Professional-Practice

DALI MCU: Digital potentiometer with DALI

Manual lighting control with the DALI MCU for rooms with grouped luminaires with as many as 50 ECG, with or without dividing wall

Content

1. Application

Consider you want to switch on/off and dim the light in a room, a restaurant or bar, a foyer or lounge etc – but you want to do it from either of its two doors, no matter which. For this to work, the two control points would have to operate synchronously in such a fashion that the lighting system responds immediately and harmoniously when the brightness level is changed at either of the control devices.

With the DALI MCU digital potentiometer, it is easy to meet such requirements.

The parallel connection between the two devices (control points), which would be required for our example to work, becomes super simple – and it does not necessitate any demanding installations and/or additional control components.

Each control circuit simultaneously affords the integration of as many as 50 luminaires and of up to 4 DALI MCU control devices (control points). And all that while allowing for the required comfortable, easy and complete control over the lighting levels at any time.

2. Setup/Function of components

The components in our example (page 1) above comprise the following::

- 12 ceiling lamps, fitted with DALI ECG (e.g. QTi DALI…DIM)
- 2 DALI MCU control devices, which will be integrated in standard flush-mounting electrical boxes..

In installations with 2 to 4 parallel-connected DALI MCU control devices, the command triggered by the device last operated, will determine the current switching state and/or the brightness value in the room. At the same time, the command is transmitted to the other devices, which will automatically tune to the same value. Subsequent changes of lighting levels from another control point will therefore not cause any annoying side effects such as sudden changes in luminous power because of different switching positions of the other control points that may have been operated previously.

