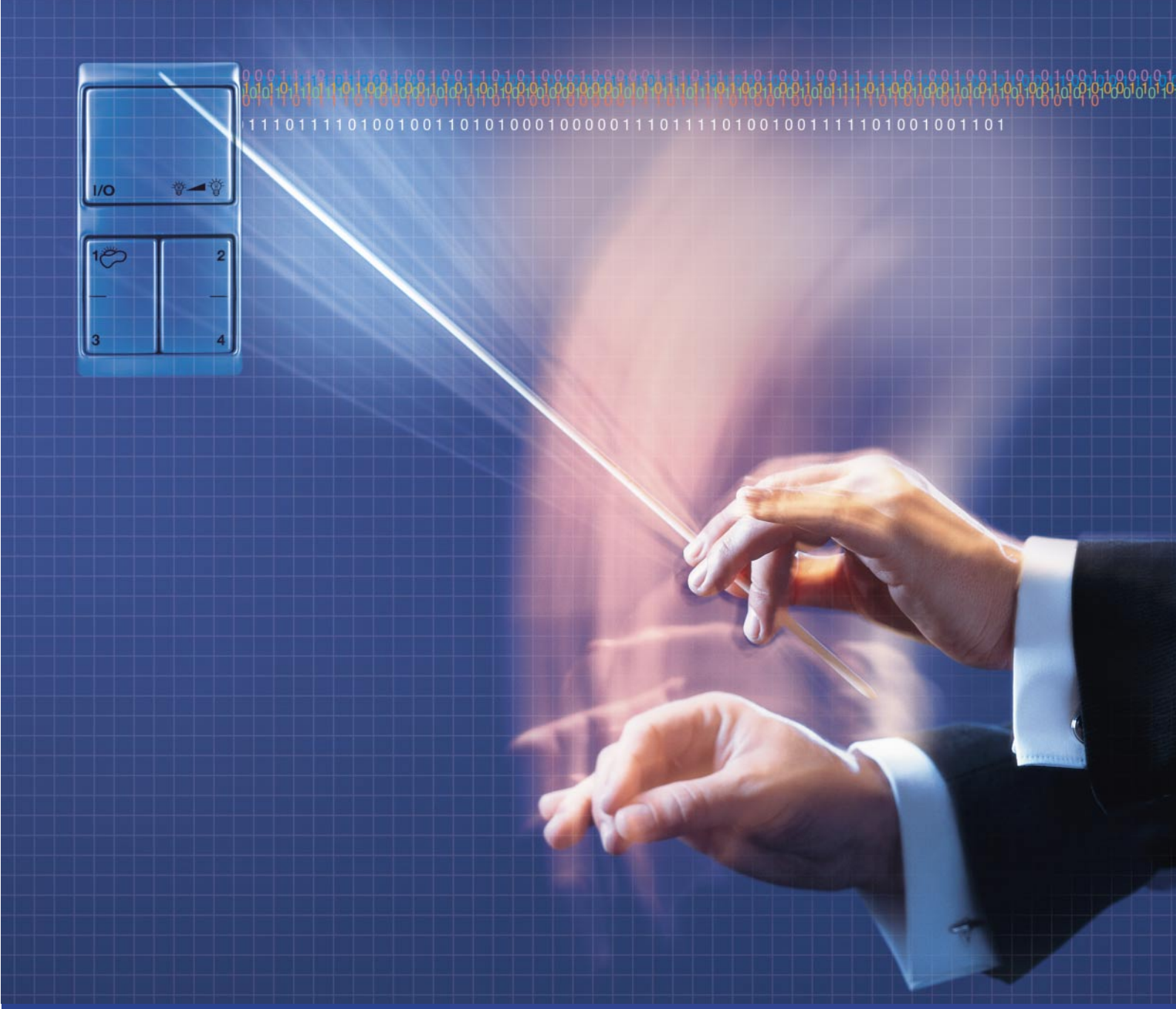

The lighting conductor: DALI from OSRAM

Genuine digital lighting control– simple, powerful, universal

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DALI – the standard for digital lighting control

Requirements of modern lighting technology

Modern lighting systems have to do more than just switch light on and off. Nowadays, light is one of the comfort features of a room and part of an energy-saving concept in facility management.

The most important thing is to create lighting situations (lighting scenes) that can be stored and recalled, possibly with integrated presence and daylight-dependent control. The system must also be very easy to operate and also enable feedback messages to be sent to a building management system.

Classic systems simply cannot cope

With traditional wiring and even with the widely used analogue 1-10V interface such requirements are very difficult to meet and involve a great deal of time, effort and money. A large number of components have to be used to enable a programmed scene to be changed, to provide flexible grouping at the same time and then to integrate these settings in a daylight-dependent control system.

