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**Training Systems Australia**  
Better Learning Outcomes  
A Division of Pullman Learning Group

300 Centre Road, Bentleigh, Victoria, 3204  
p: +613 9557 7993 e: info@trainingsystemsaustralia.com.au



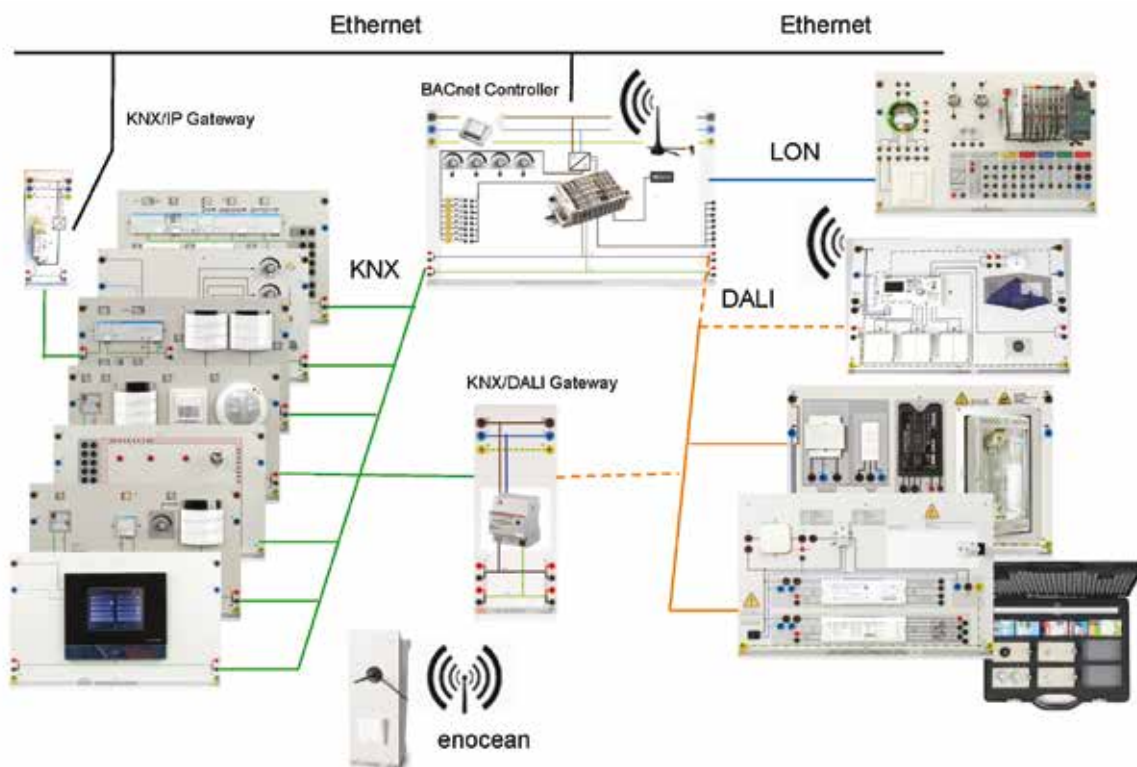
# Lighting Technology

The road to smart homes



# Introduction

Smart homes are no longer imaginings from the distant future. In a few years, intelligent building management tailored to users' needs will be a standard feature. Even now it is possible to use building management systems to increase comfort in the home, improve security and use energy more efficiently. Networking of all the appliances, lights and switches installed in a home and programming automated procedures for them is therefore very likely to become a key part of an electrician's trade.



The new products from Lucas-Nülle enhance their existing training systems, adding additional topics to the theme of lighting technology. As well as learning the basics by means of Interactive Lab Assistant, trainees can also program systems under realistic conditions, carry out experiments and gain a thorough understanding of the theory.

