

Energy saving solutions



The need to save energy

The UK government has committed itself to reducing greenhouse gas emissions by no less than 80% compared with the 1990 baseline by 2050.

To reach this target the government is increasing the pressure on businesses to act on their energy usage. This pressure comes in many forms two of which are the CRC and the climate change levy.

When this government legislation is combined with the ever rising cost of energy the result is a huge increase in pressure on individuals and businesses alike to achieve a marked reduction in energy consumption and there by primarily reducing their running costs and by default their CO₂ emissions.

During these austere times companies can significantly improve their bottom line by reducing their expenditure on energy; normally the first couple of steps to do this are switching suppliers and ensuring use of the best tariff. Significant long term saving can also be made, through the use of lighting control systems. Achieving these savings does not necessarily mean a huge investment in high tech systems, significant savings can be made by the introduction of simple products that provide the ability to control when energy is used, for example a simple staircase timer or Astrological Time switch.



The role of lighting in energy consumption

Extensive research has been conducted by the Chartered Institute of Building Services Engineers (CIBSE) on the role of lighting in energy consumption and has published in its Energy Efficiency in Lighting report:

“The total number of units of electricity consumed by the lighting installation will be affected by the length of time the lighting is switched on, which depends on the amount of daylight that is present and whether the room is occupied, but also whether there are suitable controls, either manual or automatic, to ensure optimum lighting conditions without lights being left on unnecessarily.”

In the service sector up to 40% of electricity is used for lighting alone so taking effective control of this can make significant savings in energy and reduce costs.

Simple but effective lighting controls can include time switches, dimmers and programmers, and can provide significant benefits in the reduction of energy. Additionally they are easy to use and can be installed either in new or retrofit applications.

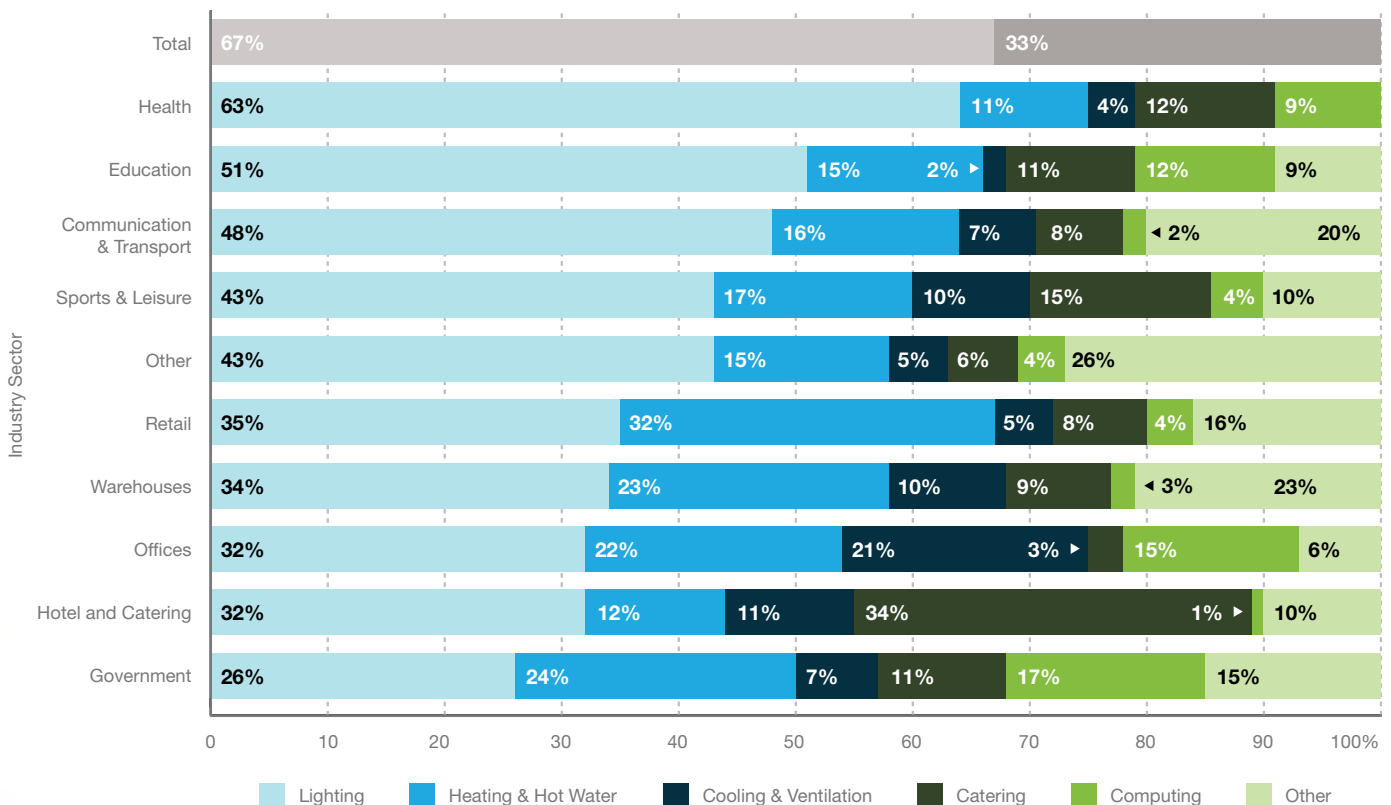
More automated solutions can be provided with occupancy sensors, daylight sensors, pre-programmed light levels and zoned lighting control with specifically designed lighting systems, which can be designed in at the new build stage or installed later as a retro fit.

