

# ABB technology and safety in hospitals

## Products, solutions, management and control

Power and productivity  
for a better world™



# A completely integrated system

## Managing hospitals and health centres: ABB challenges in control and savings

ABB offers a unique range of smart building solutions to provide power generation in hospitals and health centres. Thanks to its experience and know-how, ABB ensures the flexibility needed to control and save energy usage in the most critical medical environments and structures.

Hospitals and health centres are complex buildings where several different applications coexist. Operational continuity and energy management are probably the most relevant issues in this sector: power failures and downtimes must be absolutely prevented to avoid situations that can affect vital treatments.

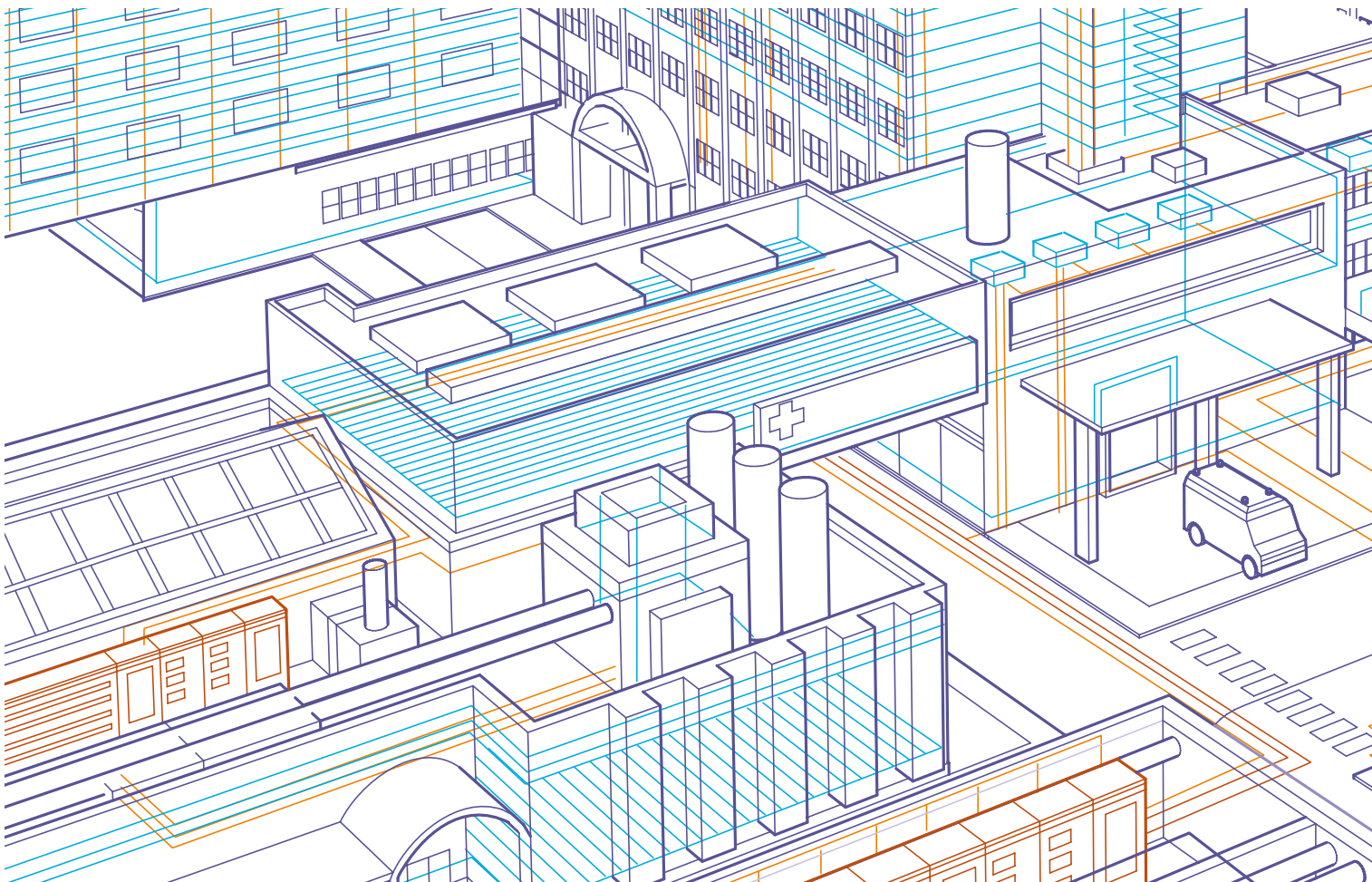
To control and save energy in medical environments and structures is a challenge.

In order to provide power generation reliable enough to keep operating theaters and to maintain an uninterrupted flow, ABB offers a fully integrated system and its experience.

In fact it is decades since ABB took care of the first hospital installation.

During the years, the company has developed skills and knowledge, from medium to low voltage distribution, as many specific product: Emax open air circuit breakers, Tmax and XT moulded circuit breakers, enclosures, DIN rail devices for protection, control, command and measurement purpose. Moreover KNX devices for building automation, PLCs and other instrumentation for industrial automation.

Aside from this, ABB is present in several countries helping customers from the network desing on, to the commissioning. At present, many of the most important hospitals around the world have been supplied with ABB components and technology. The recent offer by ABB for hospitals is presented in this document.



# A successful model, a safe system

## Clinics and hospitals across the world rely upon ABB's experience

### **Austria**

- Steyr

### **Italy**

- Varese
- Brescia
- Castelfranco Veneto
- Humanitas clinic, Milan
- Niguarda Hospital, Milan
- City of Brescia Hospital, Brescia
- Mayer Hospital, Florence

### **Bahrain**

- King Hamad

### **Netherlands**

- Clinic Erasmus
- Maxisima medisch centrum
- Van Heugten
- Medical Spectrum Twente
- Rode Kruis ziekenhuis
- Van der Heide

