

White paper



DALI

Choosing the right fieldbus for lighting-control

Alessio Costantini
International Product Manager

February 2021

DALI (Digital Addressable Lighting Interface). Choosing the right fieldbus for lighting-control.



▶ INTRODUCTION

Lighting control is more and more a matter of energy and people efficiency.

Energy efficiency because lighting is responsible for a significant part of the electrical energy consumption in a building: switching off unused lights, or integrating artificial light with natural should be one of the major targets in the design of a new building or the refurbishing of an existing one.

People efficiency, because controlling the light quality it is possible to reproduce the natural cycle of daylight, and immediately provide people with a way to tune the ambient with the needs of a specific building (for example helping guests of a hospital to relax, or helping people in an office to be motivated).

On the other hand, an ever-increasing need for improving energy efficiency in buildings, translates to a demand for saving energy. This is possible both on the technology side (thanks to the new light sources like LEDs) and on the building automation side (thanks to the lighting control). This document focuses on the lighting-control.

▶ ABSTRACT

This document aims at enabling system integrators and engineers to take into considerations some important points to make the right design choices while planning a building lighting system. Installers could also take advantage by reading this document, especially in the commissioning and maintenance phases of their installation's lifecycle. Building owners and purchasers could eventually find useful information about how to improve the total cost of ownership of their assets, so to save money in the short/medium/long terms.

DIFFERENT BUILDINGS, COMMON NEEDS

The dimensions of buildings vary from case to case, from multi-floor hospitals to large industrial facilities, from hotels to shopping malls. A typical building can be split into areas, each one intended for one or more specific use, and with different occupants' lighting needs. For example, in an industrial building, the production areas needs are different from the offices. During the building's lifecycle, those needs can change due to a refurbishment or a new destination, and it could be necessary to change the lighting behaviour of some areas.

All of this aside, all the scenarios have the following common points:

Energy efficiency	The importance of energy efficiency. The different international regulations, the EN 15232, the European Energy Performance of Buildings Directive (EPBD 2010), the ISO 50 001 and the sustainability and energy certificates such as LEED (US) or Energy Star (US), have led to the creation of technical standards such as open communication protocols (BACnet and DALI) and specialized applications designed to optimise the energy efficiency of building and room automation systems. It is possible to save up to 30% on energy by raising awareness, making energy consumption transparent and introducing targeted energy management and control.
Zone control	Lighting needs change from area to area.

Coordinated control	Lighting has to be controlled through building automation devices such as detectors or sliding windows.
Flexible wiring layout	Wiring distances could vary (it can reach even hundreds of meters).
User experience	The importance of user experience: control-units must be easy to use, and light as natural as possible.
Ease of installation and maintenance	Especially on refurbishing projects, time is a precious asset, and any impact onto existing systems must be limited
People efficiency	People efficiency is influenced by the quality of light; light has a deep impact on on some natural triggers which can improve both well being and individual performances

