Sensors and Controls

DALI

At a glance

TRIDONIC

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1. What is DALI?

DALI stands for "Digital Addressable Lighting Interface" and is an interface protocol for digital communication between electronic operating devices for lighting technology. The DALI standard was developed by Tridonic with well-known manufacturers for operating and control devices. Today they belong to the working group DALI. This team promotes the distribution of DALI and secures the further development.

2. Important informations about DALI

Parameter	Value
No polarity	The polarity (+/-) of the DALI control line does not have to be minded
Maximum count of DALI operating devices per DALI line	64
Maximum count of DALI groups	16
Maximum count of DALI scenes	16
DALI voltage	12,0 V - 20,5 V, typically 16 V DC -> Non SELV, because no galvanic isolation
DALI system current	max. 250 mA (depending on installed DALI power supply)
Data transfer speed	1,200 Baud
Maximum wire length	300 metres for a wire-cross-section (Q) of 1.5 mm^2 (The smaller the Q, the shorter the wire length has to be)

NOTICE

A DALI power supply is **always** required for each DALI line.

3. Installation

The installation of the DALI system takes place with customary installation material for **mains voltage**. For the DALI control circuit 2 wires are required (DALI is protected against polarity reversal). Mains voltage and bus line can be led in the same cable.

For example, a cable with 5 wires (L, N, PE, DA, DA) like a NYM-J 5 x 1.5 can be used (see figure below).

For control lines like e.g. JY (St) Y 2x2x0.8, the 0.8 does not relate to the wire cross section but to the wire diameter. This results in a cross section of only 0.5 mm^2. Furthermore, these control lines are not suitable for DALI installations because of their low test voltage.

Pay attention, that the participant furthest away from the power supply, should not exceed 300 m at a wire cross-section of 1.5 mm^2. The voltage drop across the DALI control line shall not be over 2 volts.

The maximum permissible line length can be calculated using this formula (assumption: U_V = 2 V and I = 250 mA)

$$l = \frac{U_V \cdot \gamma \cdot Q}{2\,I}$$

$$l = \frac{2 \cdot \gamma \cdot Q}{0.5}$$

$$l = 4 \cdot \gamma \cdot Q$$

U_V	Voltage drop in V (2 V, max)
I	DALI system current in A (0.25 A)
Q	Cross section in mm^2
l	Cable length in m
	Electrical conductivity in m / (Ohm mm^2), for copper cable: 56 m / (Ohm mm^2)

NOTE

The maximum current of 250 mA must be used for calculating the voltage drop.

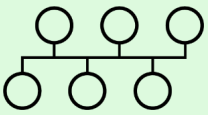
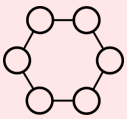
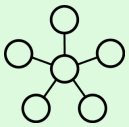
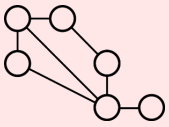
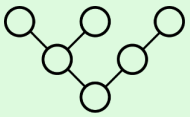
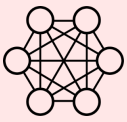
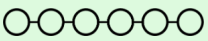
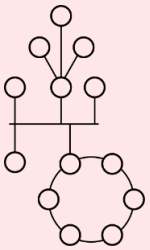
Example: DALI circuit with a cable cross-section of 1 mm^2:

$$l = \frac{U_V \cdot \gamma \cdot Q}{2\,I}$$

$$l = \frac{2 \cdot 56 \cdot 1}{0.5} \left[\frac{V \cdot \frac{m}{\Omega \cdot mm^2} \cdot mm}{A} \right]$$

$$l = 224\,m\,max$$

There are also **several kinds of wiring** for these systems:

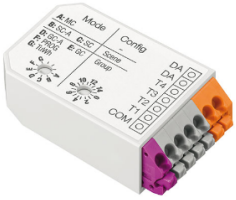
Allowed	Not allowed
Bus wiring 	Ring wiring 
Star wiring 	Mesh wiring 
Tree wiring 	Full mesh wiring 
Line wiring 	Mixed wiring 

NOTICE

Connection points or deformed cables increase the resistance of the cable and thus lead to shorter permissible cable lengths.

4. Required Components

Control module,
e.g. DALI XC



DALI power supply,
e.g. DALI PS1

DALI operating device,
e.g. LCA 75W one4all lp PRE

DALI does **not** need any control unit or central. All informations like scene values or group assignments are saved in the operating device. Furthermore, DALI is **event driven**. This means, without a command there is no reaction and without a specific query you get no feedback.

5. Limits

The DALI bus is limited to a **maximum of 64 addresses** (depending on counting method: 0-63 or 1-64). Additionally, the available current (DALI PS1: 200 mA; DALI PS2: 240 mA) is limiting the maximum count of the participants (devices).