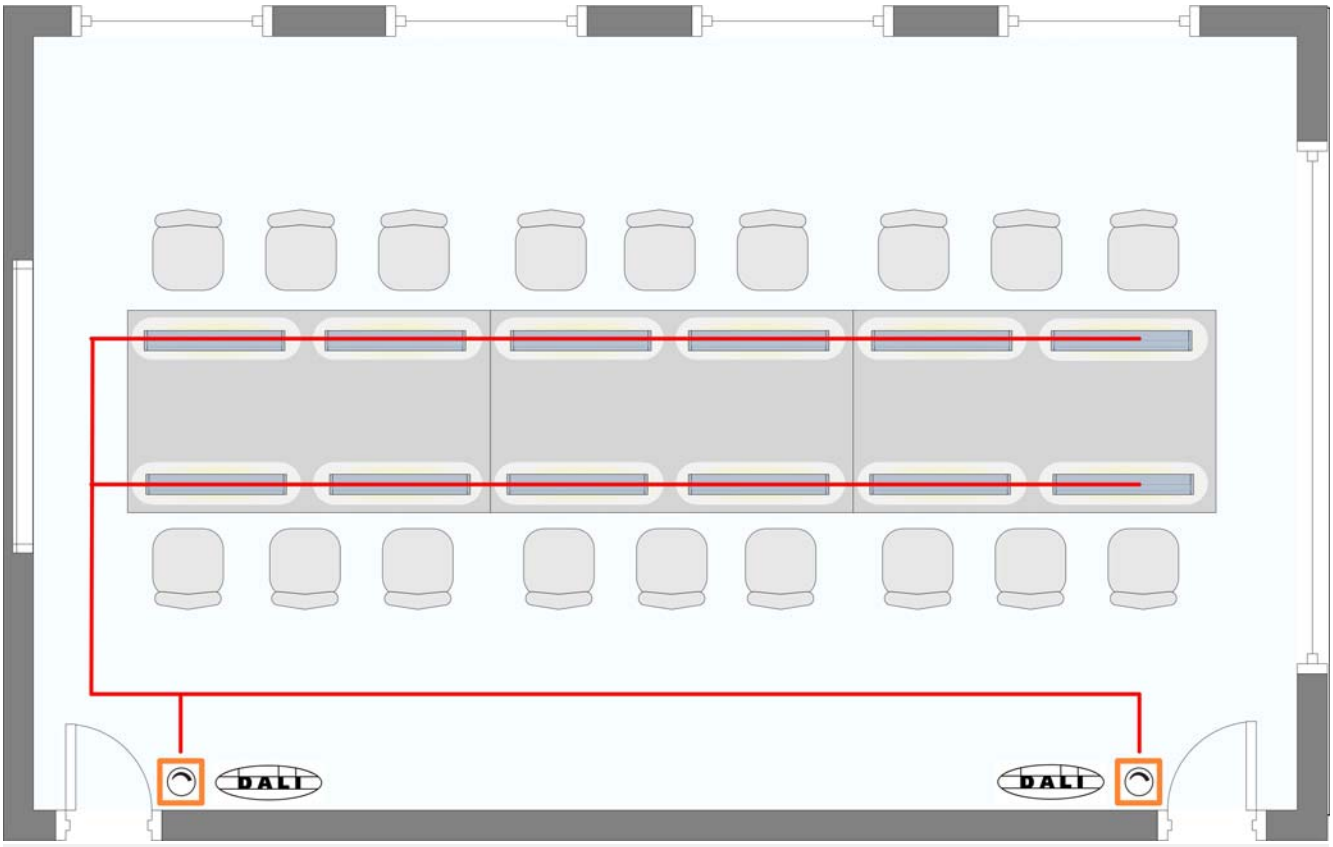

Figure 2: DALI wiring layout

3. User benefits

Lighting levels in the room can be controlled from any of the two control points. The control device most recently used will determine the current operating condition of the entire lighting system, i.e. of all luminaires and control devices integrated into that control circuit.

Use of the control devices is really simple, because:

- switching the light on/of is by single pressure of the rotary knob and
- by turning the rotary knob to the left or right, you can set the required brightness value.

Moreover, you can also ask the DALI MCU to store a particular brightness value by double-pressing the rotary knob (double-click). The next time the light is turned on, the system will then automatically return to this lighting level. The digital potentiometer has no mechanic turning limit in either direction and brightness values are set in small individual mechanical steps. Therefore, the required brightness can be set comfortably and accurately at a high resolution.

4. Installation

The installation used in our example (figure 2) should be done as follows
The mains supply to the luminaires and to one of the two DALI MCUs control devices may run through the same or through different phases (by means of a single conductor or by a 5-pole NYM cable).
In our circuit, one of the two DALI MCUs control devices must be supplied with 230V mains power. The second control device will operate without a separate mains supply in the same control circuit. With this setup, you can control up to 25 ECG independent of their power consumption. Each DALI ECG comes with the interface that has a power consumption of approx. 2mA. The internal power supply of a DALI MCU connected to the mains will provide approx. 52mA – enough to supply up to 25 ECG and another DALI MCU not connected to the mains.The following wiring diagram (figure 3), for example, shows that the control device labelled “Door A” has a mains connection. Likewise, the control device “Door B” could get the mains connection instead. This wiring diagram is based on the use of a 5-pole NYM cable and supply for the entire lighting system through one Phase (L and N).

