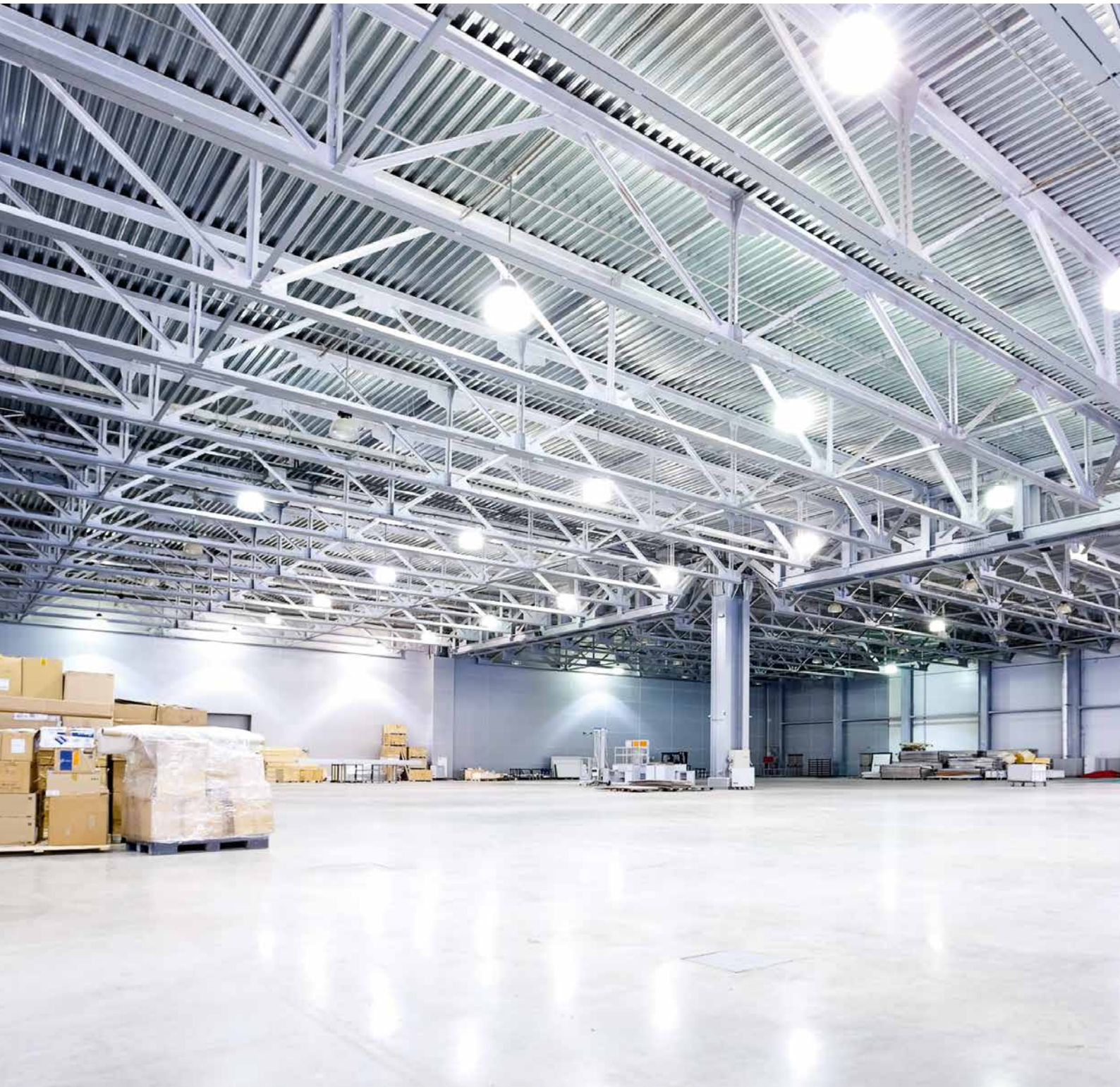
Lighting Control Solutions



Contents

zhu difeng, Fotolia

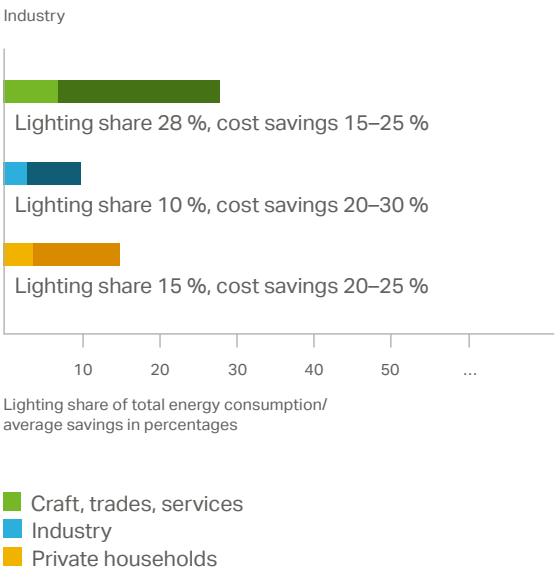
ENERGY EFFICIENCY THROUGH LIGHTING MANAGEMENT

Artificial light illuminates living spaces, office buildings and manufacturing halls. We also rely on it to light up the streets at night and provide vibrant settings for attractions and displays.

General society is incredibly dependant upon lighting – in fact, lighting currently accounts for some 15 % of worldwide electricity consumption. However, within industrial facilities, service providers and commercial businesses, this consumption is considerably higher at 30 %. Clearly, lighting not only impacts our well-being, but the electricity bill as well. In times of increased energy prices, modern lighting technology can help save electricity quickly and effectively to cut costs. How much, though, depends on the type of company – in large industrial buildings, there are obviously more lights than in a workshop.

Moreover, general factors also play a role – such as the size and height of a room, the design of the lights used or the lighting output. Any potential savings are then optimized with state-of-the-art lighting management that is backed by a trusted control system which specializes in efficiency. This allows companies to reduce lighting-related energy consumption by up to 70 %.

Lighting Share and Energy Savings Potential
(Source: Energieagentur BMU, DENA)



Lighting share of total energy consumption/
average savings in percentages

- Craft, trades, services
- Industry
- Private households

MODERN LIGHTING TECHNOLOGY

Demand-Oriented, Convenient, Energy-Saving

Modern lighting management offers more than mere reductions in energy and costs, it unites economics and resource conservation with user comfort and flexibility.

Its foundation is an intelligent lighting control system, which ensures that the correct light is available in the right amount at the right time by using daylight sensors, presence sensors and thoughtfully programmed lighting scenarios.

Source: BMW

Switching
More than simply switching lamps on and off: Lighting management enables the creation of individual solutions. For example, it can adapt to production processes, maintenance intervals or to employees' work schedules.

Christian Hillebrand, Fotolia

Dimming
Individually controlling lighting intensity effectively adapts both the lighting ambiance and lighting conditions to user requirements. Dimming also saves energy and increases the lifespan of the lights.

lightpixel, Fotolia

Constant Light Control
Perfect for office buildings or production facilities with daylight: Combining brightness sensors, presence detectors and defined lighting intensities always ensures sufficient lighting – and saves electricity if the sunlight is particularly bright.

photocreo, Fotolia

Color Temperature Control
From warm white to cold white – lighting control systems enable customization of the color temperature. Depending on the use, custom lighting increases performance or provides a cozy nighttime atmosphere.

Michael Warwick, Shutterstock

Special Lighting Effects
The right light brings buildings and objects to life. Colorful facades, atmospheric background lighting or presenting exhibits in exciting contrasts – creativity is virtually unlimited thanks to modern lighting control.

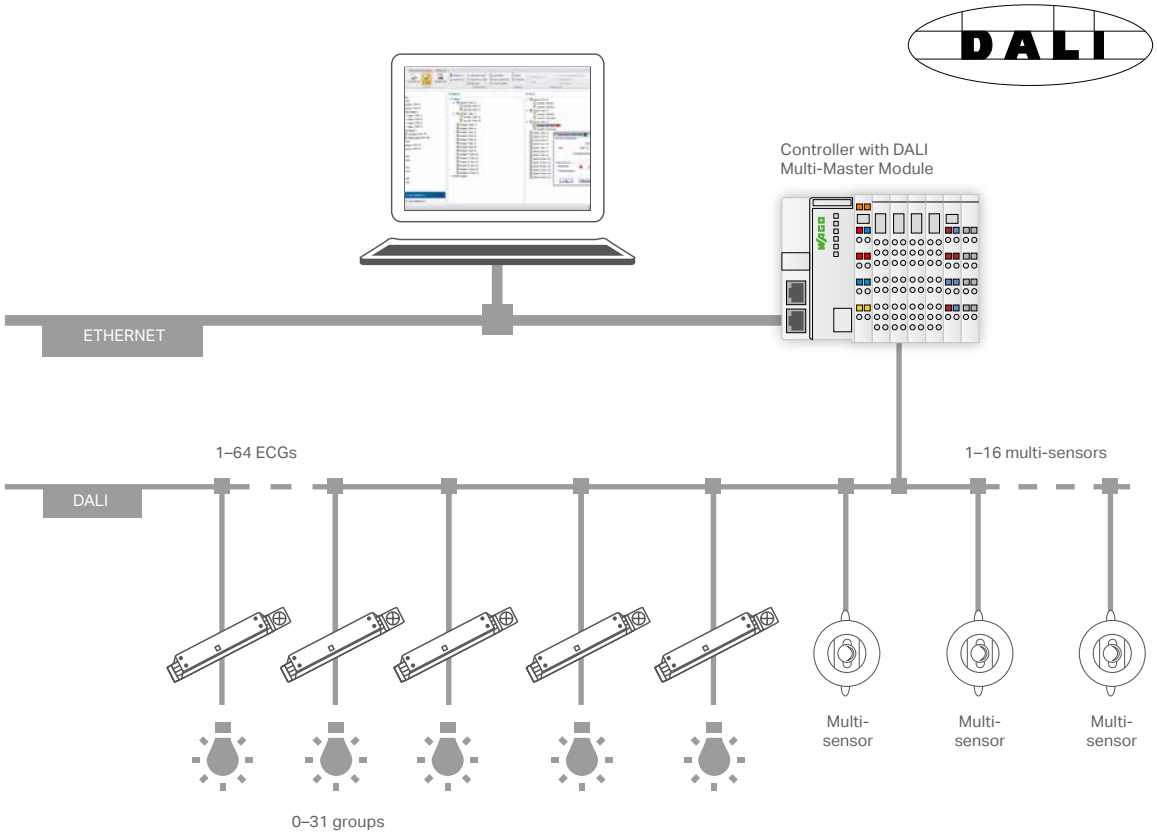
zhudifeng, iStock

LIGHTING TECHNOLOGIES

DALI – Digital Addressable Lighting Interface

DALI is a communication protocol that controls lights. It communicates between lighting applications, such as electronic ballasts, brightness sensors, presence detectors or DALI controllers. DALI is used in building automation to control individual lights and groups of lights. In functional building and utility construction today, the vast majority of dimmable lights are already equipped with DALI components.

The key benefit is obvious: DALI offers incredible flexibility through the simple adjustment of lighting control to new conditions. No rewiring is necessary with a new room division or a change in room usage – the allocation or grouping of the lights is simply changed instead. This manufacturer-independent protocol is defined in the IEC 62386 standard and ensures interoperability of control devices in lighting applications.



