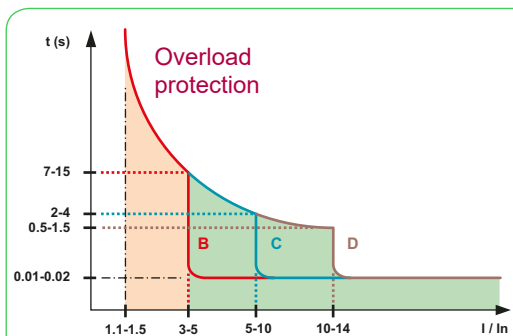
iC60N / iC40  
circuit breakers

Reflex iC60

### Reflex iC60

The Reflex iC60 devices (▶ page 26) are integrated control circuit breakers which combine the following main functions in a single device:

- circuit breaker for cable protection,
- remote control by latched and/or impulse-type order,
- remote indication of product status,
- interface compatible with Acti 9 Smartlink and programmable logic controller (remote control and indications).



The tripping curve makes the protection more or less sensitive to:

- the inrush current at power up;
- the overload current during the short (< 1 s) lamp starting phase.

Figure 18. tripping curves

### Usual values

- Circuit breaker rating: 10, 13, 16, 20, 25, 32 A
- Curve: B or C depending on habits.

Circuit breaker: fast dimensioning  
▶ page 19

Optimized calculation: ▶ "My Ecodial" software



[1] In the particular case of three-phase circuits supplying discharge lamps with electronic ballasts, harmonic currents of the third order and multiples of three are generated and combined in the neutral conductor. The neutral cable must be sized to prevent it from overheating. However, the current flowing through the neutral cable may become greater than the current of each phase and cause nuisance tripping.

[2] In the case of installations with very long cables in a TN or IT system, it may be necessary to add differential protection to protect human life. In all cases, the choice of curve must be confirmed by a design note.

### Principles for selection

- Circuit breakers are used to:
  - guard against fires that might be caused by a faulty electric circuit (short-circuit, overload, insulation fault),
  - protect the people against electric shock in the event of indirect contact.
- The choice of circuit breakers must be optimized to provide absolute protection while ensuring continuity of service.
- Although the circuit breakers are sometimes used as lighting circuit control units, it is recommended to install:
  - separate control devices (switch, contactor, impulse relay ▶ page 25)
  - or an integrated control circuit breaker designed for lighting applications (Reflex iC60 ▶ page 26) which withstands a larger number of switching operations.

### Choice of breaking capacity

- The breaking capacity must be greater than or equal to the presumed short-circuit current where circuit breaker must be installed.
- However, in the event of use in combination with an upstream circuit breaker limiting the current, this breaking capacity can possibly be reduced (cascading).

### Choice of rating

- The rating ( $I_n$ ) is chosen above all to protect the electrical network:
  - for cables: it is chosen according to the cross section,
  - for Canalis prefabricated busbar trunking: it must be simply less than or equal to the rating of the busbar trunking according to manufacturer recommendation.
- Generally, the rating should be greater than the rated current of the circuits. But in the case of lighting circuits, to ensure excellent continuity of service, it is recommended that this rating correspond to about twice the rated current of the circuit, by limiting the number of lamps per circuit.
- The rating of the upstream circuit breaker must always be less than or equal to that of the control device located downstream (on-off switch, residual current circuit breaker, contactor, impulse relay, etc.).

### Choice of tripping curve

- Electricians always use the same curve for lighting circuits: B or C depending on habits.
- However, to prevent nuisance tripping, it may be advisable to choose a less sensitive curve [2] (e.g. go from B to C)

### Continuity of service

Nuisance tripping can be generated by:

- the inrush current which could be very high during circuit closing with LED luminaires (see figure 18),
- and sometimes the harmonic current flowing through the neutral of three-phase circuits [1].

### Three solutions

- Choose a circuit breaker with a less sensitive curve: change from B curve to C curve or from C curve to D curve [2].
- Reduce the number of lamps per circuit
- Start up the circuits successively, using time delay auxiliaries on the control relays ▶ page 29).

**Under no circumstances may the circuit breaker rating be increased, as the electrical connections would then no longer be protected.**



Know more about  
Circuit Breaker?





## 2. Circuit breaker

### Maximum number of LED luminaires per circuit breaker rating

- The new lighting technologies with electronic interfaces (ballasts, drivers) cause a high transient inrush current at power up that can trip the circuit breaker. These phenomena are particularly increased with LED lighting.
  - For LED lamps, one important criteria is to select Circuit Breaker rating and curve to avoid this tripping at power up. This is the purpose of the table below.
- Then the current limitation of the controlling device (iCT, iCT+, iTL, iTL+, Reflex) will be considered (see > p. 28)

B

Circuit breaker rating		10 A				16 A				20 A			
Unit power of the luminaire (W)	Curve	B	C	D	B, C, D with iCT+ or iTL+ up to 16A	B	C	D	B, C, D with iCT+ or iTL+ up to 16A	B	C	D	B, C, D with iCT+
10		15	30	45	207	22	44	66	331	31	63	94	331
30		11	23	34	69	17	34	51	110	24	49	73	110
50		8	17	25	41	12	25	37	66	17	35	52	66
75		5	11	16	27	7	15	22	44	10	21	31	44
150		2	5	7	13	3	7	10	22	4	9	13	22
200		2	4	6	10	3	6	9	16	3	7	10	16
250		1	3	4	8	2	4	6	13	2	5	7	13
400		-	1	1	5	1	2	3	8	1	3	4	8

Circuit breaker rating		25 A			32 A			40 A			63 A		
Unit power of the luminaire (W)	Curve	B	C	D	B	C	D	B	C	D	B	C	D
10		35	71	106	45	90	135	54	108	162	73	146	219
30		27	55	82	34	69	103	41	83	124	56	113	169
50		20	40	60	25	50	75	30	61	91	41	83	124
75		12	24	36	15	30	45	18	37	55	25	50	75
150		5	11	16	7	15	22	8	17	25	11	23	34
200		5	10	15	6	12	18	7	14	21	10	20	30
250		3	7	10	4	9	13	5	11	16	7	15	22
400		2	4	6	2	5	7	3	7	10	4	9	13

Figure 19. Maximum number of lamps according to the circuit breaker rating and curve, for LED lamps at 40°C, 230 V AC, Cos φ = 0.95



According to the control device used, the transient current surge may:

- require the circuit breaker to be derated according to the number of luminaires / circuit breaker rating coordination curves, when using standard control devices: CT, TL (electromechanical control device),
- be reduced by the use of the following technologies:
  - softStart: using a command integrated in the driver or a dimmer switch,
  - controlled contactor (iTL+, iCT+) (closes when the voltage passes through "0", derating is related to the Cos φ of the lighting circuit).

These technologies allow circuit breakers without derating related to the technology of the lamps to be used.

Example:

Circuit rated power = 230 V AC x Circuit breaker rating x Cos φ.



## 2. Circuit breaker



### 230 V AC single-phase copper cable

Infrequently used
Recommended
Acceptable
Not recommended (high inrush currents)
Risk of overheating/overloading the cable

Example described at bottom of page

[1] If the voltage or power factor is different, the lighting power and the cable length must be recalculated (the value of the nominal load current (A) does not change):

- for a voltage of 110-115 V: divide the values by 2.
- for a different power factor, see the table below:

Cos φ	Multiplying factor to be applied for	
	Power	Length
0.85	0.895	1.118
0.5	0.526	1.9

[2] Maximum values not to be exceeded to guarantee cable protection.

Rule for design: for circuit breaker rating selection, in order to limit nuisance tripping, it's recommended to use a minimum of 2 x Nominal Load current.



### Dimensioning tool for cable and circuit breaker

From the main characteristics of the installation (lighting power, distance from electrical switchboard), these tables can be used to determine:

- the cross-section of the conductors on the power supply line for a voltage drop less than 3% at the lamps (NFC 15100 or IEC 60364), whatever the installation method and insulating material used for the conductors,
- the circuit breaker rating for protection and continuity of service with a design margin, whatever the type of lamps.

#### Characteristics of the installation

at 40°C, 230 V AC, Cos φ = 0.95 [1]

Lighting power (kW) including any ballast losses	Nominal load current (A)	Maximum cable length (m) for a 3% voltage drop (the value shown is the average distance between the electrical switchboard and the lamps)							
		1.5	2.5	4	6	10	16	25	
0.2	1	294	489	783					
0.4	2	147	245	391	587				
0.7	3	98	163	261	391	652			
1.3	6	49	82	130	196	326	522		
2.2	10	29	49	78	117	196	313	489	
3.5	16	18	31	49	73	122	196	306	
4.4	20		24	39	59	98	157	245	
5.5	25			31	47	78	125	196	
7.0	32			24	37	61	98	153	
8.7	40				29	49	78	122	
10.9	50					39	63	98	
13.8	63						50	78	

Cable	1.5	2.5	4	6	10	16	25
Cross section of each conductor (mm²)							

Circuit breaker	1.5	2.5	4	6	10	16	25
Rating (A) Recommended	Twice the nominal load current of the lighting circuit						
Maximum [2]		2 x 6 A = 12 A 13 or 16 A rating to be used					

Cable with PVC type insulation	13	16	25	32	40	50	63
Other insulating material more efficient at high temperature.	16	20	32	40	50	63	80

### Example of an open-plan office

#### Characteristics of the installation

- 20 luminaires with 50 W 230 V single-phase LED lamps.
- Power factor (Cos φ): 0.95.
- Average distance from the switchboard: 60 m.

#### Calculations

- Lamp power: 20 x 50 = 1000 W.
- Power efficiency factor estimated at 85%: Pin = 1000 ÷ 0.85 = 1176 W.
- Lighting power (P): 1176 W ≈ 1.2 kW; the next highest value in the table, i.e. **1.3 kW**, is selected.
- Corresponding nominal load current (I = P/U Cos φ): = 1176 W/(230 V x 0.95) = 5.4 A.

The next highest value in the table, i.e. **6 A**, is selected.

- Average distance from luminaires: 60 m; the next highest value in the table, i.e. **82 m**, is selected.

#### Cable and protection values selected

- The recommended cable cross-section so as not to exceed a 3% voltage drop at the end of the line is therefore: **2.5 mm²**
- Minimum recommended circuit breaker rating: 2 x 6 A = 12 A, equivalent to the next highest normalized value of **13 A** or **16 A**. This rating is effectively less than or equal to the maximum authorized rating (16 or 20 A) to ensure that the cable is protected.



## 2. Circuit breaker

### 230 V AC three-phase copper cable between phase and neutral or 400 V AC between phases

Infrequently used
Recommended
Acceptable
Not recommended (high inrush currents)
Risk of overheating/overloading the cable

Example described at bottom of page (with correction of the values in the table taking into account a power factor of 0.85)

[1] If the voltage or power factor is different, the lighting power and the cable length must be recalculated (the value of the nominal load current (A) does not change):

- for a different voltage, multiply the lighting power and the cable length by:
  - 0.577 for a voltage of 230 V between phases,
  - 0.5 for a voltage of 110-115 V between phase and neutral.
- for a different power factor, see the table below:

Cos φ	Multiplying factor to be applied for	
	Power	Cable length
0.85	0.895	1.118
0.5	0.526	1.9

[2] Maximum values not to be exceeded to guarantee cable protection.

Rule for design: for circuit breaker rating selection, in order to limit nuisance tripping, it's recommended to use a minimum of 2 x Nominal Load current.



#### Characteristics of the installation

Balanced three-phase circuit, at 40°C, Cos φ = 0.95  
230 V AC between phase and neutral or 400 V AC between phases [1]

Lighting power per phase (kW) including any ballast losses	Nominal load current per phase (A)	Maximum cable length (m) for a 3% voltage drop (the value shown is the average distance between the electrical switchboard and the lamps)							
		1	2	3	4	6	10	16	25
0.2	1	587	978	1565					
0.4	2	294	489	783	1174				
0.7	3	196	326	522	783	1304			
<b>1.3 x 0.895 = 1.2</b>	<b>6</b>	<b>98</b>	<b>110</b>	<b>163</b>	<b>182</b>	261	391	652	1044
2.2	10	59	98	157	235	391	626	978	
3.5	16	37	61	98	147	245	391	611	
4.4	20		49	78	117	196	313	489	
5.5	25			63	94	157	250	391	
7.0	32			49	73	122	196	306	
8.7	40				59	98	157	245	
10.9	50					78	125	196	
13.8	63						99	155	

**Cable**  
Neutral conductor cross-section equal to the phase cable cross-section

Cross section of each conductor (mm²)	1.5	2.5	4	6	10	16	25
---------------------------------------	-----	-----	---	---	----	----	----

**Circuit breaker**  
Rating (A) Recommended Twice the nominal load current of the lighting circuit

		2 x 6A = 12A 13 or 16 A rating to be used					
<b>Maximum [2]</b>							
Cable with PVC type insulation	13	16	25	32	40	50	63
Other insulating material more efficient at high temperature	16	20	32	40	50	63	80

### Example of a warehouse

#### Characteristics of the installation

- 55 x 50 W 230 V LED lamps connected to a three-phase circuit between phase and neutral.
- Power factor (Cos φ): 0.85.
- Average distance from the switchboard: 120 m.

#### Calculations

- Lamp power per phase: (55 x 50)/3 = 916 W.
- Power efficiency factor estimated at 85%: Pin = 916 ÷ 0.85 = 1077 W.
- Lighting power per phase (P): 1077 W = 1.1 kW.
- Corresponding nominal load current (I = P/U Cos φ): = 1077 W/(230 V x 0.85) = 5.5 A.

The next highest value in the table, i.e. **6 A**, is selected.

- Correction of the values in the table for the maximum cable length to take into account the power factor:

- 98 x 1.118 = 110 m,
- 163 x 1.118 = 182 m

The next highest corrected value in the table after 120 m, i.e. 182 m, is selected.

#### Cable and protection values selected

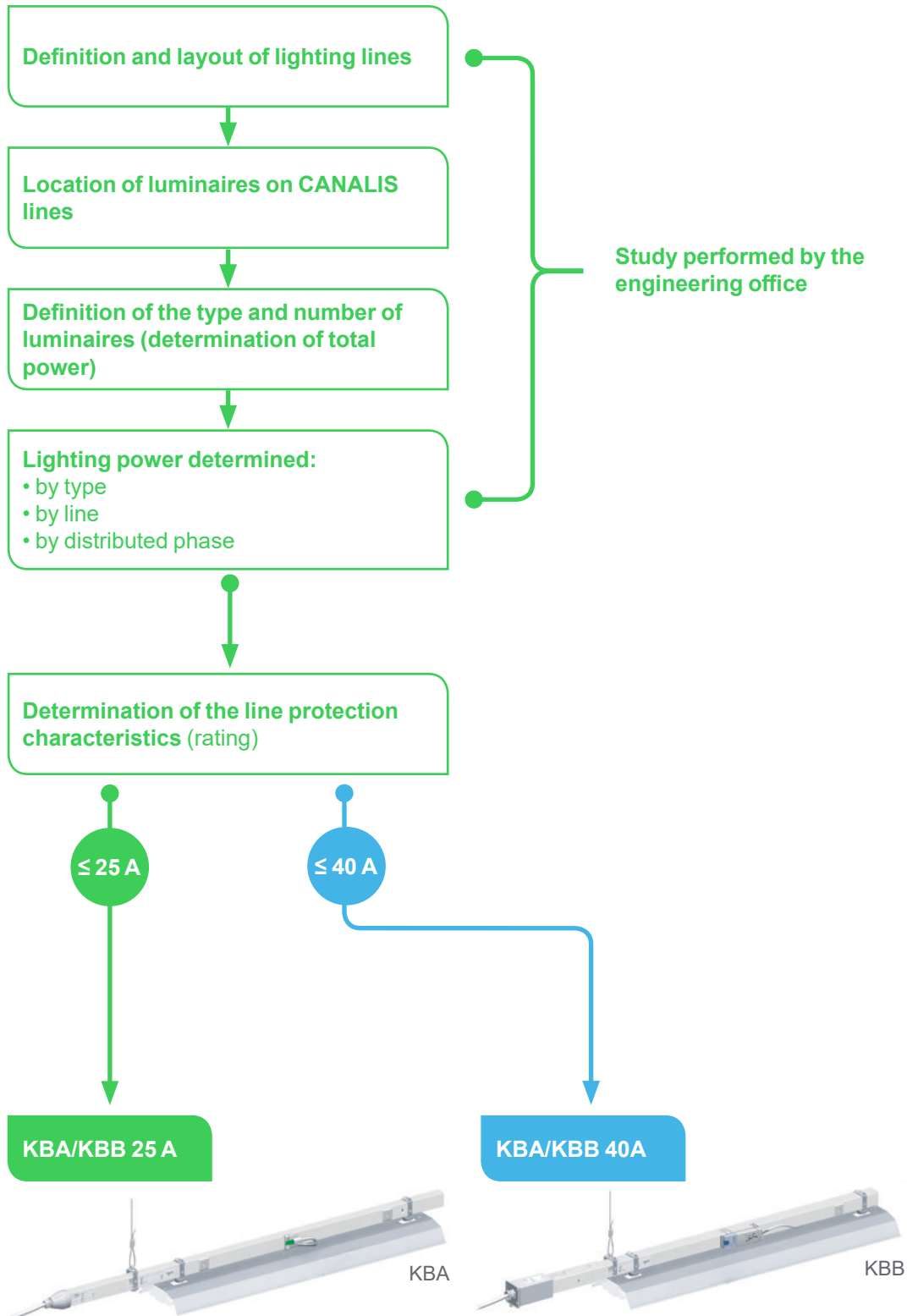
- The recommended cable cross-section per phase so as not to exceed a 3% voltage drop at the end of the line is therefore: **2.5 mm²**.
  - Minimum recommended circuit breaker rating: twice 6 A, i.e. **13 A or 16 A** as a normalized value.
- This rating is effectively less than or equal to the maximum authorized rating (16 or 20 A) to ensure that the cable is protected.



## 2. Circuit breaker

Dimensioning tool for busbar and circuit breaker

### Step 1: choice of busbar trunking rating



B





## 2. Circuit breaker

### Step 2: confirmation of the busbar trunking rating according to the length of the circuit and to the choice of circuit breaker rating

#### Single-phase Canalis 230 V AC busbar trunking

Characteristics of the installation		
at 35°C, Cos φ = 0.95 <sup>[1]</sup>		
Lighting power (kW) including any ballast losses	Nominal load current (A)	Maximum busbar trunking length (m) for a voltage drop < 3% at the end of the busbar trunking. Lamps evenly spaced along the busbar trunking (most common case)
0.2	1	
0.4	2	
0.7	3	375
1.3	6	188
2.2	10	113
3.5	16	144
4.4	20	115
Prefabricated busbar trunking		
Type of busbar trunking	Rigid (KBA or KBB)	
Rating (A)	25	40
Circuit breaker		
Rating (A)	Recommended	Twice the nominal load current of the lighting circuit
		2 x 6 A = 13 or 16 A rating to be used
Max.	25	40



#### Three-phase 230 V AC Canalis busbar trunking between phase and neutral or 400 V AC between phases

Characteristics of the installation		
at 35°C, Cos φ = 0.95		
230 V AC between phase and neutral or 400 V AC between phases <sup>[2]</sup>		
Lighting power per phase (kW) including any ballast losses	Nominal load current per phase (A)	Maximum busbar trunking length (m) for a voltage drop < 3% at the end of the busbar trunking. Lamps evenly spaced along the busbar trunking (most common case)
0.2	1	
0.4	2	
0.7	3	751
1.3	6	375
2.2	10	225
3.5	16	288
4.4	20	231
Prefabricated busbar trunking		
Type of busbar trunking	Rigid (KBA or KBB)	
Rating (A)	25	40
Circuit breaker		
Rating (A)	Recommended	Twice the nominal load current of the lighting circuit
		2 x 6 A = 13 or 16 A rating to be used
Max.	25	40



[1] If the voltage or power factor is different, certain values in the table are to be recalculated (the value of the rated current does not change):

- for a voltage of 110-115 V: divide the values by 2,
- for a different power factor, see the table below:

Cos φ	Multiplying factor to be applied for	
	Power	Busbar trunking length
0.85	0.895	1.118
0.5	0.526	1.9

Rule for design: for circuit breaker rating selection, in order to limit nuisance tripping, it's recommended to use a minimum of 2 x Nominal Load current.