## Benefits to you

- All lighting technology topics are taught in a way that closely mirrors authentic practice
- Use of modern bus systems and industrial components
- Integration of lighting into building management systems

# UniTrain-I LED Lighting Technology

Light-emitting diodes (LEDs) are playing an ever greater role in the technology of lighting. In particular, their energy-saving attributes and small size are leading to innovative changes in lighting techniques. The course explains how LEDs work and how they can be used. The course contents include such things as current consumption, mixing of colours and the perception of colour.



LED lighting and colour perception

## Training contents

- Familiarisation with various types of LED
- Adjusting brightness of LEDs using PWM
- Recording characteristics and measuring brightness
- Additive mixing of colours and adjusting colour temperature
- Colour perception and display
- Course duration: 10 h approx.

# Conventional Wiring in Buildings

The training system designed for the topic of lighting circuits includes the standard circuits used in conventional wiring installation. Preparation of and working with various types of circuit diagram forms an introduction to wiring installation and is used as a basis for subsequent topics and more complex installation circuits.



*Lamp circuits*



*Fluorescent lighting circuits*



*Dimmer circuits*

## Training contents

- Analysis of installation plans
- Lighting circuits  
(on/off, multiple switches, changeover switches and intermediate cross-over circuits with or without earthed sockets)
- Circuits for fluorescent lamps (on/off, multiple-switched, lead-lag and tandem circuits)
- Electronic dimming of various lights
- Calculation of efficiency
- How electronic ballast and transformers work
- Bell and door-opening systems
- Intercom systems with door opener

# Energy-efficient Lighting using DALI Control

Training systems covering various types of building lighting. Apart from ways of lighting rooms, this course also investigates effects lighting and lighting of spaces. The lights themselves are supplied with the system. They are set up in a way that minimises dazzle and makes it possible to learn without disturbance.



*Energy-efficient lighting*

## Training contents

- Familiarisation with various types of lights
- Familiarisation with various types of components
- Uses and operation of thermal radiators (incandescent bulbs)
- Various conventional dimmers
- Programmable universal dimmers
- Interfaces to various management levels
- Controlling lighting with DALI
- Generating colour or monochrome light
- Creating lighting effects

# Discharge Lamps Controlled by DALI

Halogen-metal vapour lamps have been developed from high-pressure mercury vapour lamps. The addition of halogen compounds of various metals has led to an improvement in all aspects of performance: Halogen-metal vapour lamps produce large quantities of light and offer good colour reproduction. Sodium vapour lamps are used in addition to halogen-metal vapour lamps and this course compares the two types.



*Discharge lamps*

## Training contents

- Investigation of various ballast and triggering systems
- Investigation of various gas discharge lights
- Dimming lights using DALI
- Networking of multiple lights

# Lighting of Exits and Emergency Escape Routes

Lighting of exits and emergency escape routes represents a key aspect of planning and management of the lighting for buildings. There are now standards which must be observed, and energy-efficient lighting needs to be used in order to guarantee lights will continue to operate for a pre-defined length of time in the absence of mains power.



