



Technical collection

Lighting circuits guide

Simple solutions
for control and protection
of lighting circuits





General Content

Energy Efficiency challenge p. **4**

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and dimensioning Guide p. **10**

Lighting control simple
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Energy, What is in our future?

50%

The required emissions reduction of GHG (Greenhouse Gas) to stabilize the greenhouse effect by 2050.

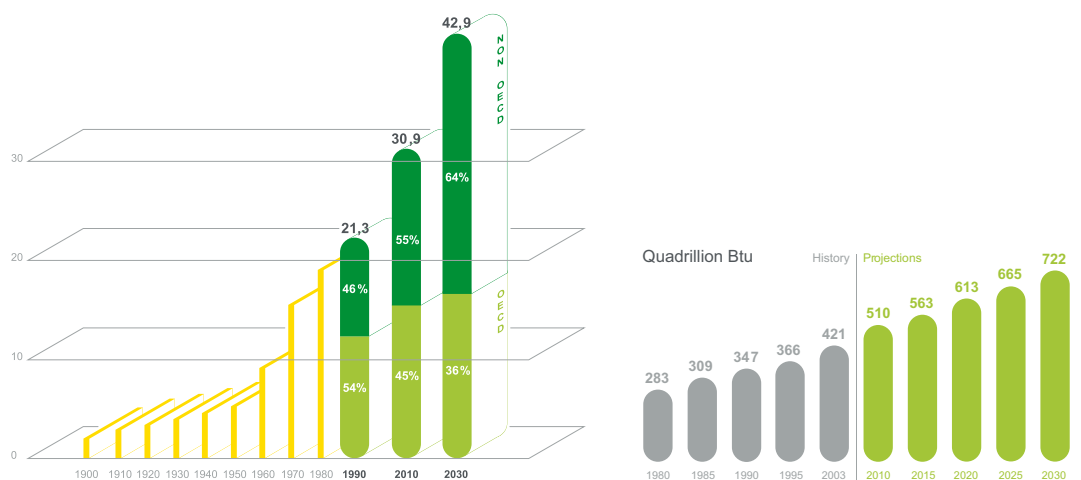
30%

Possible savings with today's technology that could reduce emissions or electrify the rest of the non electrified world.

Why the pressure on energy use will not go away

- World energy consumption has risen 45% since 1980. It is projected to be 70% higher by 2030.
- Emerging markets (including China and India) account for more than 75% of new demand placing new pressures on global resources. Meanwhile, mature markets such as North America, Europe and Japan will also face increased demand and limited resources. These mature markets will continue legislating to reduce consumption, shift to alternative energy sources, and improve energy security.
- Increased resources competition and political instability will cause oil and natural gas prices to remain at or above current levels for the foreseeable future. Coal will continue to be a cheap and plentiful resource especially in emerging markets. This will maintain pressure on reducing emissions and sustain the need for global climate change actions.
- More than ever, global warming is at the top of the agenda. Environmental concerns and public opinion on climate change will drive continued actions by legislators, opinion leaders, and special interest groups forcing industry to respond.

The trends we see now will continue for the next 25 years.



“ We must learn to adapt and manage energy consumption, energy costs, and pollutants. ”



Prepare & Understand

30%

Energy savings in 2020
could avoid the construction
of 1000 new power plants.

We can all adapt to the new energy world

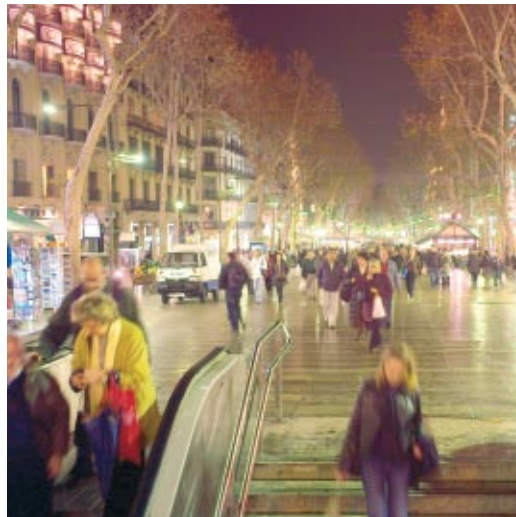
Energy use reduction and management will be a continued focus of policy makers. Key targets for future policies will be:

- Limiting final energy consumption in all sectors.
- Measuring and tracking energy use to establish benchmarks and targets.
- Promoting alternative green energy sources and technologies.
- Opening markets to promote emissions trading and demand reduction.

Buildings and Industry offer the largest and most accessible opportunities for savings.

Commit to understand the impact and opportunity in your business.

Energy efficiency is the quickest, cheapest, cleanest way to extend our world's energy supplies.



Industry

- Over 30% of consumed energy.
- Motors account for 60% of the electricity usage.
- Average facility can reduce its energy consumption by 10 to 20%.



Buildings

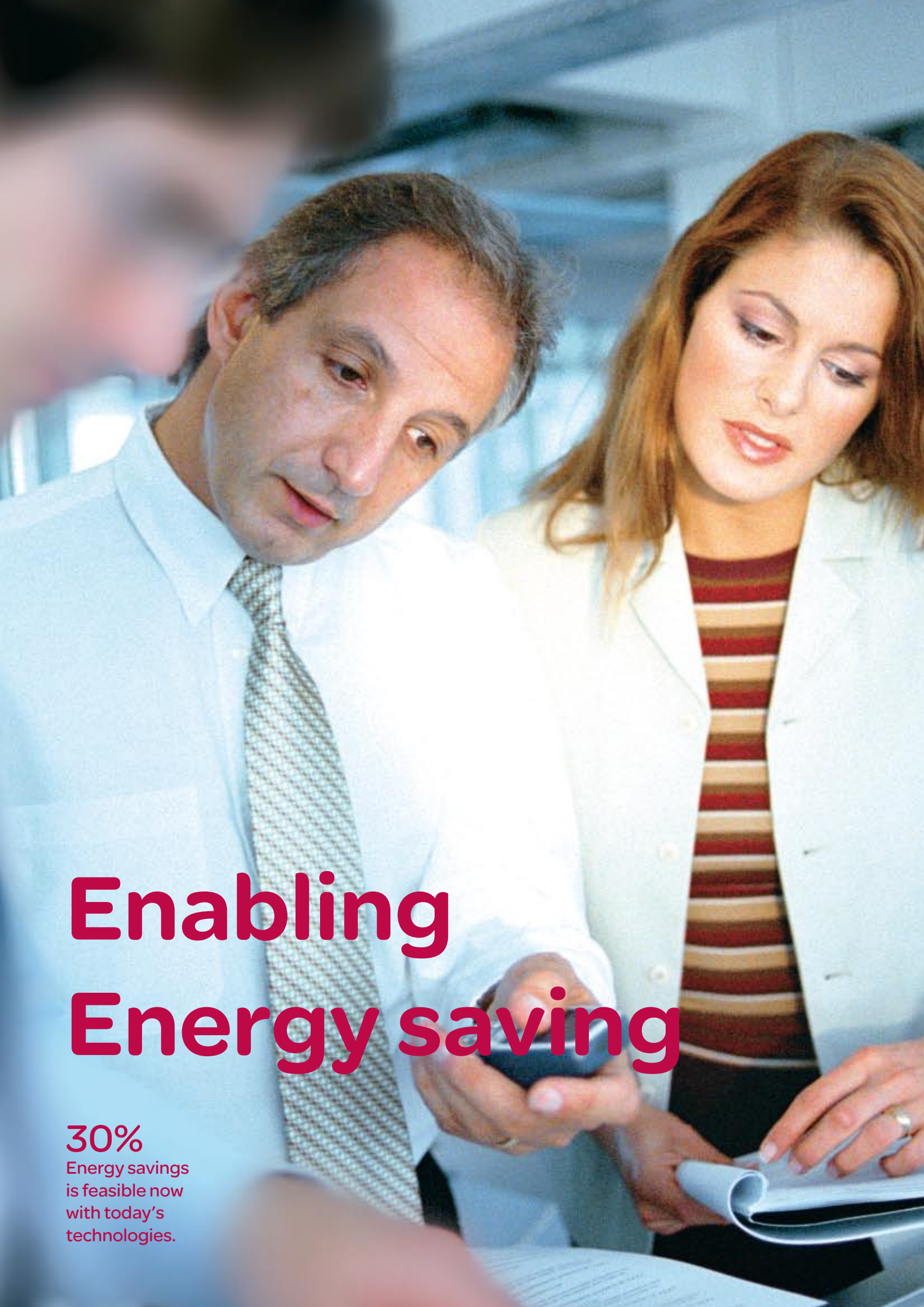
- Over 20% of consumed energy and going (EU & US).
- 3 key areas: HVAC, lighting & integrated building solutions.
- Technical projects can yield up to 30% of energy savings.



Residential

- Over 20% of consumed energy (EU & US).
- Using energy efficient products may save 10% to 40% electricity.

“ Schneider Electric has made this commitment and we can help you. ”



Enabling Energy saving

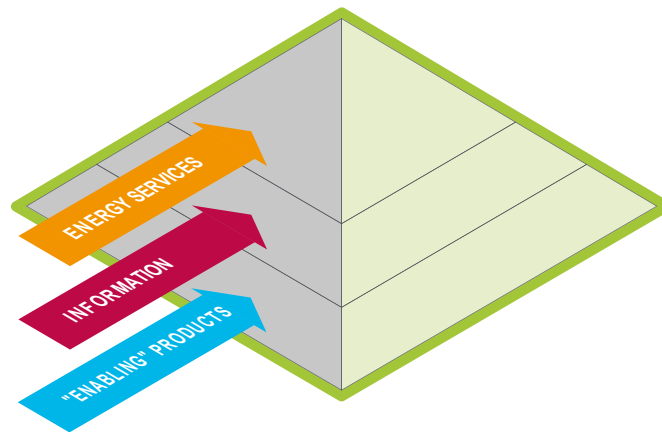
30%

Energy savings
is feasible now
with today's
technologies.

Solutions that enable and sustain energy efficiency

Our products & solutions are at every link in the energy chain enabling 10 to 30% or more in energy savings.

- Technology is crucial to achieving energy efficiency. Energy smart innovations will continue to have significant impact on enabling energy and emissions reduction.
- Information, expertise and knowledge are crucial to apply technologies in practical and economically feasible ways.
- Behavioral and procedural actions facilitate the ability initiate and to sustain all savings.



Help customers make the right decisions to manage energy.
Provide information that evokes confidence in decision making.
Technology & Solutions to enable sustainable savings.

Solutions & Knowledge

- HVAC, Ventilation, Fan control, Lighting control & management
- Pump, compressor control, Motor control & management
- Power management, Critical power solutions
- Facility management, Process optimization
- Energy Information services, Audits & Assessments
- Energy services...

Enabling technology

- Metering, Monitoring & Control, Automation & Sensors
- Drives & motor control, Lighting control systems
- Building automation systems, Electrical distribution
- Power Factor Correction, Power Filtering
- Uninterruptible Power Systems
- SCADA, Information Systems
- Management Tools...

“ Schneider Electric enables customers to make a difference! ”

**Lighting accounts
for a considerable proportion
of electricity consumption,
whatever the field of activity:**

Industry



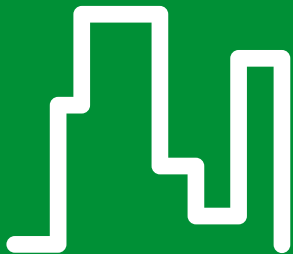
10 %

Residential



40 %

Tertiary



25 % to 50 %

Public lighting



100 %

Careful consideration should therefore be given to the technologies used, in order to strike the best balance between usage and total cost.

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Step by step procedure

Introduction



Project specifications and financial constraints

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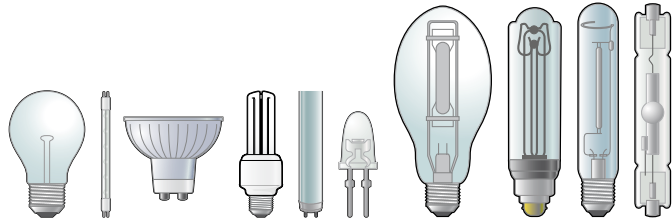
The lighting design depends on:

- the application,
- the initial investment,
- operation and maintenance.

Lamps

► pages 14 to 17

- General characteristics.
- Electrical constraints.



Current

Energy savings and user comfort

Switching capacity

Continuity of service

Management

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Choice of devices for energy savings and improved comfort.



Auxiliaries

► page 34



Choice of auxiliaries or control devices with built-in auxiliary.

Control

► page 26



- Impulse relay or modular contactor.



- Reflex iC60.



- RCA

Fast dimensioning
► pages 30 to 31



Wiring diagram

Electrical distribution

► page 18



- Cable cross-section dimensioning factors.
- Canalis type.

Fast dimensioning
► pages 22 to 25



Safety

Protection

► page 20



- Circuit breaker for the protection of electrical conductors, control devices and loads.
- Earth leakage protection function for the complementary protection of people and goods.

Fast dimensioning
► pages 22 to 25



Emergency lighting

► page 37



Coordination

Project specifications and financial constraints

Selection criteria

The application

Outdoors



20...70 lux

Warehouse



125...300 lux

Home



200 lux

Office



400...500 lux

Workshop



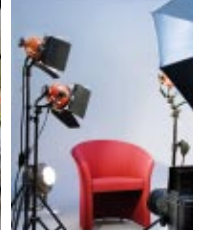
300...1000 lux

Shop



500...1000 lux

Studio



2000 lux

The work of the lighting designer involves creating specific lighting atmospheres using different types of lamp.

Illumination level and quality

Lamp power output

Varies according to the chosen technology and is influenced by the colour of the premises and the amount of natural light.

Distance (d) between the lamps and the area to be lit

The illumination level is proportional to $1/d^2$.

Light fitting

The shape and efficiency of the reflector create a more or less focused light beam. For example, a spot lamp has a small angle which generates a stronger but more localised light.

The initial investment

Electrical architecture

The number of lamps used, their output and geographical distribution determine the number of circuits, the cross-section and length of electrical distribution, the control and protection devices and the associated lighting components (transformer, ballasts, possible reactive compensation, etc.).

Cost of the lamps

The cost varies according to the technology chosen. Generally, lamps with high lighting efficiency and long-life lamps are expensive and conversely.

Cost of the light fittings

The light fitting depends mainly on the application. Other criteria can be used to narrow down the choice: attractiveness, price, climatic conditions, etc.

Operation and maintenance

Consumption

Consumption depends on:

- the lighting efficiency and the input power, type and number of lamps used;
- optimisation of lighting times.

Service life

The service life varies according to the chosen technology. Lamps with a long service life are expensive, but require less frequent maintenance.



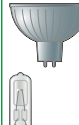

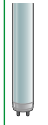
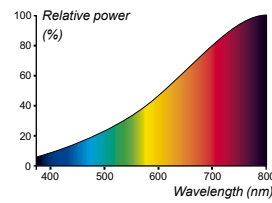
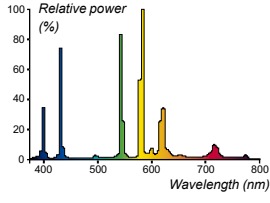
Accessibility

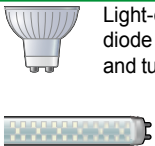
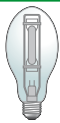
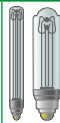
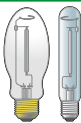
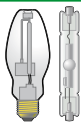
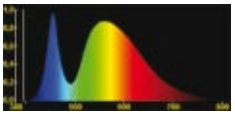
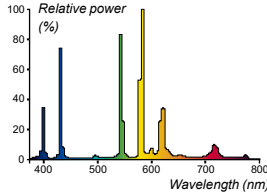
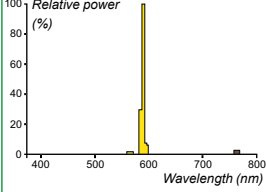
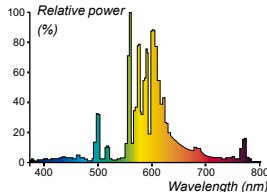
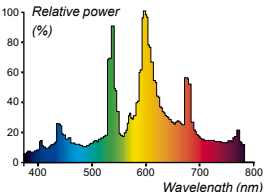
Accessibility determines the number of man-hours and whether lifting equipment is required (basket). It must be taken into consideration, depending on the continuity of service required and exploitation environment (traffic, crowded and opening hours...).



The various types of lamp

General characteristics

Types of lamp		Incandescent lamps			Fluorescent lamps	
		 Basic lamps	 LV halogen lamps	 ELV halogen lamps	 Compact fluorescent lamps	 Fluorescent tubes
Associated component required for operation		-	-	Electromagnetic or electronic transformer	Integral or external electronic ballast (same as for fluorescent tube)	Ferromagnetic ballast + starter + optional capacitor, or electronic ballast
The application						
Lamp power output (most common rated powers)		400 to 1000 lm (40 to 100 W)	2000 to 10,000 lm (100 to 500 W)	400 to 1000 lm (20 to 50 W)	300 to 1600 lm (5 W to 26 W)	850 to 3500 lm (14 to 58 W)
Lighting efficiency (Lm/W)		5 to 15	12 to 25		45 to 90	40 to 100
Lighting quality		<p>Lighting spectrum It determines the quality of the light (the fuller the spectrum, the closer it is to sunlight)</p> 				
Colour rendering		★★★★★			★★ or ★★★ according to the price and type of lamp	
Ambience		Warm			Variable from cold to rather warm	
Installation	Height	2 to 3 m	Average	2 to 3 m	Average	3 to 12 m
	Comments		Direct or indirect lighting			Suspended, flush-mounted or surface-mounted
Number of switching operations (on/off)		★★★★ (high)			★★ (several times each hour)	
Ignition time		Instantaneous			A few seconds (almost instantaneous with some electronic ballasts)	
Use	Interior lighting	<ul style="list-style-type: none"> Homes, shops, restaurants 	<ul style="list-style-type: none"> Projector, spotlight, indirect lighting in housing or shops 	<ul style="list-style-type: none"> Homes Shops: spotlights, window displays Humid locations: bathroom, swimming pool 	<ul style="list-style-type: none"> Homes Offices, showrooms Shops 	<ul style="list-style-type: none"> Offices, schools, clean rooms Warehouses, workshops Supermarkets, garages, shops, gymnasias
	Exterior lighting				<ul style="list-style-type: none"> Under shelter, at the entrance to buildings 	<ul style="list-style-type: none"> Lighting for a pedestrian path on bridges and foot bridges
The initial investment						
The lamp	Price range (most common rated powers)	0.5 to 10 \$ (40 to 100 W)	5 to 30 \$ (100 to 500 W)	2 to 50 \$ (20 to 50 W)	2 to 50 \$ (5 to 26 W)	2 to 30 \$ (14 to 58 W)
	Max. price	25 \$	120 \$	55 \$	100 \$	70 \$
Associated components		-	-	<ul style="list-style-type: none"> Transformer: <ul style="list-style-type: none"> electronic: 10 to 50 \$ ferromagnetic: 7 to 20 \$ 	<ul style="list-style-type: none"> Electronic ballast: from 15 to 200 \$ Ferromagnetic ballast: from 7 to 20 \$ + starter: from 0.5 to 15 \$ 	
The light fitting	Price range	10 to 30 \$			15 to 60 \$	
Operation and maintenance						
Service life	Range	1000 to 2000 h	2000 to 4000 h		5000 to 20,000 h	7500 to 20,000 h
	Comments	Service life divided by two in the event of overvoltage > 5%			50% longer with external electronic ballasts by comparison with ferromagnetic ballasts	
Average consumption to emit 10,000 lm during 10 h		10 kWh	5 kWh	5 kWh	1.7 kWh	1.7 kWh
Analysis						
Strengths ★		<ul style="list-style-type: none"> ★ Instant ignition ★ Frequent switching possibility ★ Lower investment costs 			<ul style="list-style-type: none"> ★ Low operating cost: little maintenance ★ Energy savings 	
Weaknesses ★		<ul style="list-style-type: none"> ★ Low efficiency, 95% of energy dissipated in the form of heat, which requires good ventilation ★ High consumption ★ High operating cost: frequent maintenance 			<ul style="list-style-type: none"> ★ Does not withstand frequent switching ★ Single-tube versions with magnetic ballast and bottom-of-the-range compact lamps generate visible flicker 	
		<ul style="list-style-type: none"> ★ Dimensions of the transformer 			<ul style="list-style-type: none"> ★ Useful replacement for basic incandescent lamps ★ Requires numerous lights, dimensions ★ Unattractive basic version 	
Notes		Declining technology. As part of their energy saving programmes, some countries (Australia, California, Canada, Cuba, UK, etc.) are planning to phase out the use of incandescent lamps.			Most widely used technology for a large number of uses. Excellent value for money.	

LEDs lamps		High-intensity discharge lamps			
 Light-emitting diode lamps and tubes	 High-pressure mercury vapour lamps	 Low-pressure sodium vapour lamps	 High-pressure sodium vapour lamps	 <ul style="list-style-type: none"> ■ Metal-iodide lamps ■ Metal-halide lamps 	
Electronic driver (integrated or non-integrated)	Ferromagnetic ballast without ignitor	Ferromagnetic ballast + ignitor + optional capacitor or electronic ballast (for lamp up to 150 W)			
Low-power LED network or power LEDs (1 to 3 Watts)	3200 to 10,000 lm (80 to 250 W)	3900 to 20,000 lm (26 to 135 W)	7000 to 25,000 lm (70 to 250 W)	7000 to 40,000 lm (70 to 400 W)	
50 to 120 (constantly improving)	30 to 65	110 to 200	40 to 140	70 to 120	
Lighting spectrum defined by the manufacture 					
Numerous colour rendering and ambience possibilities	★★	★	★★★	★★★★	
Many different scenarios	Cool white > 3m	Monochromatic orange - At a height or on the ground	Dominant yellow > 3m	Dominant white > 3m	
★★★★ (very high)	★ (several times each day)				
Instantaneous	Several minutes to reach the nominal illumination level.				
<ul style="list-style-type: none"> ■ Already in the standards: <ul style="list-style-type: none"> □ road lights, traffic signs, routing □ decoration □ battery-operated handheld or isolated lighting ■ Substitute solution under development: most conventional lamps (incandescent, halogen, fluorescent tubes, high-intensity discharge lamps) 	<ul style="list-style-type: none"> ■ Industry, warehouses 	<ul style="list-style-type: none"> ■ Tunnels, motorways ■ Safety lighting ■ Runway lighting 	<ul style="list-style-type: none"> ■ For white sodium only: shopping malls, warehouses, showrooms 	<ul style="list-style-type: none"> ■ Shopping malls, showrooms, gymnasias ■ Factories, workshops ■ Horticulture ■ Theatre, stage 	
	<ul style="list-style-type: none"> ■ Public lighting ■ Docks 		<ul style="list-style-type: none"> ■ Public lighting ■ Roads, monuments ■ Tunnels, airports, docks, car parks, parks 	<ul style="list-style-type: none"> ■ Public lighting ■ Pedestrian streets, stadiums ■ Safety lighting ■ Worksite lighting ■ Airports 	
10 to 20 \$ for incandescent lamp replacement lamps	8 to 30 \$ (80 to 250 W)	40 to 150 \$ (26 to 135 W)	20 to 90 \$ (70 to 250 W)	30 to 150 \$ (70 to 400 W)	
	200 \$ (1000 W)	170 \$ (180 W)	290 \$ (1 000 W)	500 to 1000 \$ (2000 W)	
Electronic driver, if external: 15 to 200 \$	<ul style="list-style-type: none"> ■ Electronic ballast: from 80 to 400 \$ ■ Ferromagnetic ballast: from 20 to 200 \$ (high power: from 80 to 600 \$) + starter: from 15 to 100 \$ 				
10 to 200 \$	100 to 200 \$				
> 50,000 h	8,000 to 20,000 h	12,000 to 24,000 h	10,000 to 22,000 h	5,000 to 20,000 h	
<ul style="list-style-type: none"> ■ Independent of the switching frequency ■ The quality of the driver influences the overall service life 	50% longer with external electronic ballasts by comparison with ferromagnetic ballasts				
1 kWh	2.5 kWh	0.7 kWh	1 kWh	1 kWh	
<ul style="list-style-type: none"> ★ Very long service life of the LED ★ Insensitive to impacts and vibrations ★ Unlimited number of switching operations ★ Instant ignition ★ No ultraviolet emissions ★ Dimensions of the driver and heat sink for power LEDs ★ Generation of significant harmonics of the 3rd and 7th orders 	<ul style="list-style-type: none"> ★ Low operating cost: little maintenance ★ Energy savings ★ Very powerful lighting ★ High investment cost ★ Long or very long ignition time (2 to 10 minutes) 		<ul style="list-style-type: none"> ★ Operate down to -25°C emitting very little heat 		
Technology seeing significant expansion: <ul style="list-style-type: none"> ■ increased performance ■ fall in prices 	Becoming obsolete: replaced with high-pressure sodium vapour or metal iodide lamps	Becoming obsolete	Most frequently used technology for outdoor public lighting	The trend is to use them as a useful replacement for high-pressure sodium vapour lamps	

The various types of lamp

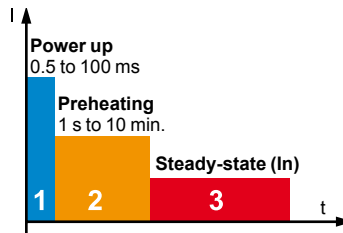
Impacts of selected lamps on the choice of components

Lamp selected Induced electrical constraints

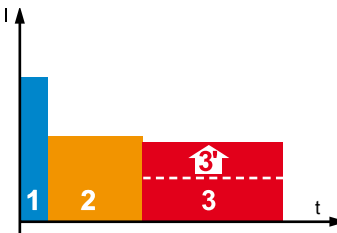
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Current profile of a lamp in its various phases over time

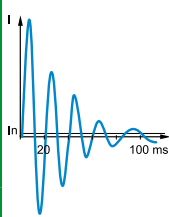
Start of life



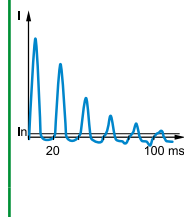
End of life



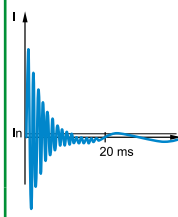
1 Inrush current at power up



Very low resistance of the filament when cold



Initial saturation of ferromagnetic circuits

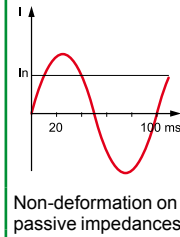


Initial charging of circuit capacitors

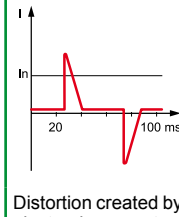
2 Preheating current

All discharge lamps (fluorescent and high intensity) require a phase of gas ionisation before ignition which results in over-consumption

3 Steady-state current



Non-deformation on passive impedances



Distortion created by electronic converter rectification/filtering

3' End of life

Over-consumption beyond the nominal service life (time after which 50% of the lamps of a given type are at end of life)

Incandescent lamps

Basic and LV halogen	■ 10 to 15 In for 5 to 10 ms			■		Up to 2 times the nominal current
ELV halogen lamps + ferromagnetic transformer		■ 20 to 40 In for 5 to 10 ms		■		
ELV halogen lamps + electronic transformer			■ 30 to 100 In for 0.5 ms		■	

Fluorescent lamps with

Non-compensated ferromagnetic ballast		■ 10 to 15 In for 5 to 10 ms		■ Duration: from a few tenths of a second to a few seconds	■	Up to 2 times the nominal current
Compensated ferromagnetic ballast			■ 20 to 60 In for 0.5 to 1 ms	■ Amplitude: from 1.5 to 2 times the nominal current In	■	
Electronic ballast			■ 30 to 100 In for 0.5 ms		■	

LEDs lamps





Drivers for LED lighting			■ 30 to 100 In* for 0.1 to 3 ms		■ Harmonics* of the 3rd and 7th orders	See manufacturer's data
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High-intensity discharge lamps with

Non-compensated ferromagnetic ballast		■ 10 to 15 In for 5 to 10 ms		■ Duration: from 1 to 10 mn	■	Up to 2 times the nominal current
Compensated ferromagnetic ballast			■ 20 to 60 In for 0.5 to 1 ms	■ Amplitude: from 1.1 to 1.6 times the nominal current In	■	
Electronic ballast			■ 30 to 100 In for 0.5 ms		■	

(*) LED lamps: the disturbance levels (current peaks at power up, harmonics) are highly variable from one manufacturer to another and from one type of LED lamp to another.

Recommandation to be taken according type of lamp

	Electrical connection 	Circuit breaker 	Earth leakage protection function 	Control device 
Power factor	<p>▶ page 19</p> <p>■ The cross-section of the conductors is conventionally dimensioned by the steady-state current.</p> <p>A However, it must take into account the lamps' long preheating and end-of-life overcurrents.</p> <p>B In three-phase circuits with lamps generating harmonic currents of order three and multiples of three, dimension the neutral conductor accordingly.</p>	<p>▶ page 20</p> <p>C The circuit breaker rating should be dimensioned to protect the conductors without tripping:</p> <ul style="list-style-type: none"> □ at power up; □ during the lamp preheating and end-of-life phases. <p>D The choice of its tripping curve and the number of downstream lamps can optimise continuity of service.</p>	<p>▶ page 21</p> <p>■ The sensitivity of the earth leakage protection function should be dimensioned to protect:</p> <ul style="list-style-type: none"> □ people from electric shock: 30 mA; □ property from fire: 300 or 500 mA. <p>■ The rating (of the Vigi module or residual current circuit breaker) should be greater than or equal to that of the upstream circuit breaker (coordination).</p> <p>E For excellent continuity of service, choose a product that is:</p> <ul style="list-style-type: none"> □ time-delayed (S type) for upstream protection against fire, □ "Super immune" (Si) for the protection of people. 	<p>▶ page 26</p> <p>■ The tables at the end of the guide indicate, for each rating, the total lamp power that can be supplied by a modular power actuator.</p> <p>■ Application of these rules ensures that these control devices withstand:</p> <ul style="list-style-type: none"> □ the inrush current at power up (compatible with their making capacity); □ the preheating current (compatible with their thermal resistance). <p>F The choice of product depends on:</p> <ul style="list-style-type: none"> □ the load type and power □ the number of operations per day □ the control application (push-button, PLC, etc.)
	Risk of conductor overheating	Risk of nuisance tripping	Risk of overload	
1	★ During the nominal service life. At end of life	★	★	★
Close to 1 at full load		★ C D	★ Harmonic leakage currents	★ F
> 0.92		★ C D	★ High-frequency leakage currents generated by the electronic circuits E	★
0.5	★ The preheating overcurrent is short and is therefore not to be taken into account. Average at end of life	★ C	★ Harmonic leakage currents	★ F
> 0.92		★ Series compensation ★ Parallel compensation C D	★ Harmonic leakage currents	Series compensation: ★ F Parallel compensation: ★ F
> 0.92 with external ballast > 0.5 with integral ballast		★ C D	★ High-frequency leakage currents generated by the electronic circuits E	★
> 0.92	★ During the nominal service life	★	★ Harmonics of the 3rd and 7th orders	★
0.5	★ The long preheating phase and end of life require that the electrical connections withstand twice the nominal current	★	★ Harmonic leakage currents	★ F
> 0.92	A B		★ Harmonic leakage currents	★ F
> 0.92			★ High-frequency leakage currents generated by the electronic circuits E	★
Selection guide	▶ page 19	▶ page 20	▶ page 21	▶ page 26

★ : none ★ : low ★ : medium ★ : high **A B C D E F** : recommendation

Electrical distribution selection

Cable and prefabricated busbar trunking selection principles



Power distribution

- The electrical conductors have to transport energy from the electrical switchboard to the lighting loads.
- They can be cables or prefabricated busbar trunking.
- Where large areas have to be lit, they comprise a main circuit and branch circuits to the light fittings.
- 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.

Cable cross-section dimensioning factors

Nominal current of circuits

- The total circuit power must be analysed 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 sizing electrical distribution, one should allow for the fact that the lamps consume 1.5 to 2 times their nominal current:
 - at end of life for all lamps;
 - during the long preheating phase for high-intensity discharge lamps.

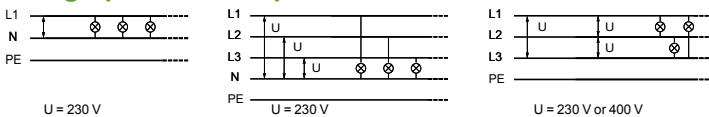
Length of electrical distribution

The cable resistance induces 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 aluminium. The use of aluminium is reserved for high-current electrical distribution.

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 optimise 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, generating a possible overload. The circuit must therefore be sized according to this harmonic rate.

Derating factors to prevent overheating of electrical conductors



Conductor cross-section



Cables:
Fast dimensioning
▶ page 22
Optimised calculation
▶ "CanBrass" software

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 admissible voltage drop (>U) in steady state:
 - 3% for circuits less than 100 m;
 - 3.5% permissible above 200 m.
- Cable cross-section:
 - most commonly (< 20 m): 1.5 or 2.5 mm²;
 - very long (> 50 m) high-power circuit, to limit voltage drops: 4 to 6 mm², or even 10 mm² (> 100 m).

Type of electrical distribution	Cables	Canalis
		
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 distribution	■	■
Nominal current of circuits	■	■ Easier selection, by lamp type
Use for Halogen free material	■	

Canalis prefabricated busbar trunking

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



Canalis:
Fast dimensioning
▶ page 24
Optimised calculation
▶ "CanBrass" software

Advantages in every stage in the life of a building

Design

- Simplified electrical circuit diagram.
- Direct choice of model, depending on the type and number of lamps.
- Direct correspondence between the circuit breaker rating and that of the trunking (example at 35°C: KDP 20 A -> 20 A circuit breaker).
- Guaranteed performance irrespective of the installation (in accordance with the IEC 60439-2 standard).
- Suitable for all environments: IP 55 as standard, in conformity with sprinkler tests.
- 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, polarising, 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 of 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 KDP	Canalis KBA	Canalis KBB
				
Installation	Type	Flexible	Rigid	Very rigid
	Installation procedure	<ul style="list-style-type: none"> ■ Installed in a suspended ceiling or false floor ■ Attached to the structure of the building (installation spacing up to 0.7 m) 	<ul style="list-style-type: none"> ■ Suspended (installation spacing up to 3 m) 	<ul style="list-style-type: none"> ■ Suspended (installation spacing up to 5 m)
Light fitting attachment	to the trunking	No	Yes	Yes
Prewired light fitting offering		-	Canalis KBL	Canalis KBL
Power circuits	Quantity	1	1	1 or 2
	Type	<ul style="list-style-type: none"> ■ Single-phase ■ Three-phase 	<ul style="list-style-type: none"> ■ Single-phase ■ Three-phase 	<ul style="list-style-type: none"> ■ 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		20 A	25 or 40 A	25 or 40 A
Protection by fuses		With tap-off KBC16DCF..	With tap-off KBC16DCF..	With tap-off KBC16DCF..
Tap-off spacing		1.2 - 1.35 - 1.5 - 2.4 - 2.7 - 3 m	No tap-off or 0.5 - 1 - 1.5 m	No tap-off or 0.5 - 1 - 1.5 m

Protection selection

Circuit breaker selection principles



Disjoncteur iC60N

Reflex iC60

Circuit breakers

- Protective devices are used to:
 - guard against fires that might be caused by a faulty electric circuit (short-circuit, overload, insulation fault);
 - protect people against electric shock in the event of indirect contact.
- The choice of protective devices must be optimised to provide absolute protection while ensuring continuity of service.
- Although the protective devices are sometimes used as lighting circuit control units, it is recommended to install:
 - separate control devices (switch, contactor, impulse relay ▶ page 26).
 - or an integrated control circuit breaker designed for lighting applications (Reflex iC60 ▶ page 27) which withstands a larger number of switching operations.