[2] If the voltage or power factor is different, the lighting power and the busbar trunking length must be recalculated (the value of the nominal load current (A) does not change):

- for a different voltage, multiply the lighting power and the busbar trunking length by:
  - 0.577 for a voltage of 230 V between phases,
  - 0.5 for a voltage of 110-115 V between phase and neutral.
- for a different power factor, see the table below:

Cos φ	Multiplying factor to be applied for	
	Power	Busbar trunking length
0.85	0.895	1.118
0.5	0.526	1.9

- Infrequently used
- Recommended
- Overloaded busbar trunking or Circuit Breaker rating not compatible with busbar rating

■ Example described at bottom of page (with correction of the values in the table taking into account a power factor of 0.85)



### 3. Residual current devices



iID

iC60N + Vigi iC60

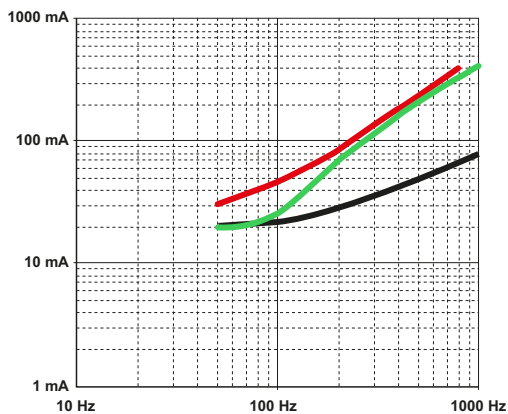
#### Principles for selection

- Earth leakage protection devices are used to:
  - guard against fires that might be caused by an electric circuit with an insulation fault,
  - protect the people against electric shock (direct or indirect contact).
- The choice of protective devices must be optimized to provide absolute protection while ensuring continuity of service.
- The implementation of earth leakage protection on lighting circuits varies according to standards, the earthing system and installation customs.



#### "SI" type technology

Tripping curve of a 30 mA earth leakage protection function



- : international standard IEC 479 determines the limit current for earth leakage protection tripping according to the frequency. This limit corresponds to the current that the human body is capable of withstanding without any danger.
- : standard earth leakage protection devices are more sensitive to high-frequency currents than "SI" type and could reduce continuity of service.
- : "SI" type "super immune" protection devices are less sensitive to high-frequency disturbance while ensuring personal safety.

#### Choice of sensitivity

- For protection against fire only: 300 mA.
- For protection against electric shock: 30 mA.

#### Choice of rating

- The rating must be greater than or equal to the total consumption of the circuit. This consumption can be as much as twice the rated current of the lamps:
  - in the case of discharge lamps, due to the long starting time (several minutes),
  - higher consumption by lamps that have exceeded their nominal service life.
- The rating of the earth leakage protection function (Vigi module or earth leakage protection switch) should always be greater than or equal to the rating of the upstream circuit breaker.

#### Continuity of service

##### Protective device discrimination

- For a two-level earth leakage protection system, the following are recommended:
  - upstream time-delayed earth leakage protection with sensitivity greater than or equal to three times the downstream protection (for example, 100 or 300 mA type protection),
  - one or more instantaneous 30 mA earth leakage protection devices downstream.

##### "SI" type super immune protection

- Compact fluorescent lamps, high-intensity discharge lamps with electronic ballast and LED, generate high-frequency currents (several kHz) that flow between conductors and earth in the ballast input filters and through stray capacitance in the installation.
- These currents (up to several mA per ballast) can trip standard earth leakage protection devices.

● To avoid such problems and maintain excellent continuity of service, "SI" type earth leakage protection is recommended.

- To avoid unwanted trippings of Residual Current Devices, it is recommended that the permanent leakage current must not exceed 0,25 iΔn.

iΔn is the rated residual operating current (Ex: 30mA)

The formula below helps to evaluate the lighting spots leakage currents and cables leakage currents (mA):

$$0,011 \text{ (mA/m)} \times L \text{ cable (m)} + 3 \text{ (mA/kW)} \times P \text{ (kW)} < 0,25 \text{ i}\Delta n \text{ (mA)}$$

L cable = Maximum length of cable if lightings are distributed in daisy-chain  
 L cable = Sum of all cables length if lightings are distributed in star



Know more about RCD?



# 4. Surge protection devices



PRF1 Master      iPRD      iQuick PRD

B

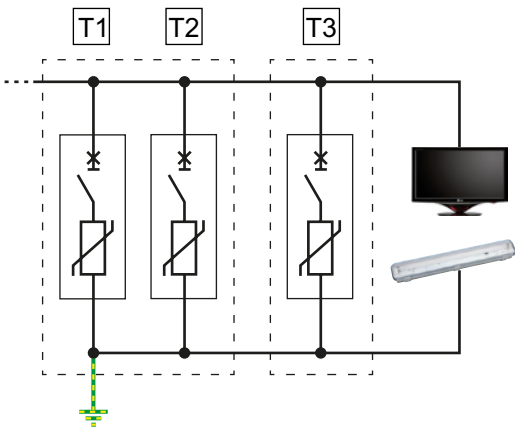
## Coordination between the protection system and the surge protective device

Good coordination between the protection system and the surge protective device can prevent tripping on lightning waves and ensure isolation for the installation network at its end of life.

## Surge protective device cascading

### Terminal protection and fine protection

- To effectively protect an electrical installation, the discharge capacity of the surge protective devices to be installed should be determined according to the characteristics of the installation.
- Protection should be provided at the installation terminal (terminal protection) and, if necessary, near sensitive equipment (fine protection).
- The terminal protection system protects the whole installation, whereas the fine protection system protects only the loads with which it is associated.



## Street Lighting

Given the widespread use of electronics in luminaires, it is recommended to establish a type 3 fine protection system at the level of each luminaire.

## Principles for selection

- Surge protective devices are used to:
  - limit overvoltages so prevent fires which could be generated by the destruction of loads due to the effects of lightning,
  - ensure the continuity of service of the most sensitive loads.
- The choice of protective devices must be optimized to provide absolute protection while ensuring continuity of service.
- Implementation: surge protective devices are used at all levels of the electrical installation, and on communication networks.

## Choice of the type of surge protective device

- Type 1** Installed in the main electrical switchboard when the building is equipped with a lightning protection system. For more effective protection of loads, it should be combined with a type 2 surge protective device to absorb residual overvoltages.
- Type 2** Installed in the main electrical switchboard, it is designed to discharge the currents generated by indirect lightning strokes and causing induced or conducted overvoltages on the power distribution network.
- Type 3** Installed to complement the Type 2 surge protective device if the distance between the surge protective device and the load is >10 m.

## Choice of surge protective device dimensioning

- Type 1** The discharge capacity is  $I_{imp} = 12.5 \text{ kA}$  or  $25 \text{ kA}$  depending on building risk analysis.
- Type 2** There are different discharge capacities for each of these categories ( $I_{max} = 20, 40, 65 \text{ kA}$  ( $8/20 \mu\text{s}$ )); this choice depends mainly on the exposure zone (moderate, average, high).
- Type 3** They are designed to reduce overvoltage across the terminals of sensitive equipment.

## Choice of breaking capacity

The surge protective device should be combined with a "circuit breaker or fuse" short-circuit protective device. This device will be chosen according to the installation's short-circuit current. The use of surge protective devices with an integrated disconnect circuit breaker ensures good coordination of the circuit breaker and surge protective device.

## Continuity of service

### Precaution against nuisance tripping:

In a TT system, a residual current device of the "SI" type or delayed "IΔn" type should be installed upstream of the surge protective device. This type of device is immune to the risks of unwanted tripping due to lightning. The other solution is to install the residual current device downstream of the surge protective device.



Know more about SPD?







# 5. Control devices

## Principles for selection

- Their role is to control luminaire switching on and off.
- Their technology allows a very large number of switching operations to be performed without adversely affecting their performance, in normal operating conditions.
- The installation of a control relay (impulse relay, contactor) allows:
  - remote control of a high-power lighting circuit,
  - easy performance of sophisticated functions (central control, timer, programming, etc.),
  - control of three-phase circuits.
- The iCT+ and iTL+ are especially suitable for lamps with a high inrush current (LED lighting, lamps with electronic ballast).



## Choice of control relay



		Impulse relay		Modular contactor	
					
		iTL	iETL	iTL+	iCT
					
					iCT+
Type of power circuit architecture (modular/monobloc)		<ul style="list-style-type: none"> <li>● Circuit protection is provided by a separate circuit breaker.</li> <li>● The control and power circuits are separate.</li> </ul> They can also relay the management devices, which often have a limited switching capacity and do not allow multi-polar switching (phase/neutral or three-phase).			
Installation		In enclosure and panel			
Control	Number of points	Multiple	Multiple	Single (as standard) or multiple (with auxiliary)	Single
	Type	Impulse-type, by push button		Latched-type by switch (as standard) or impulse-type by push button (with auxiliary)	
	Consumption	0	1 VA	1 to 2 VA	1 VA
Remote status indication	Protections	Auxiliary on circuit breaker			
	Control	Auxiliary on contactor or impulse relay	–	Auxiliary on contactor or impulse relay	–
Control circuit	Push button, selector switch	12 to 230 V AC	230 V AC	12, 24, 48, 110, 230 V AC	230 V AC
	PLC	6 to 130 V DC	–	24 V AC, 24 V DC by TI24 iACT interface and iATL 24 V DC	–
Remote reclosing of the protective device		–	–	–	–
Number of switching cycles per day (on average)		< 100	< 1000	< 100	< 1000
Flexibility of control		By combining auxiliaries	With relay circuitry	By combining auxiliaries	With relay circuitry
Additional functions		Many functions due to the use of auxiliaries: <ul style="list-style-type: none"> <li>● time delay</li> <li>● illuminated push-button control</li> <li>● step-by-step control</li> <li>● signaling</li> <li>● latched-type control</li> <li>● centralized multi-level control</li> <li>● control by PLC</li> </ul>	–	Many functions due to the use of auxiliaries: <ul style="list-style-type: none"> <li>● time delay</li> <li>● m push-button control</li> <li>● step-by-step control</li> <li>● signaling</li> <li>● latched-type control</li> <li>● centralized multi-level control</li> <li>● control by PLC</li> </ul>	–
Rating (commonest values in bold)		16 or 32 A	16 A	16, 25, 40, 63 A	20 A
Controlled power		Several kW			
Type of circuit controlled		Single-phase (1 or 2 P) or three-phase (3 or 4 P monobloc or in conjunction with iETL extension)	Single-phase (1P) Conducting neutral	Single-phase (1 or 2 P) or three-phase (3 or 4 P)	Single-phase (1P) Conducting neutral
Number of lamps controlled		▶ page 29			
Favorite applications		<ul style="list-style-type: none"> <li>● Residential</li> <li>● Service sector and industrial buildings (offices, corridors, shops, workshops, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>● Residential</li> <li>● Service sector buildings (hotels, hospitals)</li> </ul>	<ul style="list-style-type: none"> <li>● Service sector and industrial buildings (offices, open-space offices, warehouses, supermarkets, indoor car parks, etc.)</li> <li>● Infrastructure (tunnels, outdoor car parks, public lighting, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>● Residential</li> <li>● Service sector buildings (hotels, hospitals)</li> </ul>





# 5. Control devices

## Choice of control relay (cont.)

		Reflex iC60 integrated-control circuit breaker	RCA iC60 remote control
			
		<b>Reflex iC60</b>	<b>RCA iC60</b>
Type of power circuit architecture (modular/monobloc)		<b>Monobloc</b> The circuit protection and power switching functions are incorporated in a single device	<b>Monobloc</b> The circuit breaker combined with the RCA performs the circuit protection and power switching functions
Installation		In enclosure and panel	In enclosure and panel
Control	Number of points	Multiple	Multiple
	Type	Pulse or latched	Pulse or latched
	Consumption	5 VA	1 VA
Remote status indication	Protections	Incorporated	<ul style="list-style-type: none"> <li>● Incorporated</li> <li>● By MCB auxiliary</li> </ul>
	Control	Incorporated	<ul style="list-style-type: none"> <li>● Incorporated</li> <li>● By MCB auxiliary</li> </ul>
Control circuit	Push button, selector switch	230 V AC 24/48 V AC/DC with iMDU auxiliary	230 V AC 24/48 V AC/DC with iMDU auxiliary
	PLC	24 V DC with Ti24 interface	24 V DC with Ti24 interface
Remote reclosing of the protective device		–	Yes
Number of switching cycles per day (on average)		<10	1 to 2 on average
Flexibility of control		Integrated auxiliary functions	Integrated auxiliary functions
Additional functions		Numerous functionalities incorporated: <ul style="list-style-type: none"> <li>● choice of control order interpretation mode</li> <li>● control and indication interface compatible with 24 V DC programmable logic controller standards</li> <li>● compatibility with Vigi iC60 residual current protection auxiliaries</li> <li>● control orders time delayed by time delay relays or PLCs</li> </ul>	Numerous functionalities incorporated: <ul style="list-style-type: none"> <li>● remote reclosing possible, following an electrical fault</li> <li>● choice of control order interpretation mode</li> <li>● control and indication interface compatible with 24 VDC programmable logic controller standards</li> <li>● control orders time delayed by time delay relays or PLCs</li> <li>● compatibility with the auxiliaries of the iC60 and Vigi protection product offering (iOF, iSD indications and iMN, iMX tripping, etc.)</li> </ul>
Rating (commonest values in bold)		10, 16, 25, 40, 63 A	1 to 63 A
Controlled power		Several kW	Several kW
Type of circuit controlled		Single-phase (2P) or three-phase (3 or 4P)	Single-phase (1 or 2P) or three-phase (3 or 4P)
Number of lamps controlled		▶ page 28	
Favorite applications		<ul style="list-style-type: none"> <li>● Service sector and industrial buildings (offices, open-space offices, warehouses, supermarkets, indoor car parks, etc.)</li> <li>● Infrastructure (tunnels, outdoor car parks, public lighting, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>● Infrastructure (tunnels, indoor/outdoor car parks, public lighting, etc.)</li> </ul>

B



# 5. Control devices



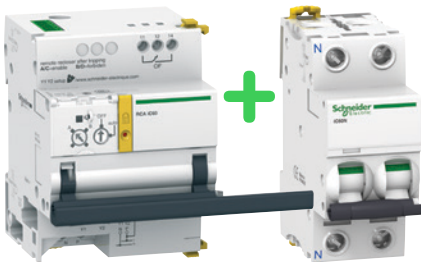
iTL



iCT



Reflex iC60



RCA iC60



iTL+



iCT+



Ventilation spacer



Know more about control devices?

## Choice of rating

- The rating printed on the front of the products never corresponds to the rated current of the lighting circuit.
- The standards that determine the ratings do not take into account all the electrical constraints of the lamps due to their diversity and the complexity of the electrical phenomena that they create (inrush current, starting current, end-of-life current, etc.).
- Schneider Electric regularly conducts numerous tests to determine, for each type of lamp and each lamp configuration, the maximum number of lamps that a relay with a given rating can control for a given power.

### iTL impulse relays and iCT contactors

- The rating should be chosen according to the tables on the following pages.
- The rating of the iTL and iCT must be equal to or greater than the protective device's rating.

### Reflex iC60 and RCA iC60

- The rating is determined by the cable characteristics in the same way as for the circuit breaker.
- The switching capacity is defined in the following tables.

## Thermal dissipation

- **Modular iTL+ impulse relays and iCT+ contactors**, due to their operating principle, constantly dissipate heat (several watts) due to:
  - electronic dissipation,
  - power contact resistance.

Where several modular contactors are installed side by side in a given enclosure, it is therefore recommended to insert a side ventilation spacer at regular intervals (every contactor). Heat dissipation is thus facilitated. If the temperature inside the enclosure exceeds 40°C, apply to the rating a derating factor of 1% per °C above 40°C.

- **The impulse relays, Reflex iC60 and RCA**, can usefully replace the modular contactors:
  - they consume less energy and dissipate less heat (no permanent current in the coil).
  - They require no spacer,
  - depending on the application, they allow a more compact installation with less wiring.




# 5. Control devices


## Dimensioning tool for control devices


The accumulation of lamps on a single circuit increases the inrush current. For this reason, the number of luminaires is limited.

iCT+ and iTL+ devices with zero crossing technology makes it possible to avoid this constraint.

### Selection table

Products		iCT contactors							
Type of lamp		Maximum number of lamps for a single-phase circuit and maximum power output per circuit							
		16 A		25 A		40 A		63 A	
LED lamps									
 With driver	10 W	48	480	69	690	98	980	205	2050
	30 W	38	1140	54	1620	77	2310	158	4740
	50 W	27	1350	39	1950	56	2800	117	5850
	75 W	17	1275	25	1875	36	2700	73	5475
	150 W	9	1350	12	1800	18	2700	37	5550
	200 W	7	1400	9	1800	15	3000	31	6200
	250W	5	1400	7	1800	12	3000	24	6200
	400W	3	1400	4	1800	7	3000	15	6200

Products		iCT+ contactors				iTL impulse relays			
Type of lamp		Maximum number of lamps for a single-phase circuit and maximum power output per circuit							
		20 A		16 A		32 A		16 A	
LED lamps									
 With driver	10W	331	3310	50	500	72	720	331	3310
	30W	110	3300	17	510	22	660	110	3300
	50W	66	3300	10	500	13	650	66	3300
	75W	44	3300	7	525	9	675	44	3300
	150W	22	3300	4	600	5	750	22	3300
	200W	16	3200	3	600	4	800	16	3200
	250W	13	3250	2	600	3	800	13	3250
	400W	8	3200	1	600	2	800	8	3200

Products		Reflex iC60 C curve									
Type of lamp		Maximum number of lamps for a single-phase circuit and maximum power output per circuit									
		10 A		16 A		25 A		40 A		63 A	
LED lamps											
 With driver	10W	30	300	44	440	71	710	108	1080	146	1460
	30W	23	690	34	1020	55	1650	83	2490	113	3390
	50W	17	850	25	1250	40	2000	61	3050	83	4150
	75W	11	825	15	1125	24	1800	37	2775	50	3750
	150W	5	750	7	1050	11	1650	17	2550	23	3450
	200W	4	800	6	1200	10	2000	14	2800	20	4000
	250W	3	750	4	1000	7	1750	11	2750	15	3750
	400W	1	400	2	800	4	1600	7	2800	9	3600

**Note:** Reflex iC60 - LED lamps

- B curve, the number of lamp should be reduced by 50% (keep the whole number just lower).
- D curve, the number of lamp should be increased by 50% (keep the whole number just lower).

You know the **power** and the **number of lamps** ...



... to define your **control device** and its range

You know the **power of lamps**, your **control device** and its range ...



... to define the **maximum number of lamps**



## 6. Control auxiliaries devices



- These auxiliaries can perform a great variety of functions:
    - from the simplest (signaling, timer, illumination delay, etc.),
    - to the most sophisticated (centralized multi-level control, step-by-step control, etc.).
  - Moreover, some auxiliaries make it possible to overcome electrical disturbance which may detract from satisfactory switching operation.
  - Schneider Electric has the most comprehensive and coherent product offering in the market.
- All the auxiliaries in a family (modular contactor or impulse relay) are compatible with all the devices in that family.
- They are very easy to install thanks to their integral mounting clips which simultaneously provide electrical and mechanical connection.



