

# INTELLIGENT INSTALLATION SYSTEM AND DALI SAVE ENERGY

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## ABSTRACT

*This paper deals with the intelligent building installation system and integration DALI interface (Digital Adressable Lighting Interface) in a higher-ranking building management system such as the European Installation Bus (EIB). This combination opens up a whole new range of options to designers for the intelligent interconnection of various systems and save energy.*

## 1. INTRODUCTION

ABB i-bus® is the intelligent building installation system that meets the highest standards, being both future-orientated and highly flexible. ABB i-bus® provides increased security, economic efficiency, convenience and flexibility, whether in office buildings, industrial plants or residential properties. Functions such as lighting, shutter control and heating can be individually adapted to the requirements of the user. Later changes can be easily implemented.

DALI has now established itself as the digital interface standard for dimmable electronic control gear (ECG). Among other things, two key characteristics contributed to this development: DALI is far easier to handle than the familiar, standardised 1 - 10 V technology, and it has a much wider range of functions.

## 2. MODERN BUILDING INSTALLATION WITH ABB i-bus®

With ABB i-bus®, you can carry out all the required functions from any location in the building. It is also possible to operate the installation remotely, for example via a mobile or the Internet. If several functions are to be executed using a single command, this can be implemented without problem. With central commands and user-defined procedures, all the shutters can, for example, be raised simultaneously, the constant lighting control activated and each room regulated to a separate temperature; all with a single push button action.

With ABB i-bus®, professional security functions can be integrated into the building installation. A security control panel manages all security-related signals and triggers alarms. The security control panel can also be conveniently operated via the ABB i-bus®. Signals can be displayed at any location or printed out via a logging printer.

In building installations using ABB i-bus®, functions are not only executed via direct manual operation. Using closed-loop control systems, the user can preselect an individual daily profile for the room temperature or the room lighting level can be constantly regulated to a required value. Time programs are recommended for regularly recurring events. Shutters and blinds can be raised automatically should the wind become too strong. ABB i-bus® monitors the building and can isolate, for example, electrical circuits in the event of a fire or monitor the energy consumption.

ABB i-bus® makes it possible for current information about the building installation to be displayed continually. You can see at a glance in which rooms the lights are switched on or which doors and windows are open. Measured values can be shown on a display and alarm signals inform you about possible dangers in your building.

If someone has forgotten to switch the light off, you can simply switch it off from the display terminal, without even having to walk up the stairs. You can monitor your building via the telephone or the Internet. This is the best way to remain constantly informed.

### 3. How does ABB i-bus® work?

EIB – one system has won through ABB i-bus® corresponds to the European system .European Installation Bus. (EIB for short) which in the meantime is being used all over the world. Since the EIBA (European Installation Bus Association) merged with two other European organizations to form the Konnex Association, KNX has become the new standard in building technology. ABB i-bus® corresponds to both the EIB standard and the KNX standard.

With ABB i-bus®, electrical loads are not switched directly in the circuit with switches and push buttons as in conventional electrical installations (see Fig.1).

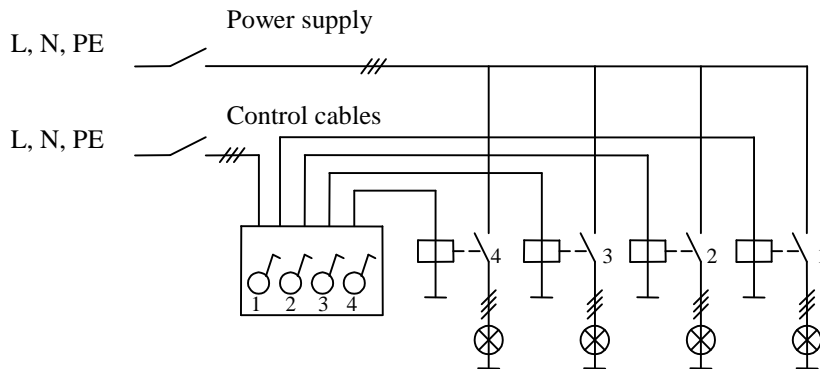


Fig.1: Conventional electrical installation

Commands are sent instead from sensors (e.g. electronic push buttons) on a twin-core data cable and are received by actuators. The actuators then execute these commands, for example by switching the circuit (see Fig.2).