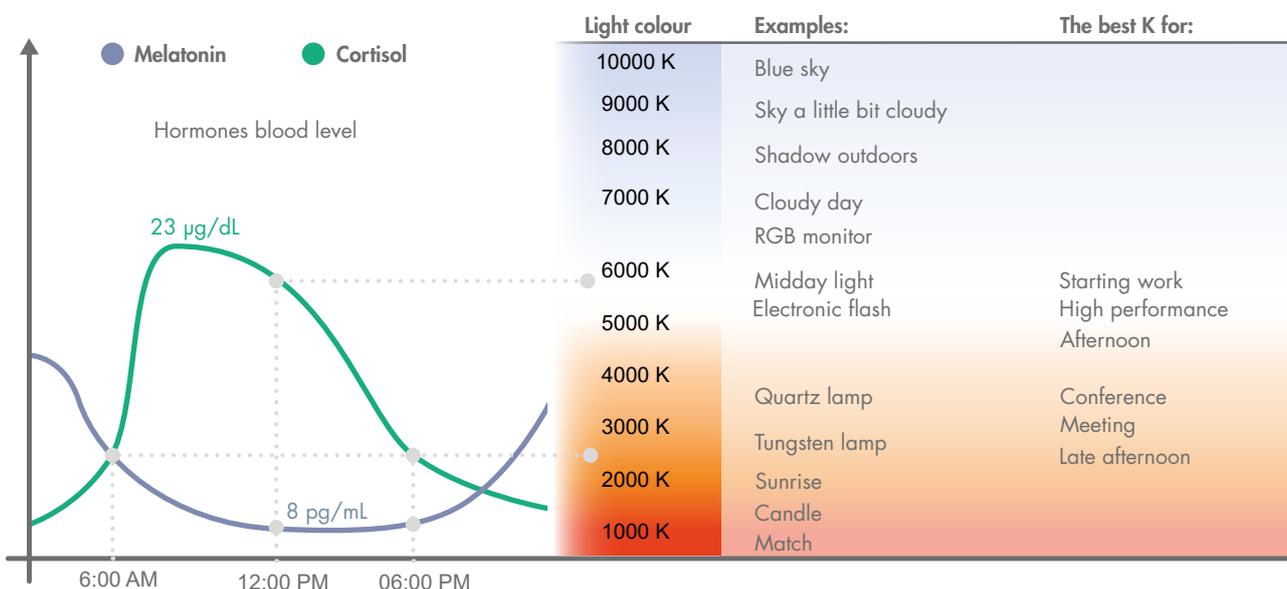
PEOPLE EFFICIENCY IN A BUILDING

TUNABLE WHITE CONTROL

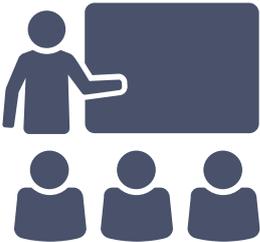
Our biological clock is regulated by light and darkness. In the morning, as the sun comes up, light levels increase, the colour of light shifts towards cooler colour temperatures, and we wake up and become active. In the evening, as the sun goes down and the colour of light shifts towards warmer colour temperatures, we unwind, relax and prepare for sleep.

Our body's hormone levels rise and fall with these light cycles: reproducing this behaviour is becoming more and more popular in indoor lighting in order to improve the people's quality of life and performance. A light-control system with tunable white can be used to mimic the natural cycle of daylight, or it can be programmed to create specific scenes at certain times of the day. You can set a more motivating lighting (cooler light, 6000K) during the peak hours, or select a more relaxing lighting (warmer light, 2500K) during the break times. Systems can be pre-programmed to meet the demands of the user or commissioned on site and updated at any time.

The graph below shows how our hormones change during the day according to the colour temperature: the cortisol is our waking hormone, whilst melatonin controls our sleeping rhythm. Warmer temperature is more relaxing, while cooler temperature creates a motivating environment.



TUNABLE WHITE APPLICATIONS ACCORDING TO THE BUILDING USE

Building use	Advantages of tunable white control	How?
 <p>Offices and commercial environments</p>	<ul style="list-style-type: none"> • Productivity • Staff welfare • Vibrant workplace • Flexibility of multi-use spaces 	<ul style="list-style-type: none"> • Cooler temperatures for improving concentration and focus or compensating a energy levels dip in the afternoon • Warmer temperatures for activities requiring creativity and cooperation
 <p>Schools and educational spaces</p>	<ul style="list-style-type: none"> • Concentration • Better learning outcomes • Environment dynamicity • Lighting matching the learning needs 	<ul style="list-style-type: none"> • Cooler temperatures for improving concentration and focus during test activities • Warmer temperatures for activities requiring creativity and cooperation or relax
 <p>Hospitals and healthcare environments</p>	<ul style="list-style-type: none"> • Brief recovery time • Patient sleep pattern • Patients' control over their environment • Better quality of care 	<ul style="list-style-type: none"> • Cooler temperatures for speed ing up the inner body clock in the morning • Warmer temperatures for relax

THE DESIGNER DILEMMA: WHICH TECHNOLOGY SHOULD I CHOOSE?