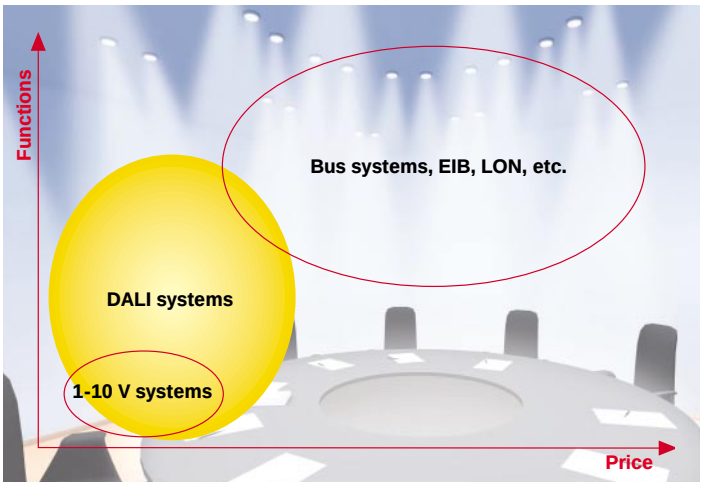
Bus technology is too costly

Up to now, lighting control systems with a high level of user convenience have been based on digital installation bus systems, such as EIB and LON. Although the bus technology can meet many of the requirements, it is actually designed for much more complex tasks in buildings and is therefore cost-intensive. It generally calls for a separate special control line and expensive expert knowledge for the initialisation process, and it allows users to make simple changes to the settings only in exceptional cases.

DALI – the simple and flexible alternative

What modern lighting technology needs therefore is a system that is as flexible as it is simple, a system that focuses on room-based lighting control with just a few low-cost components, minimal wiring and a user-friendly operating concept. The lighting industry has therefore developed a new digital communication standard for lighting applications precisely for this purpose. It is called DALI, short for Digital Addressable Lighting Interface.

DALI closes the gap between previous 1-10V technology and complex bus systems.



Comparison of lighting control systems with standard interfaces

Features of DALI
Floating voltage control input
Two-wire line, polarity-free
Dimming curve analogous to the behaviour of the eye (linear optical sensitivity)
Addressing options: all together, by group, individual
Scene memory in the DALI ECG (maximum of 16)
Individual feedback messages (e.g. lamp fault)
Digital on/off switching in the ECG (without switching relays)

DALI – from an interface standard to a complete lighting management system

DALI – the common standard

DALI is a joint development by the majority of the lighting industry. The aim was to create a uniform standard in the lighting industry. DALI does not define a lighting system. Instead it defines the standard for communication between the controller and the electronic control gear – and is therefore included in control gear standard EN 60929 as Annex E4. Interchangeability of ECGs from different manufacturers is therefore guaranteed. Confusion about lots of different proprietary solutions is now a thing of the past.

Brilliant advantages for lighting designers and users

DALI offers intelligent room-based lighting management with low component costs and high functionality.

- Simple installation
  DALI is installed by using standard installation material for mains voltage. In five-wire mains cables, the two wires not needed for power supply can be used for the DALI interface, with no need to worry about the polarity.

- Simple design, versatile functionality
  Every ECG in the DALI system can be addressed individually in digital format and therefore interference-free, can belong to more than one group at the same time, can store the lighting levels for different lighting scenes and even be switched on and off digitally without the need for relays. Feedback messages from individual DALI ECGs are also possible (e.g. lamp faults).

- Simple operation
  The intelligence of the DALI system resides in the DALI controller. Automatic routines are run in the controller for detecting the connected components and addressing them. The user supplements these with simple commands using the control elements. It is just as quick and easy to change the settings and adjust them to suit new requirements.

”Digital” is not always what it seems

Some ECG manufacturers keep referring to ”digital electronic control gear” in their technical documentation. Many tender documents also mention digital ECGs incorporated in a digital lighting system. Often these are not true digital components as specified in the DALI standard as they do not meet the following three essential criteria:

- Digital addressing
- Digital processing
- Digital communication

Only DALI meets all three criteria at all times.

Advantages of using DALI
No need to worry about the mains voltage phase
No need to worry about polarity
No separate bus line
No wiring by groups
Each DALI ECG can be addressed individually
No need for scene memory modules
Status messages from DALI ECGs (e.g. lamp faults)
Synchronised scene transitions
No external relay, DALI ECGs switch themselves on and off

The DALI-Logo – guarantee for interchange-ability of DALI ECGs

Perfect lighting with DALI from OSRAM

Groups and scenes – the basis of efficient lighting control

A group in the context of lighting design is a meaningful collection of luminaires. In offices, these groups are mostly rows of lights. Different lighting moods in the room can be created by setting different lighting levels for these groups (on, off or dimmed) – this is how we define ”scenes”.

With DALI, luminaires and their associated ECGs can be freely assigned to groups, irrespective of their physical arrangement in rows either down or across. The lighting mood arising from a particular setting can be selected at the push of a button and can be changed at any time.

Example: lighting management in a multi-functional conference room

DALI lighting control systems from OSRAM can be used for an extremely wide range of applications. The DALI BASIC lighting control system shows the main advantages and areas of application.