### **Germany**

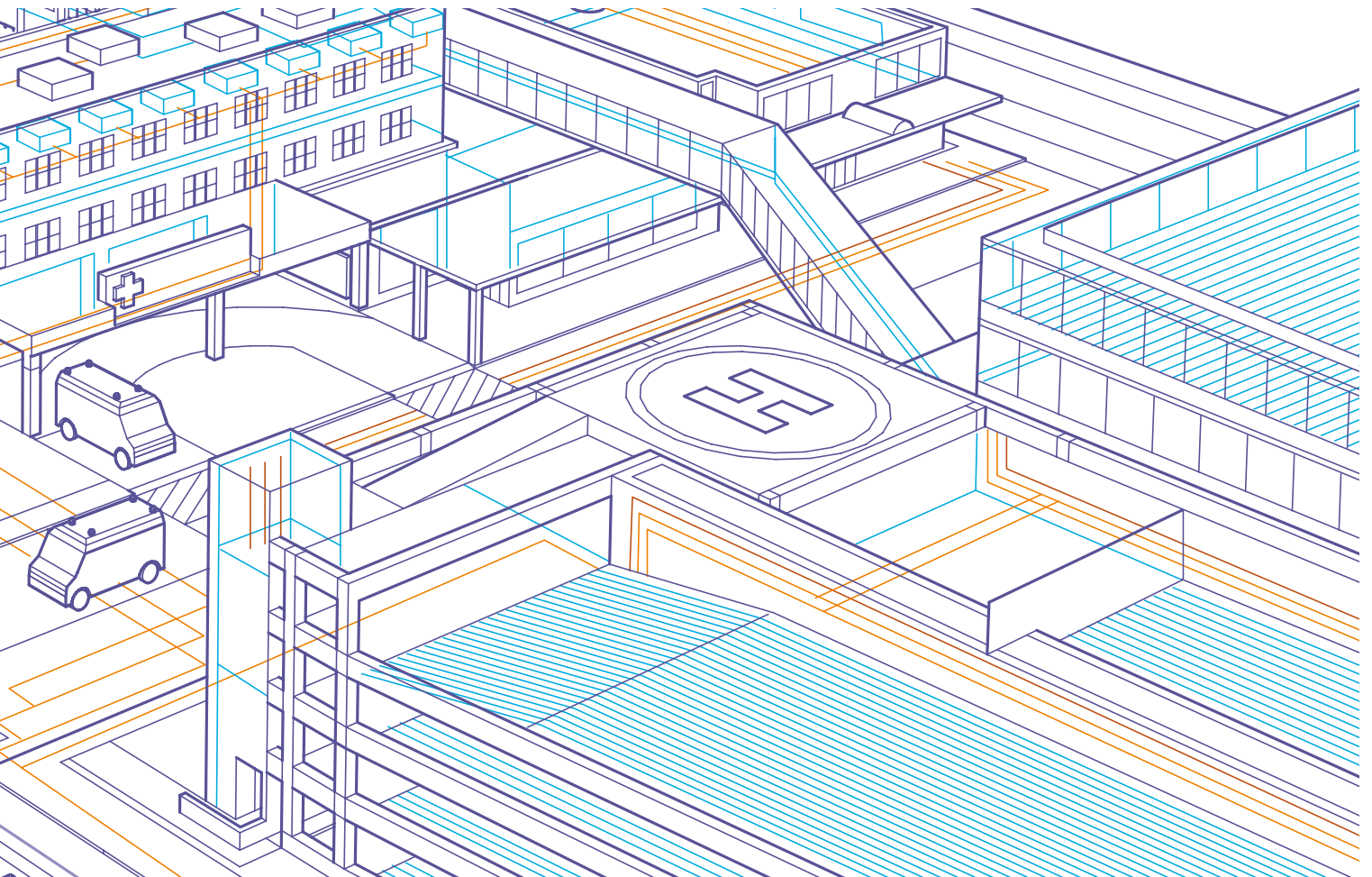
- Bielefeld

### **Norway**

- City Clinic, Oslo

### **Switzerland**

- University Hospital, Zurich
- Triemli Spital, Zurich



# Effective and reliable technology

## ABB components and solutions: innovation and safety

A wide range of reliable products assuring patients' and medical staff's safety in intensive care units, operating theatres, first aid and day hospital premises, ambulatories, nursing homes, dentist's and vet's.

Over ten years' experience, state-of-the-art solutions offered to the most important Italian hospitals, a complete and performing range of products: this is H+Line, an ABB

products range specific for group 2 medical locations, where operational continuity and reliability are key requirements for patients' and medical staff's safety and protection





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.

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, electrical installers and investors 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.



H+Line: safety first

ABB switchboards and devices for medical locations



Protection by electrical separation as laid down by IEC EN 60364 reference standard (user electrical plants with a rated voltage of no more than 1000 V in alternating current and 1500 V in direct current) prevents the generation of hazardous currents due to contacts with earths under voltage because of a fault in the main insulation of the circuit.

QSO range of switchgears for operating theatres are the ideal solution to supply group 2 medical locations according to the IEC 60364-7-710 reference standard. All the switchboards are wired by ABB, and are equipped with the declaration of conformity which is necessary for the system commissioning, guaranteeing the installer full conformity.

Compactness, total protection selectivity and maximum ergonomics and simplicity during maintenance operations make QSO range the most suitable product to assure service continuity in medical locations.

By using insulating transformers, the protection against indirect contacts can be guaranteed without having to automatically break the circuit at the first fault to earth. Insulating transformers are therefore suitable for use in plants where the sudden and automatic breaking of the service may have serious implications: examples of these applications are plants for medical and surgery rooms (in accordance with IEC EN reference standard 60364, Part 7, Section 710) where specific electromedical devices perform patients' monitoring and attending functions.

To meet the special needs of these fields of application, ABB supplies preassembled wall-mounted and floor-standing QSO switchboards, complete with an insulation transformer and an ISOLTESTER-DG device for detecting and signalling the first fault to earth. QSO switchboards represent the ideal solution for all medical locations classified by the IEC EN reference standard 60364-7-710, as group 2 medical locations (anaesthesia, surgery, preoperative preparation, surgical plaster applications, postoperative waking, heart catheterizations, intensive care, angiography and blood flow tests, premature births) where the use of an IT-M (Medical IT) system is mandatory. In addition, they are suitable for installation in any further medical locations and any other room where the automatic breaking of the service at the first fault to earth is dangerous or inconvenient: industrial laboratories, craft workshops (jewellery' and the like), test laboratories, school laboratories, research institutes and any other room with similar problems.



# H+Line: continuous protection

## Safety comes first



### ISOLTESTER

ISOLTESTER-DIG is the range of insulation monitoring devices specifically designed by ABB for group 2 medical locations. ISOLTESTER-DIG measures the insulation to earth in IT-M network and the thermal and electrical overload of the insulation transformer, complying with the international standards: EN 61557-8, IEC EN 60364-7-710 and UNE 20615.

Thanks to a codified signal, the new ISOLTESTER-DIG-PLUS IT networks insulation monitoring device grants absolute reliability of measurement in any operational condition, even if high network interferences occur. Furthermore it is fitted with a RS485 serial port through which it can be perfectly integrated with communication systems such as PLC/PC by using ModbusRTU protocol. The measurement of network maximum and minimum values enables a wider monitoring and an easier plant checking in case of any fault. Finally, the programmable output relay allows to manage any warning condition signalled in a dedicated way.