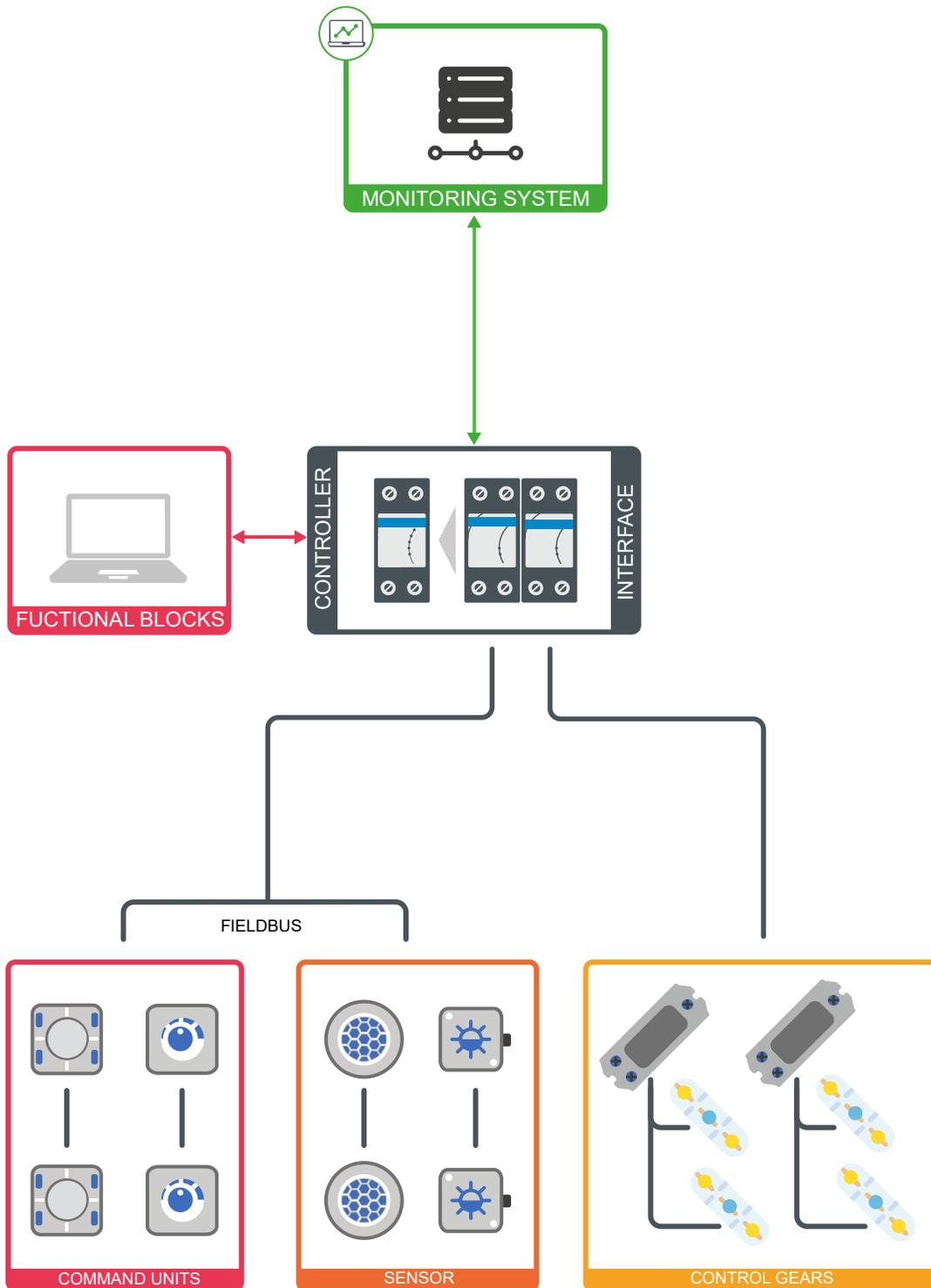
The requirements for typical lighting control projects can be transformed into key specifications as follows:

Requirement	Key specifications	Solution
Zone control	Modular, scalable solution	Modularity
Coordinated control	Easy interaction with other subsystems	Coordinated control
Energy efficiency	Capability of implementing control-logics	Intelligence
Flexible wiring layout	Free and flexible layout, long distances	Fieldbus
User experience	Using the right device in the right way	Know-How + Ecosystem
Ease of installation	Easy wiring, easy set-up	Fieldbus + Intelligence
People efficiency	White balance control	Tunable white control
Need for change	No rewiring, easy reshaping	Flexibility