Trade Associations

As a major player in the Electrical Distribution Industry Hager is an active member in a number of UK Trade Associations



* the data below is provided by CIBSE



Simple energy saving solutions

DIN rail mounted time switches

Time based switches such as time switches and programmers provide selectable on-off periods during the day, week and year or a combination of all to control various electrical loads.

Simple and effective energy savings can be achieved by setting these devices so that the various loads are only switched on when they are actually needed, thereby saving unnecessary usage of energy. The hager range of DIN rail mounting timers include electro-mechanical time switches with an analogue display, and have 1 channel for daily or weekly

programming. These products are ideal for controlling loads such as lighting, heating and shop window displays etc.

Digital timer switches have been developed with more programmable flexibility for daily, weekly and yearly timing functions where a more varied level of control is required in domestic and commercial applications.

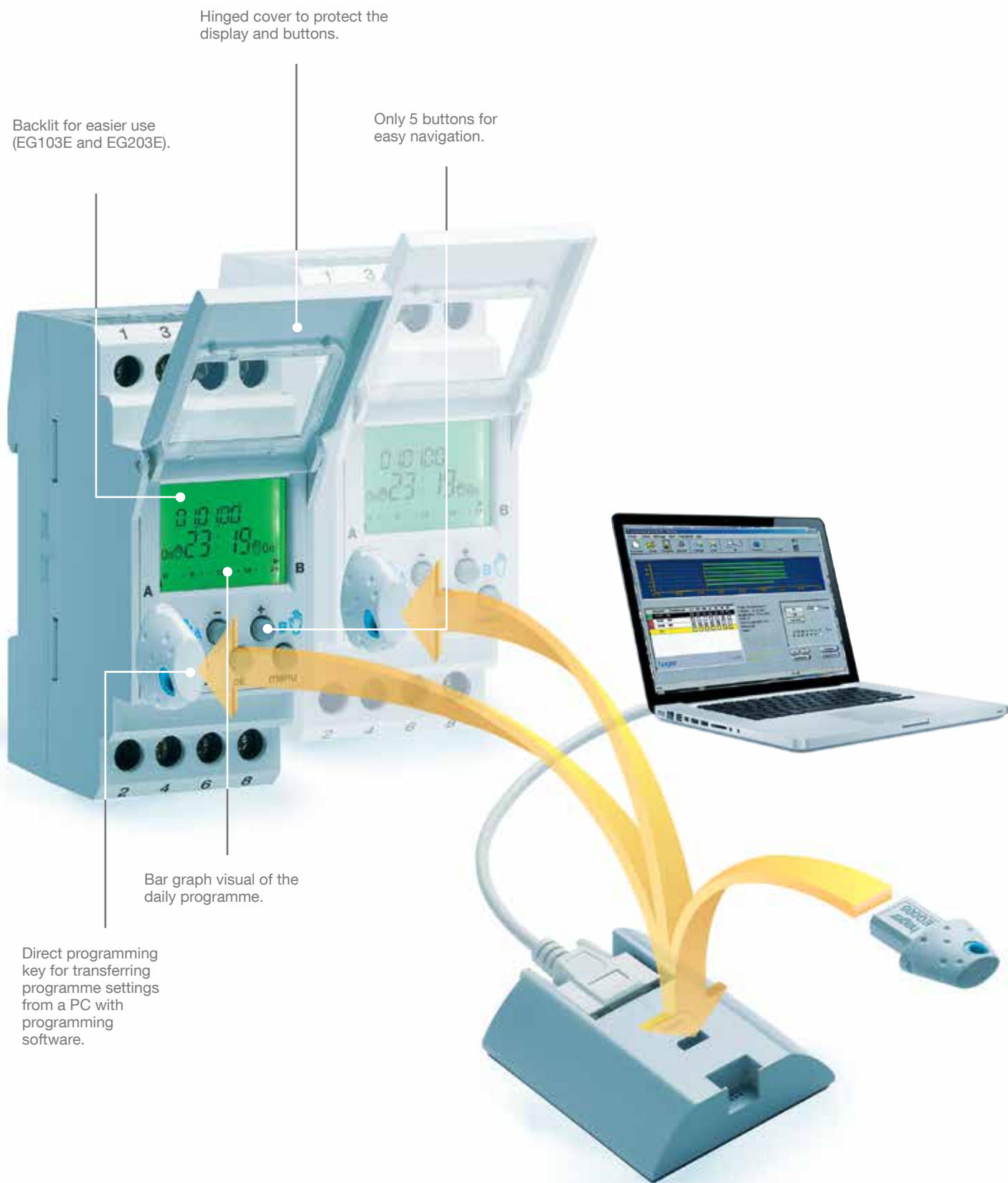
An optional Programme Key is available on some models to provide easy backup to a PC and quick re-installation of the programme.