### SELVTESTER

SELVTESTER-24 tests the insulation to earth of 24 V AC/DC SELV circuits dedicated to scialitic lamps supply. Scialitic lamps insulation is to be monitored in order to prevent detaching from conductors when being moved. The conductors, by contact with the metal structure of the lamp, may transfer a potential of over 250 V, resulting in damage to equipment and people.

SELVTESTER-24 measures the variation in potential of the two network polarities with reference to earth in order to signal when insulation drops below a set value, through the frontal microbreakers, identifying the faulty pole in direct current. The output signal can be connected to QSD-DIG 230/24 remote signalling panel. The frontal panel of the device carries test pushbutton, status indicator and two LEDs for low insulation signalling.



### QSD

QSD-DIG 230/24 remote signalling panel enables to send alarm signals from the insulation monitoring devices to all the medical locations attended by medical staff, as laid down by reference standards.

QSD-DIG 230/24 panel provides an acoustic and luminous signal in case of low insulation or thermal and electrical overload. Moreover, it is provided with a TEST pushbutton to periodically check its operating status and a pushbutton for disconnecting the acoustic signal. It is assembled in universal 3-module flush-mounted boxes.





## TI

Medical single-phase insulating transformers provide galvanic separation between the distribution network and the user load in accordance with the IEC 61558-1 and IEC 61558-2-15 reference standards concerning power supply in group 2 medical locations. ABB medical insulating transformers combine conformity with reference standards to maximum performance and limited dimensions thanks to which it is thus possible to reduce switchboards costs. The range is made up of transformers with 3, 5, 7,5 and 10 kVA power, available with two PT100 temperature probes, on the primary and the secondary winding, thus enabling continuous and precise temperature monitoring. ABB transformers are provided with a particular impregnation system which allows maximum heat dissipation thanks to the exclusive vacuum-pressure technology. Finally, the insulating transformer has a metallic shield between the two windings allowing to reduce network interferences and harmonic components coming from the supply. Upon communication of the item serial number, ABB will provide the testing certificates of each medical insulation transformer.



## QSO

The new QSO operating theatre switchboards are the ideal solution to supply operating theatres and group 2 medical locations according to the IEC 60364-7-710 reference standard. All the switchboards are wired by ABB, and are equipped with the declaration of conformity which is necessary for the system initial start up, guaranteeing the installer full conformity for plant performance. Compactness, total protection selectivity and maximum ergonomics and simplicity during maintenance operations make QSO range the most suitable product to guarantee service continuity at medical locations.



## ISOLTESTER MRM BOX

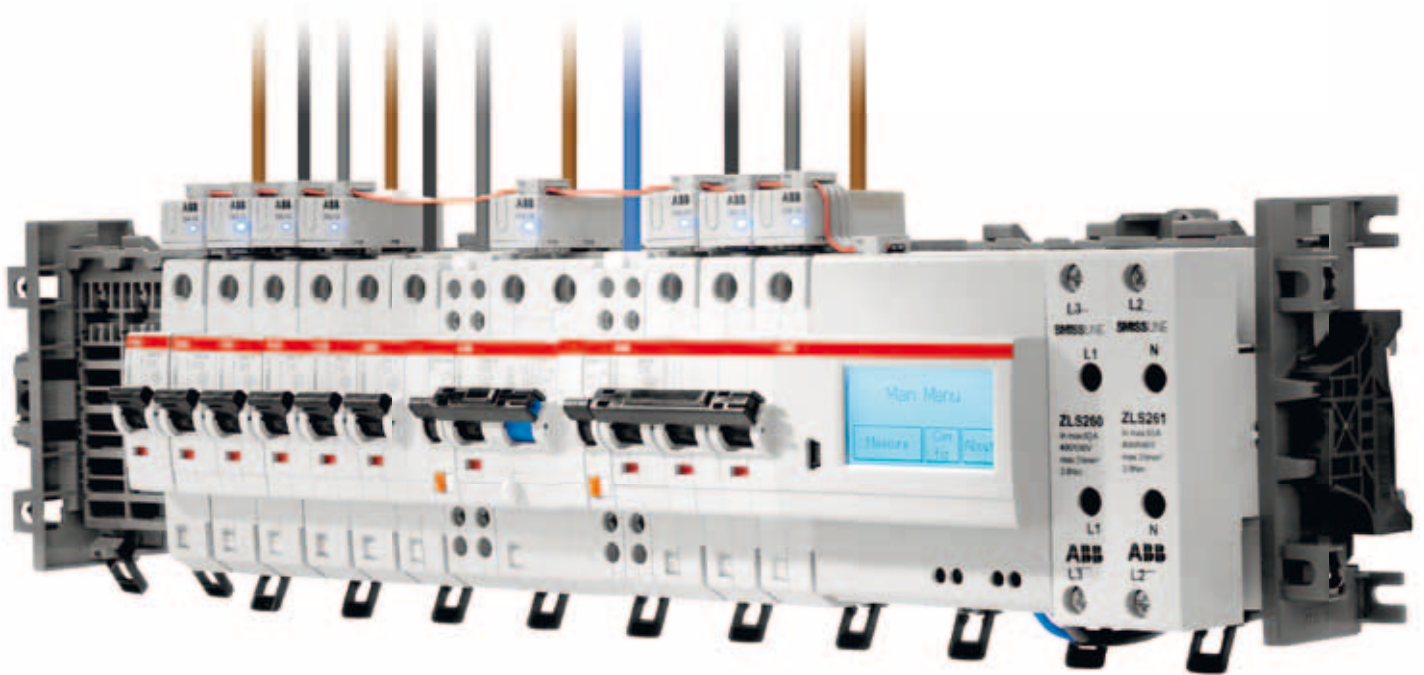
Thanks to its CP415M touch screen and AC500-eCo series PLC PM554-T terminals it is possible to control the status of a group of operating theatres (from 2 to 99) from two different positions. The personnel may verify the status of each operating theatre and any alarm signalling in real time. ISOLTESTER MRM BOX includes exclusive H+Line software in 5 languages, which allows for very simple system installation: no programming is necessary. It is sufficient to insert the total number of operating theatres to be monitored on the touch screen panel.

# SMISLINE - Pluggable System

## Keeps downtime to a minimum

SMISLINE allowed a high maintenance of electrical systems. Wherever availability is necessary in 365 days at 24 hours a day the pluggable system gives a maximum on Flexibility.

SMISLINE protection devices are simply snapped into a plug-in socket system. The arduous task of power supply and connection is done. In addition to savings in time and money, another advantage of the system is the quick and easy exchangeability of the devices. If the corresponding spare capacity is planned, subsequent expansion consists merely of plugging in and connecting additional devices.