Solution	Description
Modularity	A modular solution can be split into subsystems and composed according to each zone needs.
Coordinated control	Very often, Building Automation systems are multi-vendor that try to use the best solution in any sub-system. Standardization is a key point to allow multi-vendor systems to interact. By using standard protocol and interfaces, it is possible to put in place a reliable system, and maintain each system separately
Intelligence	An "intelligent" solution allows a certain degree of customization: by composing the functional blocks inside the control unit, the requested function can be implemented.
Fieldbus	A fieldbus definitely grants some advantages over plain copper wiring. The designer's focus must be the choice of the right fieldbus. For sure, a fieldbus that covers long distances with a free layout is a very good starting point. If it is also easy to wire, than: deal!
Know-How	UThe solution manufacturers embed their know-how in the products. Products designed by companies with a solid reputation in a specific application should be preferred to do-it-all solutions. The trial-and-error process grants that manufacturers with a long time experience in a specific area have already solved many problems that could annoy users.
Ecosystem	Accessing a large ecosystem of modules allows designers to go beyond the constraints of the technical solution so to adhere as much as possible to the desired project requirements
Flexibility	Digital addressing permits an easy reconfiguration and maintenance. Once installed, DALI (Digital Addressable Lighting Interface) control gears can be re-addressed and re-grouped via software rather than having to rewire the blocks.

The blocs of a lighting control subsystem	
Blocks	Description
Controller	The control unit that implements all the controlling functions. It is the intelligence of the system.
Control gears	Devices connected to the light source (such as ballasts for controlling LEDs or NEON lights).
Command units	Switches and dimmers that allow users to interact with the system.
Sensors	Presence detector (i.e. PIR) and lighting sensors that check the requested conditions in a zone.
Fieldbus	The wired or wireless data highway connecting all the devices.
Interface	The hardware/software connector to other subsystems.
Functional blocks	The available or user-created functions that permit implementing the control logic.
Monitoring system	Checks if the system is behaving as expected.

DALI ARCHITECTURE



FROM DESIGN TO COMMISSIONING: THE TOTAL COST OF OWNERSHIP

A solution must be evaluated for its compliancy with the technical specifications. Purchase price seems to be the very second (sometime the first!) decision criterion.

A lighting control system must be designed, commissioned, operated, maintained and, sometimes, dismantled.

Each of those activities can be translated into a cost. For each cost, there are some cost-breakers, meant as factors which can help to cut-down that cost.

Phase	Costs	Cost-breakers
Design	<ul style="list-style-type: none"> • Learning process • System design 	<ul style="list-style-type: none"> • Ease of use • After-sales support provided by the manufacturer • Use of standard protocols/interfaces • Good documentation
Commissioning	<ul style="list-style-type: none"> • Wiring costs • Set-up costs 	<ul style="list-style-type: none"> • Free layout • Standard cables • Modularity • Good documentation • Ease of use • After-sales support provided by the manufacturer • Use of standard protocols/interfaces
Operation	<ul style="list-style-type: none"> • Learning process • Downtime 	<ul style="list-style-type: none"> • Ease of use • After-sales support provided by the manufacturer • Good documentation • Manufacturer's bankability • Reliability • Cybersecurity
Subsequent changes	<ul style="list-style-type: none"> • Wiring costs • Set-up costs 	<ul style="list-style-type: none"> • No hand rewiring but parameters set-up
Maintenance	<ul style="list-style-type: none"> • Learning process • Downtime • Lifecycle 	<ul style="list-style-type: none"> • Ease of use • After-sales support provided by the manufacturer • Good documentation • Manufacturer's bankability • Reliability • Cybersecurity • Use of standard protocols/interfaces • Remote access to the system

COMPARING LIGHTING CONTROL SOLUTIONS

The table below compares the differences between the most common types of dimming control.

Dimming control	Advantages	DALI	0/1-10V	DSI	Phase-cut control (Traditional)
Tunable white control	Human centric lighting	Yes	No	No	No
Communication type		2-wire digital bus	2-wire analogue bus	Digital proprietary bus	Traditional system
Two-way communication	<ul style="list-style-type: none"> • Feedback • Diagnose 	Yes	No		
Addressable luminaires	<ul style="list-style-type: none"> • No rewiring • Easy reshaping 	64	No	No	No
Group addresses		16	No	No	No
Standardised dimming curve	Very smooth dimming control	Yes	No	Yes	Yes
Polarity-free & free wiring topology	Reduction of wrong connections risks	Yes	No (each device needs its own wiring)		
Switched off via the control circuit	No additional components required (i.e. relay)	Yes	No	Yes	Yes
Max length	Use of standard cables	300 m	300 m	250 m	-

DALI: Digital Addressable Lighting Interface. Learn more at <https://www.dali-alliance.org/dali/>

DSI: Digital Serial Interface. Learn more at https://en.wikipedia.org/wiki/Digital_Serial_Interface

DALI A WORLDWIDE STANDARD FOR LIGHTING CONTROL



The DALI bus was created by the leading lighting manufacturers that together have cooperated to realise a common digital interface for controlling light fixtures.