Lighting control for four typical situations (scenes) for a multi-functional conference room:

Scene 1: Reception
- Pleasant bright light for greeting

Scene 2: Lecture
- The perfect lighting for giving and listening to a lecture

Scene 3: Slide presentation
- Slide projection

Scene 4: Discussion
- The lighting scene for subsequent discussion.

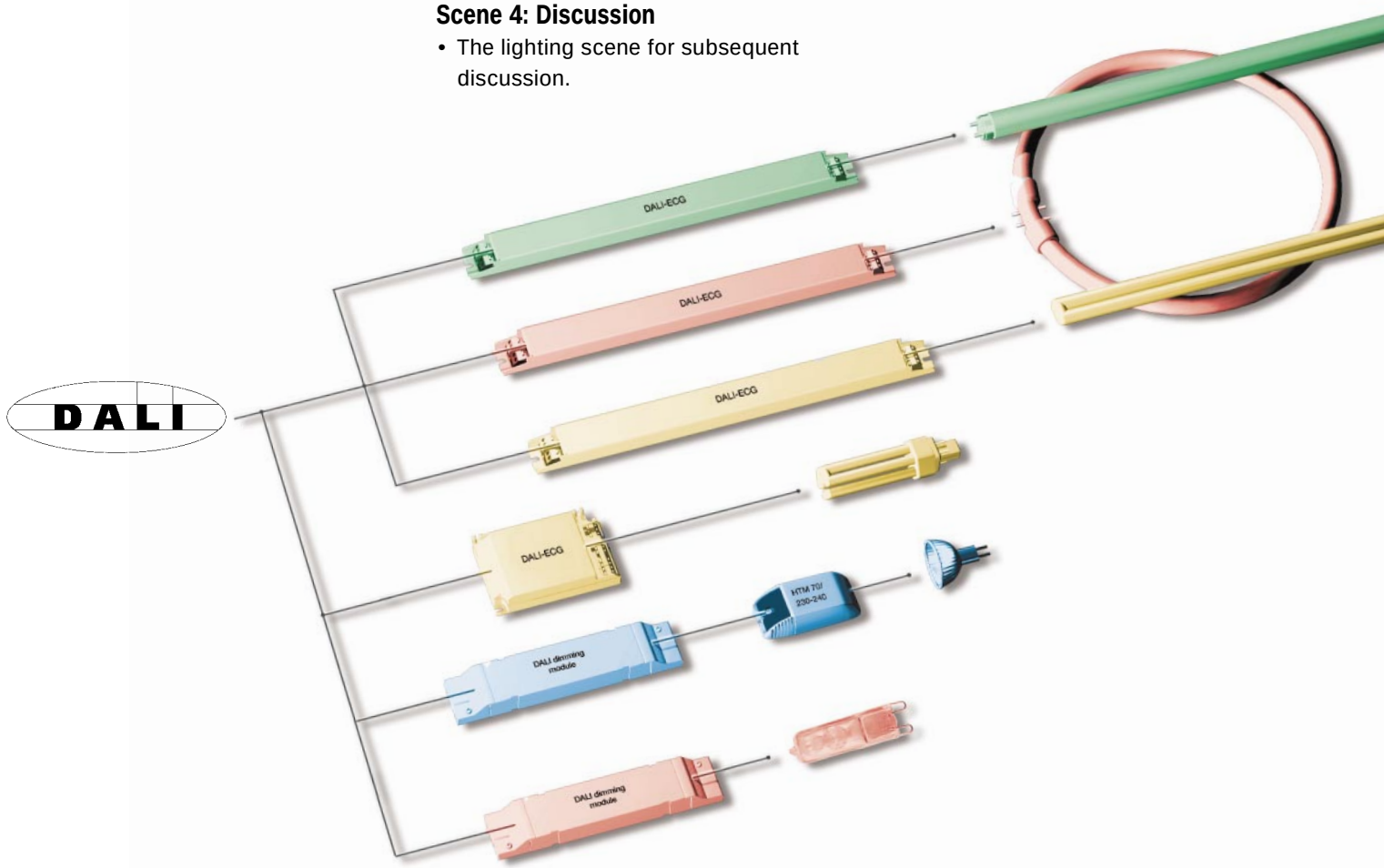
The groups are defined as follows for creating the scenes:

Group 1 Downlights
OSRAM DECOSTAR® IRC 50W

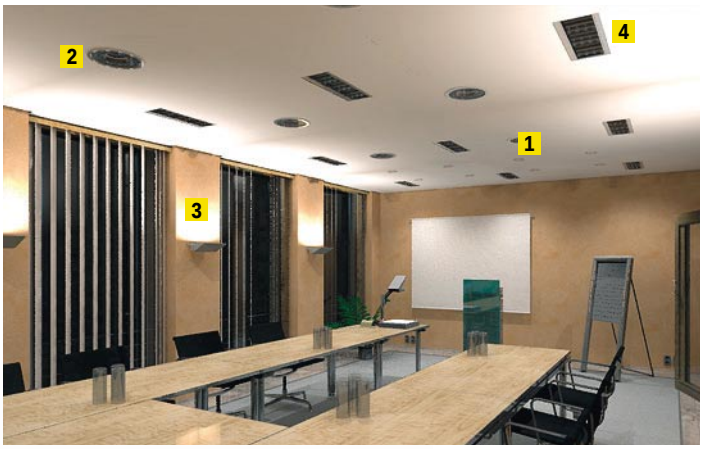
Group 2 Recessed ceiling luminaires
HALOPIN® 25W + FC 22W

