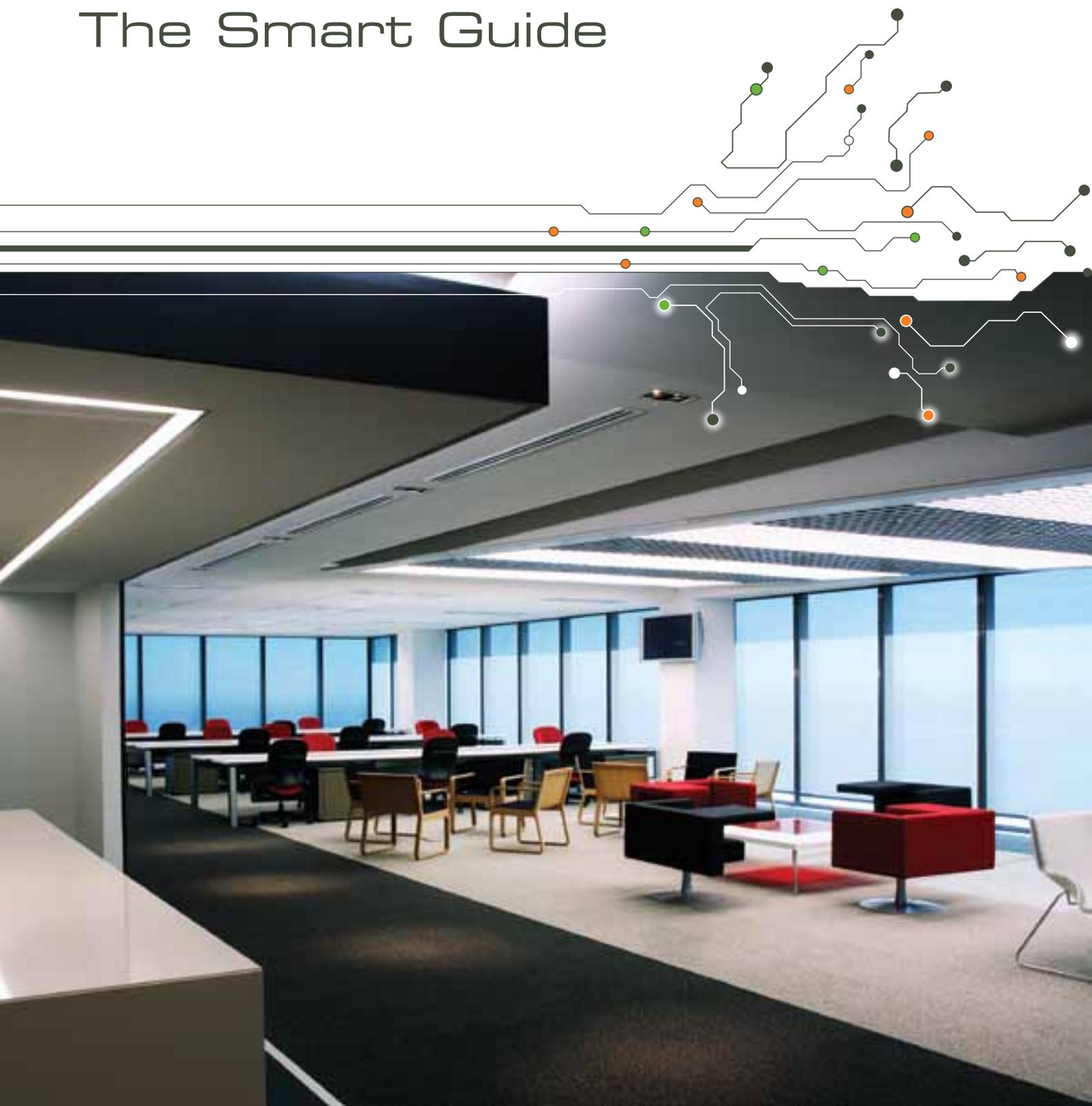


mySmartCTI™



# The Smart Guide





Design » Deliver »  
Optimise » Guarantee



## The Smart Guide

### Contents:

|                                   |    |
|-----------------------------------|----|
| What is DALI?                     | 4  |
| Advantages of DALI                | 4  |
| DALI Wiring                       | 5  |
| Open Protocol                     | 6  |
| Differences between DALI and BMS  | 7  |
| DALI System Characteristics       | 7  |
| Intelligent DALI Lighting Control | 8  |
| Servicing & Maintenance           | 10 |
| About mySmartCTI                  | 11 |

Lighting accounts for up to 40% of the total energy used within the average commercial building. Much of this energy is wasted either through over lighting an area or by lighting an area when it is not required.