*Controller for emergency exit and safety lighting*

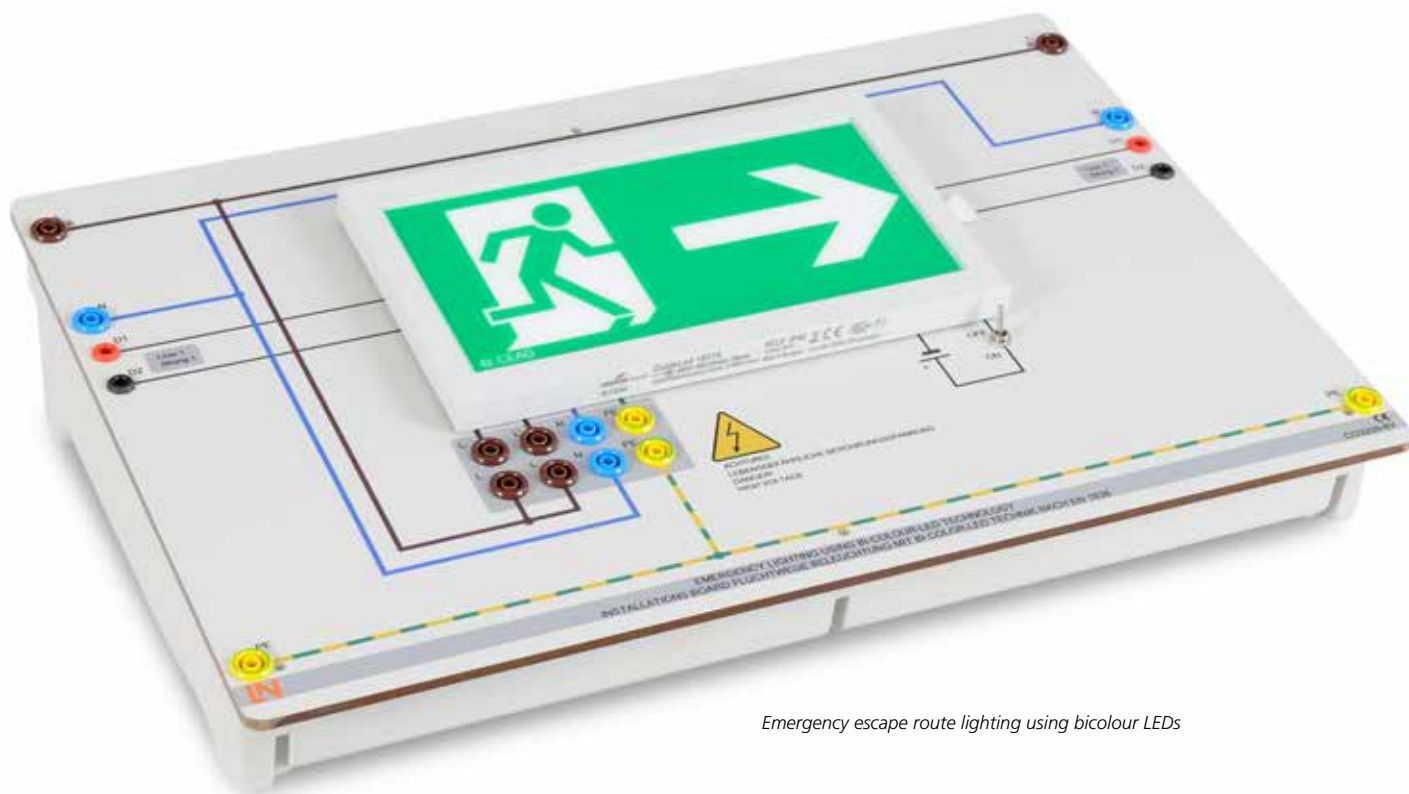
## Training contents

- Design and function of emergency lighting systems
- Design and function of safety lighting and emergency exit routes
- Programming emergency lighting controllers
- Ensuring emergency power supply
- Software-controlled evaluation of events