5. Wiring

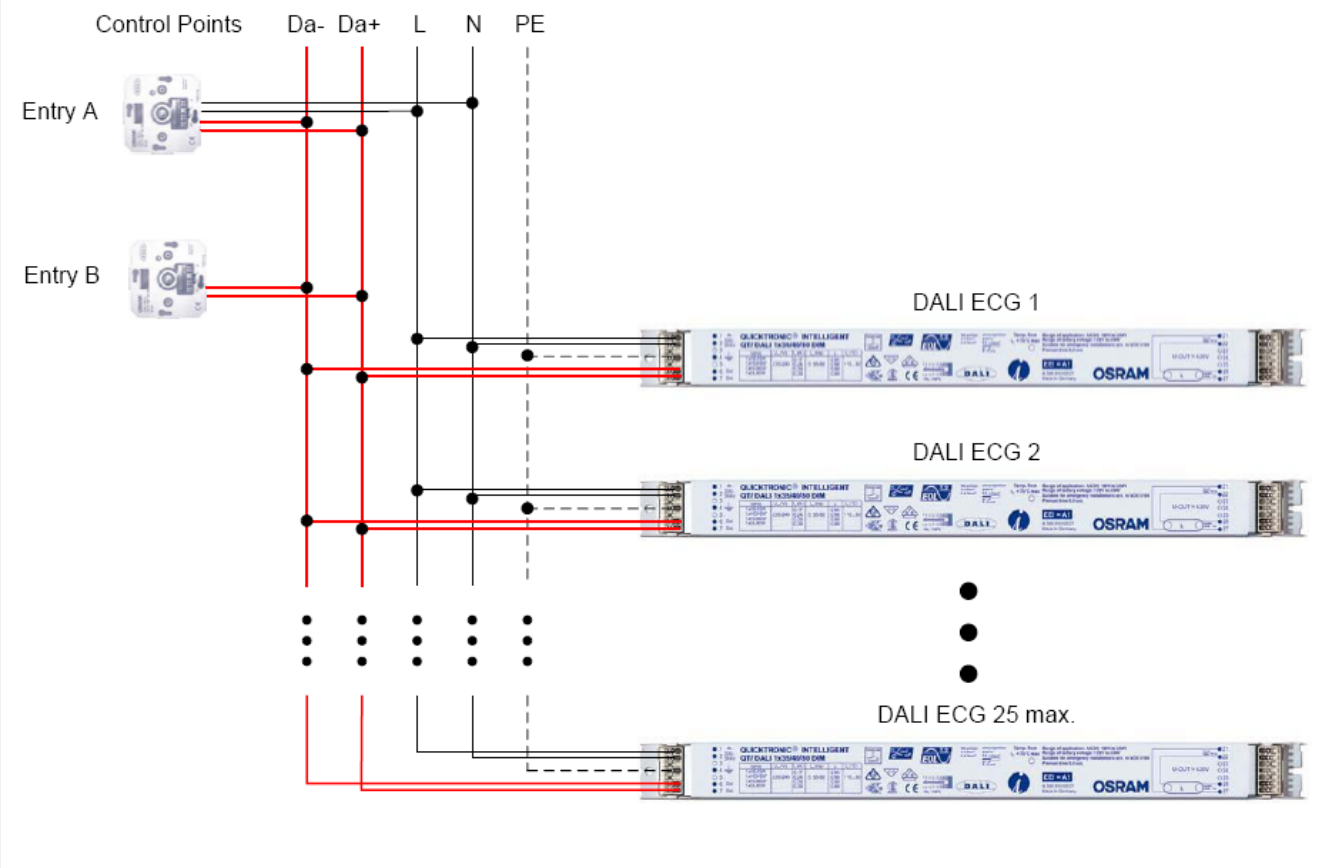

Figure 3: Wiring scheme of a conference room

You can control up to 25 ECG with this setup (figure 3). If you also connect the second control device to the 230V mains, you can operate up to 50 luminaires and two additional DALI MCUs without mains connection in one and the same control circuit (i.e. 4 control points in total – figure 4). However, it is not permissible to connect more than two control devices in the same control circuit to the mains.