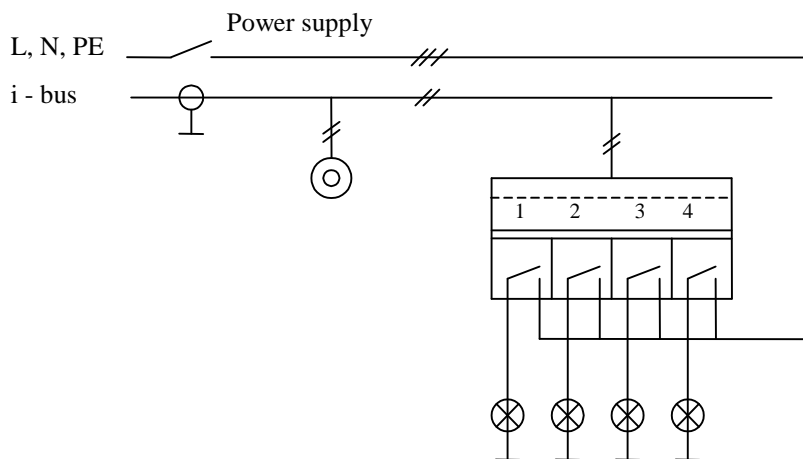


Fig.2: Electrical installation with ABB i-bus®

Sensors are, e.g. push buttons and switches, room thermostats, movement sensors, time switches, binary inputs, zone terminals, current modules, analogue inputs. Actuators are, e.g. binary outputs, dimmers, light controllers, shutter actuators, universal concentrators, display units.

Electrical installations with ABB i-bus® offer the user numerous advantages:

- Electrical loads can be switched independently of the electrical circuit (e.g. the light in the hallway can be operated from the lounge or from elsewhere in the house).
- Electrical loads can be switched by several sensors without complicated two-way circuits or remote-control switches.

- Functional associations between actuators and sensors can be modified at any time and adapted to individual requirements.
- All the functions can be programmed so that they run automatically. Logic operations can also be created (e.g. if the brightness level drops below a specific value after 18:00, all the shutters are lowered and the light in the hallway is switched on).
- The switching states of electrical loads can be displayed.

#### 4. *DALI - standard with a future*

The requirements for modern lighting technology are extremely varied. While previously lighting was only required for visual tasks, nowadays factors such as comfort, ambience, functionality and energy saving are in the foreground. Furthermore, a modern lighting system is increasingly being incorporated in the Facility Management (maintenance and preparation management) of the building installation. Often, a complex lighting management system is needed which meets the uses of the premises. All these requirements are either not adequately met by the traditional analogue electrical installation or only with considerable effort and cost. The DALI standard has emerged from this background. The manufacturers from the lighting industry, primarily the leading manufacturers of electronic ballasts, joined together to define a new standard for the digital communication of a lighting system. This resulted in the DALI protocol (Digital Addressable Lighting Interface).

A two-core control cable which does not need to be shielded is used for the exchange of information and transmission of the digital commands. It is not necessary to take the polarity into account. The control cable must not have any SELV characteristics (safety extra-low voltage).

A DALI power source (16 V DC) supplies the individual DALI devices, the DALI processor, controller, control devices or modules which are responsible for managing the scenes and groups in the DALI line. A separate relay or a calculation of the switching capacity is not required as the switching relay is integrated in the DALI ballast.

There are DALI devices (e.g. LED DALI converter, DALI switch actuators) which consist internally of several DALI devices and can only be addressed via a common DALI control cable. The internal DALI devices have different individual DALI addresses and can be addressed individually via DALI. These devices can be connected to the DALI-Gateway DG/S 8.1. The internal DALI devices are detected and monitored. They cannot however be triggered individually. The control is carried out globally. With DALI, a standard has been created which meets the requirements of modern lighting technology due to its digital possibilities.