Emergency lighting using bicolour LEDs

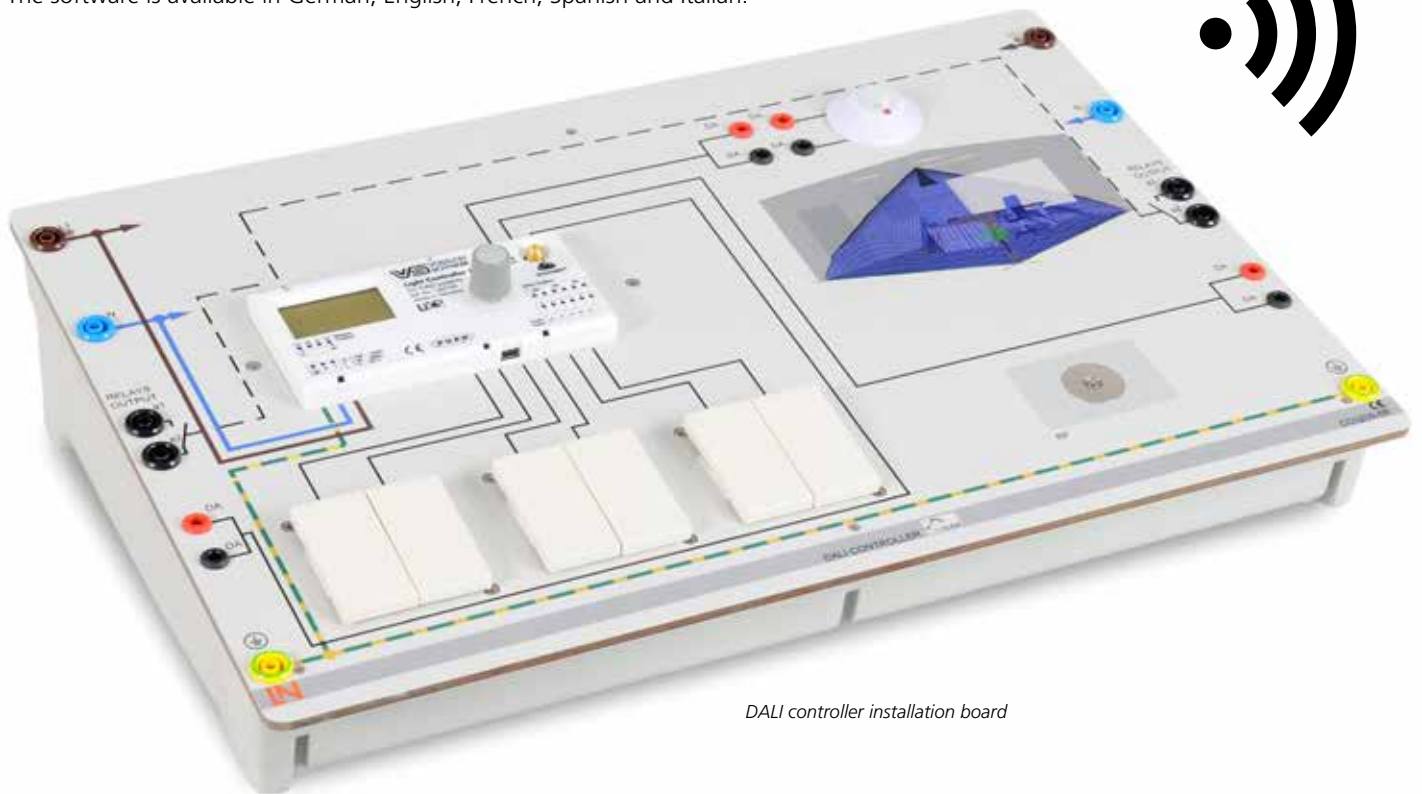


Emergency escape route lighting using bicolour LEDs

# DALI Controller Installation Board, Programmable with Push-button and Sensor Control

The board includes not only a DALI controller but also external push-buttons and a DALI-controlled brightness and presence detector. Programming is accomplished using an internal display in conjunction with a push-button/rotary switch. The DALI bus is not implemented using safety extra-low voltage by default, so cabling to the DALI system needs to be compatible with mains voltages. The DALI bus has electronically reversible overload and short-circuit protection. DALI ballast components can number up to a maximum of 64, while a maximum of 16 multi-sensors can be handled.

The software is available in German, English, French, Spanish and Italian.