Communication	Bidirectional
Speed	1.2 kBaud
Transmission time	833 µs per bit
Telegram duration	One telegram consists of 19 bits and lasts 15.83 ms
No. of subscribers	Up to 64 DALI addresses
Cable lengths	Up to 300 m
Wiring	Reverse polarity protected in line, tree, star and mixed structures
Applications	Control a wide range of lights – from basic fluorescent lamps right through to the LEDs. This covers the typical lighting used in office and administrative buildings, halls, tunnels and many more locations.
Typical applications	Switching, constant light control, color temperature control, dimming

Advantages:

- **Automated lighting management**
- **User-friendly operation**
- **Automatic addressing of slaves**
- **Detection of faulty lights**
- **Flexible wiring**
- **Interoperability**

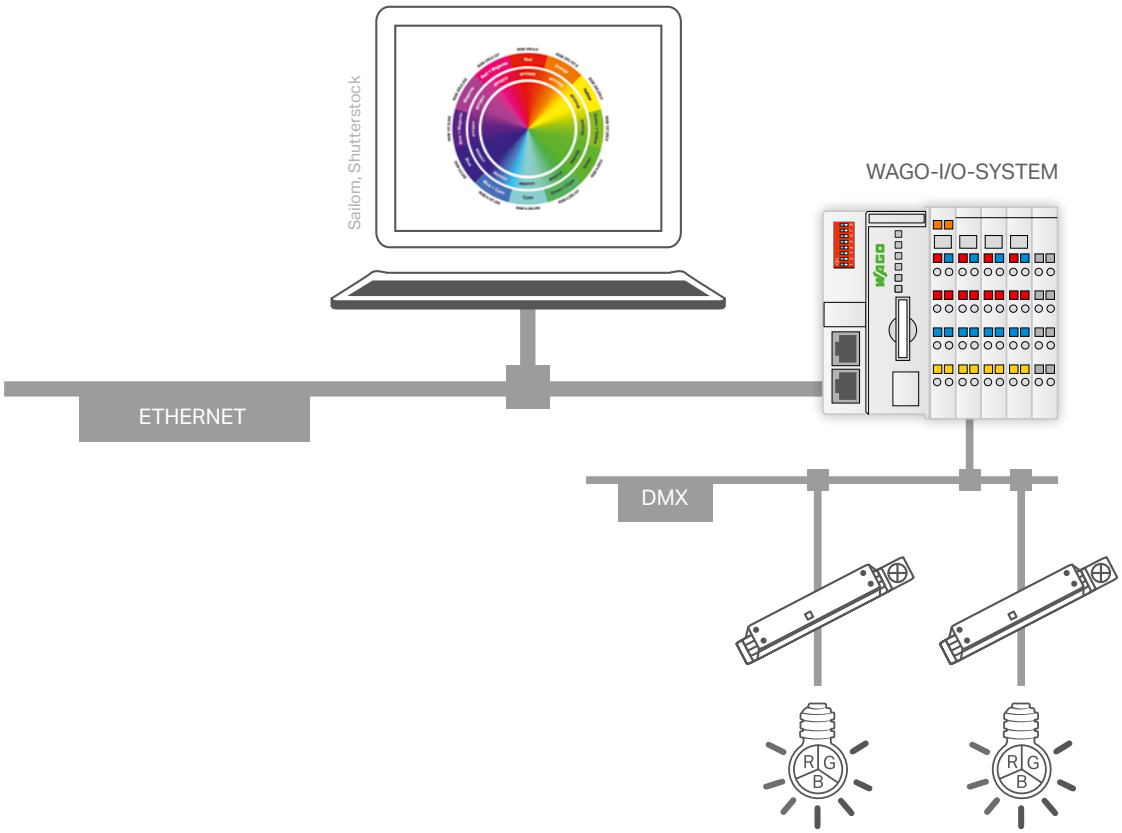
buketbariskan, iStock

LIGHTING TECHNOLOGIES

DMX – Digital Multiplex

DMX is a communication protocol which originated in the theater to provide artistic stage and event lighting. Its primary focus has been controlling intelligent lighting equipment and special effect devices. Given its flexibility, DMX is quickly becoming common in functional and utility buildings – mostly when lighting is used as a design element.

The protocol focuses on modern LED technology, which is used for special lighting effects because it is efficient and provides a dazzling array of colors. DMX is thus particularly suited for controlling color and light temperature; it also enables, for example, the impressive illumination of facades or the highlighting of special architectural features. DMX is based on the RS-485 serial interface standard. Typically, three-pole XLR plugs are used for cabling.



Communication	Bidirectional
Speed	250 kBaud
Transmission time	4 µs per bit
Telegram lifespan	One telegram of 512 channels lasts 22.76 ms
No. of subscribers	32 devices
Cable lengths	Up to 500 m
Applications	Control lighting effects, e.g., foyer lighting or architectural lighting and much more
Typical applications	Switching, special lighting effects

Advantages:

- **High transmission rates**
- **Rapid color change**
- **Integrate different device types (e.g., touch panels, stage lighting, mixing desks)**

CONTROLLERS AND BUS MODULES

One System for Every Application

WAGO offers a comprehensive range of fieldbus controllers and bus modules that support established protocol standards. The firm reduces hardware and system costs while providing virtually unlimited application possibilities. Configuration, programming and visualization are easily performed using the IEC 61131-3-compliant WAGO-I/O-*PRO* software package.

The WAGO-I/O-SYSTEM provides simple operation and maximum efficiency!

Controllers

Bus modules

Maximum Return on Investment

- Open, fieldbus-independent design optimizes investments

Minimal Lifecycle Costs

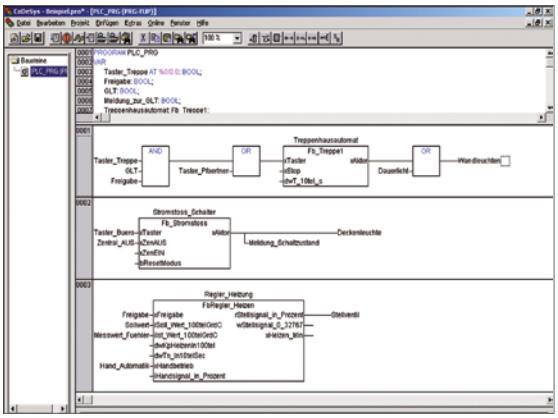
- Simple operation reduces planning, commissioning and maintenance costs
- Streamlined design significantly reduces installation errors
- Easy-to-install components eliminate unnecessary (and often costly) accessories and manufacturer-specific configuration tools

Compact Design

- Finely granular I/O modules enable node customization
- Space-saving design permits high integration density and direct connection

Maximum Operational Reliability

- Industry-leading quality and reliability for a wide variety of applications – all WAGO components adhere to the highest standards for environmental exposure (e.g., climate, vibration and shock loading, EMC and emitted interference)

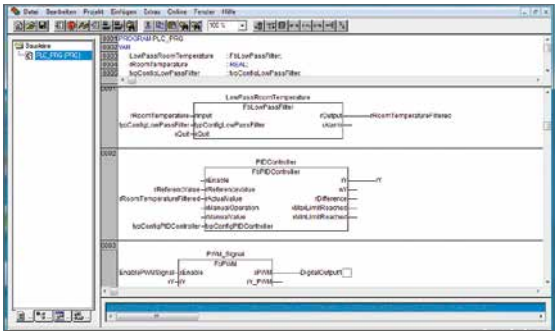


Software

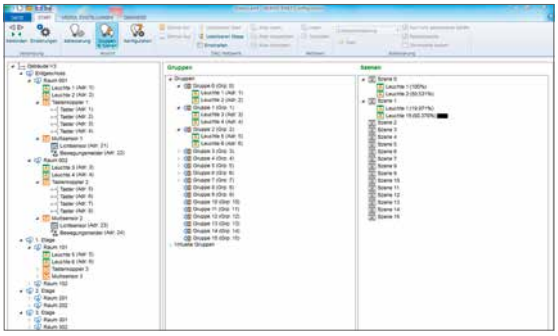
KNX ETHERNET DMX BACnet DALI enocean MP-BUS Modbus

BASIC WAGO SOFTWARE

WAGO-I/O-*CHECK*
WAGO-I/O-*CHECK* is an easy-to-use Windows® application for checking inputs and outputs, as well as displaying a WAGO-I/O-SYSTEM 750 node. The node does not have to be connected to a fieldbus system. In addition to checking the actuators/sensors connected on the field-side and module-specific configurations, the application can also document node configuration.



WAGO-I/O-*PRO*
WAGO-I/O-*PRO* is a basic tool for creating control programs. The software contains freely selectable and graphic/text-based programming languages (FBD, LD, IL, ST, CFC and SFC) according to the international standard IEC 61131-3. In addition to individual programming using WAGO-I/O-*PRO*, function blocks can also be accessed from pre-designed libraries. Graphically structured programs, such as those created with the Function Block Diagram (FBD) programming language, are very easy to create.



Specific Software Tools
In addition to these general software tools, WAGO also offers tools specifically engineered for select technologies, applications and products. Among these are WAGO's DALI and BACnet Configurators, which allow devices connected to a specific network to be easily and efficiently addressed and parameterized. The individual tools and functions are described on their respective product or technology pages.

designsstock, PantherMedia; Sailom, Shutterstock

Web Visualization
Project-specific visualizations are generated in the WAGO-I/O-*PRO* software's editor. Ready-made macros with a graphical configuration interface are available for certain functions or function blocks, which can be easily integrated into a project. Visualization is performed on a Webserver, which is locally contained in the ETHERNET controllers. This allows the visualization to be displayed in a Web browser on any Internet-connected computer connected (e.g., for remote maintenance). The Web visualization can also be accessed on a tablet or smartphone using WAGO's free app.

lightpixel, Fotolia

*flex*ROOM®

Our Solution for Office and Administrative Buildings – A Variable Room Concept

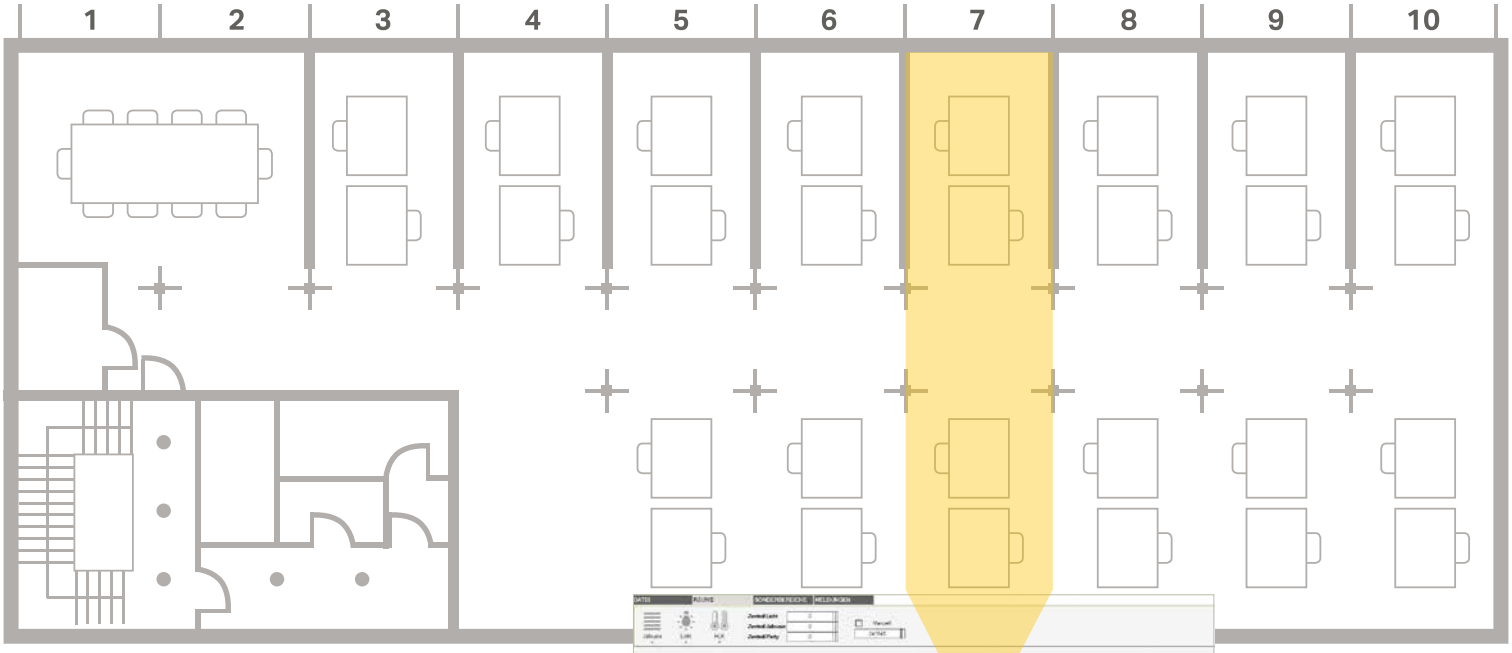
WAGO's ***flex***ROOM® concept is based on room segments. The basic idea: A segment is the smallest common denominator and the part of a room to which a window is allocated. Using this principle, WAGO's ***flex***ROOM® concept can be readily and flexibly applied to any office or administrative building. Each segment is provided with functions for sun protection, lighting and room temperature control.

Our Concept
Planning, commissioning and building operation must demonstrate maximum efficiency and a high degree of adaptability. Pre-configured programs and pre-defined hardware significantly streamline planning and commissioning. The more applications created within a project, the greater the benefit. Flexible building operation (e.g., conversions and room remodeling) via special maintenance levels eliminates external service costs.

Install, commission and configure according to project specifications – WAGO ***flex***ROOM® combines these strengths into a standard module. The integrated control unit and application software are precisely tailored to room requirements.

Configure Instead of Program!
Each WAGO ***flex***ROOM® Distribution Box has a Web interface. Both the commissioning technician and end-user can configure controls for each room via a standard Web browser, regardless of location and distribution box. Complete wall relocations, room assignments, lighting and shading groups can be changed from the parameter interface. No additional software is required.