Protection of electrical distribution against short-circuits and overloads

Protection of loads against overloads

Protection of control devices

Choice of breaking capacity

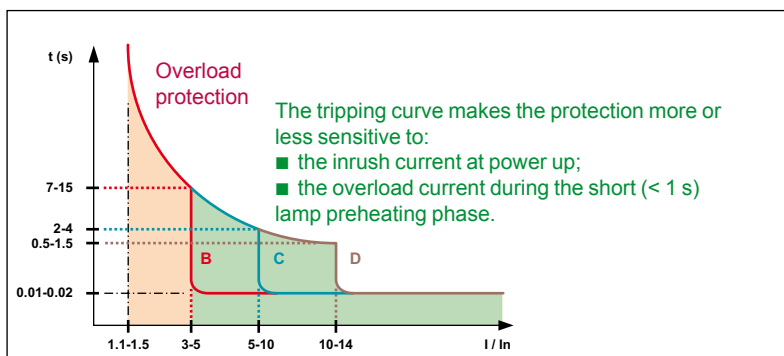
- The breaking capacity must be greater than or equal to the prospective short-circuit current upstream of the circuit breaker.
- However, in the event of use in combination with an upstream circuit breaker limiting the current, this breaking capacity can possibly be reduced (cascading).

Choice of rating

- The rating (I_n) is chosen above all to protect the electrical conductors:
 - 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.
- Generally, the rating should be greater than the nominal current of the circuits. However, in the case of lighting circuits, to ensure excellent continuity of service, it is recommended that this rating be **approximately twice the rated current** of the circuit (see the paragraph opposite) 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 (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 according to habits.
- However, to prevent nuisance tripping, it may be advisable to choose a less sensitive curve (e.g. go from B to C).



(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. The neutral cable must be sized to prevent it from overheating. However, the current flowing through the neutral cable may be greater than the current in each phase and can 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 an earth leakage protection device to protect human life.

Continuity of service

Safety measures to guard against nuisance tripping

- Nuisance tripping can be generated by:
- the inrush current at circuit closure,
 - the overload current during the lamp preheating phase,
 - 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 curve B to curve C or from curve C to curve D (2).
 - **Reduce the number of lamps per circuit.**
 - **Start up the circuits successively,** using time delay auxiliaries on the control relays (see page 34 and example on page 35).
- Under no circumstances may the circuit breaker rating be increased, as the electrical conductors would then no longer be protected.**

Reflex iC60

The Reflex iC60 (see page 34) devices 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).



Circuit breaker:
 Fast dimensioning
 ▶ pages 22 to 25
 Optimised calculation
 ▶ "My Ecodial" software

Usual values

- Circuit breaker rating: value equal to twice the rated current of the circuit (6, 10, 13, 16 or 20 A).
- Curve: B or C depending on habits.

Protection selection

Earth leakage protection device selection principles



iID

iC60N + Vigi iC60

Earth leakage protection devices

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

Protecting the installation against fires generated by a cable insulation fault

Protecting people against electric shock

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 preheating 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 residual current circuit breaker) should always be greater than or equal to the rating of the upstream circuit breaker.

Continuity of service

Safety measures to guard against nuisance tripping

Choice of time delay

Discrimination

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

"Super immune" protection

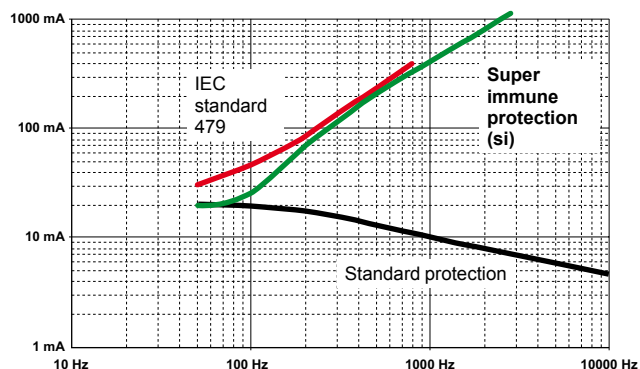
"Si" type "Super immune" protection

- Compact fluorescent lamps and high-intensity discharge lamps with electronic ballast 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.

"Si" type technology

- Red curve —: 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.
- Black curve —: standard earth leakage protection devices are more sensitive to high-frequency currents than to 50/60 Hz.
- Green curve —: the "Si" "Super immune" protections are less sensitive to high-frequency disturbances, whilst at the same time ensuring personal safety.

Tripping curve of a 30 mA earth leakage protection function





Electrical distribution and protection fast dimensioning

Cable cross-section, circuit breaker rating



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 the bottom of the page

(1) If the voltage or power factor is different, the lighting power and the cable length must 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	Multiplier coefficient 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.

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, whatever the installation method and insulating material used for the conductors,
- the circuit breaker rating for protection and continuity of service with a safety 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	Rated 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

Cross-section of each conductor (mm ²)	1.5	2.5	4	6	10	16	25
--	-----	-----	---	---	----	----	----

Circuit breaker

Rating (A)	Recommended	Twice the rated current of the lighting circuit						
		2 x 6 A = 13 or 16 A						
Maximum (2)								
Cable with PVC 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

- 30 light fittings with 2 x 18 W 230 V single-phase fluorescent lamps.
- Power factor (Cos φ): 0.95.
- Average distance from the switchboard: 60 m.

Calculations

- Lamp power: 30 x 2 x 18 = 1080 W.
- Ballast losses, estimated at 10% of the lamp power: i.e. 108 W.
- Lighting power (P): 1080 + 108 = 1188 W = 1.2 kW the next highest value in the table, i.e. **1.3 kW** is selected.
- Corresponding rated current (I = P/U Cos φ) = 1188 W/(230 V x 0.95) = 5.4 A the next highest value in the table, i.e. **6 A** is selected.
- Average lamp distance: 60 m the next highest value in the table, i.e. **82 m** is selected.

Cable and protection values selected

- The cable cross-section recommended 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 standard value of **13 A or 16 A**.
- This rating is in fact less than or equal to the maximum authorised rating (16 or 20 A) to ensure that the cable is protected.

Three-phase copper cable 230 V AC 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 the bottom of the page
(with table value correction allowing for 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 rated current 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	Multiplier coefficient to be applied for Power	Multiplier coefficient to be applied for 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.

Characteristics of the installation

three-phase balanced 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	Rated 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)							
		1.5	2.5	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			
1.3 x 0.895 = 1.2	6	98 110	163 182	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 (mm ²)	1.5	2.5	4	6	10	16	25

Circuit breaker

Rating (A)	Recommended	Twice the rated current of the lighting circuit						
		2 x 6 A = 13 or 16 A						
Maximum (2)								
Cable with PVC 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

- 39 x 70 W 230 V sodium vapour lamps with compensation, 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: (39 x 70)/3 = 910 W.
- Ballast losses per phase, estimated at 10% of the lamp power: i.e. 91 W.
- Lighting power per phase (P): 910 + 91 = 1001 W = 1 kW.
- Corresponding current (I = P/U Cos φ): = 1001 W/(230 V x 0.85) = 5.1 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 the power factor into consideration:
 - 98 x 1.118 = 110 m;
 - 163 x 1.118 = 182 m the corrected value immediately above 120 m in the table, i.e. **182 m** is selected.

Cable and protection values selected

- The cable cross-section per phase recommended 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 the standard value.
- This rating is in fact less than or equal to the maximum authorised rating (16 or 20 A) to ensure that the cable is protected.



Electrical distribution and protection fast dimensioning

Type of Canalis, circuit breaker rating



These tables are used to determine from the main characteristics of the installation (type of flexible or rigid busbar trunking, type of lamp, lighting power, distance from the electrical switchboard):

- the busbar trunking rating (20, 25 or 40 A) for a voltage drop less than 3% at the lamps,
- the circuit breaker rating for protection and continuity of service with a safety margin, whatever the type of lamps.

Step 1: Select the busbar trunking rating according to the number and type of lamps

Characteristics of the lamps			Characteristics of the circuit											
Type of lamp the most commonly used with prefabricated busbar trunking systems			Power-factor correction			Lamp unit power (W) without control ballast losses			35°C, voltage drop to be checked according to the length of the busbar trunking in the following table					
									230 V single-phase circuit			Three-phase circuit		
						Flexible (KDP)			Rigid (KBA or KBB)					
						20 A			25 A			40 A		
						20 A			25 A			40 A		
Maximum number of light fittings and maximum total power														
Fluorescent tubes	Yes	36 W	66	2400 W	66	3750 W	66	6000 W	99	3 x 1200 W	99	3 x 1200 W	99	3 x 1200 W
		58 W	50		62		62		75	to	75	to	75	to
		2 x 36 W	42	3000 W	52		67		99	3 x 3000 W	99	3 x 3750 W	99	3 x 3750 W
		2 x 49 W	30		38		61		92		115		115	
		2 x 58 W	26		32		52		78		96		96	
	No	36 W	44	1600W	55	2000 W	55	3250 W	105	3 x 1600 W	105	3 x 2000 W	105	3 x 3250 W
	58 W	28		35		45		84		84		84		
	2 x 36 W	22		27		44		66		81		81		
	2 x 49 W	16		20		33		49		61		61		
	2 x 58 W	14		17		28		42		51		51		
High-pressure mercury vapour lamps	Yes	250 W	14	3500 W	17	4250 W	22	5500 W	Usage infrequent	51	3 x 3750 W	66	3 x 3750 W	
		400 W	8		10		13			30		39		
	No	250 W	9	2400 W	11	2800 W	14	3600 W		33	3 x 2000 W	42	3 x 3250 W	
	400 W	6		7		9		21		27		27		
High-pressure sodium vapour lamps or metal-iodide lamps	Yes	150 W	22	3300 W	27	4100 W	35	5250 W	Usage infrequent	81	3 x 4050 W	105	3 x 5250 W	
		250 W	14		17		22			51	to	66	to	
		400 W	9	3600 W	11	4400 W	14	5600 W		33	3 x 4400 W	42	3 x 5600 W	
	No	150 W	11	1650W	13	2000 W	17	2550 W		39	3 x 2000 W	51	3 x 2550 W	
	250 W	6		8		10		24			30		30	
	400 W	4		5		6		15		18		18		

Example described at the bottom of the page

Example of a factory

Characteristics of a light line

- 30 light fittings with 2 x 58 W 230 V fluorescent lamps, evenly spaced along 75 m and suspended from a rigid KBA type busbar trunking.
- Single-phase or three-phase power supply: under consideration.
- Power factor: 0.95.
- Operating temperature: < 35°C.

Calculations

- Power of the lamps: 30 x 2 x 58 = 3480 W.
- Ballast losses, estimated at 10% of the lamp power: i.e. 348 W.
- Lighting power: 3480 + 348 = 3828 W = 3.83 kW, i.e. 1.28 kW per phase for a three-phase supply.
- Corresponding rated current (I = P/U Cos φ):
 - single-phase: 3828 W / (230 V x 0.95) = **17.5 A**;
 - three-phase (230 V between phase and neutral): 17.5/3 = **5.85 A** per phase.

Step 1: select the busbar trunking rating according to the number and type of lamps (see table above)

Find the example in the table:

- line: fluorescent tube with power factor correction, type 2 x 58 W,
- column:
 - if single-phase circuit: KBA 25 A seems sufficient as 30 light fittings < 32;
 - if three-phase circuit: KBA 25 A seems sufficient as 30 light fittings < 96.

Step 2: confirm the busbar trunking rating according to the length of the circuit (tables on next page)

Find the example in the table:

- single-phase:
 - 16 A < 17.5 A < 20 A;
 - the max. corresponding lengths for KBA 25 A (70 and 56 m) are less than the 75 m of the installation;
 - this requires changing to KBA 40 A to ensure a voltage drop < 3%. This busbar trunking overdimensioning leads us to consider a three-phase solution.
- three-phase:
 - 5.85 A is almost 6 A;
 - the max. corresponding length for KBA 25 A (375 m) is far longer than 75 m;
 - therefore a three-phase KBA 25 A solution guarantees a voltage drop that is far less than 3% at the end of the busbar trunking.

Select the circuit breaker rating

Minimum value: twice 6 A = 12 A, i.e. 13 or 16 A as the nearest standard value.

Note: a higher rating (up to 25 A) is possible and guarantees that the busbar trunking is protected. However, it is important to check that this rating is also compatible with the busbar trunking supply cable protection.

Step 2: confirm the busbar trunking rating according to the length of the circuit and select the circuit breaker rating

Single-phase Canalis 230 V AC busbar trunking

Characteristics of the installation
at 35°C, Cos φ = 0.95 (1)

Lighting power (kW) including any ballast losses	Rated current (A)	Maximum length of the busbar trunking (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	330	375	
1.3	6	165	188	384
2.2	10	99	113	231
3.5	16	62	70	144
4.4	20	49	56	115
5.5	25		45	92
7.0	32			72
8.7	40			58
10.9	50	Overloaded busbar trunking		
13.8	63	Overloaded busbar trunking		

Busbar trunking system

Type of busbar trunking	Flexible (KDP)	Rigid (KBA or KBB)	
Rating (A)	20	25	40

Circuit breaker

Rating (A)	Recommended	Twice the rated current of the lighting circuit		
Maxi	20	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 (2)

Lighting power per phase (kW) including any ballast losses	Rated current per phase (A)	Maximum length of the busbar trunking (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	661	751	
1.3	6	330	375	769
2.2	10	198	225	461
3.5	16	124	141	288
4.4	20	49	113	231
5.5	25		90	184
7.0	32			144
8.7	40			115
10.9	50	Overloaded busbar trunking		
13.8	63	Overloaded busbar trunking		

Busbar trunking system

Type of busbar trunking	Flexible (KDP)	Rigid (KBA or KBB)	
Rating (A)	20	25	40

Circuit breaker

Rating (A)	Recommended	Twice the rated current of the lighting circuit		
Maxi	20	25	40	

- Infrequently used
- Recommended
- Acceptable
- Not recommended (high inrush currents)
- Risk of overheating/overloading the cable
- Example described on page 20

(1) If the voltage or power factor is different, some values in the table must 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	Multiplier coefficient to be applied for	
	Power	Length of the busbar trunking
0.85	0.895	1.118
0.5	0.526	1.9

(2) If the voltage or power factor is different, the lighting power and the length of the busbar trunking must be recalculated (the value of the rated current 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	Multiplier coefficient to be applied for	
	Power	Length of the busbar trunking
0.85	0.895	1.118
0.5	0.526	1.9



Control devices

Principles for selection of modular remote control devices

Control devices

- Their role is to control light fitting switching on and off by switching the conductor(s).
- Their technology allows a very large number of switching operations (approximately 100,000) 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;
 - sophisticated functions (central control, timer, programming, etc.).
- Control of a three-phase circuit.

Choice of control device

		Impulse relay		Modular contactor	
					
		iTL iETL iTL+		iCT iCT+ iCT+	
Type of power circuit architecture (modular/monobloc)		<ul style="list-style-type: none"> ■ Circuit protection is provided by a separate circuit breaker. ■ The control and power circuits are separate. They can also relay the management devices (▶ page 36), 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	None except when controlled		When it is in operation (1 to 2 W)	
Remote reclosing of the protective device		–	–	–	–
Number of switching cycles per day (on average)		< 100	< 1000	< 100	< 1000
Complexity of control		★ By combining auxiliaries	★ With relay circuitry	★ By combining auxiliaries	★ With relay circuitry
Rating (most common values in bold)		16 or 32 A	16 A	16, 25 , 40 , 63 A	20 A
Installation options		Many possible functions by using auxiliaries: <ul style="list-style-type: none"> ■ time delay ■ illuminated push-button control ■ step-by-step control ■ signalling ■ latched-type control ■ centralised multi-level control 			
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 ETL 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		▶ pages 30 to 32	No derating: ■ 16 A in steady-state conditions	▶ pages 30 to 32	No derating: ■ 20 A in steady-state conditions
Remote status indication	Protection	Auxiliary on circuit breaker			
	Control	Auxiliary on contactor or impulse relay	–	Auxiliary on contactor or impulse relay	–
Control circuit	Push-buttons, linear switches	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	–
Favourite applications		<ul style="list-style-type: none"> ■ Residential ■ Service sector and industrial buildings (offices, corridors, shops, workshops, etc.) 	<ul style="list-style-type: none"> ■ Residential ■ Service sector buildings (hotels, hospitals) 	<ul style="list-style-type: none"> ■ Service sector and industrial buildings (offices, open-space offices, warehouses, supermarkets, indoor car parks, etc.) ■ Infrastructure (tunnels, outdoor car parks, public lighting, etc.) 	<ul style="list-style-type: none"> ■ Residential ■ Service sector buildings (hotels, hospitals)

★ : low ★ : medium ★ : high

Reflex iC60

The best all-in-one for lighting control and protection applications

- Total safety of the installation.
- Easy wiring.
- Reduced consumption and heating in the switchboard.
- Bistable solution.
- Ready to be connected with a Acti 9 Smartlink or a PLC.



Reflex iC60 integrated control circuit breakers



Reflex iC60

Monobloc

The circuit protection and power switching functions are incorporated in a single device

In enclosure and panel

Multiple

Pulse or latched

Very low, except for control

–

< 10

★ Integrated auxiliary functions

10, 16, 25, 40, 63 A

Numerous functionalities incorporated:

- choice of control order interpretation mode
- control and indication interface compatible with 24 Vdc programmable logic controller standards
- compatibility with Vigi iC60 earth leakage protection auxiliaries
- control orders time delayed by time delay relays or PLCs

Several kW

Single-phase (2P) or three-phase (3 or 4P)

► pages 31 to 33

Incorporated

Incorporated

230 V AC

24/48 V AC/DC with auxiliary iMDU

24 V DC with Ti24 interface

- Service sector and industrial buildings (offices, open-space offices, warehouses, supermarkets, indoor car parks, etc.)
- Infrastructure (tunnels, outdoor car parks, public lighting, etc.)

RCA iC60 remote control



RCA iC60

Monobloc

The circuit breaker combined with the RCA performs the circuit protection and power switching functions

In enclosure and panel

Multiple

Pulse or latched

Very low, except for control

Yes

1 to 2 on average

★ Integrated auxiliary functions

1 to 63 A

Numerous functionalities incorporated:

- remote reclosing possible, following an electrical fault
- choice of control order interpretation mode
- control and indication interface compatible with 24 Vdc programmable logic controller standards
- control orders time delayed by time delay relays or PLCs
- compatibility with the auxiliaries of the iC60 and Vigi protection product offering (IOF, iSD indication auxiliaries and iMN, iMX tripping auxiliaries, etc.)

Several kW

Single-phase (1 or 2P) or three-phase (3 or 4P)

► pages 31 to 33

■ Incorporated

■ By MCB auxiliary

■ Incorporated

■ By MCB auxiliary

230 V AC

24/48 V AC/DC with auxiliary iMDU

24 V DC with Ti24 interface

- Infrastructure (tunnels, indoor/outdoor car parks, public lighting, etc.)



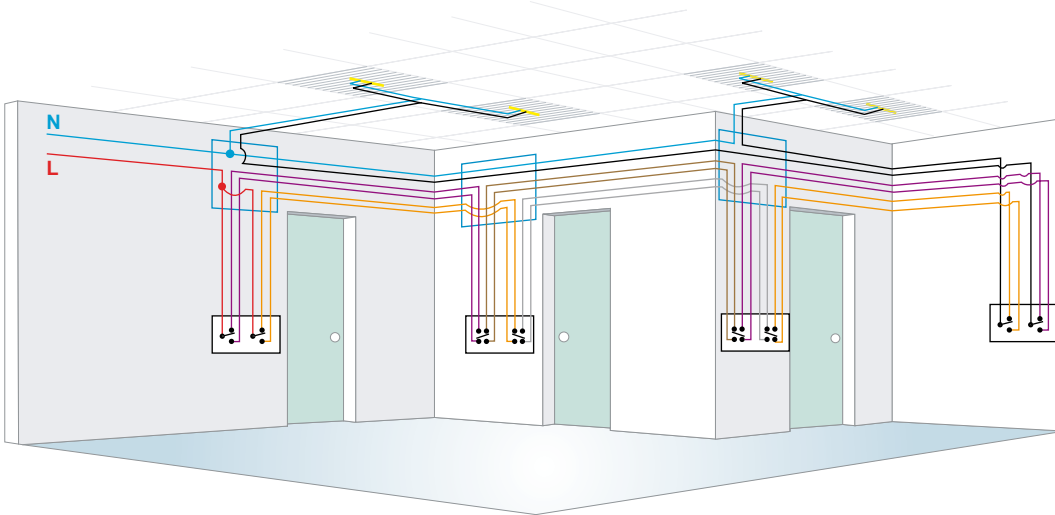
Control devices

Example

Simplification of cabling through the use of controls

Controlled by switches without relay

- Conventional cabling with two-way switches and four-way switch(es).



Controlled by power relays (contactor, impulse relay, Reflex iC60, RCA)

- **Lower investment costs:**

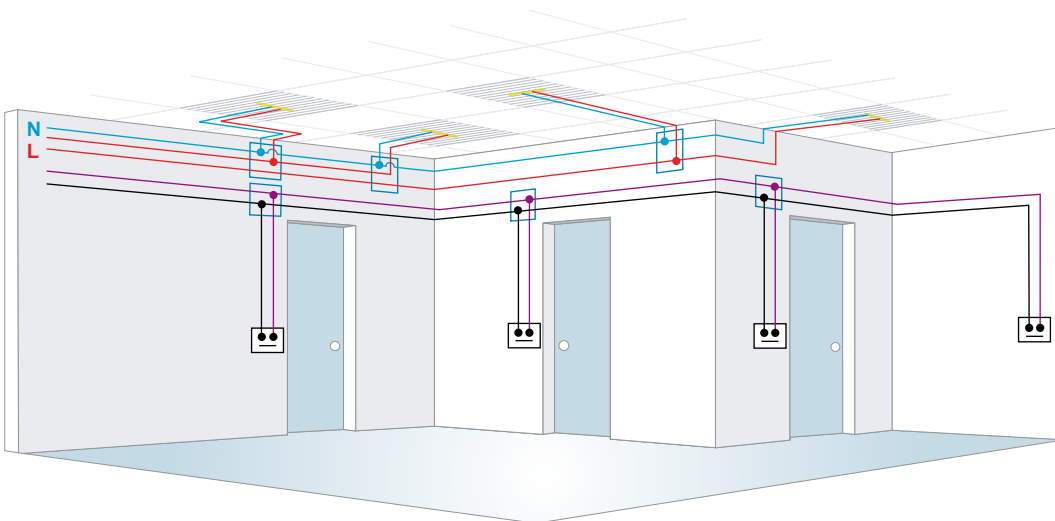
- fewer cables,
- small control circuit cross-section,
- faster installation (simplified cabling).

- **Upgradeable circuits:**

- easy to add a control point,
- potential for adding auxiliaries (time delay, timer, centralised multi-level control, etc. page 34) and management functions.

- **Energy savings:**

- no power consumption in the control circuit (impulse relay),
- automated management of switching on/off (movement detector, programmable time switch, light sensitive switch, etc. ▶ page 35).





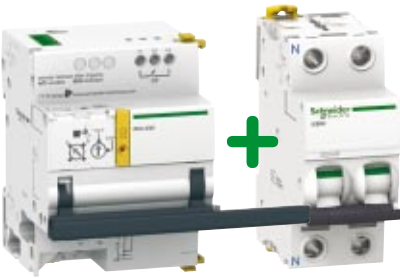
iTL



ICT



Reflex iC60



RCA



Ventilation spacer ref. A9A27062

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 relay 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, preheating 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 relay 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

- 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 contactors**, due to their operating principle, constantly dissipate heat (several watts) due to:

- coil consumption,
- 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 1 or 2 contactors). 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.



Control devices

Rating performance according to the type and number of lamps

Information

Modular contactors, impulse relays or Reflex iC60 do not use the same technologies. Their rating is determined according to different standards and does not correspond to the rated current of the circuit (except for iTL+ and iCT+). For example, for a given rating, an impulse relay is more efficient than a modular contactor for the control of light fittings with a strong inrush current, or with a low power factor (non-compensated inductive circuit).

Relay rating

- The table below shows the maximum number of light fittings for each relay, according to the type, power and configuration of a given lamp. As an indication, the total acceptable power is also mentioned.
- These values are given for a 230 V circuit with 2 active conductors (single-phase phase/neutral or two-phase phase/phase). For 110 V circuits, divide the values in the table by 2.
- To obtain the equivalent values for the entire 230 V three-phase circuit, multiply the number of lamps and the maximum power output:
 - by $\sqrt{3}$ (1.73) for circuits with 230 V between phases without neutral;
 - by 3 for circuits with 230 V between phase and neutral or 400 V between phases.

Note: The power ratings of the lamps most commonly used are shown in bold. For powers not mentioned, use a proportional rule with the nearest values.

Type of lamp	Unit power and capacitance of power factor correction capacitor	Maximum number of light fittings for a single-phase circuit and maximum power output per circuit											
		iTL impulse relay				iCT contactor							
		16 A		32 A		16 A		25 A		40 A		63 A	
Basic incandescent lamps - LV halogen lamps - Replacement mercury vapour lamps (without ballast)													
	40 W	40	1500 W	106	4000 W	38	1550 W	57	2300 W	115	4600 W	172	6900 W
	60 W	25	to 1600 W	66	to 4200 W	30	to 2000 W	45	to 2850 W	85	to 5250 W	125	to 7500 W
	75 W	20		53		25		38		70		100	
	100 W	16		42		19		28		50		73	
	150 W	10		28		12		18		35		50	
	200 W	8		21		10		14		26		37	
	300 W	5	1500 W	13	4000 W	7	2100 W	10	3000 W	18	5500 W	25	7500 W
	500 W	3		8		4		6		10	to 6000 W	15	to 8000 W
	1000 W	1		4		2		3		6		8	
	1500 W	1		2		1		2		4		5	
ELV 12 or 24 V halogen lamps													
With ferromagnetic transformer	20 W	70	1350 W	180	3600 W	15	300 W	23	450 W	42	850 W	63	1250 W
	50 W	28	to 1450 W	74	to 3750 W	10	to 600 W	15	to 900 W	27	to 1950 W	42	to 2850 W
	75 W	19		50		8		12		23		35	
	100 W	14		37		6		8		18		27	
With electronic transformer	20 W	60	1200 W	160	3200 W	62	1250 W	90	1850 W	182	3650 W	275	5500 W
	50 W	25	to 1400 W	65	to 3350 W	25	to 1600 W	39	to 2250 W	76	to 4200 W	114	to 6000 W
	75 W	18		44		20		28		53		78	
	100 W	14		33		16		22		42		60	
Fluorescent tubes with starter and ferromagnetic ballast													
1 tube without compensation (1)	15 W	83	1250 W	213	3200 W	22	330 W	30	450 W	70	1050 W	100	1500 W
	18 W	70	to 1300 W	186	to 3350 W	22	to 850 W	30	to 1200 W	70	to 2400 W	100	to 3850 W
	20 W	62		160		22		30		70		100	
	36 W	35		93		20		28		60		90	
	40 W	31		81		20		28		60		90	
	58 W	21		55		13		17		35		56	
	65 W	20		50		13		17		35		56	
	80 W	16		41		10		15		30		48	
	115 W	11		29		7		10		20		32	
1 tube with parallel compensation (2)	15 W	60	900 W	160	2400 W	15	200 W	20	300 W	40	600 W	60	900 W
	18 W	50		133		15	to 800 W	20	to 1200 W	40	to 2400 W	60	to 3500 W
	20 W	45		120		15		20		40		60	
	36 W	25		66		15		20		40		60	
	40 W	22		60		15		20		40		60	
	58 W	16		42		10		15		30		43	
	65 W	13		37		10		15		30		43	
	80 W	11		30		10		15		30		43	
	115 W	7		20		5		7		14		20	
2 or 4 tubes with series compensation	2 x 18 W	56	2000 W	148	5300 W	30	1100 W	46	1650 W	80	2900 W	123	4450 W
	4 x 18 W	28		74		16	to 1500 W	24	to 2400 W	44	to 3800 W	68	to 5900 W
	2 x 36 W	28		74		16		24		44		68	
	2 x 58 W	17		45		10		16		27		42	
	2 x 65 W	15		40		10		16		27		42	
	2 x 80 W	12		33		9		13		22		34	
	2 x 115 W	8		23		6		10		16		25	
Fluorescent tubes with electronic ballast													
1 or 2 tubes	18 W	80	1450 W	212	3800 W	74	1300 W	111	2000 W	222	4000 W	333	6000 W
	36 W	40	to 1550 W	106	to 4000 W	38	to 1400 W	58	to 2200 W	117	to 4400 W	176	to 6600 W
	58 W	26		69		25		37		74		111	
	2 x 18 W	40		106		36		55		111		166	
	2 x 36 W	20		53		20		30		60		90	
	2 x 58 W	13		34		12		19		38		57	

Reflex iC60

The best all-in-one for lighting control and protection applications

- Total safety of the installation.
- Easy wiring.
- Reduced consumption and heating in the switchboard.
- Bistable solution.
- Ready to be connected with a Acti 9 Smartlink or a PLC.



Integrated control circuit breakers Reflex iC60

10 A		16 A		25 A		40 A		63 A	
28	1120 W	46	1840 W	70	2800 W	140	5600 W	207	8280 W
23	to	36	to	55	to	103	to	152	to
29	2175 W	31	2600 W	46	3600 W	80	6800 W	121	9800 W
15		23		33		60		88	
12		15		22		43		60	
9		13		18		34		49	
6	1500 W	9	1500 W	12	3600 W	22	6000 W	30	8250 W
4	to	5	to	8	to	12	to	19	to
2	2000 W	3	3000 W	4	4500 W	8	7500 W	10	10000 W
1		1		3		5		5	
11	220 W	19	380 W	27	540 W	50	1000 W	75	1500 W
8	to	12	to	19	to	33	to	51	to
7	500 W	10	800 W	14	1050 W	27	2200 W	43	3300 W
5		8		10		22		33	
47	940 W	74	1480 W	108	2160 W	220	4400 W	333	6660 W
19	to	31	to	47	to	92	to	137	to
15	1200 W	24	2000 W	34	2600 W	64	5100 W	94	7300 W
12		20		26		51		73	
16	244 W	26	390 W	37	555 W	85	1275 W	121	1815 W
16	to	26	to	37	to	85	to	121	to
16	647 W	26	1035 W	37	1520 W	85	2880 W	121	4640 W
15		24		34		72		108	
15		24		34		72		108	
9		15		21		43		68	
9		15		21		43		68	
8		12		19		36		58	
6		9		12		24		38	
11	165 W	19	285 W	24	360 W	48	720 W	72	1080 W
11	to	19	to	24	to	48	to	72	to
11	640 W	19	960 W	24	1520 W	48	2880 W	72	4080 W
11		19		24		48		72	
11		19		24		48		72	
8		12		19		36		51	
8		12		19		36		51	
8		12		19		36		51	
4		7		9		17		24	
23	828 W	36	1296 W	56	2016 W	96	3456 W	148	5328 W
12	to	20	to	29	to	52	to	82	to
12	1150 W	20	1840 W	29	2760 W	52	4600 W	82	7130 W
8		12		20		33		51	
8		12		20		33		51	
7		11		15		26		41	
5		8		12		20		31	
56	1008 W	90	1620 W	134	2412 W	268	4824 W	402	7236 W
28	to	46	to	70	to	142	to	213	to
19	1152 W	31	1798 W	45	2668 W	90	5336 W	134	8120 W
27		44		67		134		201	
16		24		37		72		108	
9		15		23		46		70	



Control devices

Rating performance according to the type and number of lamps (cont.)

Type of lamp	Unit power and capacitance of power factor correction capacitor	Maximum number of light fittings for a single-phase circuit and maximum power output per circuit													
		iTL impulse relay		iCT contactor											
		16 A	32 A	16 A	25 A	40 A	63 A								
Compact fluorescent lamps															
With external electronic ballast	5 W	240	1200 W	630	3150 W	210	1050 W	330	1650 W	670	3350 W	Infrequent use			
	7 W	171	to 1450 W	457	to 3800 W	150	to 1300 W	222	to 2000 W	478	to 4000 W				
	9 W	138		366		122		194		383					
	11 W	118		318		104		163		327					
	18 W	77		202		66		105		216					
	26 W	55		146		50		76		153					
With integral electronic ballast (replacement for incandescent lamps)	5 W	170	850 W	390	1950 W	160	800 W	230	1150 W	470	2350 W	710	3550 W		
	7 W	121	to 1050 W	285	to 2400 W	114	to 900 W	164	to 1300 W	335	to 2600 W	514	to 3950 W		
	9 W	100		233		94		133		266		411			
	11 W	86		200		78		109		222		340			
	18 W	55		127		48		69		138		213			
	26 W	40		92		34		50		100		151			
High-pressure mercury vapour lamps with ferromagnetic ballast without ignitor															
Replacement high-pressure sodium vapour lamps with ferromagnetic ballast with integral ignitor (3)															
Without compensation (1)	50 W	Infrequent use		15	750 W	20	1000 W	34	1700 W	53	2650 W				
	80 W			10	to 1000 W	15	to 1600 W	27	to 2800 W	40	to 4200 W				
	125/110 W (3)			8		10		20		28					
	250/220 W (3)			4		6		10		15					
	400/350 W (3)			2		4		6		10					
	700 W			1		2		4		6					
With parallel compensation (2)	50 W	7 µF		10	500 W	15	750 W	28	1400 W	43	2150 W				
	80 W	8 µF		9	to 1400 W	13	to 1600 W	25	to 3500 W	38	to 5000 W				
	125/110 W (3)	10 µF		9		10		20		30					
	250/220 W (3)	18 µF		4		6		11		17					
	400/350 W (3)	25 µF		3		4		8		12					
	700 W	40 µF		2		2		5		7					
1000 W	60 µF		0		1		3		5						
Low-pressure sodium vapour lamps with ferromagnetic ballast with external ignitor															
Without compensation (1)	35 W	Infrequent use		5	270 W	9	320 W	14	500 W	24	850 W				
	55 W			5	to 360 W	9	to 720 W	14	to 1100 W	24	to 1800 W				
	90 W			3		6		9		19					
	135 W			2		4		6		10					
	180 W			2		4		6		10					
	With parallel compensation (2)	35 W	20 µF	38	1350 W	102	3600 W	3	100 W	5	175 W	10	350 W	15	550 W
55 W		20 µF	24		63		3	to 180 W	5	to 360 W	10	to 720 W	15	to 1100 W	
90 W		26 µF	15		40		2		4		8		11		
135 W		40 µF	10		26		1		2		5		7		
180 W		45 µF	7		18		1		2		4		6		
High-pressure sodium vapour lamps - Metal-iodide lamps - Metal halide lamps		With ferromagnetic ballast with external ignitor, without compensation (1)	35 W	Infrequent use		16	600 W	24	850 W	42	1450 W	64	2250 W		
	70 W				8		12	to 1200 W	20	to 2000 W	32	to 3200 W			
	150 W				4		7		13		18				
	250 W				2		4		8		11				
	400 W				1		3		5		8				
	1000 W				0		1		2		3				
	With ferromagnetic ballast with external ignitor and parallel compensation (2)	35 W	6 µF	34	1200 W	88	3100 W	12	450 W	18	650 W	31	1100 W	50	1750 W
		70 W	12 µF	17	to 1350 W	45	to 3400 W	6	to 1000 W	9	to 2000 W	16	to 4000 W	25	to 6000 W
		150 W	20 µF	8		22		4		6		10		15	
		250 W	32 µF	5		13		3		4		7		10	
		400 W	45 µF	3		8		2		3		5		7	
		1000 W	60 µF	1		3		1		2		3		5	
2000 W	85 µF	0		1		0		1		2		3			
With electronic ballast	35 W		38	1350 W	87	3100 W	24	850 W	38	1350 W	68	2400 W	102	3600 W	
	70 W		29	to 2200 W	77	to 5000 W	18	to 1350 W	29	to 2200 W	51	to 4000 W	76	to 6000 W	
	150 W		14		33		9		14		26		40		

(1) Circuits with non-compensated ferromagnetic ballasts consume twice as much current for a given lamp power output. This explains the small number of lamps in this configuration.

(2) The total capacitance of the power factor correction capacitors in parallel in a circuit limits the number of lamps that can be controlled by a contactor. The total downstream capacitance of a modular contactor of rating 16, 25, 40 or 63 A should not exceed 75, 100, 200 or 300 µF respectively. Allow for these limits to calculate the maximum acceptable number of lamps if the capacitance values are different from those in the table.