The use of presence detectors, daylight harvesting sensors and automated scheduling of lighting control means that the optimum level of light is available for the tasks being performed. Users are more comfortable, have more control over their lighting requirements and are more productive while the building uses less energy.

This guide aims to offer an insight into DALI including where and how best to implement a smart lighting control solution in commercial buildings. Based on our experience, gained over many hundreds of commercial projects, we hope that you find this guide interesting and informative.

**Peter Garrett**

*Managing Director, mySmartCTI*

## What is DALI?

DALI STANDS FOR DIGITAL ADDRESSABLE LIGHTING INTERFACE AND SINCE ITS DEVELOPMENT IN THE 1990'S HAS BECOME ONE OF THE DOMINANT STANDARDS FOR CONTROL OF LIGHTING BALLASTS. IT ALLOWS EACH LIGHT'S BALLAST TO BE INDIVIDUALLY ADDRESSED, CONTROLLED AND QUERIED OVER A 2-CORE LIGHTING CONTROL CIRCUIT.

The driving forces behind the development of DALI were the European lighting ballast manufacturers Helvar, Hüco, Philips, Osram, Tridonic-Atco, Trilux and Vossloh-Schwabe. Their goal was to design a ballast standard that allowed any manufacturers ballast to be interconnected in an installation.

Up to 64 DALI devices may be placed on a DALI network. Within each DALI network ballasts may be assigned in up to 16 groups and scenes. Multiple DALI networks may be interconnected within a building across open protocols such as KNX or by proprietary systems. Most important it should be noted that DALI is a protocol designed for the digital control of lighting ballasts. It is not designed as a full lighting control solution or a Building Management System.

## Advantages of DALI

The largest advantage of DALI is that every light throughout a project can be individually addressed, controlled and queried. This gives an extremely high level of control and management for the building. Additionally, should the use of the building change, or it needs to be reconfigured it is possible to change the layout of the lighting ballasts relative to their control points without needing to rewire when compared to an analogue installation. Whilst the cost of a DALI ballast may be more when compared to an analogue equivalent the reduced wiring and installation costs and associated flexibility should offset any increased hardware costs.

Where DALI is most advantageous is in a building that is likely to have a relatively high churn rate and hence requires a corresponding high level of flexibility of configuration. To support this flexibility there also needs to be a robust Facilities Management Team to deliver these benefits and interpret the reporting that a state-of-the-art DALI system is capable of producing.

# DALI Wiring

As DALI is not defined as a Safety Extra Low Voltage system this means that normal wiring standards are applicable. DALI control cables may be run next to the normal mains wiring to a maximum length of 300m using 1.5mm<sup>2</sup> cables.

DALI wiring consists of 2 control wires with a current limited power supply supplying a maximum current of 250ma.