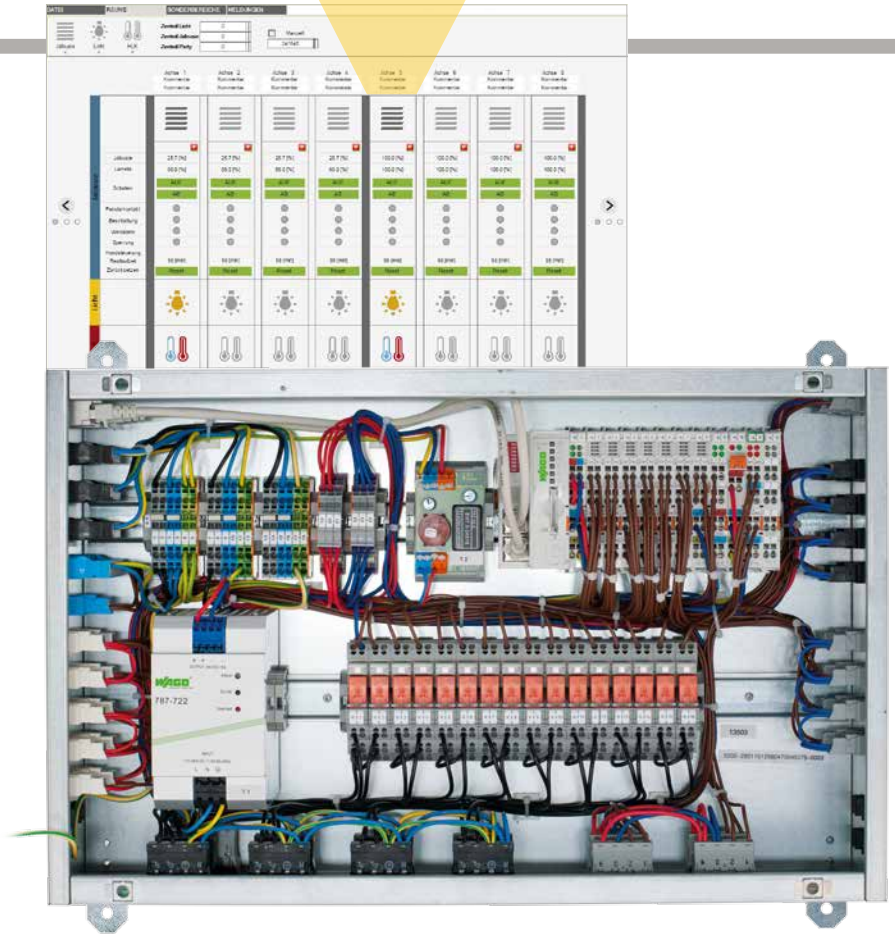
Parameter Setting
For each room, parameters can be individually stored for lighting, shading and room control. All parameters are cyclically saved either directly in the distribution box or on a separate computer via network connection. A higher-level management station accesses the distribution box parameters via the open Modbus TCP/IP protocol. This ensures that all modifications can be implemented on site or via the management station. BACnet or KNX IP systems can also be connected via Modbus TCP/IP.



*flex*ROOM® Advantages

Ready-to-operate distribution boxes are then delivered for immediate installation directly into a suspended ceiling or a sub-floor. Segment configuration is performed directly in the distribution box via a standard Web browser. No expert knowledge is required to configure rooms or convert them later.

Several ***flex***ROOM® Distribution Boxes can be wired into a building automation network via ETHERNET to automate a building area, floor or an entire section of offices. A standard Web browser also establishes communication between the distribution boxes. If electrical distribution boxes are already present, then ***flex***ROOM® components can also be installed in them, or retrofitted during facility renovation. Space conversion costs are reduced with ***flex***ROOM® because are expenses transparent, making them predictable.



Example of a ***flex***ROOM® Office Distribution Box for eight segments

More information?

Visit our website at:
www.wago.de/flexroom

iegors, Fotolia

OFFICE BUILDINGS

Conventional Switching – Inexpensive Lighting Control via Relay

The following requirements are met:

- Switching individual lights or lighting groups
- Overriding lights using a timer
- Typical lighting for hallways, restrooms, tea kitchens and stairwells, as well as utility and installations rooms

Libraries and Function Blocks

Scheduler

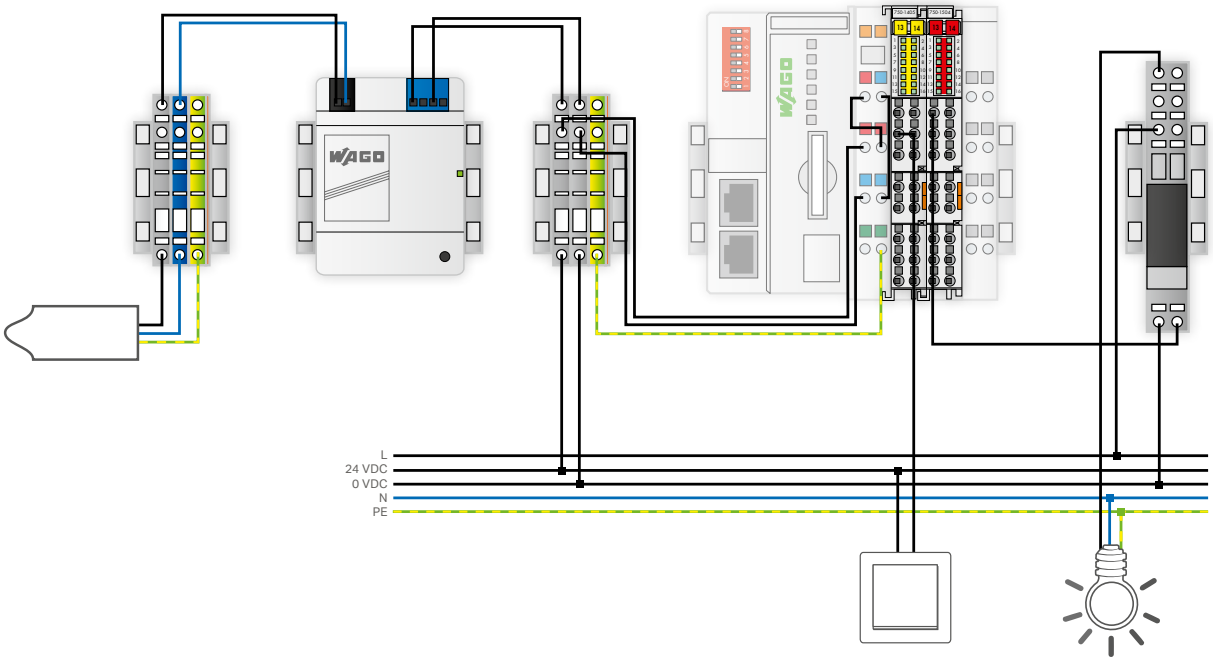
- Time switching programs (week, month)
- Detection of public holidays
- Allocation plan

Building Automation

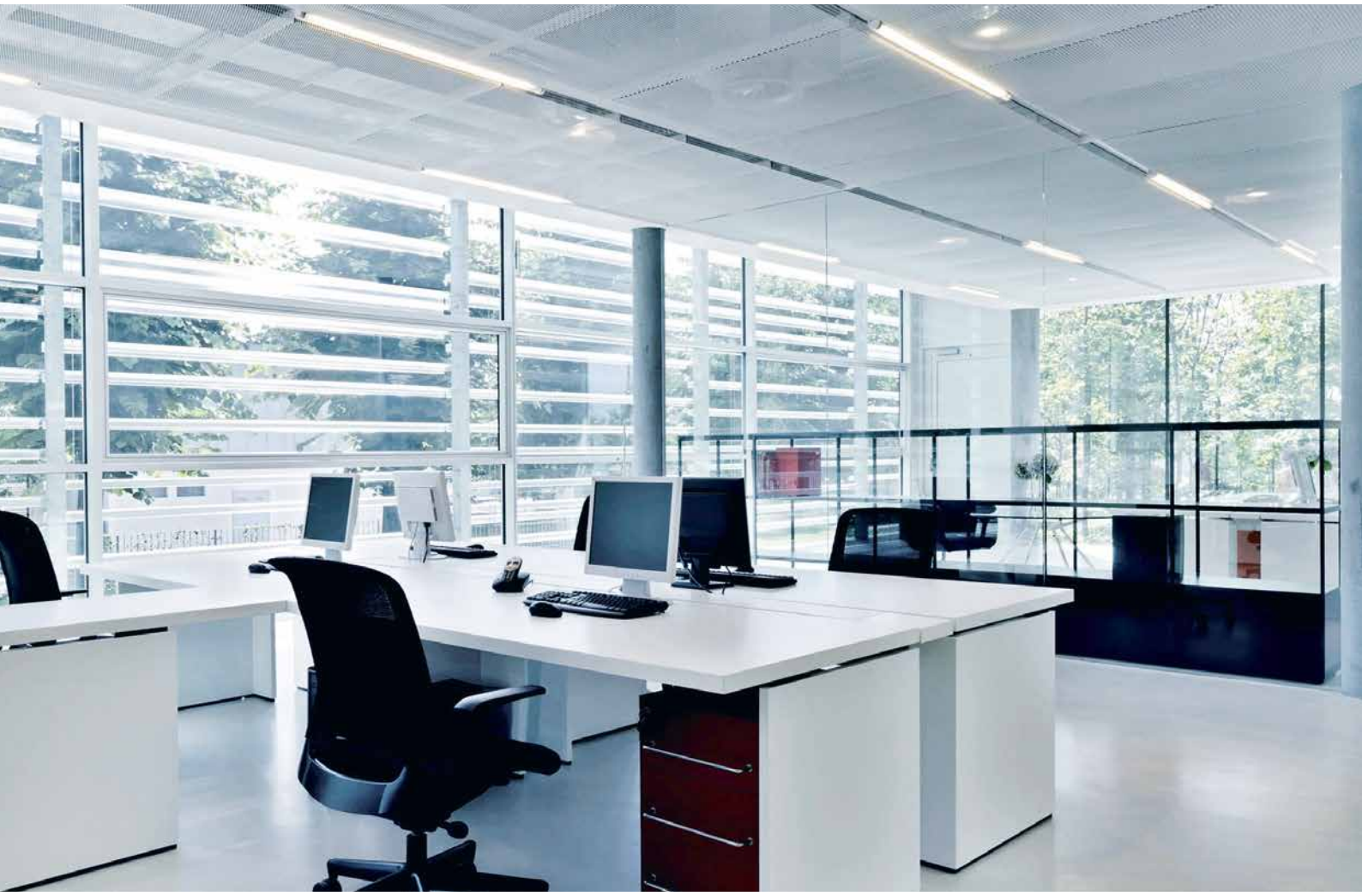
- Latching relays
- Light control
- Stairwell light control
- Twilight control
- Evaluation of button actuation
- Scenes

Web Calendar

- Web-based calendar software
- User authentication
- Different calendar views
- Language, color, time zone selection
- Three priority levels
- 50 channels with 24 times per day



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-1012	Power Supply for I/O
750-88x	ETHERNET Controller
750-430	Digital Input Module
750-530	Digital Output Module
750-600	End Module
788-354	Relay



Teun van den Dries, iStock

OFFICE BUILDINGS

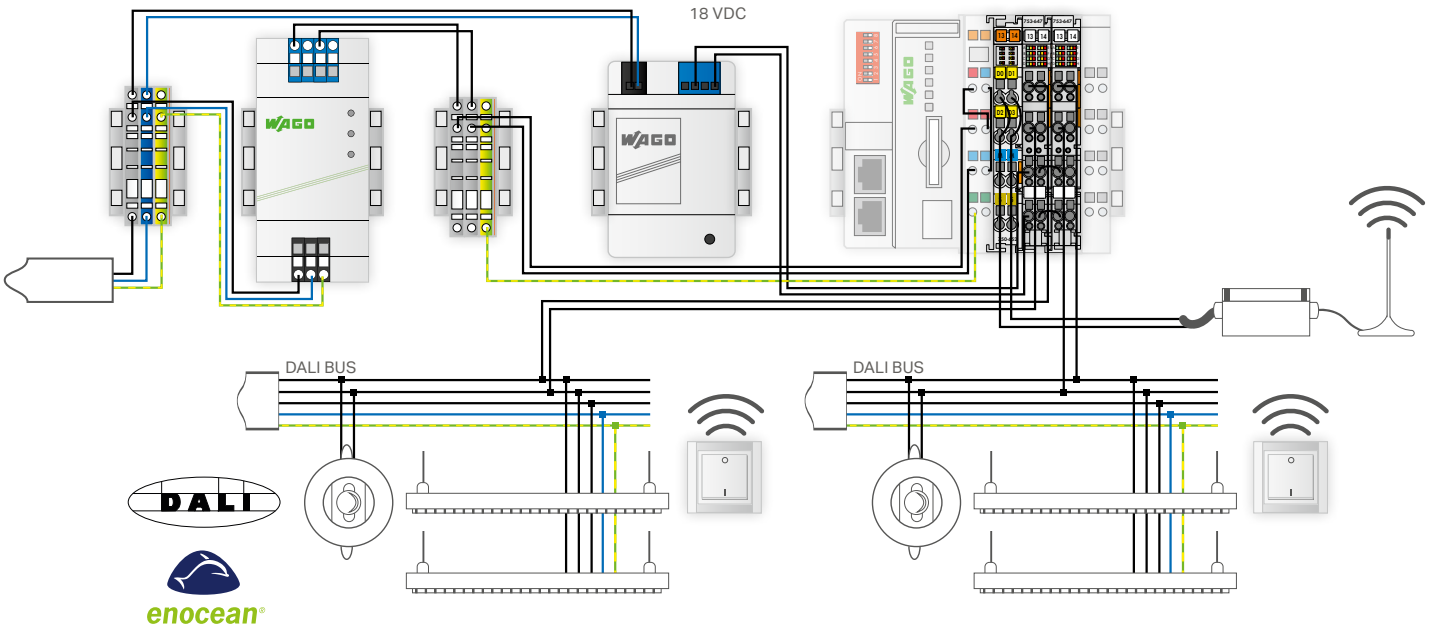
Dimming and Control – Modern DALI Lighting Control

The following requirements are met:

- Evaluation of allocation information/ presence detection
- Lighting changed according to presence detection/automatic light
- Overriding lights using a timer
- Automatic lighting control to minimize lighting intensity or provide constant light control
- Dimming lights during the day to minimize light intensity
- Light status query

Libraries and Function Blocks

Scheduler	DALI	DALI Sensor Types
• Time switching programs (week, month) • Detection of public holidays • Allocation plan	• Addressing and localization of lighting • Groups and scene formation • Switching • Dimming • Constant Light Control • Status query • Operating hours evaluation • Error detection	• Sensor addressing and localization • Presence detection • Brightness detection • Button recognition



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-1012	Power Supply for I/O
787-1007	DALI Power Supply
750-88x	ETHERNET Controller
750-652	Serial Interface for EnOcean Gateway
753-647	DALI Multi-Master Module
750-600	End Module
2801-8201	WAGO DALI Multi-Master Kit
758-940/002	EnOcean Button
Any	RS-485 EnOcean Gateway

Are you familiar with our DALI configurator?