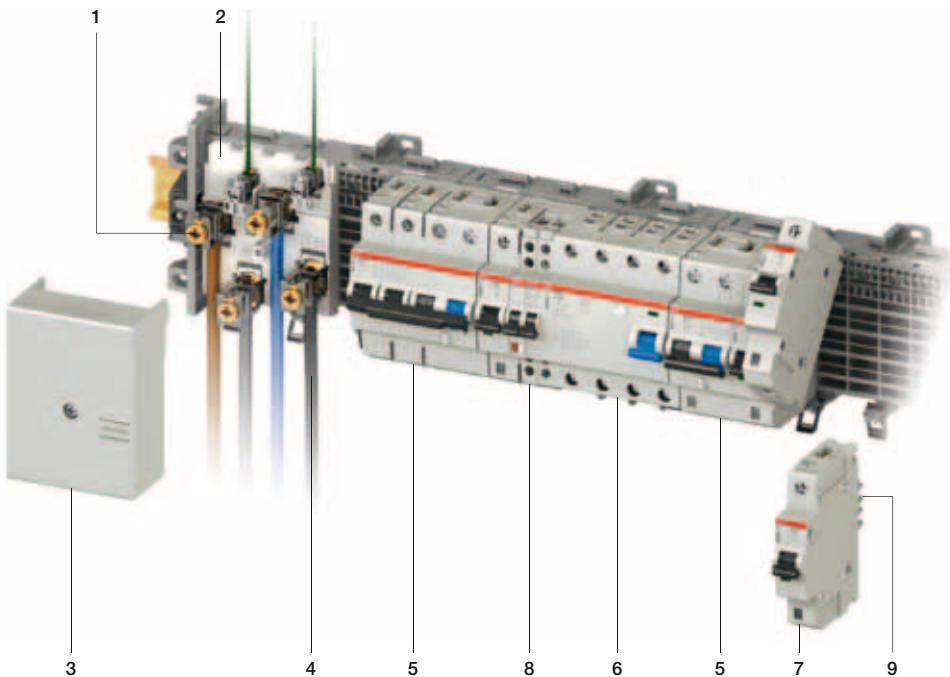
# Efficiency you can touch

## Plug in components during ongoing operation

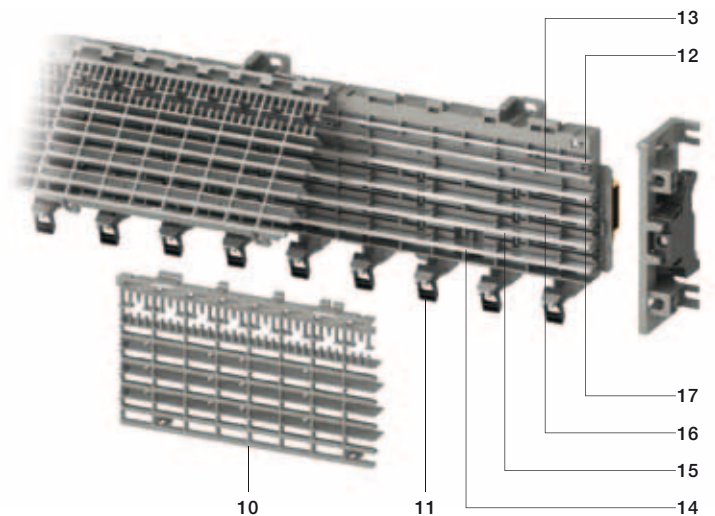
### Even safer: protection against electrical hazards

We have upgraded our unique SMISSLINE socket system even further through the addition of a pioneering innovation: With the new SMISSLINE TP system, components can now be plugged in or unplugged load-free without any risk from electrical current running through the body.

The SMISSLINE TP pluggable socket system is completely finger-safe (IP2XB) – when devices are plugged in and unplugged, the system is always touch-proof. This means that SMISSLINE TP prevents any danger to personnel from switching arcs or accidental arcing.

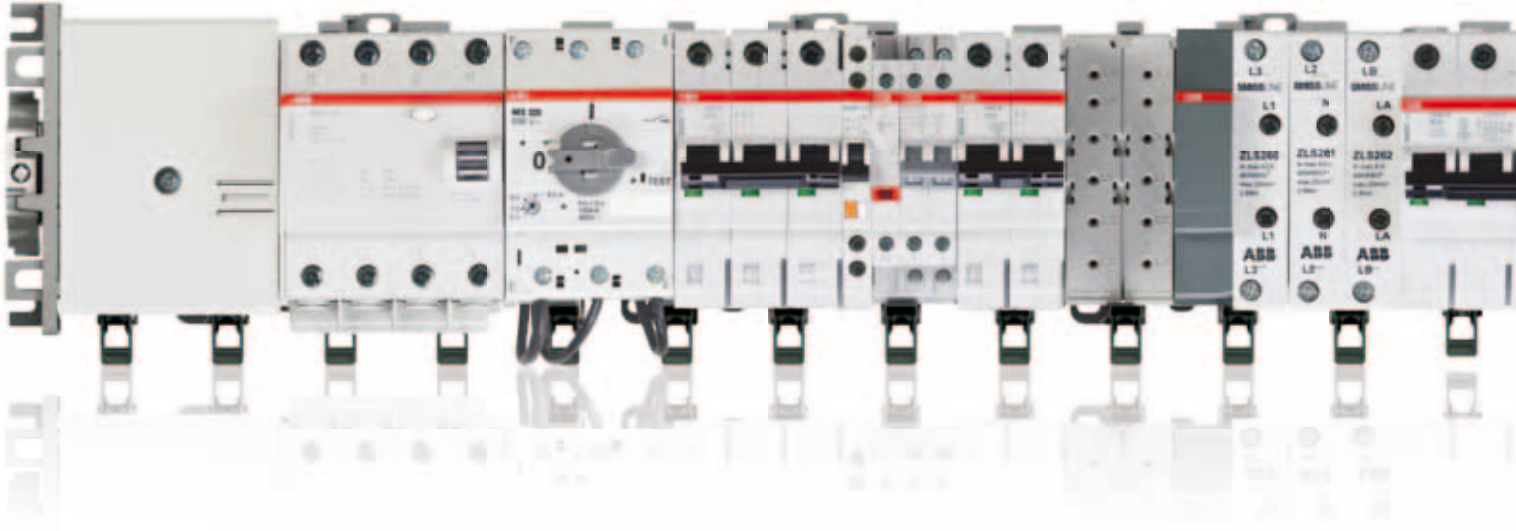


- 1 Supply terminal
- 2 Incoming terminal block with a max. current rating of 160 A  
50 mm<sup>2</sup> (2 x 25 mm<sup>2</sup>) + 2 x 10 mm<sup>2</sup> (LA, LB)
- 3 Cover for incoming terminal block
- 4 Supply cable
- 5 RCBO FS401 and FS403
- 6 Residual-current circuit breaker F404
- 7 Miniature circuit breaker S401 M
- 8 Signal contact
- 9 Plug contacts
- 10 Spare way cover
- 11 Device latch
- 12 Busbar LA
- 13 Busbar LB
- 14 Busbar L3 or DC +, –
- 15 Busbar L2 or DC +, –
- 16 Busbar L1 or DC +, –
- 17 Busbar N