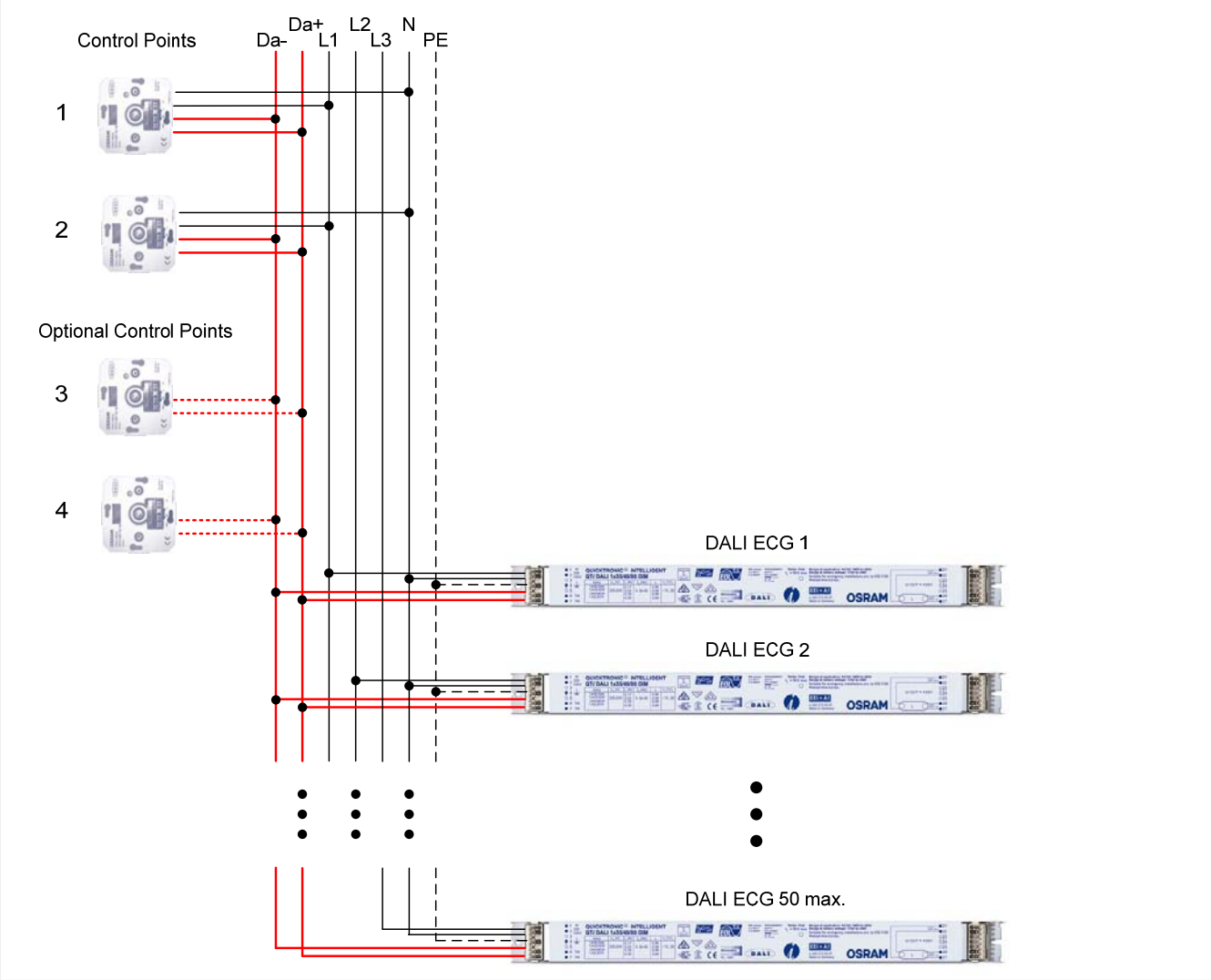

Figure 4: Wiring scheme with 4 control points for addressing up to 50 ECG

Laying the control line in indoor installations is generally not difficult. For the two control wires (DALI signal), you can use two wires in the same 5-pole NYM cable that provides the mains supply. You may chose any arrangement for the parallel wiring, but a closed circuit of the control line is not permissible. Moreover, the total running length of the control line must not exceed 300m.

It is important to observe correct polarity of the feed cables when connecting the control line with two or more DALI MCU control devices.

Because each of the devices has its own power supply, the connections must not be mixed up – i.e. the positive wire must be connected to Da+ and the negative wire must be connected to the Da- connector of the control device. Erroneous wiring, however, will not destroy the device, because the DALI MCU comes with an inverse-polarity protection feature – however, correct operation will only resume when the wiring has been corrected to match device polarity. It is not necessary to observe control line polarity on the ECG side.