Today, DALI is the world's preferred standard, adopted by many companies. By using the DALI bus, architects, specifiers, integrators and end-users can rely on the compatibility and interchangeability of different control gears.

The remarkable success of this standard is also due to:

- its very easy installation (just two non-polarized wires with free topology)
- its low commissioning costs (no certified wires or fees are required)
- its scalability and flexibility.

DALI has the most part of the technical specifications mentioned before (see "Key specifications") and is a worldwide standard managed by the DiiA association. The association members are allowed to certify their products according to the standard, by following a formal process that warranties inter-operation in multi-vendor installations.

The large ecosystem of DALI modules (more than 1000 items) allows designers to find a solution for their needs. This ecosystem includes 3 types of devices:

Device type	Description
Control gear	Directly connected to the lamp, controls the lamp according to remote commands
Control devices	<ul style="list-style-type: none"> • Application controllers implementing functions and sending commands to the control gear • Input devices providing information to the system (push buttons, occupancy sensors, light sensors, switches)
Bus power supplies	Bus power supply provider, often embedded into the Application controller.

Notes:

- The maximum cable length between furthest-apart devices is 300 m.
- Each DALI subnet allows the connection of 64 control gears.
- DALI has inherited the lighting control default features: dimming and tunable white.



THE CARLO GAVAZZI SOLUTION

A modern lighting control system goes beyond the light turning ON/OFF. DALI protocol is capable of creating light intensity and correlated colour temperature (CCT) to deliver Human Centric Lighting solutions focusing on people and their needs. DALI is the ideal solution for lighting control but needs to be complemented with an effective industrial-grade fieldbus to provide the necessary flexibility and reliability in a building automation system. This fieldbus is called Dupline® and is the Carlo Gavazzi bus solution.

▶ DUPLINE® AN INDUSTRIAL-GRADE FIELDBUS FOR BUILDING AUTOMATION

The Dupline® fieldbus is part of the Carlo Gavazzi heritage. It is a free-layout bus, using a simple twisted pair to reach up to 2 km length. There are more than 250,000 installations worldwide, using Dupline® in the mining industry, automation systems, building automation, and, of course, lighting control. Thanks to the combination of DALI and Dupline®, it is easy to scale the system and thus match the needs of large buildings. Leveraging the peculiarities of a building automation system (such as the presence detectors, temperature sensors and sunlight shutters) through the Dupline® sensors, allows adapting to a specified preference and thus optimizing the building's operational efficiency and user comfort. This is why DALI is not a competitor of building automation systems but an extension of their potential. To be able to run a lighting control system and to manage the Dupline® fieldbus and the relevant connected sensors, there is the need to be part of an ecosystem which is the task of UWP 3.0

▶ THE UWP 3.0 THE MULTI PURPOSE ECOSYSTEM

UWP 3.0 is the core of an ecosystem for managing many different applications in the realms of energy efficiency, building automation and car parking guidance. The UWP 3.0 ecosystem includes more than 220 different devices in the Carlo Gavazzi range, allowing also to connect a huge range of products from different vendors. The UWP 3.0 device can be connected to Dupline® and DALI items, thanks to dedicated modules.

▶ LIGHTING CONTROL WITH DUPLINE® AND DALI: MUCH MORE THAN 2

The DALI bus, together with the powerful UWP 3.0 controller, can help you to achieve a higher energy efficiency rating and to meet local green building requirements for energy saving. The Carlo Gavazzi solutions feature all the benefits of the DALI protocol and respond to the following needs:

Needs	DALI protocol	Dupline® + DALI, the Carlo Gavazzi solution
Max number of devices	<ul style="list-style-type: none"> • 64 for each DALI network • Routers have to be used to extend the limits 	Up to 49 DALI networks equivalent to 3,136 devices can be managed by an UWP 3.0 controller
Greater distance	300 m	1200 m
More applications	No: Designed only for lighting control	Yes: Energy monitoring, Building automation and Car parking guidance
Optimizing DALI addresses	PIR sensors and I/O modules use DALI addresses	All the DALI addresses can be used for control gears
Range of products	Only DALI certified modules	DALI + a wide range of Dupline® modules
High-level automation	NO	YES
Remote management	NO	<ul style="list-style-type: none"> • BMS • Open industrial protocols such as: Modbus, BACnet, MQTT