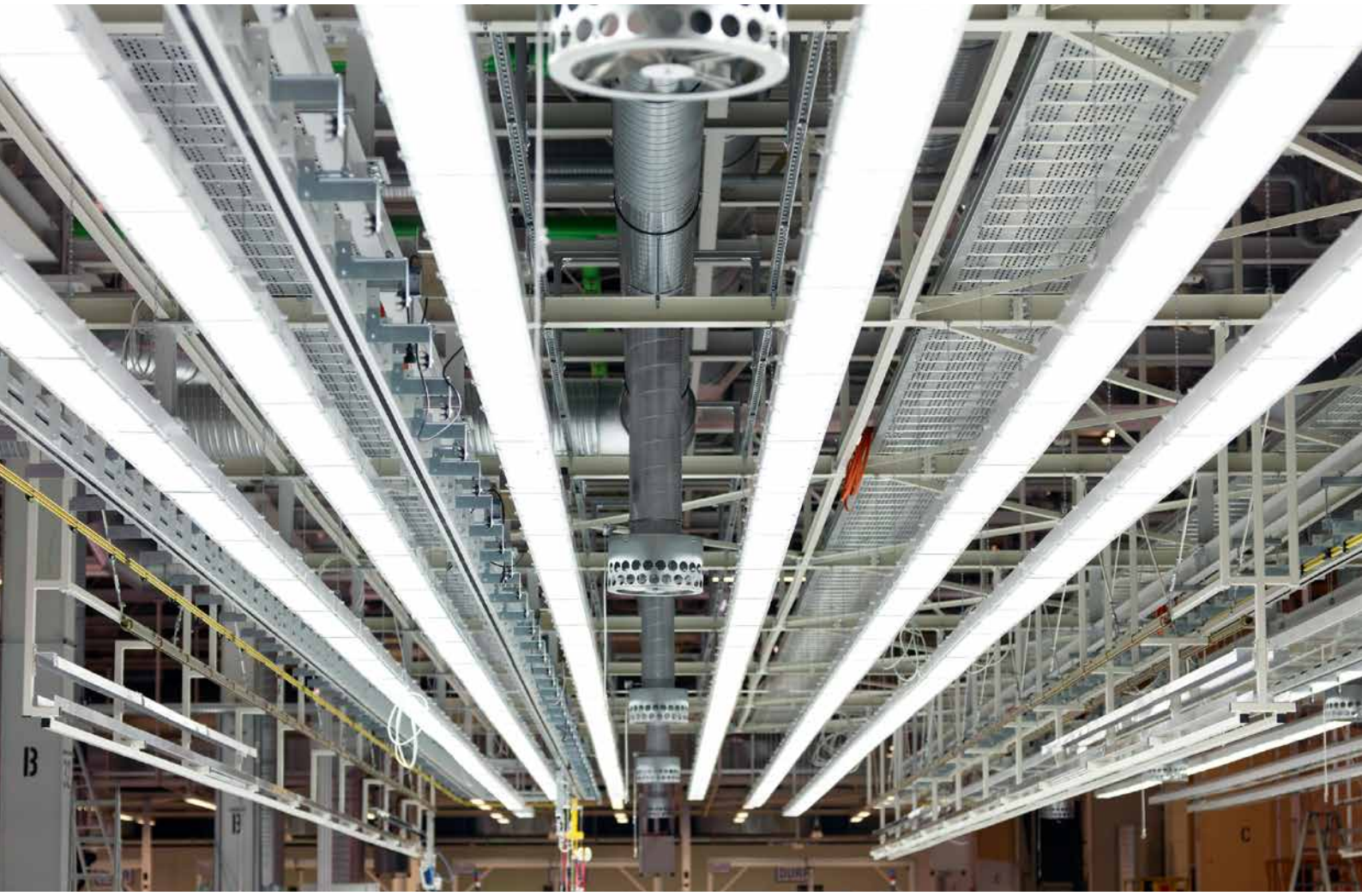
The free DALI Configurator is a graphic configuration interface for configuring and starting up a DALI Multi-Master Module (753-647) and the DALI network. www.wago.de/dali

EnOcean

- Connecting sensors per EEP
- Unidirectional and bidirectional communication
- Support for EnOcean switches, room operating panels

Web Calendar

- Web-based calendar software
- User authentication
- Different calendar views
- Language, color, time zone selection
- Three priority levels
- 50 channels with 24 times per day



Source: BMW

WAGO LIGHTING MANAGEMENT

Our Solution for Production Facilities and Warehouses: An Intelligent Concept for Flexible Lighting Management

Our Concept
WAGO Lighting Management is a proven concept based on predefined hardware and preconfigured software which greatly simplifies both planning, commissioning and operation. The basic idea: WAGO Lighting Management is based on different lighting requirements in warehouses and production facilities.

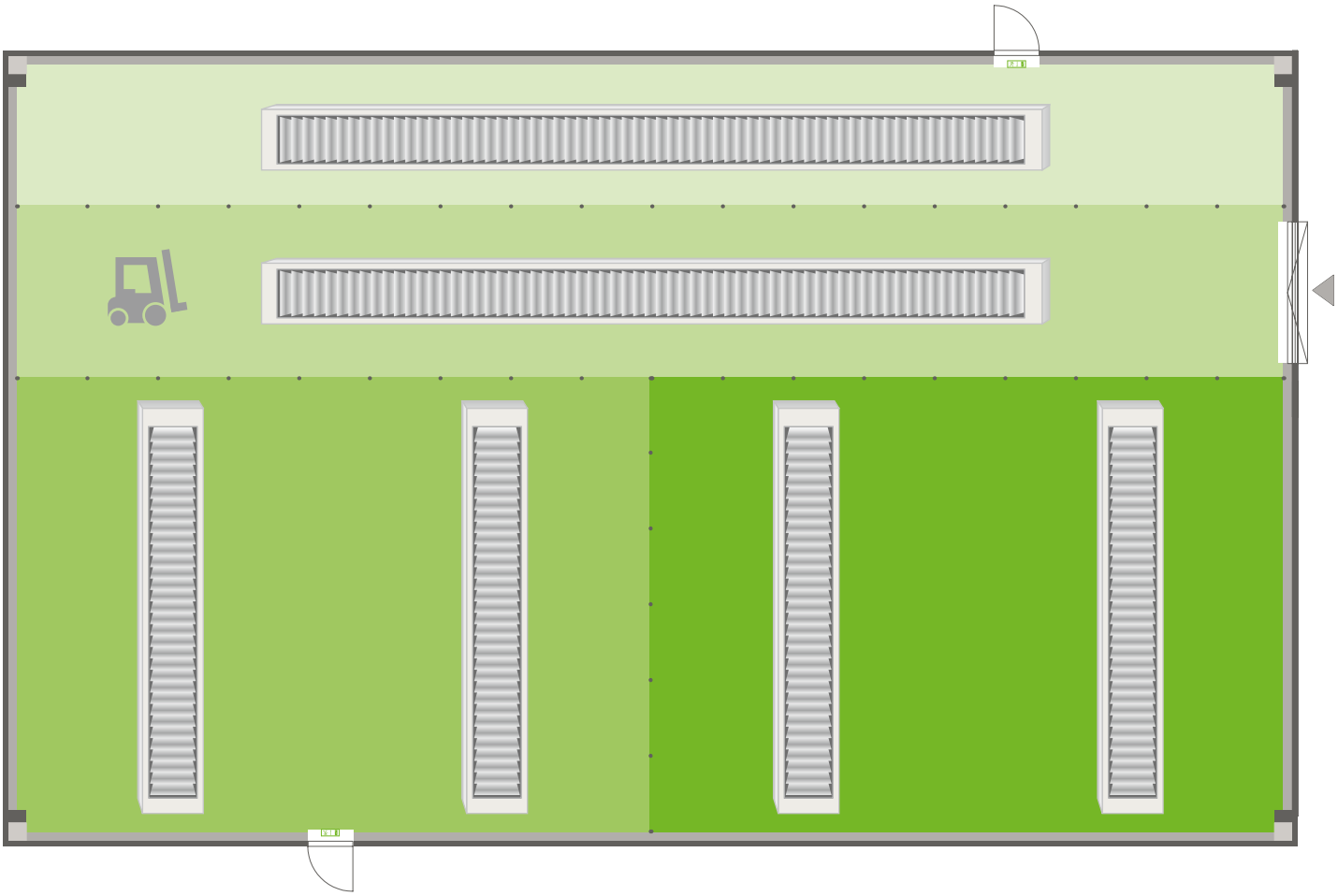
For example, a production facility is divided into virtual rooms in which the light can be flexibly adapted. Each virtual room receives signals from the sensors and actuators in order to automatically set the appropriate light intensity. By using the virtual rooms, conversions and room remodeling can be implemented quickly and simply via Web configuration.

Operation
WAGO Lighting Management features a Web interface allowing you to easily create and edit virtual rooms. Do you need to illuminate a production line, hallway or a storage area? No problem – simply create three different rooms with the required functions.

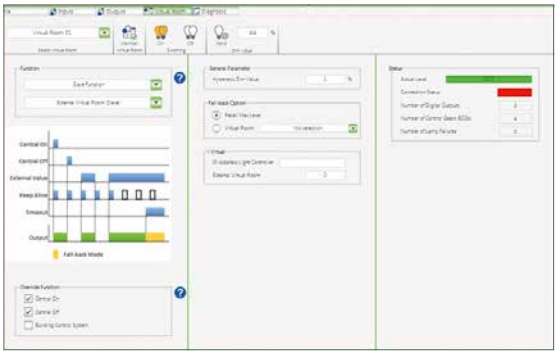
Parameter values are stored on an SD card or a backup server via FTP. The values can be forwarded to a higher-level building control system or to a production control center via Modbus TCP/IP.

Talk to us!

Together we will create a customized solution for your application.

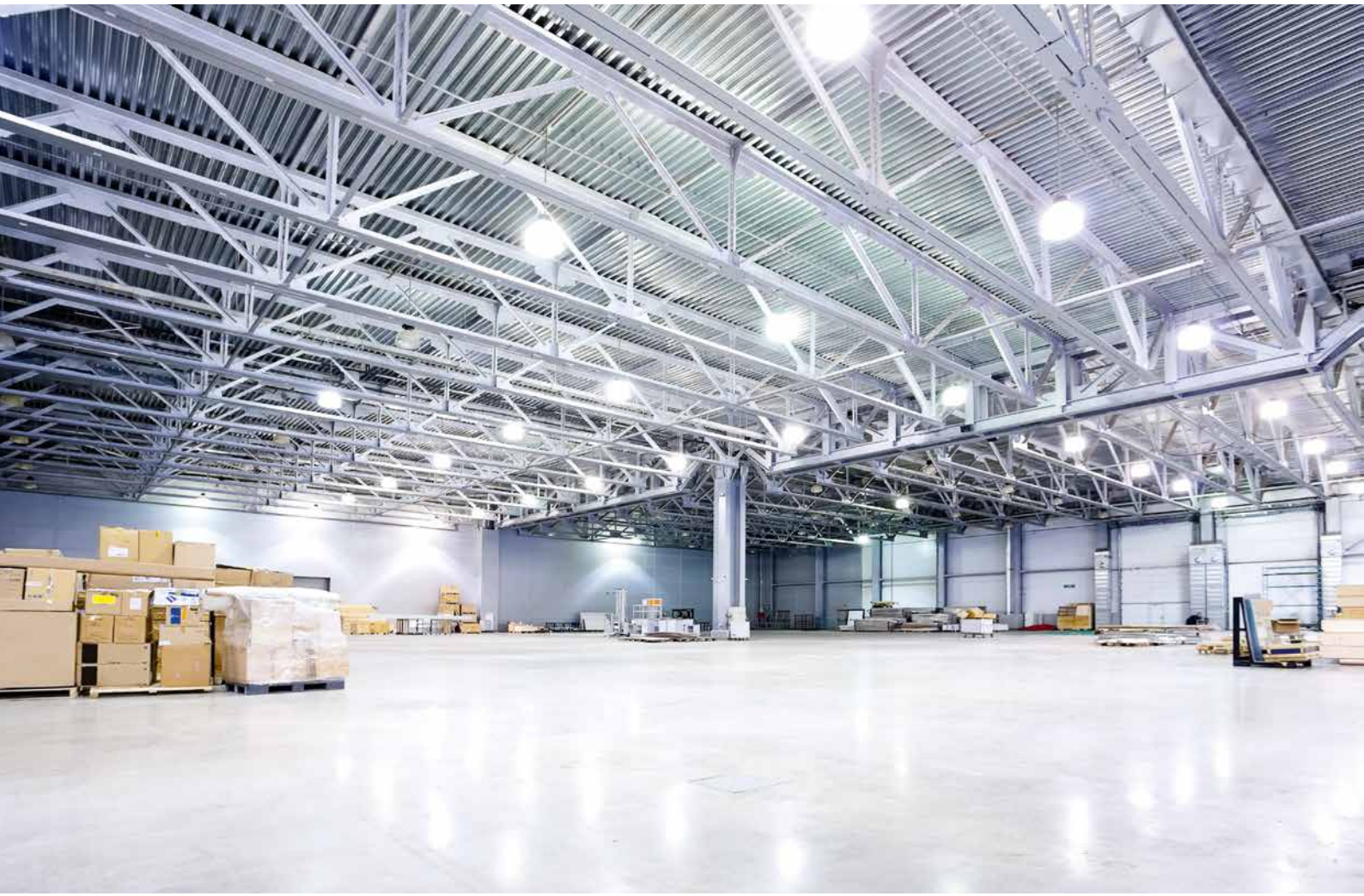


Works photo, WAGO



WAGO Lighting Management Benefits

- Reduce lifecycle costs through efficient lighting management
- Adapt to all equipment requirements
- Commissioning via easy wizard-based configuration
- Simple, programming-free conversion
- Connect to higher-level management and control systems within industrial or technical building environments



jkitan, iStock

WAREHOUSES

Conventional Switching via 1/3 and 2/3 Circuit

The following requirements are met:

- Switching individual lights or lighting groups
- Overriding lights using a timer

Libraries and Function Blocks

Building Automation

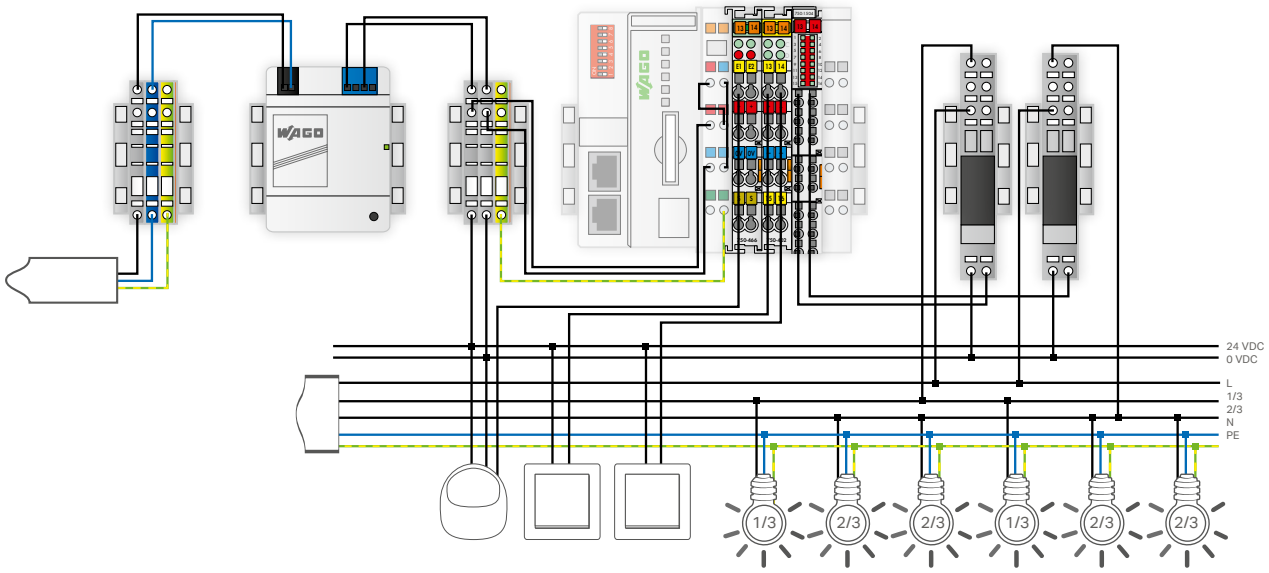
- Latching relays
- Light control
- Stairwell light control
- Twilight control
- Evaluation of button actuation
- Scenes

Scheduler

- Time switching programs (week, month)
- Detection of public holidays
- Allocation plan

Web Calendar

- Web-based calendar software
- User authentication
- Different calendar views
- Language, color, time zone selection
- Three priority levels
- 50 channels with 24 times per day



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-1012	Power Supply for I/O
750-88x	ETHERNET Controller
750-430	Digital Input Module
750-530	Digital Output Module
750-600	End Module
788-354	Relay

Works photo, WAGO

PRODUCTION FACILITIES

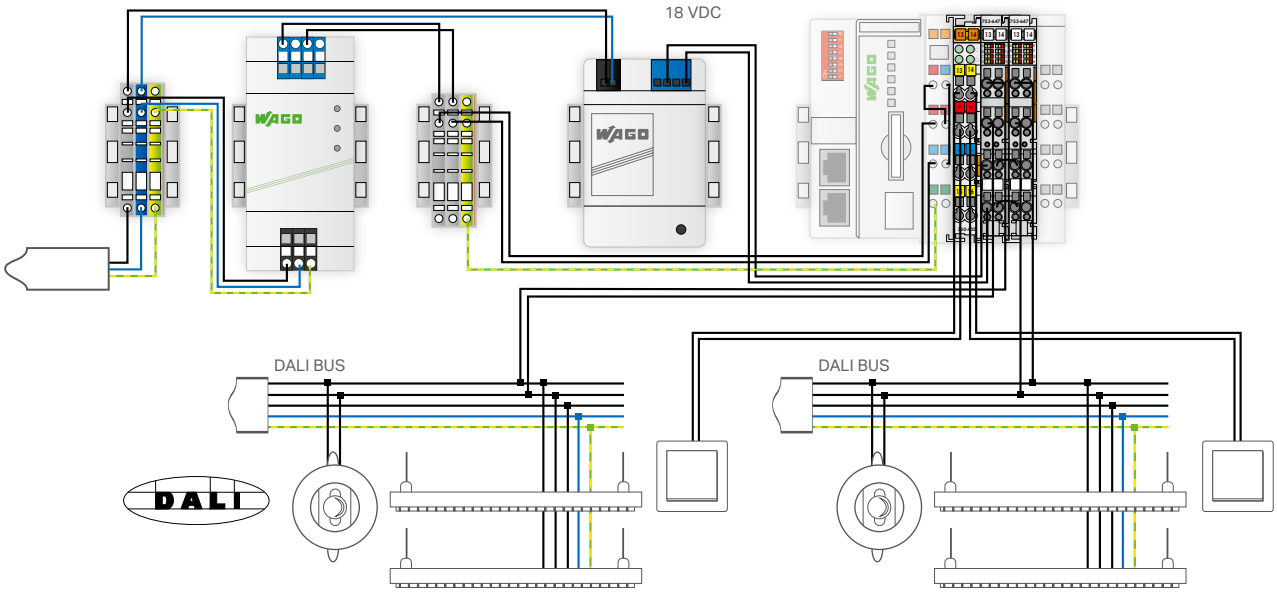
Modern Production Facility Lighting Augmented by Daylight

The following requirements are met:

- Allocating short addresses
- Group and scene control to trigger predefined lighting moods
- Evaluation of allocation information/ presence detection

Libraries and Function Blocks

Building Automation	DALI	DALI Sensor Types
• Latching relays • Light control • Stairwell light control • Twilight control • Evaluation of button actuation • Constant light control 1–10 V • Dimming 1–10 V • Scenes	• Addressing and localization of lighting • Groups and scene formation • Switching • Dimming • Constant Light Control • Status query • Operating hours evaluation • Error detection	• Sensor addressing and localization • Presence detection • Brightness detection • Button recognition



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-1012	Power Supply for I/O
787-1007	DALI Power Supply
750-88x	ETHERNET Controller
750-402	Digital Input Module
753-647	DALI Multi-Master Module
750-600	End Module
2851-8xxx	DALI Sensors

Are you using a High Bay Sensor?

Normal presence detectors for the office area typically have a ceiling height range of up to four meters. High Bay Sensors, on the other hand, are designed for a mounting height of up to 13 meters.

Scheduler

- Time switching programs (week, month)
- Detection of public holidays
- Allocation plan

Web Calendar

- Web-based calendar software
- User authentication
- Different calendar views
- Language, color, time zone selection
- Three priority levels
- 50 channels with 24 times per day

thomas lehmann, iStock

RECEPTION AREAS

Special Lighting Effects with DMX – Stirring Emotions with Light

The following requirements are met:

- RGB color light control
- Periodic light sequences
- Cross fade sequence
- Channel value changes
- Saving color combinations

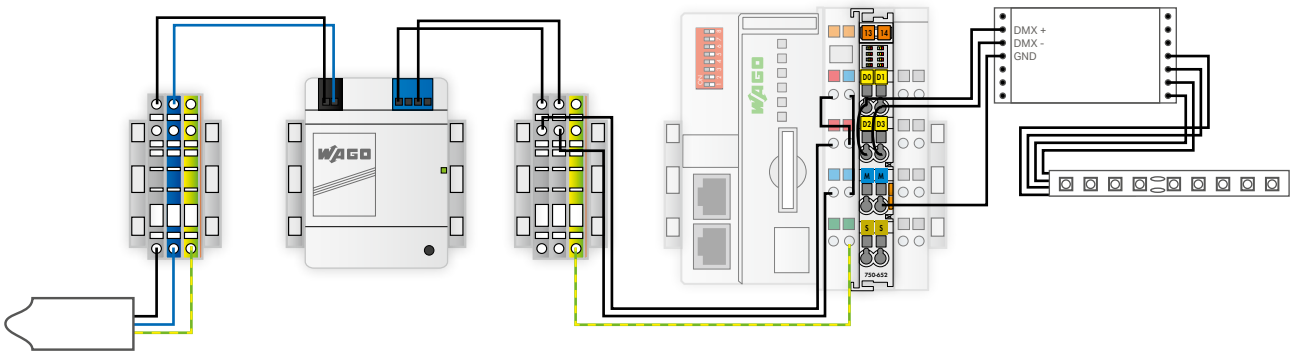
Libraries and Function Blocks

DMX

- Periodic light sequences
- Cross fade sequence
- Sequences for running light or flash effects
- RGB color visualization

Building Automation

- Latching relays
- Light control
- Stairwell light control
- Twilight control
- Evaluation of button actuation
- Dimming 1–10 V
- Scenes



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-1012	Power Supply for I/O
750-88x	ETHERNET Controller 750-88x
750-652	Serial Interface
750-600	End Module
Any	DMX 4-Channel RGBW Control Gear
Any	RGB LED Strip

WAGO supports up to 512 channels (1 DMX Universum).

We recommend a number of 21 channels to optimize operation.

Works photo, WAGO

HOTELS

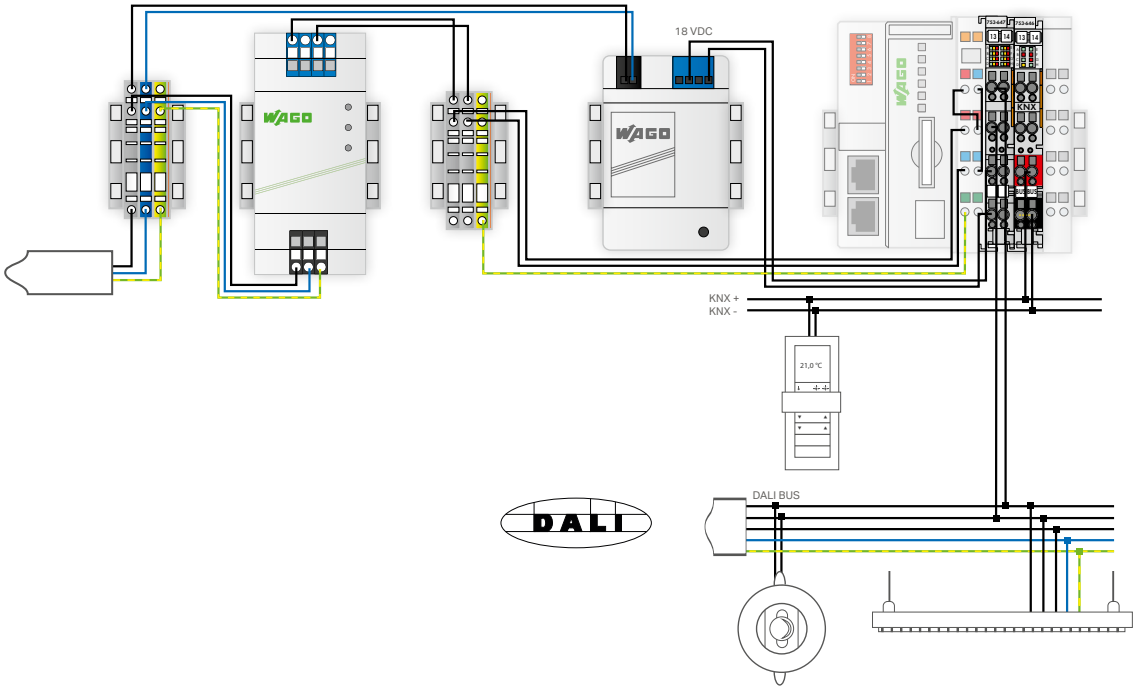
Room Lighting – DALI Color Control with KNX