### Choice of auxiliaries and pre-auxiliary control devices

Function		Pre-auxiliary impulse relay or impulse relay + auxiliary	Modular contactor + auxiliary	Reflex iC60 integrated-control circuit breaker	RCA iC60 remote control
<b>Centralized control</b>	Centralized control (1 level) for a group of circuits while maintaining separate control of each of them. Example: control of a whole storey or room by room	iTLc or iTL + auxiliary iATLc	-	Integrated	Integrated
	Centralized control (1 level) + signaling	iTL + auxiliary iATLc+s	-	Integrated	Integrated
	Centralized control (2 levels) Example: control of a whole storey, a zone or room by room	iTL + auxiliary iATLc+c	-	Via PLC	Via PLC
	Impulse-type local control + latched-type centralized control	-	iCT + auxiliary iACTc	Integrated	Integrated
<b>Interface with PLC</b>	Allows control from Acti 9 Smartlink or a PLC	Auxiliary iATL24	Auxiliary iATL24	Reflex iC60 Ti24 version	Reflex iC60 Ti24 version
<b>Signaling</b>	Remote signaling of lamp status (lit or extinguished)	iTLs or iTL + auxiliary iATLs	iCT + auxiliary iACTs	Integrated	Integrated
<b>Timer</b>	Return to rest position after an adjustable time delay	Auxiliary iATEt + iTL	Auxiliary iATEt + iTL	Time delay relays (iRT) + PLC	Time delay relays (iRT) + PLC
<b>Step-by-step control</b>	Allows control of 2 circuits with a single control unit	Auxiliary iATL4 + 2 impulse relays iTL	Via PLC	Via PLC	Via PLC
<b>Illuminated push button compensation</b>	Allows fault-free control by illuminated push buttons	1 or more iATLz auxiliaries for each iTL	-	Max. leakage current: 1.35 mA on Y2 input	Max. leakage current: 1.35 mA on Y2 input
<b>Change in type of control</b>	Operates on latched orders coming from a changeover contact (selector switch, time switch, etc.)	iTLm or iTL + auxiliary iATLm	Standard operation	Yes	Yes
	Impulse-type local control + latched-type centralized control	Standard operation without auxiliary	Auxiliary iACTc + iCT	Integrated	Integrated
<b>Time delay</b>	Illumination delay Allows the inrush current at the head of the network to be limited by powering the circuits in succession	Auxiliary iATEt + iTL	Auxiliary iATEt + iCT	Time delay relays (iRT) + Reflex iC60	Time delay relays (iRT) + RCA iC60
<b>Disturbance suppressor</b>	Can prevent disturbance generated on the electrical network at power off	Not applicable	1 iACTp auxiliary per iCT	Not applicable	Not applicable
<b>Voltage adaptation for control</b>	Allows 24 V or 48 V AC/DC control	Possible in V AC and V DC	<ul style="list-style-type: none"> <li>● Possible in V AC</li> <li>● With auxiliary iMDU in V DC</li> </ul>	Possible with an auxiliary iMDU	



# 7. Time management devices

B



- These devices chiefly make it possible to optimize power consumption by managing lighting control according to various parameters:
  - time, day or date,
  - a given limited duration,
  - movement or the presence of personnel,
  - level of luminosity,
  - the amount of natural light.
- They can also improve everyday comfort through:
  - automation of the tasks of switching on/off,
  - manual or automatic adjustment of the illumination level.

## Choice of management devices for energy optimization and improved comfort

Products	Potential energy savings	Functions	Compatibility
			<b>LED lamps (unit power 2 to 8 W)</b>
<b>IH</b> Electromechanical time switches	50%	<ul style="list-style-type: none"> <li>● Hourly, daily or weekly</li> <li>● 1 or 2 circuits</li> <li>● With or without power reserve (operation in the event of mains failure)</li> </ul>	15 to 50 W
<b>IHP</b> Digital programmable time switches	50%	<ul style="list-style-type: none"> <li>● Daily, weekly or annual</li> <li>● 1 or 2 circuits</li> <li>● With or without conditional input</li> <li>● Switching interval: at least 1 min.</li> </ul>	25 to 200 W
<b>IC</b> Light sensitive switch	30%	<ul style="list-style-type: none"> <li>● Controlled by:                             <ul style="list-style-type: none"> <li>□ astronomical clock (automatic sunrise and sunset calculation)</li> <li>□ luminosity detection (adjustable from 2 to 2000 Lux)</li> </ul> </li> <li>● With or without programmable clock function</li> </ul>	30 to 200 W
<b>MIN</b> Timer	30%	<ul style="list-style-type: none"> <li>● 30 s to 1 h</li> <li>● 50% reduction of luminosity before extinction of incandescent lamps with PRE auxiliary</li> </ul>	55 to 150 W

**Note:** IH/IHP/IC

To control lighting loads, whenever the power is significant and the type of lamp generates major inrush stress, it is recommended to combine a power actuator with each circuit:

- a contactor
  - an impulse relay with its latched-type control auxiliary
  - a Reflex iC60
- or
- a RCA iC60 (low rate of switching).



Know more about time management devices?







# 1. What you need to know about smart LED dimmers?

Schneider Electric provides various types of dimmers, wall mounted dimmers integrated in wiring devices for residential and small building applications, Rail DIN dimmers installed in switchboards for applications such as offices, hotels, healthcare, retail and outdoor lighting.

Dimmers integrate a wide range of technologies: wireless such as radiofrequency, Bluetooth low energy, wired technologies and bus technologies such as KNX and DALI. Today, LED lamps are available in all types: bulbs, spots, stripes and tubes. Different LED lamps need different dimmer behaviors from a technical point of view.

## What is a dimmer and how does it work?

- A dimmer is a control unit that varies the level of lighting from 0 to 100% of lighting power.
- Dimming is performed by varying the incoming voltage of the light. Dimmers depend on the type of lights or loads.
- Conventional dimmers use 2 technologies:
  - RL (leading edge) Inductive loads have a high outrush current,
  - RC (trailing edge) Capacitive loads have a huge inrush current.

## The dimmer range optimized for LED lamps

 **Wireless technology**  
Radio Frequency / Bluetooth



Universal dimmer insert for LED lamps (Push button, rotary, slide)



Universal LED dimmer micro-module



Universal DIN dimmers



KNX Universal dimming actuator





## 2. Wiser residential system

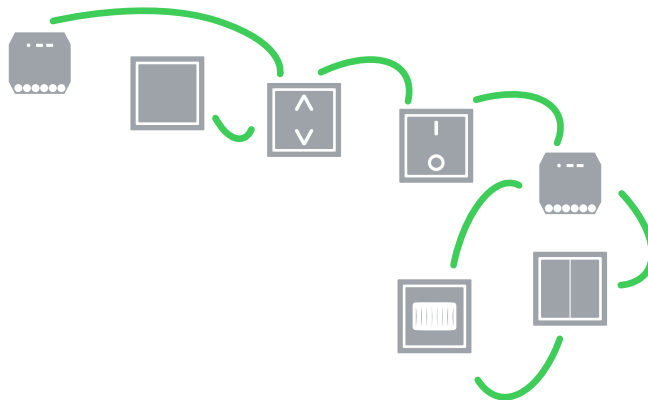
### Wiser in your home

Wiser is a convenient, flexible system for controlling building functions. Wiser offers you a wide range of solutions for your home to meet your preferences and requirements. These start with simple control solutions for individual lights or blinds, all the way up to multi-device room

control systems and even full home control systems. You can conveniently set and run all these options via the Wiser app. You can also add a wide range of Wiser devices to the Wiser app on your smartphone.

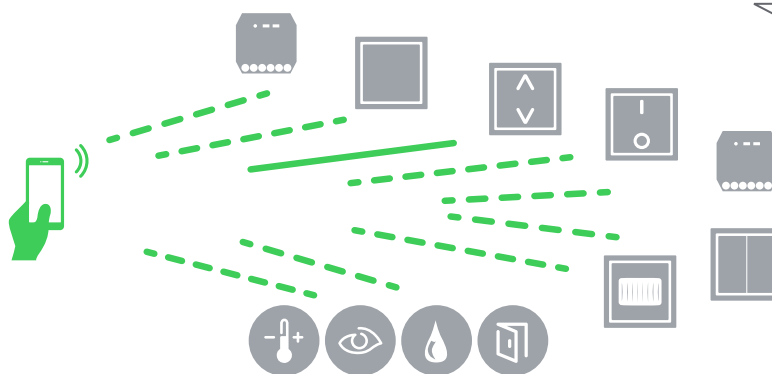
The room control system offers the following control options:

#### Networked operation without the Wiser app



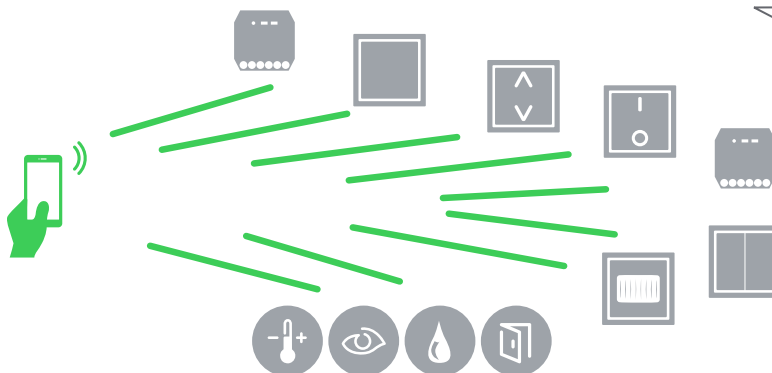
For certain applications, you can also set up a room control system using only Wiser devices without the need for the Wiser app. For example, you can connect Wiser modules to one or more Wiser push buttons flexibly and according to your specific requirements. Or you can pair two Wiser push button modules to set up a simple alternating switch system without any additional wiring.

#### Individual operation using the Wiser app



With the Wiser app, you can control all Wiser devices individually. To do this, pair the device in question with the app. This will allow you to adjust specific settings and set actions to run automatically. To do so, simply set up individual moments.

#### Parallel operation using the Wiser app



You can use the Wiser app to control multiple Wiser devices with a single operating step simply create a moment with multiple Wiser devices.



## 2. Wiser residential system

The home control system offers the following control options:  
Operation via Wi-Fi

### Is a single room not enough for you?

Then why not use Wiser with Wiser Home Touch to control functions in your entire building either using your own home network or from anywhere in the world via a cloud connection.

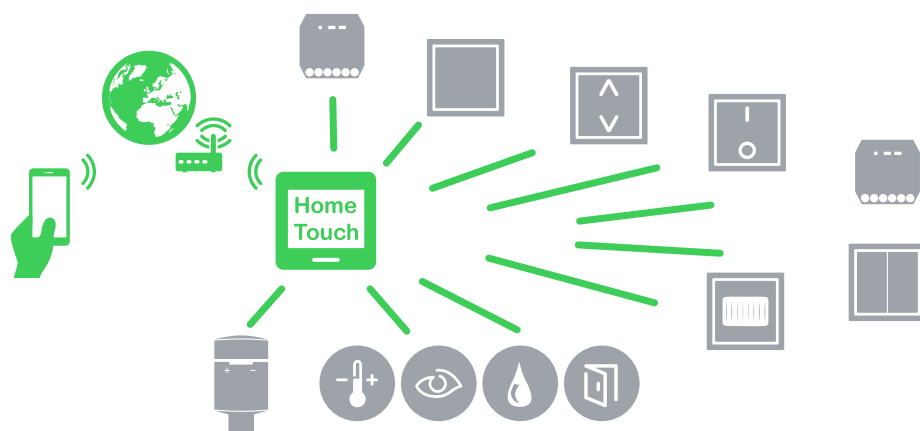
All the Wiser devices that you can connect in a room control system can also be used for your home control system.

You can convert devices you have already used for room control so that they can be controlled via Wiser Home Touch.

In this way, you will no longer be restricted by the Bluetooth range of the devices.

You will need the following items to set up a home control system:

- Wiser devices
- The Wiser Home Touch
- Your own Wi-Fi router
- Your smartphone with the Wiser app.



**Figure 20.** The Wiser Home Touch acts as the central transmission device in your Wiser network. It connects your smartphone to your Wiser devices via your router. In this system, your smartphone and Home Touch will communicate via Wi-Fi.

### Wiser Home Touch

- Easy pairing of multiple devices with the Wiser app
- Wiser Home Touch as a central communication element
- Wi-Fi transmission
- Wiser Home Touch setup in a few simple steps
- Worldwide access to your Wiser system.

## 2. Wiser residential system

### Wiser light and shutter devices



Unica Wiser  
relay switch  
NU353718



Unica Wiser universal  
push-button dimmer LED  
NU351520



Unica Wiser universal  
rotary dimmer LED  
NU351620



Unica Wiser blind  
control switch  
NU350818



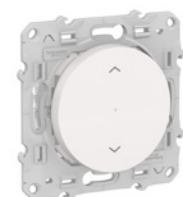
Odade Wiser  
relay switch  
S520530



Odade Wiser universal  
push-button dimmer LED  
S520522



Odade Wiser universal  
rotary dimmer LED  
S520513



Odade Wiser blind  
control switch  
S520567



Wiser dimmer micromodule  
CCT5010-0001



Wiser micro module light switch  
CCT5011-0001



Wiser micro module shutter  
CCT5015-0001





### 3. KNX tertiary system

KNX is the intelligent building control system for all areas in which your customers live and work. From single-family houses to office complexes, the comprehensive portfolio of KNX solutions from Schneider Electric enables you to achieve flexible, energy efficient, comfortable solutions that are easy to plan, install and operate.

#### Comfort

Everyone nowadays expects more comfort and convenience in their domestic and working lives. What is called for are comfortable solutions that can be operated straightforwardly and without fuss, to make living and working easier.

#### Cost efficiency

Intelligent networking of all building systems can avoid unnecessary energy consumption and reduce operating costs on a sustained basis. The ability to expand modular KNX system technology ensures economical solutions that are guaranteed to remain tailor-made over the long haul.



#### Flexibility

In order to allow for flexible room usage over several decades, it is necessary for building functions to be adapted to the users' requirements easily in a cost-effective way without the need for walls to be opened up and new cables to be laid.

#### Protection and security

To let residents feel as safe as possible, building technology must be able to react in a fast and intelligent way in any situation and at any time. No matter whether the building is full of life or quiet.



### 3. KNX tertiary system



#### The intelligent bus principle

In conventional electrical installations, the control functions are mostly carried over the load cables. This means each function needs its own control cable. The intelligent solution is achieved by the installation bus which carries all the control signals in a building, thus making subsequent changes easy to implement.

#### One bus for maximum flexibility

As part of a conventional electrical installation, it is necessary to specify how and where household systems are to be controlled prior to the building work. A KNX installation is flexible, because all functions can be changed and expanded at any time.

The two-wire installation bus routed in parallel to the 230 V electrical power supply connects all devices and systems of the household technology together and transmits all the control signals. This is based on fast transmission rates with the highest levels of immunity to interference.

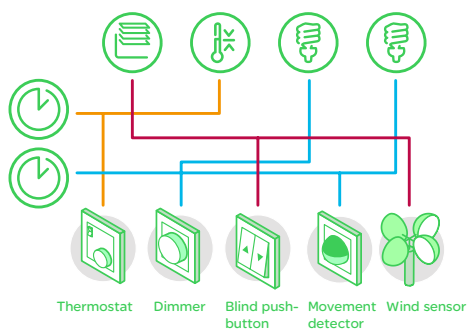


Figure 21. The conventional solution: many separate lines, meaning less flexibility.

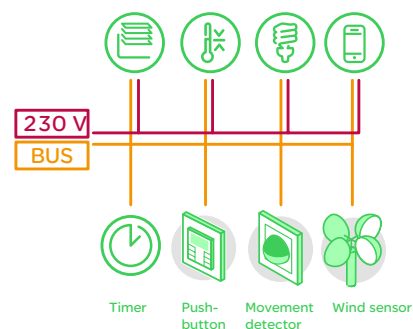


Figure 22. The intelligent KNX solution: the bus carries out all control functions for maximum flexibility.



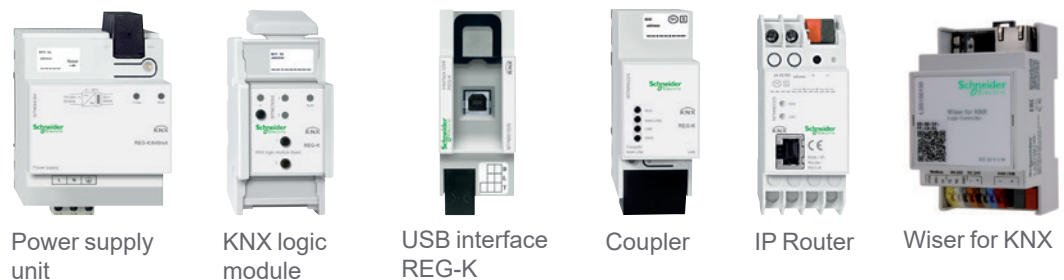
### 3. KNX tertiary system



All the devices for a KNX installation are connected together by a bus, thus allowing them to exchange data. The function of the individual bus devices is determined by their project planning, which can be changed and adapted at any time.

#### System devices

They are needed for the fundamental functioning of the system. They consist of power supply units for generating bus voltage, couplers for connecting bus segments and interfaces for connecting programming devices.



Power supply unit

KNX logic module

USB interface REG-K

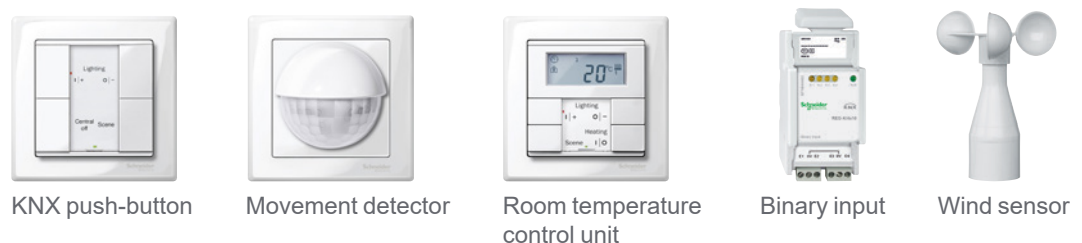
Coupler

IP Router

Wiser for KNX

#### Sensors

These are the starting point for every action, because they gather information and send it on the bus as a data telegram. This can be information about room temperatures, movements, wind measurements or manually input instructions.



KNX push-button

Movement detector

Room temperature control unit

Binary input

Wind sensor

#### Actuators

They receive data which are then converted into actions. This can include controlling blinds, dimming lights or controlling heating and air conditioning systems.



Switch actuator

Dimming actuator

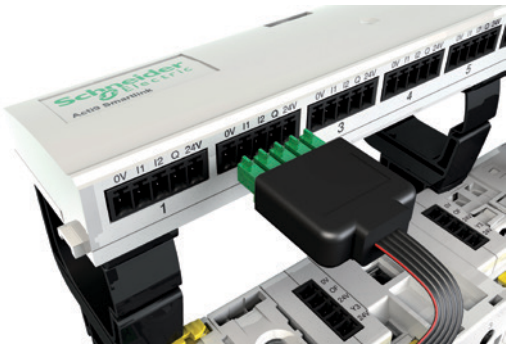
Heating actuator

Blind actuator

KNX DALI-Gateway



## 4. Acti9 SmartLink system



The Acti9 Smartlink is an open system that remotely measures, balances, monitors and controls final distribution.

It is designed to fit into tertiary building projects and integrates in a Building Management System or an Energy Management System.

It consists of:

- a Modbus Slave version (Acti9 Smartlink Modbus)
- a Modbus Master version (Acti9 Smartlink SI B) with the following functions: radio hub, Modbus gateway and embedded web server: this provides web pages for configuring the system, and real-time monitoring of values (status of circuit breakers, energy meters, alarms and monitoring and control).

These modules transmit data to a PLC or monitoring system.

### The system supports

- Alarm monitoring on current, voltage, power factor, tripping, power, consumption thresholds and their transmission by email.
- Monitoring and control via web pages of loads, energy and power by zone and by usage.
- Single access point for a full analysis of the status of switchboard power distribution (measurements, protection status, temperature, consumption, alarms, control and monitoring).

### Functions

#### Transmission of data collected by Acti9 switchgear assemblies

- Circuit breakers, residual current circuit breakers and residual current devices:
  - open/closed state, tripped state,
  - number of opening/closing cycles,
  - number of tripping actions.
- Contactors, impulse relays, Reflex iC60:
  - opening and closing control,
  - open/closed state,
  - number of opening/closing cycles,
  - total period of operation of the load (device closed).
- Remote controlled circuit breaker/Reflex iC60:
  - opening control ,
  - closing control ,
  - contactor open/closed state,
  - circuit breaker open/closed state,
  - number of opening/closing cycles,
  - total period of operation of the load.
- Pulse meters (energy, water, gas, etc.):
  - number of pulses recorded,
  - pulse value setting (default: 10 Wh),
  - total consumption recorded,
  - possibility of resetting energy meters.
- Digital inputs/outputs.



Know more about  
Acti9 SmartLink?





# 4. Acti9 SmartLink system

## Example of an installation



**Modbus master**

- Acti9 Smartlink SI B

**Ethernet link**

- Ethernet 10/100 MB, Modbus TCP server

**Wireless communication**

- No additional wiring
- Up to 20 sensors connected

**Analog inputs**

- 2 analog inputs, 0..10 V or 4..20 mA, e.g.: connection of a temperature probe

**Prefabricated cables**

- Simplified and faster cabling

**Modbus slave**

- Acti9 Smartlink Modbus

**Modbus communication**

- Up to 8 Acti9 Smartlink Modbus or other Modbus slaves connected

## Ethernet network connection

Acti9 Smartlink SI B has an embedded Web server used to display data showing the state of circuit breakers, energy meters, power data, phase unbalance and current alarms. Manual control is also possible via the Web page.