(3) High-pressure mercury vapour lamps without ignitor, of power 125, 250 and 400 W, are gradually being replaced by high-pressure sodium vapour lamps with integral ignitor, and respective power of 110, 220 and 350 W.

Note: Reflex iC60

High-pressure sodium vapour lamp with electronic ballast

For the 10 A and 16 A B-curve ratings, the number of lamps should be reduced by 10% to limit unwanted magnetic tripping.

LV halogen incandescent lamp, 1500 W

For the 10 A B-curve rating, the number of lamps should be reduced by 10% to limit unwanted magnetic tripping.

Integrated control circuit breakers Reflex iC60									
10 A		16 A		25 A		40 A		63 A	
158	790 W	251	1255 W	399	1995 W	810	4050 W	Infrequent use	
113	to 962 W	181	to 1560 W	268	to 2392 W	578	to 4706 W		
92		147		234		463			
79		125		196		396			
49		80		127		261			
37		60		92		181			
121	605 W	193	959 W	278	1390 W	568	2840 W	859	4295 W
85	to 650 W	137	to 1044 W	198	to 1560 W	405	to 3146 W	621	to 4732 W
71		113		160		322		497	
59		94		132		268		411	
36		58		83		167		257	
25		40		60		121		182	
9	469 W	15	770 W	20	1000 W	41	2050 W	64	3200 W
6	to 625 W	10	to 1000 W	15	to 1760 W	33	to 3500 W	48	to 5600 W
5		8		10		24		34	
3		4		6		12		19	
1		2		4		8		12	
0		1		2		5		8	
6	313 W	10	500 W	15	750 W	34	1700 W	52	2600 W
6	to 963 W	9	to 1540 W	13	to 1760 W	31	to 4900 W	46	to 7000 W
6		9		10		24		36	
3		4		6		13		21	
2		3		4		10		14	
1		2		2		7		9	
0		0		1		4		7	
4	153 W	7	245 W	11	385 W	17	595 W	29	1015 W
4	to 253 W	7	to 405 W	11	to 792 W	17	to 1198 W	29	to 2070 W
3		4		8		11		23	
2		3		5		8		12	
1		2		4		7		10	
3	88 W	4	140 W	7	245 W	12	420 W	19	665 W
3	to 169 W	4	to 270 W	7	to 450 W	12	to 720 W	19	to 1440 W
2		3		5		8		13	
1		2		3		5		9	
0		1		2		4		8	
12	416 W	19	400 W	28	980 W	50	1750 W	77	2695 W
7	to 481 W	11	to 750 W	15	to 1350 W	24	to 2500 W	38	to 4000 W
3		5		9		15		22	
2		3		5		10		13	
0		1		3		6		10	
0		0		1		2		3	
14	490 W	17	595 W	26	910 W	43	1505 W	70	2450 W
8	to 800 W	9	to 1200 W	13	to 2200 W	23	to 4400 W	35	to 7000 W
5		6		9		14		21	
3		4		5		10		14	
2		3		4		7		9	
0		1		2		4		7	
0		0		1		2		3	
15	525 W	24	840 W	38	1330 W	82	2870 W	123	4305 W
11	to 844 W	18	to 1350 W	29	to 2100 W	61	to 4650 W	92	to 7200 W
6		9		14		31		48	

iCT+, iTL+!

Cos φ	Pc (W)	
	iTL+	iCT+
0.95	3500	4300
0.85	3100	3900
0.5	1800	2300

In the case where the standard contactors or impulse relays can only control a very limited number of lamps, the iCT+ and iTL+ are an alternative to be considered. They are in fact especially appropriate for lamps with a high inrush current consuming up to 16 A (iTL+) or 20 A (iCT+) in steady state (for example: lamps with ferro-magnetic ballast or transformer). The following table shows the controllable power Pc according to the power factor. For high intensity discharge lamps divide the power by 2 (long preheating current).

Example: How many compensated 58 W fluorescent tubes (power factor of 0.85) with ferro-magnetic ballast (10% loss) can be controlled with a 20 A iCT+?

Number of lamps N = controllable power Pc / (power output of each lamp + loss of ballast), i.e. in this case N = 3900 / (58 + 10%) = 61. In comparison, a 16 A iCT is limited to 10 x 58 W tubes, a 25 A iCT to 15 lamps, and a 63 A iCT to 43 lamps.



Control auxiliaries

Overview




Control auxiliaries

- These auxiliaries can perform a great variety of functions:
 - from the simplest (signalling, timer, illumination delay, etc.);
 - to the most sophisticated (centralised 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 connections.

Choice of auxiliaries

or control devices with built-in auxiliary

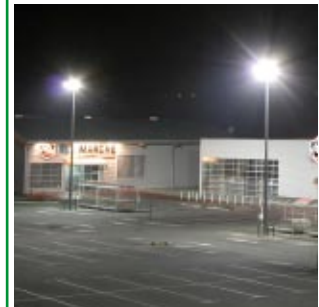
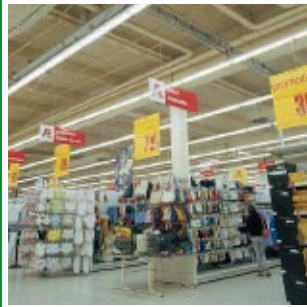
Function		Pre-auxiliary impulse relay or impulse relay + auxiliary	Modular contactor + auxiliary	Integrated control circuit breakers Reflex iC60	RCA iC60 remote control
Centralised control	Centralised control (1 level) for a group of circuits while maintaining separate control of each of them. Example: control of a whole storey or room by room.	iTLc or iTL + auxiliary iATLc	-	Integrated	Integrated
	Centralised control (1 level) + signalling	iTL + auxiliary iATLc+s	-	Integrated	Integrated
	Centralised 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 centralised control	-	iCT + auxiliary iACTc	Integrated	Integrated
Interface with PLC	Allows control from Acti 9 Smartlink or a PLC	Auxiliary iATL24	Auxiliary iATL24	Reflex iC60 Ti24 version	RCA iC60 Ti24 version
Signalling	Remote signalling of lamp status (lit or extinguished).	iTLs or iTL + auxiliary iATLs	iCT + auxiliary iACTs	Integrated	Integrated
Timer 	Return to rest position after an adjustable time delay	Auxiliary iATEt + iTL	Auxiliary iATEt + iCT	■ Time delay relays (iRT) + Reflex iC60	■ Time delay relays (iRT) + RCA iC60
Step-by-step control	Allows control of 2 circuits with a single control	Auxiliary iATL4 + 2 impulse relays iTL	Via PLC	Via PLC	Via PLC
Illuminated push-buttons compensation	Allows fault-free control by illuminated push-buttons	1 or more auxiliaries iATLz for each iTL	-	Max. current: 1.35 mA on Y2 input	Max. current: 1.35 mA on Y2 input
Change in type of control	Operates on latched orders coming from a changeover contact (selector switch, time switch, etc.)	iTLm or iTL + auxiliary iATLm	Standard operation without auxiliary	Yes	Yes
	Impulse-type local control + latched-type centralised control	Standard operation without auxiliary	Auxiliary iACTc + iCT	Integrated	Integrated
Time delay	Illumination delay (see example ► page 30). Limits the inrush current at the head of the network by powering the circuits one after the other	Auxiliary iATEt + iTL	Auxiliary iATEt + iCT	■ Time delay relays (iRT) + Reflex iC60	■ Time delay relays (iRT) + RCA iC60
Disturbance suppressor	Can prevent disturbance generated on the electrical network at power off	NA	1 auxiliary iACTp par iCT	NA	NA
Voltage adaptation for control	Allows 24 V or 48 V AC/DC control	Possible in V AC and V DC	■ Possible in V AC ■ With auxiliary iMDU in V DC	Possible with an auxiliary iMDU	

Example

Dimensioning an installation

Supermarket: main lighting circuits

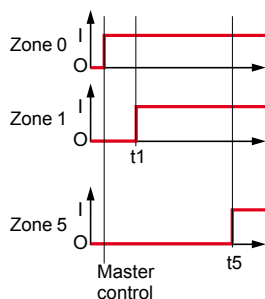
- Supply voltage: 230 V.
- Single-phase distribution.



Requirement	General lighting			Product enhancement			Car park lighting		
Circuit	Single-phase 230 V			Single-phase 230 V			Single-phase 230 V		
Number of lines	18 (1 per department)			3 (1 per display)			10		
Number of lamps per line	20 light fittings with two 58 W fluorescent tubes with electronic ballast			Four 150 W metal-iodide lamps with ferromagnetic ballast and parallel compensation			Nine 70 W high-pressure sodium vapour lamps with ferromagnetic ballast and parallel compensation		
Electrical distribution									
Main lines	Eighteen 60-m lines with Canalis KBA 25 A (2 conductors + PE)			Three 20-m lines with Canalis KDP 20 A			10 buried lines of 100 m with 10 mm ² cables		
Branch to each light fitting	1 m of cables of 1.5 mm ²			-			5 m of cables of 1.5 mm ²		
Monitoring/Control									
Protection									
Residual current circuit breaker	2P - 63 A - 300 mA - Si type 1 per group of 3 lines			2P - 63 A - 300 mA 1 for all the 3 lines			2P - 40 A - 300 mA 1 per group of 2 lines		
Possible solutions	1	2	3	1	2	3	1	2	3
Circuit breaker	2P - 25 A - curve C 1 per line	2P - 25 A - curve C 1 per line	Reflex iC60 2P - 25 A curve C 1 per line The auxiliary centralised control (Y3) and indication (OF, SD) functions are integrated	2P - 16 A - curve C 1 per line	2P - 16 A - curve C 1 per line	Reflex iC60 2P - 16 A curve C 1 per line The auxiliary centralised control (Y3) and indication (OF, SD) functions are integrated	2P - 16 A - curve B 1 per line	2P - 16 A - curve B 1 per line	Reflex iC60 2P - 16 A curve B 1 per line The auxiliary centralised control (Y3) and indication (OF, SD) functions are integrated
Control devices									
Impulse relay, contactor or Integrated control circuit breakers	iTL impulse relay 2P - 32 A 1 per line	iCT contactor 2P - 40 A 1 per line		iTL impulse relay 2P - 16 A 1 per line	iCT contactor 2P - 16 A 1 per line		iTL impulse relay 2P - 16 A 1 per line	iCT contactor 2P - 25 A 1 per line	
Control auxiliaries									
Signalling in the control panel	1 iATLs per impulse relay	1 iACTs per contactor		1 iATLc+s per impulse relay	1 iACTs per contactor		1 iATLc+s per impulse relay	1 iACTs per contactor	
Centralised control	-				1 iACTc per contactor			1 iACTc per contactor	
Inrush current limited by successive illumination of groups of lines	1 iATEt on 6 groups of 3 lines with a time delay of 2 s between each group		Via PLC	-			-		
Management devices									
Automated control by outside luminosity, timetable and calendar	-			-			1 light sensitive switch IC2000P+		

Successive illumination of 6 zones

Use of one iATEt per group of lines to limit the inrush current.



Canalis KBB with DALI system

The winning solution for controlling and supplying power to supermarket lighting





Management devices

Overview

Management devices



IHP

IC2000

■ These devices chiefly make it possible to optimise 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.



MIN

Argus 360

Choice of management devices for energy savings and improved comfort

Products	<p>potential energy saving</p>	Functions	Compatibility		
			Incandescent lamps	Fluorescent lamps	High-intensity discharge lamps
IH Electromechanical time switches	50%	<ul style="list-style-type: none"> ■ Hourly, daily or weekly ■ 1 or 2 circuits ■ With or without power reserve (operation in the event of mains failure) 	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: <ul style="list-style-type: none"> ■ a contactor ■ an impulse relay with its latched-type control auxiliary ■ a Reflex iC60 or ■ a RCA iC60 (low rate of switching) 		
IHP Digital programmable time switches	50%	<ul style="list-style-type: none"> ■ Daily, weekly or annual ■ 1 or 2 circuits ■ With or without conditional input ■ Switching interval: at least 1 min 			
IC Light sensitive switch	30%	<ul style="list-style-type: none"> ■ Controlled by: <ul style="list-style-type: none"> □ astronomical clock (automatic sunrise and sunset calculation) □ luminosity detection (adjustable from 2 to 2000 lux) ■ With or without programmable clock function 			
MIN Timer	30%	<ul style="list-style-type: none"> ■ 30 s to 1 h ■ 50% reduction of luminosity before extinction of incandescent lamps with PRE auxiliary 	2300 to 3600 W	100 to 3300 W not recommended for time delays of less than a few minutes	Not recommended for time delays of less than an hour
Argus Presence detectors	50%	<ul style="list-style-type: none"> ■ 360° ■ IP 20 ■ Detection distance: presence 4 or 12 m, movement 4 or 14 m ■ Luminosity threshold: 10 to 1000 lux ■ Time delay of 10 s to 120 minutes ■ With or without remote control 	1000 or 2300 W	1000 W not recommended for time delays of less than a few minutes	Not appropriate
Argus Movement detectors	50%	<ul style="list-style-type: none"> ■ 110, 180, 220, 300 or 360° ■ IP 44 or IP 55 ■ Detection distance: up to 12 or 16 m ■ Luminosity threshold: 2 to 1000 lux ■ Time delay of 1 s to 8 min or 5 s to 12 min 	1000, 2000 or 3000 W	400 or 1200 W not recommended for time delays of less than a few minutes	Not appropriate
STD400, STD1000, SCU10 Remote control dimmers	30%	<ul style="list-style-type: none"> ■ Control of circuits from 40 to 1500 W 	40 to 1000 W	1500 W	Not compatible

Emergency lighting

General rules

Emergency lighting

- Emergency lighting is designed to eliminate or minimise public panic in the event of a serious problem such as a fire or an earthquake, and even a simple power cut.
- Suitable for all types and sizes of buildings (schools, hotels, shopping centres, hospitals, offices, shops, museums, etc.), Schneider Electric emergency lighting is essential to the safety of the occupants.
- The anti-panic devices give out a light that enables people to see where they are and to avoid obstacles, whilst the signage units clearly show the way out of the premises. These products are mainly installed at a certain height.

Different technologies and characteristics

- These light units have a light source consisting mainly of fluorescent lamps and LEDs, a battery to supply power in the event of a mains failure and an electronic circuit board. These products are selected according to their luminous flux, IP, IK, autonomy, illuminated continuously or only in the event of a power cut...
- They are also chosen for their maintainability:
 - standard units: tests are carried out manually or via a remote control,
 - Activa/self-test units: they are tested automatically and indicate their operating state by means of coloured LEDs,
 - Dardo/addressable units: they self-test and send the result over a pair of wires to a centralising control device.

Deactivating the light units

- To prevent the batteries discharging when the installation is not used or in the event of mains failure, the light units can be deactivated via a remote control.
- The standard and self-test units are deactivated via a remote control. Addressable units are deactivated via the Dardo Plus control unit.

The installation rules and diagrams are given for information only. They vary according to the country. Only the regulations in force in each country must be observed.

Installation of evacuation BAES (signage)

Install 1 unit at each exit and at each emergency exit, at each obstacle and change of direction to make it easier to evacuate the buildings safely.

- Maximum spacing between the units on each route according to the size of the evacuation pictogram.
- At a minimum height (out of reach of the public; generally 2 m).
- Affix warning signs to the units.
- Minimum luminous flux requirement.
- Autonomy requirement in the event of mains failure (generally 1 hour).
- Required on all public premises.

Installation of anti-panic/ambiance BAES

- Minimum lighting density (in lumens) by m².
- Even distribution throughout the premises. Often with a minimum number of units per room.
- Autonomy required in the event of mains failure (generally 1 hour).
- Required on all public premises.



Evacuation unit



Anti-panic unit



Appendix

Practical recommendations for the protection and control of lighting systems

> Basic rules

- The cross-section and length of the cables must be suitable for limiting the voltage drop to less than 3% at the end of the line in steady state (see table ► pages 22 to 25).
- The I_n rating of the standard protection and control switchgear must be far higher than the rated current of the lighting circuit:
 - for the circuit breaker, take approximately twice the rated current of the circuit,
 - for the relay, always use the compatibility tables for each type of lamp and check that its rating is always higher than that of the upstream circuit breaker (short circuit coordination).
- The I_n rating of the earth leakage protection device must be greater than or equal to that of the upstream circuit breaker.

Take the lamp ignition phase into account

Problems

- All the lamps have a very strong startup current which is broken down as follows:
 - an inrush current: a surge of 10 to 100 times the rated current (I_n) at power up,
 - followed by the preheating current (for the fluorescent or discharge lamps): possible overloading to $2 I_n$ for several seconds or minutes, depending on the type of lamp.
- This therefore gives rise to the following risks:
 - conductor overheating,
 - nuisance circuit-breaker tripping,
 - control device overloading.

Recommendation no.1

- Limit the load on each circuit of 300 to 800 W per 2-wire circuit for standard 10/16 A 230 V AC switchgear.
- Multiply the number of circuits to limit the number of lamps per circuit.

Recommendation no.2

- Use the Canalis prefabricated busbar trunking systems for large tertiary or industrial buildings.

Recommendation no.3

- Switch on the circuits successively using time delay auxiliaries such as iATEt, or a PLC

Recommendation no.4

- To control lamps with ferromagnetic ballast or transformer, high-performance control devices (iCT+ contactor or iTL+ impulse relay) should be used in preference to conventional relays to optimise the control of circuits of several kW up to 16 A.

Recommendation no.5

- Curve C or D circuit breakers should be preferred to curve B circuit breakers.

Manage electronic ballast lamps carefully

Problems

- The electronic ballast lamps require particular attention (high-frequency leaks to earth, harmonics) to guard against certain risks:
 - nuisance tripping of the earth leakage protection device,
 - overheating/overloading of the neutral conductor in three-phase circuits,
 - nuisance tripping of the 4-pole circuit breaker (neutral overload by third-order and multiple currents).

Recommendation no.1

- Create the shortest possible links between the lamps and the ballast in order to reduce high-frequency interference and capacitive leaks to earth.

Recommendation no.2

- Provide adequate discrimination, install the correct earth leakage protection at each level:
 - upstream:
 - avoid instantaneous tripping 30 mA sensitivity,
 - use a time-delay protection: 100 or 300 mA, type Δ (selective).
 - use type Si ("Super immune") 30 mA instantaneous earth leakage protection for the feeders.

Recommendation no.3

- In the case of three-phase circuits + neutral with third-order and multiple harmonic rates $> 33\%$:
 - oversize the cross-section of the neutral cable with respect to that of the phases,
 - check that the neutral current resulting from the sum of the harmonics is less than the I_n rating of the 4-pole circuit breaker.

Appendix

Practical recommendations for the protection and control of lighting systems

Save energy without increasing maintenance costs



Problems

- Discharge lamps significantly reduce energy consumption but create additional problems both for the user and with respect to their management:
 - ignition is not instantaneous due to their preheating time (a few seconds for fluorescent lamps to several minutes for high-intensity discharge lamps),
 - repeated switching accelerates ageing by a factor of 3 to 5,
 - their higher investment cost requires careful management.

Recommendation no.1

- To meet an instantaneous and/or temporary lighting requirement, an additional circuit with halogen or LED lamps may be useful for premises lit by discharge lamps.

Recommendation no.2

- To limit the ageing of fluorescent lamps:
 - set the timers or presence detectors to a minimum value of 5 to 10 minutes,
 - or dim the light level rather than switch the lamps on and off completely (lamps with external dimmable ballast).

Recommendation no.3

- Use incandescent or LEDs lamps for switching every minute.

Recommendation no.4

- Set the lighting to remain on continuously in corridors and offices at peak times rather than use presence detectors that will switch it on and off repeatedly.

Recommendation no.5

- Periodically, at the end of the average life time of the lamps, replace all the lamps and their ignitor in one area to reduce maintenance costs.

Recommendation no.6

- Use impulse relay or the Reflex iC60 rather than contactor to avoid loss of energy in the coils (a few Watts/relay).

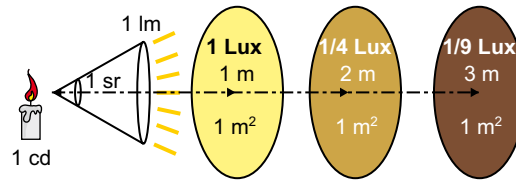


Appendix

Definition of light-related units

Candela (cd)

- Old definition: luminous intensity (luminosity) of 1 candle.
- Modern definition (standard international unit): luminous intensity of light at a wavelength of 555 nm over $1.46 \cdot 10^{-3}$ W/steradian.



Lumen (lm)

Luminous flux of 1 cd in a 1 steradian cone ($1 \text{ sphere}/4\pi$).

Lux (lx)

Illumination (quantity of light/m²) of 1 lumen/m².

Lighting efficiency (lm/W)

Ratio of the luminous flux emitted to the electrical power consumed.

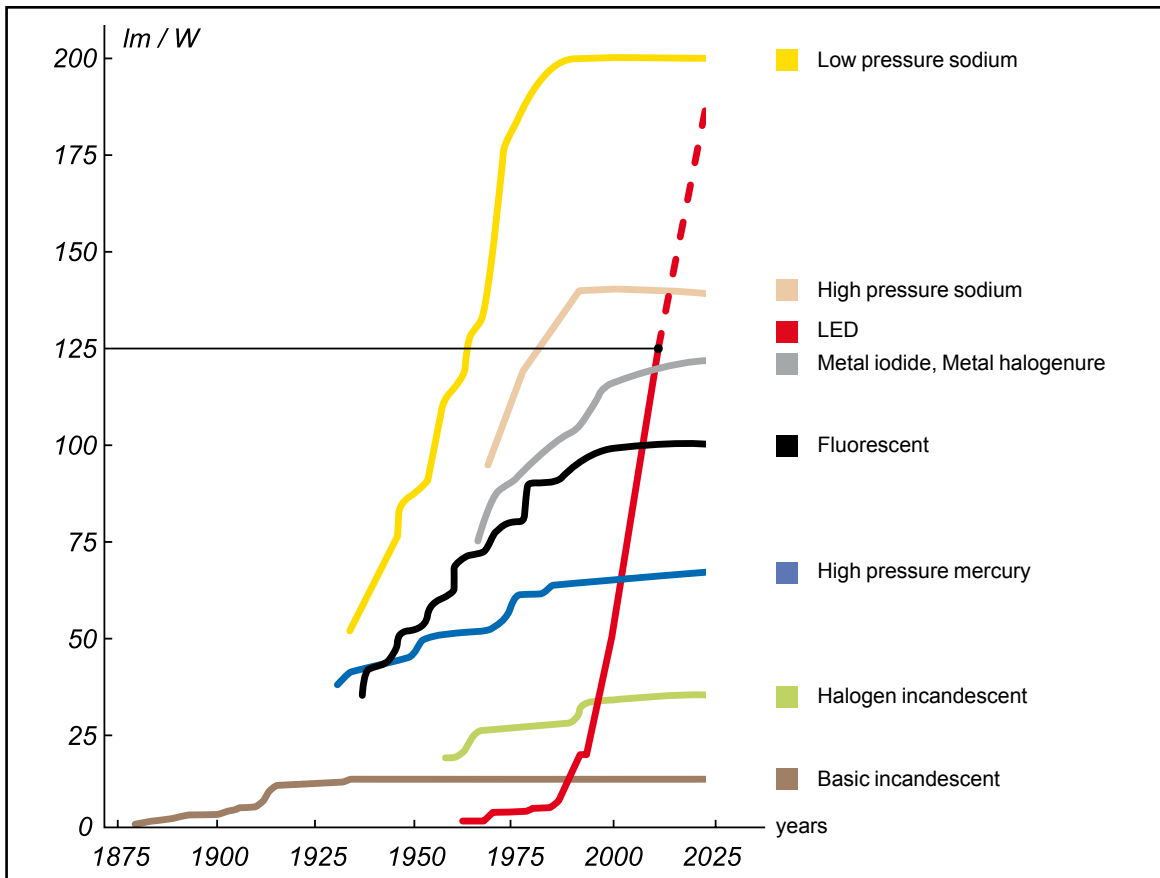
The energy that is not converted into light is dissipated in the form of heat.

The lighting efficiency decreases by 30 to 70% towards the end of the life of the lamp.

Progress in the performance of each technology over time

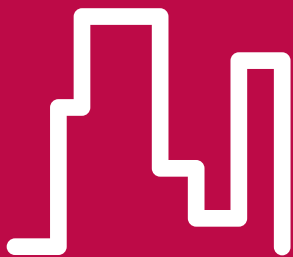
The graph below illustrates:

- the low efficiency of the incandescent lamps despite the halogen technology,
- the obsolescence of the mercury technology usefully replaced by sodium or metal iodide,
- the high performance of the fluorescent lamps,
- to meet an instantaneous and/or temporary lighting requirement, an additional circuit with halogen or LED lamps may be useful for premises lit by discharge lamps.



How to realize smart lighting control and energy saving?

Energy savings with Lighting Control



Lighting can represent
25% to 50% of energy
consumption in buildings
depending on the business.

"Smart" lighting control is one way of quickly cutting the energy bill without detracting from essential comfort!

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Circuits with multiple control modes

Manual control

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"Check that the types of protection (1P, 1P+N, 2P... and earth leakage protection) conform to the installation regulations in force in the country concerned"

Control from push-buttons



User/customer benefits

Ease of use: the zone's lighting circuit can be operated from several locations. It is well appreciated in corridors, staircases and large rooms.

Comfort: the impulse relay offers silent continuous operation compared to same application using contactors. The distribution board can be installed in quiet rooms (bedrooms, offices) without disturbing users.

Energy savings: when remote control is needed, the impulse relay is the equipment with the lowest self-consumption. This is due to the fact that energy is only needed to change its state from ON to OFF, OFF to ON. No energy is needed to maintain the ON state.

An employee can check the condition of the lighting from a central location (e.g. the reception desk) by means of the status indicator and switch the light on or off to prevent any waste of power if users have forgotten to switch off the light.



Functions - Installer advantages

- **The iTL impulse relay** closes or opens its contact every time a mains voltage pulse is applied to its coil terminals. The pulse is generated by depressing one of the push-buttons. All the push-buttons are connected in parallel.
- **Maintenance operations** are facilitated by the ON/OFF toggle with locking system on the front face of the impulse relay (the remote controls are inoperative).
- **Space saving:** the iTLs impulse relay saves space due to integration of the auxiliary contact. The total width is still 18 mm.

> Zoom on

iTL

Impulse relay!



iTL

iTLs



Favorite applications

- residential
- hotel
- office
- etc.

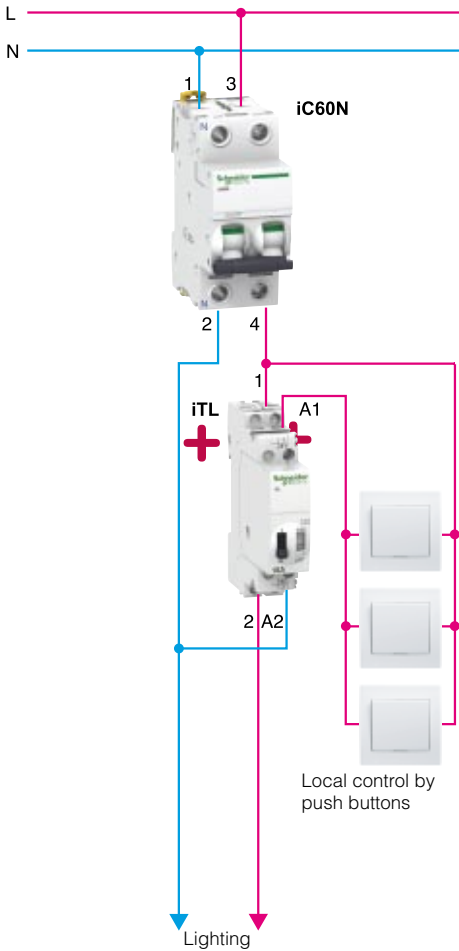


> Savings enabler

> Coil consumption of an impulse relay can be 50% lower than a contactor solution.

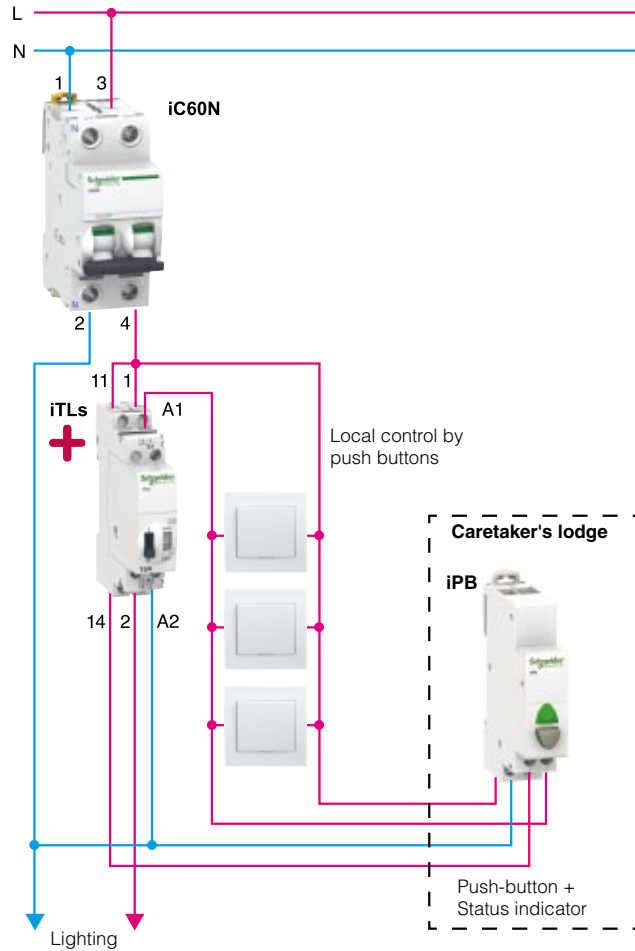
Solution diagram

Private area lighting



Common area lighting

Variant with remote reporting (circuit status)



Text for specifications

- The zone lighting shall be activated by several wall push-buttons. ON or OFF override control of lighting must be able to be performed easily from the distribution board.
- On option, it must be possible to remotely indicate the circuit status.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C16 A	1	
iTL	Impulse relay 16 A	1	A9C30811
iTLs	Impulse relay 16 A with remote indication	1	A9C32411
iPB	Push-button with indicator light	1	A9E18036
PB	Push-button	3	

Control from two-way switch



User/customer benefits

Ease of use: the status of the lighting circuit is indicated by the position of the two-way switch. The switch can be remote from the illuminated room.

Comfort: the impulse relay offers silent continuous operation. The distribution board can be installed in quiet rooms (bedrooms, offices) without disturbing users.

Energy savings: when remote control is needed, the impulse relay is the equipment with the lowest self-consumption. This is due to the fact that energy is only needed to change its state ON to OFF, OFF to ON. No energy is needed to maintain the final state.



Functions - Installer advantages

- **The iTLm impulse relay** is quite similar to a standard impulse relay, except that it is actioned not by an impulse push-button but by a changeover switch. The iTLm closes or opens its contact every time a mains voltage is applied to its ON or OFF terminal. The voltage can be applied via an two-way switch or any contacts from a time switch or other device.
- **Facilitates maintenance operations:** the coil can be manually disconnected by a switch on the front face of the impulse relay.

> Zoom on

iTLm

Impulse relay!



iTLm



Favorite applications

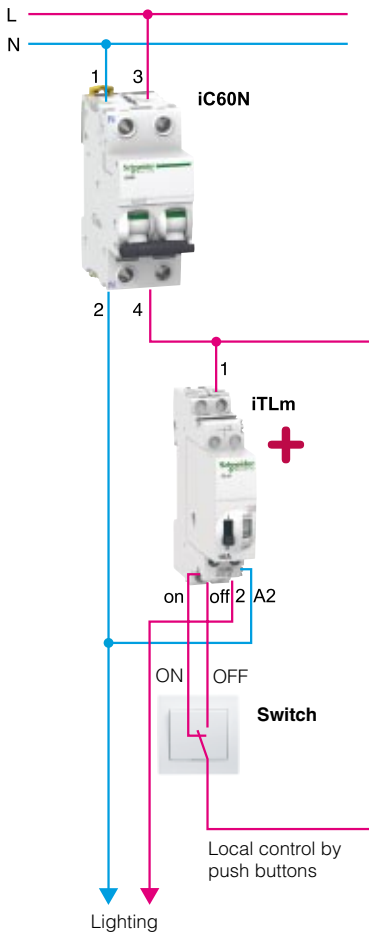
- hotel
- industry
- infrastructure.



> Savings enabler

> Coil consumption of an impulse relay can be 50% lower than a contactor solution.

Solution diagram



Text for specifications

- The lighting in the zone shall be activated by an impulse relay controlled by a two-position switch. The OFF and ON states shall be indicated above the switch. The control of the impulse relay can be mechanically disabled for easy maintenance.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C16 A	1	
iTLm	Impulse relay	1	A9C34411
I	two-way switch	1	

Lighting for a humid room



User/customer benefits

Being able to control lighting in a humid room, while ensuring personnel safety, taking into account sanitary requirements and the floor and wall cleaning operations performed each day.

All guarantees must be taken (sealed push-button, use of SELV, earth leakage protection) to ensure personnel safety and protect it from electrical hazards.

+ Functions - Installer advantages

- **Ease of installation:** the control terminal connection capacity allows the use of cable of cross section up to 4 mm².
- **Safety:** the 4 kV insulation level between the coil and the power contacts can meet the requirements of a Safety Extra Low Voltage (SELV) installation.

> Zoom on

iTL

Impulse relay!



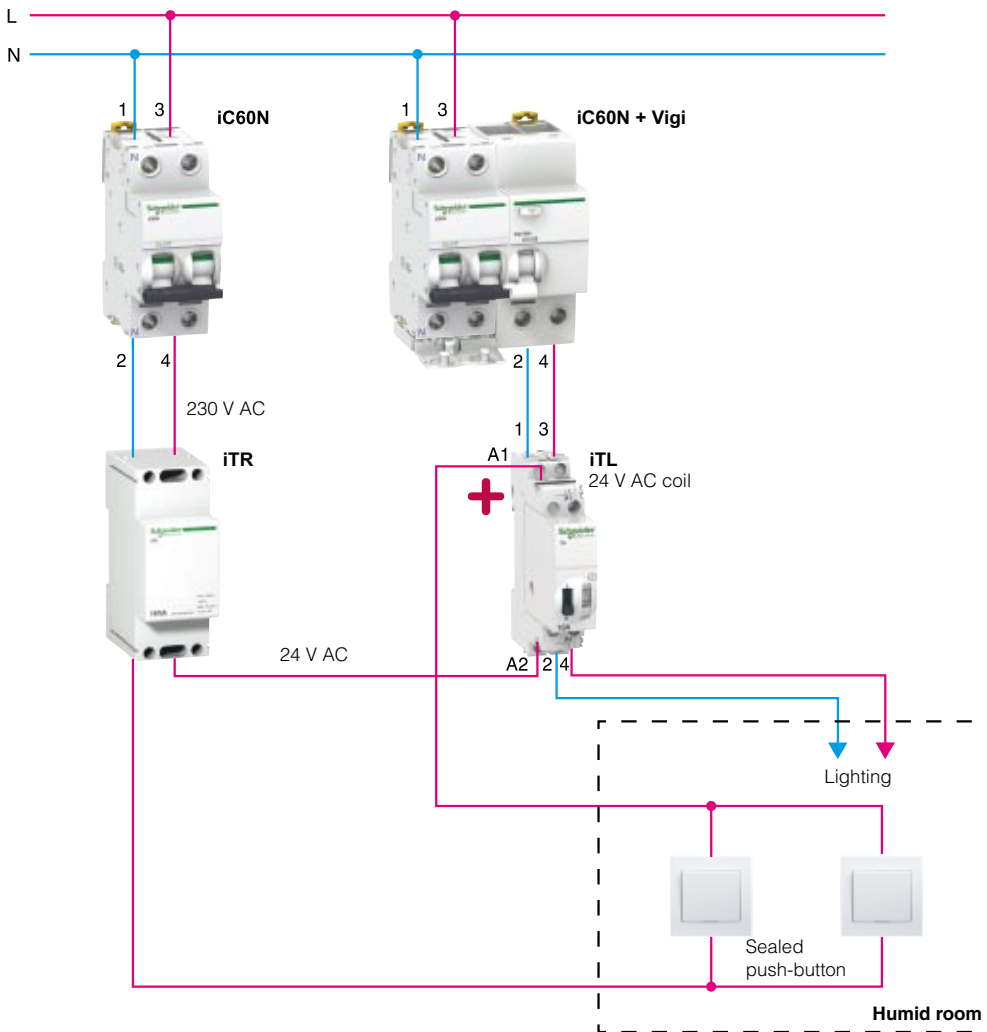
iTL



Favorite applications

- humid rooms
- outdoors
- industry.