6. Operation

The digital potentiometer comes with two different features: it responds to button pressure and left/right rotation without a mechanical end point (incremental encoder). Short pressure on the rotary knob will switch the light on/off, and anti-clockwise rotation of the knob (turn to the left) will cause a reduction of brightness, while clockwise rotation (turn to the right) will increase brightness.

Storing switch-on brightness

As you switch the light off with a short pressure of the rotary knob, the DALI MCU will store the current brightness value. This value will be recalled when the light is switched back on the next time. However, the DALI MCU control device also allows you to store a fixed switch-on value, which will be recalled every time the light is switched on, irrespective of the value which the system was set to as the light was switched off. Storing the switch-on value is very easy: simply turn the knob to the required brightness and then store the value by briefly pressing the rotary knob twice (double-click). To confirm that the DALI MCU has stored the value, all connected lamps will briefly brighten once. Irrespective of the brightness value last used (but not stored) before the lights were switched off, the system will automatically set brightness to the level stored by the DALI MCU.

RESET: Of course you can also reset the system to its default setting in which the brightness value used before switching-off the light will be restored when the light is switched back on the next time. To do so, switch off the light by pressing the rotary knob once and double-click it while the lights are still off. Again all connected lamps will briefly brighten once to confirm that the DALI MCU has been reset.

Setting a basic brightness level

We recommend setting a basic brightness level (minimum dim setting) of the lamps when using the system for the first time. To do so, take the following steps:
Reduce brightness when the light is on until you can no longer determine any further reduction of the luminous power. Press the rotary knob for a longer time (approx. 10s) to tell the DALI MCU to store this value as the basic brightness level. Again the lamps will briefly brighten once to confirm that the value has been set.
If you do not set a basic brightness level, the DALI MCU might under certain conditions trigger lighting levels that are outside the dimming range of the connected ECG. To increase the luminous power in such a case, you would have to turn the rotary knob way to the right until sufficient power is put out – this can be a nuisance.

RESET: If you want to reset the system to its default settings with a dimming range of 0…100 %, switch off the light by briefly tapping the rotary button and then press the knob for about 10 seconds while the lights are still off. Again all connected lamps will briefly brighten once to confirm that the DALI MCU has been reset.

7. Other fields of application

Consider you have a similar room with a retractable dividing wall, such as a conference room, a public hall or a restaurant. When the dividing wall is closed, you want both sections of the room to be individually dimmable and you want to be able to switch lights off/on in either section independently. When the dividing wall is open, however, you want to control lighting synchronously across the entire room (both sections) from any of the control points. To achieve this, you would set up one DALI control circuit in each of the sections You would then connect one control device in each section (figure 5) to the mains, and optionally, you could also install a second control device without mains connection in each of the sections.

One DALI MCU control device in each of the two sections must have a mains connection to make sure that it can supply its assigned control circuit when the dividing wall is closed.

When the dividing wall is closed, the position switch is in open position, so the connection between the two control circuits is broken. Then, lighting can be controlled and dimmed in both sections independently.

When the dividing wall is open, the position switch is in closed position and the control circuits in both sections and their corresponding control points are turned into one single parallel-connected control circuit. You will therefore be able to control all lamps in both sections simultaneously. Please pay special attention when connecting the control lines to the terminals of the DALI MCUs (polarity!). Single-pole interruption of the DALI control line via the position switch is generally permissible. It does not matter, which of the two control wires (Da+ or/and Da-) is used for switching or whether both are used. As soon as the previously closed dividing wall is opened – connecting the previously interrupted DALI cable between the control devices in both sections – illumination levels in both sections will adjust to a uniform brightness within approx. 10 seconds. The brightness level will match the level previously set in one of the sections. Turning the knob on any of the DALI MCUs will then change the lighting in the entire room based on this previous level.