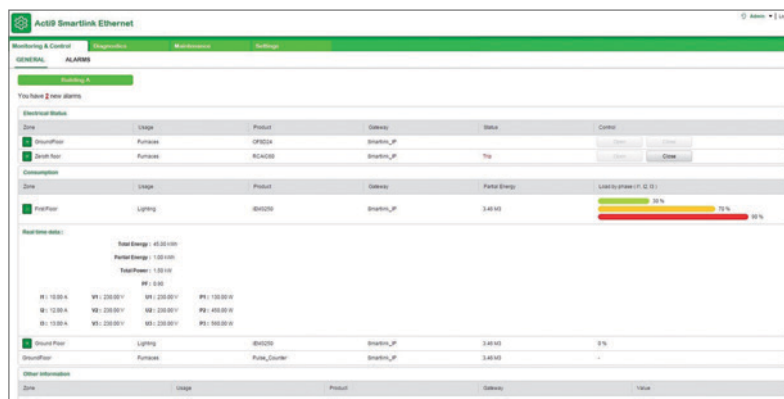


Figure 23. The Web server sets the parameters of the connection to the network servers (SNTP, SMTP), as well as the parameters of user emails and of the connection to the Facility Hero.com service





## 5. Acti9 PowerTag Link system



A9XMWD20

Acti9 PowerTag Link is an Ethernet connection concentrator (Modbus TCP/IP) for wireless devices with data display web pages.

The associated PowerTag energy sensors allow alarms to be managed via email for terminal loads, and energy, power, current and voltage to be measured accurately in real time.

The associated PowerTag Control modules are designed to monitor and control a circuit and notify wirelessly to the concentrator the information status of a contact (OF, SD, CT or TL position indication...).

The entire system can easily be installed in existing LV equipments using Multi9/Acti9/Compact NSX type circuit breakers.

### Data transmitted:

- Total and partial energy.
- Active power, apparent power, phase-to-phase and phase-to-neutral voltage.
- Currents I1, I2, I3.
- Power factor (cos phi).
- Voltage loss and overload information.
- Control order to a circuit.
- Information status of a contact.

### Functions

Acti9 PowerTag Link permits:

- Concentration of PowerTag (covered ranges Acti9 iC40/iC60, Multi9 and Compact NSX) wireless energy sensor data.
- Ethernet connection via the RJ45 port.
- Load monitoring:
  - alarm sent by the energy sensor in the event of a voltage loss,
  - pre-alarms on predefined thresholds (50 %, 80 %) or customized thresholds (thresholds on currents, power, voltages and cumulative energies),
  - load running time counter,
  - power synthesis (kW).
- Alarm management on current/voltage/load level thresholds by e-mail.
- Send control orders to PowerTag Control output to operate a load remotely.
- Collect status of contact from PowerTag Control input.
- Display of alarms and pre-alarms on Acti9 PowerTag Link embedded web pages.
- Easy integration into system with Com'X 200, Com'X 510 and other Schneider Electric software and third-party Building Management Systems (BMS) thanks to EcoStruxure Power Commission report in pdf format. This report provides dynamically all the Modbus registers and associated meanings for an easy integration into the system.
- Remote metering capability using the Acti9 PowerTag Link monitoring page.



### Commissioning software: EcoStruxure Power Commission <sup>[\*]</sup>

- Configuration and communication test of wireless devices
- Editing of a complete test report (pdf) with the Modbus communication registers for easy integration into a supervision system Windows XP, Windows 7, Windows 8 and Windows 10 compatible
- Downloadable from: <https://www.se.com/>

(\*): new name of Ecoreach software

### Installation

- On DIN rail (width 54 mm).
- 230 V AC power supply.

### Testing and start-up

- Pairing of wireless devices must be performed via the EcoStruxure Power Commission software, freely available by downloading.
- The software makes it possible, in particular, to attribute to each circuit a name, a use and the current rating (useful for alarms).



Know more about  
Acti9 PowerTag Link?



## 6. Acti9 PowerTag Link C system

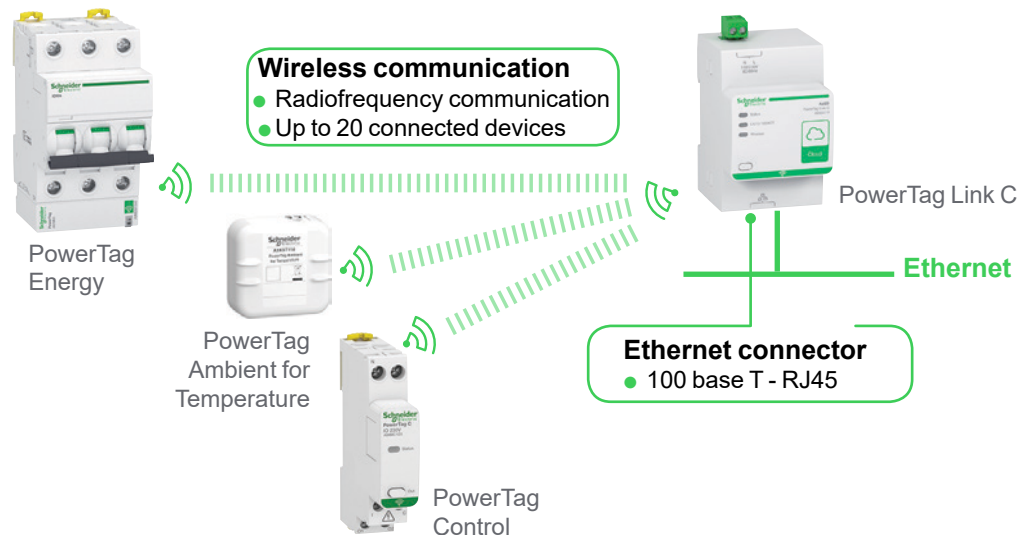
**Acti9 PowerTag Link C is a concentrator that connects the switchboard to the Facility Expert SB smartphone app. It permits:**

- Load monitoring with PowerTag Energy wireless sensors:
  - load state monitoring,
  - energy measurement.
- Temperature monitoring with PowerTag Ambient for Temperature.
- Sending of control orders to PowerTag Control output to operate a load remotely.
- Collection of status of contact from PowerTag Control input.
- Maximum of 20 wireless devices connected.

### Configuration, testing and setup

- Connected devices are configured and communication is tested via the "eSetup" app.

### Example of an installation with PowerTag Link C



Note: for additional information and list of Schneider Electric compatible devices, refer to the selection guide [CA908058E](#).

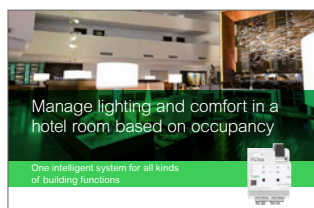
Know more about  
Acti9 PowerTag Link C?



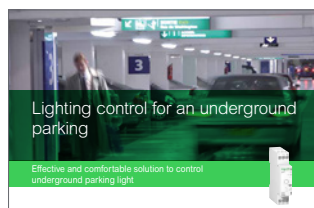








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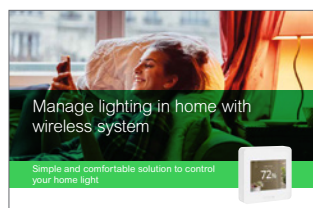
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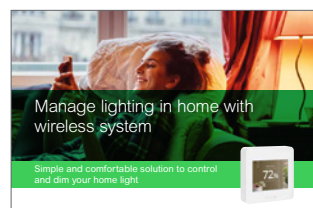
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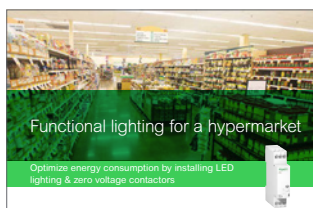
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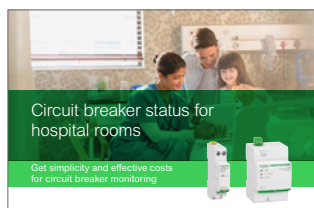
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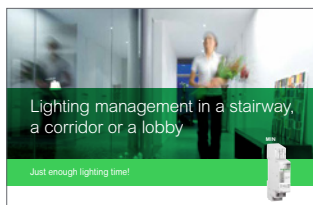
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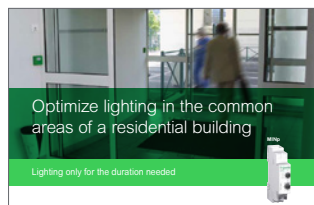
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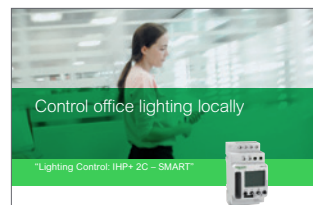
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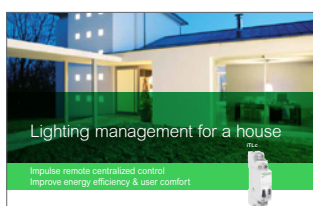
Lighting management in a stairway, a corridor or a lobby  
 > page 68



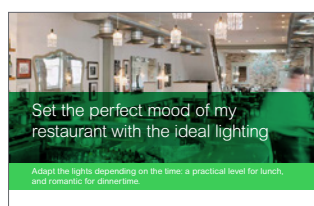
Optimize lighting in the common areas of a residential building  
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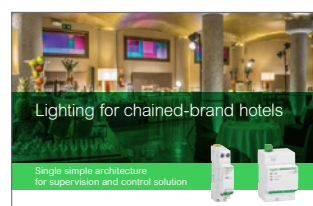
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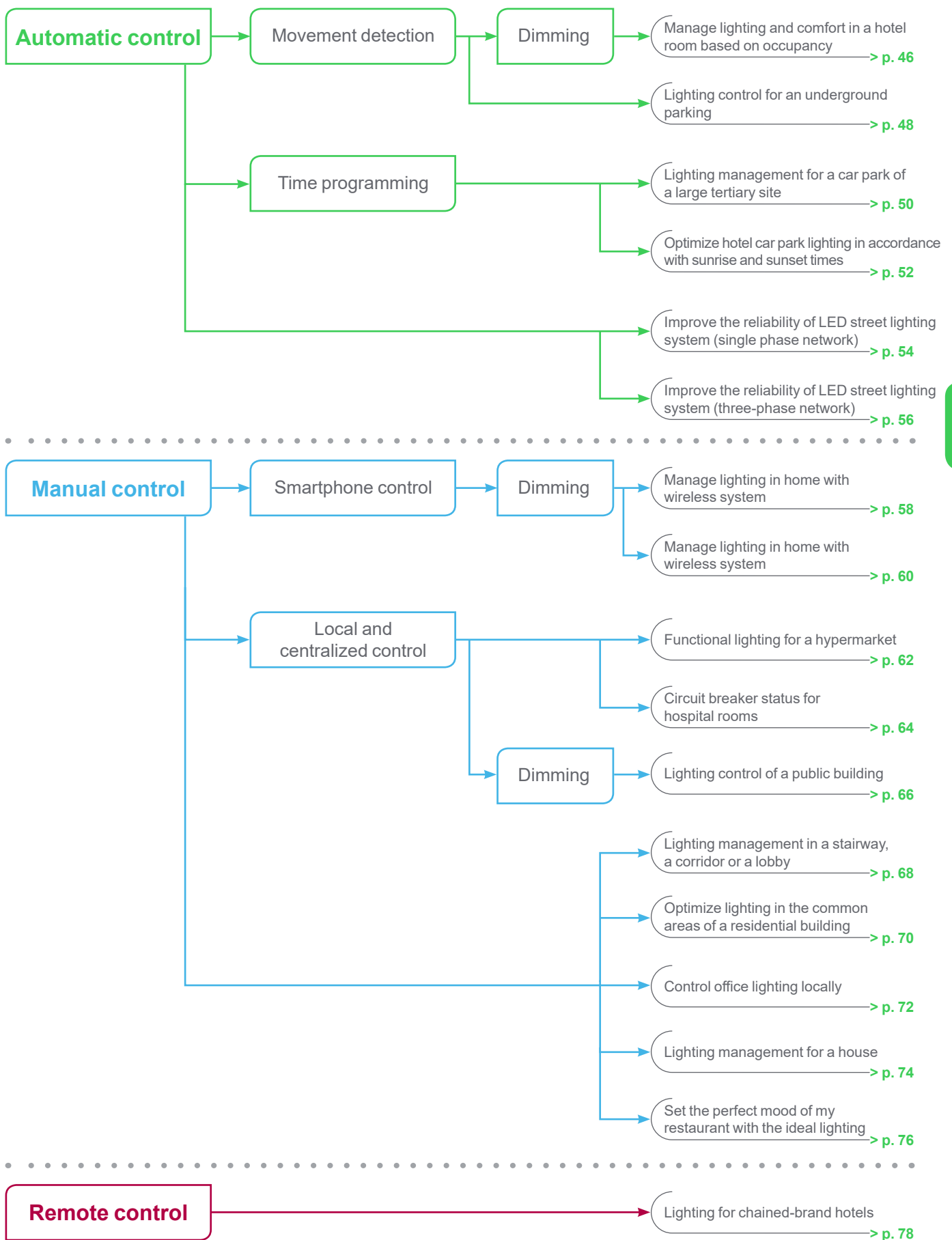


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D



# Contents





# Manage lighting and comfort in a hotel room based on occupancy

One intelligent system for all kinds of building functions



## Customer case

The manager of a future new hotel wants to ensure guest satisfaction, operational efficiency and sustainability performance of lighting and heating in his hotel.

## Benefits

- KNX is an international and future-proof standard.
- Less wiring and increased level of possible functions: products all fit the same standard and can operate together across the same network.
- Flexibility is a particularly strong benefit of a KNX solution. Needs change within a building's environment, so a flexible control solution allows adaptations with minimal disruption.

## Our recommendation

Centralized and dynamic building management system based on KNX technology controls lighting, heating and energy consumption in the common areas and the guest rooms. The same system offers the possibility for the customers to change the settings in their room according to their wishes.

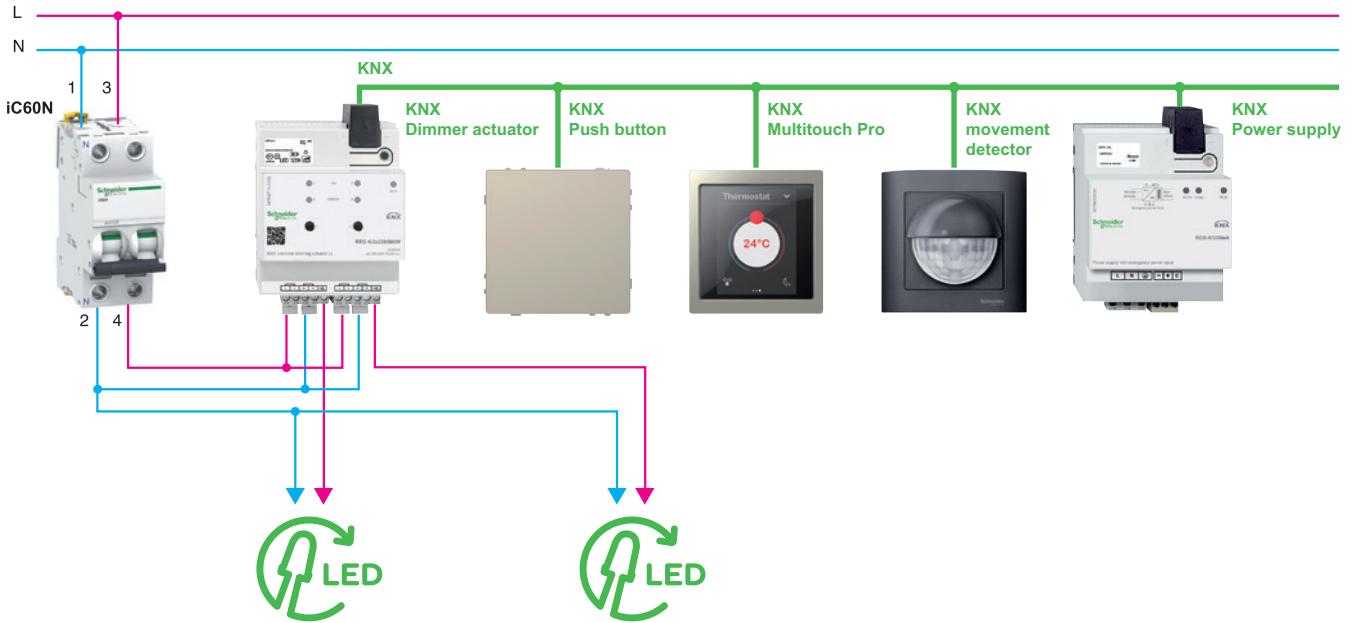
KNX dimmer actuators, KNX push button movement detection and multitouch pro manage and control lighting in the room as well as staff service requests.

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# Solution Diagram



## Specifications

- All components of the solution should communicate through KNX International Standard.
- The dimmer actuator should automatically recognize the connected load.
- On one channel, the combinations of ohmic and inductive, or ohmic and capacitive loads can be done. The combinations of inductive and capacitive loads will not be possible on one channel.

Products used			
Product	Function	Quantity	Reference
Acti9 iC60N 2P	MCB	1	Depend on rating
KNX	Dimming actuator	1	MTN6710-0002
KNX	Power supply	1	MTN683832
KNX	Push-button pro	1	MTN6180-6033
KNX multitouch pro	Room controller	1	MTN6215-5910
KNX	Movement sensor	1	MTN632714

More about KNX Dimmer actuator



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# Lighting control for an underground parking

Effective and comfortable solution to control underground parking light



## Customer case

For his new building, the building manager wishes to optimize car park lighting operation and control energy costs. Also he wants to increase the building resident's comfort by ensuring lighting for people's movement.

The lighting should automatically be extinguished after a certain time, once the people have left.

It must be possible to override the automatic system to switch on the lighting by remote override control in case of maintenance.

## Benefits

- Cost optimization by providing light at the right time, only when it is needed.
- Comfort: automatic switching on without having to look for the lighting control.
- Reliability with zero crossing technology contactor to limit the inrush current coming from LED luminaires.

## Our recommendation

Thanks to the silent zero crossing contactor Acti9 iCT+, the LED lighting can be controlled without any issues.  
Thanks to the Argus 360 which allows detection of people in movement, the lighting comes on automatically for a given period.  
A two position wall switch, located at the main entrance of the parking, can be used to switch on the lighting by override control if necessary.