Solution diagram



Text for specifications

- The installation must meet the requirements of the safety rules for use of Safety Extra Low Voltage (SELV).

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N + Vigi iC60	MCB 1P+N C16 A + Vigi earth leakage module	1	
iTL	Impulse relay 2P, 25 A, 24 AC	1	A9C30112
iTR	Safety transformer 16 VA, 12-24 V AC	1	A9C15918
PB	Sealed push-button	2	

Manage lighting in a hotel corridor



Customer's needs

The hotel manager wants to increase user comfort and save on lighting-related energy costs.

Recommendation

● Set lighting times to a minimum in passageways using a timer to:

- switch on one or more lights from one or more control points; keep lighting on for a pre-set time
- switch it off automatically.
- "Override" function for permanent lighting.
- Use "Switch-off warning" in MINp timer to improve user safety.



Customer advantages

- Provides significant energy savings.
- Provides greater comfort with silent electronic timers.
- Implementation is extremely simple using standard existing control push-buttons.
- User safety is increased using "switch-off warning" function
- Different override modes (permanent, long duration) cover the various hotels operation needs (cleaning, maintenance...).

Product advantages

- An time delay can be set:
 - up to 20 min.
 - up to 30 luminous control push-buttons can be installed in parallel.
- Automatic selection of the control push-buttons connection facilitates installation.
- Mechanical compatibility with the distribution comb busbar makes the product easy to install on symmetrical rail.
- The "switch-off warning" function is integrated in MINp timer, it warns that the lighting is about to be switched off by flickering of the lamplight.

> Zoom on

MIN

Just enough light!



MINs



MINp



Favorite applications

- office + education
- hotel
- industry
- residential
- etc.

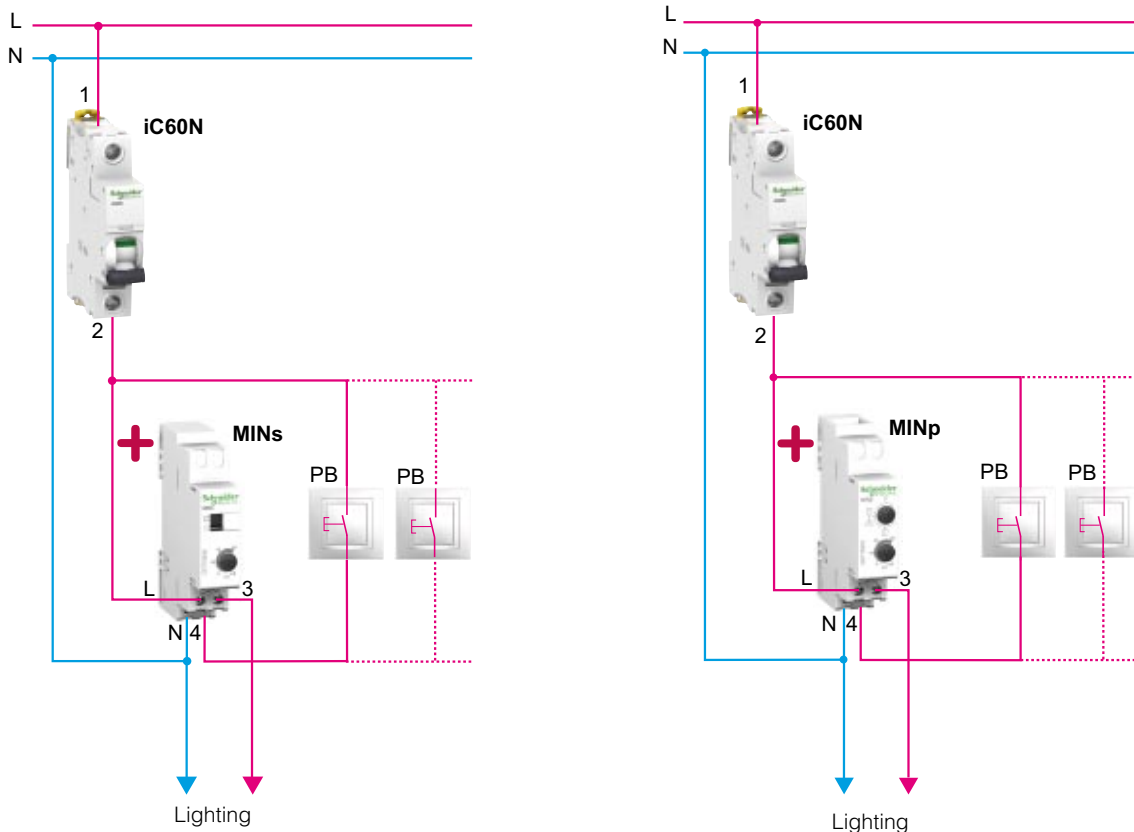
For more details see catalogue.



> Energy Efficiency benefits

- > Automation provides significant energy savings and greater comfort with silent electronic timers.
- > Different override modes (permanent, long duration) cover the hotels various operation needs (cleaning, maintenance...).

Solution diagram



Text for specifications

- MINs and MINp switch-off time delay can be set between 0.5 and 20 min.
- For MINp, 1h fixed time delay is started by pressing the control push-button for more than 2 s.
- For higher powers (2.5 kW for MINs and 3.6 kW for MINp), relay with a iCT contactor and its protective circuit-breaker: their ratings depend on installed power and load type.

> Products used

Product	Description	Unit	Reference
MINs	Electronic timer	1	CCT15232
MINp	Electronic timer with integrated switch-off warning	1	CCT15233
iC60N	MCB 1 pole	2	
PB	NO push-button	4	

Manage lighting in a garage



Customer's needs

The private home-owner wants to increase comfort without increasing his energy bill.

Recommendation

● Set lighting times to a minimum in passageways using a timer to:

- switch off one or more lights without using two-way push-button cabling (impulse relay function); keep lighting on for a pre-set time,
- switch it off automatically.
- "Override" function for permanent lighting.
- Use "Switch-off warning" to improve safety.



Customer advantages

- Provides significant energy savings.
- Provides greater comfort with silent electronic timers.
- Energy saving can be improved using MINt "impulse relay" function to further reduce the time the load is switched on.
- Implementation is extremely simple using standard existing control push-buttons.
- User safety is increased using "switch-off warning" function.
- Different override modes (permanent, long duration) cover the various operation needs in the garage (long time repair...).

Product advantages

- The "impulse relay function" integrated in MINt, allows the lighting to be switched Off or On by pressing a short time on the control push-buttons.
- 30 luminous control push-buttons can be installed in parallel.
- Automatic selection of the control push-buttons connection facilitates installation.
- Mechanical compatibility with the distribution comb busbar makes MINt easy to install on symmetrical rail.
- The "switch-off warning" function is integrated in MINt timer, it warns that the lighting is about to be switched off by flickering of the lamplight.

> Zoom on

MIN

Just enough light!



MINt



Favorite applications

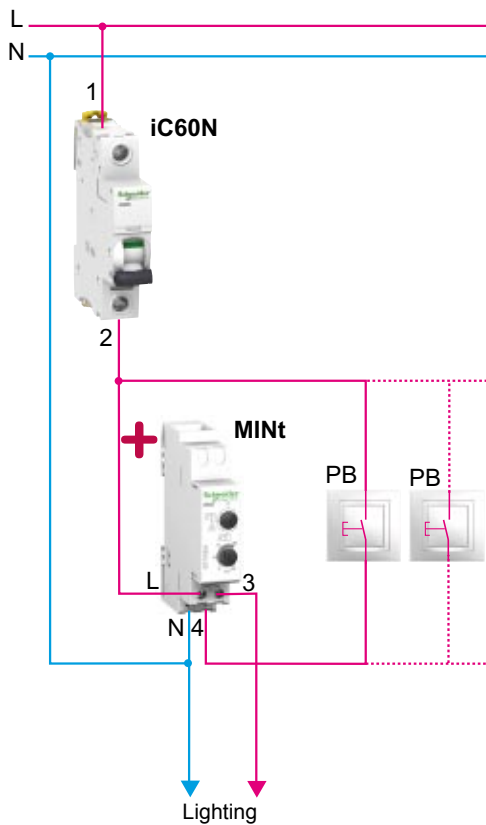
- office + education
- hotel
- industry
- residential
- etc.



> Energy Efficiency benefits

- > Automation ensures more energy savings and comfort with silent electronic timers.
- > The “impulse relay” reduces the time the load is switched on.
- > Different override modes (permanent, long duration) cover the various operation needs in the garage (long time repair...).
- > User safety is increased using integrated "Switch-off warning" function.

Solution diagram



Text for specifications

- MINt switch-off time delay can be set between 0.5 and 20 min.
- 1 h fixed time delay can be started by pressing the control push-button for more than 2 s.
- For higher powers (3.6 kW), relay with a iCT contactor and its protective circuit-breaker: their ratings depend on installed power and load type.

> Products used

Product	Description	Unit	Reference
MINt	Electronic timer with integrated switch-off warning	1	CCT15234
iC60N	MCB 1 pole	1	
PB	NO push-button	1	

Ensure effective lighting of the entrance of a block of flats



Customer's needs

Shared building premises (entrance halls, cellars, garages...) have the specific feature of episodic and irregular use. Moreover, they are normally located in dark places requiring lighting at all times of the day and night. Permanent lighting of these places is incompatible with the notion of energy savings.

Recommendation

By using MINp timer, it is easy to efficiently manage temporary lighting of shared building premises.

The switch-off warning function built into MINp warns by flickering of the lamplight just before the end of the period, thus enabling the restart a new lighting period in complete safety without reaching total darkness.

If permanent lighting is needed (servicing, maintenance,...), the "On" override function will ensure continuous operation of lights.



Customer advantages

- Automation provides:
 - significant energy savings,
 - greater comfort,
 - better security.
- The "override" function on the front face enables permanent lighting for cleaning and maintenance services.

Product advantages

- An up to 20 min. time delay can be set.
- Automatic selection of the control push-buttons connection facilitates installation.
- 30 luminous control push-buttons can be installed in parallel.
- Mechanical compatibility with distribution comb busbar makes MINp easy to install on symmetrical rail.

> Zoom on

MIN

Just enough light!



MINp



Favorite applications

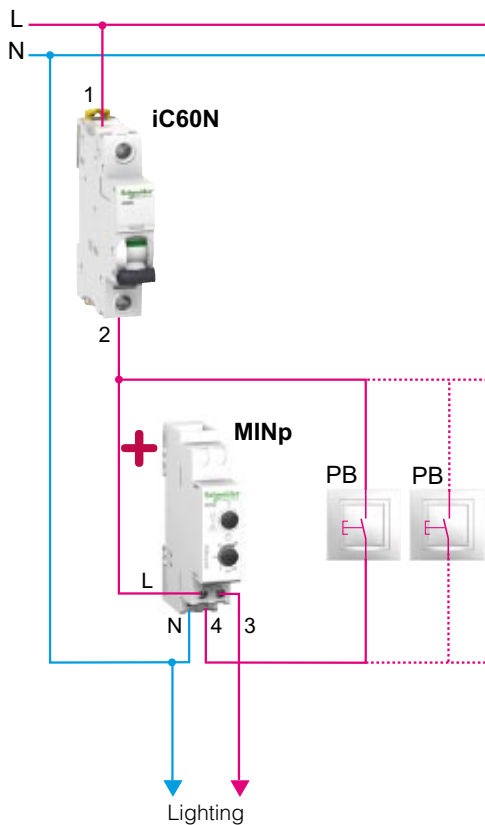
- office + education
- hotel
- industry
- residential
- etc.



> Energy Efficiency benefits

- > Energy saving by automatically extinguishing lighting when it is not necessary.
- > Comfort and safety increased with the associated early switch-off warning.

Solution diagram



Text for specifications

- The switch-off time delay can be set between 0.5 and 20 min.
- 1 h fixed time delay is started by pressing the control push-button for more than 2 s.
- The MINp timer requires connection of push-buttons in the installation phase.
- For higher powers (3.6 kW), relay with a iCT contactor and its protective circuit-breaker: their ratings depend on installed power and load type.

> Products used

Product	Description	Unit	Reference
MINp	Electronic timer with integrated switch-off warning	1	CCT15233
iC60N	MCB 1 pole	1	
PB	NO push-button	1	

> Lighting Control

Manage lighting in a stairway, corridor or hall



Customer's needs

The building manager wants to increase user comfort and save on lighting-related energy spendings.

Recommendation

- Set lighting times to a minimum in passageways using a timer to:
 - switch on one or more lights from one or more control points,
 - keep lighting on for a pre-set time,
 - switch it off automatically.
- "Override" function for permanent lighting.



Customer advantages

- Automation provides:
 - significant energy savings,
 - greater comfort,
 - better security.
- The "override" function on the front face enables permanent lighting for cleaning and maintenance services.

Product advantages

- An up to 7 min. time delay can be set.
- 30 luminous control push-buttons can be installed in parallel.

> Zoom on

MIN

Just enough light!



MIN



Favorite applications

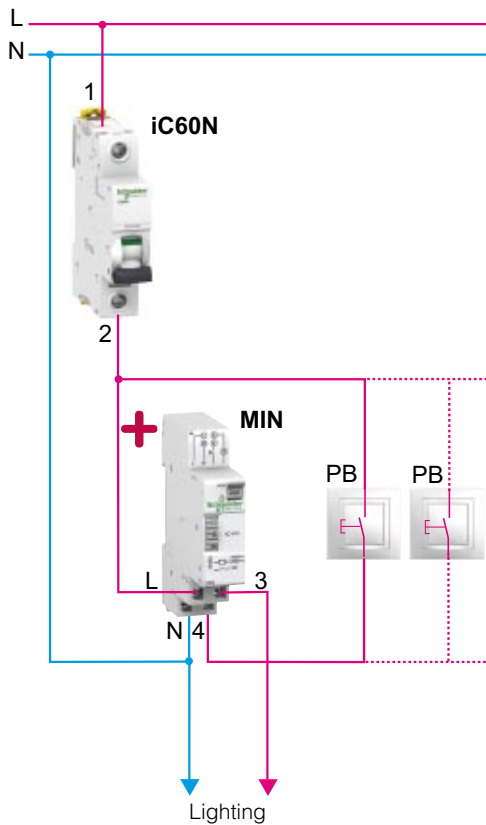
- office + education
- hotel
- industry
- residential
- etc.



> Energy Efficiency benefits

- > Automation provides significant energy savings and greater comfort.
- > Different override modes (permanent, long duration) cover various operation needs (cleaning, maintenance...).

Solution diagram



Text for specifications

- The switch-off time delay can be set between 1 and 7 min. in steps of 15 s.
- For higher powers (2.5 kW), relay with a iCT contactor and its protective circuit-breaker: their ratings depend on installed power and load type.

> Products used

Product	Description	Unit	Reference
MIN	Electromechanical timer	1	15363
iC60N	MCB 1 pole	1	
PB	NO push-button	1	

Automatic switching off of the lighting after a long period



Customer's needs

Ensuring that the lighting will be systematically switched off following a more or less long period of activity.

Recommendation

- Allow the user full independence for switching the lighting on or off:
 - one or more push-button control points;
 - no unintentional switching off during activity.
- Timer setting beyond the foreseeable period of activity (3 or 4 hours, for example).



Customer advantages

- Unlike with a timer, it is possible to switch off the lighting at any time. No minimum duration of lighting.
- Assurance that the lighting will be switched off even if forgotten.

Product advantages

- The time delay can be up to 10 hours.
- Direct connection to the contactor by clips.
- Several types of time delay possible.

> Zoom on

iATeT

Multi-function auxiliary timer!



iATeT



Favorite applications

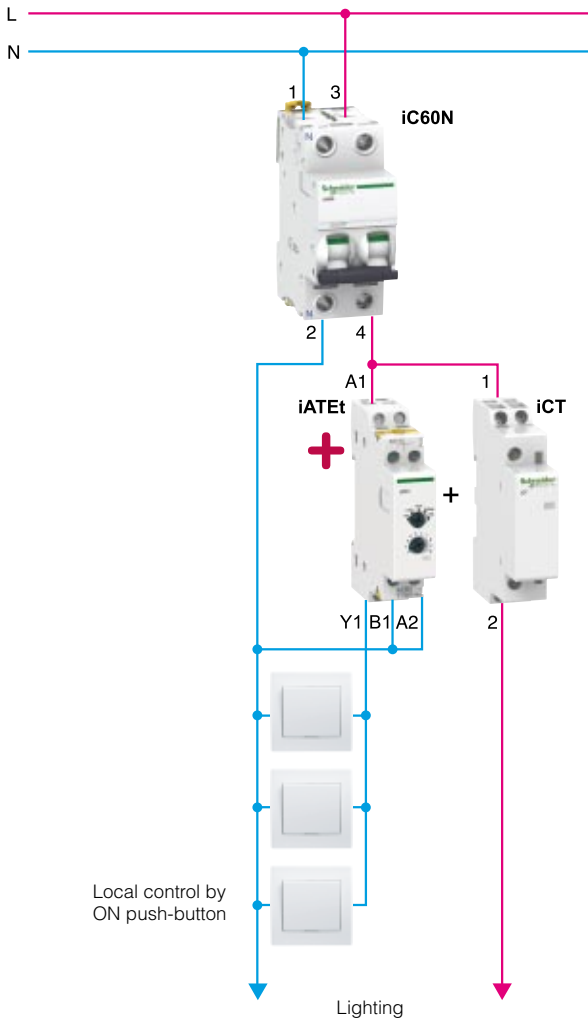
- hotel
- office
- etc.



> Savings enabler

Allows an energy saving of up to 10% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

- The lighting shall be operated manually ON from several push-buttons. A long-delay timer will turn it off after a programmable delay of up to 10 hours. Each press of a push-button will reset the timer.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C25 A	1	
iATEt	Multifunction time delay auxiliary	1	A9C15419
iCT	Contacteur 1P 25 A	1	A9C20731
PB	Push-button	3	

ON/OFF according daylight - sensor-free



User/customer benefits

Energy savings, safety: outside lighting is automatically activated and deactivated according to the position of the sun. The sun position is detected by means of an astronomical time switch that takes the seasons into account.

As a result, outside lighting is only used to ensure safety around the building, without wasting energy. Extra savings can be achieved by providing lighting only on working days.



Functions - Installer advantages

- **Maintenance free:** the IC Astro offers similar functionality to a twilight switch but does not require a light sensor. Therefore, no cleaning and no replacement due to vandalism are required.
- **Easier installation:** than for a twilight switch since wiring for a light sensor is no longer required.
- **Geographical optimization:** sunrise and sunset times can be adjusted to take into account the local longitude, shading from higher buildings, nearby cliffs, etc.
- **Extension:** an override 230 V AC input is provided in the IC Astro. An external switch will provide ON override for testing during maintenance operations.

IC Astro

Programmable astronomical twilight switch!



IC Astro



Favorite applications

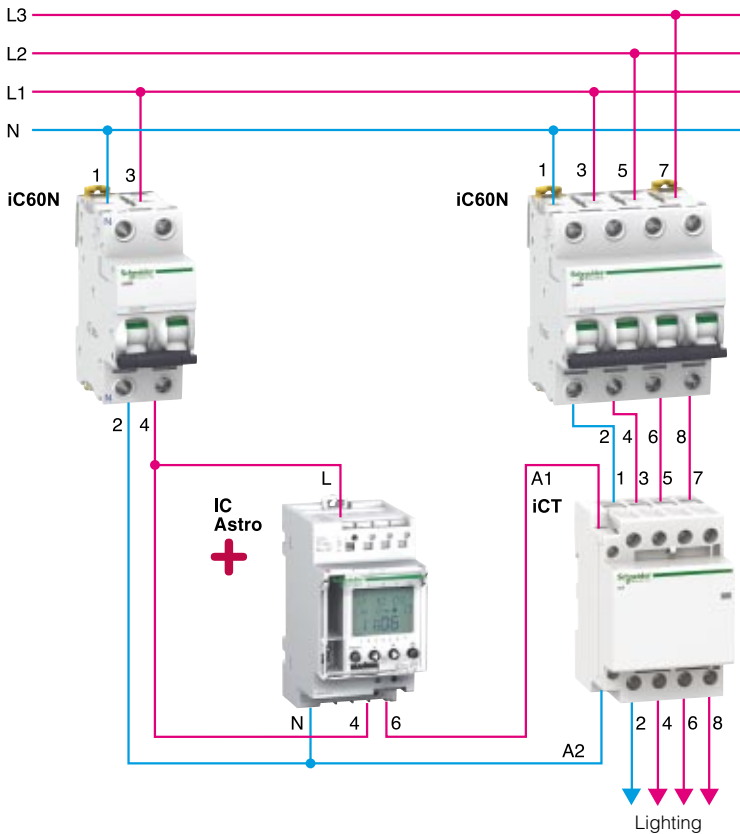
- hotel
- office
- etc.



> Savings enabler

> Up to 25% energy saving can be expected, depending on settings.

Solution diagram



Text for specifications

- Outside lighting shall be controlled by a time switch taking into account local sunrise and sunset hours.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C16 A	1	
iC60N	MCB 3P+N C25 A	1	
IC Astro	Programmable astronomical twilight switch	1	CCT15223 ⁽¹⁾ , CCT15224 ⁽²⁾
iCT	Modular contactor 3P+N 25 A	1	A9C20834

(1) English, French, Spanish, Portuguese, Hungarian, Polish, Romanian, Czech, Slovak, Bulgarian, Greek, Slovene, Serbian, Croatian languages.

(2) English, French, Italian, German, Swedish, Dutch, Finnish, Danish, Russian, Ukrainian, Latvian, Lituaniien, Estonian, Turkish languages.

> Lighting Control

ON/OFF according daylight and presence with override



User/customer benefits

Energy savings, safety: people movements are detected and if light is required it will come on automatically and turn off after a while when they have left. This saves unnecessary lighting and improves safety, since there is no wall switch to look for in the darkness.

Flexibility: a two-way switch at the reception desk (for example) provides a continuous ON override option for special occasions

Sensitivity: a presence detector is much more sensitive than a movement detector (PIR). It will detect the slightest movement.



Functions - Installer advantages

- **The PIR** activates a relay for higher power handling. Sensitivity is adjustable for taking into account the natural light, as is the timer for the ON state delay after the last movement is detected.
- **The two-way switch** provides the option of continuous supply of the relay.

> Zoom on

Argus Presence

Presence detector!



Argus Presence



Favorite applications

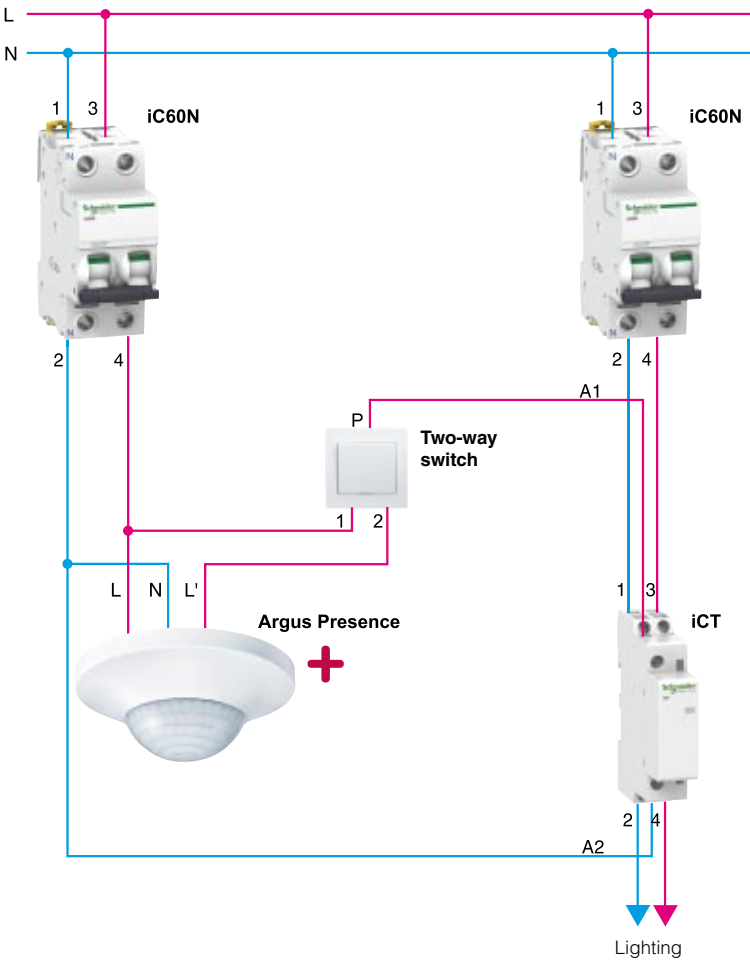
- hotel
- office
- etc.



> Savings enabler

> PIR enables 20 to 80% savings on lighting circuit electricity consumption, depending on adjustment and flow of persons.

Solution diagram



Text for specifications

- The zone lighting shall be activated by movement detection, taking into account the natural light.
- The lighting can be set continuously ON from a remote switch.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C32 A	1	
Argus Presence	Presence detector	1	MTN 550590
iCT	Contacteur 1P+N 25 A	1	A9C20732
Two-way switch		1	

Optimise hotel car park lighting



Customer's needs

The hotel manager wishes to optimise car park lighting operation and control energy costs. He wants to increase the hotel guests' comfort and safety.

Recommendation

Use a twilight switch to automatically control the car park lighting (On or Off) according to the external brightness and the predetermined twilight switch threshold.



Customer advantages

- A heightened feeling of safety is provided at minimum cost as the lighting is always "On" when it is dark.
- The settings are easily accessible on the twilight switch located in the electrical distribution panelboard.

Product advantages

- Adjustable brightness threshold from 2 to 2000 Lux.
- Screwless terminals for easy and fast connection.
 - Simple push-button on front face for test the cabling.
- Delivered rotating wall-mounted cell for easier installation.

> Zoom on

IC

With darkness comes light!



IC2000



Favorite applications

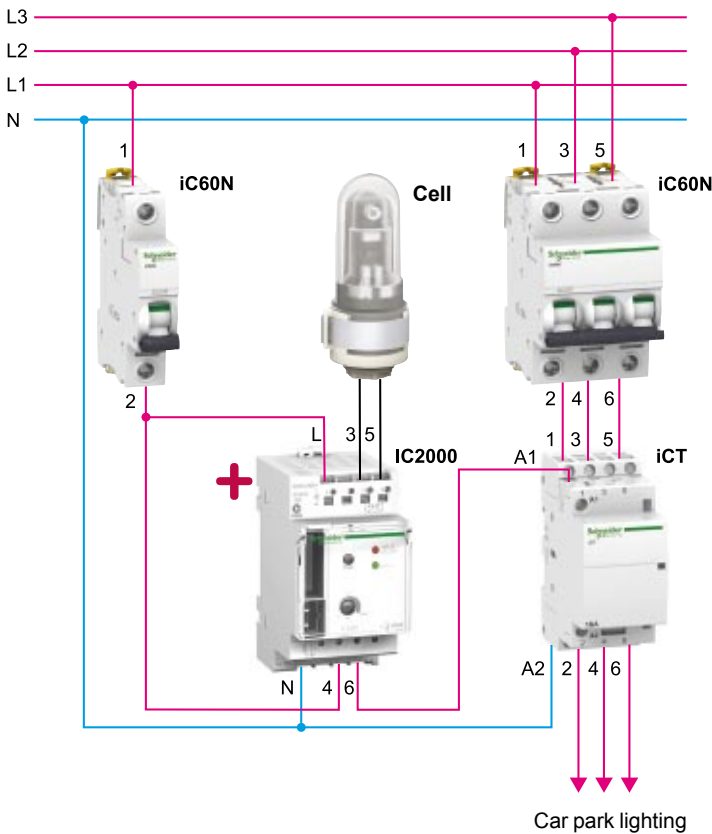
- office + education
- hotel
- industry
- etc.



> Energy Efficiency benefits

- > Power saving by automatically extinguishing lighting when it is not necessary.
- > Avoiding relying upon uncertain human action secures savings.
- > A heightened feeling of safety is provided at minimum cost as the lighting is always "On" when it is dark.

Solution diagram



Text for specifications

The solution is to set the lighting operation threshold on the IC2000 twilight switch according to the external brightness measured by the wall-mounted cell:

- The characteristics of protection circuit-breakers and iCT contactor depend on the installed power and type of load.
- iCT contactor, if power consumption exceeds 2300 W.

> Products used

Product	Description	Unit	Reference
IC2000	Twilight switch (delivered with wall-mounted cell)	1	CCT15368
iC60N	MCB 1 pole	1	
iC60N	MCB 3 poles	1	
iCT	Modular contactor 3 poles	1	

Optimise shop-window lighting



Customer's needs

The shop owner wants to light up the shop window at nightfall and save energy by automatically switching off the lighting late at night when the streets are empty.

He wants to prevent the lighting from switching on, on shop closure days.

Recommendation

Use a programmable twilight switch to automatically control shop-window lighting according to brightness and/or the time of the day.



Customer advantages

- A heightened feeling of safety is provided at minimum cost as the lighting is always "On" when it is dark.
- The settings are easily accessible on the twilight switch located in the electrical distribution panelboard.

Product advantages

- Compact 45 mm product.
- Intuitive text guidance for easy programming.
- External input to override operation using a standard switch.
- Adjustable light level from 2 to 2100 lux.
- Adjustable time delay to prevent unwanted operation in case of short variance of light.
- Automatic winter/summer time change.

> Zoom on

IC

With darkness comes light!



IC2000P+



Favorite applications

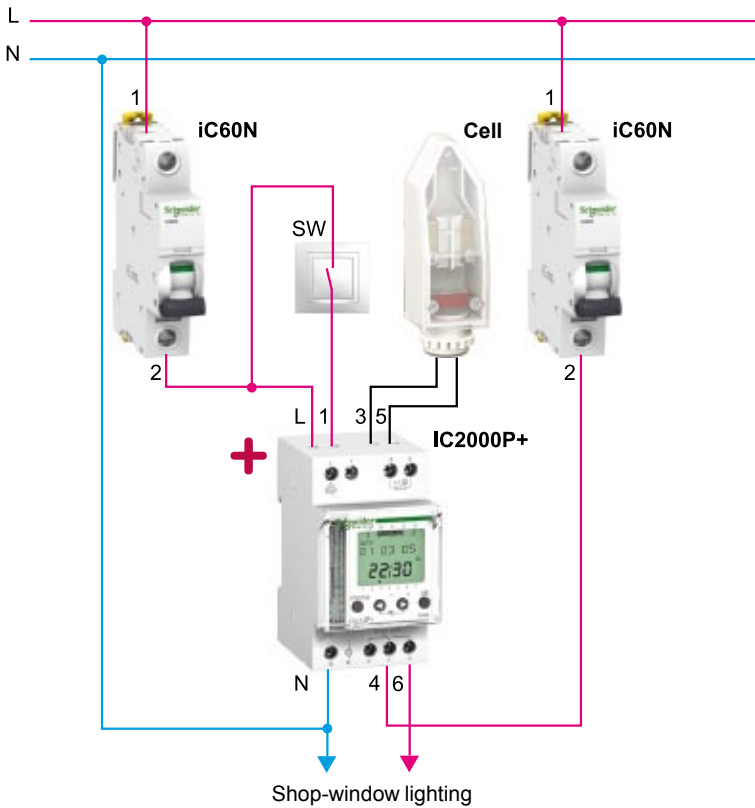
- office + education
- hotel
- industry
- etc.



> Energy Efficiency benefits

- > Power saving by automatically extinguishing lighting when it is not necessary and when there are fewer passers-by.
- > The change to summer/winter time is automatic.
- > Excellent shop-window lighting as soon as night starts to fall.

Solution diagram



Text for specifications

- IC2000 P+ twilight switch associated with a wall-mounted cell:
 - program on the IC2000P+, the period when you might need light (example: from 9 p.m. to 6 a.m. except Sunday),
 - set the lighting operation threshold on the IC2000P+ according to the external brightness (example: 20 lux).
- Switching the external input on with the standard switch SW, turns on the light permanently.
- Circuit-breakers to protect the devices and the lighting circuits.
- iCT contactor, if power consumption exceeds 2300 W.

> Products used

Product	Description	Unit	Reference
IC2000P+	Programmable twilight switch (delivered with a wall-mounted cell)	1	15483
iC60N	MCB 1 pole	1	
iC60N	MCB 1 pole	1	
SW	One-way switch	1	

> Lighting Control

Automate public lighting according to sunrise and sunset with reduced light feature



Customer's needs

The mayor of the commune wants to improve the reliability of public lighting operation to increase the comfort and safety of his citizens. But in the meantime he wants to monitor lighting operation time to make energy savings. He also wants to further reduce the light level by 50% to save more energy in the off-peak period in the evenings.

Recommendation

Use a programmable two-channel astronomical twilight switch for switch-on and switch-off of lighting according to sunrise and sunset times. Use the two channel outputs to manage the whole public lighting and only an half in peak-out periods.



Customer 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 software.

Product advantages

- Intuitive text guidance for easy programming.
- Program saved up to 12 years if mains failure.
- Use of memory key and programming via PC with "LTS" kit for saving and duplicating settings and programs.
- External "On" override control by switch or push-button.
- Mechanical compatibility with distribution comb busbar for easier installation on symmetrical rail.
- Screwless terminals for easy and fast connection.

> Zoom on

IC

With darkness comes light!



IC Astro 2C



Favorite applications

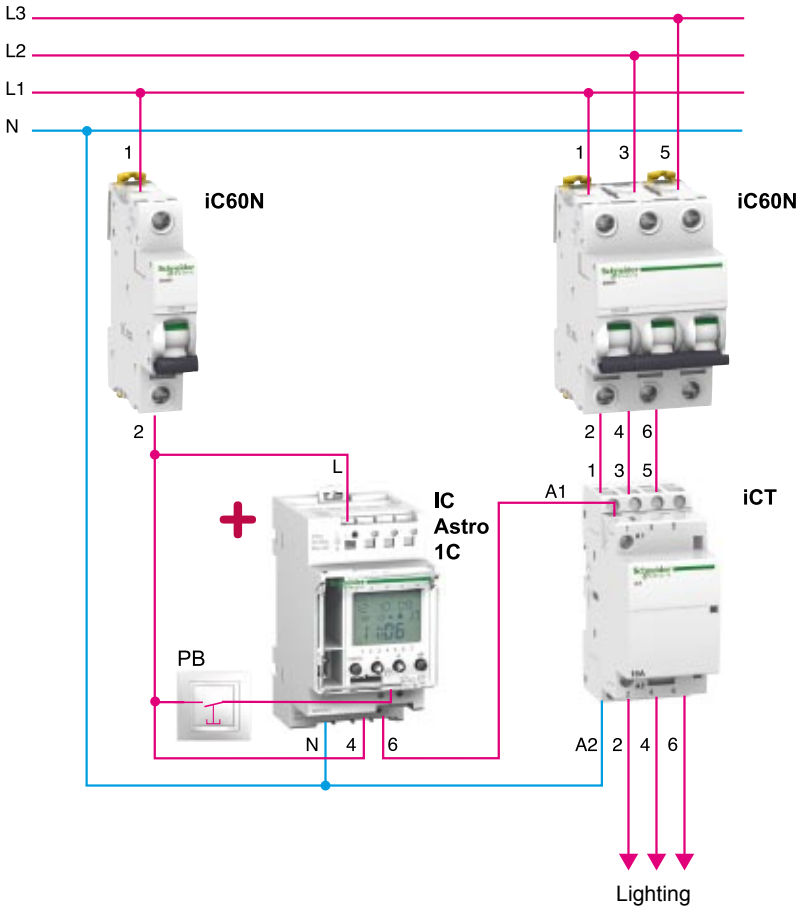
- office
- hotel
- industry
- etc.