# Efficiency you can touch

## Plug in components during ongoing operation



### SMISSLINE TP at a glance

**Safe:** load-free plugging and unplugging on voltage

**Flexible:** rapid exchange, easy expansion, mixed-pole layout possible

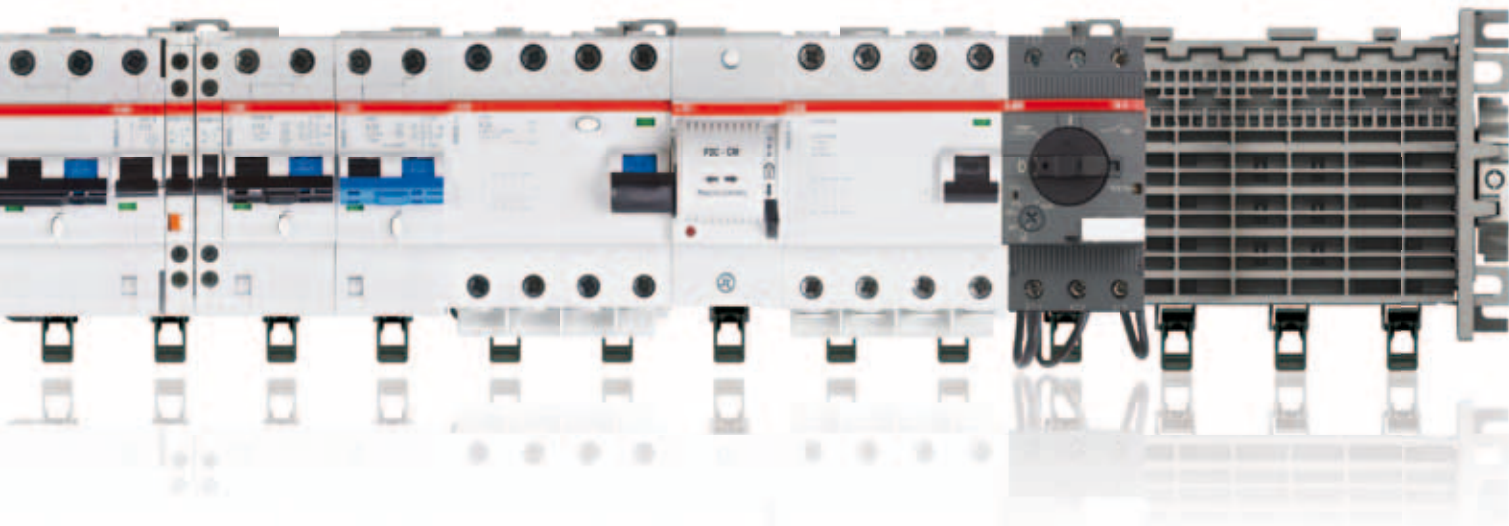
**Economical:** saves time and space thanks to the plug-in technology

### The RANGE

- Miniature circuit-breaker 1-, 2-, 3- and 4-pole
- Residual-current circuit-breaker 2- and 4-pole
- Combined RCCB-MCB 2- and 4-pole
- Surge arrester type 2
- Switch disconnector
- Motor protection switch
- Busbar system, contact rails max. 100 A; incoming system with max. 200 A
- Wide range of accessories

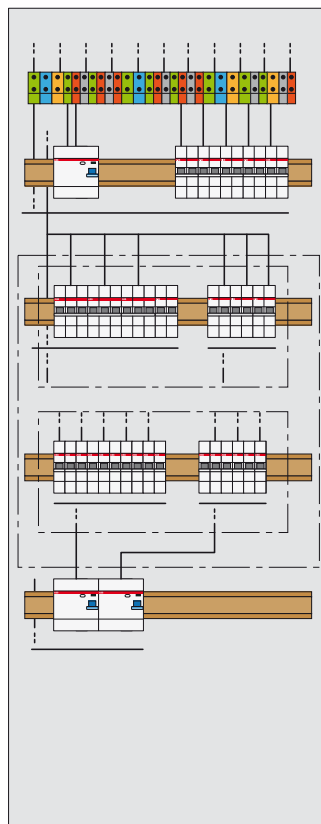
SMISSLINE touch proof makes it possible to press ahead with planning, even before all the details of a system are known. Loads can be easily reassigned. Even if the usage of an entire installation is completely changed, the effort involved remains small.





#### The vertical option has all the advantages

The vertical use of the SMISLINE TP produces a compact design which offers maximum flexibility and time/cost savings in both new and modified installations. This is yet another reason why this pluggable socket system with integrated busbars offers such advantages to planners, switchgear system designers and end customers in equal measure.



# KNX the worldwide standard for intelligent building control

## A single system instead of separate control solutions

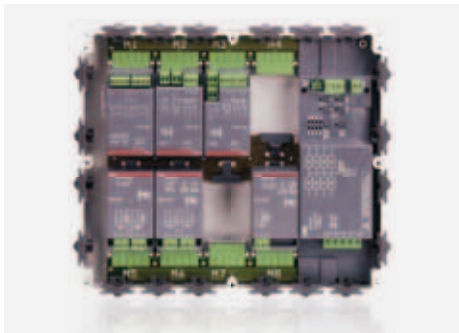
In comparison with classic electrical installations an intelligent building control system offers noticeable advantages. All the different functional subsystems within the building are integrated via a bus connection to a single communicating system. This enables the optimal, energy efficient interaction of the subsystems, which is almost impossible with conventional technology. The system allows a large number of interactive functions to be realized:

- Lighting control and regulation
- Heating/ventilation control
- Climate control
- Shutter/blind control
- Alarm monitoring
- Security function
- Central automation
- Energy and load management
- Remote control/remote maintenance
- Visualisation and operation
- Interface to other systems



### 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 250 internationally certified manufacturers are members of the KNX association.
- More than 29,000 qualified KNX partners in 112 countries 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.



# Energy efficiency with ABB i-bus® KNX

## Energy savings in the double-figure % range

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.

### 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%.

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.