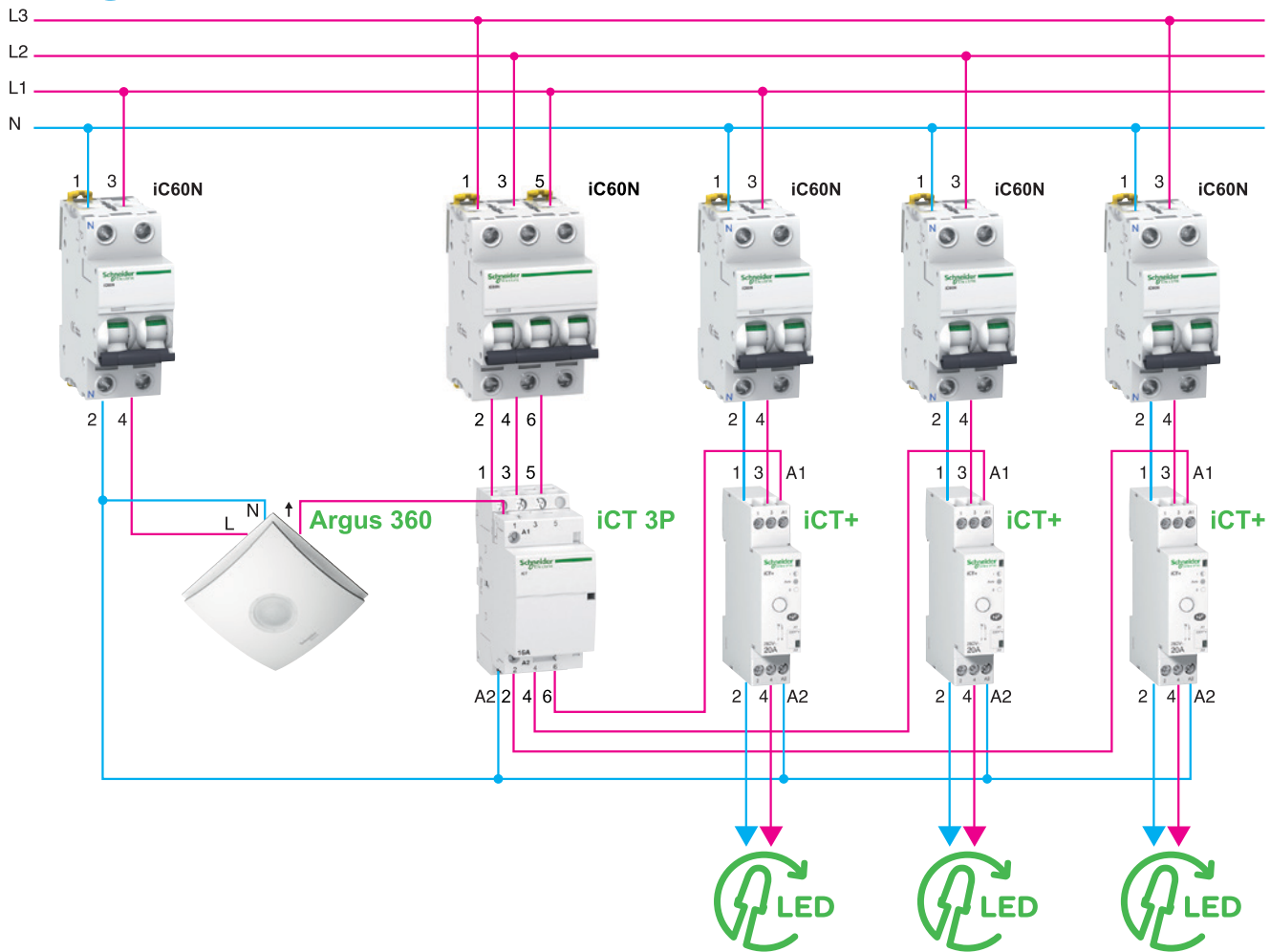
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# Solution

## Diagram



## Specifications

- Zero crossing voltage contactors must be installed to limit the inrush current when the light units are powered up.
- The lighting system is activated by movement detection.
- The phase used as control input of zero crossing voltage contactor must be the same than the distributed power phase.

Products used			
Product	Function	Quantity	Reference
Acti9 iC60N	MCB 2P	3	Depend on rating
Acti9 iC60N	MCB 2P	1	Depend on rating
Acti9 iC60N	MCB 3P	1	Depend on rating
Acti9 ICT	3P 16 A Contactor	1	A9C22813
Acti9 ICT+	1P 20 A silent contactor	3	A9C15031
Argus 360	360° indoor movement detector	1	CCT56P002

More about  
Acti9 ICT+



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# Lighting management for a car park of a large tertiary site



## Control lighting duration

### Customer case

The facility manager of a large tertiary site wants to automate the lighting system of the outdoor car park according to the time and position of the sun, without connecting a light sensor.

For cost saving reasons, after a certain time, only one lamp post out of two should remain lit.

He needs the lighting system to be programmed to operate only on working days.

He also wants the possibility to remotely override control of the lighting if necessary for maintenance operations.

### Our recommendation

The use of the Acti9 IC Astro 2C - SMART astronomical twilight switch allows:

- car park lighting according to the sun position without any sensor to wire,
- the control of 2 independent lighting circuits,
- the programming of lighting days and times,
- the possibility of override control of the lighting via a simple push button.

### Benefits

- No need for a brightness detector, so greater operating reliability and easier maintenance and installation.
- The liquid crystal display permanently shows: hour and minutes, day of the week, current operating mode and current program.
- Manual override of temporary or permanent On and Off status is possible.
- The change to summer / winter time is automatic.
- Easy to program via PC KIT LTS software.

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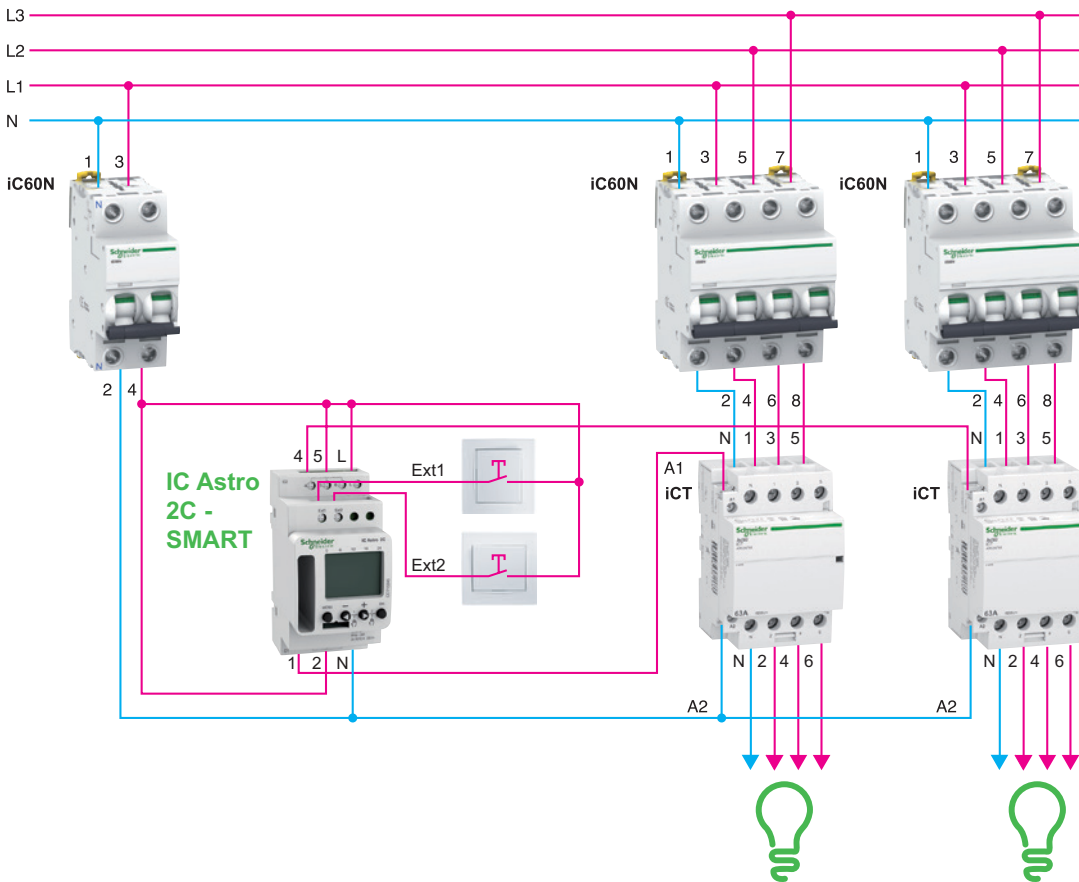
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# Solution Diagram



## Specifications

- The programmable twilight switch is configured only according to the place of installation either by selection of a country or town or by its geographical coordinates, latitude and longitude.
- Programming shall be done with software for PC.

More about  
IC ASTRO 2C -SMART



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Products used			
Product	Function	Quantity	Reference
Acti9 iC60N	MCB 1P+N	1	Depend on rating
Acti9 iC60N	MCB 3P+N	2	Depend on rating
Acti9 IC Astro 2C - SMART	Programmable twilight switch with 2 output contacts	1	CCT15245
Acti9 iCT	63 A 3P+N contactor	2	A9C24763

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# Optimize hotel car park lighting in accordance with sunrise and sunset times

“Lighting control: IC Astro 1C - SMART twilight switch”



## Customer case

The hotel manager wishes to optimize car park lighting operation. The comfort and security of hotel guests are paramount. The manager also wishes to control energy costs.

## Our recommendation

Use a one-channel programmable astronomical twilight switch allowing automatic switch-on and switch-off of lighting according to sunrise and sunset times.

## Benefits

- A heightened feeling of security is provided at minimum cost as the lighting is always On when required.
- No need for a brightness detector so greater operating reliability and easier maintenance and installation.
- The liquid crystal display permanently shows hour and minutes, day of the week, current operating mode and current program.
- Manual override of temporary or permanent On and Off status is possible.
- The change to summer/winter time is automatic.

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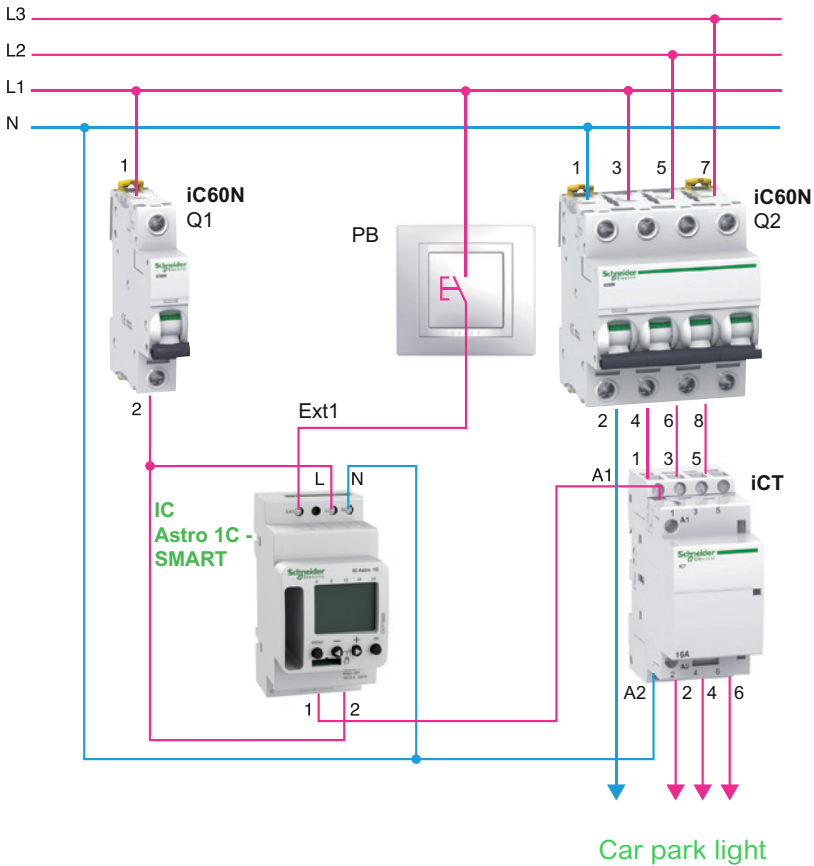
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# Solution

## Diagram



## Specifications

- The programmable twilight switch is configured only according to the place of installation either by selection of a country or town or by its geographical coordinates, latitude and longitude.
- The rating of the contactor and the protection circuit-breaker depends on installed power and load type.

Products used			
Product	Function	Quantity	Reference
Acti9 IC Astro 1C - SMART	Programmable astronomic twilight switch, 1 channel	1	CCT15225
Acti9 iC60N 1P	MCB Q1	1	Depend on rating
Acti9 iC60N 4P	MCB Q2	1	Depend on rating
Acti9 iCT 3P	Modular contactor	1	Depend on rating

More about  
IC Astro 1C-SMART



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# Improve the reliability of LED street lighting system (single phase network)

Reduce the maintenance & ensure longer service life with zero voltage contactors and overvoltage protection devices



## Customer case

Due to the transition from conventional lighting technology to LED technology, the town hall technical department wants to have a compatible solution with all the light units on the market.

The solution must minimize maintenance operations thanks to increased reliability and it must be possible to interface it with existing installations.

## Benefits

- Designers: complete, simple, integrated and scalable solution.
- Ease of installation: this solution allows existing facilities to be refurbished, has smaller physical dimensions, is simple to install and easier to implement.
- Optimized maintenance: protection against the effects of lightning.
- Improve the return on investment through an optimal technical and economic solution.

## Our recommendation

The use of the Acti9 iCT+ allows to reduce the peak current at power up and also the use of the circuit breakers without any derating. The amount of wear on the switchgear is therefore limited and its service life maximized.

Acti9 iQuick PRD surge arresters are used to protect power circuits. Acti9 iPRI surge arresters are used to protect communication systems that are sensitive to overvoltages.

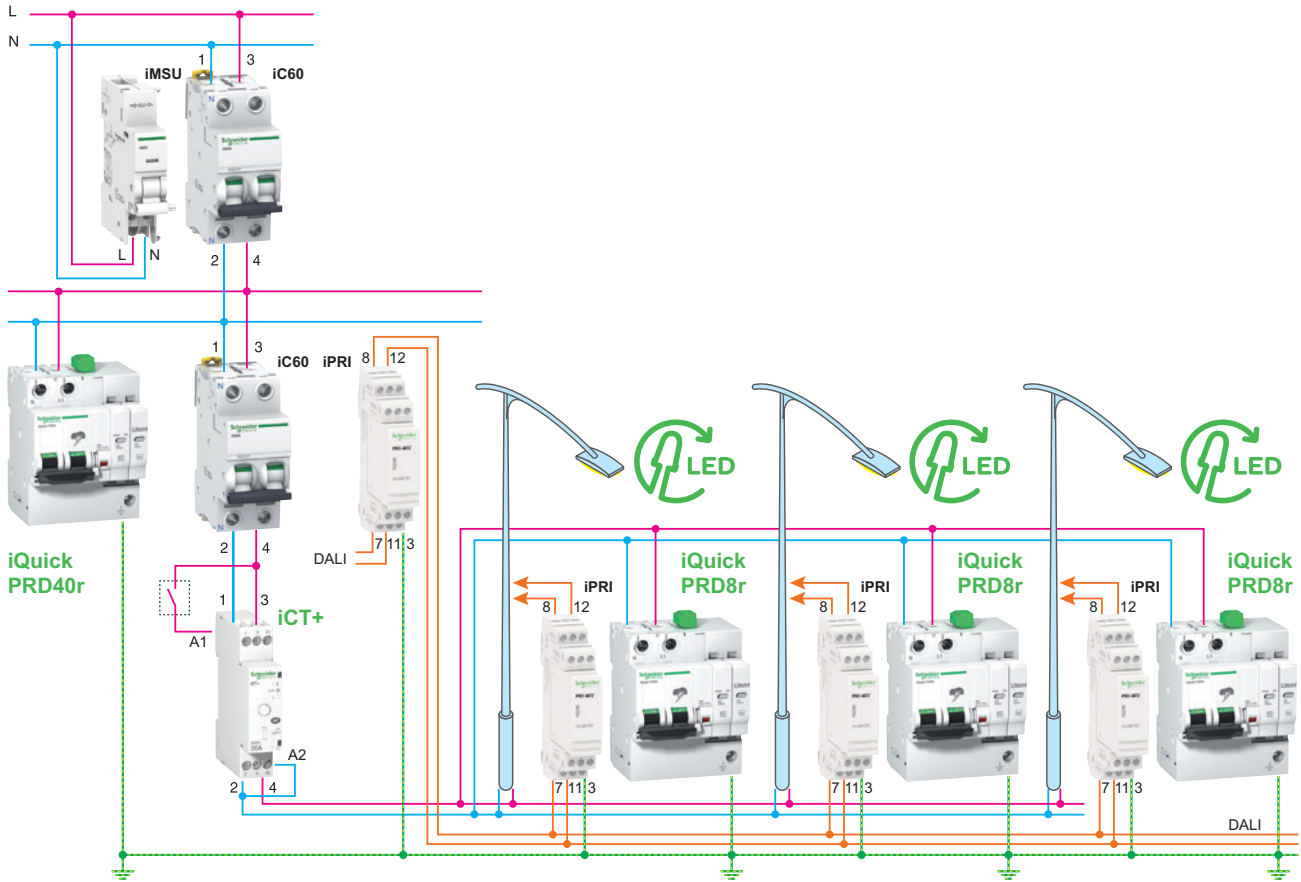
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# Solution Diagram



## Specifications

- A zero voltage contactor must be installed to limit the inrush current when the light units are powered up.
- An overvoltage relay is necessary to provide protection against temporary industrial frequency overvoltages.
- Energy network surge arresters that are coordinated and fitted with disconnectors must be installed in the distribution enclosure and in the base of each pole.
- Communication network surge arresters must be installed in the distribution enclosure and in the base of each pole.

Products used			
Product	Function	Quantity	Reference
Acti9 iQuick PRD40r (*)	1P+N withdrawable surge arrester (Type 2)	1	A9L16292
Acti9 iQuick PRD8r	1P+N withdrawable surge arrester (Type 2)	3	A9L16298
Acti9 iC60N	1P+N MCB	2	Depend on rating
Acti9 iCT+	1P+N 20 A contactor with manual control	1	A9C15031
Acti9 iPRI	Surge arrester for communication network	4	A9L16339
Acti9 IMSU	Voltage threshold release	1	A9N26500

(\*) If lightning rod close to the installation: use Type 1 + 2 surge arrester, Acti9 iPRF1 12.5r (A9L16632) + associated disconnector Acti9 iSW.

More about Acti9 iCT+



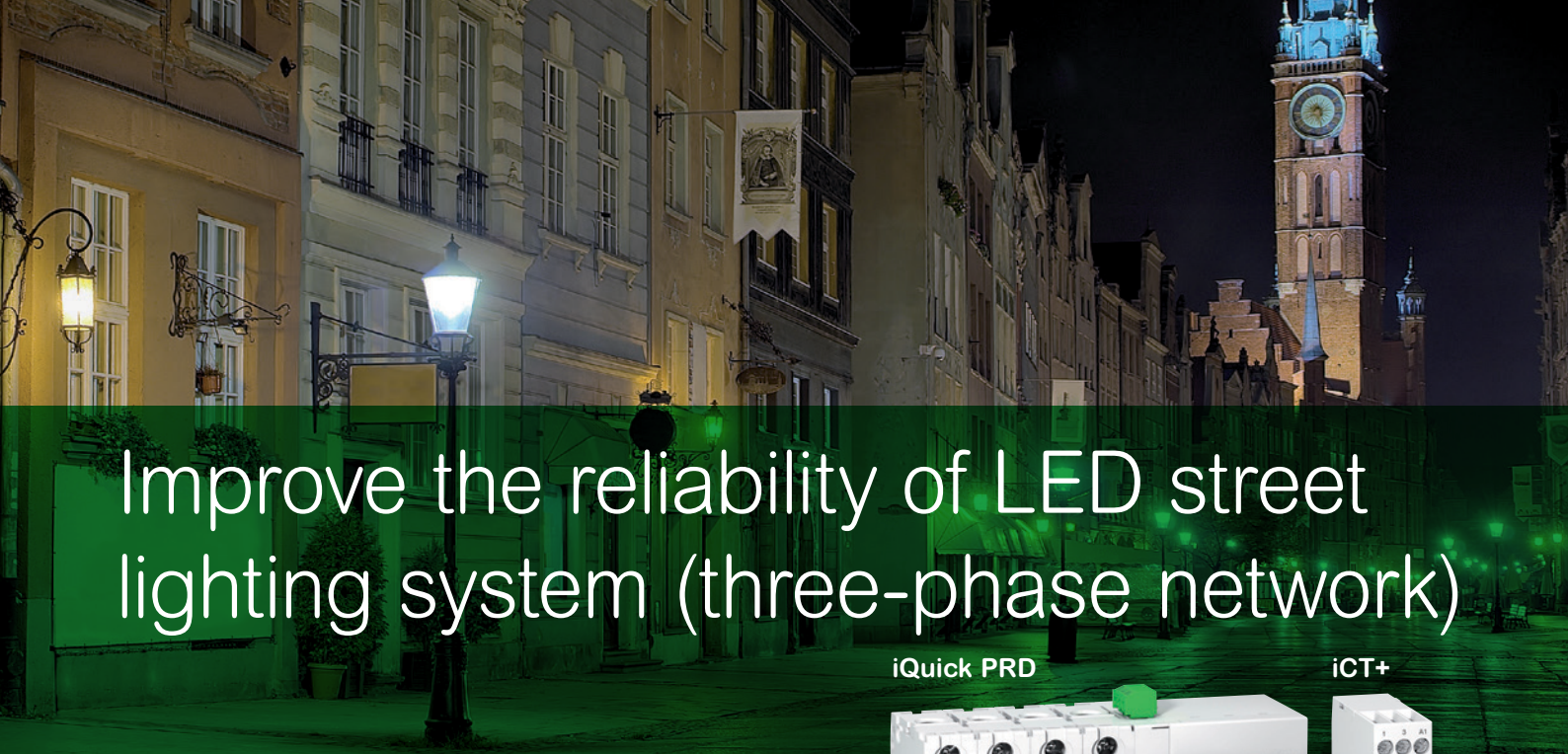
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# Improve the reliability of LED street lighting system (three-phase network)

Reduce the maintenance & ensure longer service life with zero voltage contactors and overvoltage protection devices

iQuick PRD

iCT+



## Customer case

Due to the transition from conventional lighting technology to LED technology, the town hall technical department wants to have a compatible solution with all the light units on the market.