The main control strategies provided by the UWP 3.0 controller are:

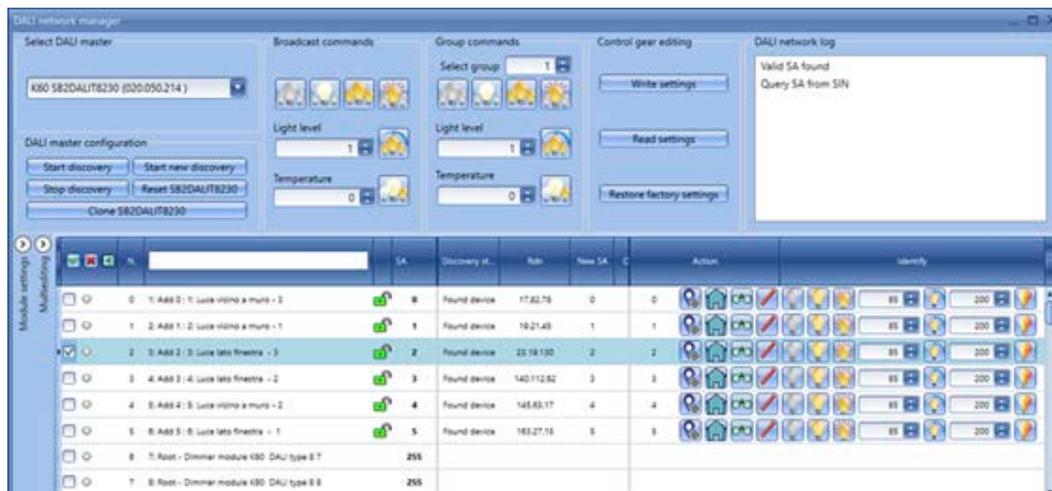
- Daylight harvesting, which provides automatic dimming to compensate for the amount of natural light
- Automatic sunrise and sunset calculation
- Automatic colour management base in calendar
- Real-time clock and schedulers to switch ON/OFF, dim or change scenario
- Light levels control according to people presence and timers
- Zone control

Interfacing it with other systems is easy, thanks to industrial protocols like BACnet or Modbus and internet protocols like FTP and MQTT.

An embedded database and web-server, allow users to access and display the history of measurement and events through dedicated dashboards.

▶ THE SB2-DALI GATEWAY

This is the key between Dupline® and DALI network. It has a built-in DALI bus power supply and it manages a DALI network. Thanks to the high scalability of the UWP 3.0 platform, up to 49 DALI master can be managed by a UWP 3.0 controller.



By means of a dedicated dashboard in the UWP 3.0 Tool you can:

- Manage DALI controls gear such as type8, type6 and type0
- Perform in easy way broadcast commands and group commands
- Replace faulty devices such as DALI master or control gears
- Check real time diagnostics
- Access to advanced tools for testing the DALI devices
- Transfer parameters between rows



WHY RELY ON CARLO GAVAZZI FOR YOUR LIGHTING CONTROL SYSTEM?

Because the UWP 3.0, DALI and Dupline® ecosystem can meet the application needs listed in the block and devices table below.

Block	Block devices
Controller	UWP 3.0
Control gears	<ul style="list-style-type: none"> • Carlo Gavazzi's ballasts from the UWP 3.0 Ecosystem • Any other vendors' DALI ballast
Command units	<ul style="list-style-type: none"> • Switches, dimming units, remote I/Os from the UWP 3.0 ecosystem • Any standard command connected to a Carlo Gavazzi's remote I/O interface
Sensors	<ul style="list-style-type: none"> • Presence detectors (i.e. PIR), lighting sensors from the UWP 3.0 ecosystem • Any standard command connected to a Carlo Gavazzi's remote I/O interface
Fieldbus	<ul style="list-style-type: none"> • DALI for connecting ballasts to the DALI master (ZONE-CONTROL) • Dupline® for connecting DALI masters to the UWP 3.0 controller • Dupline® for connecting I/Os, sensors, commands
Interface	<ul style="list-style-type: none"> • BACnet • Modbus • Standard digital and analog I/Os (0-10V, 4-20mA) • Internet protocols (FTP, MQTT)
Functional blocks	<ul style="list-style-type: none"> • Embedded into UWP 3.0 • Programmable via UWP 3.0 Tool software
Monitoring system	UWP 3.0's embedded database and web-server. In addition to this, the UWP 3.0 equips you with reporting files with all the data you need to check if the energy targets are met or if any further improvement can be made.