Group 3 Wall-mounted luminaires
Compact fluorescent lamp
OSRAM DULUX® T/E 26W +
OSRAM DULUX® L 24W

Group 4 Linear luminaires
OSRAM FQ® 24W



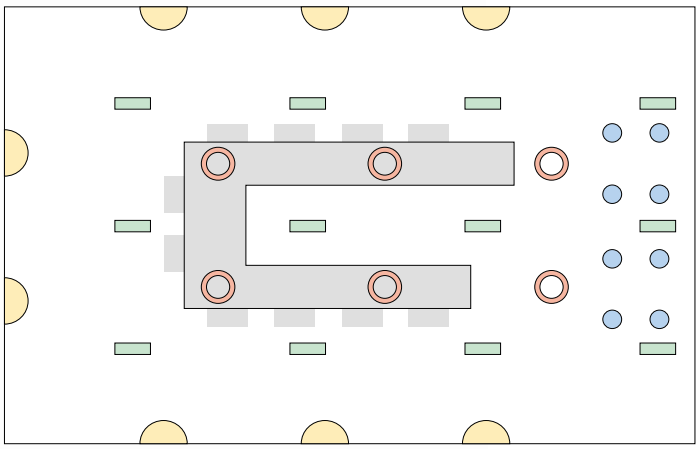
Whatever the situation: the right light at the touch of a button



Reception

Lecture

Slide presentation



Possible groupings for this multi-functional conference room

Discussion

Simply versatile: DALI BASIC

Areas of application

DALI BASIC is a multi-functional controller that is ideal primarily for:

- conference rooms
- classrooms
- sports halls
- the home

The system provides the basic functions of a modern flexible lighting control system that offers both open-loop and closed-loop control. It is impressive for its simple planning, installation and commissioning and for its ease of use with all the major functions clearly laid out.

Typical application: Open-plan office with an energy-optimised lighting scene system

Requirements:

- Daylight-dependent lighting control, can be overridden/changed as required
- Activation of the lighting system only if there is someone in the office
- Three mutually independent lighting control circuits that can switched individually to optimise energy savings
- No mutual adverse effects between the control circuits (typical min./max. control faults)
- Flexibility without changes to the wiring if there are changes in the way the office is used
- The system can be set up/changed by electricians/facility managers

Solution:

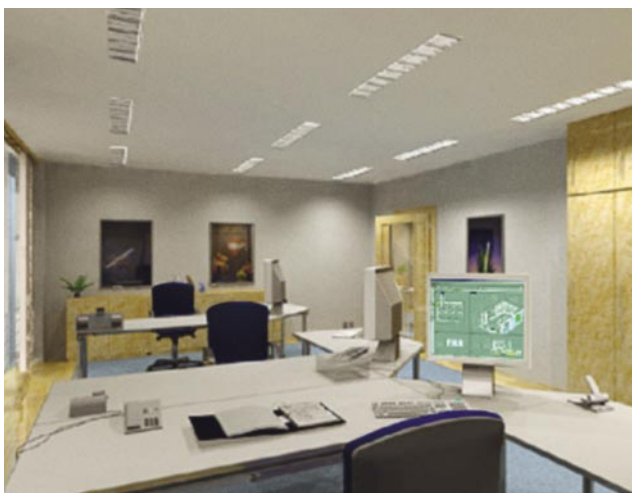
Daylight-dependent lighting control can be clearly seen in the open-plan office. The further the luminaire is from the window, the more artificial light is needed to provide the necessary background lighting. The lighting system is only activated if there is at least one person in the office.

All the requirements are met in full by DALI BASIC. Negative sensor properties can even be compensated for by mixing the values from two sensors. Since the controller addresses all three groups, the control problem of the different luminaire groups drifting apart to minimum and maximum luminous flux cannot arise.

System features

- Digital lighting control system with DALI interface
- 4 freely programmable scenes (1 for daylight-dependent control)
- 4 freely programmable groups
- 3 completely independent lighting control groups (no offset)
- Motion detection with user-definable delay (1 to 30 minutes)
- Notification of lamp faults and incorrect wiring (via LED and floating fault contact)
- Simple programming and operation using standard switches (make contacts)
- The switches can be connected in parallel so the system can be controlled from different locations
- Installation control routines (e.g. switch wiring)
- Power supply for the DALI interface integrated in the controller
- All system settings are retained even if there is a lengthy power outage
- Integration in existing 1-10V systems is possible, thanks to DALI to 1-10V converters (for installation in luminaires and in series)

DALI - BASIC switch panel



You can try out DALI BASIC at www.osram.com. It's interactive.