The solution must minimize maintenance operations thanks to increased reliability and it must be possible to interface it with existing installations.

## Benefits

- Designers: complete, simple, integrated and scalable solution.
- Ease of installation: this solution allows existing facilities to be refurbished, has smaller physical dimensions, is simple to install and easier to implement.
- Optimized maintenance: protection against the effects of lightning.
- Improve the return on investment through an optimal technical and economic solution.

## Our recommendation

The use of the Acti9 iCT+ allows to reduce the peak current at power up and also the use of the circuit breakers without any derating. The amount of wear on the switchgear is therefore limited and its service life maximized.

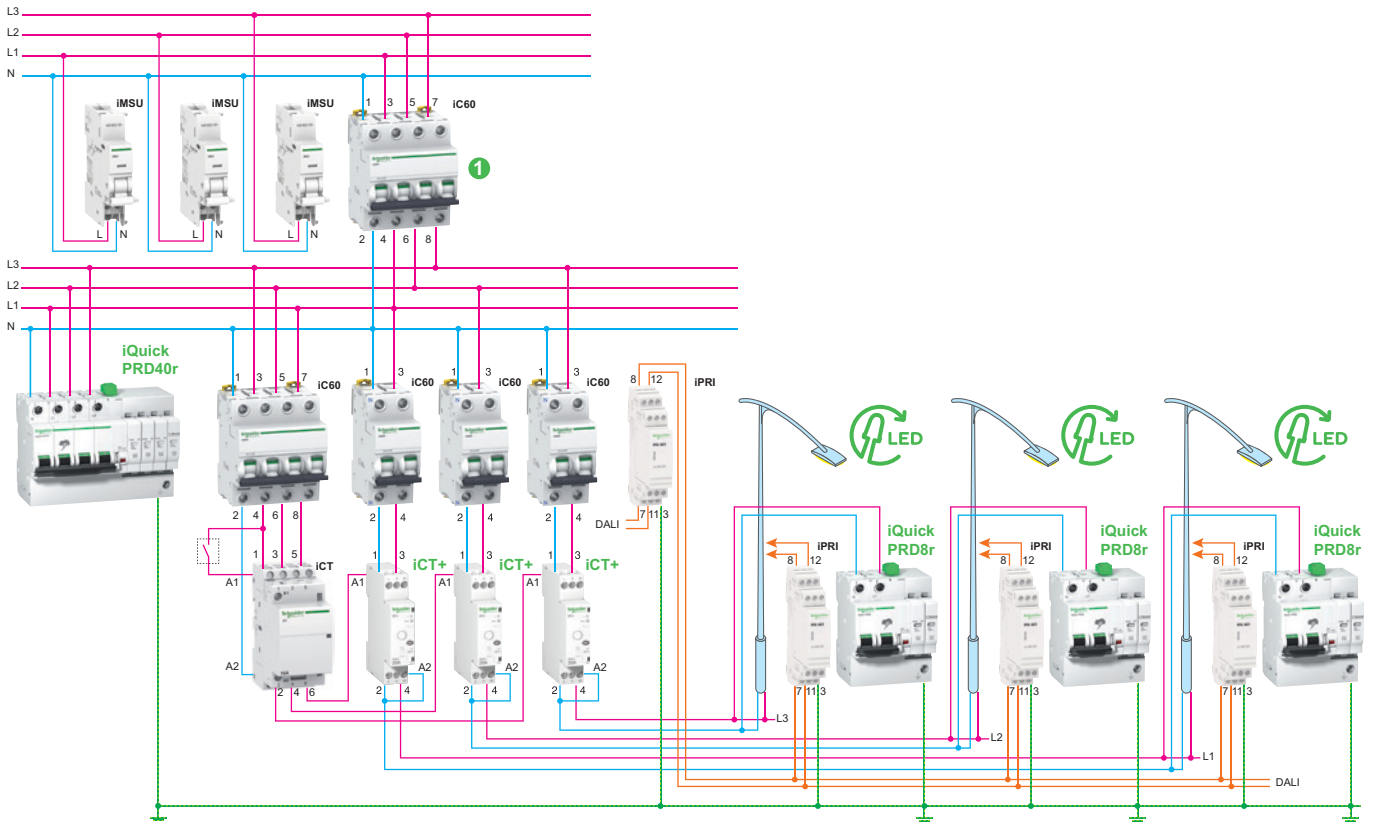
Acti9 iQuick PRD surge arresters are used to protect power circuits. Acti9 iPRI surge arresters are used to protect communication systems that are sensitive to overvoltages.

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# Solution Diagram



Note: for electrical lockout, 3 poles and neutral must be opened with corresponding upstream IC60 ①.

## Specifications

- A zero voltage contactor must be installed to limit the inrush current when the light units are powered up.
- An overvoltage relay is necessary to provide protection against temporary industrial frequency overvoltages.
- Energy network surge arresters that are coordinated and fitted with disconnectors must be installed in the distribution enclosure and in the base of each pole.
- Communication network surge arresters must be installed in the distribution enclosure and in the base of each pole.

Products used			
Product	Function	Quantity	Reference
Acti9 iQuick PRD40r (*)	3P+N withdrawable surge arrester (Type 2)	1	A9L16294
Acti9 iQuick PRD8r	1P+N withdrawable surge arrester (Type 2)	3	A9L16298
Acti9 iC60N	1P+N MCB	3	Depend on rating
Acti9 iC60N	3P+N MCB	2	Depend on rating
Acti9 iCT+	1P+N 20 A contactor with manual control	1	A9C15031
Acti9 iCT	25 A 3P contactor	1	A9C20833
Acti9 iPRI	Surge arrester for communication network	4	A9L16339
Acti9 iMSU	Voltage threshold release	1	A9N26500

(\*) If lightning rod close to the installation: use Type 1 + 2 surge arrester, Acti9 iPRF1 12.5r (A9L16632) + associated disconnector Acti9 iSW.

More about Acti9 iCT+



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# Manage lighting in home with wireless system

Simple and comfortable solution to control your home light



## Customer case

A couple is looking for a simple solution to manage lighting in their home.

They want to switch on and off the main light either locally or from their mobile phone. Also they want to dim individually their light, create and schedule different moments.

## Benefits

- Easy to install and use.
- Comfort by adjusting the lights without ruining the moment and changing the ambiance with a single tap.
- Control lights at home when you are away.

## Our recommendation

Thanks to the Unica (or ODACE) Wisier dimmer, you can turn on, off, or dim the lights from your smartphone. You can also remotely illuminate the house before you get home or switch the lights off when you're out to limit energy loss.

Also, the Wisier Home Touch is the hub for Wisier products, and a touch screen from which you can change modes, moments, and the temperature. Connect it to Wi-Fi for remote control of your home from anywhere, at any time, via the Wisier app. It keeps you in control of your home even when your phone is out of reach.

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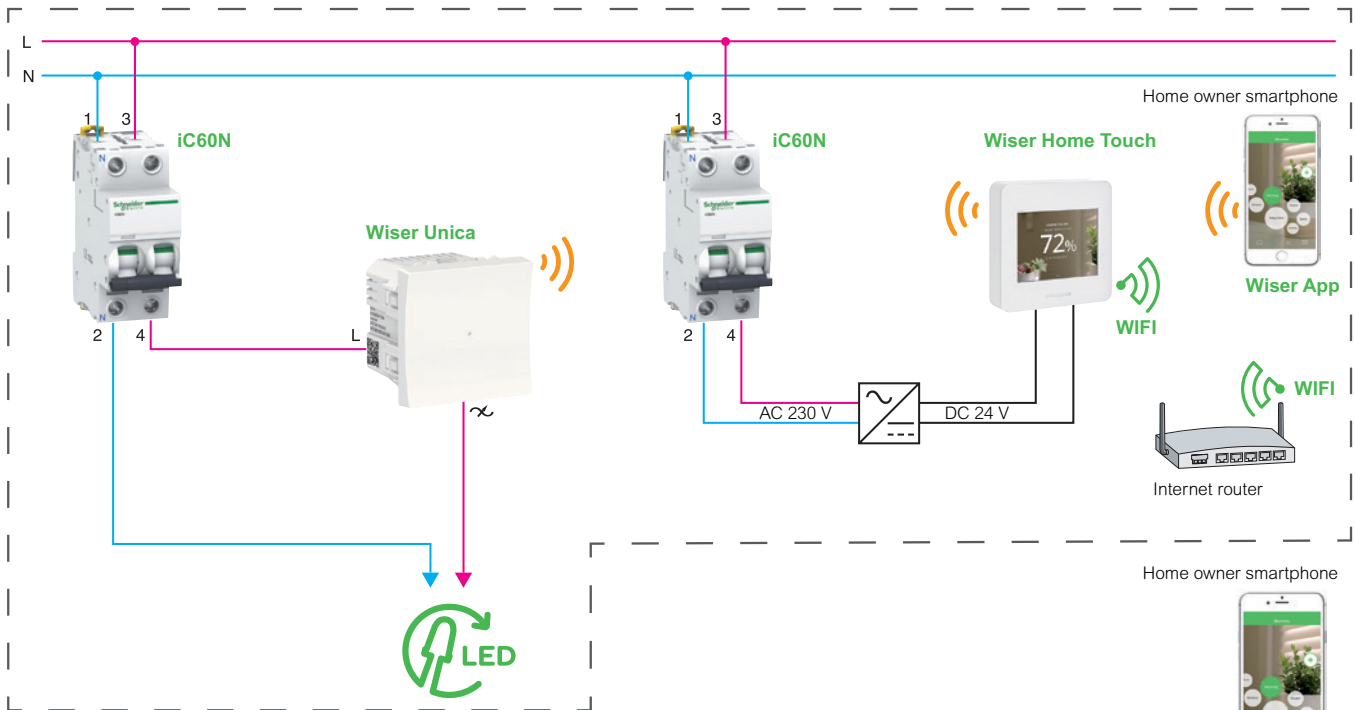
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# Solution Diagram



Note: refer to Schneider Electric Instruction Sheet to choose and use appropriate product for your installation.

## Specifications

- Manual control of the dimmer will be possible locally and it will be possible to connect additional mechanical push buttons.
- Lights will be controlled manually and locally using a smartphone app using Bluetooth or WIFI connection, and remotely using a smartphone app and smartphone connection.
- Installation will be done using add-on modules directly installed into the wall that will enable remote control and dimming of the lights.

Products used			
Product	Function	Quantity	Reference
Acti9 iC60N 2P	MCB	2	Depend on rating
Wiser Unica (or Wiser Odace)	Dimmer	1	NU351520 / NU351620 / S520522 / S520513
Wiser Home Touch	Touch panel	1	CCT501500

More about Wiser



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# Manage lighting in home with wireless system

Simple and comfortable solution to control and dim your home light



## Customer case

A couple is looking for a simple solution to manage lighting in their home.

They want to switch on and off the main light either locally or from their mobile phone. Also they want to dim individually their light, create and schedule different moments.

## Benefits

- Easy to install and use.
- Comfort by adjusting the lights without ruining the moment and changing the ambiance with a single tap.
- Control lights at home when you are away.

## Our recommendation

Thanks to the Wiser dimmer micromodule, you can turn on, off, or dim the lights from your smartphone. You can also remotely illuminate the house before you get home or switch the lights off when you're out to limit energy loss.

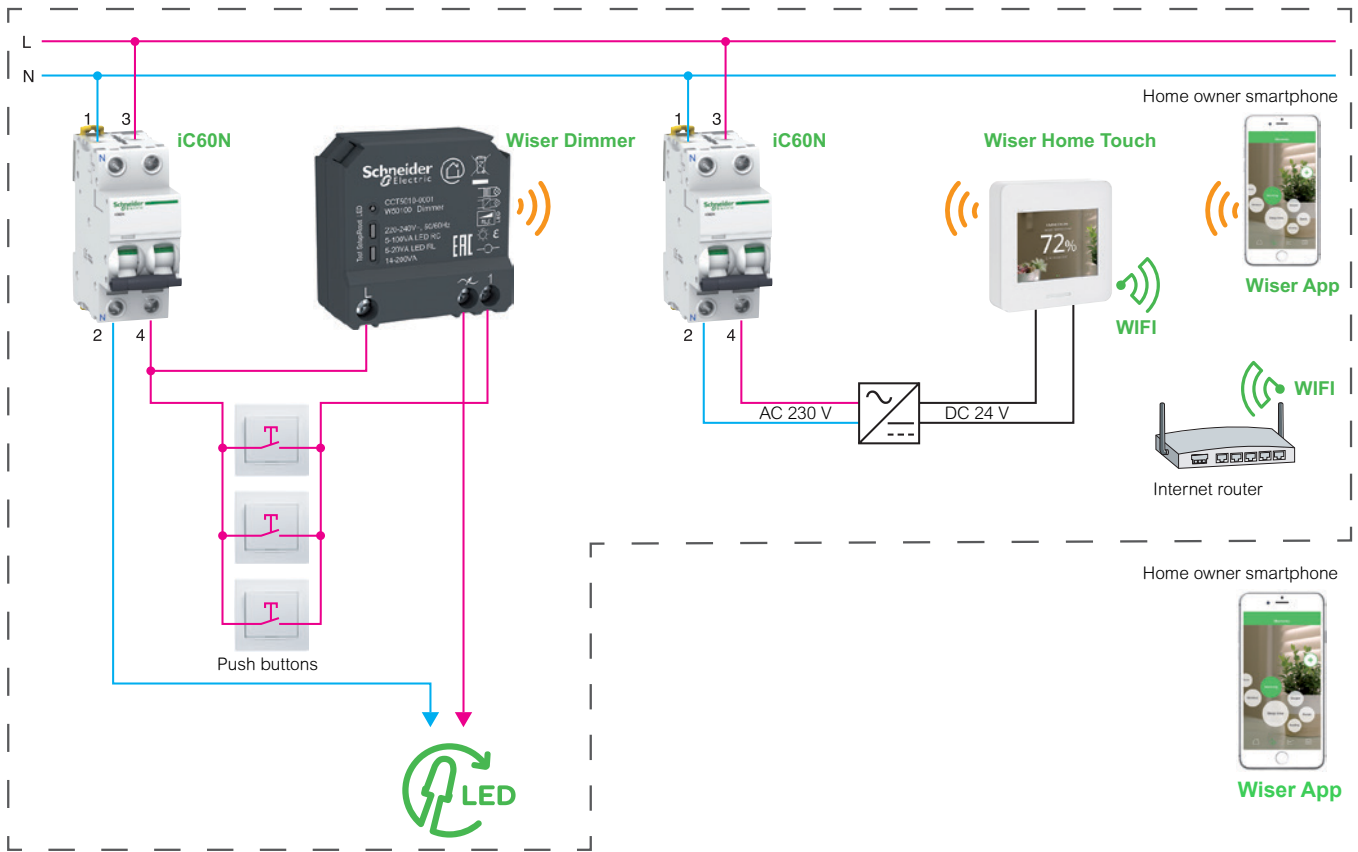
Also, the Wiser Home Touch is the hub for Wiser products, and a touch screen from which you can change modes, moments, and the temperature. Connect it to Wi-Fi for remote control of your home from anywhere, at any time, via the Wiser app. It keeps you in control of your home even when your phone is out of reach.

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# Solution Diagram



Note: refer to Schneider Electric Instruction Sheet to choose and use appropriate product for your installation.

## Specifications

- Lights will be controlled manually and locally using a smartphone app with Bluetooth or WIFI connection, and remotely using a smartphone app and smartphone connection.
- Installation will be done using add-on modules directly installed into the wall that will enable remote control and dimming of the lights.
- Manual control will be possible with up to 10 mechanical push buttons spread out into the room.

Products used			
Product	Function	Quantity	Reference
Acti9 iC60N	2P MCB	2	Depend on rating
Wiser micro module	Dimmer	1	CCT5010-0001
Wiser Home Touch	Touch panel	1	CCT501500

More about  
Wiser



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# Functional lighting for a hypermarket

Optimize energy consumption by installing LED lighting & zero voltage contactors



## Customer case

The Maintenance Department of a hypermarket want to replace the T12 fluorescent tubes of the functional lighting system with far more efficient LED luminaires.

Also they don't wish to change the distribution architecture or the type of protection (long cable length), or increase the number of feeders in the electrical switchboard.

For a given illumination level, the installed capacity with LEDs is far smaller, but the current peaks generated at power up could possibly cause unwanted tripping of the B-curve protective circuit breakers.

## Benefits

- Reduction of current peaks within a ratio of 4 to 5 at power up, thanks to the use of Acti9 iCT+ contactors, which will make it possible to:
  - keep the former protection system,
  - minimize the risk of nuisance tripping,
  - limit the level of overvoltage generated at power up and reduce "stress" for the LED drivers (Soft Start concept).

## Our recommendation

Replace the standard contactors with a zero voltage crossing contactors Acti9 iCT+.

Keep the protective circuit breakers with the same characteristics (ratings, curves).

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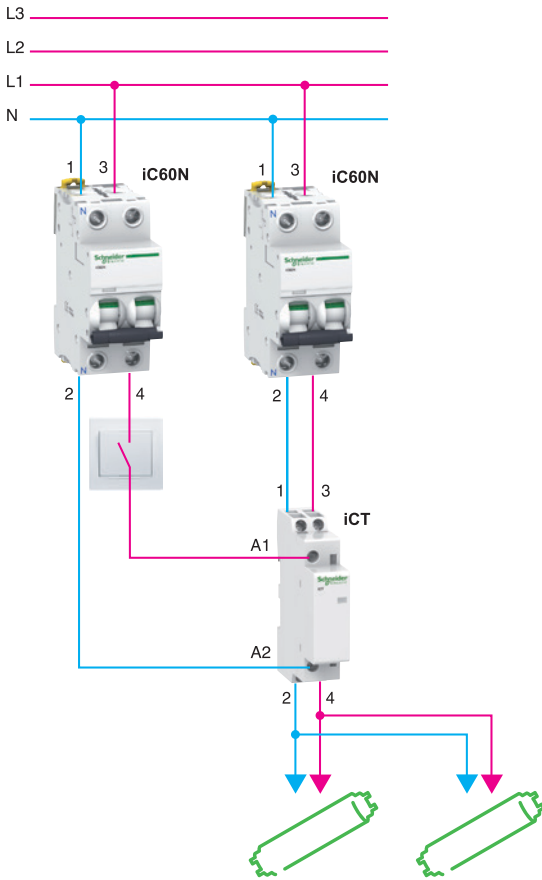




# Solution Diagram

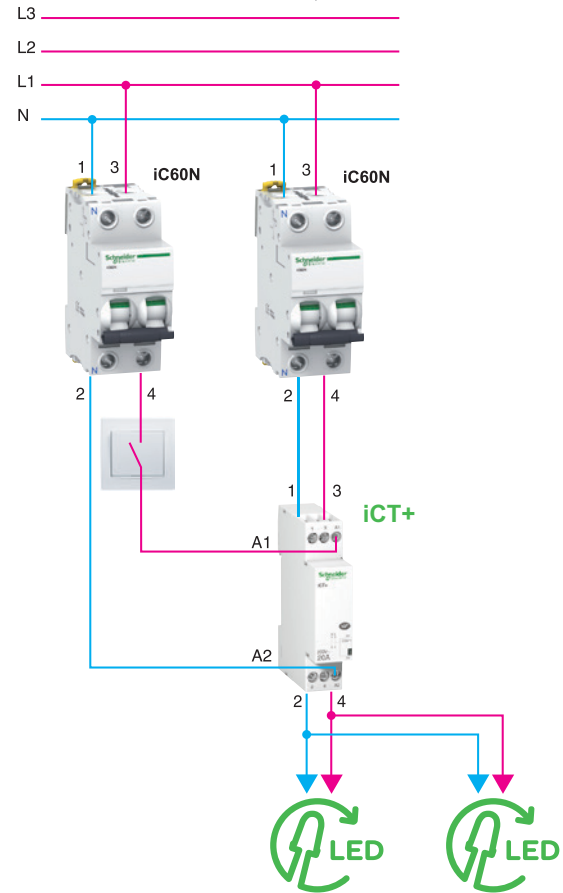
## Before

Old installation with iCT and fluorescent tubes



## After

New installation with iCT+ and LED lamps



## Specifications

- The replacement of the T12 fluorescent tube lighting system must not require:
  - a change of architecture,
  - a change in the characteristics of protective devices.

