

# Intelligent energy efficiency

How KNX bus systems control our buildings

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Modern information and automation technology has become an integral part of human life in recent years – so integral, in fact, that its presence is often taken for granted. But for a long while, two central areas of everyday life – that is, homes and office buildings – have been technologically neglected. Electrical installations in a building were mainly limited to the selection and quantities of the appropriate switches and outlets that suited the design of the house. The average user was usually not aware of the technology behind it.

Today this is no longer true: It has become very easy to fit and use intelligent installation systems. They offer unimagined flexibility, safety and energy savings, features that no one wants to do without.



The KNX system enabled the introduction of the latest technology into electrical installations **Factbox**. The functionality of the individual KNX device not only covers the entire application area of comparable conventional installation equipment, but also offers possibilities that are not enabled – or are enabled only at high costs – by the conventional technology.

Communication between the KNX equipment of different trades allows for multi-use of equipment and transmission routes, thus saving resources and also providing functions that would otherwise be achieved only via costly interfaces, and additional devices and cabling.

The measures to reduce energy consumption and efficiently use energy in buildings that are proposed in most publications today suggest the use of thermal protection of buildings and the use of efficient heating plants and cooling plants to reduce energy consumption.

The following examples show how the use of KNX equipment offers further possibilities for both energy savings and energy efficiency. Each individual measure does not appear to offer significant energy savings; however, the measures as a whole are not negligible. The enormous increase in functionality achieved through integration of the KNX equipment is the major incentive for users of such systems.

### Lighting control

One of the core applications of electrical installation technology is the switching and dimming of lights, as well as the distribution of the electrical energy. A simple measure to prevent any unnecessary energy consumption is the automatic disconnection of any illumination after a defined period of time. Thus the light that was left on in the basement will no longer be a problem. This possibility is provided by the application software itself as implemented in the KNX switch actuator ABB STOTZ-KON-TAKT. In addition, a sophisticated timing switch program can be established via an application component that

### Factbox KNX: a standard with increasing acceptance

For more than 15 years, ABB STOTZ-KON-TAKT in Heidelberg and Busch-Jaeger Elektro in Lüdenscheid have been developing and producing electrical installation equipment that is interconnectable via the KNX bus system. The KNX bus system is compliant with the European standards CENELEC EN 500090 and CEN EN 13321-1, as well as with the international standard ISO/IEC 14543-3. In China, the bus system has been integrated into the national set of standard specifications known as Chinese standard GB/Z 20965.

The KNX Association is a group based in Brussels consisting of leading European

manufacturers of installation equipment as well as companies from the United States, the Middle East and China. The KNX Association advances the KNX standard, which is completely open and platform-independent and enables a manufacturer- and trade-independent interoperability.

KNX devices are used in many areas: Electricians use it for almost all installations – ranging from the switching and dimming of artificial light to the control of audio and video equipment – as well as in all applications within buildings, whether they are single-family homes or high, multi-storey buildings.

makes it possible to switch on and off a single light or a group of lights, and that defines specific brightness levels. Since the available devices are interconnected, no additional cabling is required between the application unit and the various lamps – even if a great number of the single lamps are individually switched or dimmed.

Another possibility is to switch on the light only when needed. Motion detectors **1** are the preferred solution, as they react to minimal movements and are able to recognize whether there is a person in the room.

The KNX motion detector also has a feature to keep the illumination at a constant level, irrespective of external brightness. It can also automatically switch off the lights in response to external brightness.

The motion detector also has an alerting function; ie, it is able to react to major changes in movements. This function could be used in applications such as an alarm system.

A movement-dependent illumination control can also be established via an infrared motion detector. Busch-Jaeger offers a broad selection of wall-mounted and flush-mounted detectors **2**.

Compared to the motion detector, the Busch watchdog will only switch the

light on and then off again as soon as there is no one in the defined control range of the motion detector. It is also possible to adjust the time period during which the light is activated after a person has triggered it (so-called follow-up time).

### Shutter control

Another major KNX application refers to the control of rolling shutters and

**1** KNX motion detector by Busch-Jaeger Elektro



**2** Busch alerter 220 EIB Professional Line



## Distribution

jalousies (ie, Venetian blinds). ABB's KNX shutter actuators **3a** provide the possibility of simple automated sun protection. The controls process the following information: "The sun is shining," "Someone is present in the room," and "It is wintertime/summertime." During summer, the jalousies will completely close when the sun is shining and no one is in the room, thereby darkening the room in order to prevent unnecessary heating. If someone enters the room, the slats open just enough to lighten the room. During wintertime, the opposite control is employed. When the sun is shining and no one is in the room, the jalousie will open completely in order to better use the sun radiation for additional heating. If someone enters the room, the jalousies will be closed to a position to prevent any glare.

In order to assess the external brightness, conventional sensors may be connected via conventional interfaces, eg, 0...10V, to the KNX analog inputs. If an adjustable level is exceeded, the corresponding message will be generated, which then triggers the KNX shutter actuators. Alternatively, a KNX weather station may be used that, in addition to evaluating information on brightness, is also able to evaluate information on wind, temperature and rain. A specially adapted combined sensor is available for this and generates the corresponding messages.

The shutter control unit offers even more possibilities for an optimum adaptation of the mounting height and the blade angle **3b**.