Electromechanical time switches (DIN rail mounted)

Technical Characteristics	EH010	EH011	EH110	EH111	EH171
Width in modules 17.5mm	1	1	3	3	3
Voltage Supply	230V	230V	230V	230V	230V
Operating Cycle	24 hrs.	24 hrs.	24 hrs.	24 hrs.	7 days
Minimum Switching	15 min	15 min	15 min	15 min	2 hrs.
Supply failure back up	-	200 hrs. After 120hrs use	-	200 hrs. After 120hrs use	200 hrs. After 120hrs use
Manual override	Auto / On	Auto / On	Auto / On / Off	Auto / On / Off	Auto / On / Off

Digital time switches (DIN rail mounted)

Technical Characteristics	EG010	EG071	EG103	EG103E	EG203	EG103V	EG203E	EG493E
Width in modules 17.5mm	1	1	2	2	2	2	2	4
Voltage Supply	230V	230V	230V	230V	230V	12-24V	230V	230V
Operating Cycle	24 hrs.	7 days	7 days	7 days	7 days	7 days	7 days	Annual or 7 days
Program Steps	5 Pre-programmed	20	56	56	56	56	56	300
No. of Channels	1	1	1	1	2	1	2	4



Hinged cover to protect the display and buttons.

Backlit for easier use (EG103E and EG203E).

Only 5 buttons for easy navigation.

Bar graph visual of the daily programme.

Direct programming key for transferring programme settings from a PC with programming software.

1, 2 & 4 channel digital time switches, including the yearly EG493E programmers, can be programmed via the built-in interface or via the PC programmed software (supplied).

A print out of the programme can be produced for the project and kept in your records for future reference via the EG003. Different keys can be used to adapt the installation for

different uses. Programmes for holiday and shutdown periods can also be programmed.

A double click on the programme step is enough to quickly

modify the programme. The programme can then be saved on the PC and or be transferred to the EG005 key via the EG003 interface.

Simple energy saving solutions

Time switches



Astrological time switches are programmed in weekly cycles in accordance with their geographical location. Functions include automatic change of winter and summer time making this type of switch ideal for energy savings for commercial and residential applications especially the programming for holiday periods and bank holidays.

Staircase timers provide control of lighting circuits with automatic switch off after a pre-set time. This makes them ideal for energy saving in corridor or staircase type applications, with pre-warning of switch off and double delay functions for the occupant's safety.

Astrological Time switches		Staircase Timers	
Technical Characteristics	EE181	EMN001	EMN005
Width in modules 17.5mm	2	1	2
Voltage Supply	230V	230V	230V
Operating Cycle	7 days		
Time Delay	-	30 secs to 10 mins (1 hour if button pressed)	30 secs to 10 mins (1 hour if button pressed)
No. of Channels	2	-	-



Yearly Time switches

Technical Characteristics	EG493E
Width in modules 17.5mm	4
Voltage Supply	230V
Operating Cycle	Weekly / Monthly / Yearly
Program Steps	300
No. of Channels	4

A typical application example for energy saving using EG493E yearly time switches

To reduce energy and hence running costs, a four channel yearly time switch could be installed in a small office or business property.

One channel could be used to control the lighting during the evenings to reduce unnecessary usage of energy. Another

channel could be used to ensure that storage heating is not used over the weekends and bank holidays when the building is unoccupied. A third channel could be used to control the external advertising or building signage during unnecessary periods e.g. between 10pm to 7am. The final channel on the yearly timeswitch could be used to control the immersion heating function, again, to ensure that the water in the building will not

be turned on during weekends and / or bank holidays.

An example of potential savings from the first channel example above are shown below:

Lighting	Configuration	"Light On" Time	Consumption
Max power density 10W/m ²	Typical large office space 300m ²	11 hrs / 260 days + 1 weekend + 1 night a month	11244 kWh / year
Max power density 10W/m ²	Typical large office space 300m ²	11 hrs / 260 days Saving	8580 kWh / year
			2664 kWh / year
			25% Energy Saving

Simple energy saving solutions

Motion, Presence and Absence Detection



Using remote programmer

	Flush Mount	Surface Mount	Presence Detection	Motion Detection	Variable Timeout	Photocell	Lux Setting	
EEK510B	✓		✓	✓	✓	✓	✓	
EEK520B		✓	✓	✓	✓	✓	✓	
OSFM	✓		✓	✓	✓	✓	✓	



Motion detectors are designed to detect movements such as a person walking through a building, stairways and corridors for example. Presence detectors are designed for detecting smaller movements such as people working at a desk.

