Technology of Choice
Smart Home and
Intelligent Building Control
ABB i-bus® KNX
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Intelligent Building Control
for consultants, system integrators and electrical installers

Benefits for professionals:
Efficient planning
Economic installation
Fast integration
Simple to commission
Flexible expansion

Benefits for customers:
Comfortable to operate
Comprehensive functionality
Quick to change and expand
Energy saving
Future-proof investment
In many areas of our private and working lifes, the increasing level of automation is a trend that confronts us on a daily basis without actually being noticed.

Automation in buildings aims to combine individual room functions with one another and to simplify the implementation of individual customer preferences.

KNX is the logical development for implementing traditional and new requirements in electrical building installations and thus replacing conventional installation techniques. The intelligent installation bus system efficiently performs the conventional functions and offers an additional broad range of expanded features, which could not be realized without a bus system.

ABB offers consultants, system integrators and electrical installers a comprehensive product range with ABB i-bus® KNX, in order to meet the challenges posed to electrical building installations both today and in the future.
What does KNX stand for?

KNX – The standard

The KNX system is the leading intelligent control system for buildings world-wide.

KNX resulted from the merger of major bus systems, including the well-known EIB (European Installation Bus) that has been successfully on the market since 1992.

What does KNX stand for?

– KNX is the first globally standardized system for the automation of residential and non-residential buildings in accordance with the international standard (ISO/IEC 14543-3), the European standard (CENELEC EN 50090, CEN EN 13321-1 and 13321-2), the Chinese standard (GB/Z 20965) and the US standard (ANSI/ASHRAE 135).

– KNX has established a clearly defined system platform where the KNX products of different manufacturers can be operated with one another.

– Both the data protocol and the devices are certified compliant to the KNX standard.

– KNX thus guarantees the networkability, interoperability, is both upward and downward compatible and thus future-proof.

– Just one common software tool is required for planning, engineering and commissioning of all KNX installations.

– Both the manufacturers and the KNX Association support professionals during planning, commissioning and maintenance world-wide.

– Comprehensive training opportunities are available for beginners and experienced users in certified training centres.

– More than 170 internationally certified manufacturers are members of the KNX association.

– More than 22,000 qualified KNX partners plan, install and integrate KNX systems worldwide.

– Thousands of buildings, ranging from private houses to airport complexes around the world, are equipped with more than 10 million KNX products.
What does KNX do?

Application

The use of new materials and the application of renewable energies are considered as the most significant innovations in the building industry over the last few years. The growing desire for comfort and functionality simultaneously with the limited availability of resources and increasing energy costs provide the basis for intelligent building control in modern constructions.

KNX interconnects all the components in the electrical installation to form a networked system and thus guarantees the transparency and utilization of information across the installation. In this system, all users “communicate” via a single bus cable. Thus it is possible to integrate all the different functional subsystems within the building into a seamless solution.

KNX bus systems can be used both in residential and non-residential buildings.

Applications:
- Lighting
- Climate control
- Sun protection
- Security
- Energy management
- Operation
- Automation
- Communication
ABB i-bus® KNX
What links ABB and KNX?

ABB is represented in over 100 countries with more than 100,000 employees. Our company benefits from over 25 years of experience in intelligent building control systems.

ABB develops, produces and sells a complete range of innovative products for building installation.

ABB plays a leading role in the KNX Association. ABB i-bus® KNX conforms to the international KNX standards and thus belongs to the leading technology worldwide for intelligent building control.
Climate change and growing shortages of resources are the big challenges of our time. Efficient and sustainable energy usage is therefore an urgent necessity.

Scientific studies and measured values in practice show a high energy saving potential when bus technology is used in room and building automation.

The ABB i-bus® KNX intelligent building control system provides its customers with a broad range of options for optimum energy efficiency. On the basis of the KNX standard, energy in the double-figure % range can be saved.