This apparatus, with the size of only two standard sections, allows optimum positioning of each individual jalousie on all sides of the building where the sun is shining. This optimum positioning is the result of evaluation of the current date and time, geographical width and length, alignment of the individual building sides, blade geometry and the message "The sun is shining." For this evaluation, permanent shadow sources, such as neighboring buildings, and temporary shadow sources, such as broad-leaved trees, are taken into account.

### The KNX motion detector has a feature to keep illumination at a constant level.

#### Heating control

One example of the overlapping functionalities of the KNX system is the temperature control for individual rooms in connection with the boiler control **4**. The control elements shown for switching and dimming of the light and for moving the shutters up and down are also equipped with a temperature sensor. This sensor registers and displays the room temperature, compares it to the current nominal value and submits the set value to the electrically controlled valve that is also connected to the KNX system.

In the application unit of ABB STOTZ-KONTAKT or in the room panel and control panel of Busch-Jaeger Elektro, a temperature profile and time profile

have been defined; they send different set point values to the thermostat depending on the time and the day of the week. Thus the bathroom may be heated to a pleasant 24 °C long before someone wakes up. On the other hand, the application unit or the room panel or control panel may switch the temperature control to night operation in the evening. The rooms will be heated only if necessary, and the room temperature will be controlled to the required comfort level. Independent of these controls, manual manipulations are always possible.

The KNX boiler control provides another possibility for energy savings. In the case of a conventional boiler control, the entry temperature of the heating is controlled only on the basis of the outside temperature, whereas the boiler control that is connected to the KNX system will check the valve drives that are also connected to the KNX system and will determine their position.

The valve position provides the information to the boiler control on how much heating energy is required in the rooms and whether the entry temperature may be reduced below the current value. This prevents any undesired losses due to an entry temperature that is too high.

#### Room and Control Panel

The Busch-Jaeger Room and Control Panel **5** can also control complex processes, such as lighting scenarios, attendance simulations and individual room temperature control, in a simple manner via the KNX system.

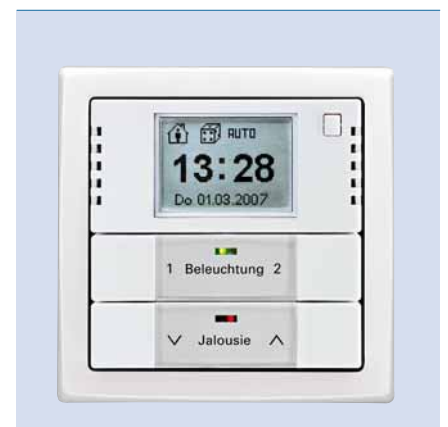
**3a** Jalousie control für SMI drives



**3b** The ABB Stotz jalousie component



**4** Solo RTR 6128-xx



5 Multifunctional Room and Control Panel



The panel possesses a graphic-compatible LCD screen with an integrated background light. It enables activation of up to 210 switch and control functions on various display pages that have been programmed to customer specifications by the installer. During an absence, the room temperature can be automatically lowered to save energy.

Various pre-programmed light scenarios offer significant energy savings, since the room lighting can be immediately adjusted to the actual requirements (eg, reading, watching TV) by simply pressing a button. This means the conditions are active only under the circumstances where they are currently required.

#### Busch radio control

With the new Busch radio control system, open windows can be localized via the Room and Control Panel or via the LED Busch-WaveLINE [6](#). If some windows are open, the heating may be turned down automatically by the KNX system in order to save energy. This system can be easily installed in existing windows.

For the latter case, the LED WaveLINE is connected to the home network system via a KNX bus coupler. If one or several windows are tilted or completely open, the room heating may be reduced or the entire heating system can be switched to night control, if desired.

#### Remote control

Gateways enable remote access to the KNX system [7](#), allowing the system to connect with an analog or digital telephone network, a local network or the Internet.

6 LED WaveLINE and switch



Take, for example, a house in the countryside that is used only during the weekend: The heating for some rooms can be controlled to a comfortable temperature from Friday evening to Sunday evening. Should the planned visit to the weekend house not take place, a simple phone call or mouse click is sufficient to switch the heating to minimum standby operation.

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#### Application-independent basic functions

Apart from application-specific equipment, the product range of ABB STOTZ-KONTAKT and Busch-Jaeger includes various generic equipment, eg, binary inputs and actuators. Binary inputs make the relevant information available to the KNX system. This information can then be transformed by actuators, for example.

Such equipment enables further functionalities that help reduce energy consumption in buildings. After closing hours in offices, the actuators – automatically controlled by a timer – can turn off the sockets that are used for devices with standby functions. This may refer to printers, access points for the WLAN or even the cof-

7 Gateway to the KNX system



fee machine. In a residential building, a central “off” button may activate the same function. In addition to the reduction in energy consumption, the potential danger of unattended electrical equipment is reduced.

#### Prepared for the future

Generally speaking, functional buildings require major renovation after a period of approximately 10 years. Such renovation often implies a modification of the electrotechnical infrastructure. Instead of refurbishing the complete electrical installation and adjusting it to the new requirements, in most cases it is sufficient to reprogram functionalities and to install some new devices. KNX systems not only secure the comfort, flexibility and environmental compatibility of today's buildings, but also secure the economic efficiency of future upgrades.

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