> Energy Efficiency benefits

- > Power saving by automatically extinguishing lighting when it is not necessary.
- > The change to summer/winter time is automatic.
- > Manual override of temporary or permanent On and Off status is possible.

Solution diagram



Text for specifications

- IC Astro 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.
- A difference in sunrise and sunset times is adjustable separately by ± 120 min.
- PB push-buttons (or switches) are connected to external inputs 1 and 2 for manual override operation of lighting.
- Circuit breakers to protect the devices and the lighting circuits.
- Maximum admissible power of the IC Astro output contacts depends on the load type.
- The rating of the iCT contactors protection circuit-breaker depends on installed power and load type.

> Products used

Product	Description	Unit	Reference
IC Astro 2C	Programmable astronomical twilight switch, 2 channels (delivered with a memory key)	1	CCT15243, CCT15244
PB	1 module NO push-buttons or one-way switch	2	
iC60N	MCB 1 pole	1	
iC60N	MCB 3 poles	2	
iCT	Modular contactor 3 poles	2	15383

Automate lighting of surroundings of a building



Customer's needs

When a public or tertiary building requires illumination of its surroundings at night-fall, simple time programming is not sufficient to ensure safety and energy saving at the same time as the brightness threshold varies according to season and climate. The site manager wishes to light up the surroundings when the natural brightness threshold becomes insufficient, and switch off automatically when daylight is sufficient again.

Recommendation

The IC 100 twilight switch is the ideal product for problem-free management of these needs. Once installed and its threshold set, it will automatically switch on and turn off the lighting at the right time. A built-in time delay avoids untimely closing or tripping during undesired transient brightness conditions.



Customer advantages

- Simplicity.
- Energy savings.
- Comfort.
- Safety.

Product advantages

- Simplicity of installation.
- Economic solution.
- Robustness.
- Indication of front panel brightness threshold (LED).
- Setting the tripping threshold from 2 to 100 lux.

> Zoom on

IC

With darkness comes light!



IC 100



Favorite applications

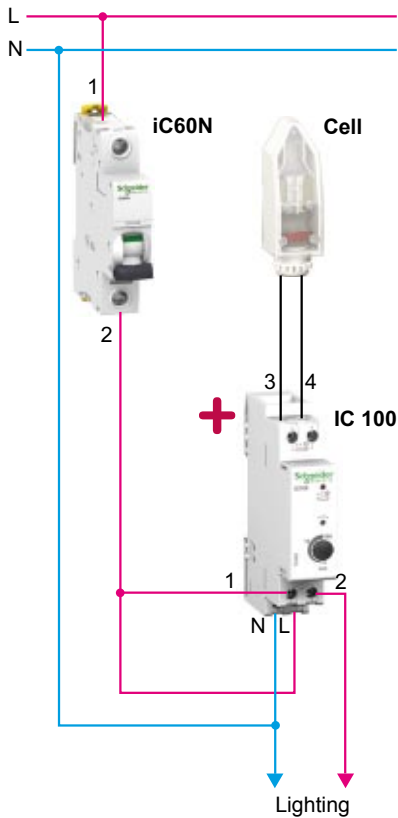
- office + education
- hotel
- industry
- etc.



> Energy Efficiency benefits

- > Energy saving by automatically extinguishing lighting when it is not necessary.
- > Automation ensures major energy savings, increased comfort and enhanced safety.

Solution diagram



Text for specifications

The solution is to set the lighting operation threshold on the IC 100 twilight switch according to the external brightness measured by the wall-mounted cell:

- The photoelectric cell detects low brightness, causes closure of IC 100 contact and ensures lighting.
- The IC 100 monitoring light comes on when brightness threshold is reached and switches off lighting.
- Time delay on closing and breaking of contact: 10 s.
- For higher powers, relay using a iCT contactor and its protective circuit-breaker: their ratings depend on installed power and load type.

> Products used

Product	Description	Unit	Reference
IC 100	Twilight switch (delivered with wall-mounted cell)	1	15482
iC60N	MCB 1 pole	1	

Optimise hotel car park lighting in accordance with sunrise and sunset times



Customer's needs

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

Recommendation

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



Customer 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.

Product advantages

- Intuitive text guidance for easy programming.
- Program saved up to 12 years if mains failure.
- Use of memory key and programming via PC with "LTS" kit for saving and duplicating settings and programs.
- External "On" override control by switch or push-button.
- Mechanical compatibility with distribution comb busbar for easier installation on symmetrical rail.
- Screwless terminals for easy and fast connection.

IC

With darkness
comes light!



IC Astro 1C



Favorite applications

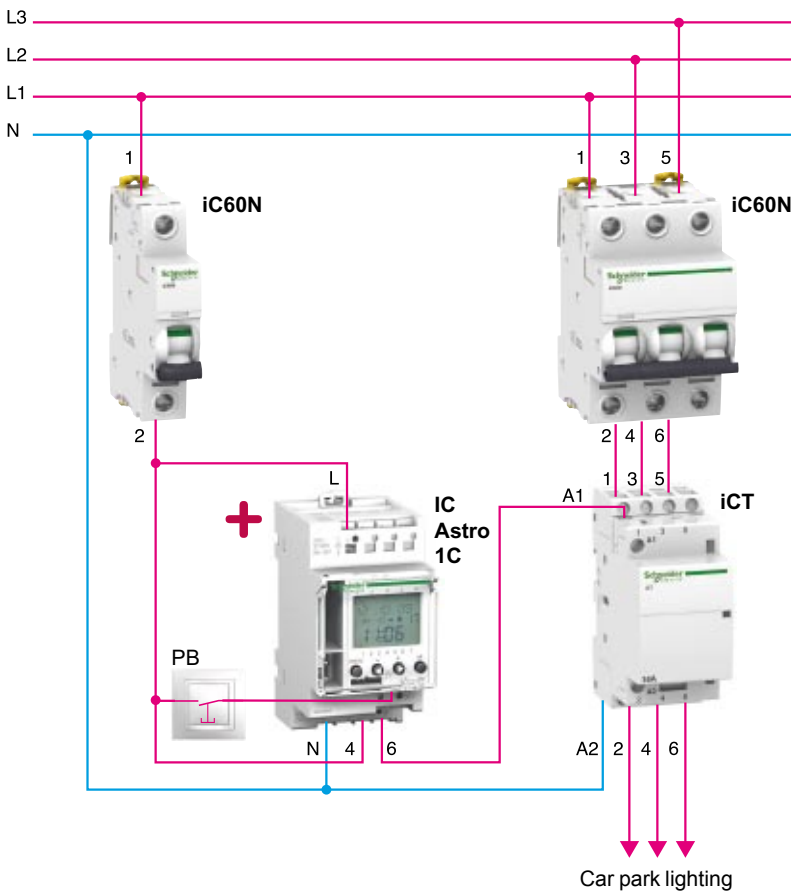
- office
- hotel
- industry
- etc.



> Energy Efficiency benefits

- > Power saving by automatically extinguishing lighting when it is not necessary.
- > The change to summer/winter time is automatic.
- > Manual override of temporary or permanent On and Off status is possible.

Solution diagram



Text for specifications

- The IC Astro 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.
- A difference in sunrise and sunset times is adjustable separately by ± 120 min.
- PB push-button (or switch) is connected to external input 1 for manual override operation of lighting.
- Circuit-breakers to protect the devices and the lighting circuits.
- Maximum admissible power of the IC Astro output contact depends on the load type.
- The rating of the iCT contactor protection circuit-breaker depends on installed power and load type.

> Products used

Product	Description	Unit	Reference
IC Astro 1C	Programmable astronomic twilight switch, 1 channel	1	CCT15223, CCT15224
iC60N	MCB 1 pole	1	
iC60N	MCB 3 poles	1	
iCT	Modular contactor 3 poles	1	
PB	NO push-button	1	

Centralized push-buttons with local ON/OFF



User/customer benefits

Energy savings, safety: the lighting for each zone can be activated and deactivated locally by users. At a central point (for example reception desk) the attendant can turn off all the lighting zones in one action to avoid wasting energy in case some users forget to switch off.

For safety reasons all the lighting zones can also be turned on in one action.



Functions - Installer advantages

- Local push-buttons activate impulse relays, individually, for each lighting circuit.
- One central ON and one central OFF push-button are connected to every iTLc impulse relay. So all the impulse relays can react simultaneously to common commands.
- The iTLc impulse relay saves wiring and space as the central command interface is integrated. The overall width is still 18 mm.

iTLc

Impulse relay!



iTLc



Favorite applications

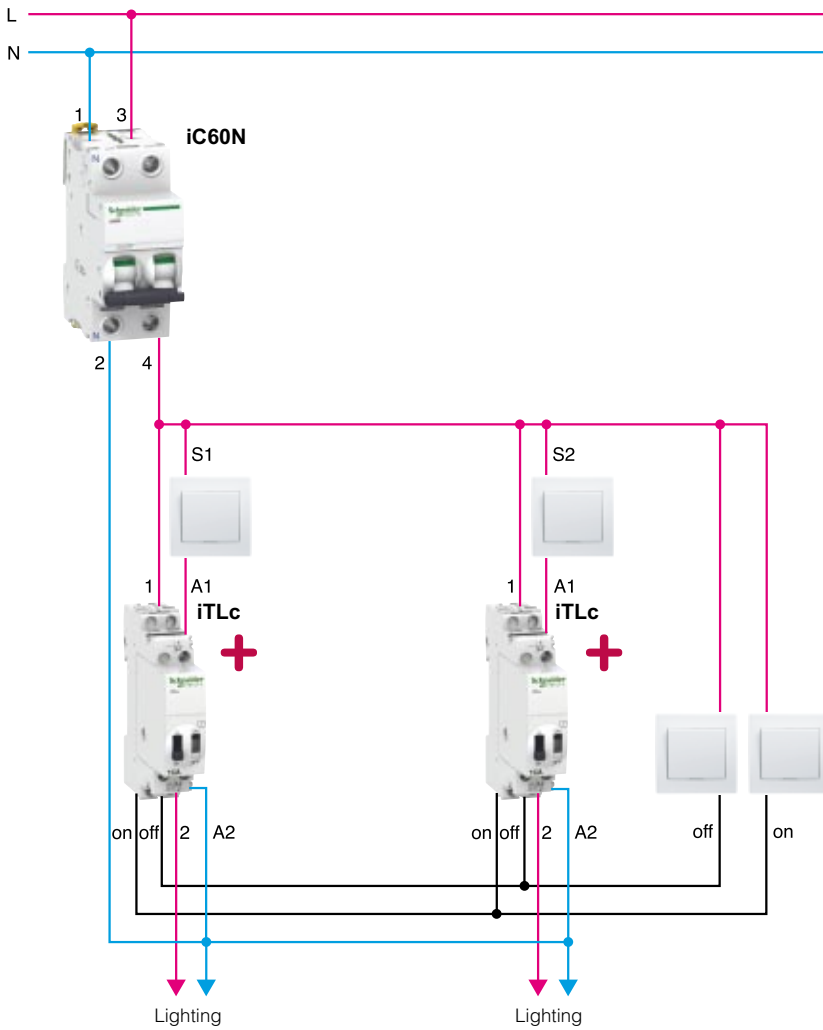
- hotel
- office
- etc.



> Savings enabler

> Central ON/OFF push-buttons allow an energy saving of up to 15% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

- Each lighting circuit shall be activated by local push-buttons and from general ON and OFF push-buttons from the reception desk.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C-16 A	1	
iTLC	Impulse relay 16 A with centralised control	2	A9C33411
PB	Push-button	4	

> Lighting Control

Centralized ON+OFF push-buttons with status indicator, local ON/OFF



User/customer benefits

Energy savings, safety: the lighting for each zone can be activated and deactivated locally by users. At a central point (for example reception desk) the attendant can turn ON or OFF all the lighting zones in one action to avoid wasting energy in case some users forget to switch off.

A lighting status indicator gives visual feedback of the action.



Functions - Installer advantages

- **iTL impulse relays:** each one drives a single lighting circuit in a conventional way with local push-buttons.
- **iATLc+s auxiliary module:** provides iTL status changeover contacts and collects common ON and OFF command. It is compatible with standard iTL impulse relay for new or upgrading existing installations.
- **Common remote ON and OFF push-buttons** are connected to every iATLc+s on the related ON inputs and OFF inputs. All impulse relays will react simultaneously to common commands.

> Zoom on

iATLc+s

Central command!



iTL+iATLc+s



Favorite applications

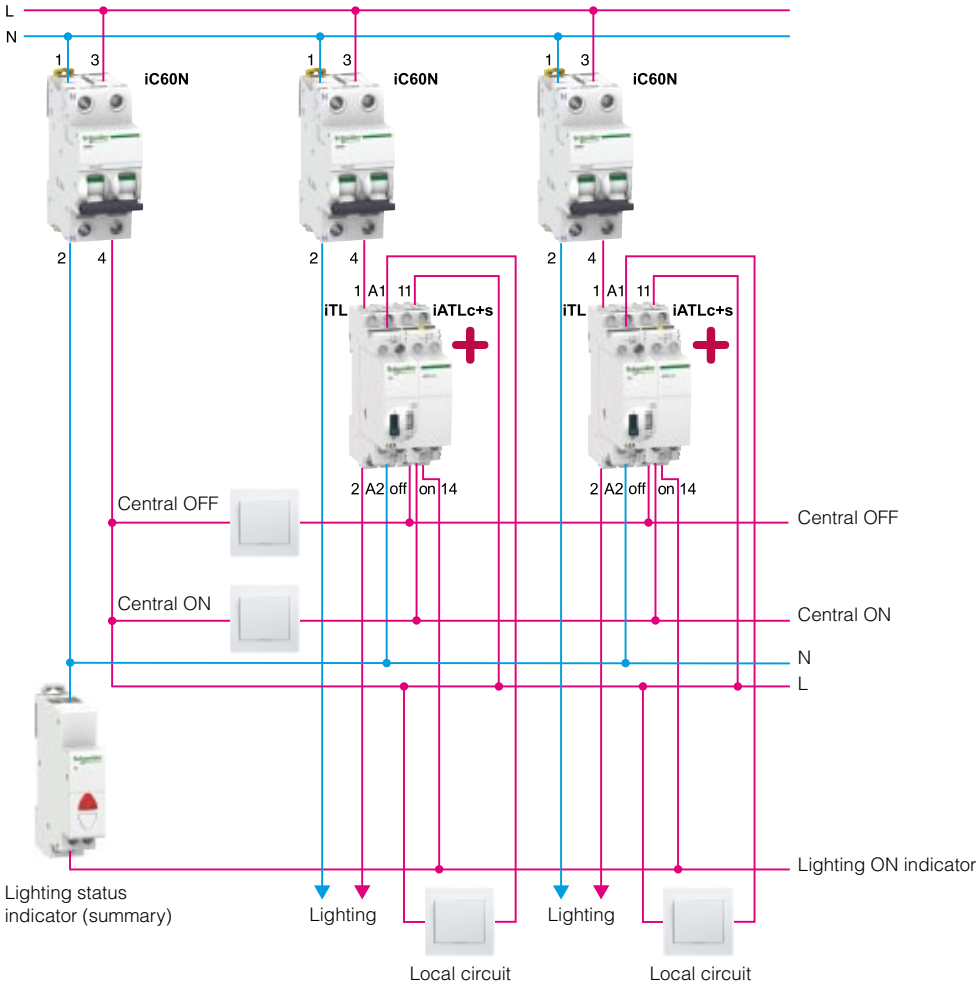
- office + education
- hotel
- industry
- retail
- etc.



> Savings enabler

> Central ON/OFF push-buttons allow energy saving of up to 10-15% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

- Each lighting circuit shall be activated by local push-buttons and by common ON and OFF push-buttons at the reception desk where a summary status indicator will be provided.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C10 A	2	
iTL	Impulse relay	2	A9C30811
iATLc+s	Central command	2	A9C15409
iIL	Indicator light	1	A9E18320
PB	Push-button	4	

Centralized ON overriding with local ON/OFF



User/customer benefits

Energy savings, safety: the lighting for each zone can be activated and deactivated locally by users.

At a central point (for example reception desk) the attendant can turn off all the lighting zones in one action to avoid wasting energy in case some users forget to switch off.



Functions - Installer advantages

- **Local push-buttons** activate impulse relays, individually, for each lighting circuit.
- **One central OFF push-button** is connected to every iATLc auxiliary module for iTL or directly to every iTLc impulse relay. As a result, all the impulse relays can react simultaneously to common commands.
- **The iTLc impulse relay** saves wiring and space as the central command interface is integrated; overall width is still 18 mm.
- **The iATLc central command interface** is compatible with the standard iTL impulse relay for upgrading existing installations, iATLc+iTL is equivalent to iTLc.

iTLc

Impulse relay!



iTLc



Favorite applications

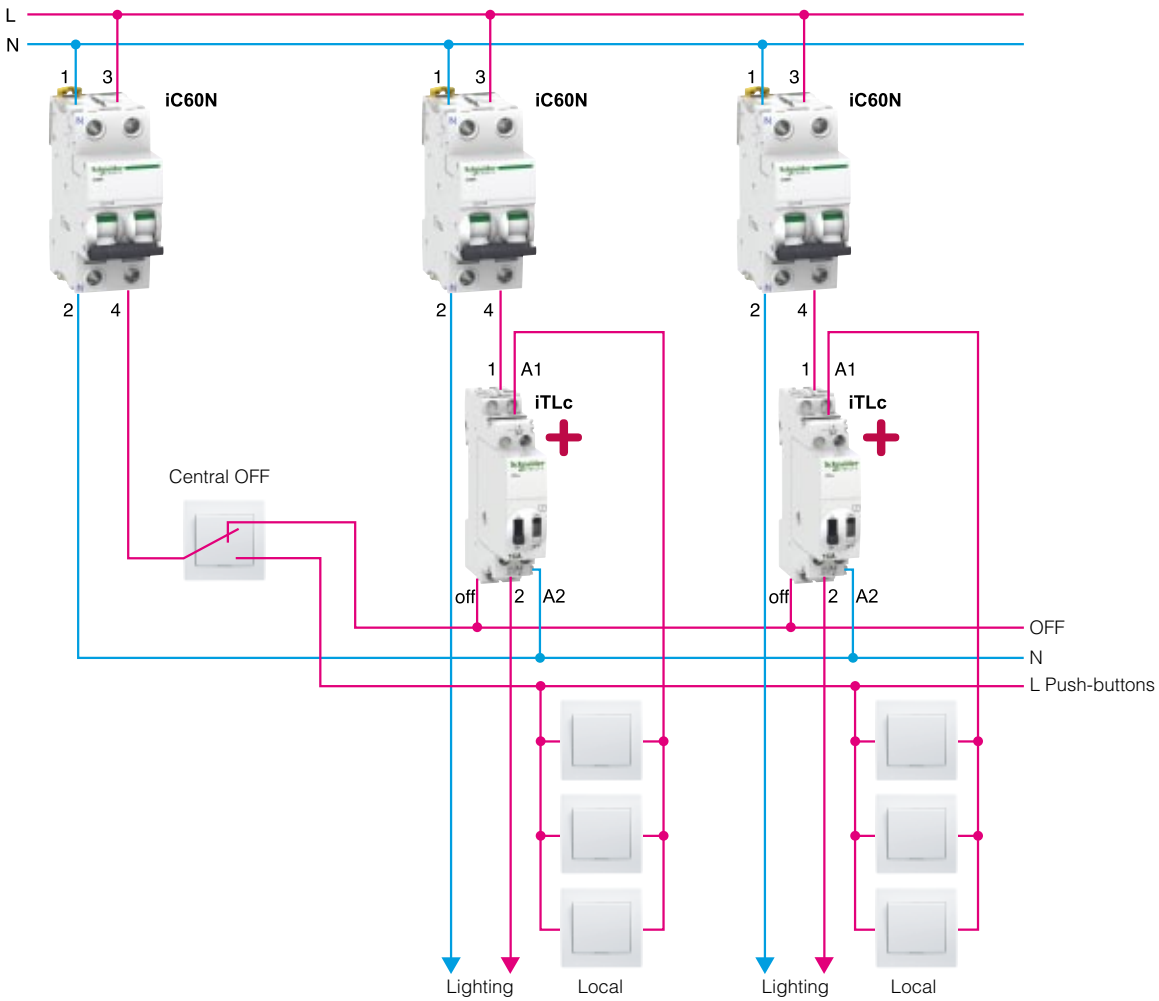
- office + education
- hotel
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Central OFF push-button allows an energy saving of up to 10-15% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

- Each lighting circuit shall be activated by local push-buttons and from a general OFF push-button at the reception desk.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C16 A	2	
iTLc or iTL+iATLc	Impulse relay with centralised control	2	A9C33411
PB	Push-button	6	
Two-way switch	Changeover switch	1	

> Lighting Control

Centralized ON+OFF overriding with local ON/OFF



User/customer benefits

Energy savings, safety: the lighting for each zone can be activated and deactivated locally by users. At a central point (for example reception desk) the attendant can turn off by overriding all the lighting zones in one action to avoid wasting energy in case some users forget to switch off.

For safety reasons all the lighting zones can be turned ON in one action.

Local actions are permitted only when central overriding is deactivated.



Functions - Installer advantages

- Local push-buttons activate impulse relays, individually, for each lighting circuit.
- One central ON switch and one central OFF switch are connected to every iTLc impulse relay.
- **Savings:** the iTLc impulse relay saves wiring and space as the central command interface is integrated; overall width is still 18 mm.
- **Extension:** by adding one MCB and iTLc per extra lighting zone. The connection method is similar.

> Zoom on

iTLc

Impulse relays!



iTLc



Favorite applications

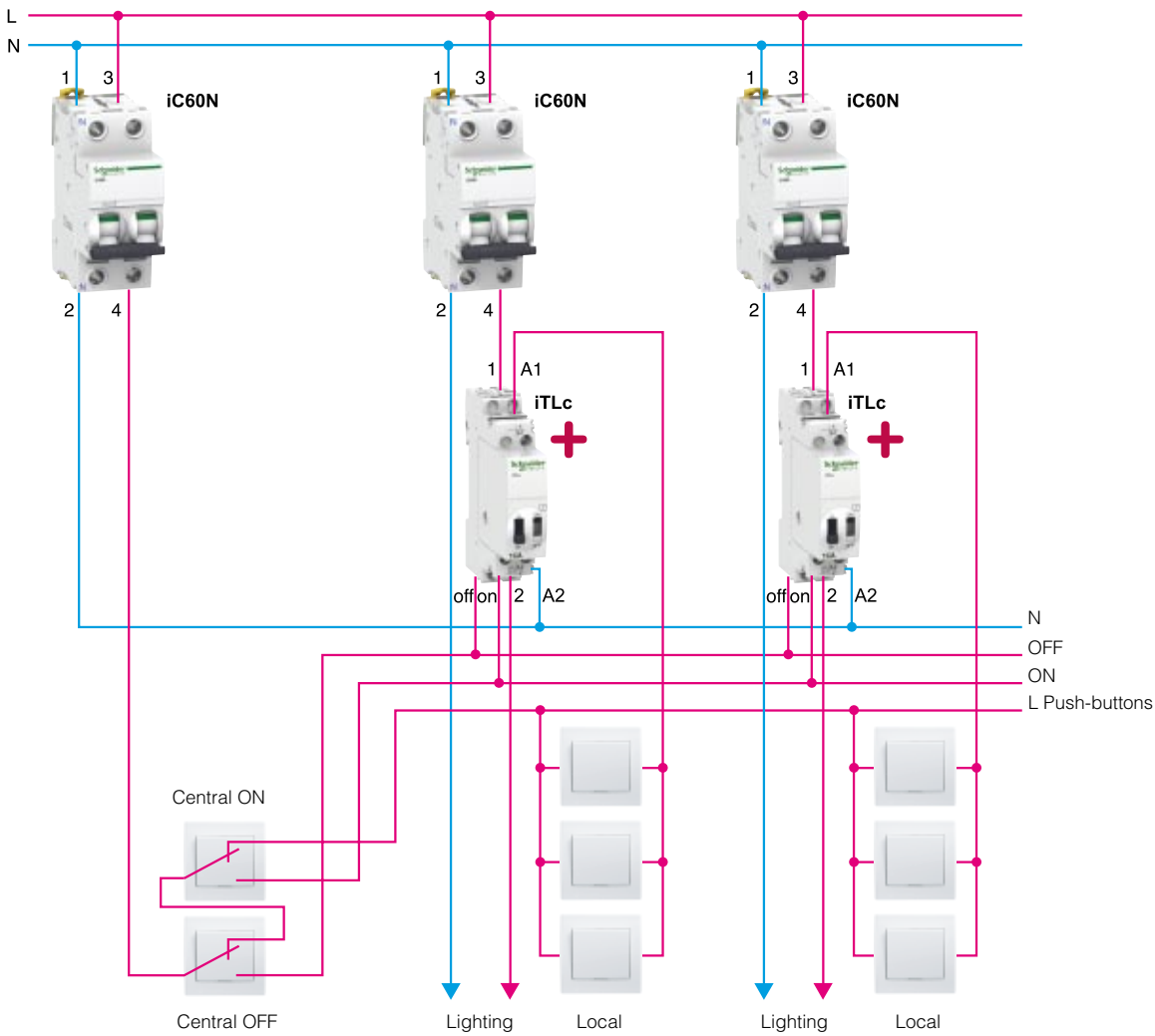
- office + education
- hotel
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Central push-buttons allow an energy saving of up to 10-15% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

- Each lighting circuit shall be activated by local push-buttons and from general ON and OFF push-buttons at the reception desk.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C16 A	2	
iTLc	Impulse relay with centralised control	2	A9C33411
PB	Push-button	6	
Two-way switches	Changeover switch	2	

Retro-fit with wireless lighting



User/customer benefits

Office implantation will move with tenant's configuration that the flexibility of Canalis allows.

Evolutivity thanks to a number of tap-off outlets available for new loads and extension.



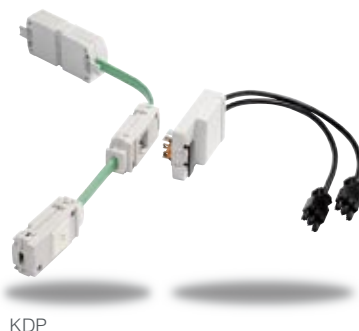
Functions - Installer advantages

- **Quickness of installation with 2 in 1:** 1 circuit for lighting and 1 circuit for emergency lighting.
- **Lighting devices will be fed by Canalis KDP** meanwhile the push-button will follow the new wall structure.
- **Intuitive mounting** of Canalis elements and simple programming of RF push-button. This push-button can be removed for new configuration without light modification.

> Zoom on

KDP

Flexible busbar!



KDP



Favorite applications

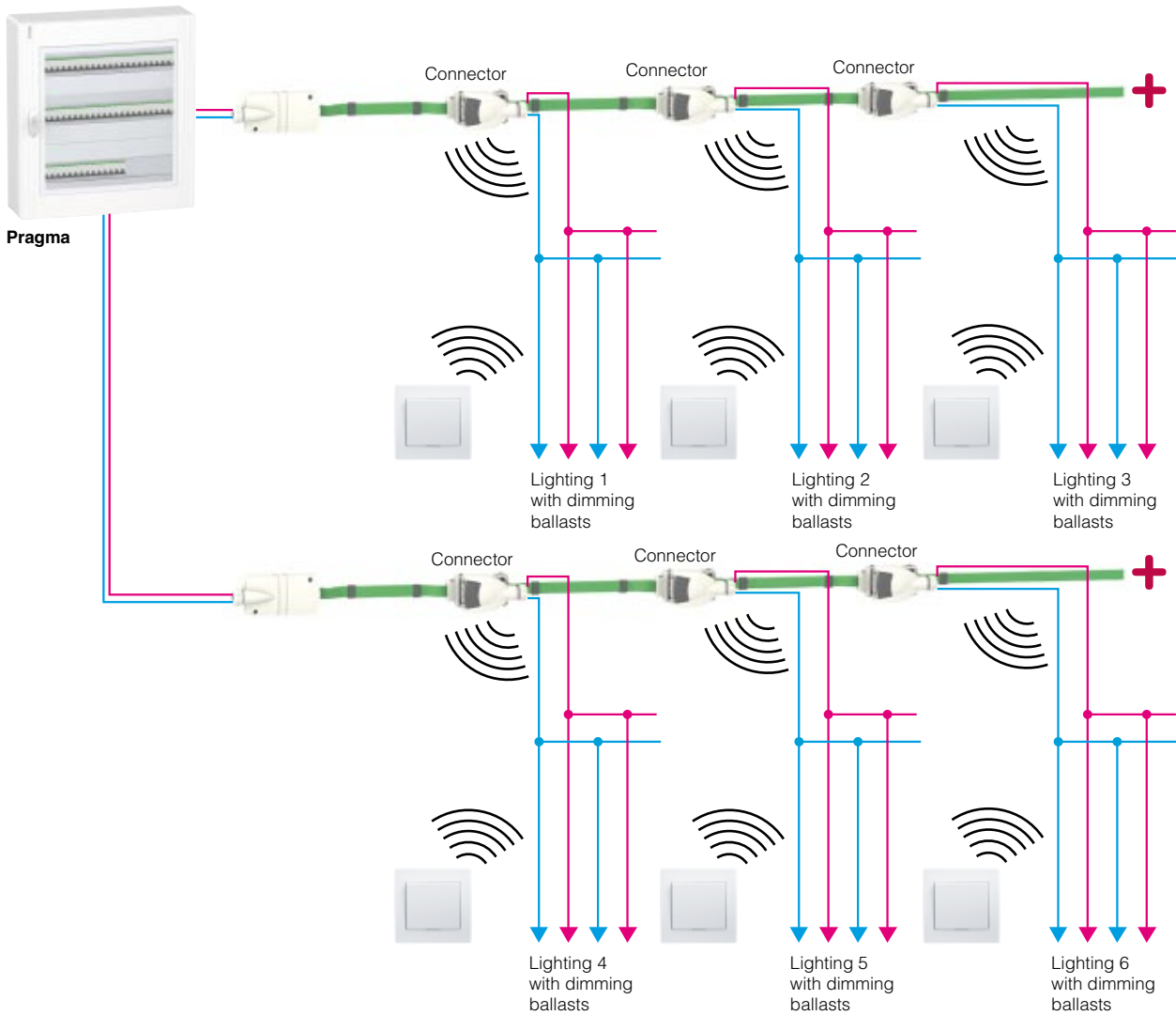
- office
- hall buildings
- schools.



> Savings enabler

- > During installation & renovation.
- > **Half time reduction** versus cable installation.
- > During operation with **maintenance-free** and **dust-free renovation**.
- > Depending on optional accessories (IC2000) and user's discipline.

Solution diagram



Text for specifications

- The electrical power shall be distributed by a flexible busbar trunking system, with plug-in openings factory fitted, at regular intervals for radio frequency connectors.

> Products used

Product	Description	Unit	Reference
Canalis KDP	20 A 3P	1	KDP20ED4192120
Feed units	MCB 1P+N C32 A	1	KDP20ABG4
Connectors	RF 6 A	1	KBC06CERFZ
Concrete fixing plug		1	KDPZF21
Pragma	48 modules	1	
Push-button	Alvais RF	1	
Fastening support & plate		1	

Control office lighting locally



Customer's needs

The facility manager wants to optimise his operating cost by saving lighting energy in the offices.

Recommendation

Use IHP+2c and iTL to control office lighting locally by push-buttons and centrally by a programmable time switch.



Customer advantages

- 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.

Product advantages

- Display on backlit LCD screen of the hour and minutes, the day of the week, the current operating mode and the day schedule.
- Use the "kit LTS" programming tool for easy programming with a PC.
- 84 switching operations to offer large programming capacities.
- Mechanical compatibility with distribution comb busbar for easier installation on symmetrical rail.
- Screwless terminals for easy and fast connection.

> Zoom on

IHP

Efficiency at your fingertips!



IHP+2c



Favorite applications

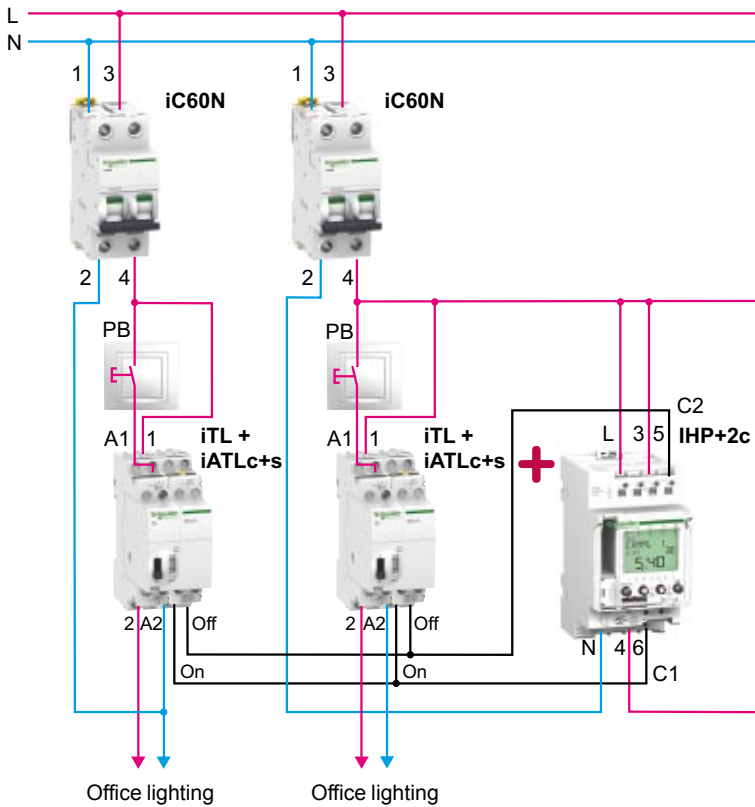
- office + education
- hotel
- industry
- etc.



> Energy Efficiency benefits

- > Energy saving by automatically extinguishing lighting when it is not necessary.
- > Easy modification of time switch program for special events and vacation avoiding useless energy spending.

Solution diagram



Text for specifications

Control the lighting of the building:

- By a centralized order transmitted by an impulse type IHP+ 2c to the iATLc+s impulse relay auxiliary. IHP+ 2c functions provide the benefit of centralised:
 - time programming,
 - manual override operation.
- Locally by means of push-buttons and benefit from iTL functions: manual operation using the iTL toggle.

> Products used

Product	Description	Unit	Reference
IHP+2c	Programmable time switch, 2 channels (C1&C2)	1	CCT15853 *
iC60N	MCB 2 poles	2	
iTL	Impulse switch	2	
iATLc+s	Impulse relay	2	
PB	NO push-button	2	

* French, English, Swedish, Dutch, Finnish, Norwegian/Danish languages. Others languages are available with other references.

Create museum exhibition areas light control



Customer's needs

The museum exhibition manager wants to control the main lighting separately and together in three show-rooms. The lights are fluo-tubes installed with 1-10 V ballasts. Dimming is a requirement create low light level and to adapt consumption.

Recommendation

The solution is to separate the exhibition area into three separate, thematic areas. The three 1-10 V controllers are combined together to use the feature of common light control. With the combination of 1-10 V controllers the advantages of two memorized light levels can be used.



Customer advantages

- With a simple press on external push-buttons the two memorized light levels of the controller can be recalled.
- No change of fuse is needed; the controllers are equipped with electronic protections.
- Dimming lighting just 25% saves 20% in energy.

Product advantages

- Signalling on the controller front face is very clear: the front control push-button lights blue when the controller is "On" and flashes when a fault occurs.
- Up to 25 standard control push-buttons can be installed in parallel.
- Up to 20 controllers installed in parallel can be controlled with only one push-button.

> Zoom on

SCU

Light under your control!