Around the world new legislation is promoting the use of energy efficient technologies. In Europe, for example, the criteria for energy efficiency in buildings is detailed in the European Standard EN 15232; the allocation into energy efficiency classes A to D serves as the basis for the evaluation.

The following diagram shows the differences in energy consumption for three building types in the energy efficiency classes A, B and D relative to the basis values in class C. For example, by using class A, 30% of the thermal energy can be saved in offices.

<table>
<thead>
<tr>
<th>Building Automation and Control (BAC) efficiency classes to EN 15232</th>
<th>Efficiency factor for thermal energy</th>
<th>Efficiency factor for electric energy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Office</td>
<td>School</td>
</tr>
<tr>
<td>A High efficiency BACS® and TBM**</td>
<td>0.70</td>
<td>0.80</td>
</tr>
<tr>
<td>B Advanced BACS and TBM</td>
<td>0.80</td>
<td>0.88</td>
</tr>
<tr>
<td>C Standard BACS</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>D Non energy efficient BACS</td>
<td>1.51</td>
<td>1.20</td>
</tr>
</tbody>
</table>

* BACS: Building automation and control system
** TBM: Technical building management
Potential savings according to scientific studies:

- Room heating control: about 14 to 25 %
- Heating automation: about 7 to 17 %
- Shutter control: about 9 to 32 %
- Lighting control: about 25 to 58 %
- Air-conditioning control: about 20 to 45 %

In total, the average energy savings that result through optimization with KNX lie in the range of 11 to 31 %.

In principle, optimization of the energy consumption in buildings means:

- Energy is only consumed when it is actually needed (for example through the usage of presence detectors)
- Only the amount of energy actually required is used (for example through the use of constant lighting control)
- The energy used is employed at the highest possible degree of efficiency (for example through the use of electronic ballasts)

Using the versatile functionality that intelligent building control offers real energy savings can be made. ABB i-bus® KNX is making a significant contribution to global climate protection and at the same time reducing operating costs in today’s buildings.
How does ABB i-bus® KNX work?
Intelligent building control in detail

Within the KNX bus system, all sensors (e.g. buttons or motion detectors) are interconnected to the actuators (e.g. dimming actuators, roller shutter actuators) via a data cable as opposed to directly wired switches and consumers (conventional installation). The actuators control the power circuit to the consumer.

Communication for all devices is implemented using data telegrams on the same bus cable. The sensors send commands, actuators “listen in” and execute a defined function as soon as they are addressed.

A broad range of functions can be parameterized with ABB i-bus® KNX, such as group commands, logical sequences, control and regulation tasks.
Up to 64 devices can be connected to a line. Lines can be extended up to 255 devices by using repeaters. Up to 15 lines can be compiled to an area or a main line. Up to 15 areas are possible.
The elements of the “intelligent building control system”
Management, structure and topology

The communication medium – the KNX cable
In simple terms, the KNX bus consists of a pair of twisted-pair wires (cable type, e.g. YCYM 2 x 2 x 0.8 or J-H(ST) H 2 x 2 x 0.8 halogen-free) that connect the KNX devices. Over this cable, data telegrams are transmitted, and the electronics of the bus devices are supplied with energy. The KNX system can also be extended over IP-Networks and using RF solutions.

The KNX structure
The KNX structure created is very flexible in its design due to the possible connection of the devices: linear, tree and star wiring configurations are allowed.

The KNX topology
The KNX topology is arranged in lines that can be interconnected via couplers depending on the size of the network. The devices in the respective lines (sensors and actuators) are supplied with energy by a power supply (30 V) whereby the entire KNX bus system can be configured with more than 50,000 bus devices.

Schematic representation of the KNX bus
Concrete electrical planning
The system

The KNX system is characterized by a high level of planning security. Products can be selected from different manufacturers in accordance with the KNX standard. The functionality of the systems is parameterized via software.