Motion detectors are particularly effective when used in low use areas such as bathrooms, toilets and storerooms when the lighting will only be activated when the area is occupied, thereby saving energy.

Presence detectors are ideal for controlling lighting in office spaces as they not only detect large movements but also smaller activities such as people

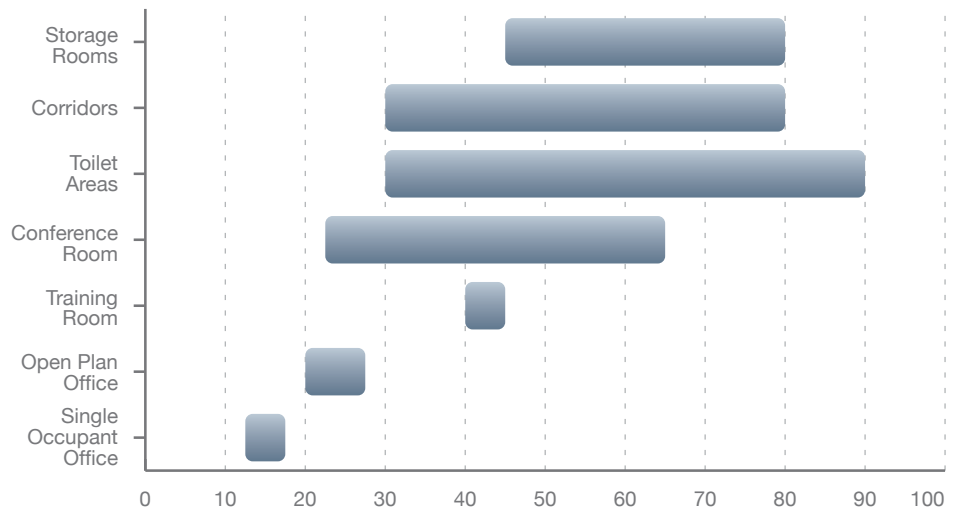
working, so that they are not left in darkness. When the area is left unoccupied the lighting will be switched off thereby minimising the energy usage of the area.

Some motion and presence detectors include a photocell which senses natural daylight and can be used to control the lighting during periods of high ambient light, thus avoiding the use of unnecessary energy.

A typical application example for energy savings using motion and presence detectors

In a large commercial building or office complex motion detectors could be installed in the toilet and storage areas, and presence detectors fitted in the office areas. With the additional benefit occupancy levels in every area. Some typical examples of savings per area can be seen in the following diagram:

Energy Saving Potential through use of Occupancy Sensors



Absence Detection	Remote Control	Remote Programming	Comments
✓	✓	✓	Klik applications and absence detection
✓	✓	✓	
	✓	✓	Standard presence detection

Simple energy saving solutions

Lighting dimmers and twilight switches

The Hager dimmers can be used with any dimmable residential load: as the detection principles allow the control of lamps including dimmable CFL and LED.

The phase control dimming method used provides opportunities for energy saving under dimmed conditions, by reducing the total power consumed.

The "lamp learning" function further reduces the risk of a non detectable lamp and is an easy way for the end customer to adapt his product to the

load without having to call the installer. For the installer, it simplifies the ability to select a dimming function which is not dependant on the load technology the end-use will connect. The installer will also have the opportunity to adapt the product to suit via a dimming mode override feature.

The EVN range of products supports the "green" technology initiative, as they can control "energy savings" loads. They also provide "energy-saving" dimming through use of a low standby consumption of only 0.2 W.

A typical energy saving application using DIN-Rail mounted dimmers.

A large restaurant having two walls, made almost entirely from windows, has dimmable lighting installed to allow each dining area to be individually adjusted, by external pushbuttons, to the required light ambience.

During daylight occupancy the areas nearest the windows are adjusted to use the benefit of natural daylight and hence save energy during this period.

	1 Module Basic EVN011	1 Module Enhanced EVN012	2 Modules Basic EVN002	2 Modules Enhanced EVN004
Power Supply	230V 50/60Hz			
Consumption	200mW			
Incandescent	300W		500W	
Halogen 230V (& energy saver)	300W		500W	
Halogen LV Inductive	300VA		500VA	
Capacitive Electronic Transformers	300W		500W	
Dual Mode Transformers	300W		500W	
Dimmable CFL	60W		100W	
Non Dimmable CFL (ON/OFF)	Not compatible			
Direct Dimmable LED	60W		100W	
Remote command (ON/OFF/DIM)	N/L PB	N/L (luminous PB)	L PB	24-230V AC/DC (230VAC Luminous PB)
Distance PB/Dimmer	50m			
Remote command (scene input)	No			24-230V AC/DC (230VAC Luminous PB)
Size	1 Module		2 Modules	
Local Command	No		Yes	
Manual config. of the dimming mode	No	Yes	No	Yes
Settable Dim Speed	No			Yes
Protection against Shortcut	Electronic			
Protection against Overheating	Electronic			
Wiring	1.5 to 6mm ²			
Temperature	-10°C to +45°C			



Lighting Level Detection

Light detection products operate by sensing ambient light and switching on or off against a preset lux level or time. Generally the lighting will be unnecessary during certain periods of the day and therefore energy will be saved when controlled by these devices.