The best references: DALI BASIC in actual practice

Comfort and energy savings – with the DALI BASIC lighting control system these are no strangers even in a tennis hall

The following example – just one of our many reference projects – clearly shows the enormous versatility of DALI BASIC.

Sports and events in perfect combination: four-court tennis hall in Töss

The BASIC controller is the perfect solution for meeting the lighting requirements of the four-court tennis hall in Töss near Zurich. OSRAM set up the system together with Fluora, the Swiss luminaire manufacturer. One objective was to enable the light over the four courts to be switched on and off from a central control console at the pay desk.
Automatic constant light function up to individual switch off of the lighting system were required in order to save energy. On the other hand, whenever events were to be held in the hall there were to be two additional lighting scenes to create a festive atmosphere.

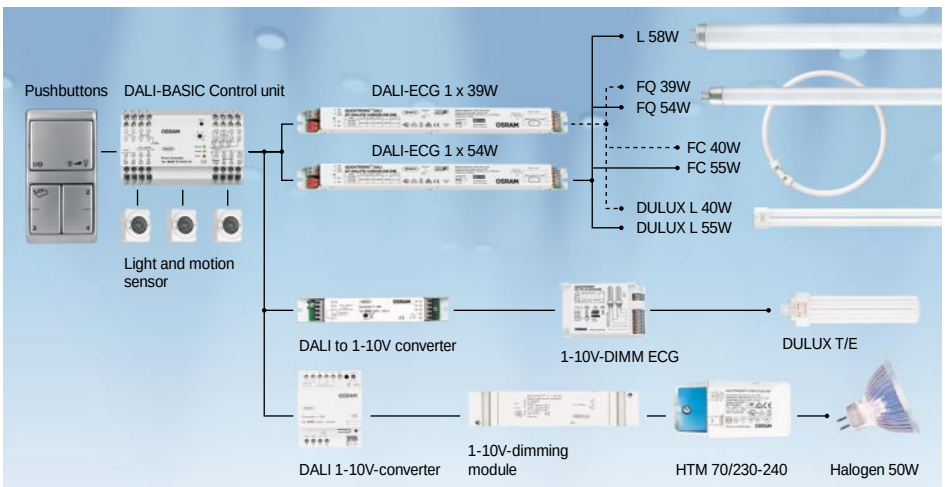
Four BASIC controllers were able to cover the entire requirement profile with ease. The lighting for all four courts can be individually controlled with their own controllers. Staff at the pay desk can control the lighting in the various zones with just two switches (on/off).

With just two scenes, a constant ”on” light scene and an ”off” scene the system is easy to use – there is no need to know about all the various functions of the controller.

For events, any of the four areas can be individually lit. A control console is located between courts 2 and 3.

DALI BASIC could also provide the following convenience features:

- Automatic shutdown of the complete lighting system at the end of play.
- Activation of the lighting system via motion detectors to deter intruders at night.



Schematic diagram of DALI BASIC

Maximum possible ease of use: the new DALI ADVANCED lighting control system

DALI ADVANCED was developed to handle more complex applications in which a large number of luminaire groups have to be controlled or a wide variety of lighting scenes need to be called up. The components of this lighting control system use the tried and trusted 433 MHz radio transmission standard for communication. Only communication between the control unit and the DALI ECG is via a cable.

Areas of application

DALI ADVANCED is the solution for advanced users with high demands in terms of ease of use: The system offers particularly comfortable remote open-loop and closed-loop control with presence detection. It is ideal for large offices, conference rooms, classrooms, sports halls and foyers – and also as a sophisticated system for the home. The use of battery-operated radio components means that the DALI ADVANCED system has the flexibility to cope if modifications are made to the system itself or when the system is retrofitted in buildings.

Simple operation

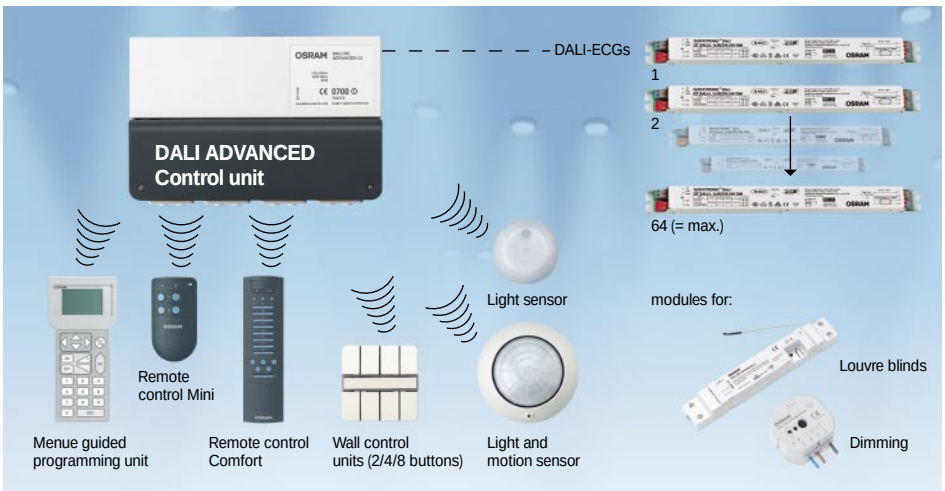
2-way, 4-way and 8-way switches that can be combined with one another are available for operating the system from the wall. The control points can then be adapted individually to meet the needs of the user. There is a choice of two remote controls – Mini and Comfort. The Comfort manual transmitter can be used to address 16 groups individually. It can also be used for central override dimming of lighting scenes and for additional control of eight groups, for example floor-standing luminaire dimmers and louvre blind modules. In addition, five scenes can be stored in each Comfort manual transmitter and called up at any time.