*DALI controller installation board*

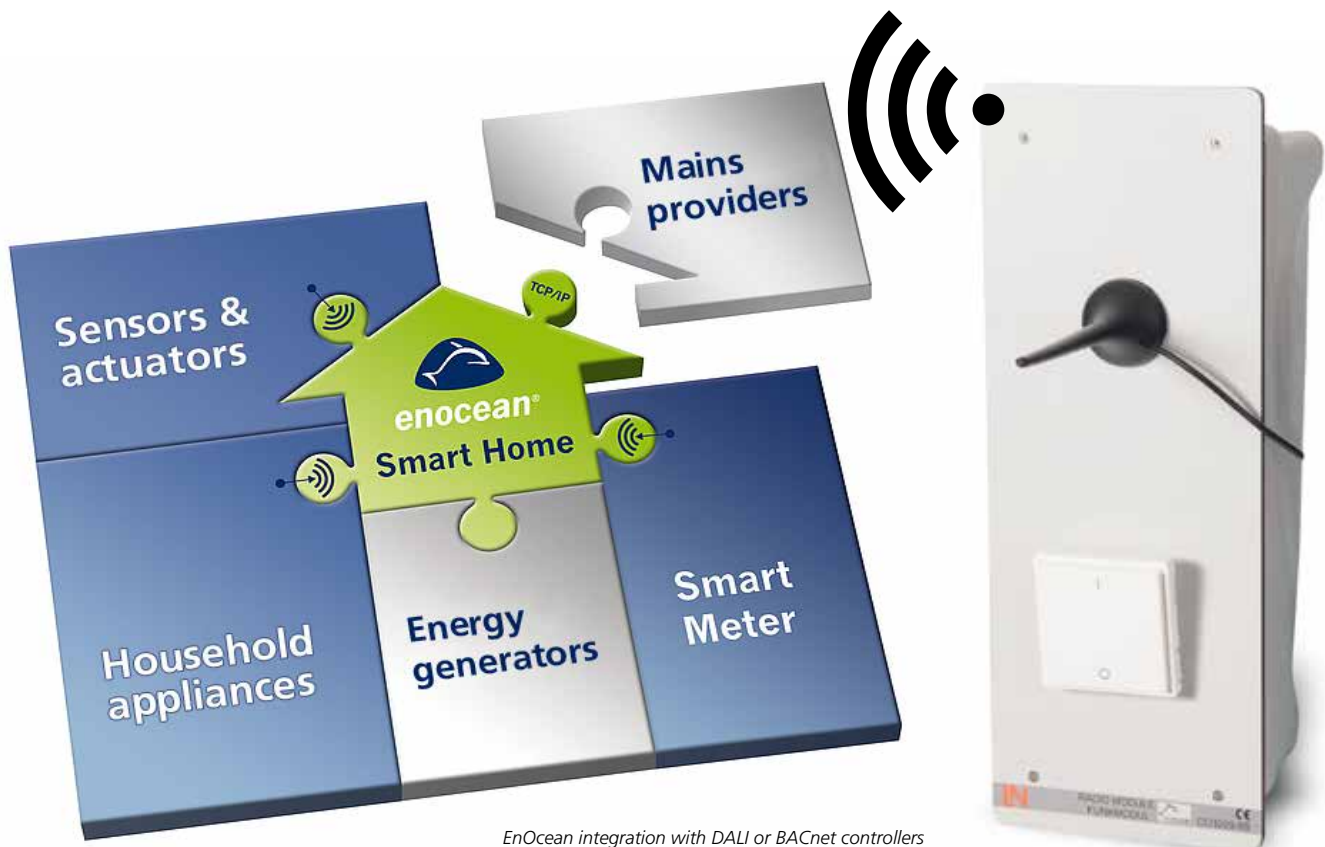


## Training contents

- Automatic and semi-automatic motion sensors
- Constant lighting control
- Scenic/effects lighting
- Push function
- On/off function
- Stairway lighting (timer function)
- System analysis software, password protection, addressing capabilities
- Software languages:  
German, English, French, Spanish, Italian

# EnOcean Transmitter Installation Board

EnOcean is a battery-free radio system for building automation. EnOcean can be integrated with multiple building management systems. BACnet controllers, DALI and KNX systems can all communicate with the radio system.



*EnOcean integration with DALI or BACnet controllers*

## Training contents

- Incorporating radio components into building management systems
- Familiarisation with and parameter setting for radio components
- Determining the broadcast ranges of radio components
- Receiver components with and without additional antennae
- Operating maintenance-free radio components with no additional power source



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**p** +61 3 9557 7993  
**e** [info@trainingsystemsaustralia.com.au](mailto:info@trainingsystemsaustralia.com.au)  
**w** [trainingsystemsaustralia.com.au](http://trainingsystemsaustralia.com.au)  
**a** 300 Centre Road, Bentleigh, VIC, 3204