The following table shows the range of products available, which can be used for effective lighting control in public areas such as shopping malls, street lighting and illuminated display areas.

	Light Sensitive Switch	Light Sensitive Programmer	Astrological Time Clock
Technical Characteristics	EE100	EE171	EE181
Width in modules 17.5mm	3	3	2
Operating Cycles	-	7 days	7days
Program Steps	-	1 min	1 min
Voltage Supply	230V	230V	230V
No. of Channels	-	1	2



Simple energy saving solutions - Combining products



The previous pages of this document have shown typical applications of stand-alone products to provide energy saving solutions, however by combining some of these products even greater reductions in energy consumption can be achieved.

As most applications are unique in their use of energy and have different lighting requirements, the following examples may be of help in determining what could be possible to further enhance the reductions in energy usage and cost. The products are easy to install, can be fitted in standard modular enclosures based on the 17.5mm design and can be quickly mounted on DIN rail. They are easy to set and programme and therefore can be changed for future requirements. Overall the installation can contribute to the improvements in the energy performance of the building.

**Example 1:
Scene control**

**Products used:
Time Switch EG203E & Dimmer
EV102**

By combining the operations of a dimmer and time switch significant energy savings can be realised.

The 2 channel weekly time switch can be used to control the lighting more effectively during the evenings and weekends when the building is unoccupied. The heating can be similarly switched off during these same unoccupied periods. Additionally the time switch can also be programmed with dimmers so that the lighting can be dimmed at certain times during the day. For example the first setting could be in the morning when the lighting could be dimmed as the natural daylight could be sufficient to provide enough

ambient light. The dimmer could be operated later in the afternoon as daylight reduces and eventually reaching full lighting levels during the evening. The overall effect will be to only use energy when it is actually needed.

Benefits:

- The time switch ensures that the lighting and heating is only used when they are needed and do not rely on people to remember to switch them off.
- Energy consumption is further reduced with the dimmer control so that the lighting matches the occupant's requirements against available usable daylight levels.

**Example 2:
External building signage
control**

**Products used:
Time switch EG103E & Light
Sensitive Programmer EE171**

Combining these two products provides an effective use of exterior building signage based on daylight and night time requirements.

The twilight switch is programmed to ensure that the exterior signage only activates against a preset low level of daylight, ie switches on at dusk and switches off at dawn.

With the addition of a time switch further controls can be integrated to control signage use over weekends, when it may not be needed.

Benefits:

- The twilight switch minimises the energy usage during a 24 hour day
- The "holiday" mode of the time switch EG103E provides additional energy savings by switching off signage completely during closed periods.



Simple energy monitoring solutions

Metering

Kilowatt hours meters measure the active energy used in an electric installation. The range includes meters with pulsed output for remote indication or linking into an energy management system. Kwh meters can be used for local metering of the installation or monitoring of power consumption of individual equipment.

Part References	Single phase direct measure				
	EC050	EC051	EC150	EC152	EC154M
Accuracy acc IEC1036	Class 1 (1%) 0.02 to 32A~		1% Class B according to EN 50470-3	1% Class B according to EN 50470-3	1% Class B according to EN 50470-3
I max	32A ~ direct		63A ~ direct	63A ~ direct	63A ~ direct
Supply	Single phase 230V ~ 50Hz		Single phase 230V~ ± 15% 50/60Hz	Single phase 230V~ ± 15% 50/60Hz	Single phase 230V~ ± 15% 50/60Hz
Counter	Total without reset		Total + partial with reset	Total + partial with reset	Total + partial with reset
Width 17.5mm	1 modules		3 modules	3 modules	3 modules
Approvals	MID approved		MID approved	MID approved	MID approved

Part References	Three phase direct measure
	EC350
Accuracy acc IEC1036	1% Class B according to EN 50470-3
I max	63A ~ direct
Supply	Three phase 230V~ ± 15% 50/60Hz 400V~ ± 15% 50/60Hz
Counter	Total + partial with reset
Width 17.5mm	4 modules



EC051 - Single Phase Kwh Meter



EC320 - Three Phase Kwh Meter

Energy saving

klik.system project, increasing your control

klik.system is designed to give you the control you require for lighting in your building, this ensures that the minimum amount of energy is used, also allowing people to use the building in comfort and safety.

klik.system allows for a variety of control philosophies:

Basic manual system

For manual switching using pluggable switch drops for fast installation and reconfiguration if required.

Standard automatic system

This employs state of the art plug-in presence detectors complete with photocell technology. Automatically saving energy when areas are not occupied by switching lighting off, and not switching lighting on when sufficient natural daylight is available. Absence detection enables even more control and therefore energy savings.