Setting up with menu prompts

To set the system up all that is needed is a simple manual programming unit with a large LC display. This unit can also be used for more than one ADVANCED system. Once the radio link has been automatically established to the controller, all the settings can be made in clearly structured steps through a menu.

Sensors replace eyes and manual control

Two types of sensors – a light sensor and a combined sensor for light and movement – provide even greater convenience in the DALI system. Because they do not require cables for transmitting the signals and because they run on batteries, the sensors can be installed anywhere in the room, so the best locations for detecting motion or for determining the brightness level in the room can be chosen to suit the local circumstances. Further sensors (up to eight) may be integrated in the system at any time and assigned the appropriate functions.



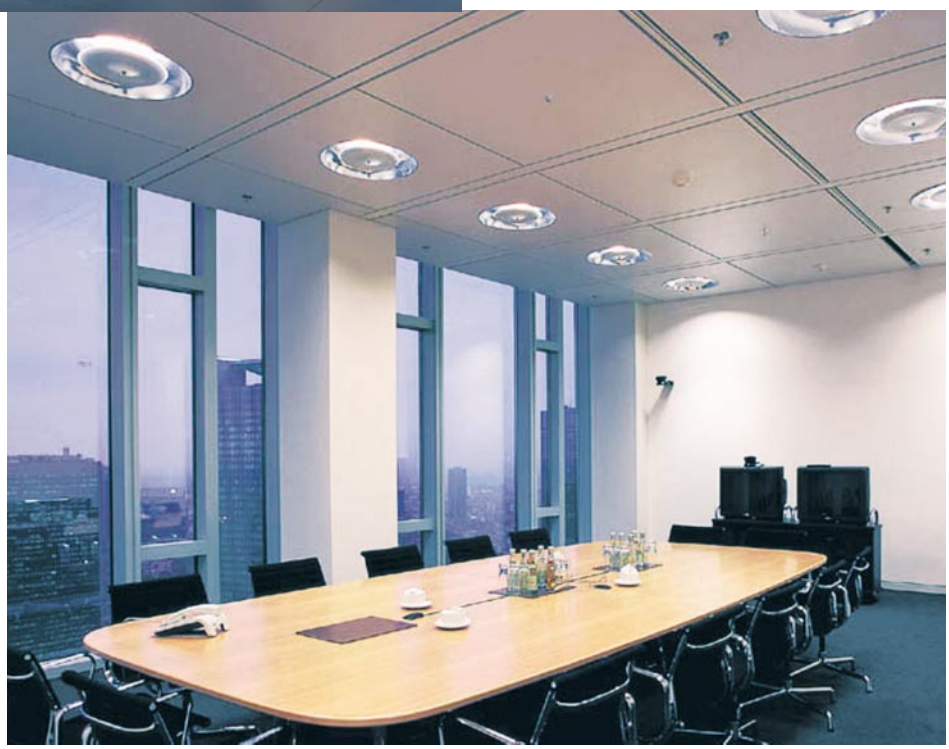
Schematic diagram of DALI ADVANCED

System features

- Digital lighting control system with DALI interface
- 16 freely programmable scenes
- 16 freely programmable groups
- Group-based lighting control
- Motion-dependent system activation
- Radio control units that can be matched to one another and combined as required
- 2, 4 and 8-way switches available
- Simple and fully featured remote control
- Battery operation so no cables needed for the operating components
- Simple programming with menu-based manual programming unit
- All system settings are retained even if there is a lengthy power outage
- Integration in existing 1-10V systems possible with DALI to 1-10V converters
- The same programming unit can be used for different systems

DALI helps to put headlights in the spotlight: IAA Frankfurt, Audi booth

Typical application: Conference room with scene control



Requirements

- A large number of lighting situations (scenes) depending on the room layout. Can be overridden/changed as required
- Activation of the lighting system only if there is someone in the office
- Remote control
- Separate control units for groups and scenes
- Daylight-dependent lighting control
- No mutual adverse effects between the control circuits (typical min./max. control faults)
- Flexibility without changes to the wiring if there are changes in the way the office is used
- The system can be set up/changed by electricians/facility managers

Solution:

Lectures are given in the conference room by different people. For this reason, different lighting moods need to be produced that can be instantly changed by users without the need for complicated instructions. It must also be possible to control the lighting from the lectern by remote control.