The DALI x/e-touchPANEL 02 makes it possible to control up to 128 devices (2 DALI lines, each with 64 devices) which makes it the ideal solution for smaller lighting projects. For larger projects, connecDIM is a good solution. connecDIM is a cloud-based light management system that makes it possible to control a theoretically unlimited number of light points.

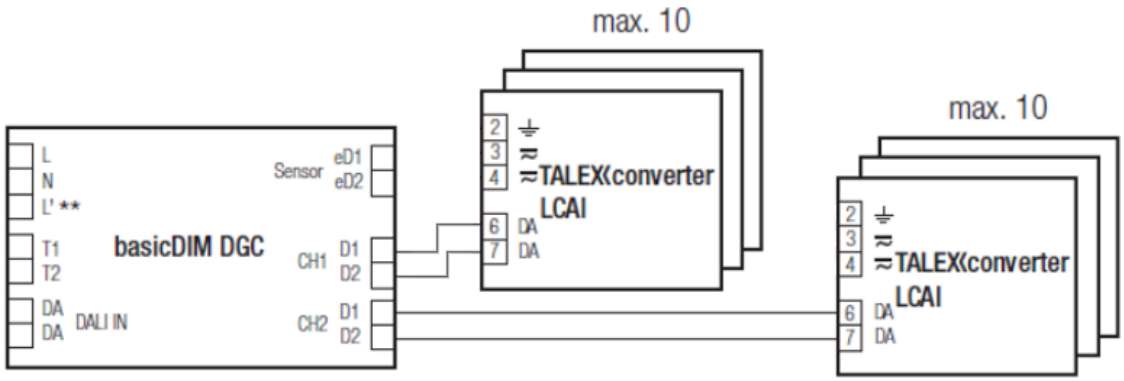
Control devices like DALI XC **don´t use any** DALI addresses. Operating devices, dimmer, switching devices and sensors use **one or more DALI/eDALI addresses**. Electronic ballasts for fluorescent lamps, LED Drivers have a current consumption of 2 mA, operating devices like DALI XC a current consumption of 6 mA.

That means, you can connect up to

- 64 operating devices à 2 mA (each 1 DALI address) = 64 x 2 mA = **128 mA**
- 12 operating devices à 6 mA (no DALI address needed -> eD addressing) = 12 x 6 mA = **72 mA**

in each DALI line. With this configuration **200 mA** will be used. However, in new systems there should be at least 10 % reserve in case of expansions.

By use of the basicDIM DGC, **addresses can be saved**. The basicDIM DGC owns a DALI interface at the input and 2 DALI / DSI outputs. For each DALI output you can control up to 10 devices with a broadcast. Therefore you can control 20 devices together with only one DALI address (address of the DGC).



6. DALI power supply

In order that a DALI bus system can work, you **always** need a DALI power supply (i.e. DALI PS1). The use of other current- or voltage sources, wich don´t fit into the DALI standard, is not allowed or possible.

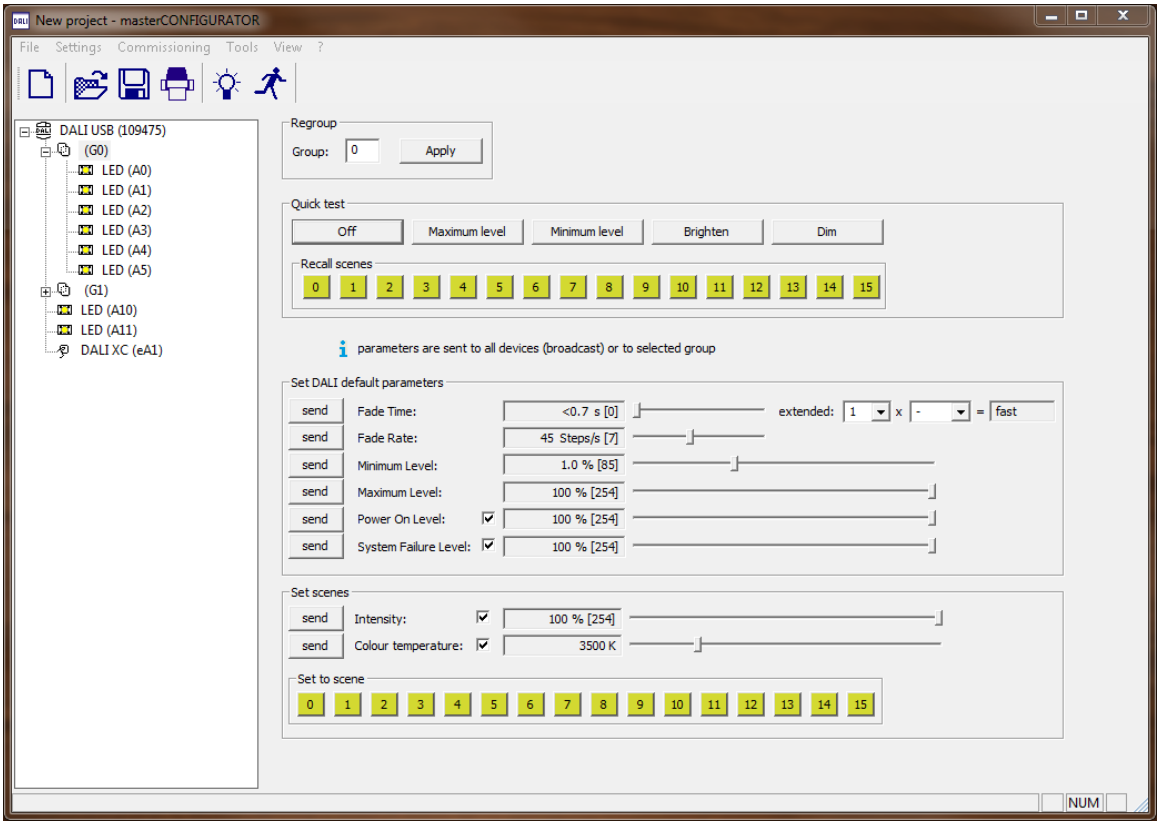
⚠ CAUTION!