The following requirements are met:

- Central ON/OFF
- Dimming
- Color temperature and light scenes
- Evaluating allocation information/ presence detection
- Lighting changed according to presence detection/automatic light
- Automatically control lighting to minimize light intensity and provide constant light control
- Very simple KNX to DALI connections

Libraries and Function Blocks

DALI Color Control	KNX	Web Calendar
• Light show (color mixing) • Color temperature	• Connecting KNX devices • ETS Plug-In • Freely editable KNX objects	• Web-based calendar software • User authentication • Different calendar views • Language, color, time zone selection • Three priority levels • 50 channels with 24 times per day



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-712	Power Supply for I/O
787-1007	DALI Power Supply
750-88x	ETHERNET Controller
750-402	Digital Input Module
753-647	DALI Multi-Master Module
753-646	KNX Module
750-600	End Module
2801-8xxx	DALI Sensors
Any	KNX Touch Sensor
Any	KNX Switch Actuator

Photo: toom Baumarkt

RETAIL CENTERS

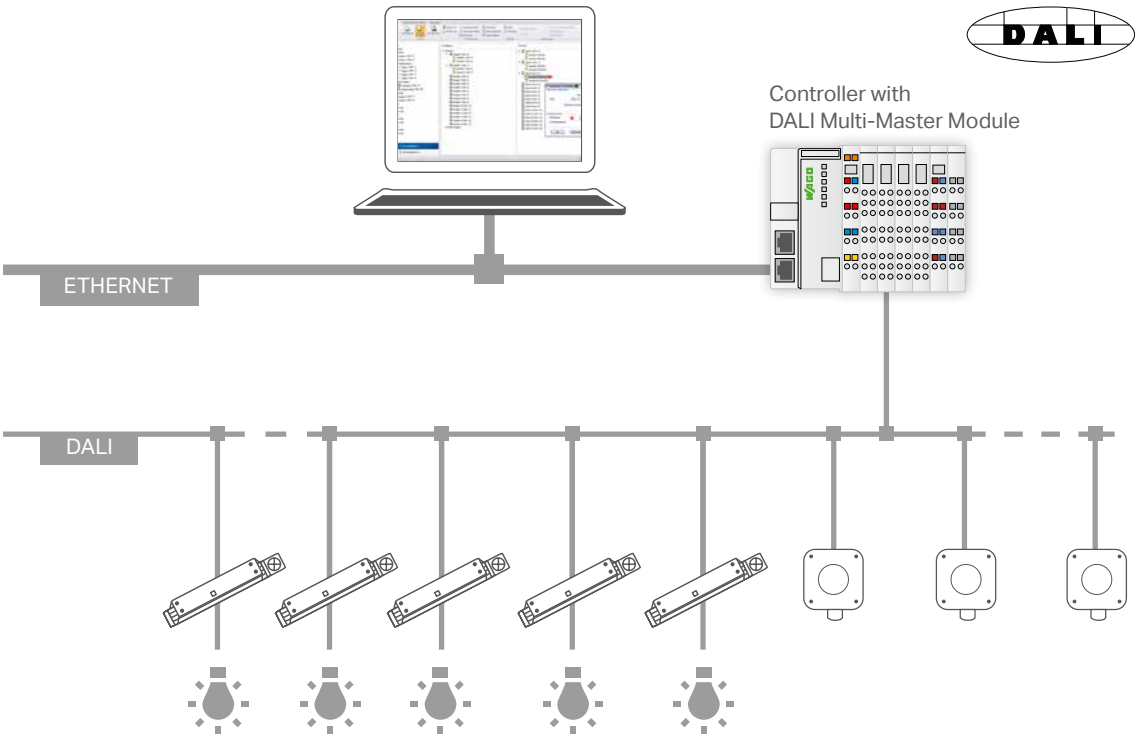
Daylight-Dependent Control in a DIY Store

The following requirements are met:

- Lighting (LED) in merchandising area
- Individually defined scenes depending on brightness sensors and store hours via a DALI bus
- Switching of side room lighting via buttons and motion detectors
- Central operation via touch panel and market manager PC possible

Libraries and Function Blocks

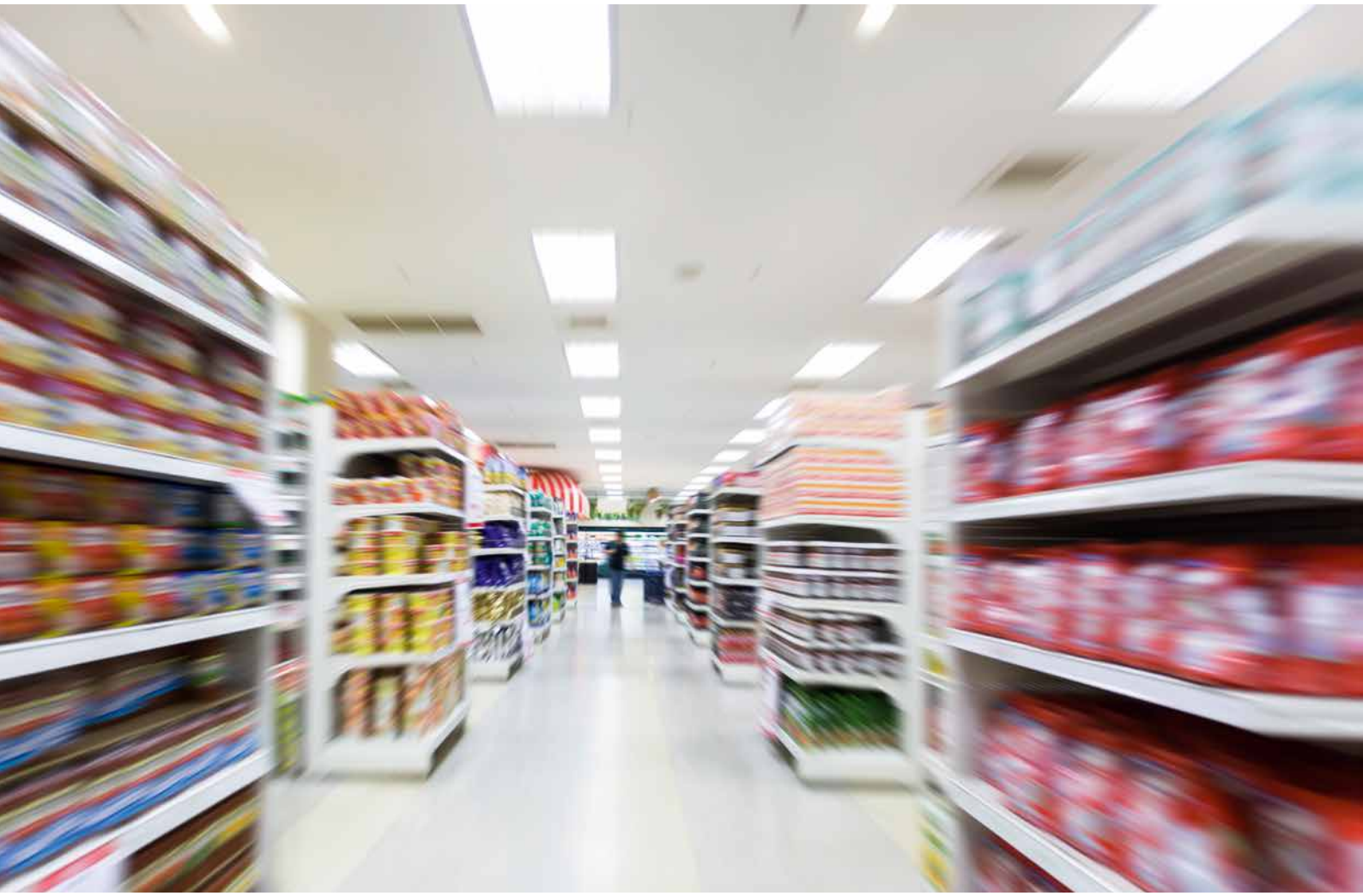
Building Automation	DALI	Power Measurement
• Latching relays • Light control • Stairwell light control • Twilight control • Evaluation of button actuation • Constant light control 1–10 V • Dimming 1–10 V • Scenes	• Addressing and localization of lighting • Group and scene formation • Switching • Dimming • Constant Light Control • Status query • Operating hours evaluation • Error detection	• Measuring current, voltage, active power, power factor and energy consumption • Configuration and visualization interfaces



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-1012	Power Supply for I/O
787-1007	DALI Power Supply
750-88x	ETHERNET Controller
750-459	0–10 V AI for Light Sensors
753-647	DALI Multi-Master Module
750-494	3-Phase Power Measurement Module
750-600	End Module
2007-8873	Terminal Block Assembly for Current and Voltage Transformers
855 Series	Plug-In Current Transformers
Any	Sensors

Data Logging & Reporting

- Data logging
- Data storage
- Data visualization



06photo, iStock

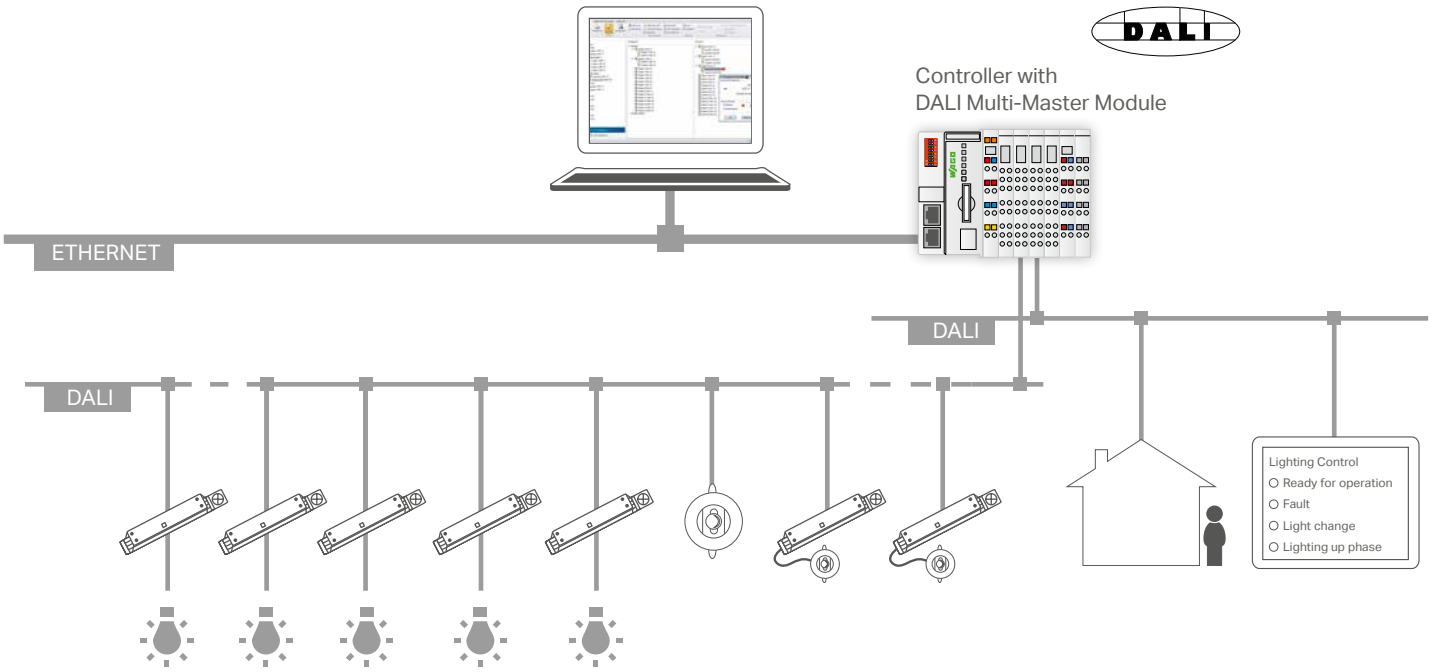
RETAIL CENTERS

Centralized Lighting Management for Sales Areas

DALI lighting control manages the lighting system in the merchandising area that consists of light bands and recessed light fixtures in the checkout area.

Features:

- Area lighting control for 1/3 and 3/3 circuits
- Readjustment of light intensity for light aging
- Daylight-dependent control in the checkout area
- Easy commissioning and error detection for system faults
- Functional safety when exchanging individual lights
- Failsafe function, maintaining store operation if a controller ever fails
- Cabling that is prefitted for controlling LED pictogram lights via a group battery system
- Suitable for new and existing branches



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-1012	Power Supply for I/O
787-1007	DALI Power Supply
750-88x	ETHERNET Controller
750-430	DI message EMA/door system
750-530	DO connection LED display
753-647	DALI Multi-Master Module
750-600	End Module

We offer an individualized software solution with Web configuration and updates via SD card.

Talk to us.