The essential functions of DALI are:

- Individual dimming speeds for each device
- Lightscenes with fade times
- Scene devices reach their final brightness value simultaneously
- DALI ballasts have a dimming range of 1 to 100%
- DALI uses a logarithmic dimming curve corresponding to human eye response;
- Current brightness values and ON/OFF states can be queried
- Ballast and lamp faults are detected
- Behaviour in the event of a system fault can be defined
- Global control of all DALI devices (broadcast mode)
- Connection of a maximum of 64 ECG units to one control line;
- Individually addressable ECG with assignment to a maximum of 16 groups and 16 light schemes;
- Control line protected against polarity reversal;
- Use of standard installation cable, rather than special bus cable;
- Switching and dimming via the control line, without additional switching relays;

- Mains phase for the power supply independent of the control line.
- Synchronous scheme transitions;

These features also offer the optimum prerequisites for integration in higher ranking light control or building automation systems (Fig. 3). An interconnection of this kind can easily be implemented with the aid of the numerous gateway modules available.

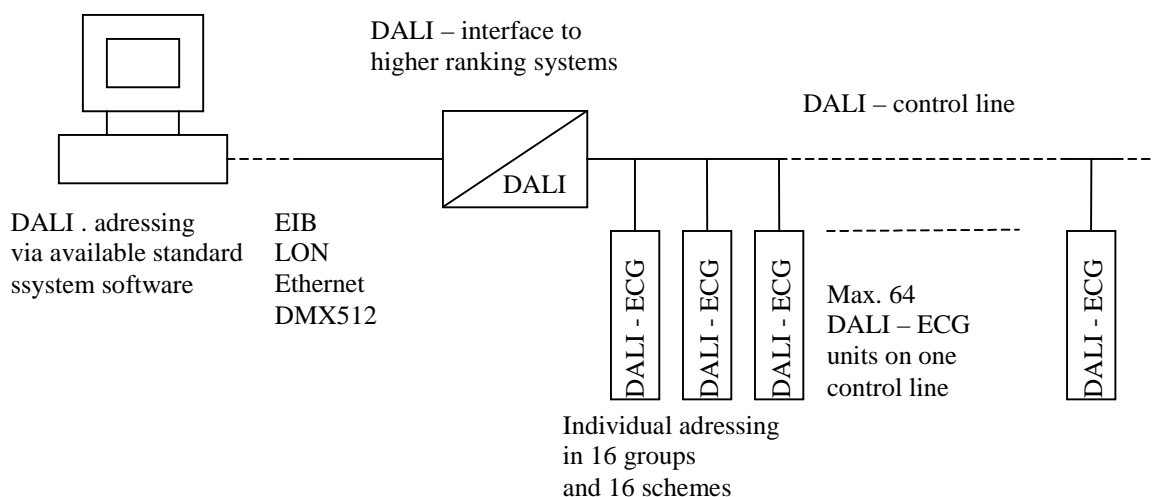


Fig.3 The DALI integration in higher ranking systems

## 5. CONCLUSIONS

Dynamic light is the watchword of the future in modern lighting. Its growing acceptance is primarily due to three factors. First, the dimming of artificial light as a function of incoming daylight makes it possible to save energy, thereby cutting energy costs by more than 50%. Second, dynamic light, especially in combination with colour effects, is an ideal means of attracting attention. Third, variable light permits the creation of individual light schemes and atmospheric effects for different applications and moods. DALI has established itself since 1999 as a company-neutral interface standard. It is possible to control fluorescent lamps, incandescent lamps, LEDs etc. via DALI, combine them into light scenes and to integrate them with the ABB i-bus® DALI-Gateway DG/S 8.1 in the EIB / KNX building installation. The DALI standard can be seen as a subsystem of modern building system technology which links the components of lighting technology and is not dependent on one manufacturer.

## 6. REFERENCES

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