All this is child's play with DALI ADVANCED – control components can be combined as required. All the essential functions can be controlled at any time with the fully featured remote control. Set-up and any fundamental changes to the system can be completed by facility managers with the manual programming unit.

All you need to know about DALI at a glance

The facts

Definition

DALI = Digital Addressable Lighting Interface.

The interface

DALI is the new digital interface standard for ECGs. The DALI protocol will be incorporated in ECG standard IEC 929 as Annex E4.

The standard

DALI is supported by most of the lighting industry as the new digital standard in lighting control. DALI is a joint development, designed to meet all the requirements placed on a modern lighting control system. The aim was to create a uniform non-proprietary standard in the lighting industry.

The new attractive alternative

DALI closes the gap between previous 1-10V technology and complex bus systems.

The user-friendly system

The DALI interface is the basis for a modern, flexible and simple lighting management system characterized by a small number of low-cost components, minimal wiring and user-friendly operation.

Links to building management systems

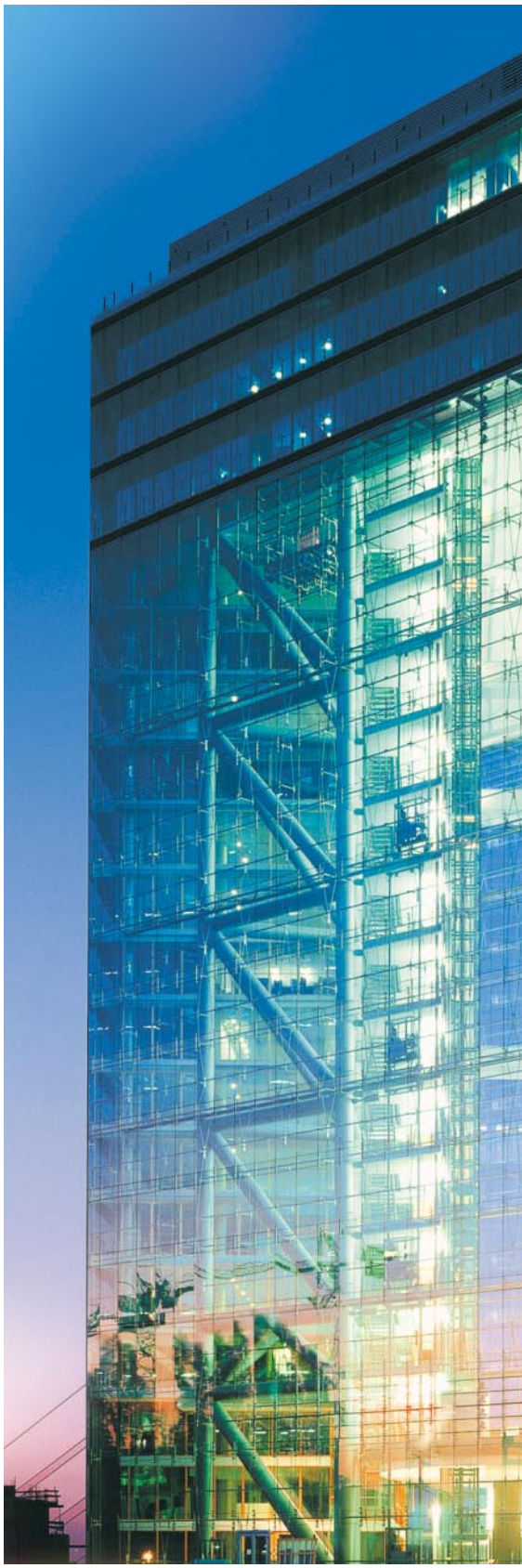
DALI is designed primarily to provide user-friendly lighting control within a room but can be linked via a gateway with building management systems.

Flexible lighting management

In a DALI system the control gear can be addressed all together, in groups or individually. Up to 16 freely defined groups, 64 individual addresses and up to 16 lighting scenes can be provided.

The most important properties and benefits

- The polarity of the control lines is of no consequence with OSRAM DALI ECGs
- The two unused wires in NYM 5 x 1.5 mm^2 cables can be used for the DALI interface
- Each unit can be addressed individually
- Luminaires are assigned to groups only after the DALI system has been initialised – groups are not assigned by the way in which they are wired
- Each DALI ECG may belong to more than one group – groups can be formed along and across the room at the same time
- Scene light values and group assignments are stored in the DALI ECGs. This means that far fewer system components are needed compared with systems with a 1-10 V interface
- Feedback messages from the DALI ECG, e.g.:
  – Lamp on/off
  – Current light value
  – Lamp fault
- Special settings, e.g. rate of change in the lighting level or emergency power characteristics
- Synchronous dimming – all the DALI ECGs end the dimming process simultaneously when there is a change of scene
- Interference-proof digital data transfer
- Stored data is retained even after a length power outage
- The DALI interface does not need a separate bus line
- DALI only defines communication between the ECGs or DALI-compatible loads and the controller
- In modern building management systems, DALI is a subsystem for controlling light
- The lamp is switched on and off by the DALI ECG – no external switching relays are needed



Frequently asked questions

Is DALI a new bus system?
No. DALI is only the interface for the lighting system.