Diagram 1: DALI Wiring

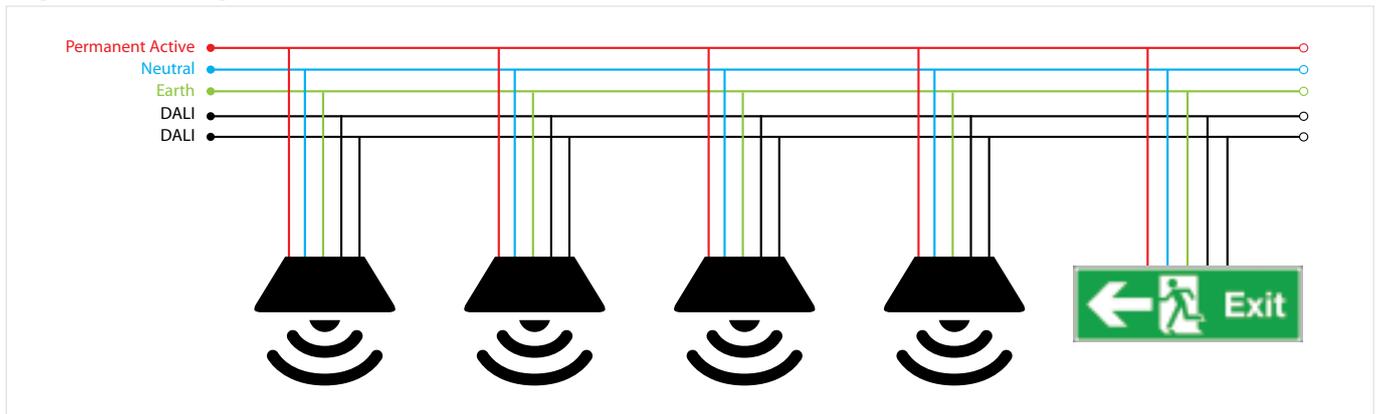
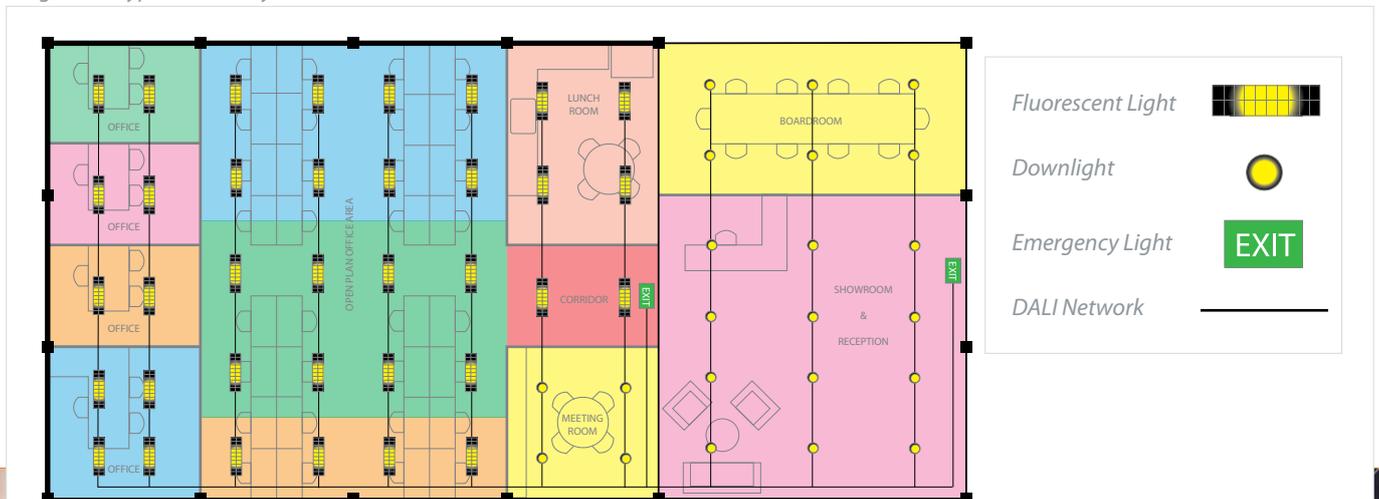
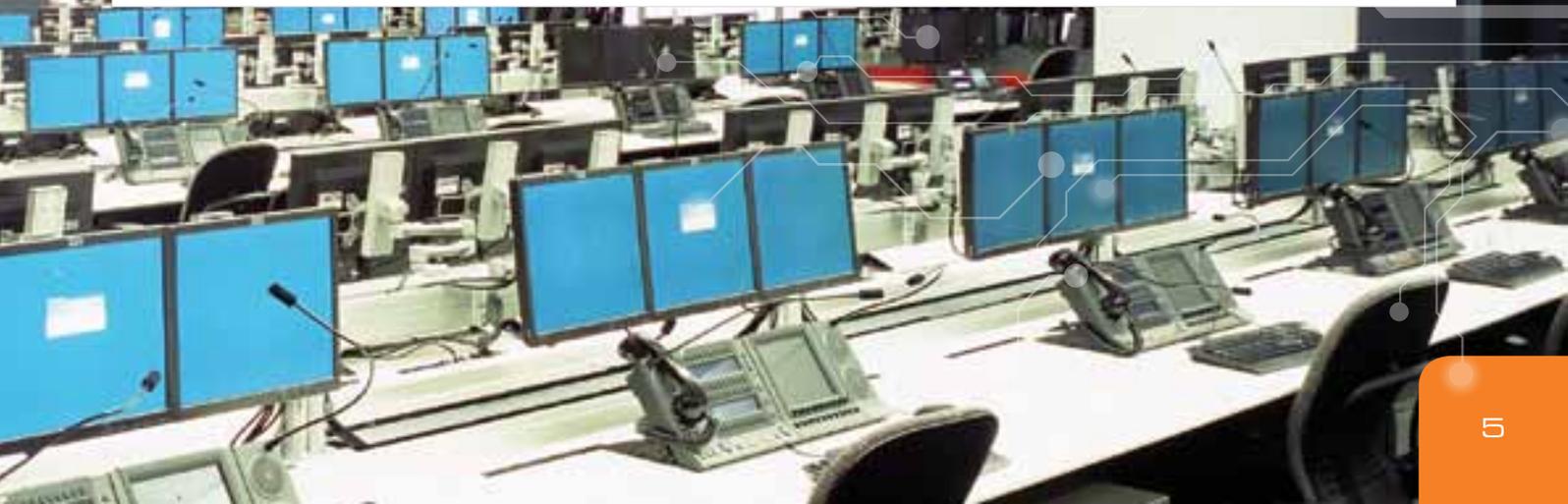