SCU10-SAE



Favorite applications

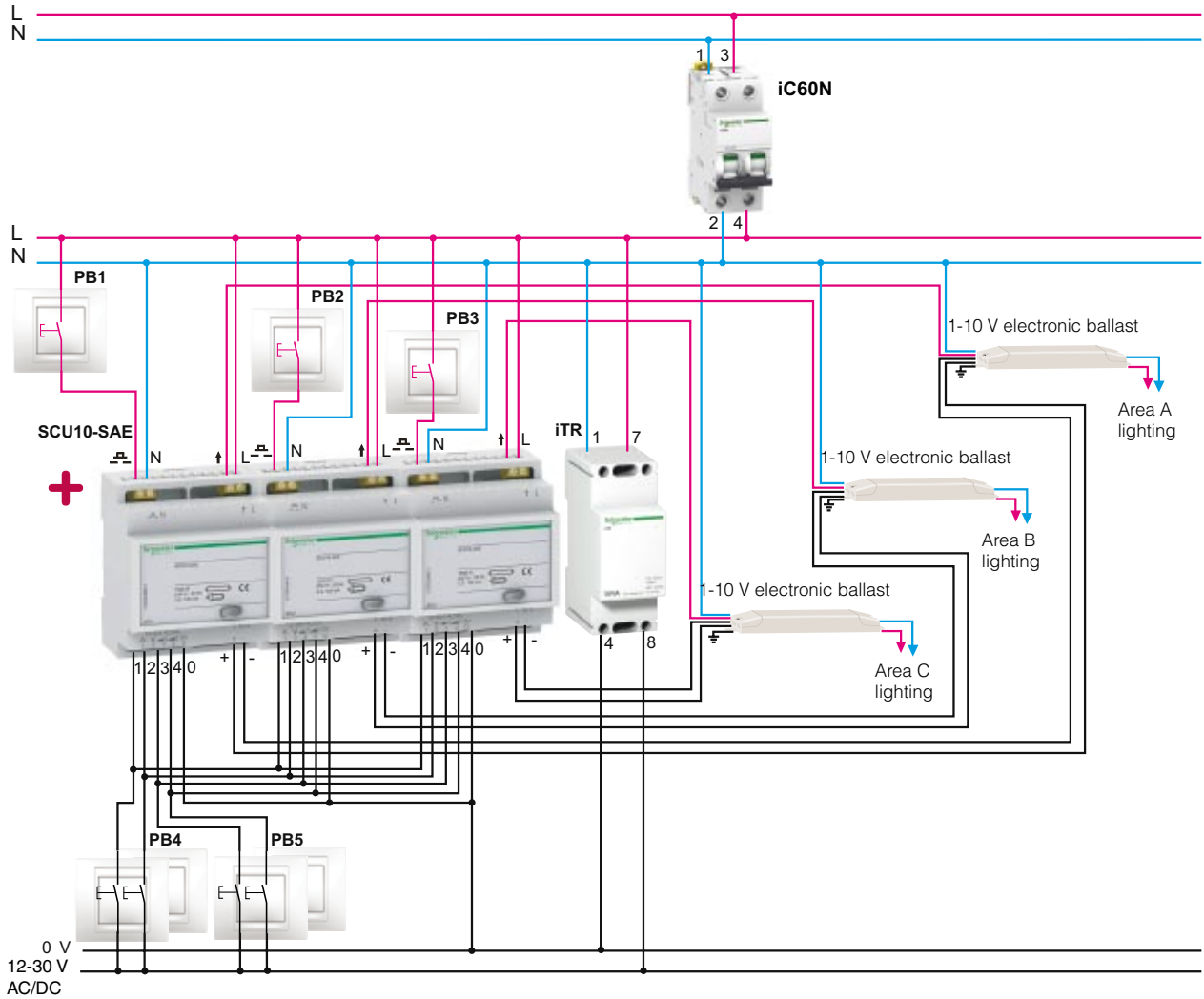
- office + education
- hotel
- industry
- residential
- etc.



> Energy Efficiency benefits

- > The room lighting can be adapted to the customer's requirements.
- > Dimming your light level ensures major energy saving, increased comfort.

Solution diagram



Text for specifications

- The three SCU10-SAE control the three separated rooms light level independently via the PB1, PB2, PB3 push-buttons and control the three rooms light commonly via PB4 and PB5 push-buttons.
- The PB1, PB2, PB3 and PB4 push-buttons are used to adjust brightness. A short press switches the lighting "On" or "Off", a long press increases or reduces the lighting output.
- The PB5 push-button is used to memorize the light level for two different lighting scenes. **For scene 1:** a short press use saved light level 1 and a long press save the light level 1. **For scene 2:** a short press use saved light level 2 and long press save the light level 2.

> Products used

Product	Description	Unit	Reference
SCU10-SAE	1- 10 V controller with 4 digital input card	3	CCTDD20012
iC60N	MCB 1 pole	1	
iTR	230 V AC/8-12 VAC transformer -4 VA	1	A9A15213
PB1, PB2, PB3	NO 230 V push-buttons	3	
PB4, PB5	NO 12 V push-buttons	4	

Optimizing the lighting of open plan offices



Customer needs

On average, over one-third of the total energy consumed in office buildings is used for lighting. In this type of building, occupied mainly during the daytime, undeniable energy savings can be achieved by optimizing luminaire lighting times. This installation can manage switching off of the lighting at the desired times, while allowing users to control the luminaires outside of the programmed period.

Proposed solution

- Lighting circuits are switched on and off by office users by means of room-mounted push-buttons located in each zone.
- An IHP time switch sends to the Reflex iC60 circuit protection and control device orders for switching off according to the building's operating requirements.
- The Reflex integrated control circuit breaker is configured in mode 1 to allow local restarting of the lighting.
- The light switching on/off data and electrical faults are transmitted to the building's monitoring room.



Benefits for users/customers

- **Energy efficiency:** optimization of lighting times allows energy savings of up to 30%.
- **Simplicity:**
 - automated and secure lighting management solution,
 - indications on the front panel of the product and remote signalling.
- **Safety:** padlocking possible without any additional accessory.
- **Continuity of service:** the Reflex iC60 is a bistable actuator which does not change state in the event of a power outage.

> Zoom on

Reflex iC60

Integrated control circuit breaker!



Reflex iC60N



Favorite applications

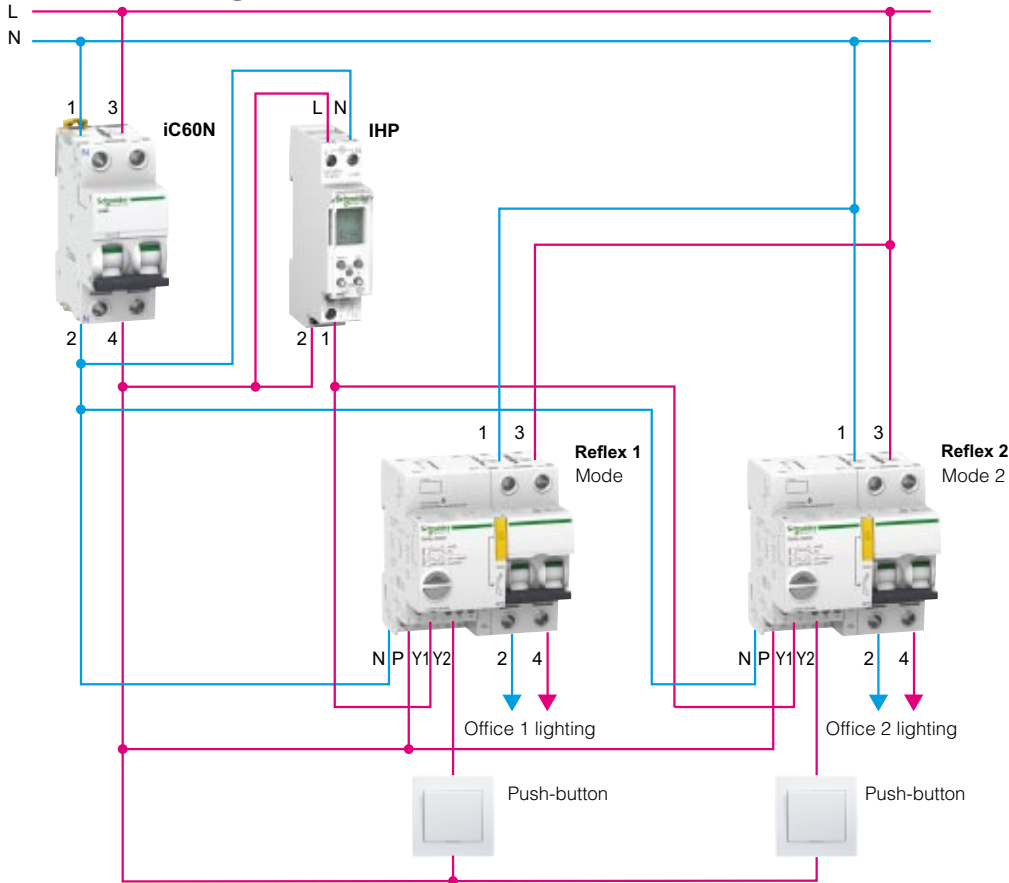
- offices
- educational institutions
- industry
- retail trade
- etc.



> Energy savings

> The Reflex iC60 integrated control circuit breaker makes it possible to save up to 30% of electricity consumption while ensuring user safety and comfort.

Solution diagram



Technical specifications of the solution

- The lighting loads must be powered by an integrated control circuit breaker.
- Lighting circuits are switched on and off by the users of the premises by means of room-mounted push buttons.
- Centrally controlled switching off of the lighting circuits must be able to be programmed by means of a time switch.
- It must be possible for the occupants to restart the lighting outside of the programmed lighting times.

> Products used

Product	Description	Unit	Reference
iC60N	Miniature circuit breaker 1P+N C 10 A	1	-
Reflex iC60N	2P integrated control circuit breaker, C curve, 25 A, 230 V, 50 Hz	2	A9C52225
PB	N/O room-mounted push-button	2	-
IHP	Weekly programmable time switch	1	15854

Local push-buttons enabled by a keycard



User/customer benefits

Energy savings: the user enables the room lighting by inserting the keycard into its support. Local push-buttons will be active.

The lighting is turned off when the card is removed.



Functions - Installer advantages

- **Keycard switch:** the changeover contact energizes the push-buttons when the card is inserted and the OFF inputs of the impulse relays when it is removed.
- **iTLc impulse relay:** drives a single lighting circuit in a conventional way with local push-buttons. Independent ON and OFF inputs are provided for centralized control.

iTLc

Impulse relays!



iTLc



Keycard switch



Favorite applications

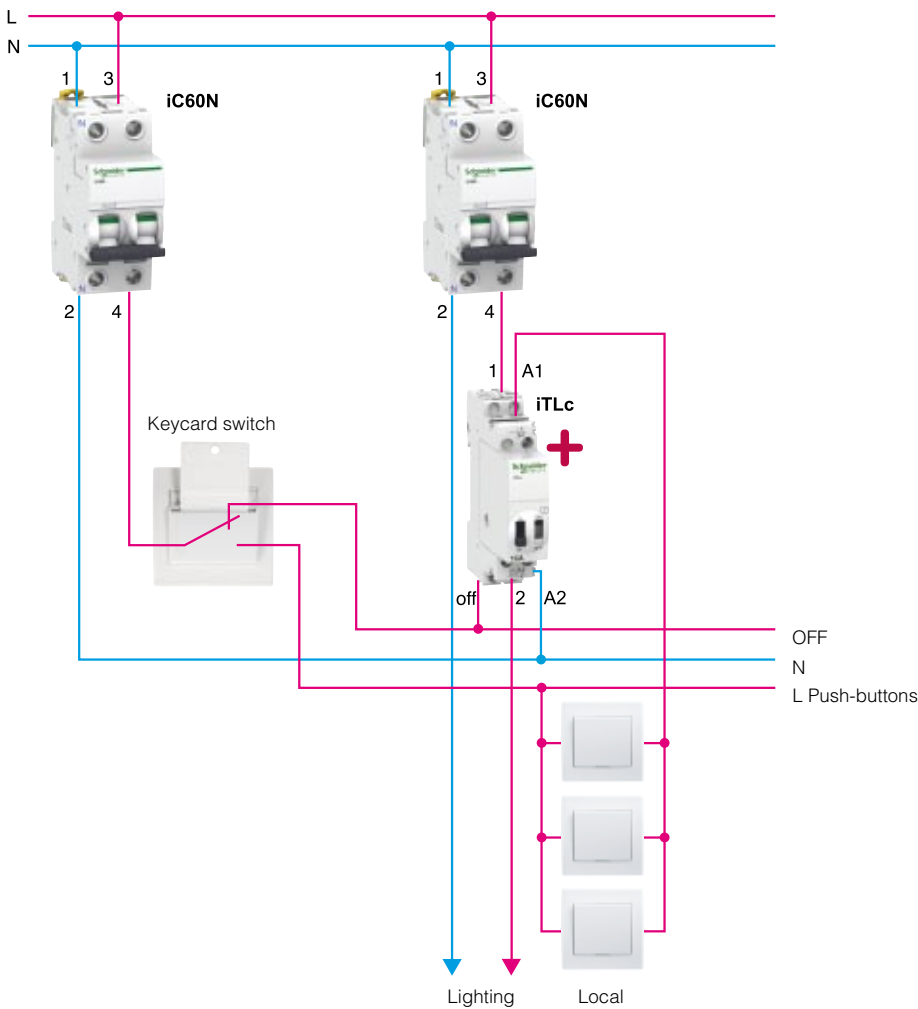
- office + education
- hotel
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Keycard control allows an energy saving of up to 10-15% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

- Use of the lighting is enabled by keycard detection. When the card is in its base, pressing a push-button turns it ON and pressing again or removing the card will turn it OFF.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C10 A	1	
Keycard switch	Changeover contact type	1	
iTLc	Impulse relay with centralised control	1	A9C33411
PB	Push-button	3	

Centralized ON+OFF overriding and local push-buttons enabled by a keycard



User/customer benefits

Energy savings: use of the room's lighting circuits is enabled while the keycard is inserted into its base.

Convenience: since a push-button is provided for each lighting circuit, Room ON and Room OFF push-buttons are provided for faster use.



Functions - Installer advantages

- **Keycard switch:** when the card is inserted the NO changeover contact is closed, energizing the push-button line and making the Room ON and Room OFF push-buttons operational. When the card is removed, the NC contact feeds the OFF input of the iTLc relay.
- **iTLc impulse relay:** drives a single lighting circuit in a conventional way with local push-buttons. A 230 V signal on the OFF input from the Room OFF push-button or from the keycard's NC contact will reset the relay. The room ON signal sent to the ON inputs activates the relays.

> Zoom on

iTLc

Impulse relays!



iTLc



Keycard switch



Favorite applications

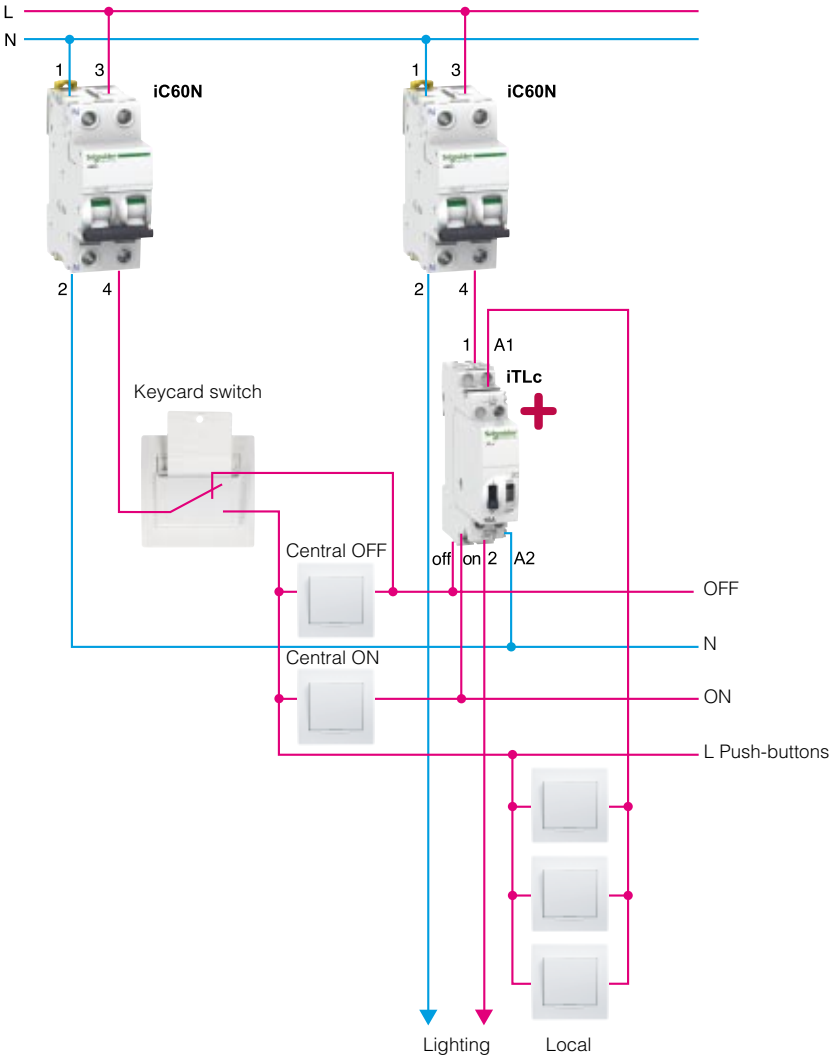
- office + education
- hotel
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Keycard control allows an energy saving of up to 10-15% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

● Use of the lighting is enabled by keycard detection. Each circuit can be controlled separately by a separate push-button and collectively by Room ON and Room OFF push-buttons.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C10 A	1	
Keycard switch	Changeover contact type	1	
iTLc	Impulse relay with centralised control	1	A9C33411
PB	Push-button	5	

> Lighting Control

Centralized ON+OFF overriding and local push-buttons enabled by a keycard, delayed disabling



User/customer benefits

Energy savings: use of the room's lighting circuits is enabled when the keycard is inserted into its base.

Convenience: push-buttons are provided for each lighting circuit. Room ON and Room OFF push-buttons are provided for faster use (action on several circuits).

Safety: the lighting stays ON for the preset time once the card has been removed.



Functions - Installer advantages

- **Keycard switch:** when the card is inserted the NO changeover contact is closed, so the push-button line is energized, Room ON and Room OFF push-buttons are operational. When the card is removed, the NC contact feeds the OFF input of the iTLc impulse relay.
- **iRTC time delay relay:** its changeover contact energizes the push-button line as soon as the Y1 input is high. The adjustable time delay starts when the keycard switch contact opens, then the changeover contact energizes the OFF inputs of the iTLc impulse relays.
- **iTLc impulse relay:** drives a single lighting circuit in a conventional way with local push-buttons. A 230 V signal on the OFF input from the Room OFF push-button or NC contact of the iRTC will reset the relay. The Room ON signal sent to the ON input activates the relay.

> Zoom on

iRTC

Time delay relay!



iRTC



Keycard switch



Favorite applications

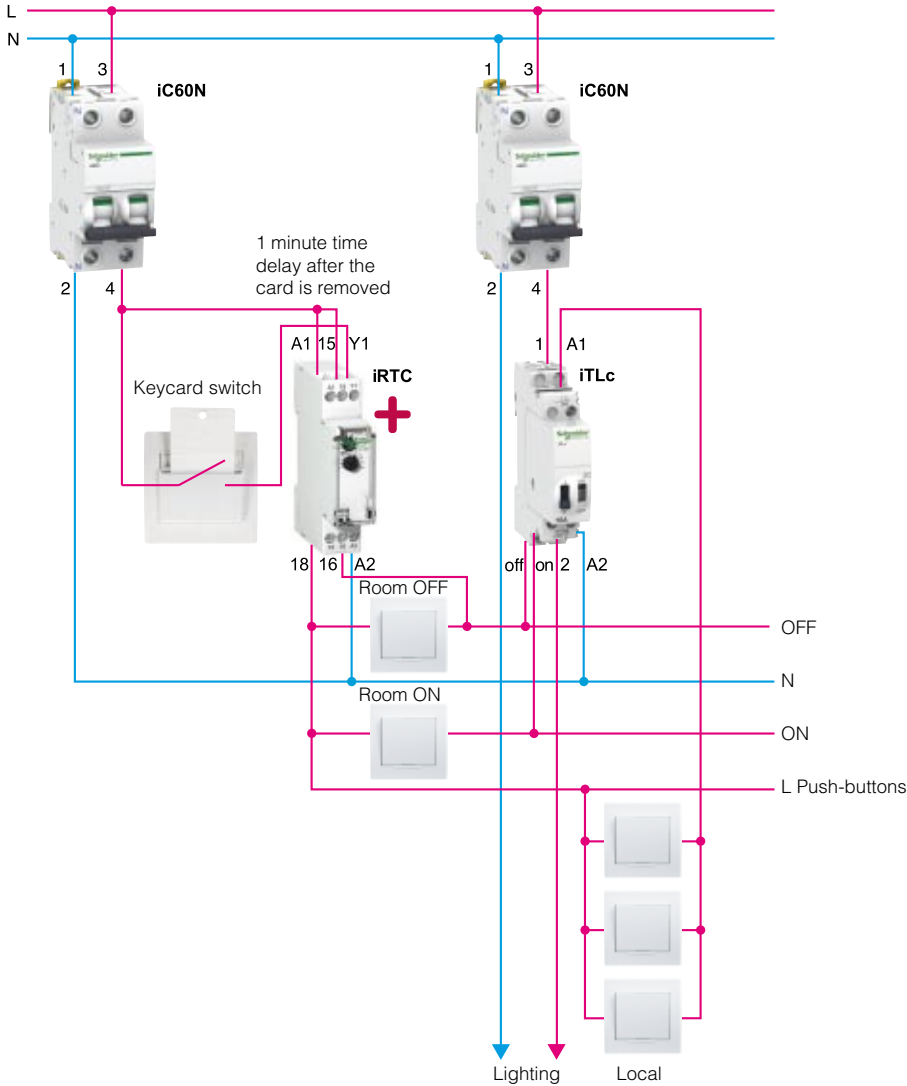
- office + education
- hotel
- industry
- retail
- infrastructure.



> Savings enabler

> Keycard control allows an energy saving of up to 10-15% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

- Use of the lighting is enabled by keycard detection. Each circuit can be controlled separately by a separate push-button, and collectively by Room ON and Room OFF push-buttons. Automatic Room OFF comes after the preset time delay once the card has been removed.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C10 A	1	
Keycard switch	Changeover or Normal Open contact type	1	
iRTC	Time delay relay	1	A9A16067
iTLc	Impulse relay with centralised control	1	A9C33411
PB	Push-button	5	



Lighting and wall socket circuits enabled by a keycard with delayed disabling



User/customer benefits

Energy savings: use of electrical appliances in the room is enabled when the keycard is inserted into its base.

Safety, comfort: electrical appliances are turned off after a time delay starting when the card is removed, making it easier to have a last look before leaving.



Functions - Installer advantages

- **Keycard switch:** the NO contact is closed when the card is inserted; it energizes the Y1 time delay input.
- **iRTC time delay relay:** its changeover contact energizes the push-button line as soon as the Y1 input is high. The adjustable time delay starts when the keycard switch contact opens, then the changeover contact energizes the OFF inputs of the iTLc impulse relays.
- **iTLc impulse relay:** drives a single lighting circuit in a conventional way with local push-buttons. A 230 V signal on the OFF input will reset the relay.
- **iCT relay:** the power relay is directly fed by the iRTC time delay relay when the card is inserted. The iCT relays control the switched lighting circuit and the wall socket circuit.

iRTC

Time delay relay!



iRTC



Keycard switch



Favorite applications

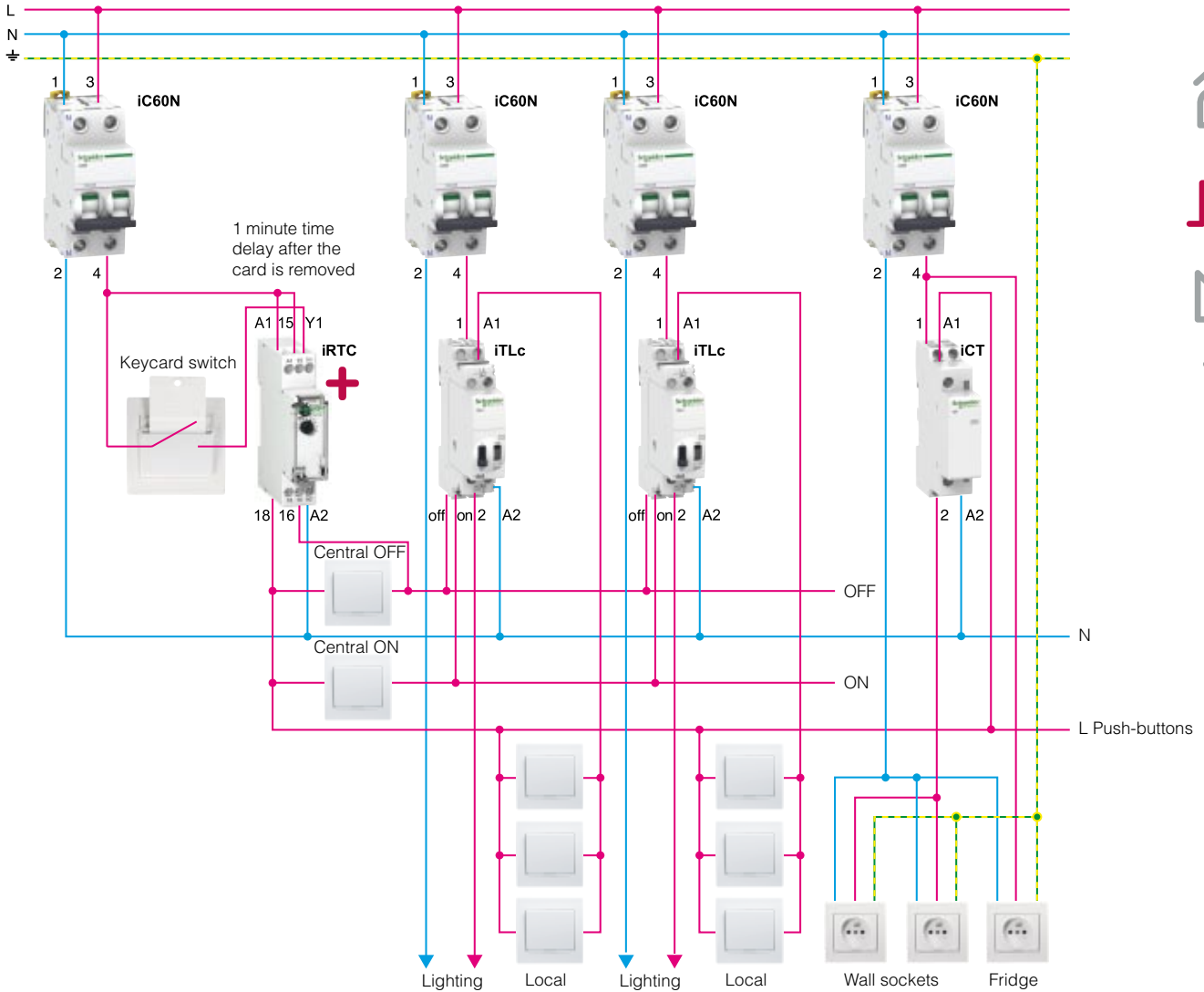
- office + educations
- hotel
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Keycard control allows an energy saving of up to 10-15% on lighting circuit electricity consumption, depending on user's discipline.

Solution diagram



Text for specifications

● Use of the room's lighting and wall sockets is enabled by keycard detection. The end of enablement comes after a presetable time delay starting when the card is removed.

> Products used

Product	Description	Unit	Reference
iC60N (Q1)	MCB 1P+N C2 A	1	
iC60N (Q2, Q3)	MCB 1P+N C10 A	2	
iC60N (Q4)	MCB 1P+N C16 A	1	
Keycard switch	NO contact type	1	
iRTC	Time delay relay	1	A9A16067
iTLc	Impulse relay with centralised control	2	A9C33411
iCT	Contacteur 1P+N 16 A	1	A9C22712
PB	Push-button	8	
Wall socket		3	

Controlling power off for a hotel room by keycard



Customer needs

A hotel room is a private space yet remains under the responsibility of the operator. Ensuring customer safety and comfort while optimizing profitability are the main concerns of a hotel manager.

To limit electrical risks during periods of non-occupancy of the room and reduce electricity consumption, the proposed system allows all the electrical circuits used by the customer (power sockets, lighting) to be powered off except for the facilities that must be left powered up for reasons of comfort (refrigerator, air conditioning).

Proposed solution

- The room's power supply is provided by a distribution board fastened horizontally in the false ceiling at the room entrance. This arrangement does not allow the use of a modular contactor.
- A Reflex iC60 integrated control circuit breaker can switch off the circuits' power supply when the keycard has been removed from its reader located at the entrance to the room.
- Customer presence and electrical fault information is reported to the room's PLC without any additional interface. This information is then transmitted to the supervision room via a communication bus.



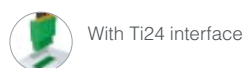
Benefits for users/customers

- **Safety:** No unwanted temperature rise, which allows installation in a false ceiling.
- **Energy efficiency:** No permanent consumption because the Reflex iC60 is a bistable product.
- **Efficiency:** No undesirable noise in steady-state conditions, unlike a contactor.
- **Simplicity:** Simplicity of the control circuit thanks to the Ti24 interface, which provides a direct link with the room's PLC.

> Zoom on

Reflex iC60

Integrated control
circuit breaker!



Reflex iC60



Applications:

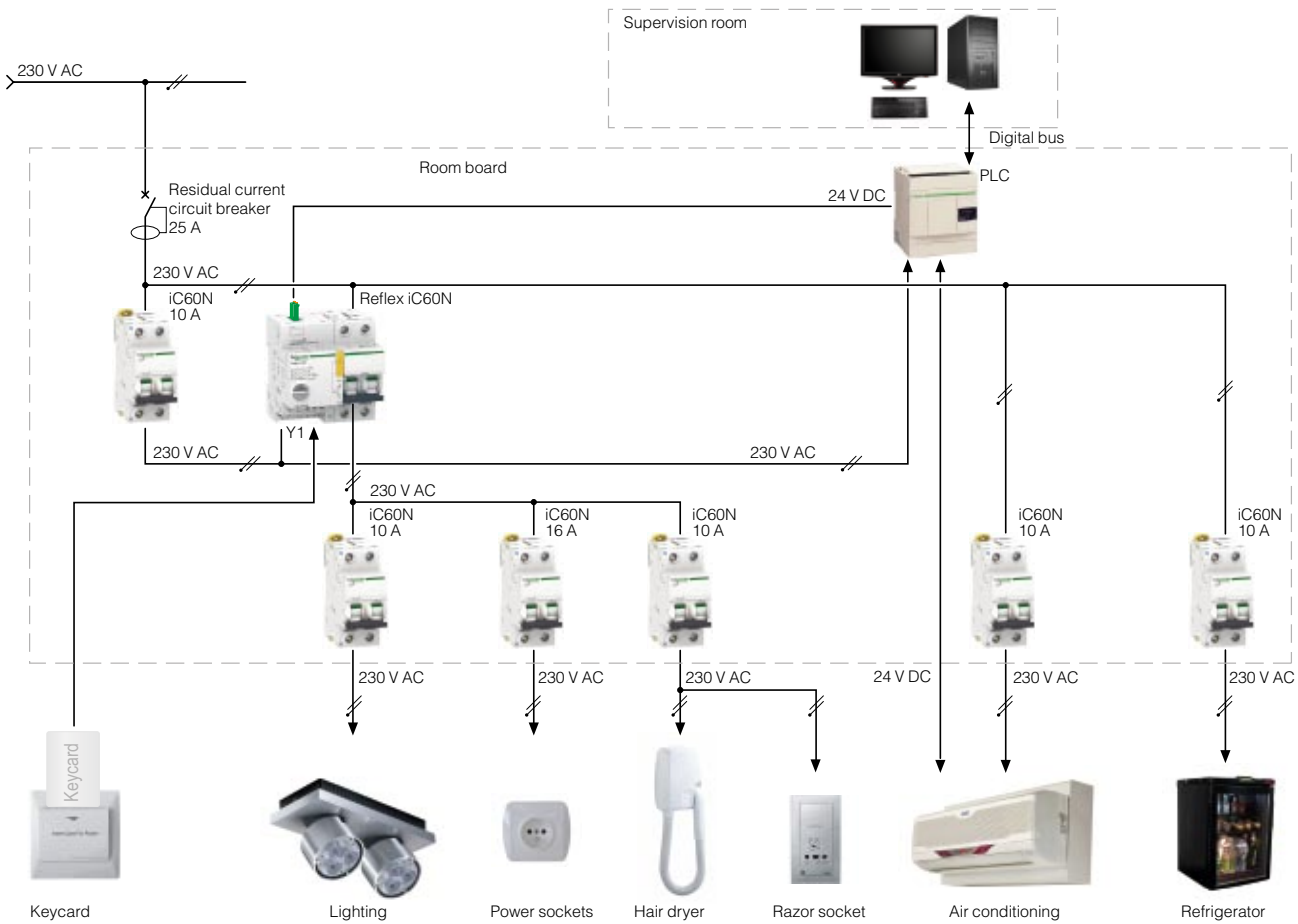
- hotel
- supermarket
- factory
- university
- offices.



> Energy savings

> The Reflex iC60 integrated control circuit breaker makes it possible to save up to 30% of electricity consumption while ensuring user safety and comfort.

Solution diagram



Technical specifications of the solution

- The non-priority loads must be powered by an integrated control circuit breaker, which should be able to operate in all positions to allow installation in a false ceiling.
- The integrated control circuit breaker can be controlled by the presence of the keycard in its reader.
- The circuit-breaker state (open/closed) shall be indicated at the PLC level.
- The solution must generate no noise or unwanted temperature rise.

> Products used

Product	Description	Unit	Reference
Reflex iC60N	2P integrated control circuit breaker, C curve, 25 A 230 V 50 Hz, with Ti24 interface	1	A9C62225
iC60N	10 A 2P circuit breaker, C curve	5	-
iC60N	16 A 2P circuit breaker, C curve	1	-

Time scheduled OFF and local push-buttons



User/customer benefits

Ease of use: zone lighting is activated with local push-buttons.

Energy savings: the lighting is automatically deactivated at the programmed closing time and then periodically.

Flexibility of use: light can still be switched ON after switch-off time. It will be deactivated after the next programmed interval if no manual OFF comes earlier.

Global building energy performance: this application can be selected as C-class energy performance.



Functions - Installer advantages

- ON/OFF control of lighting circuits (unlimited number of circuits): with **iTLc impulse relays**.
- **Time scheduling:** an **IHP+** time switch sends periodic OFF pulses starting at closing time. The interval is programmable. Pulses are collected by the iTLc.
- **Savings:** minimum wiring and maximum space saving as the iTLc does not need any auxiliary override module.
- **Extension:** by adding one MCB and iTLc per extra lighting zone. The connection method is similar.

iTLc Impulse relay!



iTLc



Favorite applications

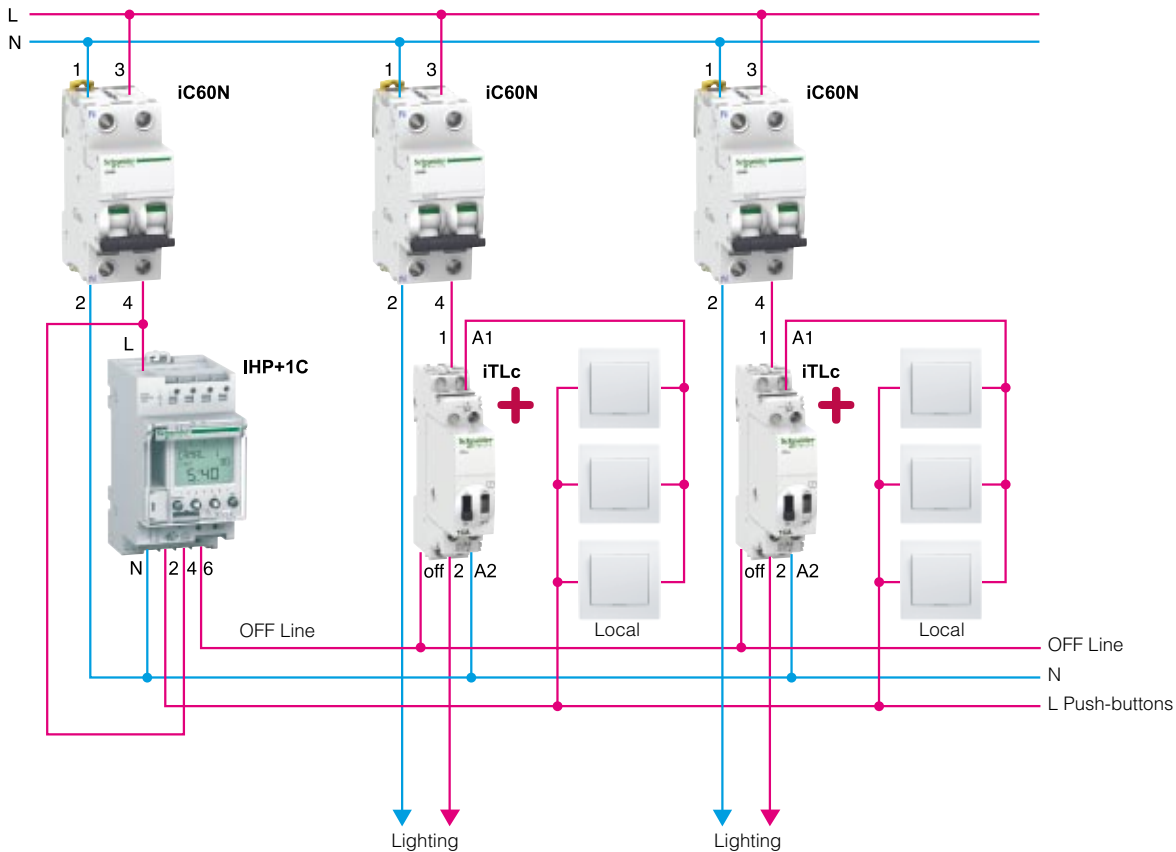
- office + education
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Up to Up to 15% energy saving can be expected, depending on user's discipline.