Is DALI a competitor for EIB or LON?
No, a lighting control system with a DALI interface is only a subsystem for controlling light.

What is the difference between DSI and DALI?
DSI is an outdated digital interface (from Tridonic) which does not support digital addressing.

Do you have to take into account the group assignments when wiring up the system?
No, the luminaires are not assigned to groups until after the system has been set up.

Can DALI be integrated in building management systems (e.g. EIB or LON)?
Yes, by using gateways.

Does the polarity of the DALI control line need to be taken into consideration?
No.

How can DALI ECGs be addressed?
They can be addressed individually, in groups or all together.

Can I get feedback messages from DALI ECGs?
Yes, for example whether the lamp is faulty.

Does DALI support different luminaire group levels?
Yes, different group levels can be created for different applications. For example, for one application the groups may be arranged parallel to the window, and for another application they may be perpendicular to the window.

Where are the address data and the scene light values stored?
Directly in the ECG.

If there is a power failure is the data in the ECG lost?
No, the data is permanently stored in the ECG. It is retained even after a lengthy power outage.

What happens if an ECG fails?
The ECG simply has to be replaced and adjusted to the appropriate settings (depending on the controller).

Can existing 1-10 V lighting systems be upgraded with a DALI controller?
Yes, a DALI to 1-10V converter is needed for each 1-10V luminaire group (e.g. DALI CON 1-10V SO).

Can the wiring for the DALI ECGs be checked on a building site?
Yes, by using the basic function dim all/on/off.

What insulation is required for the DALI control line?
The same as for 1-10 V systems, namely mains voltage insulation.

Can existing 1-10V control lines be used?
Yes.

Can control and power cables be laid together?
Yes. A 5 x1.5 mm2 NYM cable can be used for example.

What happens if I have DALI ECGs from different manufacturers in the same system?
No problem; the units are DALI-compatible if they carry the DALI symbol.
(You may just find that different preheat times (lamp switch-on times) are needed).

Will there be further DALI control gears/ modules?
Yes. For example for LEDs or for halogen lamps.

Can controllers from different manufacturers be combined?
No. In any control system only the DALI ECGs are interchangeable, not the control components.

Lighting control made even easier: *Touch DIM*

Dimming with mains voltage

To make lighting control with DALI components even easier, OSRAM has come up with something special for its new generation of DALI ECGs – the Touch DIM one-switch control. It is now possible to dim and switch the control gear directly with mains voltage at the control terminals. To use this function all that is needed is appropriate wiring of the ECGs.

More than standard

Touch DIM is an additional function that goes beyond the functionality defined in the DALI standard. With Touch DIM, as with DALI operation, there is no need to worry about the polarity of the control lines. This is a distinct advantage over the widely used 1-10V interface.* It could not be easier for both operating modes or wiring variants. What's more, Touch DIM mode offers the following comfort functions:

- Soft starting from any dimmer setting
- Automatic dimming to the stored reference value
- Override dimming at any time
- Storage of the reference switch-on value in the ECG
- Storage of the current status in case of a power failure

** The Touch DIM function is also possible with OSRAM converters from DALI to the 1-10V interface.*

Automatic changeover

All that is needed for Touch DIM is a standard switch for mains voltage. The ECG is changed over from DALI (factory default setting) to the Touch DIM function by pressing the switch for at least 3 seconds. This ensures that the function is not activated by mistake. If the ECG is used again in a DALI system, the unit automatically changes over again with the next DALI command. It is possible to toggle between the two operating modes any time and any number of times.

Either – or

Touch DIM must not be used simultaneously with a DALI control system as this may lead to malfunctions in the ECG/converters or in the control system. Either DALI mode or Touch DIM mode.

For a general overview of DALI see the DALI Handbook, published by the Activity Group DALI (AG DALI). The technical details of DALI control units and DALI ECGs from OSRAM are given in the OSRAM DALI Guide and on the OSRAM home page at www.osram.com

TOUCH
DIM

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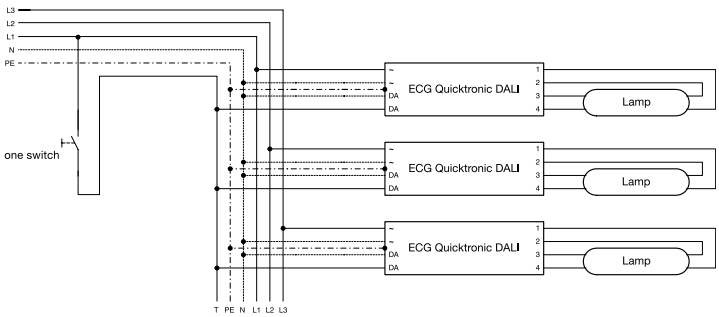

Wiring for one-switch operation, Touch DIM

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