Building Automation and Control (BAC) efficiency classes to EN 15232	Efficiency factor for thermal energy			Efficiency factor for electric energy		
	Office	School	Hotel	Office	School	Hotel
<b>A</b> High efficiency BACS* and TBM**	0.70	0.80	0.68	0.87	0.86	0.90
<b>B</b> Advanced BACS and TBM	0.80	0.88	0.85	0.93	0.93	0.95
<b>C</b> Standard BACS	1	1	1	1	1	1
<b>D</b> Non energy efficient BACS	1.51	1.20	1.31	1.10	1.07	1.07

\* BACS: Building automation and control system  
\*\* TBM: Technical building management



# KNX the worldwide standard for intelligent building control

## A single system instead of separate control solutions



### How does it work ?

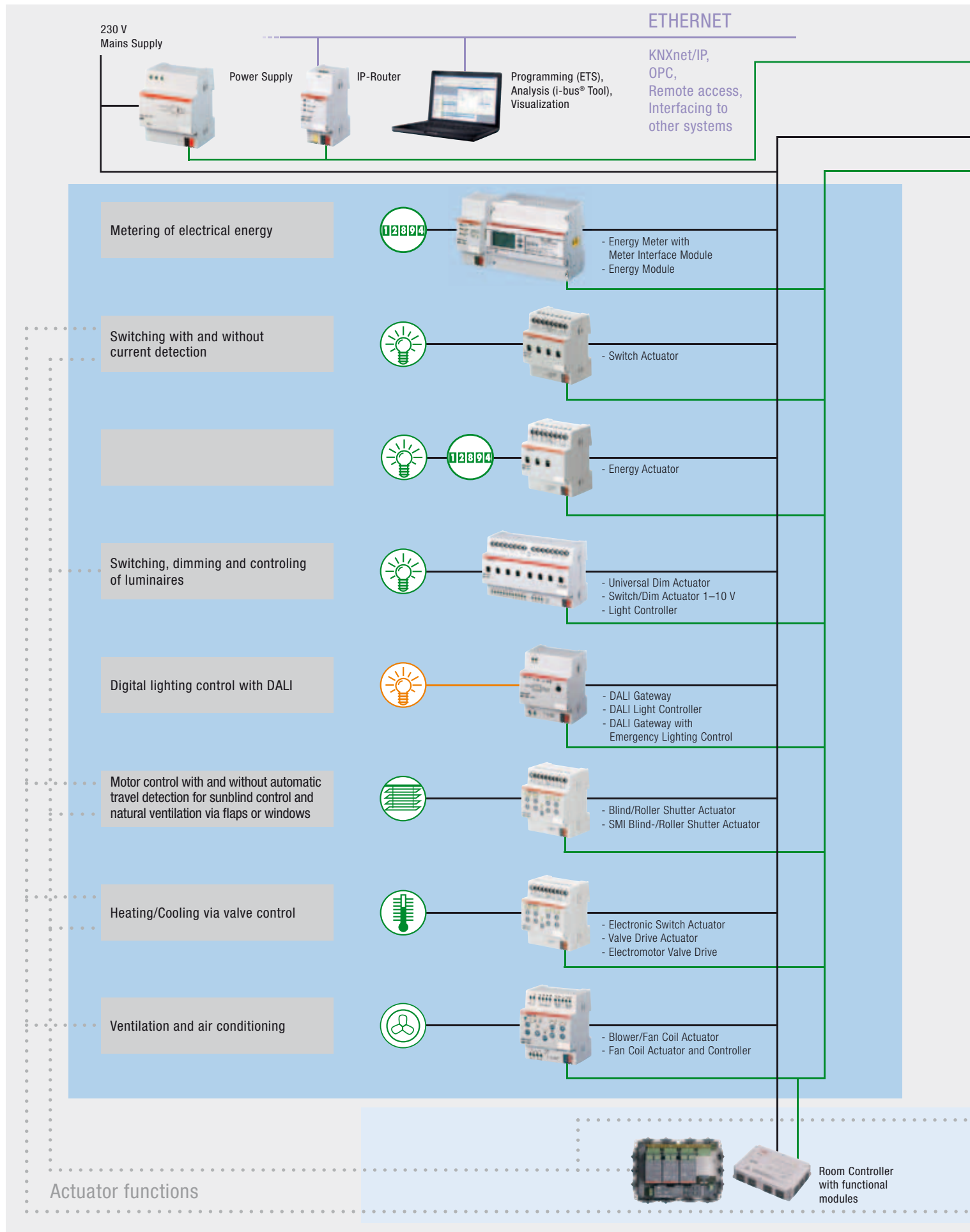
Within the KNX bus system, all sensors (e.g. buttons or motion detectors) are interconnected to the actuators (e.g. dimming actuators, roller shutter actuators) via a data cable as opposed to directly wired switches and consumers (conventional installation). The actuators control the power circuit to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

# KNX the worldwide standard for intelligent building control

## A single system instead of separate control solutions



## KNX-Main Line/TP

Line 1 2 3 4 ... 13 14 15

Power Supply



Line Coupler

- 64 devices/line
- 15 lines/area with superordinated main line
- max. 15 areas with superordinated area line

- Binary Input



Binary sensor signals

- Analogue Input



Analogue sensor signals

- Weather Station and Weather Sensor



Weather sensors



Displaying and operating

- Presence Detector  
- Movement Sensor  
- Light Sensor

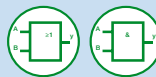


Presence and movement detection

Light sensor

Lighting Control

- Logic Module  
- Application Unit Logic  
- Application Unit Time  
- Time Switch



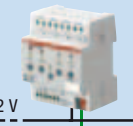
Control, Logic and Time

- Room Thermostat  
- Air Quality Sensor



Room climate control

- Security Terminal  
- Security Module  
- Interface for Intrusion Alarm Panel  
- Fault Monitoring Unit  
- Monitoring Unit  
- Data Logging Unit



Security and Surveillance

Room Master devices with different combinations of inputs and outputs and internal logical interconnection



Solutions for rooms with sensor and actuator functions

Sensor functions

# Application overview

## Light control

- Switching and dimming locally, group-wise or centrally
- Time and presence controlled
- Constant light control
- Integration of DALI
- Light scenes



## Shutter/Blind control

- Shutters and blinds with lamellas
- Curtains and windows
- Control depending on wind, rain and sun
- Sun shading control