Solution diagram



Text for specifications

- The zone's lighting circuits shall be manually operated by local push-buttons. At the preset closing time the lighting shall be automatically switched off, periodic off shall occur at programmable intervals during closing time, while reactivation with push-buttons will remain available.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C16 A	2	
iTLc	Impulse relay 16 A with centralised control	2	A9C33411
IHP+ 1C	Programmable time switch	1	CCT15851
PB	Push-button	6	

Time scheduled ON+OFF and local ON/OFF push-buttons



User/customer benefits

Energy savings: the lighting for all zones is automatically activated at the beginning of the programmed occupancy hours and deactivated at the end. Lights can be switched off for the midday break.

Flexibility: from every zone users can activate and deactivate the local lighting from a single push-button. The automatic ON and OFF will still be active.



Functions - Installer advantages

- **Manual ON/OFF control** of each lighting circuit (unlimited number): with **iTLc impulse relays**.
- **Time scheduling:** an **IHP+** 2-channel time switch sends ON and OFF pulses at opening and closing times. Pulses are collected by the iTLcs on their ON/OFF override inputs. It is suggested that several OFF pulses are programmed overnight to prevent misuse of manual activation.
- **Extension:** more iTLc can be added and connected in parallel on the ON/OFF pulse lines.

iTLc

Impulse relay!



iTLc



Favorite applications

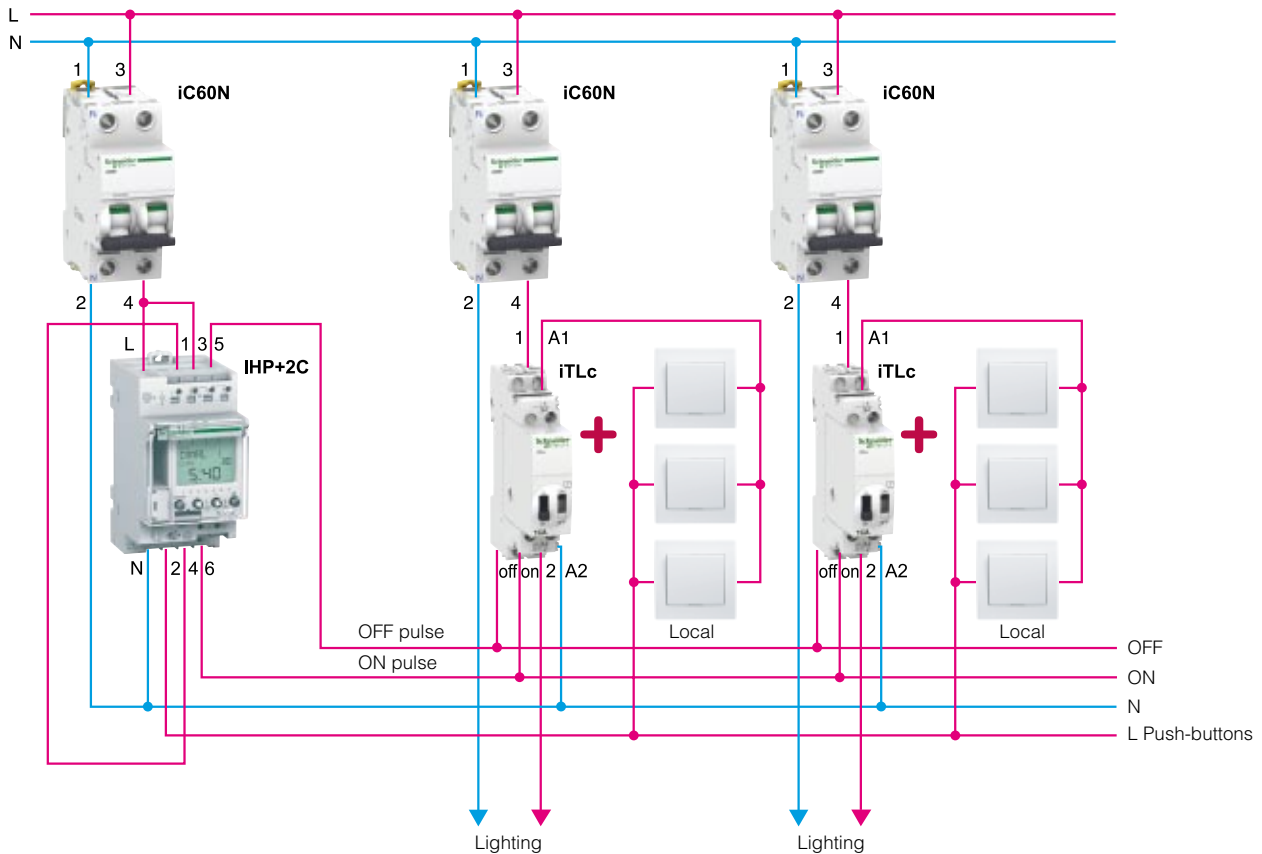
- office + education
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Depending on user's discipline, savings of 10 to 20% can be expected.

Solution diagram



Text for specifications

- The zone's lighting circuits shall be manually operated by local push-buttons. At the preset opening time the lighting for all zones shall be automatically switched on and then switched off at the closing time and periodically during the closing time. The local push-buttons will still be active.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C16 A	2	
iTLc	Impulse relay 16 A with centralised control	2	A9C33411
IHP+ 2C	Programmable time switch	1	CCT15853
PB	Push-button	6	

Building vacancy program with zone OFF push-buttons and local push-buttons



User/customer benefits

Energy savings: the lighting of rooms on different floors is automatically turned OFF at a defined preset time (closing time of the building). Each floor can be turned off manually with a dedicated push-button. Each room can be turned ON and OFF locally.

Convenience: Outside the closing period the lighting can be switched ON locally; it will stay ON until the next periodic stop sent by the time switch.



Functions - Installer advantages

- **Hard-wired solution:** for lighting applications, group control and time scheduling. Provided with conventional electrotechnical equipment. Testing is simple, extension is by addition of iTLc impulse relay.
- **iTLc impulse relay:** controls one lighting circuit with a dedicated push-button. Its ON and OFF inputs get the common Floor OFF order from a push-button and building OFF from the building time switch.
- **iATLc+c:** there is one auxiliary module per floor. This module isolates the common OFF order of its floor, preventing it from turning OFF the other floors.
- **IHP+ 1C:** this impulse 1 channel time switch defines the closing time of the building. A 1 second impulse must be programmed at the closing time and later, every x hours during the closing period, depending on the desired frequency of the periodic stops.
- **Option:** common ON order can be provided by cabling the ON inputs of iTLcs the same way as the OFF inputs. For an automatic ON impulse at the beginning of a working day, replace the IHP+ 1C with an IHP+ 2C connected to every iATLc+s (second diode) and every ON input.

> Zoom on

iATLc+c

Central control for impulse relays!



iATLc+c



Favorite applications

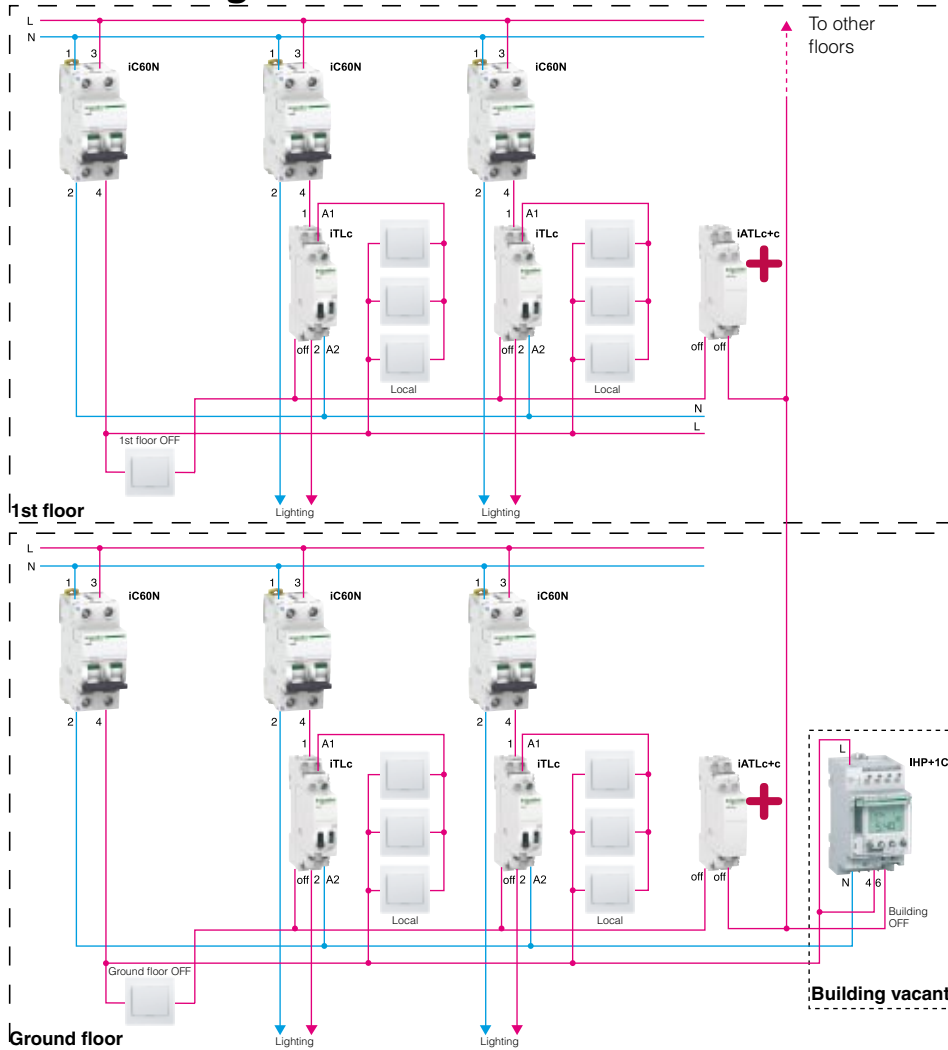
- office + education
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Up to 30% depending on programming and user's discipline

Solution diagram



Text for specifications

● Each lighting circuit shall be activated individually by local push-buttons. A lighting de-activation push-button shall be provided on each floor, with action on the defined lighting zone. A zone is a group of circuits. All floors shall be de-activated at the closing time defined in a time switch and then periodically until the building is opened again. Manual action is possible between periodical stops.

> Products used

Product	Description	Unit	Reference
IC60N	MCB 1P+N C2 A	2	
IC60N	MCB 1P+N C10 A	4	
iATLc+c	Central command	2	A9C15410
iTLc	Impulse relay 16 A with centralised control	4	A9C33411
IHP+ 1C	Programmable time switch	1	15851
PB	Push-button NO	14	

> Lighting Control

Centralized ON+OFF and local push-buttons, 1 circuit enabled by daylight condition



User/customer benefits

Energy savings: once the lighting circuit closest to the windows is defined, this circuit is automatically turned off when there is sufficient natural light, and action on its push-button is cancelled. The other lighting circuits in the room remain independent from this automatic control.

Efficient use: users can activate and de-activate each lighting circuit from a single push-button. Room ON and OFF push-buttons are provided for efficient use on all of the room's circuits.



Functions - Installer advantages

- **Circuit manual ON/OFF:** control of each lighting circuit (unlimited number) with push-buttons coupled to iTLc impulse relays.
- **Room manual push-buttons** activate and de-activate all iTLc impulse relays simultaneously, from their ON/OFF inputs.
- **Twilight switch + outdoor sensor:** an IC2000 delivers the supply to the push-buttons on the window circuit only when the natural light level is low. When the light is sufficient or by actioning the general OFF push-button a general OFF signal is sent to all iTLc.
- **Extension:** more iTLc can be added and connected in parallel on the ON/OFF lines.

> Zoom on

IC2000

Light sensitive switch!



IC2000 + Cell



Favorite applications

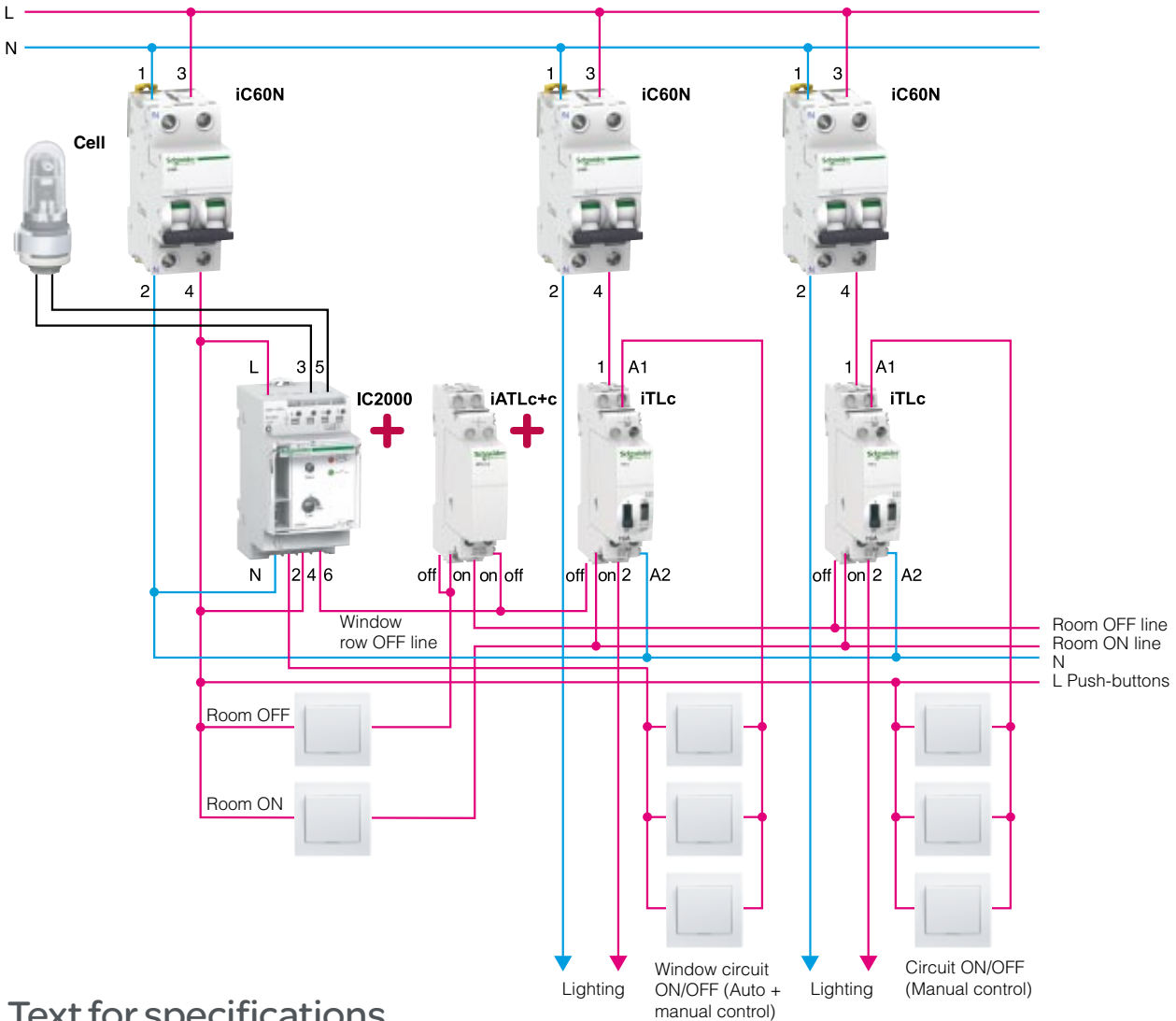
- office + education
- industry
- retail
- infrastructure
- etc.



> Savings enabler

> Depending on the user's discipline, a saving of 20% can be expected.

Solution diagram



Text for specifications

- The room's lighting circuits shall be individually operated by dedicated push-buttons and simultaneously by Room ON and Room OFF push-buttons. Manually actioning the lighting circuit closest to the windows will only be possible when the natural light level is insufficient; it will be automatically turned OFF when sufficient light is detected.

> Products used

Product	Description	Unit	Reference
iC60N	MCB 1P+N C2 A	1	
iC60N	MCB 1P+N C10 A	2	
IC2000	Twilight switch + outdoor sensor (cell)	1	CCT15368
iATLc+c	Central command	1	A9C15410
iTLc	Impulse relay 16 A with centralised control	2	A9C33411
PB	Push-button	8	



Monitor lighting time and manage the bells in a school



Customer's needs

The school director wants to optimise his operating costs by saving lighting energy and to automatically start school bells at the right time.

Recommendation

Limit the amount of lighting used to the number of hours required for school activities by programming the times during which classrooms and common areas need to be lit.

Monitor how long the lighting is used and be informed when the time is exceeded (for maintenance purposes).

Program bell operating times and durations.



Customer advantages

- Automatic management of school bells and lighting.
- 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 to allow cleaning and maintenance persons to work outside school hours.
- Automatic summer/winter time change.

Product advantages

- Display on backlit LCD screen of the hour and minutes, the day of the week, the current operating mode and the day schedule.
- Use the "kit LTS" programming tool for easy programming with a PC.
- 84 switching operations to offer large programming capacities.
- Mechanical compatibility with electrical distribution comb busbar for easier installation on symmetrical rail.
- Screwless terminals for easy and fast connection.

> Zoom on

IHP

Efficiency at your fingertips!



IHP+2c



Favorite applications

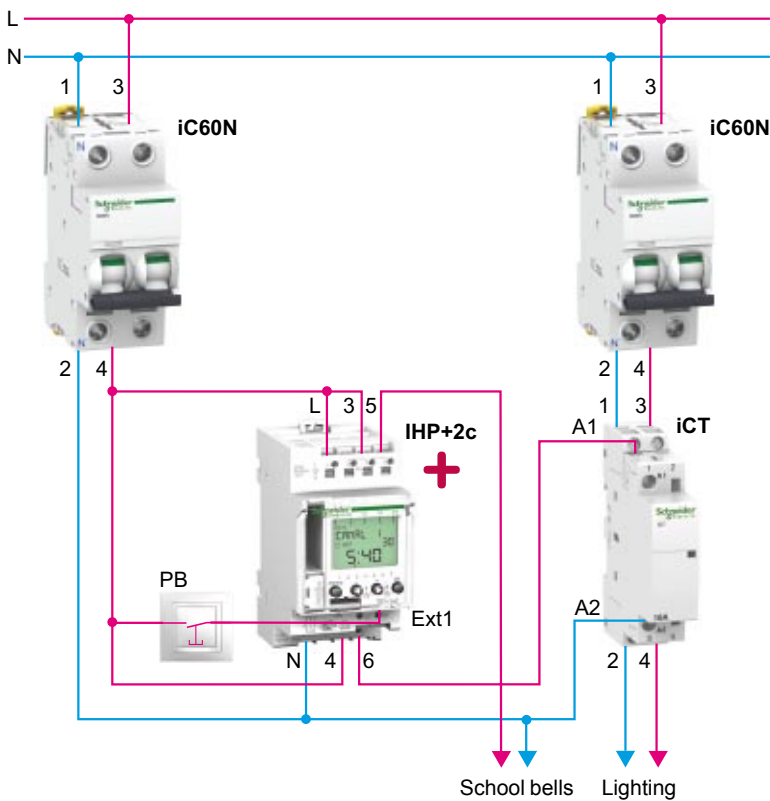
- office + education
- hotel
- industry
- residential
- etc.



> Energy Efficiency benefits

- > Energy saving by automatically extinguishing lighting when it is not necessary.
- > Easy modification of time switch program for special events and vacation, avoiding useless energy spending.
- > The change to summer/winter time is automatic.

Solution diagram



Text for specifications

IHP+2c programmable time switch to program:

- on IHP+2c output 1; the days and times when the lighting should be switched on (example: Monday to Friday 8 h 15 to 9 h 30 and 15 h 30 to 18 h 30),
- on IHP+2c output 2; the day, time and duration of school bell operation using the pulse function (example: Monday to Friday every hour from 8 h 30 to 16 h 30, the bells operate 20 s).

- Standard switch or push-button connected to the external input 1 for off-hours timer operations.
- Circuit-breakers to protect the devices and lighting circuits.
- iCT contactor, to manage the school lighting.
- The characteristics of protection circuit-breakers and iCT contactor depend on the installed power and type of load.

> Products used

Product	Description	Unit	Reference
IHP+2c	Programmable time switch, 2 channels	1	CCT15853*
iC60N	MCB 1 pole	2	
iCT	Modular contactor 2 poles	1	
PB	NO push-button	1	

* French, English, Swedish, Dutch, Finnish, Norwegian/Danish languages. Others languages are available with other references.

> Lighting Control

Manage lighting in various parts of a shop



Customer's needs

The shop manager wants to control the energy consumption while maintaining an appropriate lighting level in the different parts of his shop.

Recommendation

- A time switch ITM offers all the necessary features in a single product:
 - shop and window lighting limited to opening times,
 - time delay of storeroom lighting,
 - flashing of the illuminated shop sign in, association with a twilight switch when night falls.



Customer advantages

- Automation ensures better control of energy expenses.
- The shop window and sign are valorised.
- The range of features reduces installation volume.

Product advantages

- Easy copying of the program from one time switch to another with the memory cartridge.
- Multifunctional, compact, modular and economical.
- Simple accessible configuration on the front face.
- Possibility to control up to 4 separate outputs.

> Zoom on

ITM & IC

Program, time delay, count.
Let yourself be guided!



ITM4c-6E



IC2000



Favorite applications

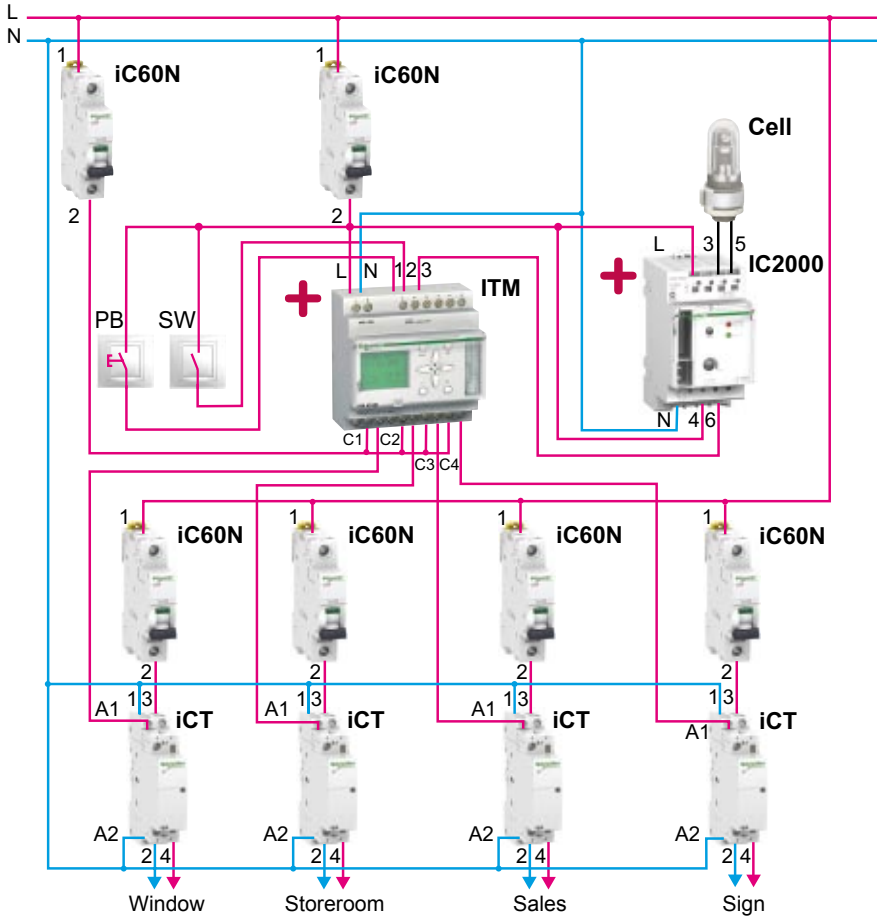
- office + education
- hotel
- industry
- etc.



> Energy Efficiency benefits

- > Automation ensures better control of energy expenses by automatically extinguishing lighting when it is not necessary.
- > Energy saving while emphasising the shop window and lighted signs.

Solution diagram



The ITM is used to control 4 output channels (C1 to C4) according to the status of 3 inputs (E1 to E3). The E3 input is conditioned by the level of external brightness controlled by IC2000.

Output	Use	Type of function used (programming)	Input	Type of input used	Connected components
C1	Window lighting	Weekly time programming	-	-	-
C2	Stock room lighting	Timer	E1	Control input	PB push-button
C3	Sales area lighting	Weekly time	E2	Override input programming	SW switch
C4	Neon sign	Flashing	E3	Condition input	Twilight switch

Output C1 allows lighting of the shop window at the required times and days.

Output C2, programmed in timer function, receives the operating authorisation from PB push-button connected to input E1.

Output C3 authorises lighting of the sales area at the required times and days. It can be forced by the SW switch cabled to the input E2.

Output C4 makes the shop sign flash when the twilight switch connected to E3 enables it to do so.

> Products used

Product	Description	Unit	Reference
ITM 4c-6E	Multifunctional switch	1	15270
IC 2000	Twilight switch (delivered with a wall-mounted cell)	1	CCT15368
iC60N	MCB 1 pole	1	
iC60N	MCB 1 pole	5	
iCT	Modular contactor 2 poles	4	
PB & SW	NO push-button & one-way switch	1	

> Lighting Control

Monitor lighting time and manage the bells in a school



Customer's needs

The school director wants to optimise his operating costs by saving lighting energy and to automatically start school bells at the right time.

Recommendation

Limit the amount of lighting used to the number of hours required for school activities by programming the times during which classrooms and common areas need to be lit. Monitor how long the lighting is used and be informed when the length of time is exceeded. Program bell operating times and durations.



Customer advantages

- All the necessary features in a single product. Control up to 4 separate outputs:
 - general management output,
 - lighting output,
 - bell output,
 - preventive maintenance output.
- The range of features reduces installation volume.

Product advantages

- Easy copying of the program from one time switch to another with the memory cartridge.
- Multifunctional, compact, modular and economical.
- Simple accessible configuration on the front face.

> Zoom on

ITM

Program, time delay, count.
Let yourself be guided!



ITM4c - 6E



Favorite applications

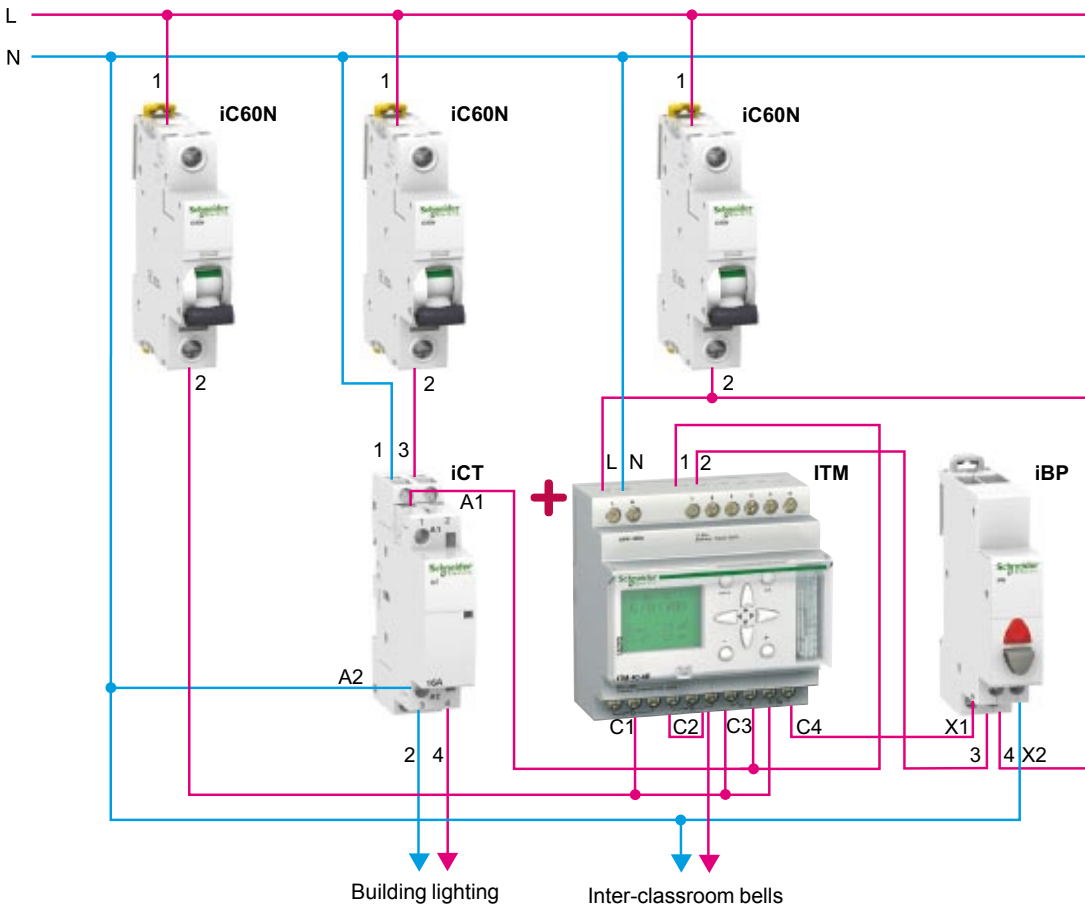
- office + education
- hotel
- industry
- etc.



> Energy Efficiency benefits

- > Energy saving by automatically extinguishing lighting when it is not necessary.
- > Easy modification of time switch program for special events and vacation, avoiding useless energy spending.
- > The change to summer/winter time is automatic.

Solution diagram



The ITM multifunctional time switch controls 4 output channels (C1 to C4) according to the status of 2 inputs (E1 and E2).

Output	Use	Type of function used (Programming)	Input	Type of input used (Functions)	Connected components
C1	General management	Annual schedule programming: school opening dates	E1	Metering input: counts the number of hours the lighting operates in the building (C3 output)	C3 output
C2	Inter-classroom bells	Impulse programming: times days and operating duration			
C3	Building lighting	Weekly schedule programming: operating times and days	E2	Reset input: the counters is reset manually via the push-button	Push-button contact
C4	Duration exceeded	Hour counter programming: maximum usage time of C3 output			

C1 output, wired in series with C2 output, prevents the bells ringing on days when the school is not open.

"Building lighting" C3 output is connected to metering E1 input to which it transmits the number of hours during which it operated.

C4 output switches on the green indicator light on the push-button when the maximum usage time of C3 output is exceeded. The push-button is used to reset the number of operating hours indicated by reset E2 input.

> Products used

Product	Description	Unit	Reference
ITM4c- 6E	Multifunctional time switch	1	15270
iC60N	MCB 1 pole	3	
iCT	Modular contactor 2 poles	1	
iPB	Modular NC push-button with indicator light	1	A9E18037

Improving management of a public lighting system in a town



Customer needs

The quality of lighting is of prime importance for a town. This installation provides management of public lighting and a power supply for the power sockets distributed over the public space to allow the holding of special events (markets, street entertainment).

The objective is to ensure the following functions by remote management:

- Switching public lighting on and off;

- Switching the power socket circuit on and off;
- Information on equipment operating states, so as to plan repair operations;
- Remote restarting following an electrical fault.

In the event of a remote management failure, a function designed to ensure improved dependability of service is performed by a local PLC for switching the public lighting on and off.

Proposed solution

- The functional units are installed in street cabinets along the roads, or in equipment rooms located near the area to be powered.
- The RCA remote control auxiliary allows the PLC to switch off the power supply by actuating the iC60 device.
- Each cabinet has a local automatic control system interfacing with the central system.
- The RCA remote control is configured in 1-A mode to give priority to the management PLC and enable reclosing of the circuit breaker following a fault.



Benefits for users/customers

- Simplicity:
 - automated, secure solution for switching the power supply on and off;
 - indications on the front panel of the product and remote indication.
- Safety: Padlocking possible without any additional accessory.
- Continuity of service: Enabling of automatic reclosing upon an electrical fault.
- Energy efficiency: No permanent consumption because the RCA iC60 remote control is a bistable actuator.

> Zoom on

RCA iC60

Remote control!



RCA iC60



Applications:

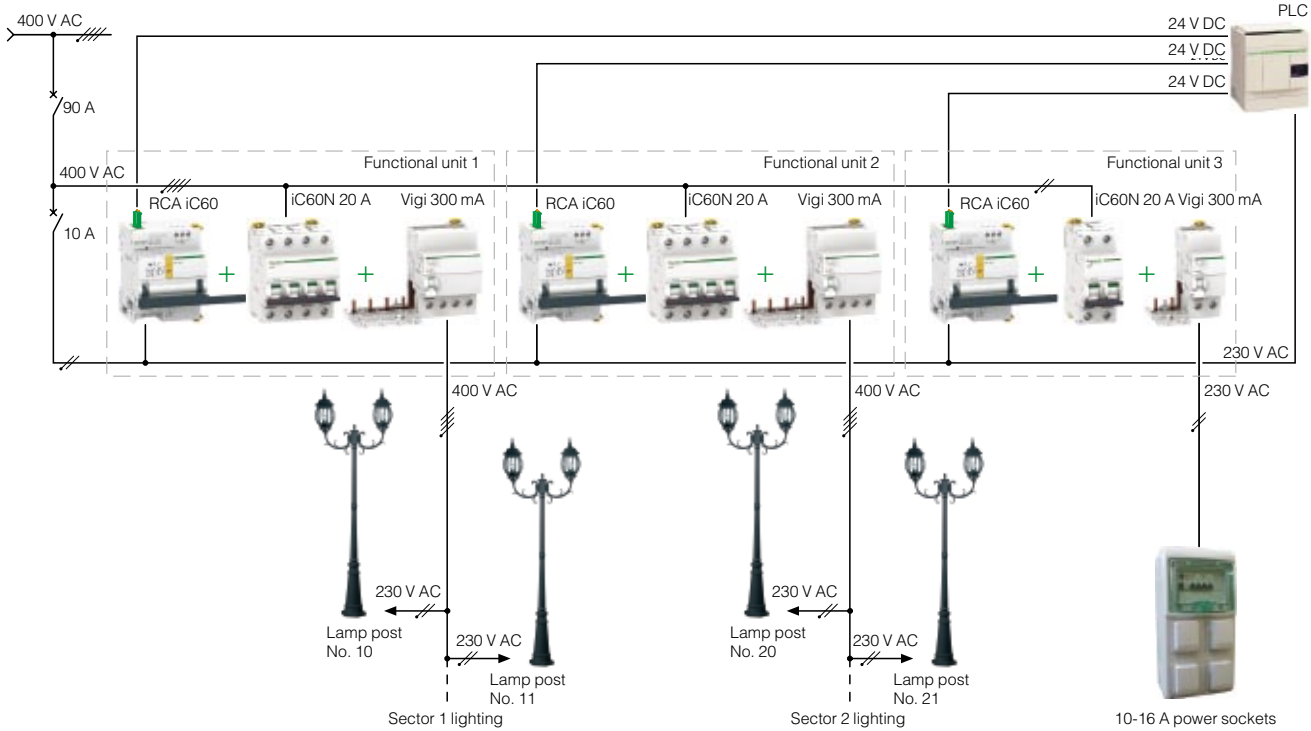
- infrastructure
- industry
- tertiary sector
- public lighting
- power distribution
- circuit load shedding.



