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## **DALI LIGHT CONTROL SYSTEM**

**М. А. Мясина, Е. С. Тарасова**

*Томский политехнический университет*

This report covers what DALI is, how it works, the required components, and the advantages and disadvantages of using a DALI system. DALI is short for Digital Addressable Lighting Interface. A DALI system is a method of controlling light fixtures in a space. DALI is a protocol, in which DALI devices communicate with each other.

Any new technology is expected to be better than its predecessor in that. It should be more flexible and have greater functionality. In 1990, European ballast manufacturers such as Philips, Osram, Tridonic, Huco, Trilux, and Vossloh-Schwabe began researching new ballasts that could communicate individually with a control unit. The reason for this research was to explore the possibilities of a lighting control system with greater flexibility than a 0-10V dimming system [6].

DALI has primarily been designed for convenient control of the lighting inside enclosed spaces. These lighting systems support several operating modes, for example:

- The presence control only.
- Light level control only.
- Manual control.
- Fully automatic.

Compact reliable occupancy sensors and light-level sensors inform the automatic switching and dimming. However, occupants may use local wall switches or hand-held remote controls for manual dimming and switching of lights in their work area to override the automatic control temporarily or to reprogram the DALI control [3].



Figure 1. – Examples of DALI products [5]

A DALI lighting control system can be as simple as a single luminaire containing a driver and a sensor. The same luminaire could be connected with other DALI devices to form a larger system – and DALI systems don’t stop at a few rooms. Using gateways, multiple DALI subnets can be connected into seamless systems, allowing many thousands of devices to be connected in a single system. This allows the strengths of DALI as a dedicated lighting control protocol to be used. A good example of this is the 2014 DALI award winner, the World Trade Centre in Abu Dhabi [1].

DALI system has the potential to save energy costs. Compared to a fixed output installation, the dimming and individual control capability provided by DALI enables considerable energy savings. In combination with dimmable drivers, presence and daylight sensors, energy savings of up to 80 percent can be achieved. If the operation of the lighting is to be rearranged or regrouped, the costs per circuit in a fixed output system could be four times higher than those in a DALI system. The ability to send queries and obtain replies – two-way communication – can greatly reduce maintenance costs. For example, DALI allows automatic testing and reporting of monthly function tests of emergency lighting. In addition, energy consumption and lamp condition can be checked for each luminaire, very easily and at no additional cost [1].

In the simplest systems, no configuration is required. Devices can work “out of the box”. Separate control cables are not required for each device – a simple 2-wire cable can be used to connect together all the DALI devices in a system. Daisy-chain and spurs are allowed. Bus-powered devices can be powered from the same 2-wire DALI cable that carries the communications information. The digital protocol allows robust communication even with low-cost cable, and with most devices being polarity insensitive, mistakes in wiring are reduced [1].

The ability to dim lights is essential for many buildings since various daily tasks require dimming. Conference rooms, auditoriums, and classrooms can all benefit from the ability to dim lights. A DALI system makes this task simple [6].

Often an owner wants to incorporate daylight into a space for color rendering purposes, to make occupants feel less like they are cooped up indoors, or to save money in energy costs. A DALI system is one of the best ways to integrate daylight with artificial light while maintaining a fairly uniform footcandle level on the workplane.

The only time the light level may not remain uniform is when daylight provides a higher footcandle level than that for which the space was designed. In this case, installing blinds or shades on the windows may be beneficial. Since each ballast can be controlled separately in a DALI system, the control unit, after receiving readings from a photosensor, can send individual messages to each ballast about how much they need to dim to keep light levels fairly constant. The advantage of a DALI system would be the guarantee of having the capability to provide adequate light levels [6].

On occasion the function or layout of a space requires modification. Whether this is a change in furniture layout, new tenant requirements, or simply new task requirements, a DALI lighting system provides the flexibility to adapt the lighting controls to any new space. Because the wiring of the ballasts plays no part in how the fixtures are grouped or controlled, changes can be made whenever the need arises. Fixtures can easily be regrouped and groups can be reprogrammed to fit the needs of the space. Because modification of a DALI system is so simple, it avoids the costly changes associated with a hard-wired system [6].

Also DALI light control systems have some disadvantages. DALI products are expensive enough. Thus a designer should carefully evaluate a project as far as what the owner is looking to obtain from the lighting control system, the budget for the project, and the required functions of the space before designing a DALI system [6].

How it works? The DALI control cable exists of 2 wires, polarity insensitive. A DALI power supply creates +/- 16V potential between those wires [5].