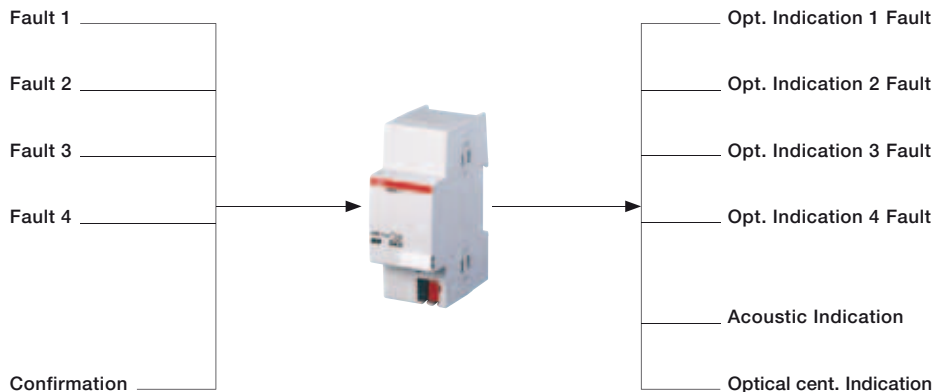


## Room temperature control

- Heating with radiators and floor heating systems
- Cooling with fan coil units
- Ventilation
- Integration of air quality measurement (CO<sub>2</sub>, Humidity)

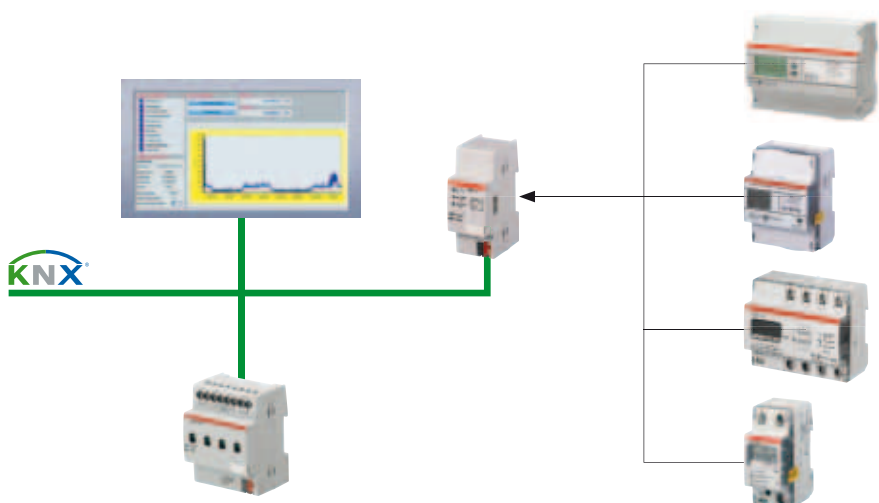






### Fault monitoring

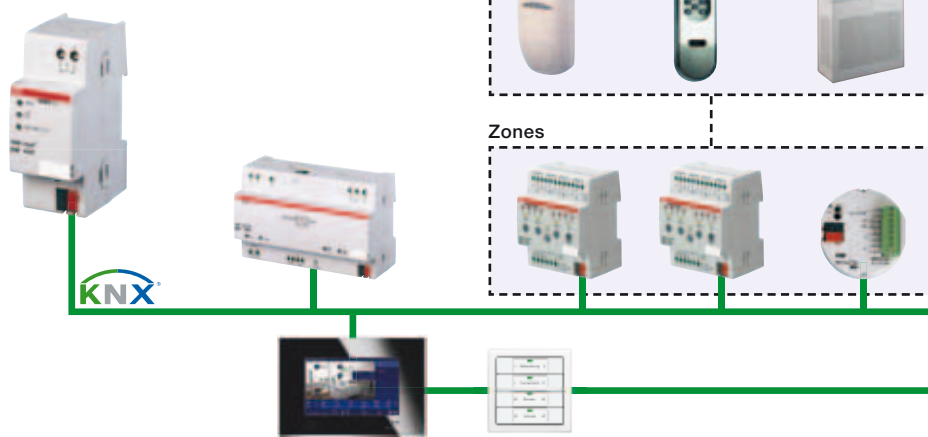
- Digital fault signals will be collected via binary inputs on KNX
- The fault monitoring unit evaluates the information and reacts on it
- Assignment to individual local optical indication
- Assignment to central optical and acoustical indication
- Integration of mobile phones (via KNX telephone gateway) or PC with visualisation software for data logging possible



### Metering

- KNX interface for ABB meters
- Automatic assembling of IR-communication with monitoring
- Metering of consumption, power, current, voltage, frequency and more
- Provide meter data for visualization, displaying, billing, energy optimizing ...
- Useful for outsourced segments like pharmacy, laundry

Security Module  
SCM/S 1.1 Master



### Security

- Special sectors in a hospital have to be secured: stock for medicines, pharmacy, technical rooms
- Security logic based on KNX:
  - Security Terminals MT/S and Security Modul SCM/S
- Security logic based on a conventional alarm panel
- Intrusion Alarm Panel L240 with KNX Interface available
- KNX and security in one system gives additional benefits

# Express the full potential

## Comprehensive, integrated solutions for the hospital environment

### QSO

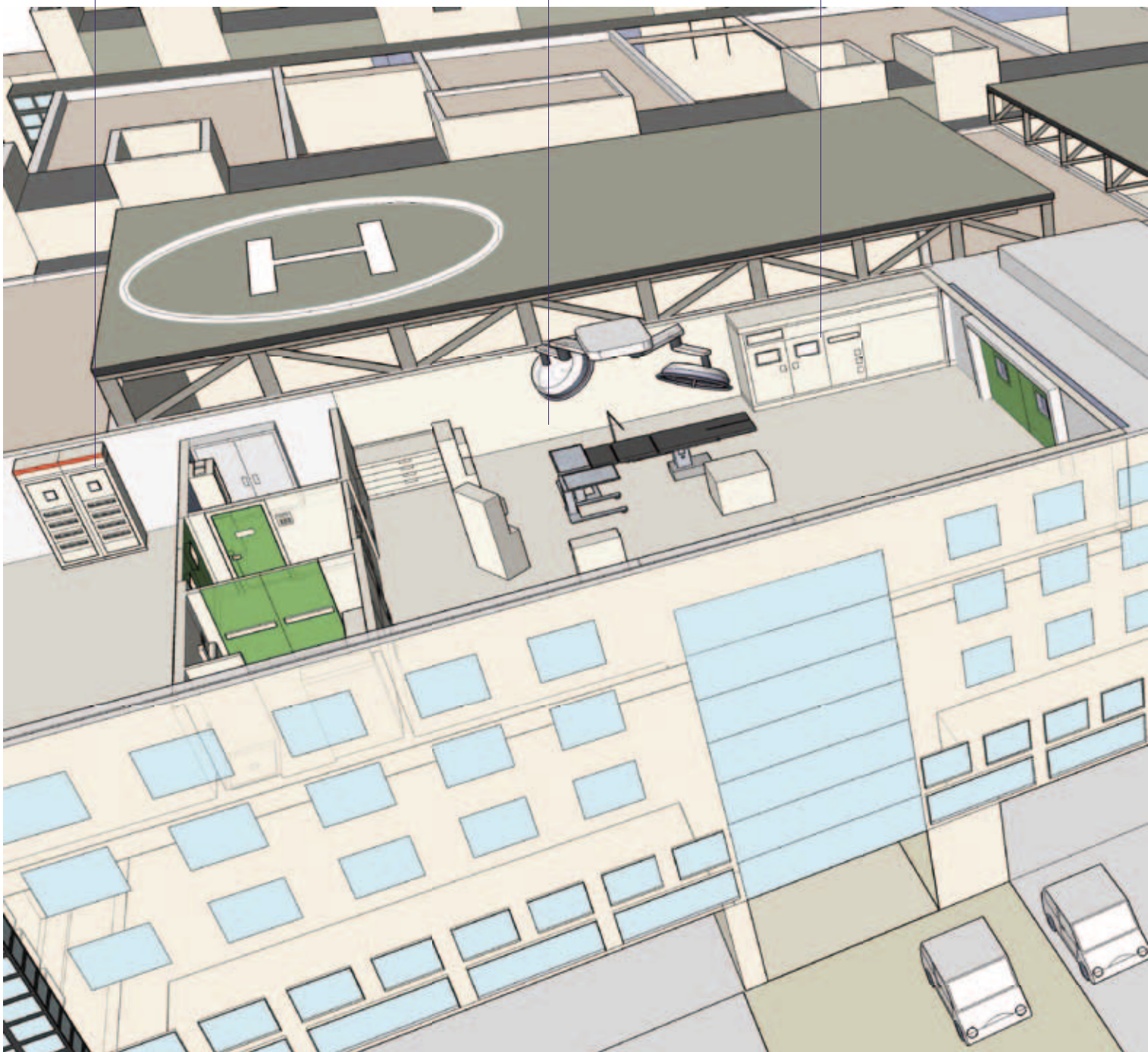
Floor standing switchboards of 5 and 7,5 kVA and 10 kVA for operating theatres, intensive care units, cardiac surgeries, long-term hospitalizations.