Diagram 2: Typical DALI Layout



Up to 64 DALI Lamps per network, 16 groups within each network and 16 scenes per group



# Open Protocol

DALI is widely acknowledged as being an open protocol under the European Standard IEC 929 / EN60629 Annex E (Control Interface for Controllable Ballasts). As an open protocol it has been developed specifically for lighting ballast control at a room level, floor level and at a whole building level when interfacing to a Lighting Control System.

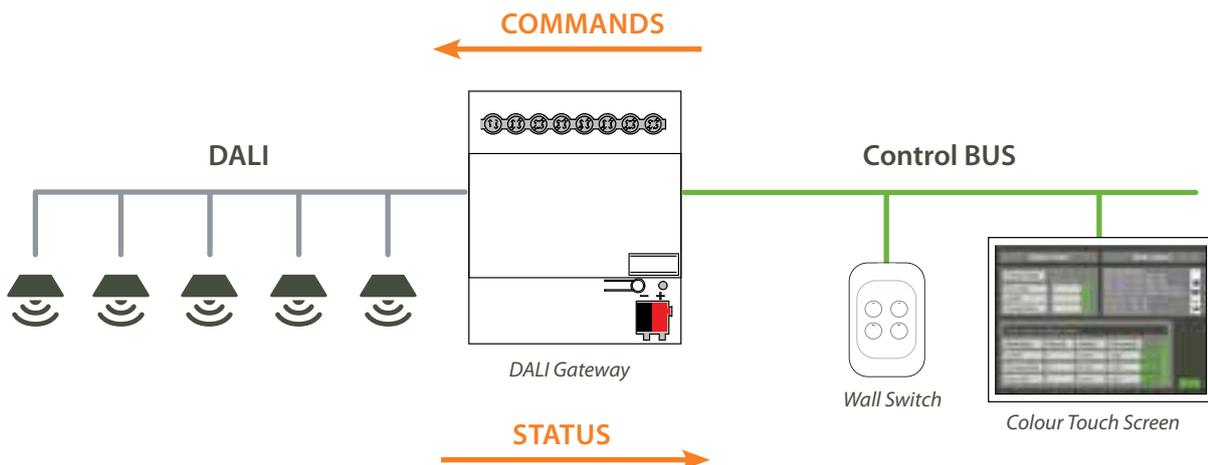
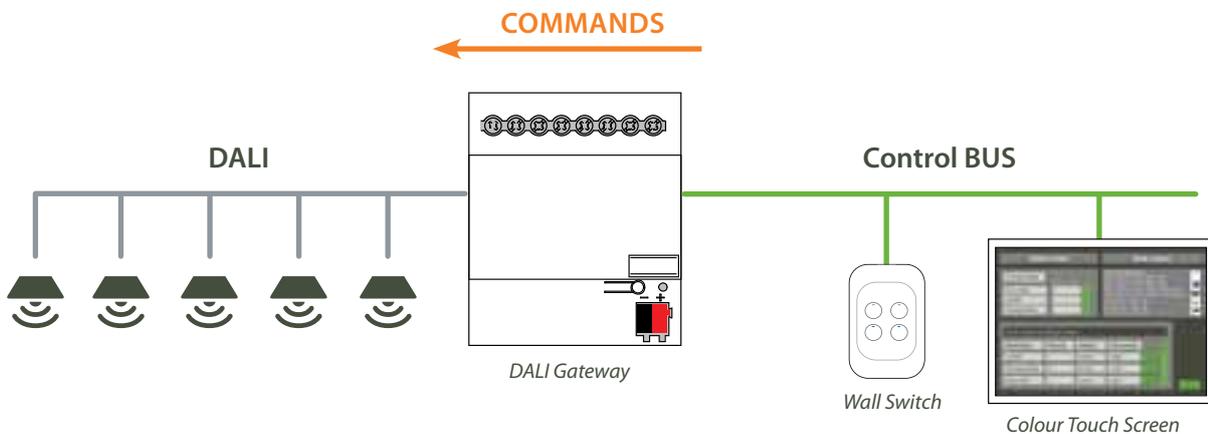
To get the most powerful and user-friendly solution a DALI installation is usually paired with another building control bus solution. This building control bus solution communicates commands to the DALI lighting ballasts via a DALI gateway.