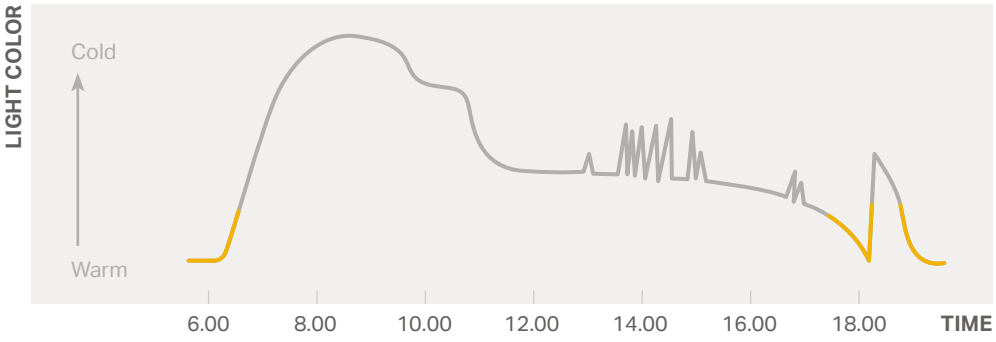
孤飞的鹤, Fotolia

SCHOOLS AND UNIVERSITIES

Lecture Room with Daylight Control

The following requirements are met:

- Time switching based on assignment plans/timetables
- Evaluation of allocation information/ presence detection
- Lighting changed according to presence detection/automatic light
- Automatic lighting control to minimize lighting intensity or provide constant light control
- Dimming lights during the day to minimize light intensity
- Status query of lights via group battery system
- Suitable for new and existing branches



Libraries and Function Blocks

Building Automation

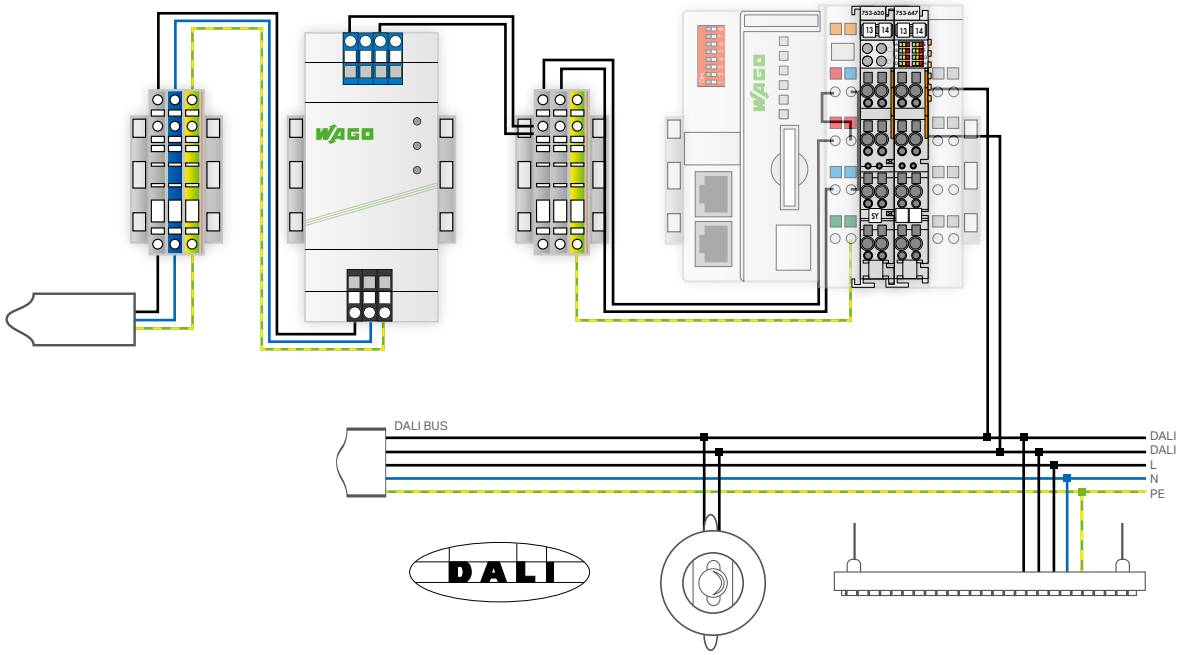
- Latching relays
- Light control
- Stairwell light control
- Twilight control
- Evaluation of button actuation
- Constant light control 1–10 V
- Dimming 1–10 V
- Scenes

DALI

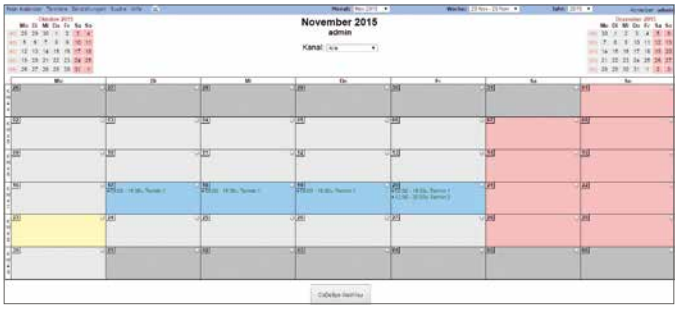
- Addressing and localization of lighting
- Group and scene formation
- Switching
- Dimming
- Constant Light Control
- Status query
- Operating hours evaluation
- Error detection

DALI Sensor Types

- Sensor addressing and localization
- Presence detection
- Brightness detection
- Button recognition



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-1012	Power Supply for I/O
750-88x	ETHERNET Controller
753-620	DALI Power Supply
753-647	DALI Multi-Master Module
750-600	End Module
2801-8201	DALI Sensor



Configuring assignment plans – FbTimetable status display

DALI Color Control

- Light show (color mixing)
- Color temperature

Scheduler

- Time switching programs (week, month)
- Detection of public holidays
- Allocation plan

Web Calendar

- Web-based calendar software
- User authentication
- Different calendar views
- Language, color, time zone selection
- Three priority levels
- 50 channels with 24 times per day

kurt_kreibich, Fotolia

EMERGENCY LIGHT

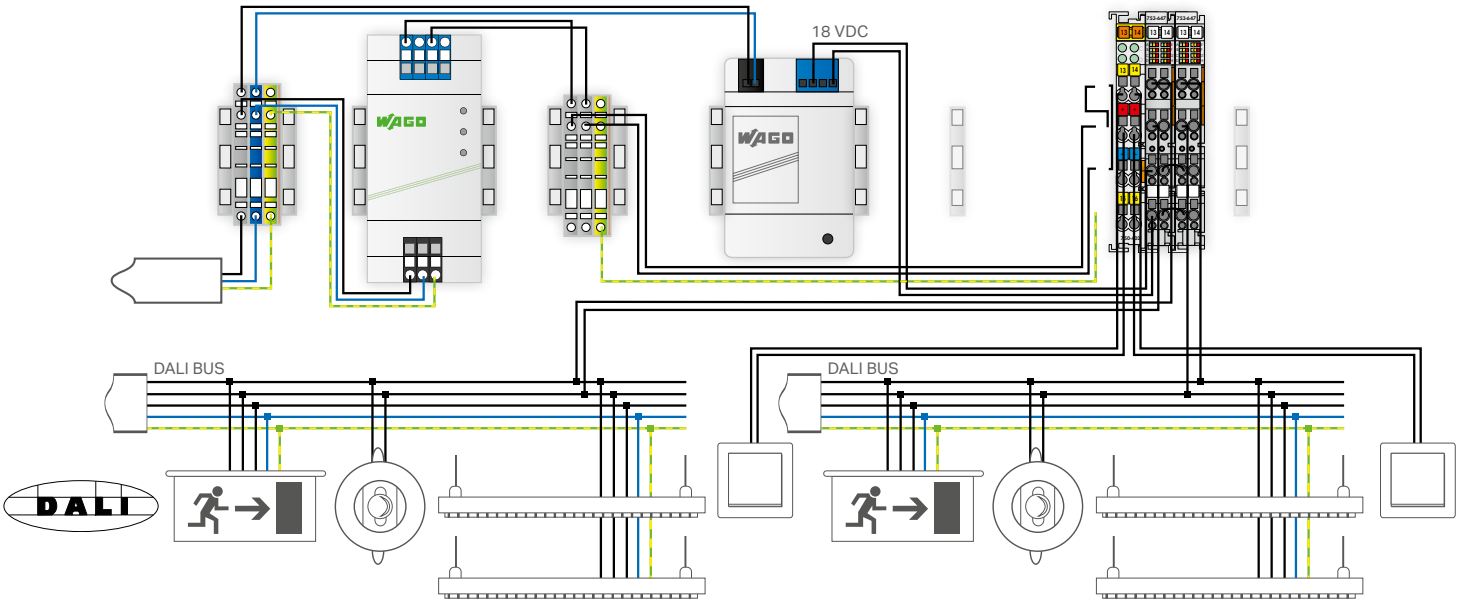
DALI-Equipped Decentralized Emergency Light

The following requirements are met:

- Addressing and group formation
- Function and duration test
- Status query of emergency lighting, measured values and factory settings
- Visualization

Libraries and Function Blocks

DALI	Emergency Lighting
• Addressing and localization of lighting • Group and scene formation • Switching • Dimming • Constant Light Control • Status query • Operating hours evaluation • Error detection	• Function test • Duration test • Status query of battery, lighting up values and identification • Visualization



Item	Description
2002 Series	Rail-Mounted Terminal Blocks
249-116	End Module
787-712	Power Supply for I/O
787-1007	DALI Power Supply
750-88x	ETHERNET Controller
750-402	Digital Input Module
753-647	DALI Multi-Master Module
750-600	End Module
2801-8201	DALI Sensor

European and International Standards:

- **DIN EN 1838**
  Lighting applications, emergency lighting
- **DIN EN 50172**
  Emergency escape lighting systems
- **DIN EN 62386-202**
  Digital Addressable Lighting Interface (DALI) – particular requirements for control gear – self-contained emergency lighting

tournee, Fotolia

EMERGENCY LIGHT

Central Emergency Light on a DALI Line

The following requirements are met:

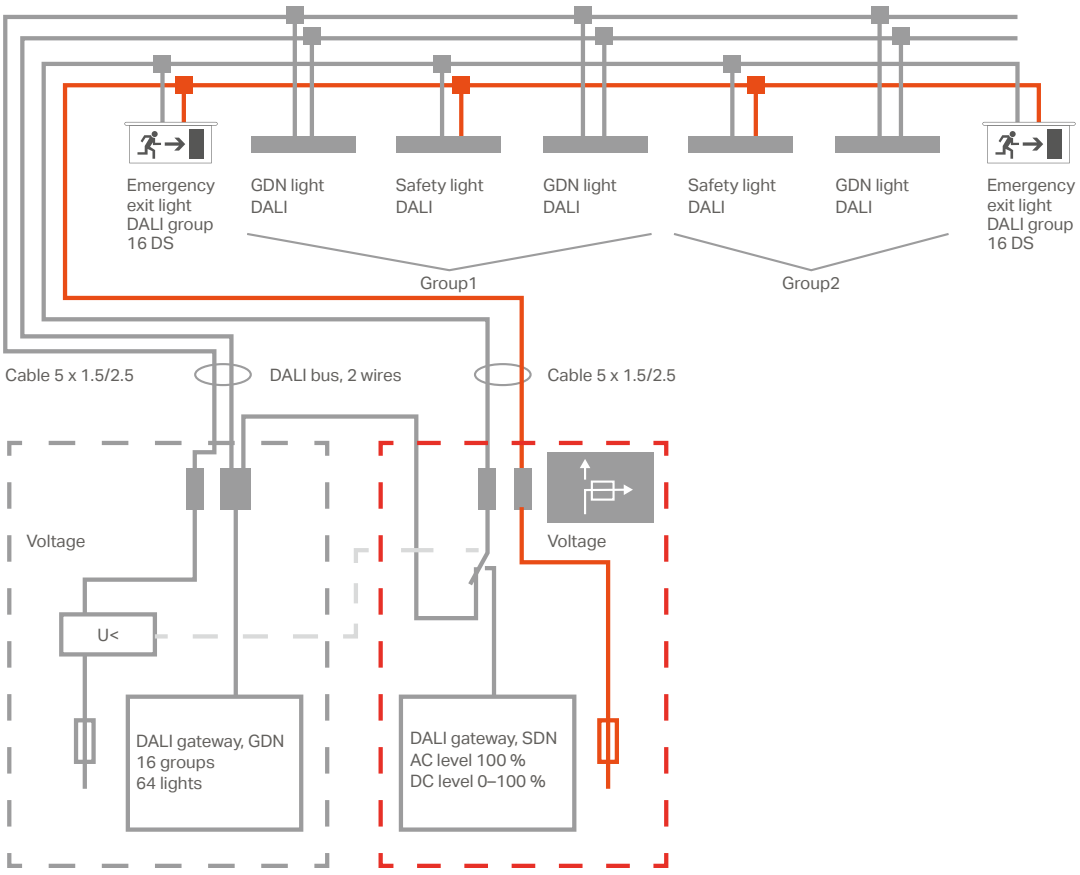
- Control devices via a DALI line without integrating a separate emergency lighting system
- When the GDN*1 switchover to the SDN*2 DALI gateway (galvanic isolation) fails
- Addressing and group formation
- Status queries

Benefits of the Dimming-capable DALI Structures:

- Consistently perfect lighting
- Reduced energy consumption
- Standards compliant

*1 GDN = General distribution network

*2 SDN = Safe distribution network



Need a solution for a central emergency lighting system?

Then talk to us. Our systems partners will be pleased to advise you on what a DALI solution could entail.