Furthermore, applications from a diverse range of building functions can be interconnected. Modifications made in the course of a project as well as expansions can be added without the necessity to completely plan and recable the installation anew. Modifications to existing systems can be undertaken even after years, as the KNX system guarantees the combination of existing and future devices.

The realization of “simple” electrical installations right up to complex building automation functions is possible with the KNX standard.
ETS – The universal KNX software
Parameterization and commissioning

The manufacturer-independent software tool ETS (Engineering Tool Software), which features user-friendly menu guidance, is used for practice-oriented planning, commissioning and maintenance of KNX installations.

Electrical professionals can simply select products from a database by drag-and-drop, set the parameters and interconnect sensors and actuators with one another. After a KNX installation has been successfully commissioned, the ETS software tool assists in the creation of the project documentation. The ETS runs under the current versions of Microsoft Windows®. ABB offers comprehensive training programs for the parameterisation and commissioning of the ABB i-bus® KNX system.
System integration
What does system integration mean?

During system integration, all the requirements of the investor or building owner are implemented using KNX devices and the respective product software.

1. Planning
During planning, the preliminary requirements of the building owner are incorporated into the concept and are summarized in the functional description.

2. Engineering
The most suitable components and software applications are selected. The planning of the bus topology is realized during the engineering phase. The system devices required for implementing the KNX network are defined. The project engineering using the ETS on the basis of the functional description also takes place in this phase.

3. Commissioning
During the commissioning phase, the KNX devices are installed and programmed. The ETS project that has already been created is downloaded into the devices using the ETS software.

4. Handover
During the handover phase, the programmed functions are checked for compliance to the requirements in the functional description. In this way, the correct function of the installation can be determined and documented.

5. Documentation
The customer receives the project documentation (schematics, function description and ETS project data) after the handover.
ABB i-bus® KNX is used on a daily basis by consultants, system integrators and electrical installers world-wide. Satisfied customers in their thousands enjoy the functional benefits that are provided by the implementation of KNX technology.

**Lighting**
Lighting control and regulation

**Climate control**
Heating, air-conditioning systems and ventilation

**Sun protection**
Blind and roller shutter control

**Security and Safety**
Security and surveillance

**Energy management**
Energy and consumption management

**Automation**
Central automation and remote control technology

**Communication**
Remote access and communication gateways

**Operation**
Display, operation, monitoring
ABB i-bus® KNX ensures optimum lighting of industrial and office buildings as well as private dwellings. The lighting requirement is monitored and controlled. In addition, subsystems (such as for example 1 – 10 V lighting control, DALI) and their interfaces are supported.

ABB i-bus® KNX is used in the following applications:
- Switching
- Dimming
- Constant lighting control
- Automatic lighting
- Lighting scenes
- 1 – 10 V control
- DALI control (Digital Addressable Lighting Interface)
- RGB control (colour light control red-green-blue)

Lighting control

1 Presence detector | 2 Light sensor | 3 Lights | 4 Touch display

Operation/Visualisation via touch display
Climate control
Heating, air-conditioning and ventilation

ABB i-bus® KNX intelligent building control integrates the heating, air-conditioning and ventilation to a coherent and efficient climate control. Measured temperature values in the rooms are recorded and supplied to the heating and climate control to generate the optimum temperature and air quality.

ABB i-bus® KNX is used in the following applications:
- Individual room temperature control
- Climate control
- Ventilation
- Fan-coil control
- Window monitoring

1 Fan Coil Unit | 2 Window contact | 3 Valve drive
4 Radiator | 5 Room thermostat

Climate control
Sensor controlled roller shutters, windows and blinds with sun position controlled louvres allow for optimal lighting conditions and contribute to an improved climate control in the room.

**ABB i-bus® KNX is used in the following applications:**
- Roller shutter and window control
- Blind control with louver adjustment
- Sun shading control
- Curtain and roller blind control
- SMI interfaces (Standard Motor Interface)
Security and Safety
Building surveillance and personal protection

The combination of ABB security technology components (e.g. smoke detectors, window contacts) and the ABB i-bus® KNX devices (Security Terminals and Security Module) provide optimum building monitoring and warning against unauthorized entry. Furthermore, emergency call stations allow immediate notification if help is required. Technical detection alarms (water, smoke, gas) can also be integrated.