Care and attention is required in choosing the control bus system to be installed as it may be open (e.g. KNX) or proprietary (e.g. C-Bus, Dynalite, DALIcontrol). In this case the openness of DALI is only as open as the building control bus and selected gateways allow. The main questions that should be asked of the control supplier are;

“ Is the DALI gateway truly open in both directions i.e. can it send commands on the DALI network as well as read and pass on query responses? ”

“ Can the DALI gateway be easily replaced with an alternate brand should the need arise? ”

Diagram 3: DALI and Control Bus Systems



## Differences between DALI and BMS

|   |  |
|---|--|
| » | DALI has a limited system size – 64 addresses, 16 groups, 16 scenes per line |
| » | DALI is designed only for communication in lighting systems                  |
| » | A BMS usually has the possibility of unlimited expansion                     |

## DALI System Characteristics

|                              |   |                             |
|------------------------------|---|-----------------------------|
| International Standard       | International Electrotechnical Commission 60929 covers electronic ballasts used in AC supplies with voltages up to 1000V and with operating frequencies at 50/60 Hz |                             |
| Effective data transfer rate | 1,200 Bits/second   |                             |
| Voltage                      | low level   | 0 Volts (-4.5 – 4.5 Volts)  |
|                              | high level  | 16 Volts (9.5 – 22.5 Volts) |
| Maximum System Current       | 250 mA  |                             |
| Maximum Current Draw         | 2 mA per device   |                             |
| Signals of Information       | On / Off  |                             |
|                              | Lamp state  |                             |
|                              | Actual brightness of lamp   |                             |
| Minimum Lead Diameter        | Up to 100m – 0.5mm <sup>2</sup>   |                             |
|                              | 100 – 150m – 0.75mm <sup>2</sup>  |                             |
|                              | 150 – 300m – 1.5mm <sup>2</sup>   |                             |
|                              | Maximum 300 m in length   |                             |
| Dimming Range                | 0.1% - 100%   |                             |
|                              | Logarithmic dimming curve   |                             |
| Cable Structure              | Linear  |                             |
|                              | Tree  |                             |
|                              | Star  |                             |
|                              | Mixed   |                             |
| Polarity                     | Not Polarity Sensitive  |                             |

No requirements for terminals and cables/wires, which have to be used for the digital interface have been defined in IEC 60929.

Design » Deliver »  
Optimise » Guarantee

## Intelligent DALI Lighting Control

WHILST SOME MANUFACTURERS MAY PROMOTE THAT DALI IS THE ONLY SOLUTION REQUIRED IN A COMMERCIAL BUILDING SMART LIGHTING SOLUTION THIS IS RARELY THE CASE. AS PRESENTED EARLIER IN THIS GUIDE DALI HAS BEEN DESIGNED FOR CONTROL OF LIGHTING BALLASTS.