Dimming connection system

This system uses our 5 and 6 core pre-wired plugs & sockets, enabling data from digital dimming detectors to control lighting. Using this system the lighting can be configured to the exact level required by the occupants of an area. The system takes into account the amount of available natural light and uses the minimum amount of power to raise the light level to the required lux.

Complete building system

Using klik.system alongside our tebis.TX we can implement a whole building system of control and wiring. With the use of KNX, a European building control standard, klik.system and tebis.TX can integrate lighting control with all other building services.

klik.systems' unique plug and play connector allows re-configuration of the building lighting distribution and control as the needs and use of the building change.

Where large offices are required to be sub-divided into smaller offices or vice versa, the klik.system can be simply re-configured with the addition of plug-in sensors, switches or control circuits linked as required.

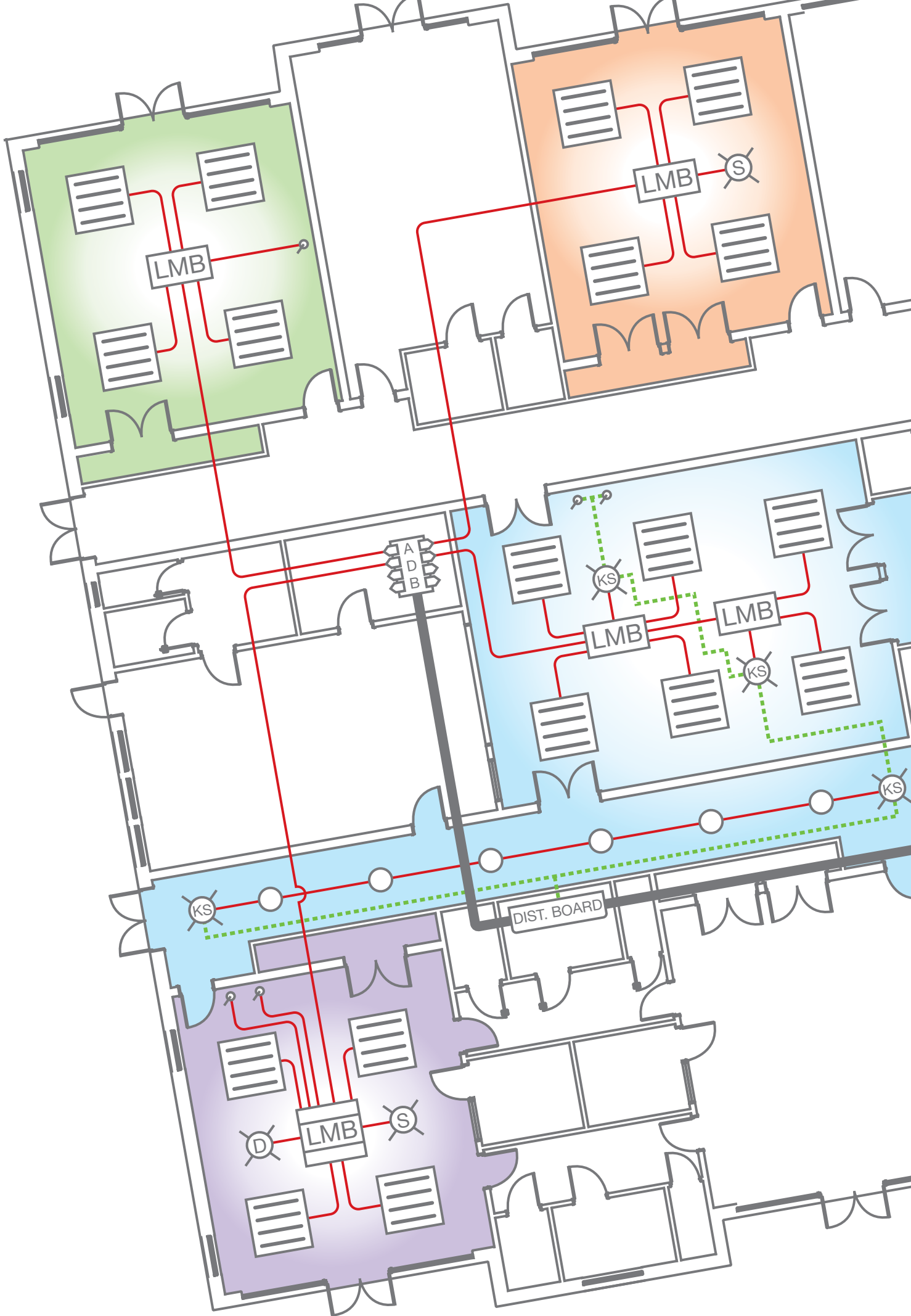
Upgrading of luminaires from on/off HF to Digital can also be catered for by a simple change to the pre-wired lead and sensor without the need to make changes to the Lighting Marshalling Boxes. To reduce disruption during maintenance periods the pre-wired leads can be disconnected on load.

klik.system also allows flexible configuration at commissioning where areas can be linked together. This is important in larger open plan areas where specification requires notional or actual corridors to be lit if any part of the area is occupied.