Furthermore, the entire ABB security technology can be integrated into the ABB i-bus® KNX system. Extended functions are realised in this way and serve the room comfort as well as the safety and security of people and the buildings they are in.

ABB i-bus® KNX is used in the following applications:
- Personal and building protection
- Door and window monitoring
- Fire and smoke alarms
- Signalling of danger and unauthorized entry
- Technical alarms
- Emergency signals
- Occupancy simulation
- Panic lighting

1 Smoke detector  |  2 Motion detector  |  3 Window contacts
4 Touch display  |  5 Security lock

Building surveillance

Silent Alarm
Telephone Gateway TG/S

Monitoring Units EUIB/S SMB/S
Security Terminal MT/S
Security Module SCM/S
Switch Actuator SA/S
Smoke detector
Security lock
Motion detector
Window contacts
Operation/Visualization via touch display
Siren
Energy management
Consumption metering and control

ABB i-bus® KNX is designed to reduce building operating costs and to employ the required energy according to demand and as economically as possible. The diverse control and interface solutions of the ABB i-bus® KNX intelligent building control system are particularly suited to this task.

ABB i-bus® KNX is used in the following applications:
- Recording of consumption and metering functions
- Demand controlled lighting
  - Scene control
  - Presence detection
  - Lighting regulation
- Energy-saving climate control
  - Room temperature monitoring
  - Control for heating and ventilation valves
  - Interfaces to air-conditioning controls

1 Visualization  |  2 Energy consumption meter with meter interface
3 Binary input  |  4 Water meter

Functional principle of consumption monitoring
Automation
Central access features

Central access features are a necessary part of purpose-built buildings due to the diverse control tasks as well as regular maintenance that is carried out. It is useful to centrally manage consumers and operating functions and flexibly adapt the building utilization. Consumption data can be read out for billing and documentation purposes.

ABB i-bus® KNX is used in the following applications:
- Central automation
- Building management
- Remote control systems and maintenance
- Operating data logging
- Data recording
- Logic and timer functions
- Fault processing
- Monitoring and security
- Interface solutions

Central data acquisition and control

Functional principle of central automation
The ABB i-bus® KNX provides interfaces to higher and lower level systems and thus enables remote maintenance and operation via gateways and routers.

ABB i-bus® KNX is used in the following applications:
- IP interconnection
- Connection via telephone gateways
- Control via remote desktops
- Infra-red remote control
- Implementation of scene functions
- Audio / video functions
- Interfaces to the OPC servers
Clear representation of the control processes in a building is a prerequisite for comfortable and safe operation. States are visualized with the versatile control, signalling and operating devices. User entries are made using buttons, on the touch panel or on a computer.

**ABB i-bus® KNX is used in the following applications:**
- Display
- Visualization
- Operation
- Signalling
- Reporting

Additionally, audio and video data can be played on the display, or camera images can be shown, e.g. of the door intercom system.
Situation – Case study 1:
“Modifications to the schematic after wiring of the building has already commenced”

Conventional planning and electrical installation: Installation draft concepts need to be modified or even recreated from scratch should modifications not fit into the existing concept. Wiring work that has already commenced must be modified or may even need to be rewired. The more advanced the progress of the installation work, the more difficult it is to accommodate further devices in the concept. The effort and expense involved in the integration of conventional switching and control elements is usually very comprehensive.

KNX planning and electrical installation: Functional modifications or additional devices are added to the existing system. Depending on the requirements, the additional work may simply be limited to a parameter change in the ETS project or supplementary connections within the distribution board. In any case the clear installation structure of the wiring for bus and load connections simplify modifications.

Advantage: flexibility in the face of changing requirements.