During the design stage of the project consideration should be given to the end-user control interfaces as well as any automated functionality required. In most cases a building control system will need to include switches, touch screens, sensors and the head-end control system.

This control system may be an open protocol such as KNX or proprietary such as Clipsal C-Bus or Philips Dynalite.





## Scheduling

Many automated tasks can be scheduled in line with the rhythms of a modern building and its occupants. This can include initial setting of light levels across the floor plate for the start of a working day. Outside of peak occupation times light levels can be set back to a lower output to reduce energy consumption.



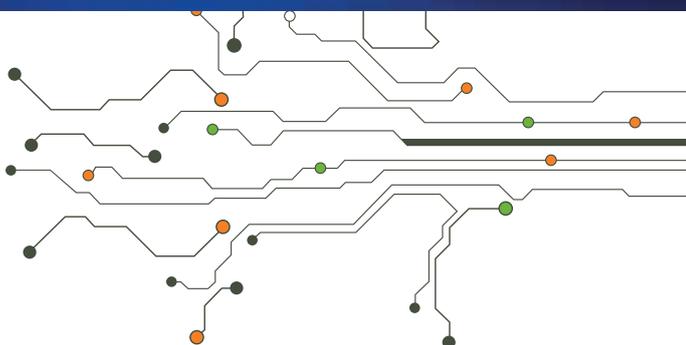
## Sensors

The external environment in which a building exists is constantly changing. This then impacts on the internal environment and its conditions for its occupants. Using sensors such as light-level sensors and presence detectors in conjunction with intelligent scheduling gives the best of both worlds. Spaces are not 'over-lit' resulting in wasted energy nor are they 'under-lit' for the task at hand resulting in reduced productivity. It is also possible to adjust the time-out function of presence detectors to allow for different times during the day and night if required.



## DALI and Emergency Lighting

It is also possible to run emergency lighting on the DALI network. DALI compatible emergency exit fittings enable scheduled automatic testing of and reporting on the batteries and lamps via the BMS or Lighting Head-End Controller. The same DALI limit of 64 addresses per single DALI network applies. It should also be noted that some DALI emergency light fittings require two DALI addresses per device.



## Servicing & Maintenance

One area that is often overlooked in an automated building is the provision for an ongoing maintenance contract with the automation solution supplier. Just like a car needs scheduled servicing to operate at its best so too does an automation system. There are two reasons for this.

The first reason is that in most cases the automation system is designed to a specification based on the predicted use of the building. Once the building is occupied the finer details of the use of the building may differ from the predicted use. Optimisation of the automation system allows for its operation to be fine-tuned to cater for these differences.

It also ensures that the occupants of the building understand and are happy with the way that the automation system functions.

The second reason is that many automation systems offer a level of reporting. These reports can be analysed by trained staff to allow further changes to improve efficiency and to pick up things like failed lighting ballasts. Did you know for example that when some high-performance lighting ballasts fail they leave the light on at full power rather than blacking out like a failed light bulb! In this case unless a report is analysed a failed ballast may not be picked up and changed leading to a reduction in energy efficiency.