### KNX

- Lighting control, e.g. light scene for operation
- Blind control to avoid direct sun light
- Climate control for the right room temperature

### SMISSLINE

Maintenance of terminal circuits is extremely easy and safe as the breakers can be snapped on and off without any tool. Completely touch proof.





#### KNX

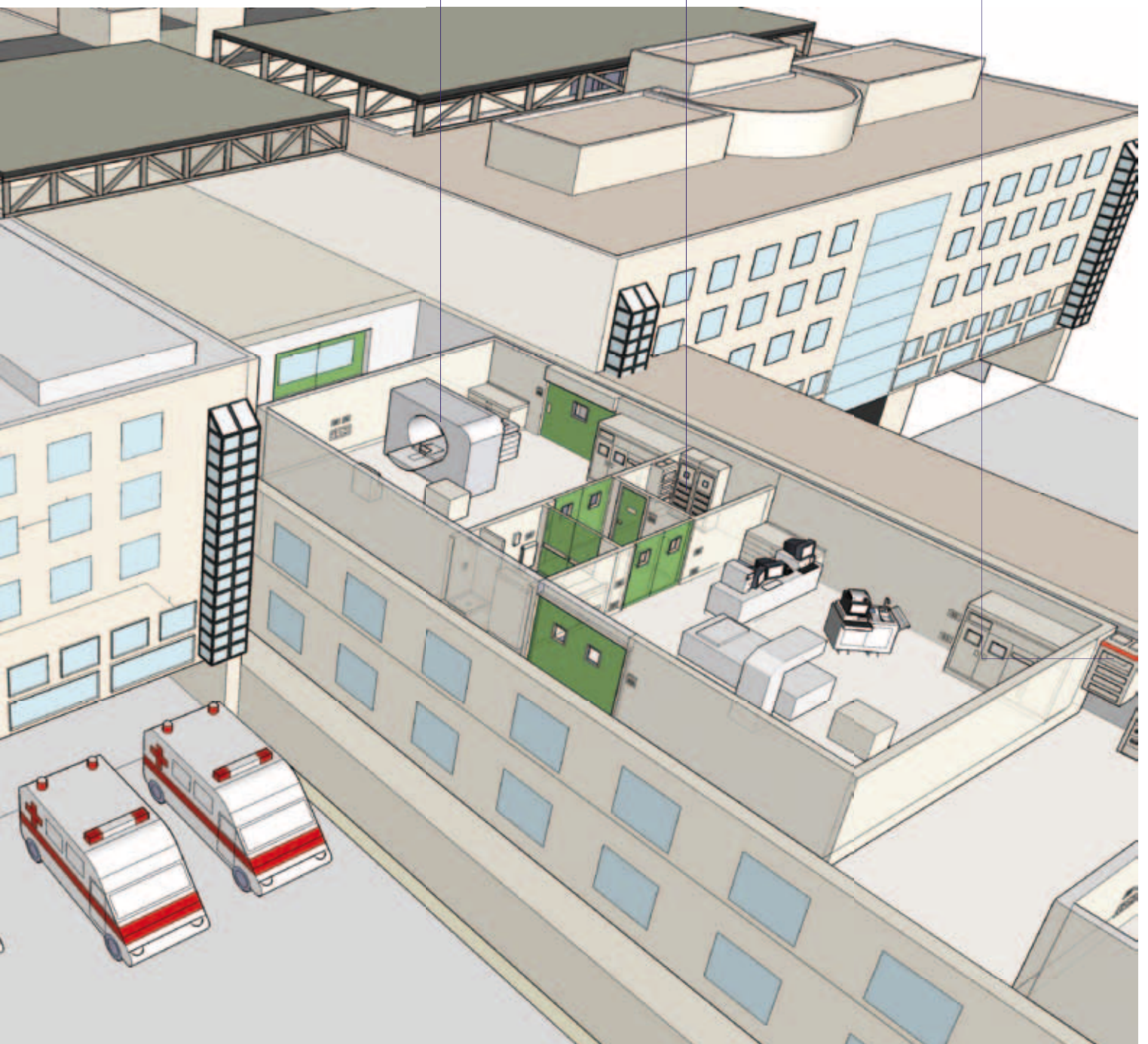
- Fault monitoring of medical devices
- Metering of energy consumption and monitoring of the same network
- Security junction e.g. against intrusion

#### SMISSLINE

Branch circuits can be enlarged comfortably as the medical environments requires new tools or devices during its life cycle. There is no need for long and expensive shutdowns because the wiring is already embedded in the modular socket.

#### QSO

Wall-mounted switchboards of 3 kVA and 5 kVA for applications such as surgery ambulatories, recovery rooms, test laboratories, dentist's and vet's.



# Contacts

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