For **each** DALI line, only one DALI power supply is allowed. Please keep in mind, that gateways of higher level systems (i.e. DMX-DALI Gateway -> translates DMX in a DALI signal) have built in DALI power supplies. Another supply is not required or allowed and would cause disturbances.

7. Programming

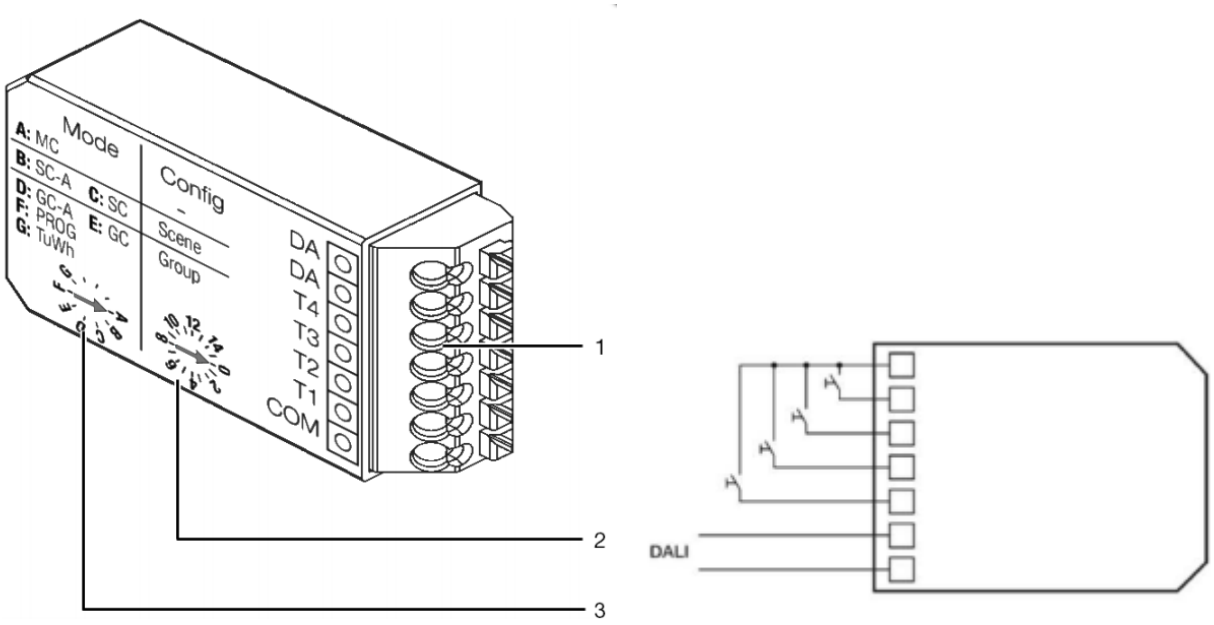
7.1. Software

If you want to use **"all"** available "DALI functions" and "extended DALI functions" of the operating device, programming over the software (i.e. Master Configurator -> Free download) with DALI USB is required.



7.2. Hardware

The easiest way is the use of a DALI control unit (i.e. DALI XC). With the setting "broadcast", all devices connected to the DALI bus are responding the same, and that with no programming. If groups should be switched or dimmed, groups can be created over the DALI XC. After allocation, the devices can be controlled. This includes scene calls. More details in the manual of the DALI XC.



(1) Terminals
(2) "Config" rotary selector switch
(3) "Mode" rotary selector switch

In a DALI system several DALI XC can effect the luminaires (like in two way connections, cross circuits and switch circuits).

⚠ CAUTION!

The DALI circuit is not SELV, that means the switches and cables have to be suitable for mains voltage. The maximum cable length between switch and the DALI XC is 50 cm. Connecting wires are included in the packaging.

8. DALI-Line example