Products used			
Product	Function	Quantity	Reference
Acti9 iCT+	Silent contactor	1	A9C15030
Acti9 iC60N	1P+N MCB	1	Depend on rating
Acti9 iC60N	1P+N MCB	1	Depend on rating

More about Acti9 iCT+



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# Circuit breaker status for hospital rooms

Get simplicity and effective costs for circuit breaker monitoring



## Customer case

The hospital facility manager wants to be notified whenever a fault occurs on the electrical installation. For the hospital room, he wants to know quickly where the fault is located and speed-up the time to repair.

## Our recommendation

The use of Schneider Electric wireless communication technology brings the combination of both metering and monitoring functions in one single architecture for low voltage installation:

- add PowerTag Energy sensors to your protection devices for metering, without extra footprint,
- add PowerTag Control 2DI module to monitor various loads such as circuits of patients' rooms,
- connect all of them to the same gateway.

## Benefits

### Innovative alternative

- Deliver similar metering and monitoring features with improved modularity thanks to wireless technology: a single gateway for monitoring and metering.

### Simplicity

- A single alarm for each application in room (lighting, socket, bed-head), thanks to daisy-chained auxiliary contacts.
- Plug and play wireless system.
- Reduced commissioning time for both metering and monitoring to supervision integration.

### Improve power availability & optimize maintenance

- Ensure serenity for the occupants, thanks to a faster detection of electrical fault.

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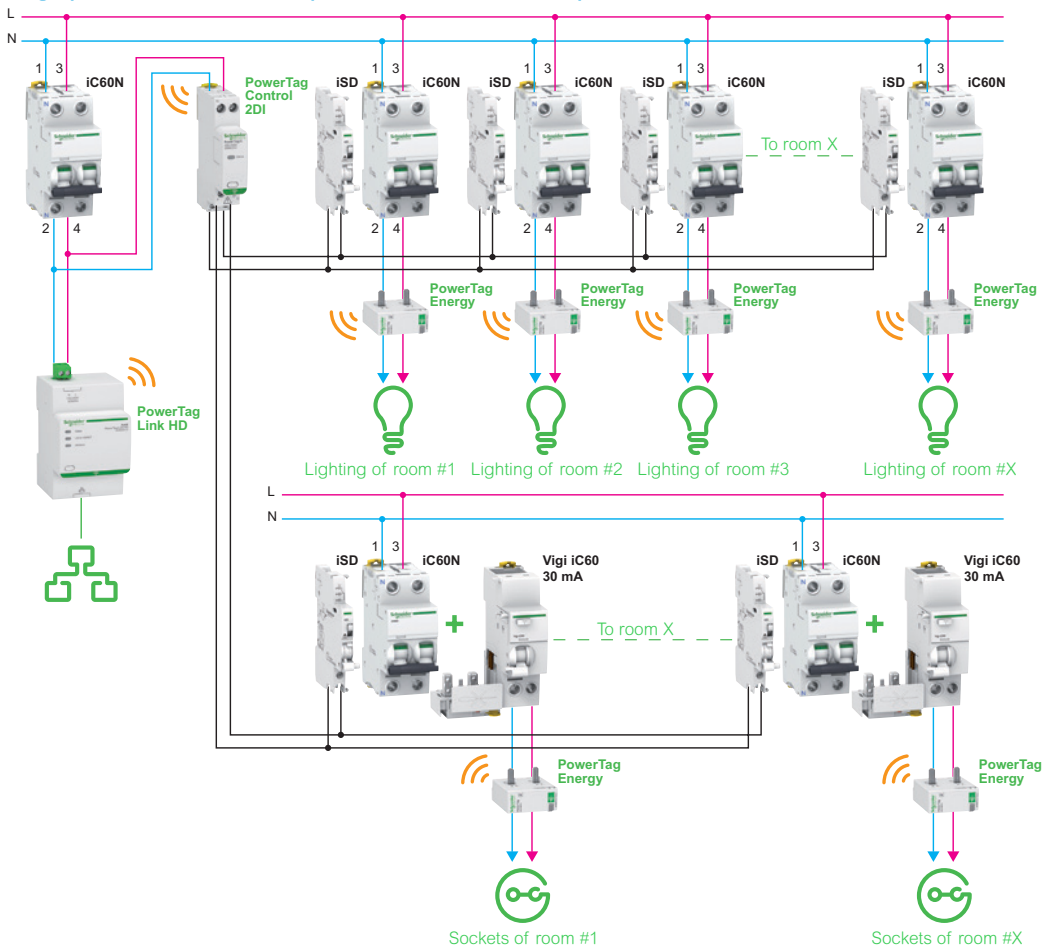
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# Solution

## Typical hospital floor patients' room electrical



## Specifications

- Electrical Distribution Boards shall be able to monitor status of circuit protection devices.
- Monitoring module shall communicate wirelessly with Ethernet gateway (no communication cables).
- Monitoring module shall have 2 inputs 230 V AC dry contact to collect status.
- Monitoring module shall be installed on DIN rail with 18 mm width size.

### Typical Bom for the system

Product	Function	Quantity	Reference
Acti9 iC60N 2P 2 A	MCB for gateway & PowerTag C	1	A9F04602
Acti9 PowerTag Link HD	Smart communication module	1	A9XMWD100
PowerTag Control 2DI	Monitoring module	1	A9XMC2D3
Acti9 iC60N 2P	MCB for lighting and socket	# of room x 2	Depend on rating
Acti9 iSD	Auxiliary fault contact	# of room x 2	A9A26927
Vigi iC60 2P 30 mA	Earth leakage protection device	# of room	Depend on rating
PowerTag Energy 63 A	Energy sensor	# of room x 2	A9MEM1522

More about  
PowerTag Link



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# Lighting control of a public building

“I want to perform simple and reliable group control for LED lighting luminaires”



## Customer case

As a Specifier, Sofia needs to build a simple, robust and cost effective architecture to control a group of LED lighting luminaires of an administrative public building.

## Our recommendation

Acti9 iCT 3P+N contactor with desynchronized Neutral Pole technology is designed to:

- control a group of single phase loads such as LED lighting luminaires,
- help extend operational lifespan and protect loads from neutral break issues,
- allow plug and play connectivity.

Schneider Electric Acti9 iCT 3P+N Contactor offer equipped with same advantages as Acti9 iCT:

- simplicity,
- flexibility,
- reliability,
- compatibility with all Acti9 iCT auxiliaries.

## Benefits

### Design phase

- Answer to basic control needs: control of a group of LED lighting luminaires.
- Improve robustness of the architecture with desynchronized neutral pole technology, compliant with EN/IEC 61095.
- Propose an answer to new connectivity needs: energy management, alarming, real time monitoring.

### Installation phase

- Feature same design and features as all Acti9 iCT contactor range.
- Optimize wiring time with specific comb busbar.

### Operation and Maintenance phase

- Improve reliability: reduce failure or damage risk of the loads with reinforced neutral pole technology:
  - the neutral pole closes before the phases and opens after them.

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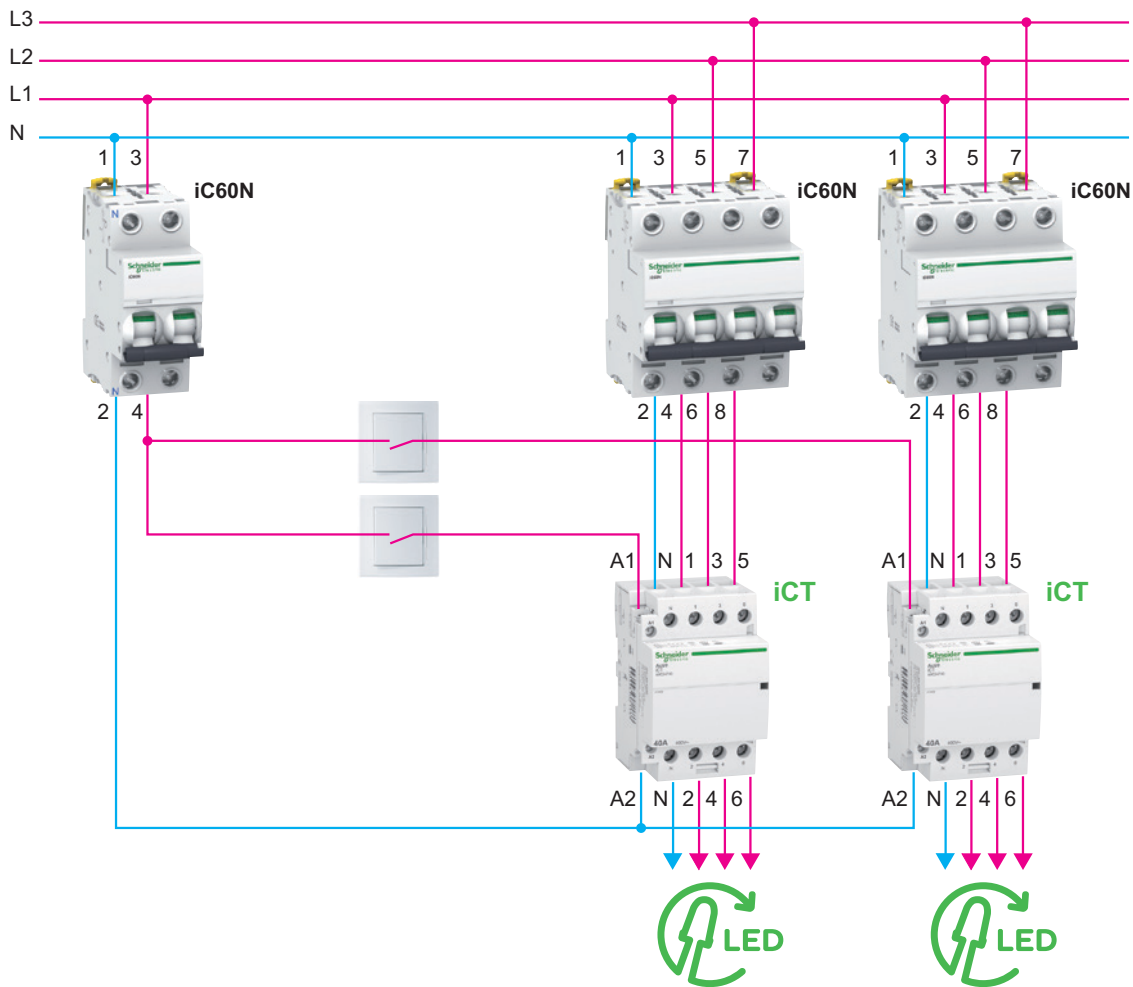
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# Solution

## Diagram



## Specifications

- A single switch must be able to switching on/off all the floor's lighting.
- The contactor controlling the lighting circuits must have a desynchronized neutral pole.

Products used			
Product	Function	Quantity	Reference
Acti9 iCT 3P+N 40 A	Contactor	2	A9C24740
Acti9 iC60N 1P+N 10 A C curve	MCB	1	Depend on country
Acti9 iC60N 3P+N 40 A C curve	MCB	2	Depend on country

More about  
iCT 3P+N



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# Lighting management in a stairway, a corridor or a lobby

Just enough lighting time!

MIN



## Customer case

The building manager wants to achieve savings on energy expenses related to lighting, while maintaining customer comfort.

## Benefits

- Energy savings: automatic management of the lighting period makes it possible to precisely optimize the "light ON" time without interfering with the user comfort.
- Easy operation: the maintenance personnel have access to permanent lighting by means of a selector switch on the front of the timer or can restart the time delay by simply pressing one of the lighting push buttons.

## Our recommendation

The use of a MIN timer makes it possible to:

- adjust the lighting period very finely, from one or more control points,
- automatically extinguish the lighting,
- the timer settings if permanent lighting is required. override.

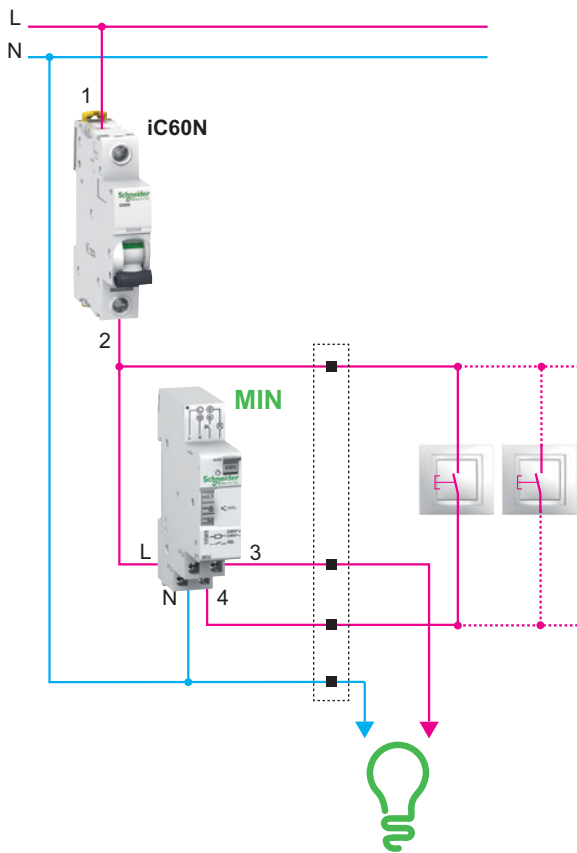
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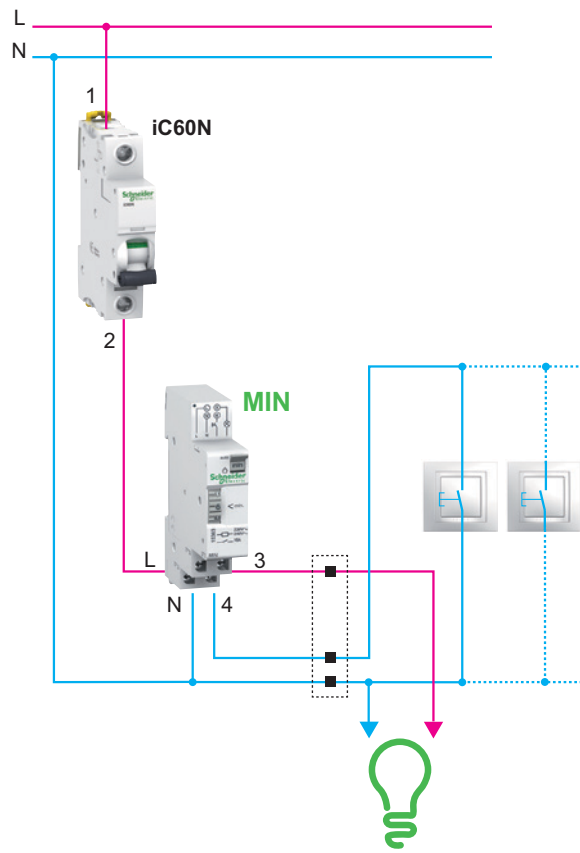


# Solution Diagram

Connection to 4-conductor riser pipe



Connection to 3-conductor riser pipe



Note: 3 or 4 wire connection to be selected using the lateral selector switch of MIN.

## Specifications

- The solution should be compatible with existing 3 or 4 conductor installations without altering the installation, via a selector on the product.
- The solution should have an extinguishing time delay adjustable from 1 to 7 minutes, and be able to override the installation's settings to permanent lighting.
- A press on a control push button restarts the preset time delay.

Products used			
Product	Function	Quantity	Reference
Acti9 MIN	Electromechanical timer	1	15363
Acti9 iC60N	MCB 1P	1	Depend on rating

More about MIN



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# Optimize lighting in the common areas of a residential building

Lighting only for the duration needed

MINp



## Customer case

In an existing installation equipped with a simple impulse relay, the association of co-owners wants to reduce the cost of lighting by preventing the lighting from being left constantly lit.

The building inhabitants agreed to automatically limit the lighting period but they would like to be notified of imminent extinguishing and press the button again if required.

The association of co-owners wants to be given remote access to a longer lighting time for a removal or for maintenance work without adding extra controls.

## Our recommendation

The use of a Acti9 MINp timer makes it possible to:

- set the lighting period to a minimum in corridors, stairs, a lobby, etc. using a timer to switch on one or more lamps from one or more control points,
- warn, through flickering of the light, that the lighting will soon be extinguished,
- have two lighting override control modes, either permanent by actuation on the front of the device, or for a period of one hour, by pressing one of the installation's pushbuttons for 2 seconds.

## Benefits

- Energy optimization: automatic management of the lighting period optimize energy consumption.
- User comfort is improved by the warning function before light goes out (the warning consists of blinking the luminaires).
- Ease of installation: the MINp is compatible with cabling of the 3- or 4 conductor type without altering the installation.
- Easy operation: two override control modes are available (permanent, long-term). They can cover the various customary needs of the building entrance (cleaning, tidying, etc.).

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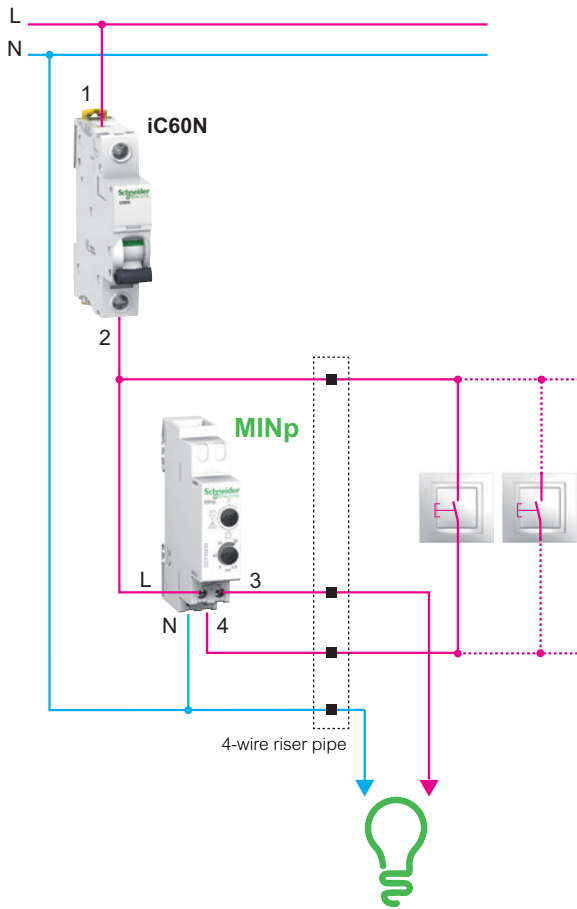
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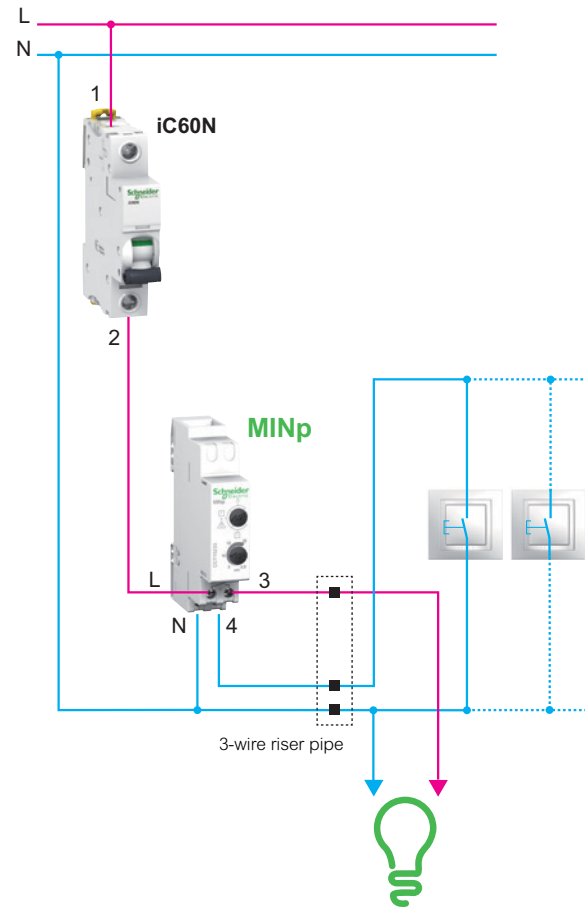


# Solution Diagram

Connection to 4-conductor riser pipe



Connection to 3-conductor riser pipe



Note: 3 or 4 wire connection to be selected using the lateral selector switch of MIN.