Building-wide common zones such as lift lobbies, stairways or break out areas can also be controlled so that the lighting is on whenever the building is occupied.

klik.system offers a comprehensive range of energy saving lighting control and distribution products to meet all requirements for a lower cost of ownership through increased energy efficiency and reduced maintenance requirements.

This system encompasses innovative cost-effective solutions, providing a fast payback for every area of the building, from the restrooms to large open plan offices.



Case Study

6 & 7 New Bridge Street



Burgin Contracting has achieved a 70 percent time saving on an electrical installation for prestigious central London offices by using klik.system.

The installation at 6-7 New Bridge Street in Central London has used klik.system from the distribution boards right through to final luminaires and lighting control. The prefabricated wiring system also provides power to fan coil units throughout the seven-storey building.

Andy Collinge, electrical operations manager for Burgin stated “The system has saved us significant time in the first fix because there are fewer hard wired connections to make. This labour saving translates into a cost saving on the job making us more competitive in the tender.

“In addition there will be significant savings when it comes to inspection and testing since the system has been designed and manufactured in a factory controlled environment, so it has been pretested. This in turn means that there should be less fault finding before we hand over the completed job and then reduced snagging afterwards.”

Burgin Contracting used 11 of our Invicta 3 TP&N distribution boards; three of these boards are for the landlord’s supplies and 8 for tenants. The dual distribution boards are all MID metered for both lighting and power to meet Part L2 and with MID approval can be used for billing tenants if the landlord chooses to do so.

The multi core home run cables from these boards supply area distribution boards (ADB) in the ceiling void. These in turn are connected into lighting marshalling boxes (LMB) via link leads. The luminaires then plug into the marshalling boxes as do the occupancy sensors that provide the lighting control.

The occupancy sensors switch the lighting on in response to presence and then switch the luminaires off after a time out period where there is no further presence detected. The occupancy sensors also contain a photocell so that the luminaires switch off if the available natural light is above a set level.

To ensure that the prefabricated wiring system complied with all of the relevant standards and regulations, we designed the system using our bespoke software package. This produced a fully calculated design, which included drawings, electrical calculations, test information and delivery schedules.

“All of the products were delivered complete with drawings that detail exactly what leads should be used where. All of the cables are labelled, so there was no problem in identifying the cables which are used for individual connections, so human error was minimised.” stated Andy Collinge.

As a manufacturer who supplies distribution boards, a lighting installation and control system and wiring accessories, we can provide all of the elements needed for a prefabricated wiring system. This minimises the problems that a contractor might have on site in liaising with several manufacturers, whilst maintaining all of the time saving benefits they would expect from a prefabricated wiring system.

In addition to this, our bespoke klik.system software does all of the necessary calculations, such as earth loop fault impedance, cable sizing and voltage drop, which are required for compliance with BS 7671. This validates the design and protects the contractor in design and build operations.

Photovoltaic solutions

Photovoltaic panels are most often retrofitted into existing buildings, usually mounted on top of the existing roof structure or on the existing walls. Alternatively, panels can be located separately from the building but connected by cable to supply power for the building.

Building-integrated photovoltaic's (BIPV) are increasingly incorporated into new domestic and industrial buildings as a principal or ancillary source of electrical power.

At Hager we have brought together a portfolio of domestic and commercial PV devices from our existing product ranges. Not only are we able to provide a range of 'loose kit' for both the AC and DC side of the installation, through our Engineered Solution business we can also offer a fully tailored solutions, design and build service for PV and wind power control enclosures to detailed specifications, all manufactured in a ISO 9001:2000 factory.

For further information download the photovoltaic catalogue from www.hager.co.uk.

Hager Enclosures

A range that meets your needs and provides the protection you require when switching to photovoltaics.

The Hager Consumer Unit has been designed to fit into today's home environment. Whether it is used to house electrical distribution, smart control devices or PV devices including metering.

Consumer Units



Garage Units



Vector II



Hager Devices

Isolation Devices



Metering



Surge Protection



Case Study

Hager Protects Solar Powered Goat Farm



Hager has supplied the circuit protection for a large solar photovoltaic (PV) system at a goat farm near Shepton Mallet.

The circuit protection consists of distribution equipment that includes a panel board, meters, RCDs and IP65 TP&N boards.

The photovoltaic installation generates a potential 100kW of electricity for the goat farm. Electricity is needed to light the goat shed, as the goats are kept undercover, as well as in the milking parlour, where heated water is required for washing and an ice bank for cooling the milk. Excess electricity is then sold back to the grid.

Mike James, Electrical and Engineering Director at Brilliant Harvest Installations Ltd comments, "I like to use Hager products in PV installations because the TP&N boards & panelboards have plenty of room; making them easy to wire. Aesthetically, the products also work very well. Good support from Hager and our local supplier, Edmundsons Electrical in Yeovil."



Energy saving solutions

tebis.TX

Tebis TX technology can achieve true energy savings through building automation. Maximum energy savings are achieved where the system controls digital lighting and heating.