CONCLUSIONS

DALI is the ideal solution for lighting control in commercial building such as offices, schools, stores and healthcare facilities where people need lighting comfort. The improved controllability of LEDs, such as correlated colour temperature (CCT) feature of DALI protocol, over legacy lighting technologies, has helped to deliver Human Centric Lighting solutions which focus on people and their needs.

Carlo Gavazzi building automation system, based on the UWP 3.0 platform, integrates all the DALI benefits such as an easy installation (just two non-polarized wires with free topology), its low commissioning costs (no certified wires or fees are required) together with the robustness and the wide range of products, key qualities of Dupline® bus.

The Carlo Gavazzi answer to mayor critical factors is based on:

- Scalability and flexibility easy to make changes, add new devices, new system branches and functions
- Dynamic feature to automatically mimic daylight colour temperature and brightness levels by changing the LED colour temperature from warm white (2700K) all the way to cool white (6500K)
- Energy efficient light control thanks to sophisticated logics
- Integration to other systems via industrial protocols.

Disclaimer: Carlo Gavazzi assumes no liability whatsoever for indirect, collateral, accidental or consequential damages or losses that occur by (or in connection with) the distribution and/or use of this document. All information published in this document is provided "as is" by Carlo Gavazzi. None of this information shall establish any guarantee, commitment or liability of Carlo Gavazzi. The technical specifications of products, and the contents relevant to the topics reported in this document are subject to change. Errors and omissions excepted. No reproduction or distribution, in whole or in part, of this document without prior permission, is allowed.

OUR SALES NETWORK IN EUROPE

AUSTRIA

Carlo Gavazzi GmbH
Ketzergasse 374,
A-1230 Wien
Tel: +43 1 888 4112
Fax: +43 1 889 10 53
office@carlo gavazzi.at

FRANCE

Carlo Gavazzi Sarl
Zac de Paris Nord II, 69, rue de la Belle Etoile,
F-95956 Roissy CDG Cedex
Tel: +33 1 49 38 98 60
Fax: +33 1 48 63 27 43
french.team@carlo gavazzi.fr

ITALY

Carlo Gavazzi SpA
Via Milano 13,
I-20045 Lainate
Tel: +39 02 931 761
Fax: +39 02 931 763 01
info@gavazziacbu.it

SPAIN

Carlo Gavazzi SA
Avda. Iparragirre, 80-82,
E-48940 Leioa (Bizkaia)
Tel: +34 94 480 4037
Fax: +34 94 431 6081
gavazzi@gavazzi.es

BELGIUM

Carlo Gavazzi NV/SA
Mechelsesteenweg 311,
B-1800 Vilvoorde
Tel: +32 2 257 4120
Fax: +32 2 257 41 25
sales@carlo gavazzi.be

GERMANY

Carlo Gavazzi GmbH
Pfnorstr. 10-14
D-64293 Darmstadt
Tel: +49 6151 81000
Fax: +49 6151 81 00 40
info@gavazzi.de

NETHERLANDS

Carlo Gavazzi BV
Wijkermeerweg 23,
NL-1948 NT Beverwijk
Tel: +31 251 22 9345
Fax: +31 251 22 60 55
info@carlo gavazzi.nl

SWEDEN

Carlo Gavazzi AB
V:a Kyrkogatan 1,
S-652 24 Karlstad
Tel: +46 54 85 1125
Fax: +46 54 85 11 77
info@carlo gavazzi.se

DENMARK

Carlo Gavazzi Handel A/S
Over Hadstenvej 40,
DK-8370 Hadsten
Tel: +45 89 60 6100
Fax: +45 86 98 15 30
handel@gavazzi.dk