## Specifications

- Be fully compatible with existing 3- or 4-conductor installations without altering the installation.
- Have an extinguishing time delay setting of between 0.5 and 20 minutes, with prior notice of lighting extinguishing, and be able to override the installation's settings to permanent lighting.
- Pressing a control push button for more than 2 s causes the start of a fixed time delay of one hour; a second long press allows extinguishing.

Products used			
Product	Function	Quantity	Reference
Acti9 MINp	Electronic timer with switch-off warning	1	CCT15233
Acti9 iC60N	MCB 1P	1	Depend on rating

More about MINp



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# Control office lighting locally

“Lighting Control: IHP+ 2C – SMART”



## Customer case

The facility manager wants to optimize his operating cost minimizing lighting energy in the offices

## Benefits

- Easy modification of time switch program for special events and vacation.
- Easy copying of the program from one time switch to another with the memory key.
- Possibility of temporary or continuous override operation with standard switch or push-button installed away from the panelboard.
- Automatic summer/winter time change.

## Our recommendation

Use IHP+ 2C – SMART and impulse relay iTL to control office lighting locally by push-buttons and centrally by a programmable time switch.

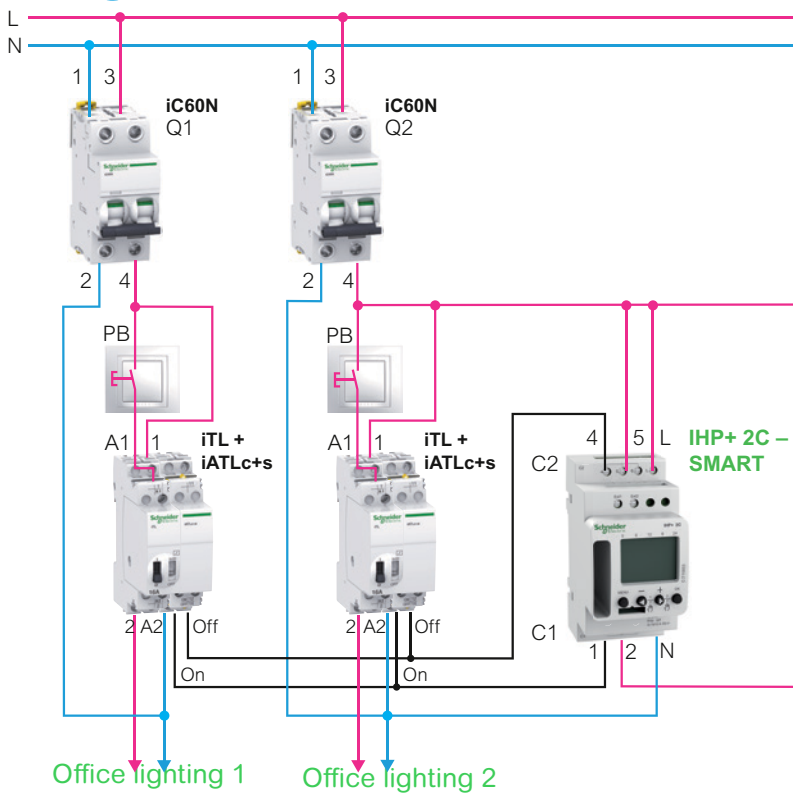
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# Solution

## Diagram



## Specifications

Control the lighting of the building:

- By a centralized order transmitted by an impulse type programmable time switch to the centralized control and signaling impulse relay auxiliary. The programmable time switch functions provide the benefit of centralized:
  - Time programming.
  - Manual override operation.
- Locally by means of push-buttons and benefit from the impulse relay functions:
  - Disconnection of remote control by selector switch for maintenance operation (auto/Off).
  - Manual controls on front face: direct and priority manual control by O-I toggle.

Products used			
Product	Function	Quantity	Reference
Acti9 IHP+ 2C – SMART	Programmable time switch, 2 channels (C1&C2)	1	CCT15553
Acti9 iC60N 2P	MCB Q1, Q2	2	Depend on rating
Acti9 iTL	Impulse relay	2	A9C30811
Acti9 iATLc+s	Centralized control + signaling	2	A9C15409

More about  
IHP+ 2C - SMART



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# Lighting management for a house

iTLc



Impulse remote centralized control  
Improve energy efficiency & user comfort

## Customer case

The lighting system must be able to be turned on locally by the residents, and it must be possible to switch off all the lighting areas by means of a centralized control in a single action, to ensure extinguishing of the whole house.

For practical reasons, all the lighting areas can also be switched on in a single action.

## Benefits

- **Energy savings:** centralized control allows extinguishing of all the rooms in the house to prevent leaving rooms lit when there are no residents.
- **Comfort:** all the rooms in the house can also be switched on in a single action.
- **Ease of installation:** the small size (18 mm) of the Acti9 iTLc is equivalent to that of a simple impulse relay.

## Our recommendation

The use of Acti9 iTLc impulse relays allows both local control of each room and centralized control of the whole house.

The centralized control is provided by ON/OFF push buttons, remotely from every rooms to be managed.

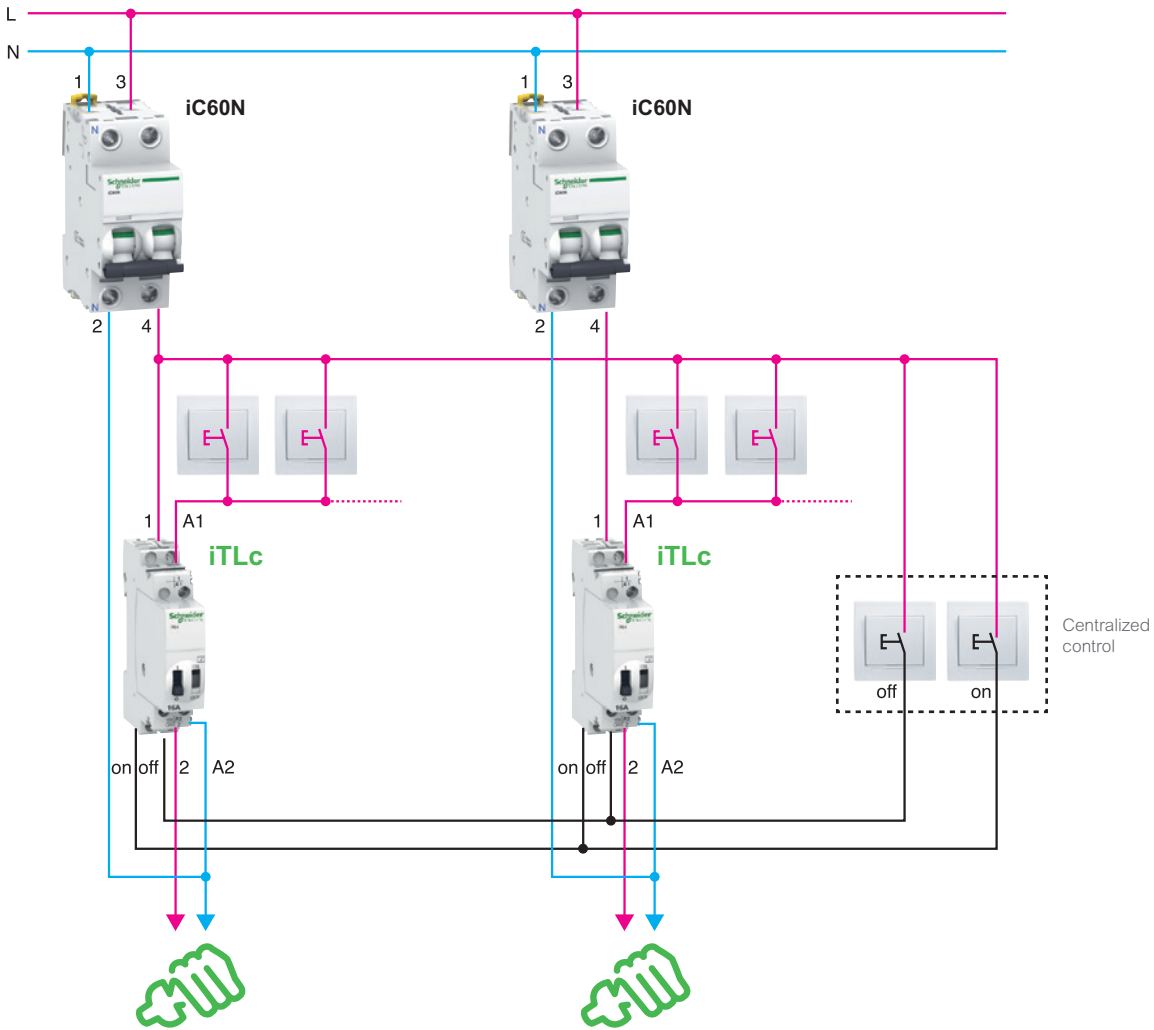
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# Solution Diagram



## Specifications

- Each lighting circuit is controlled locally via push buttons.
- All the lighting in the house is switched On and Off via a single push button.

### Products used

Product	Function	Quantity	Reference
Acti9 iC60N	MCB 1P+N	2	Depend on rating
Acti9 iTLc	Centralized-control impulse relay	2	A9C33811

More about  
Acti9 iTLc



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# Set the perfect mood of my restaurant with the ideal lighting

Adapt the lights depending on the time: a practical level for lunch, and romantic for dinnertime.

## Customer case

Ruben devotes all his time and attention to his restaurant. To step his business up, he needs to attract more people and to offer them a better experience. Ruben is considering a décor refresh of his restaurant room. By creating a décor with an attractive lighting, it's a simple way of creating a cozier ambiance. He wants to explore what can be done without having to refurbish the entire electrical installation.

## Our recommendation

Select universal Acti9 STD 400 LED+ that is compatible with all kinds of lights. It can manage up to 3 different pre-defined lighting scenes from one centralized controlling point. It enable also soft starting for improved eye comfort. It is controlled with existing 230 V push-buttons.

## Benefits

### For restaurant owner:

- Create an outstanding customer experience with a cozy lighting ambience.
- Control brightness levels from a single point and even store lighting scenarios.
- Your enhanced reputation will help improve business and your pricing model.
- Upgrade your installation with little impact on your existing installation.

### For electricians:

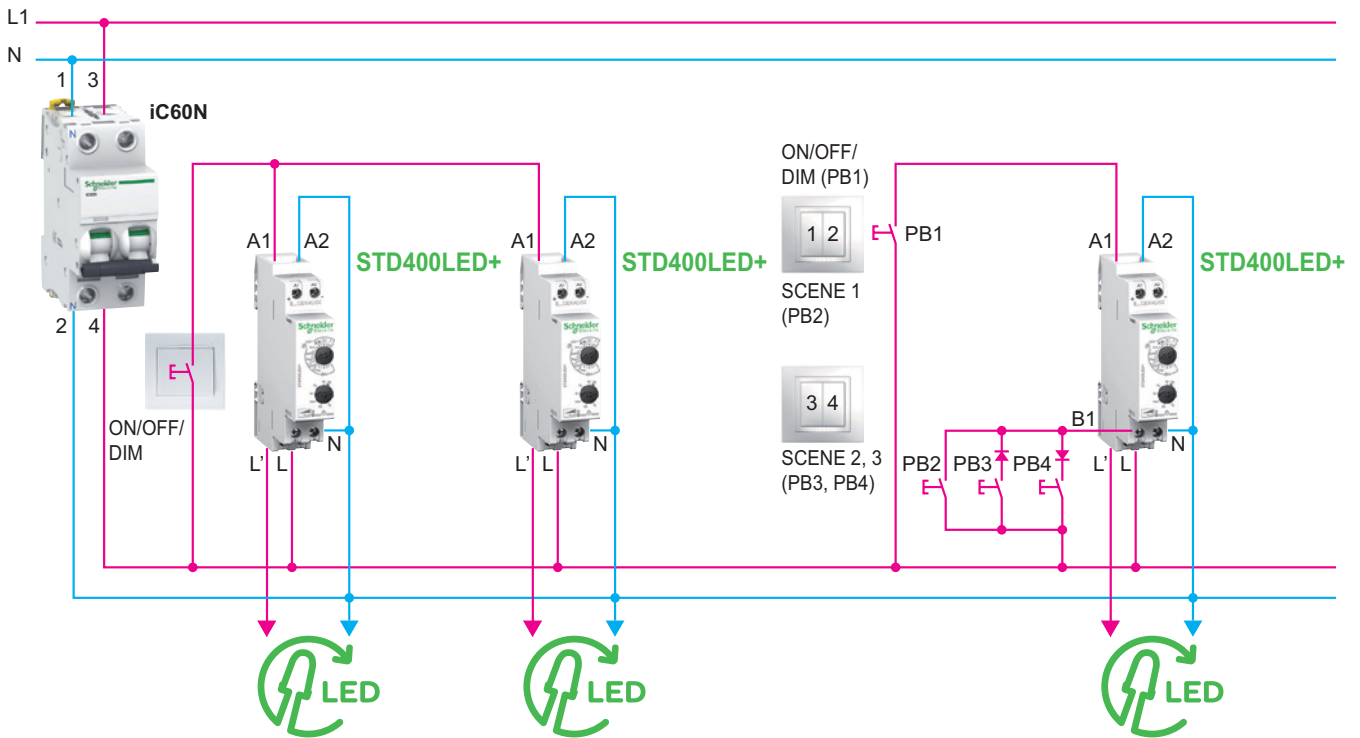
- Be efficient: Schneider Electric universal dimmer is designed for simple and fast upgrade of existing installation. Now you can propose an alternative for complete refurbishments.
- Simple product selection: just 3 references - for any situation.
- Fast installation: thanks to the low width of 18 mm only, the DIN dimmers are perfect for retrofitting in existing panelboard. So you won't lose time with any problematic situations.

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# Solution Diagram



## Specifications

- Dimmer must be compatible with following luminaire technologies: incandescent lamps, halogen lamps, dimmable compact light lamps (energy saving lamps) or dimmable LED.
- Dimmer will enable to set pre-defined lighting scenes.
- It will be controlled with existing 230 V push-buttons.

Products used			
Product	Function	Quantity	Reference
iC60N	1P+N MCB	1	Depend on rating
Acti9 STD 400 LED+	DIN universal dimmer	1	CCTDD20017

More about Acti9 STD



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# Lighting for chained-brand hotels

Single simple architecture  
for supervision and control solution



## Customer case

For his new building, the hotel manager requires to monitor part of its electrical installation and remotely control the lighting of different spaces such as lobby, restaurant, outside terrace, spa and fitness. Moreover, he would like to optimize hotel's energy consumption and limit the electricity bill.

## Benefits

### Innovative alternative

- Deliver similar monitoring and control features with improved modularity thanks to wireless technology: a single gateway for control, monitoring and metering.

### Simplicity

- Plug and play wireless system.
- Reduced commissioning time from configuration to supervision integration.

### Energy efficiency

- Track and optimize electrical consumption while improving comfort for the occupants.

## Our recommendation

The use of Schneider Electric wireless communication technology brings the combination of both metering and control functions in one single architecture for low voltage installation:

- add PowerTag Energy sensors to your protection devices for metering, monitoring without extra footprint,
- add PowerTag Control IO modules to control your various loads such as lighting in the different areas,
- connect all of them to the same gateway.



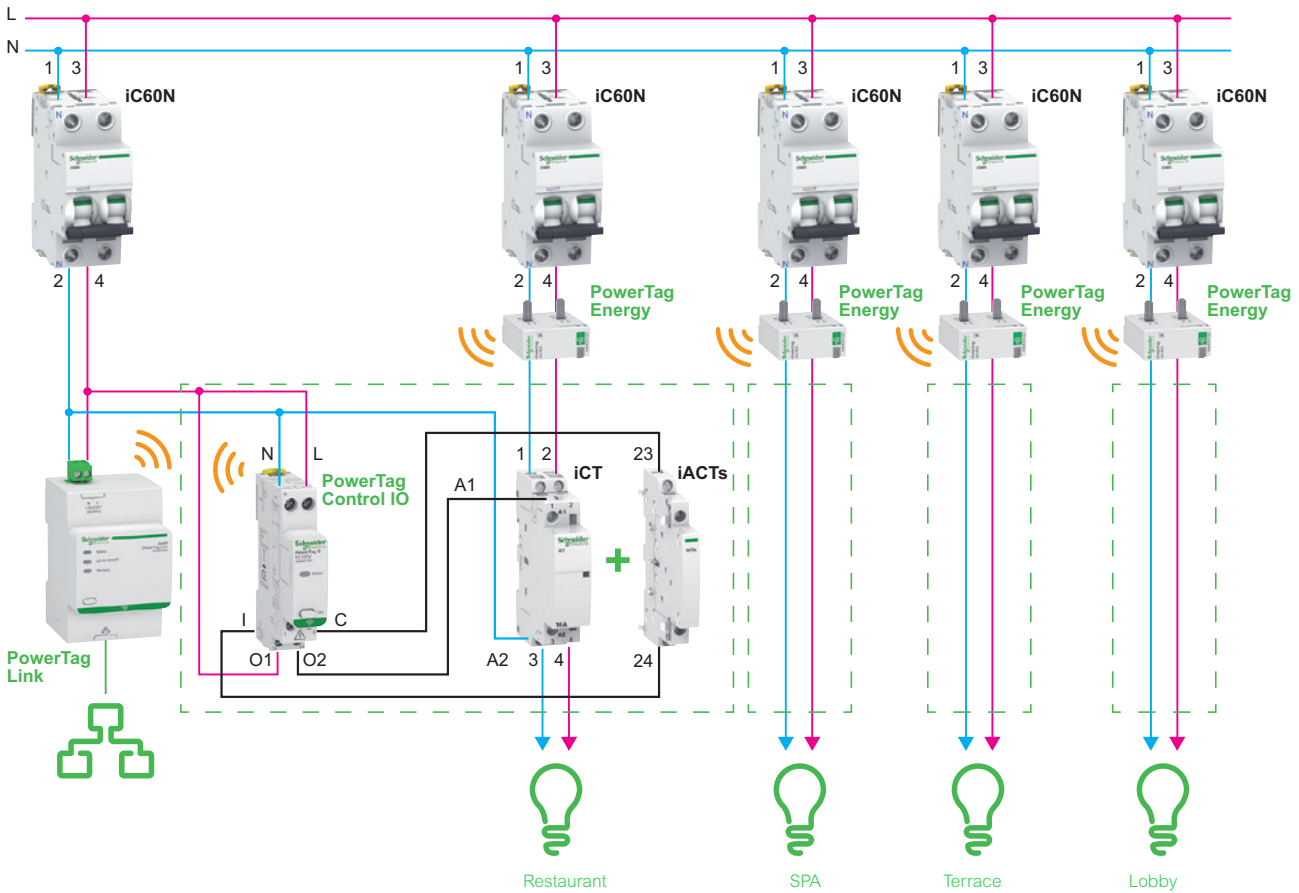
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# Solution

## Typical Lighting control panel diagram

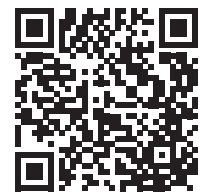


## Specifications

- Electrical Distribution Boards shall be enabled with devices to control loads and to monitor circuits by collecting status of a contact.
- Control modules shall communicate wirelessly with PowerTag Link Ethernet gateway (no communication cables).
- Control modules shall have one digital output 230 V AC dry contact, normally open or normally closed.
- Control modules shall be installed on Din rail with 18 mm width size.
- Following functions shall be included into the panel board for lighting circuits: remotely switch on/off, energy measurement, monitoring.

Typical list of material for the system of one lighting circuit			
Product	Function	Quantity	Reference
Acti9 iC60N 2P 2 A	MCB for gateway & PowerTag Control	1	A9F04602
Acti9 iC60N 2P	MCB	1	Depend on rating
Acti9 PowerTag Link	Smart communication module	1	A9XMWD20
PowerTag Control IO	Control and monitoring module	1	A9XMC1D3
PowerTag Energy 63 A	Energy sensor	1	A9MEM1522
Acti9 iCT 2P	Modular contactor	1	Depend on rating
Acti9 iACTs	Remote indication auxiliary	1	A9C15914

More about  
PowerTag Link



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