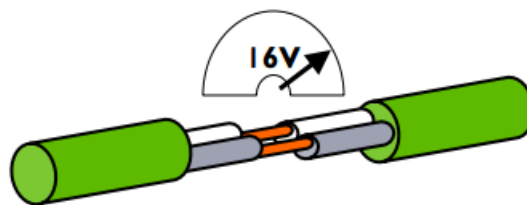


Figure 2 [5]

By short-circuiting (done at high speed in a DALI-device) the potential between the wires changes to 0V [5].

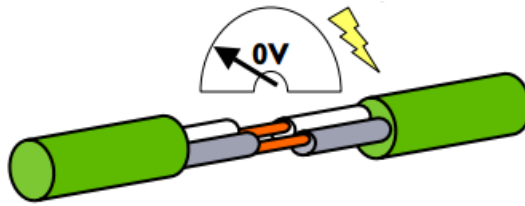


Figure 3 [5]

By changing the voltage between 0 and 16V a digital signal is created. The DALI signal exists of two parts, a “where to” and an “info” byte [5].

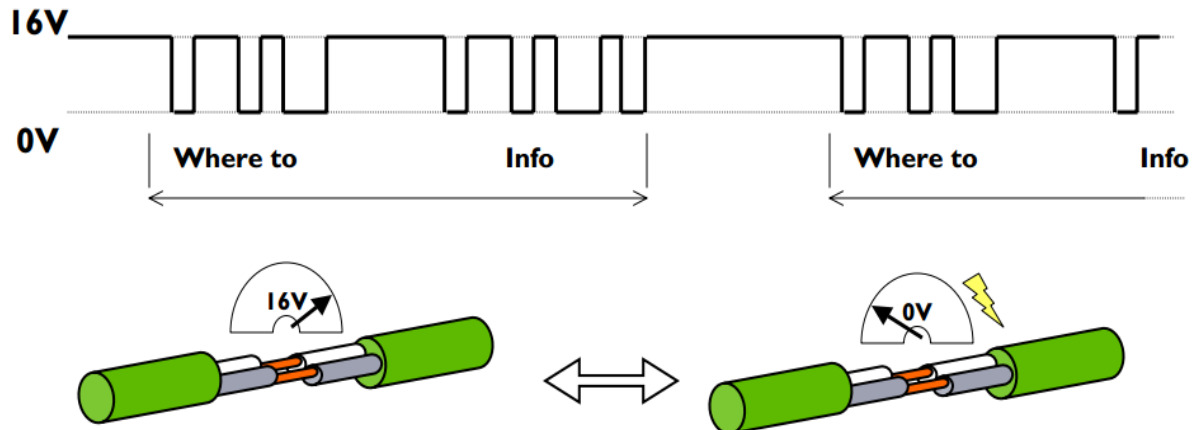


Figure 4 [5]

The “Where to” byte determines which devices should react [5]:

- “Broadcast” all Load Interfaces will react
- “Group (1-16)” Load Interfaces assigned to this group react
- “Address (1-64)” Load Interfaces with this address react

The “info” byte determines what the device should do. In example [5]:

- “on”
- “off”
- “direct level 50%” (0-100)
- “step up”
- “step down”
- “recall scene 2” (1-16) and many more...

A DALI controller will always be assigned a combination of “where to” and “info” information. Communication is always started by the controller [5].

In idle state the current signal is “high” so there is current. A driver input current is 2mA in idle state. Nominal current for 64 inputs is 128mA. Information is transferred by short circuiting the current (controller / input). An input can only “answer” (=back channel info) [5].

The power needed for the DALI-signal can be created by an external power supply. Some products have the functionality of DALI power supply integrated, I.e. MultiDim dimmers. Always use exactly 1 power supply in a DALI-system [5].

In conclusion, DALI is the ideal, simplified, digital way of communication tailored to the needs of present day lighting technology [2]. The scope of using lighting systems is constantly expanding, the light comfort is increasing, the lighting is adapting to individual requirements. Also DALI products become cheaper and thus more available.

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## **EXPERIMENTAL EVALUATION OF THE EFFECTIVENESS OF WATER MIST FIRES SUPPRESSION SYSTEM ON OIL TRANSPORTATION FACILITIES**

**G. S. Nyashina, D. O. Glushkov**  
*Tomsk Polytechnic University*

Main pipeline transport is an essential component of the fuel and energy complex of Russia. The country has an extensive network of trunk pipelines, oil pipelines and gas pipelines that pass through the territory of the majority of subjects of the Russian Federation. Most of the oil and gas industry are highly explosive. One of the areas that provide prevention of emergency situations is to equip the production facilities with modern fire protection systems.

Currently popular means for extinguishing constructed and reconstructed facilities were modern systems that use water spray. The unique features of these systems have made them nearly ideal for fighting fires. The main advantage of extinguishing water spray – high fire extinguishing efficiency with minimal effects on