> Improving lighting management

> Optimization of lighting time while ensuring improved quality of service.

Solution diagram



Technical specifications of the solution

- The lighting and power socket feeders must be powered by a modular circuit breaker combined with a remote control and an earth leakage protection auxiliary.
- This circuit breaker is remote controlled automatically via a connection with a PLC without any additional interface.
- The state of the circuit breaker (open/closed) and the presence of an electrical fault must be indicated at the PLC level.
- After tripping of the protective device, remote reclosing is enabled.

> Products used

Product	Description	Unit	Reference
RCA iC60	230 V AC 50 Hz remote control with Ti24 4P interface	2	A9C70124
iC60N	20 A 4P circuit breaker, B curve	2	-
Vigi iC60	300 mA 4P earth leakage module	2	-
RCA iC60	230 V AC 50 Hz remote control with Ti24 2P interface	1	A9C70122
iC60N	16 A 2P circuit breaker, C curve	1	-
Vigi iC60	30 mA 2P earth leakage module	1	-

Automating the lighting for an industrial workshop



Customer needs

The lighting of an industrial workshop is of prime importance to ensure employee safety and good productivity at work stations. To optimize consumption, it is advantageous to automate luminaire lighting times according to work periods. For safety reasons, employees must not be able to switch off the luminaires. However, it is necessary to allow local override control in order to perform maintenance operations (change of lamps or night work in the workshop, for example).

This installation allows the operator to choose an automated or manual mode for the control of each lighting circuit.

Proposed solution

- The lighting loads are powered by a Reflex iC60 integrated control protective device.
- The Building Management System (BMS) sends to the Reflex orders for switching on and off according to the building's operating requirements.
- The Reflex integrated control circuit breaker is configured in mode 3 to allow override control of the lighting or switching off of the lighting by the operator.
- The light switching on/off data and electrical faults are transmitted to the facility's monitoring room.

+ Benefits for users/customers

- **Simplicity:**
 - no weak current interface between the Reflex and the Building Management System (BMS),
 - lower cabling costs, up to 50% fewer connections,
 - indications on the front panel of the product and remote signalling.
- **Flexibility:** possibility of manual override control.
- **Safety:** padlocking possible without any additional accessory.
- **Continuity of service:** the Reflex iC60 is a bistable actuator which does not change state in the event of a power outage.

> Zoom on

Reflex iC60

Integrated control
circuit breaker!



Reflex iC60N with Ti24 interface



Favourite
applications:

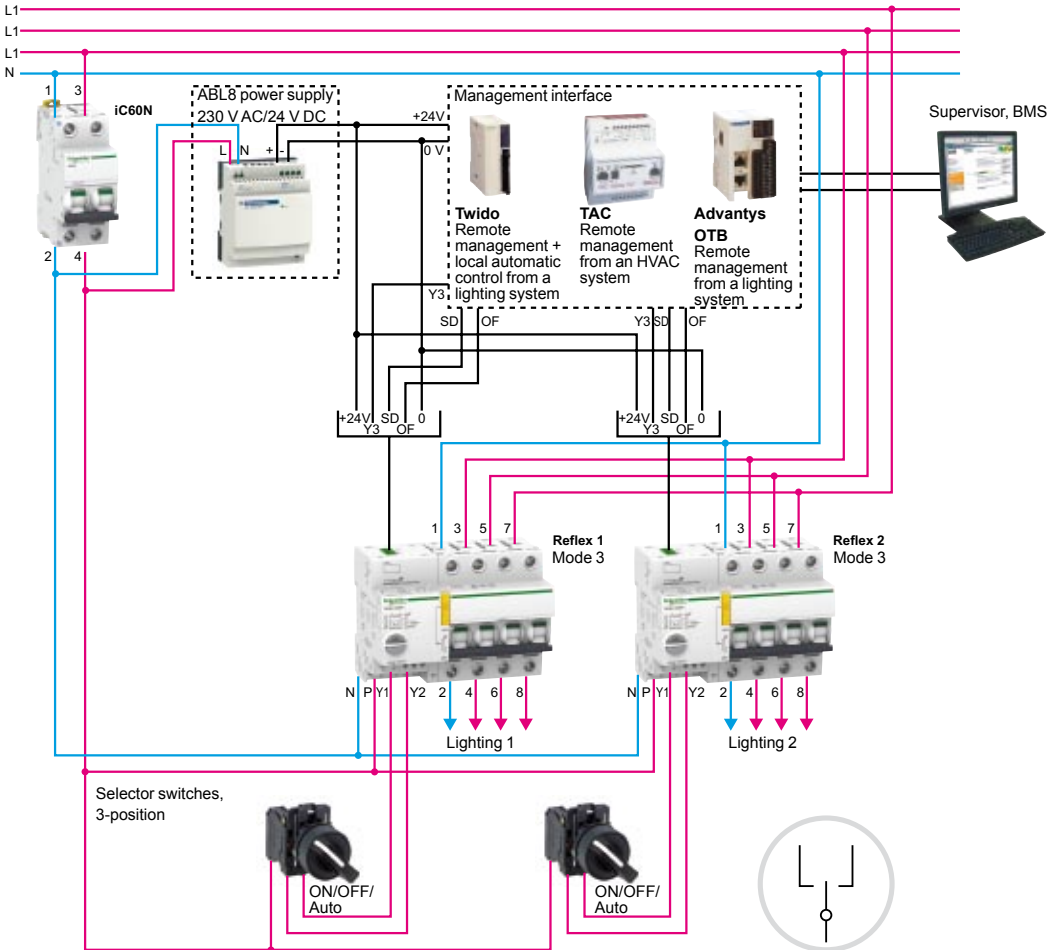
- industrial workshop
- conference room
- station platform
- airport hall
- supermarket.



> Energy savings

> The Reflex iC60N integrated control circuit breaker makes it possible to save up to 30% of electricity consumption while ensuring user safety and comfort.

Solution diagram



Technical specifications of the solution

- The lighting loads must be powered by an integrated control circuit breaker.
- ON/OFF control of lighting circuits must be supervised by a management PLC connected to a BMS.
- Manual override setting of the lighting on ON or OFF can be performed by a selector switch on the front of the electrical distribution switchboards.
- The light switching on/off data and electrical faults are transmitted to the supervision system, without any additional weak current interfaces.

> Products used

Product	Description	Unit	Reference
iC60N	Miniature circuit breaker 1P+N C 10 A	1	-
Reflex iC60N	4P integrated control circuit breaker, C curve, 25 A, Ti24 (mode 3 setting)	2	A9C62425
Harmony serie K	3-position selector switch, dia. 22 mm	2	-

Managing the lighting of an outdoor car park with two levels of intensity



Customer needs

Lighting for an outdoor car park is provided by high-power luminaires. However, depending on the level of luminosity and the occupancy of the car parks, lighting at maximum power is not always necessary. Accordingly, managing lighting according to the various levels of intensity makes it possible to optimize energy and bulb replacement costs.

This installation can manage lighting automatically by measuring the luminosity. The power is adapted according to the periods of use of the car park.

Proposed solution

- A Multifunction Time Switch sends to the Reflex iC60 circuit protection and control device orders for switching on and off according to the building's operating requirements.
- A light sensitive switch can adapt the light intensity of each zone.
- The Reflex iC60 integrated control circuit breaker is configured in mode 1 to allow override control of the lighting by the operator.
- The light switching on/off data and electrical faults are transmitted to the facility's monitoring room.



Benefits for users/customers

- **Energy efficiency:**
 - optimization of lighting times and power allows energy savings of up to 30%,
 - increase in luminaire service life.
- **Simplicity:**
 - reduction in wiring time,
 - indications on the front panel of the product and remote signalling.
- **Safety:** padlocking possible without any additional accessory.
- **Continuity of service:** the Reflex iC60 is a bistable actuator which does not change state in the event of a power outage. cas de perte de l'alimentation.

> Zoom on

Reflex iC60

Integrated
control circuit
breaker!



Reflex iC60N



Favourite
applications:

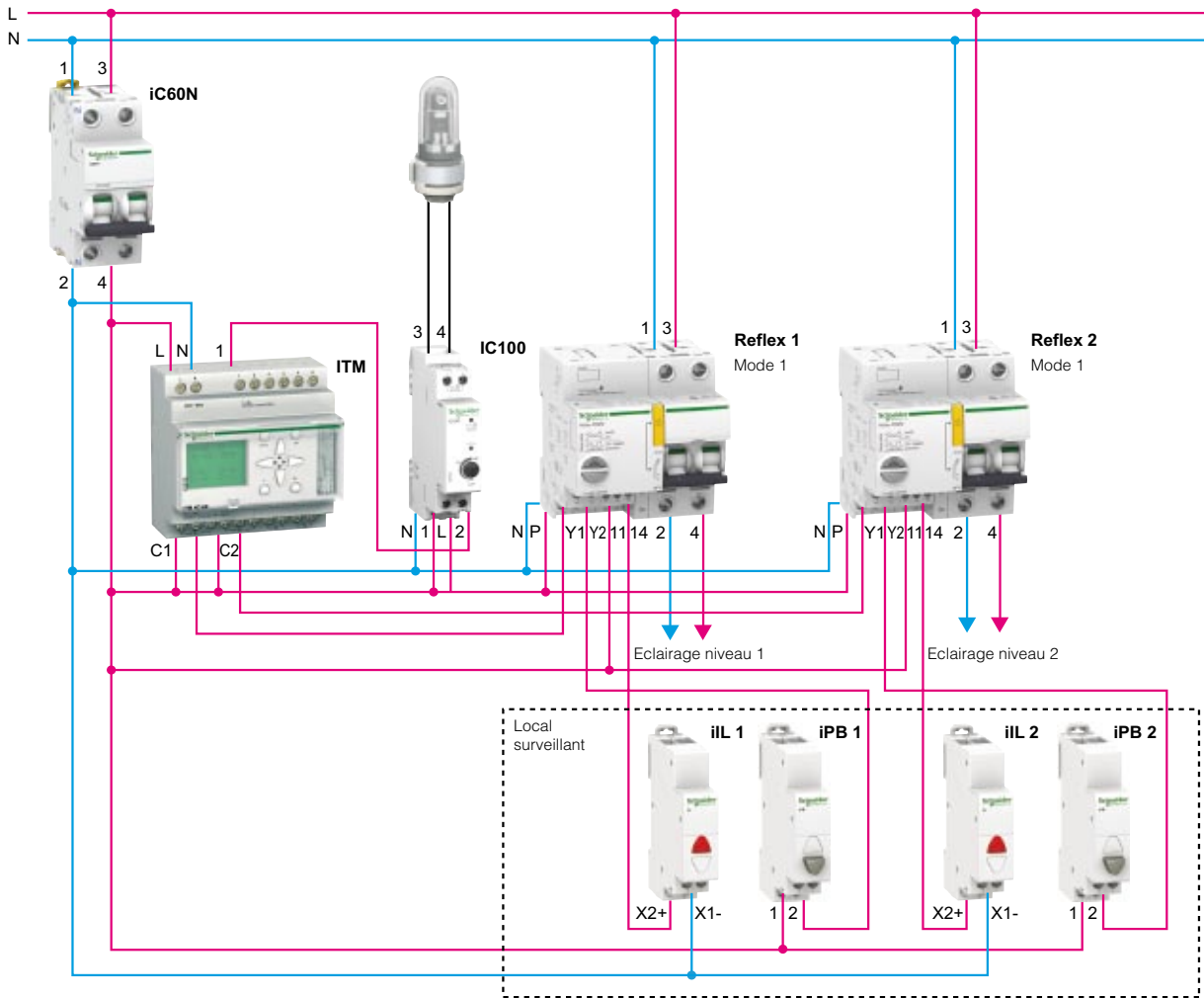
- hotel
- supermarket
- factory
- university
- offices.



> Energy savings

> The Reflex iC60 integrated control circuit breaker makes it possible to save up to 30% of electricity consumption while ensuring user safety and comfort.

Solution diagram



Technical specifications of the solution

- The lighting loads must be powered by an integrated control circuit breaker.
- ON/OFF control of the lighting circuits is performed by a time switch connected to a photocell which can adjust lighting power depending on the light intensity.
- Manual override control of the lighting by push buttons must be possible.
- The light switching on/off data and electrical faults are transmitted to the monitoring room.

> Products used

Product	Description	Unit	Reference
iC60N	Miniature circuit breaker 1P+N C 10 A	1	-
Reflex iC60N	2P integrated control circuit breaker, C curve, 25 A, 230 V, 50 Hz	2	A9C52225
ITM	Multifunction time switch	1	15270
IC100	Light sensitive switch and photocell	1	15482
iPB	Grey N/O push-button	2	A9E18032
iIL	230 V red indicator lamp	2	A9E18320

Ensure that critical loads operate correctly for personal safety



Customer needs

In an underground car park, ventilation and lighting play a major part in personal safety.

- 1- Any malfunction must immediately alert the supervision staff.
- 2- The supervision staff must be able to diagnose the malfunction and put the equipment back into service very quickly: remotely, where possible, or on site.
- 3- If the automated control device fails, these loads must remain operational without interruption.

Proposed solution

- The Acti 9 Smartlink enables all the terminal switchboards to be directly connected to the site monitoring network.
- The circuit breaker auxiliaries iOF+SD24 indicate any tripping or deliberate opening.
- The contactors and impulse relays receive the ON/OFF switching orders and indicate their state.
- Switches on the front panel of the switchboards allow the maintenance personnel to activate the automated device to control the contactors and impulse relays via push-buttons.
In this case, the position of the inhibitor switch is sent over the Modbus network by the Acti 9 Smartlink interface.



Benefits for customers

- The devices are connected to the Modbus network via the Acti 9 Smartlink communication interfaces and fully prefabricated connectors:
 - cabling is quickly installed, without risk of error (cable inversion, etc.).
 - during maintenance operations, the "fine wire" links inside the switchboard can immediately be identified. No handling tool is required, thanks to the plug-in connectors.
- A single RS485 link connects the various switchboards to the PLCs and to the monitoring system.
- Reliability of data and indications:
 - IEC 60947-5-4 compliant low-level signalling contacts iOF+SD24
 - high level of electromagnetic compatibility of Acti 9 Smartlink modules.
- Integrated into Acti 9 Smartlink, protection device trip and luminary operating time metering makes it possible to plan preventive maintenance.

> Zoom on

Acti 9 Communication System!

Acti 9 Smartlink
iOF+SD24
iACT24



Acti 9 Smartlink



Prefabricated cables



iOF+SD24



iACT24



- iOF+SD24 compatible with all Acti 9 circuit breakers and residual current devices
- Flexible contactor control management
- Conformity with IEC 60 947-5-4, IEC 60 947-5-1 and IEC 61131-2
- Prefabricated 5-point connectors.

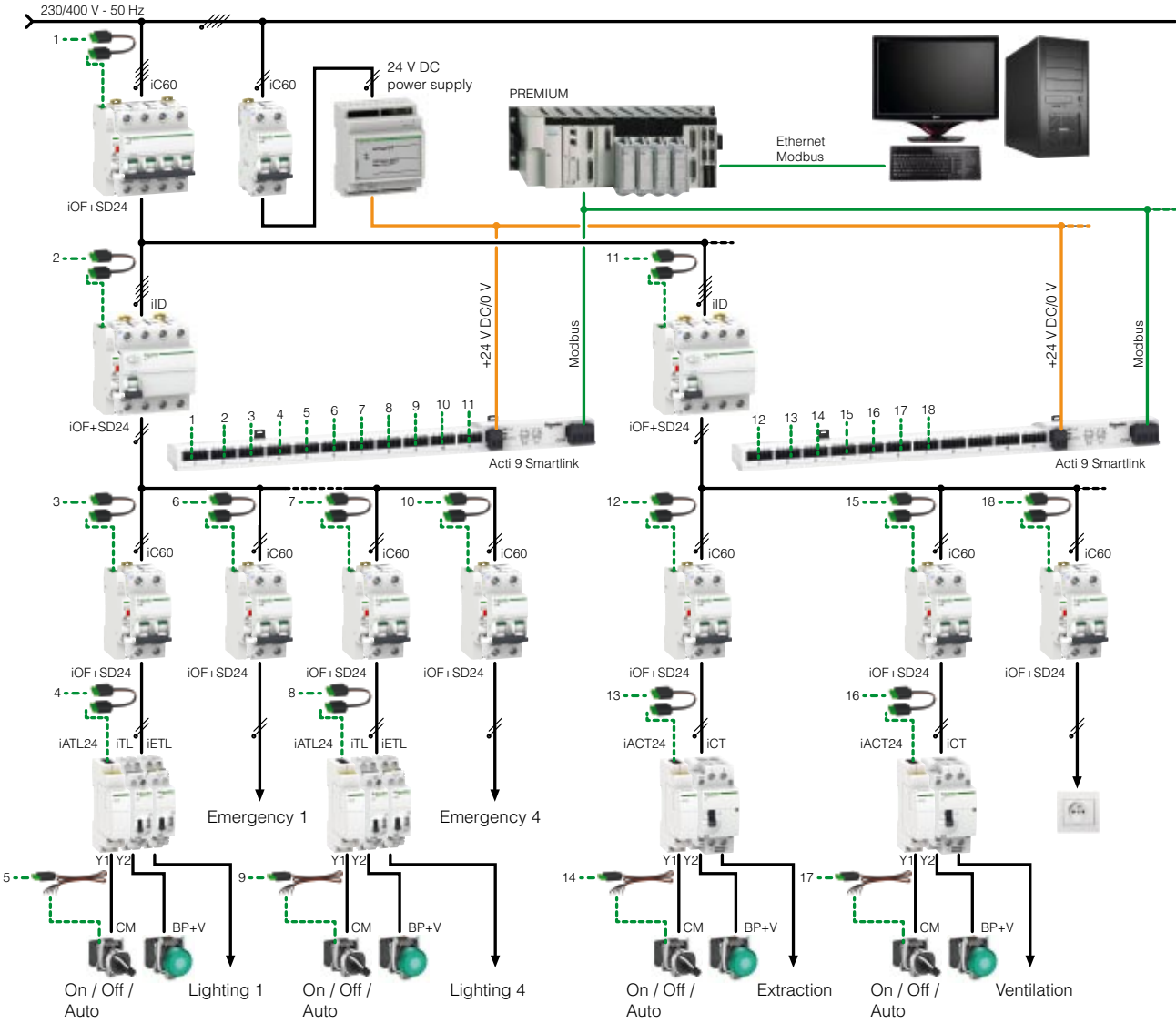
For more details see catalogue.



> Improved device availability

> Less downtime thanks to efficient, reliable remote management.

Solution diagram



> Products used

Product	Description	Unit	Reference
Acti 9 Smartlink	Communication interface		A9XMSB11
iOF+SD24	24 V DC circuit breaker auxiliaries		A9A26897
iACT24	24 V DC contactor auxiliaries		A9C15924
iATL24	24 V DC impulse relay auxiliaries		A9C15424
Prefabricated cables (pack of 6)	Short: 100 mm Average: 160 mm Long: 870 mm Long, semi-prefabricated: 870 mm		A9XCAS06 A9XCAM06 A9XCAL06 A9XCAU06
Ti24 connectors	Pack of 12		A9XC2412
Power supply	24 V DC		ABL8-MEM24006
Premium	PLC		

Dali installation in Canalis



User/customer benefits

In shopping mall, Canalis enables distribution of electricity and data to all building with possibility to have different zones.

Centralized installation: availability of power for replacement and modifications.

Lighting management linked to existing BMS.

Energy saving by adding dimming ballasts enable user to reduce by 35% the consumption of electricity: the ballasts will regulate the power of lighting according either with configuration or with presence sensor.



Functions - Installer advantages

- **Easy of installation** with Plug&Play system, type tested in factory.
- **The KBC connector** allows zoning just by phase selection.
- **Easiness of installation with 1 installation time for 3 types of load:** lighting, heaters and emergency lighting.
- Same concept for power distribution with **KS and KN to feed KBB lines.**
- The connection to BMS is done with same busbar trunking thanks to **T option of KBB.**

> Zoom on

KBB

Rigid busbar trunking!



KBB



Favorite applications

- office
- retail.

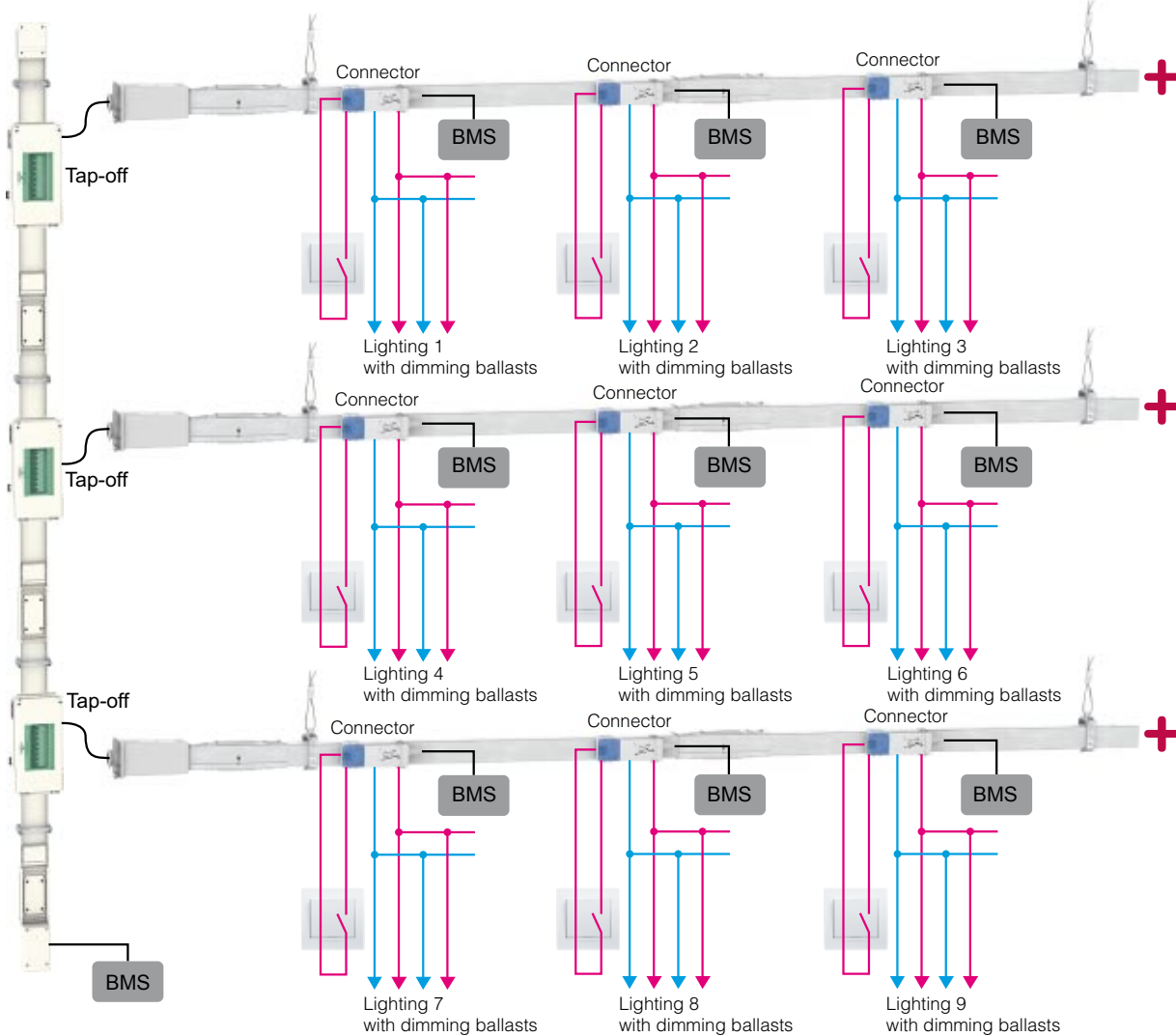


> Savings enabler

> Can reduce up to 1/3 the lighting exploitation with zoning.
And up to 35% with dimming command.

> Time: installation for safety circuit and for ambiance light circuit done in once

Solution diagram



Text for specifications

- The tap off units can be connected and disconnected under energised conditions without risk to the operator.
- Lighting distribution circuit shall allow Dali management.

> Products used

Product	Description	Unit	Reference
Canalis KBB	40 A in T version: straight length, flexible elbow, fixing brackets, hooks and feed units	1	
Canalis KBC	16 A, with protection	1	
Canalis KNA	100 A, straight length	1	
Canalis KNB	Plastic Tap-off for protection devices	1	

Create restaurant mood lighting



Customer's needs

The restaurant manager wishes to control separately the lighting in the bar (ELV halogen lighting) and in the restaurant (230 V halogen spot lighting) to create different atmosphere and adapt consumption.

Recommendation

The solution is to separate the bar and restaurant lighting systems into two separate areas. The push-button that can be accessed from the bar is used to vary the lighting manually. The ELV halogen lights in the bar are powered by a dimmer via electronic transformers. The 230 V halogen spot light in the restaurant is powered by one dimmer using two memorized light levels.



Customer advantages

- With a simple press on external push-buttons the two memorized light levels of the controller can be recalled.
- No change of fuse is needed; the dimmers are equipped with electronic protections.
- Dimming lighting just 25% saves 20% in energy.

Product advantages

- Signalling on the dimmer front face is very clear: the front control push-button lights blue when the dimmer is "On" and flashes when a fault occurs.
- Up to 25 standard control push-buttons can be installed in parallel .

> Zoom on

STD

Light under your control!



STD400RC/RL-DIN



STD1000RL-SAE



Favorite applications

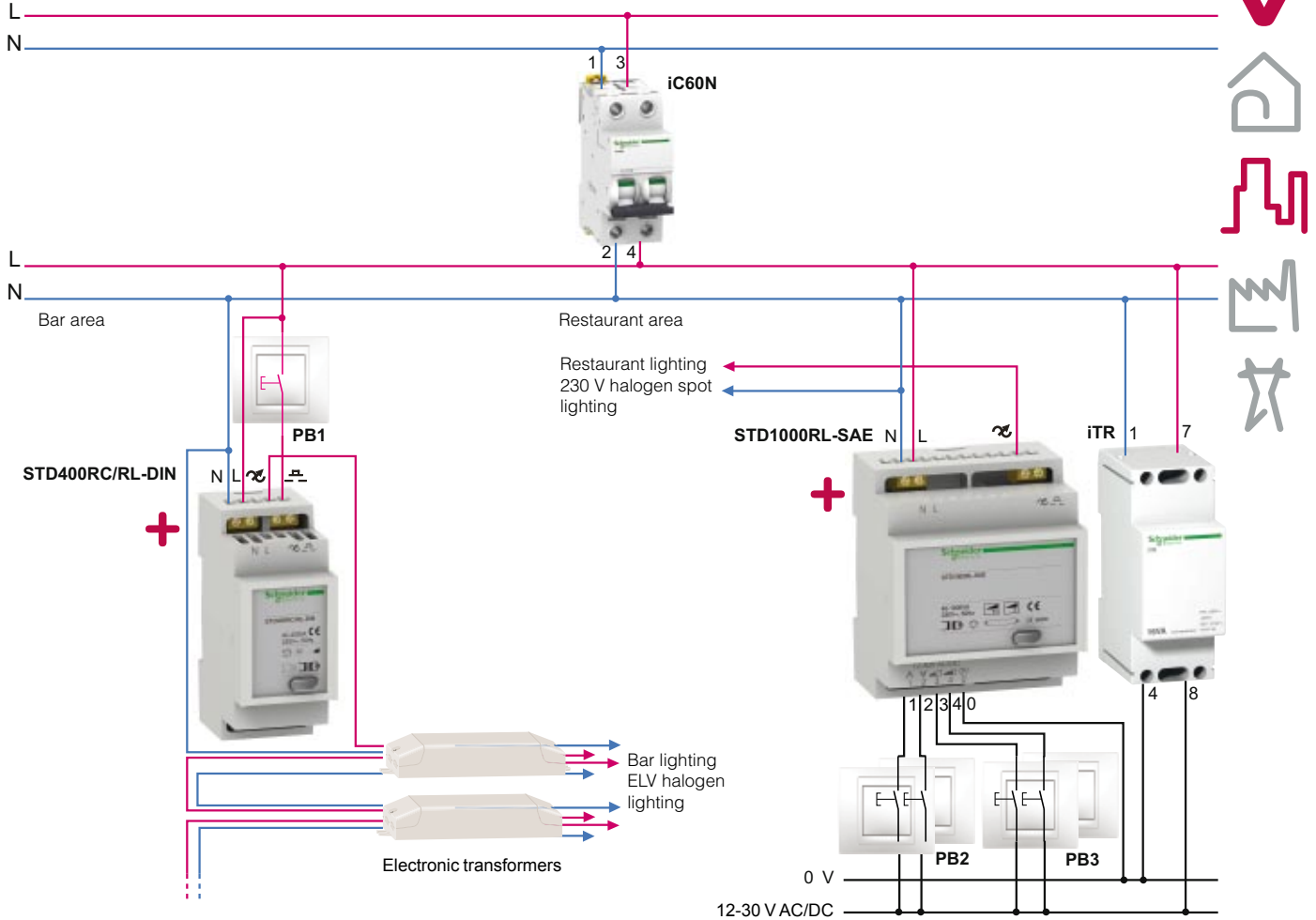
- office + education
- hotel
- industry
- residential
- etc.



> Energy Efficiency benefits

- > The room lighting can be adapted to the customer's requirements.
- > Dimming your light level ensures major energy saving, increased comfort.

Solution diagram



Text for specifications

- STD400RC/RL-DIN dimmer controls the ELV halogen lights in the bar area, via the PB1 push-button.
- STD1000RL-SAE dimmer controls the 230 V halogen spot light in the restaurant area, via PB2 and PB3 push-buttons.
- The PB1 and PB2 push-buttons are used to adjust the brightness: a short press switches the lighting "On" or "Off" and a long press increases or reduces the lighting output.
- The PB3 push-button is used to memorize the light level for two different lighting scenes. **For scene 1:** a short press use saved light level 1 and a long press save the light level 1. **For scene 2:** a short press use saved light level 2 and long press save the light level 2.

> Products used

Product	Description	Unit	Reference
STD400RC/RL-DIN	400 W universal dimmer	1	CCTDD20001
STD1000RL-SAE	1000 W dimmer with digital inputs	1	CCTDD20004
iC60N	MCB 1 pole	1	
iTR	230 V AC/8-12 VAC transformer -4 VA	1	A9A15213
PB1	NO 230 V push-button	1	
PB2, PB3	NO 12 V push-buttons	4	

> Lighting Control

Emergency lighting in public buildings: schools



User/customer benefits

High safety level: the anti-panic and signage lighting units provide a very high level of reliability and safety. They have accessories that are often required in schools: vandal-resistant screws and protection grilles.

The units provide illumination and exit signs that are highly appropriate to the young schoolchildren for whom they are intended.

The maintenance costs of these devices are very low. They will be even lower if LED units are used.



Functions - Installer advantages

● Easy and quick to install

- The emergency lighting units are designed to simplify the work of the installer: many manipulations require no tools. They can be mounted in many different ways. Simplified markings, fast connectors, cable glands, accessories, etc. Which makes them the best on the market.

- The self-test (Activa) or addressable (Dardo Plus) versions are far easier to maintain and have lower maintenance costs.

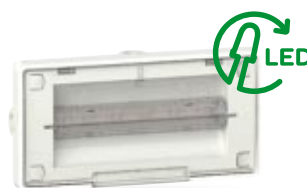
> Zoom on

BAES

Emergency lighting unit!



Evacuation BAES



Anti-panic/ambiance BAES



Favorite applications

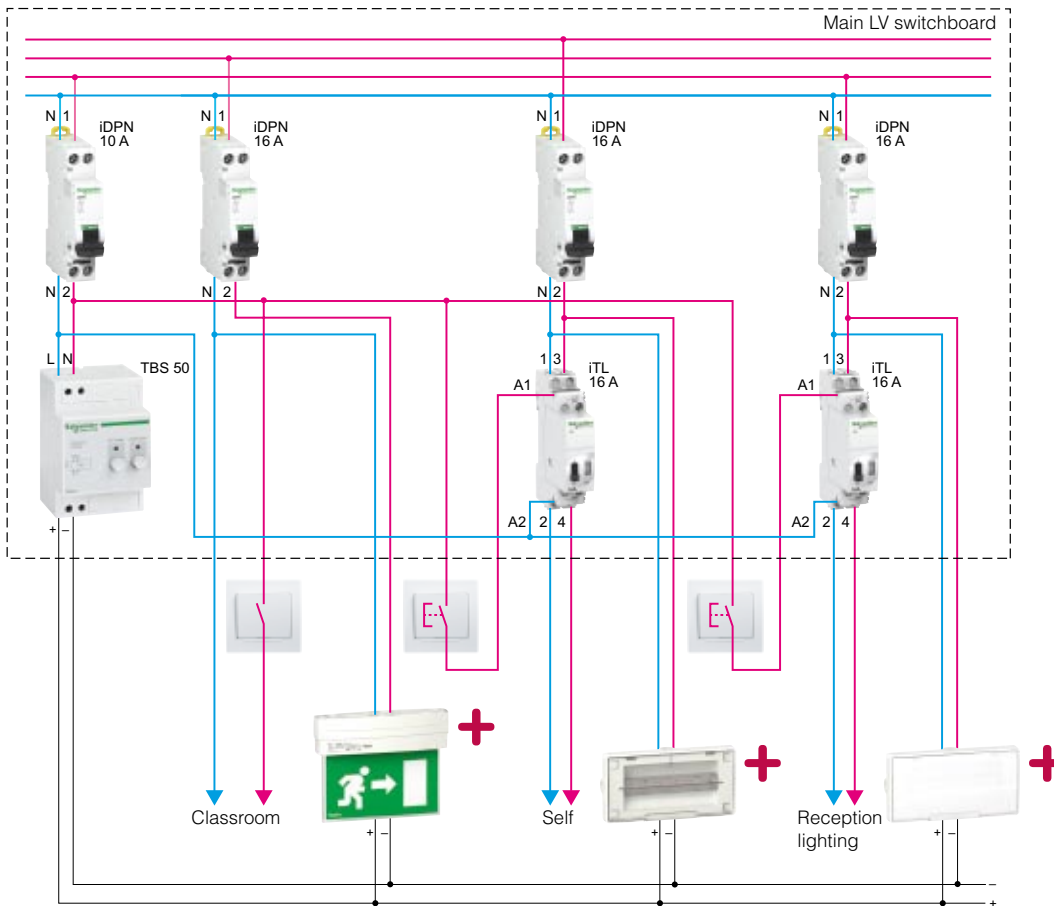
- office + education
- hotel
- industry
- retail
- infrastructure.



> A plus point in terms of purchase price and maintenance:

> The cost of purchasing and maintaining the LED versions is far lower than that of purchasing and maintaining fluorescent lighting units (no fluorescent lamps to change)

Solution diagram



Text for specifications

- The TBS50 remote control is used to deactivate lighting units. It prevents the batteries discharging if the mains supply is deliberately cut off. It is also used to test the batteries and unit light sources.

> Products used

Product	Description	Unit	Reference
iDPN	Circuit breaker 1P+N 16 A	3	
iDPN	Circuit breaker 1P+N 10 A	1	
TBS 50	Remote control (50 BAES max)	1	
iTL	Impulse relay 16 A	1	A9C30812
BAES	Evacuation BAES	1 or +	
BAES	Anti-panic/ambiance BAES	1 or +	
PB	Push-button	2	
I	Ambiance switch	1	

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