PantherMedia, David Humphrey; Works photo, WAGO

WAGO SERVICES

Individualized Advice

WAGO's staff is ready to assist every customer with advice and guidance – from selecting the right product, through telephone support during commissioning, all the way up to on-site troubleshooting.

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Contact Technical Support:
- by phone at +49 571 887 555
- by email at support@wago.com
- by contact form at www.wago.com > Service

www.wago.com/support

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Are you beginning a construction project and need advice during the planning phase or a tailored solution for your large-scale project?

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- Planning support
- Production and delivery

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- On-time delivery to the worksite
- Compliance with all relevant standards and regulations
- All from the same trusted source
- You specify the requirements and we provide the solution

Your Advantages:
- Less planning effort/shorter planning times
- Time- and cost-saving installation and operation
- Flexibility for additions

www.wago.com/projektunterstuetzung

Seminars

Innovative ideas and advanced technology are the driving forces behind the development and creation of WAGO's market-leading products. Attending WAGO training seminars provides the product insight that enables you to maximize the benefits of WAGO products. The skills and expertise gained in our effective, user-oriented sessions will ultimately save you time and enable you to get the most from our products.

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- Small groups in which all questions will be addressed.
- Collaborative learning, because education in a group setting is more effective and encourages an exchange of experiences.
- Highly practical – we believe your experiences are the ideal base to build upon with product information that's uniquely tailored to you.

WAGO Building Automation Seminars

- Building automation with WAGO KNX components
- Building automation with WAGO BACnet components
- Building automation with WAGO LON® components
- HVAC applications
- DALI applications
- EnOcean applications
- ***flex***ROOM®

Custom, On-Site Training

In addition to these open-forum seminars, WAGO also offers sessions that are specifically tailored to your organization and its particular needs. Upon request, we can conduct these seminars at your location.

www.wago.com/seminars

Recommended Illuminance per DIN EN 12464-1

Type of room, task or activity	EM
Traffic zones	
Circulation areas and corridors	100
Stairs, escalators, travolators	150
Loading ramps, loading bays	150
Rest, sanitation and first aid rooms	
Canteens and pantries	200
Restrooms	100
Excercise rooms	300
Coatrooms, washrooms, baths, toilets	200
Sanitation rooms	500
Infirmaries	500
Control rooms	
Rooms for facility installations, switchgear rooms	200
Telex and post rooms, switchboards	500
Store rooms and cold stores	
Store and stockrooms	100
Dispatch packing handling areas	300
High-bay warehouses	
Unmanned gangways	20
Manned gangways	150
Control station	150
Agriculture	
Feeding and operation of handling equipment and machinery	200
Livestock buildings	50
Pens for sick animals or calving	200
Feed preparation, dairy, utensil washing	200
Bakeries	
Preparation and baking rooms	300
Finishing, glazing, decorating	500
Cement, cement goods, concrete, bricks	
Drying	50
Material preparation, workstations at furnaces and mixers	200
General machine work	300
Rough forms	300
Ceramic, tiles, glass, glassware	
Drying	50
Material preparation, general machine work	300
Enameling, rolling, pressing, shaping simple parts, glazing, glass blowing, grinding, engraving, glass polishing, shaping precision parts, manufacture of glass instruments	750
Grinding optical lenses, crystal, hand grinding and engraving, working on medium-sized parts	750
Working on medium-sized parts	
Intricate work, e.g., grinding of ornaments (decorative grinding), hand painting	1000
Manufacture/finishing of synthetic precious stones	1500
Chemical industry, plastics and rubber industry	
Remotely operated processing installations	50
Processing installations with limited manual intervention	150
Constantly manned in processing installations	300
Precision measuring rooms, laboratories	500
Pharmaceutical production	500
Tire production	500
Color inspection	1000
Cutting, finishing, inspection	750

Type of room, task or activity	EM
Electrical industry	
Cable and wire production	300
Winding	
• large coils	300
• medium-sized coils	500
• small coils	750
Coil impregnating	300
Galvanizing	300
Assembly	
• rough, e.g., large transformers	300
• medium, e.g., switchboards	500
• fine, e.g., telephones	750
• precise, e.g., measuring equipment	1000
Electronic workshops, testing, adjusting	1500
Food and beverage industry	
Workplaces and zones • in breweries on malting floors, • for washing, barrel filling, cleaning, sieving, peeling • for cooking in canneries and chocolate factories, • in sugar factories, • for drying and fermenting raw tobacco, fermentation cellars	200
Product sorting, washing, milling, mixing and packing	300
Workplaces and critical zones in slaughterhouses, butchers, dairies, mills, on filtering floors in sugar refineries	500
Cutting and sorting of fruits and vegetables	300
Producing delicatessen foods and kitchen work, as well as cigars and cigarettes manufacturing	500
Inspection of glasses and bottles, product control, trimming, sorting, decoration	500
Laboratories	500
Color inspection	1000
Foundry and metal casting	
Man-size underfloor tunnels, cellars, etc.	50
Platforms	100
Sand preparation	200
Dressing room	200
Workstations for cupolas and mixers	200
Casting bays	200
Shake out areas	200
Machine molding	200
Hand and core molding	300
Die casting	300
Model building	500
Hairdressers	
Hairdressing	500
Crafting jewelry	
Processing precious stones	1500
Manufacturing jewelry	1000
Watch making (manual)	1500
Watch making (automated)	500
Laundries and chemical cleaning	
Goods in, marking and sorting	300
Washing and chemical cleaning	300
Ironing and pressing	300
Inspection and repairs	750

Recommended Illuminance per DIN EN 12464-1

Type of room, task or activity	EM
Leather and leather goods	
Work on vats, barrels and pits	200
Fleshing, skiving, rubbing, tumbling of skins	300
Upholstery work, shoe manufacture: stitching, sewing, polishing, shaping, cutting, punching	500
Sorting	500
Leather dyeing (machine)	500
Metal finishing and processing	
Open die forging	200
Drop forging	300
Welding	300
Rough and average machining: Tolerances ≥ 0.1 mm	300
Precision machining, grinding: Tolerances < 0.1 mm	500
Scribing, inspection	750
Wire and pipe drawing shops; cable forming	300
Sheet metalwork: thickness ≥ 5 mm	200
Sheet metalwork: thickness < 5 mm	300
Tool and cutting equipment manufacturing	750
Assembly work:	
• rough	200
• medium	300
• fine	500
• precise	750
Galvanizing	300
Surface preparation and painting	750
Tool, template and jig making, precision mechanics, micromechanics	1000
Paper and paper goods	
Edge runners, pulp mills	200
Paper manufacturing and processing, paper and corrugating machines, cardboard manufacture	300
Standard bookbinding work, e.g., folding, sorting, gluing, cutting, embossing, sewing	500
Power stations	
Fuel supply plant	50
Boiler house	100
Machine halls	200
Side rooms, e.g., pump rooms and condenser rooms; switchboards (inside buildings)	200
Control rooms	500
Outdoor switchgear	20
Printers	
Cutting, gilding, embossing, block engraving, work on stones and platens, printing machines, matrix making	500
Paper sorting and hand printing	500
Type setting, retouching, lithography	1000
Color inspection in multicolored printing	1500
Steel and copper engraving	2000
Rolling mills, iron and steel works	
Production installations without manual interventions	50
Production installations with limited manual intervention	150
Production installations with constant manual interventions	200
Slab store	50
Furnaces	200
Mill train, coiler; shear line	300
Control platforms and control panels	300
Test, measurement and inspection areas	500
Man-size underfloor tunnels, cellars and more	50

Type of room, task or activity	EM
Textile manufacturing and processing	
Workstations and zones at baths, bale opening	200
Carding, washing, ironing, deviling machine work, drawing, combing, sizing, card cutting, pre-spinning, jute and hemp spinning	300
Spinning, plying, reeling, winding	500
Warping, weaving, braiding, knitting	500
Sewing, intricate knitting, taking up stitches	750
Manual design, drawing patterns	750
Drying room	100
Automatic fabric printing	100
Burling, picking, trimming	1000
Color inspection, fabric control	1000
Invisible mending	1500
Hat manufacturing	500
Vehicle manufacturing	
Body work and assembly	500
Painting, spraying chamber, polishing chamber	750
Painting: touch-up, inspection	1000
Upholstery	1000
Final inspection	1000
Wood working and processing	
Automated processing, e.g. drying, plywood manufacturing	50
Steam pits	150
Saw frame	300
Work at joiner's bench, gluing, assembly	300
Polishing, painting, fancy joinery	750
Processing on wood working machines, e.g., turning, fluting, dressing, rebating, grooving, cutting, sawing, sinking	500
Selecting veneer woods	750
Marquetry, inlay work	750
Quality control	1000
Office buildings	
Filing, copying, traffic zones etc.	300
Writing, typing, reading, data processing	500
Technical drawing	750
CAD workstations	500
Conference and meeting rooms	500
Reception desk	300
Archive	200
Retail premises	
Sales area	300
Till area	500
Wrapper table	500
General areas	
Entrance halls	100
Cloakrooms	200
Waiting rooms	200
Tills/desks	300
Restaurants and hotels	
Reception/cashier desk, porters' desk	300
Kitchens	500
Restaurants, dining rooms, function rooms	*
Self-service restaurants	200
Buffet	300
Conference rooms	500
Corridors	100

*Lighting is determined by the display requirements.

Recommended Illuminance per DIN EN 12464-1

Type of room, task or activity	EM
Theaters, concert halls, cinemas	
Exercise rooms and changing rooms	300
Trade shows, exhibition halls	
General lighting	300
Museums	
Light-insensitive displays	**
Light-sensitive displays	**
Libraries	
Bookshelves	200
Reading areas	500
Counters	500
Car parks	
In/out ramps (during the day)	300
In/out ramps (at night)	75
Traffic lanes	75
Parking areas	75
Switch	300
Nursery schools, play schools	
Play rooms	300
Nurseries	300
Craft rooms	300
Educational premises	
Classrooms, tutorial rooms	300
Classrooms for evening classes and adult education	500
Lecture halls	500
Blackboard	500
Demonstration table	500
Art rooms	500
Art rooms in art schools	750
Technical drawing rooms	750
Practical rooms and laboratories	500
Craft rooms	500
Teaching workshops	500
Music practice rooms	300
Computer practice rooms	300
Language laboratories	300
Preparation rooms and workshops	500
Entrance halls	200
Circulation areas, corridors	100
Stairs	150
Student common rooms and assembly halls	200
Teachers' lounges	300
Libraries: Bookshelves	200
Libraries: Reading areas	500
Stock rooms for teaching materials	100
Sports halls, gymnasiums, swimming pools (general use)	300
School canteens	200
Kitchens	500
Health care premises	
Rooms for general use:	
• Waiting rooms	200
• Corridors: during the day	200
• Corridors: during the night	50
• Day rooms	200
Staff rooms:	
• Staff office	500
• Staff rooms	300

Type of room, task or activity	EM
Patient rooms, maternity wards:	
• General lighting	100
• Reading lights	300
• Simple examinations	300
• Examination and treatment	1000
• Night lighting observation lighting	5
• Bathrooms and toilets for patients	200
Examination rooms, general:	
• General lighting	500
• Examination and treatment	1000
Eye examination rooms:	
• General lighting	300
• External eye examination	1000
• Reading and color vision tests with vision charts	500
Ear examination rooms:	
• General lighting	300
• Ear examination	1000
Scanner rooms:	
• General lighting	300
• Scanners with image enhancers and television systems	50
Delivery rooms:	
• General lighting	300
• Examination and treatment	1000
Treatment rooms (general):	
• Dialysis	500
• Dermatology	500
• Endoscopy rooms	300
• Plaster rooms	500
• Medical baths	300
• Massage and radiotherapy	300
Operating areas:	
• Pre-op and recovery rooms	500
• Operating theater	1000
• Operating cavity	10000 to 100000 lx
Intensive care unit:	
• General lighting	100
• Simple examinations	300
• Examination and treatment	1000
• Night watch	20
Dental treatment rooms	
• General lighting	500
• In the patient area	1000
• Operating cavity	5000
• White teeth matching	5000
Laboratories and pharmacies:	
• General lighting	500
• Color inspection	1000
Decontamination rooms:	
• Sterilization rooms	300
• Disinfection rooms	300
Autopsy rooms and mortuaries:	
• General lighting	500
• Autopsy table and dissecting table	5000

Recommended Illuminance per DIN EN 12464-1

Type of room, task or activity	EM
Airports	
Arrival and departure areas, baggage claim areas	200
Connecting areas, escalators, travelators	150
Information desks, check-in desks	500
Customs and passport control desks	500
Waiting areas	200
Luggage store rooms	200
Security check areas	300
Air traffic control tower	500
Testing and repair hangars	500
Engine test areas	500
Measuring areas in hangars	500
Railway installations	
Covered platforms and passenger subways (underpasses)	50
Ticket hall and concourse	200
Ticket and luggage offices and counters	300
Waiting rooms	200

**The lighting should be designed to create the appropriate atmosphere.

Important Notes on the Brochure:

The solutions suggested here are only examples and WAGO can therefore not guarantee that these solutions are the rights one for you. You should always check whether such recommended solutions are suitable and functional for your specific application and always observe the pertinent legal requirements and DIN standards.

You can find all libraries here: www.wago.de/downloads

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