Situation – Case study 2:
“Exchanging a device after the electrical installation has been completed”

Non-standardized systems: The exchange of proprietary system devices is sometimes very difficult, as the design, functionality, connection assignment as well as the data protocols have different configurations and are non-compatible with products from other manufacturers. Furthermore, the availability of these devices cannot always be guaranteed.

KNX devices: Replacement of the devices with new devices or devices from other manufacturers is easy because of the functional compatibility and the common programming.

Advantage: independence through an open and standardized system.
Situation – Case study 3:
“Different systems are required to implement the building operators’ requirements”

Conventional control: Parallel control systems are operated and monitored separately, leading to increased effort and expense for the overall solution. For example, in many cases security systems cannot communicate with lighting controls or be connected to the IP environment at a higher level.

KNX technology: Sub systems can be interconnected and integrated. Examples include lighting controls (e.g. DALI) that can be connected to KNX via so-called gateways, which means that monitoring and control can be undertaken on a common control bus. Interfaces to security systems or Ethernet are also supported by KNX.

Advantage: A complete system solution through the integration of further subsystems.

Situation – Case study 4:
“Modification requests are expressed after commissioning”

Conventional technology: Implementation of modification requests is generally only possible with considerable installation effort and expense. The same applies for possible wiring faults. Time-consuming tests have to be undertaken to determine the cause. In most cases additional wiring or corrective measures are necessary.

KNX system: If a request for modifications is made, they can frequently be implemented through simple reprogramming. Should malfunctions occur; the electrician can quickly and easily determine the cause with the assistance of the ETS software and remedy it immediately.

Advantage: Quick and simple to adapt.

Situation – Case study 5:
“The ratio of benefits and costs must be proportionate”

Conventional installation: The installation of comparative conventional solutions is more time-consuming and wiring-intensive. The functionality is limited and final.

KNX installation: The investment required for a KNX solution is higher than the costs of a standard installation using conventional technology. However, because of the intelligent KNX concept more functions can be realized in a shorter time.

Advantage: More comfort through more functionality and ultimately less installation effort.
ABB i-bus® KNX
The advantages are clear

– ABB i-bus® KNX offers a comprehensive product range for implementation of your projects.

– ABB i-bus® KNX enables time-saving planning, installation and wiring as well as simple and fast parameterisation with subsequent commissioning.

– ABB i-bus® KNX devices are upward and downward compatible and comply with the KNX standard. ABB i-bus® KNX installations are almost limitlessly expandable, always re-adaptable and thus future-proof.

– ABB i-bus® KNX allows the integration of new functions at any time. Furthermore, quick and flexible reaction to the changing demands is possible during the service life of the installation.

– Energy efficiency through intelligent automation; for example, lighting control and air-conditioning is simple to realize with ABB i-bus® KNX. It saves energy costs thus making a contribution to the reduction of our carbon footprint.

– ABB i-bus® KNX provides simple and comfortable operation as well as management and monitoring – the basis for reduced operating costs, efficient facility management as well as optimum building management.

– ABB i-bus® KNX offers a high level of operating comfort and increases the value of the building for the owner.

– ABB i-bus® KNX increases the security for people and the building thus protecting the whole investment.

– ABB supports you in the selection of the most suitable products, offers a comprehensive training program and provides support for technical questions during installation and commissioning.

ABB i-bus® KNX – The bus technology for today and the future
ABB i-bus® KNX – In use worldwide

Extract from our references

Pudong International Airport
Shanghai, China

School complex
Neufahrn, Germany

Le Reve Tower, Apartments
Dubai, United Arab Emirates

Office building IO – 1
Warsaw, Poland
Further information and service about the ABB i-bus® KNX

Comprehensive information material for your projects with ABB i-bus® KNX is available:
- Catalogues
- Brochures
- Newsletters
- References
- Application manuals
- Data sheets

We also offer a qualified training program.

Further information can be found at:
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