## About mySmartCTI

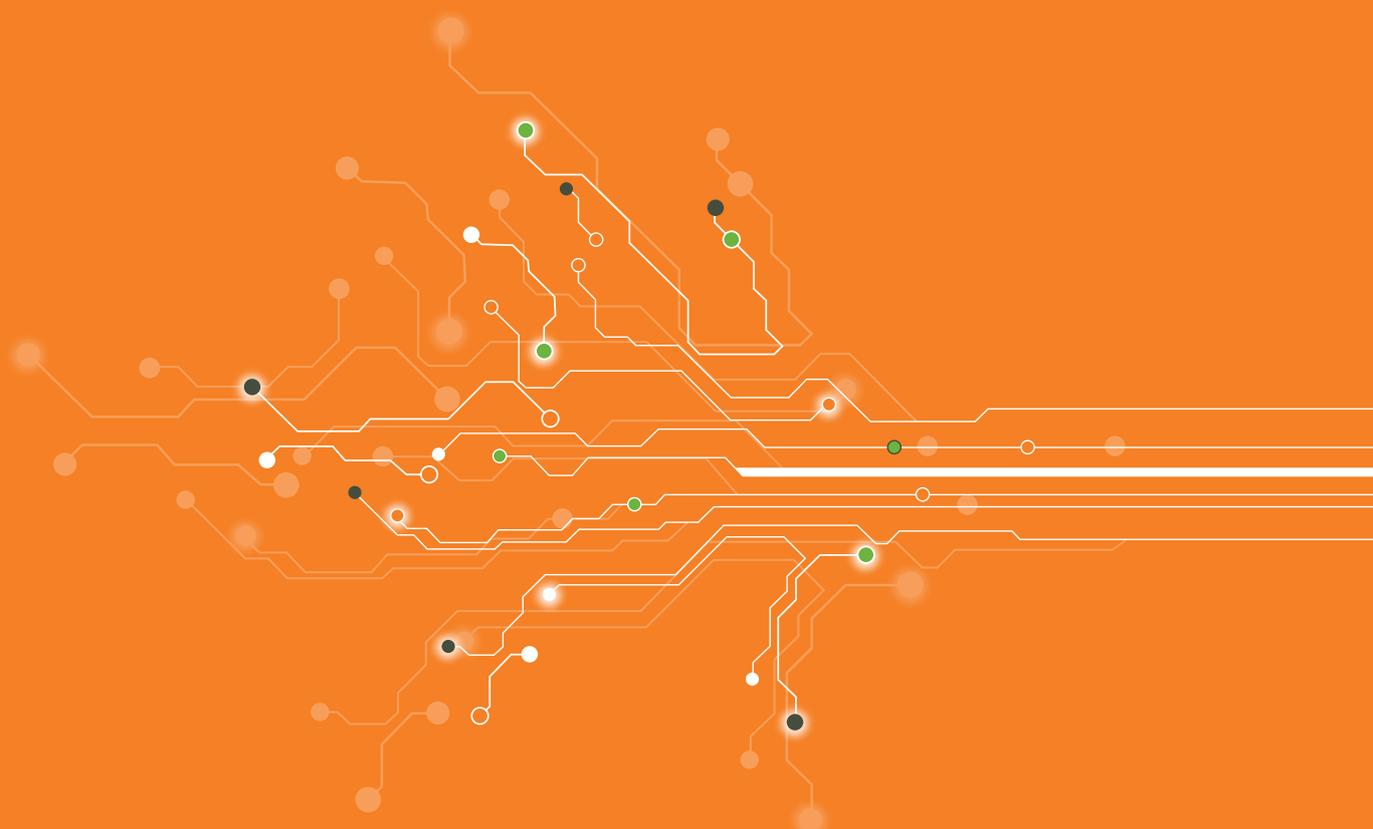
**mySmartCTI** is an Australian company that prides itself on making a positive difference for its customers, their employees and the environment. **mySmartCTI** helps to create the most energy and resource-efficient environments possible.

Using the latest technologies with highly trained consultants and service technicians, **mySmartCTI** is able to optimize buildings and outdoor built environments so they are more comfortable and use less energy and resources with a resulting reduction in ongoing operational costs.

Established, originally as Complete Technology Integrations (CTI), in Sydney in 2001 before being rebranded in 2011, **mySmartCTI** remains wholly Australian owned. With almost 50 staff it has offices in Sydney, Melbourne, Brisbane, Canberra and Perth. The company operates across a range of markets, including hospitality, education, health services, aged care, retail, residential, defence and Industrial.

**mySmartCTI's** solutions include:

- › Lighting control solutions which provide daylight harvesting and timed control
- › Basic and high performance metering and reporting solutions for energy, solar, water and gas usage
- › enGauge behavioural change displays for showing energy usage and savings
- › Fully integrated building automation systems providing lighting and façade management control, audio-visual interfacing, HVAC control, reporting and central control.
- › Hotel room control systems for controlling lighting, HVAC and blinds with full integration to the hotel check-in system
- › Stand-alone intelligent motion sensors
- › Unique custom solutions



mySmartCTI™

ABN: 85 097 753 458

1300 697 627

[www.mySmartCTI.com.au](http://www.mySmartCTI.com.au)

SYDNEY | MELBOURNE | BRISBANE | CANBERRA | PERTH