GREAT BRITAIN

Carlo Gavazzi UK Ltd
4.4 Frimley Business Park,
Frimley, Camberley, Surrey GU16 7SG
Tel: +44 1 276 854 110
Fax: +44 1 276 682 140
sales@carlo gavazzi.co.uk

NORWAY

Carlo Gavazzi AS
Melkeveien 13,
N-3919 Porsgrunn
Tel: +47 35 93 0800
Fax: +47 35 93 08 01
post@gavazzi.no

SWITZERLAND

Carlo Gavazzi AG
Verkauf Schweiz/Vente Suisse
Sumpfstrasse 3,
CH-6312 Steinhausen
Tel: +41 41 747 4535
Fax: +41 41 740 45 40
info@carlo gavazzi.ch

FINLAND

Carlo Gavazzi OY AB
Ahventie, 4 B
FI-02170 Espoo
Tel: +358 9 756 2000
myynti@gavazzi.fi

PORTUGAL

Carlo Gavazzi Lda
Rua dos Jerónimos 38-B,
P-1400-212 Lisboa
Tel: +351 21 361 7060
Fax: +351 21 362 13 73
carlo gavazzi@carlo gavazzi.pt

OUR SALES NETWORK IN THE AMERICAS

USA

Carlo Gavazzi Inc.
750 Hastings Lane,
Buffalo Grove, IL 60089, USA
Tel: +1 847 465 6100
Fax: +1 847 465 7373
sales@carlo gavazzi.com

CANADA

Carlo Gavazzi Inc.
2660 Meadowvale Boulevard,
Mississauga, ON L5N 6M6, Canada
Tel: +1 905 542 0979
Fax: +1 905 542 22 48
gavazzi@carlo gavazzi.com

MEXICO

Carlo Gavazzi Mexico S.A. de C.V.
Circuito Puericultores 22, Ciudad Satelite
Naucalpan de Juarez, Edo Mex. CP 53100
Mexico
T +52 55 5373 7042
F +52 55 5373 7042
mexicosales@carlo gavazzi.com

BRAZIL

Carlo Gavazzi Automação Ltda. Av.
Francisco Matarazzo, 1752
Conj 2108 - Barra Funda - São Paulo/SP
Tel: +55 11 3052 0832
Fax: +55 11 3057 1753
info@carlo gavazzi.com.br

OUR SALES NETWORK IN ASIA AND PACIFIC

SINGAPORE

Carlo Gavazzi Automation Singapore Pte. Ltd.
61 Tai Seng Avenue #05-06
Print Media Hub @ Paya Lebar iPark
Singapore 534167
Tel: +65 67 466 990
Fax: +65 67 461 980
info@carlo gavazzi.com.sg

MALAYSIA

Carlo Gavazzi Automation (M) SDN. BHD.
D12-06-G, Block D12,
Pusat Perdagangan Dana 1,
Jalan PJU 1A/46, 47301 Petaling Jaya,
Selangor, Malaysia.
Tel: +60 3 7842 7299
Fax: +60 3 7842 7399
info@gavazzi-asia.com

CHINA

Carlo Gavazzi Automation
(China) Co. Ltd.
Unit 2308, 23/F.,
News Building, Block 1, 1002
Middle Shennan Zhong Road,
Shenzhen, China
Tel: +86 755 83699500
Fax: +86 755 83699300
sales@carlo gavazzi.cn

HONG KONG

Carlo Gavazzi Automation
Hong Kong Ltd.
Unit No. 16 on 25th Floor, One Midtown,
No. 11 Hoi Shing Road, Tsuen Wan,
New Territories, Hong Kong
Tel: +852 26261332 / 26261333
Fax: +852 26261316

OUR COMPETENCE CENTRES AND PRODUCTION SITES

DENMARK

Carlo Gavazzi Industri A/S
Hadsten

MALTA

Carlo Gavazzi Ltd
Zejtun

ITALY

Carlo Gavazzi Controls SpA
Belluno

LITHUANIA

Uab Carlo Gavazzi Industri Kaunas
Kaunas

CHINA

Carlo Gavazzi Automation (Kunshan) Co., Ltd.
Kunshan

HEADQUARTERS

Carlo Gavazzi Automation SpA
Via Milano, 13
I-20045 - Lainate (MI) - ITALY
Tel: +39 02 931 761
info@gavazziautomation.com



CARLO GAVAZZI
Automation Components

Energy to Components!

www.gavazziautomation.com