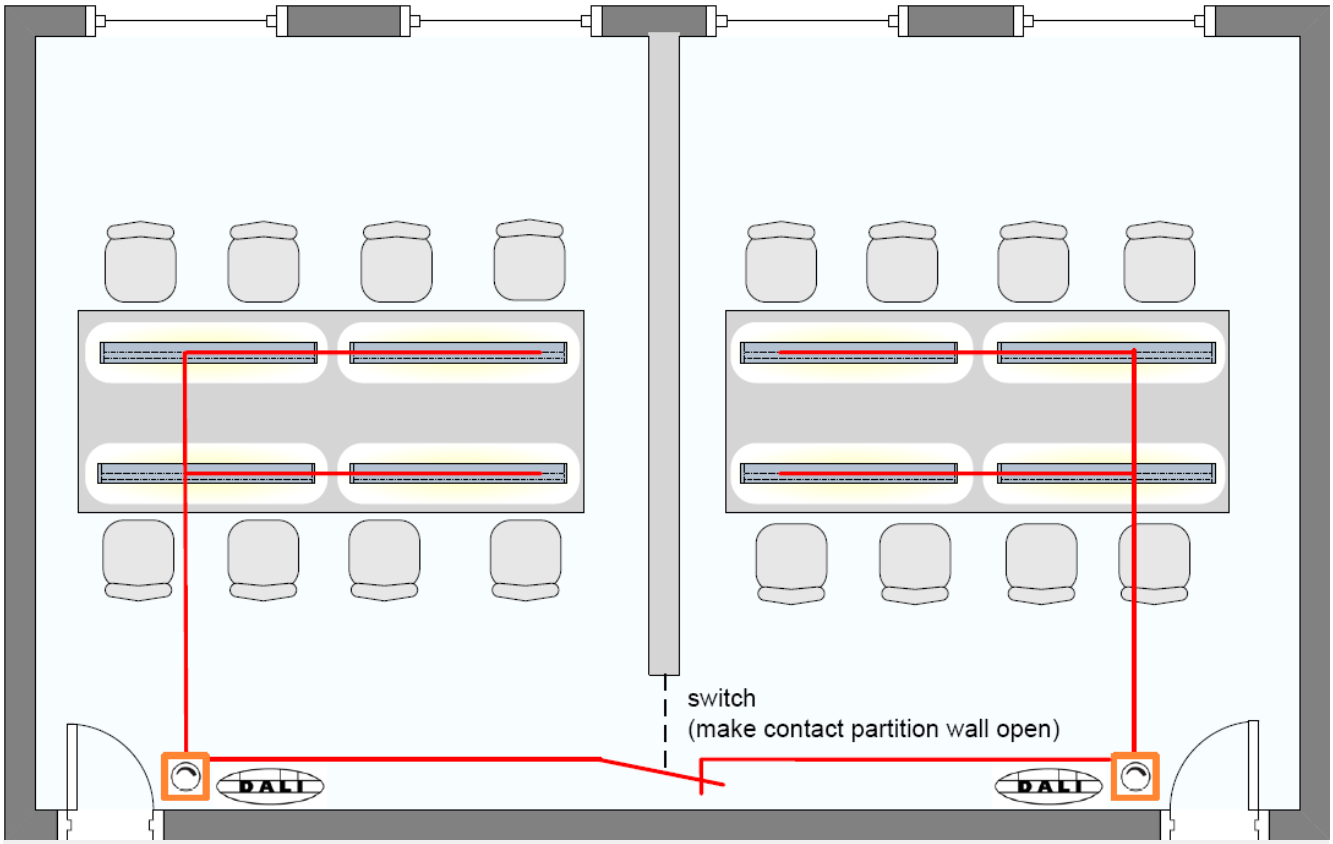

Figure. 5: DALI wiring layout in a dividable room

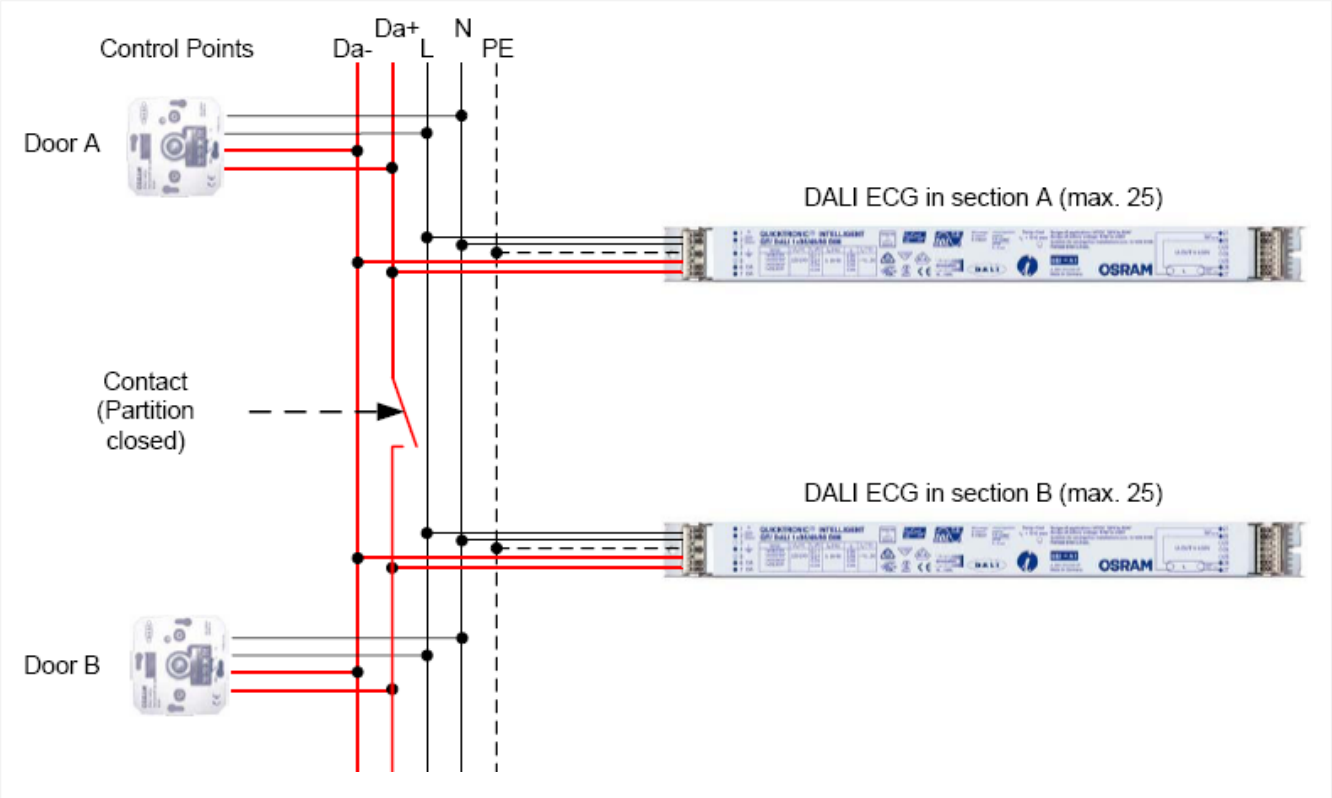

Figure. 6: Wring scheme of a room with partition

Additional interesting uses of the DALI MCU include dimmable individual luminaires, groups of luminaires, custom settings in RGB colour mix systems with designer lamps or decorative lamps, and the control of fluorescent lamps with different colour temperatures in daylight luminous ceiling applications, LED colour tile systems or in illuminated displays (signage).

8. Technical data

Designationg	DALI MCU
Order reference (EAN)	4008321189721
Power connection	L, N
Operating voaltage	230 V AC, 50-60 Hz
Power consumption	3 W max.
DALI connection	da+/da-, max. 300 m cable legth,25 DALI ECG max.
Perm. Cable cross-section	1…4 mm^2
Ambient temperature	0…+50 °C
Type of protection	IP 20
Protection class	II
CE requirement	EMC to EN 61547, low voltage to EN 60628