Configuring the system for both automatic switching of lighting / heating plus predetermined timed settings is simplicity itself. In addition, by using daylight linking PIR devices to dim lighting in response to natural lighting availability, energy savings can be

maximised. This alone has been proven to cut lighting energy consumption by up to 70%*.

Source: Building Energy Research Group, Department of Building and Construction, City University of Hong Kong



Scene Setting & Scheduling

Set a scene with one button to close blinds and dim lighting for a presentation for example, or schedule blinds to close and heating to lower at the end of each day.

Lighting Control

Switch all lights on or off or dim from a main switch point manually or automatically dependent on time of day, whether a space is occupied or even on the level of natural light available.

Shutter / Blind Control

Open or shut blinds and shutters manually, automatically or using remote control.

Heating Control

Constant in-room temperature display. Controlled manually, automatically or using remote control.

In Room LCD Display

Shows temperature, time of day, state of circuits and can be used as four switch inputs eg set for after hours cleaning or offices / store closed etc.

Remote Control Interface

Hand held remote gives total control of lighting, heating and shutters or blinds wherever you are in the room.

As a building design changes to match future need control systems will need to adapt. Tebis TX is ultimately flexible so more or different control can easily be added. Coupled with this, the energy savings available and current regulation pushing towards a greener future make it simple to see the benefits of Tebis TX.

Case Study

Simple local “Green” heating control from renewable sources using Tebis



Electrical contractor James Duggie has used Hager's Tebis system to simplify the installation and control of a 'green' heating system that uses two renewable sources of energy for a home in Lossiemouth. The bus-based system also provides the home with sophisticated lighting control.

Water is heated for the underfloor system using a combination of solar panels and a ground source heat compressor that extracts energy from the ground via two 100 metre bore holes. A Tebis module switches the compressor on and off in response to the temperature of the water in the holding tank.

Each room in the house has an individual Tebis room controller, which combines a thermostat with switching. These thermostats connect to a Horstmann four channel heating controller, which controls the heating, towel rails, hot water and the temperature of the water in the central pump.

Depending on demand, Tebis switches the valves for the underfloor heating to different rooms.

Says James Duggie of James M Duggie & Sons: "Tebis has made an extremely sophisticated heating system easy to install and programme. Using just a single bus line and connecting the components together has made it simple to combine and manage two renewable sources of energy."

"Using a conventional hard wired system would require complex wiring diagrams and detailed planning with information needed from several sources. It would then need multicore cabling and any alterations would have involved extra multicore cabling."

"We have avoided all of these complications by using a bus system. We only need to install one bus line or cable and all of the devices tap into this. Also there is no need to worry about control scenarios until the end of the process and any change is easy to achieve with no disruption."

"A bus system also means that we can also programme in extra functionality. It gives us truly local heating control for each room. So for example we can time heating to come on at different times in

rooms. The child's bedroom switches on at 8.00pm while the master bedroom switches on later at 10.00 P.M."

"Bus system technology can significantly contribute to efficient energy consumption, not just by making it simple to use renewable sources, but also in the management of that energy usage."

The Tebis system also controls other services in the home. It switches and dims lighting and will set different lighting scenes, again using the room controller. A master switch by the front door can switch off all the lights in the home and if desired all the heating down to frost protection.

The smoke alarm is also connected to Tebis, so that if there is a fire, lights are switched on to illuminate an escape route. Says Duggie: "Tebis can be used to provide almost any functionality in the home without the disruption that hard wiring would cause. It is also easy to change this functionality in the future. We find that the best approach is to install the Tebis system, let the homeowners live in the house for a few months and then come back to programme the system to meet their needs."

Case Study

Flexible Control For New University Extension



McGills Electrical has used Hager's Tebis bus based system to supply a future proofed and flexible central lighting control solution for the University of Dundee's new 6,500m² library extension.

Using Tebis, McGills installed a single 30V bus line throughout the extension. A conventional hardwired solution would have used multiple cables. All the lighting circuits and switches controlling them then simply tap onto the bus line via connectors.

Says Graham Sutherland, project manager for McGills: "Providing a solution for switching several lighting circuits supplied from different distribution boards can be a major exercise."

"A conventional hardwired solution would have involved multi-core cabling throughout the building, all being terminated into one central grid switching unit. Apart from the logistics of terminating several cables into the correct switch there is no flexibility to change specifications during the build. Any change in switching control would involve extra cabling."

Using Tebis each input and output device is assigned an address and then programmed so certain lighting circuits only respond to signals from particular switches. Individual circuits can respond to more than one switch, so an infinite number of switching variations are possible using the system.

The bus system also makes it easy to check the emergency lighting. Someone simply switches off all the lighting circuits to simulate a mains failure for a walk test.

Says Sutherland: "We probably saved about 20% labour time using Tebis compared to conventional hard wiring. More importantly however the system gives us the flexibility to change or add to the specification without having to run new cabling throughout the building."

The new extension provides students with IT and WiFi facilities, integrates other libraries into one central building and provides additional room for research.