Healthcare Building Solution

If the building space is modular, eco-friendly and augmentable over time, it’s best done with ABB Building Solutions. Energy distribution and automation suiting the spaces.

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Building Segment Overview

Building Segment Overview
Segmentation

In a certain sense, the technology is transversal, but the solutions are effective when the technology is calibrated to the application. The best technical and economic compromise, the best design solutions are the result of experience, system choices and component choices.
The careful and detailed analysis of the needs of the case of interest defines the user case.

Building Segment Overview
Segmentation

Residential

Single Family
- Houses
- Private dwellings
- Single Apartments

Multiple Family
- Multi family dwelling
- Apartment's complex

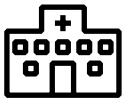
Commercial

Hospitality
- Hotels, Resorts, Motels
- Dormitories, Lodgings, Rooming
- Cruiser ships

Office
- Low/Mid/High-rise
- Multi-purpose
- Laboratories
- Call centres
- Single/Time-share property

Retail & Mall
- Stores, Hypermarkets
- Retail chains, Malls
- Restaurants, Food chains
- Showrooms

Leisure Facilities
- Casinos, Theme parks
- Sport stadiums, gym-pools
- Museum, Theatres



Institutional

Healthcare
- Hospitals
- Nursing, Retirement homes
- Elderly Care, Day Care
- Multi-centres

Educational
- Schools, Universities, Colleges
- Research facilities
- Archives, Libraries

Public
- State/city buildings, Halls
- Post-offices
- Temples, Historic
- Police, Military, Prisons

Infrastructure

Transportation
- Airports, Ports, Stations
- Bus/Truck/Train terminals
- Parking facilities
- Tunnels

Storage
- Warehouses
- Cold storage plants

Others Infrastructure
- Water/Sewage treatment

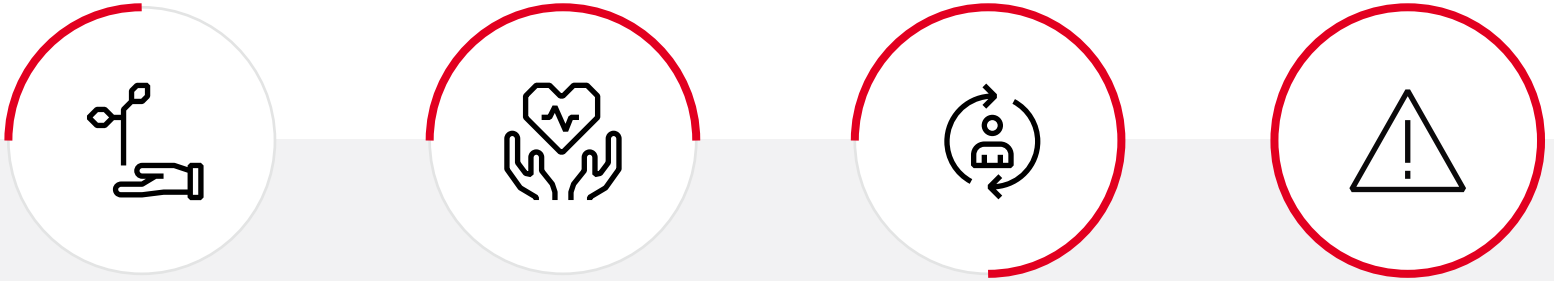
Industrial

Manufacturing
- Factory
- Manufacturing
- Transformation
- Packaging

Others Industrial
- Chemical, Pharmaceutical
- Processing
- Telecom
- Power Plants
- Agricultural

Building Segment Overview
Building performances

Currently, the strategic lines that guide the definition of the characteristics of a building are aimed at satisfying 4 classes of fundamental needs:



— Environmental sustainability

— Health & comfort

— Life cycle cost and value

— Future performance

These classes of basic needs can be translated into 7 performances that measure the quality of the building itself. Transversal aspects common to all the required performances are scalability and modularity, more important the more rapidly the market demands change.

Building Segment Overview
Building performances

Connectivity

The building enables its intelligent components to connect providing proper cyber security, preventing software vulnerabilities and minimizing risks associated with data flow and storage.

Efficiency

The building optimizes the energy consumption and supports the efficient use of resources.

Total Cost of Ownership

The building gives the transparency of the operating and maintenance costs. Warnings occur before a major fault.

Sustainability

The building runs with the best CO_2 footprint, according to GHG protocol sector 1.2.

Productivity

The building increases the productivity of employees, sets the right conditions (light, air quality, temperature …) adapting to the occupancy and expected performances.

Flexibility

The building technology allows it to adapt easily to new usage requirements.

Well-being

The building technology keeps employees and visitors healthy.

Healthcare Solution

Healthcare Vertical Profile
Introduction

The generalized term "Health Care Building/Premises" applies to a varied selection of buildings defined typically by their use, these definitions vary by country and region and typically include :

- GP Doctors premises
- Health centres
- Primary care centres
- Resource centres
- Urgent care centres
- Community hospitals
- Acute Hospitals

Primary and community care buildings provide a wide range of frequently accessed, less specialized, care services. Many of these services can be delivered from shared accommodation with facilities for doctors, pharmacy etc.
Acute or main regional hospitals provide for the delivery of specialist healthcare services to a larger population group by region, city or even country. The rational being that it is more efficient to centralize specialist staff and equipment which patients access less frequently. Acute and main regional hospitals are generally made up of several specialist departments, each providing a specific service from dedicated accommodation. Buildings vary in size, location and function, however all building contain some rooms and spaces common to all.

Hospital room/ spaces are generally grouped by common environmental room requirements some of which will include the following:

- Temperature,
- Humidity
- Air quality
- Air pressure
- Air change rate
- Lighting levels
- Lighting luminaires
- Emergency lighting provision
- Electrical supply resilience
- Provision of medical gas
- Sound levels
- Provison of Data connections
- Fire detection and suppression

Healthcare Vertical Profile
Customer needs

For the healthcare vertical, our research shows 9 key requirements need to be addressed, which are anchored in the 4 customer needs categories.

Health and Comfort

- **Healthier environment:** Sufficient ventilation and air change rates throughout hospital with focus on critical areas combined with Indoor air quality, temperature and humidity monitoring and control
- **Healthcare Space Efficiency:** Covid-crisis readiness with flexible spaces and contingency plan implementing streamlined infection prevention processes and measures
- **Patient comfort:** Easy to use inpatient room temperature comfort settings, Facilitated communication with medical staff and entertainment and connectivity during recovery

Environmental performance

- **Healthcare Building self-sufficiency:** Reduce emissions in line with hospital decarbonization targets enabling integration of onsite renewables generation and clean power electric vehicle charging
- **Power Supply resilience:** Onsite energy storage for load profile management combined with reliable and safe backup power to keep critical equipment active during accidents or crises and Prediction of potential equipment failure with continuous monitoring

Healthcare Vertical Profile
Customer needs

Life cycle cost and value

- **Energy-efficient infrastructure:** Resource conservation planning which enables management of carbon credits schemes where relevant and funding for implementation of energy saving measures
- **Energy Management:** Good overview of energy and utilities consumption onsite combined with simple and reliable access to energy data measured and invoiced

Future performance

- **Data access and use:** Digitalisation of processes and documentation to deliver streamlined and secure management of both patient and building data, Compliant and flexible user rights management for data access. Crucial is also Cyber-security prevention and counter-measures
- **Integrated and open platform:** Evolution of applications and functions through APIs allows seamless integration of building and healthcare equipment and compliance with Esign, SOP, MOP

Points of interaction

Hospital Points of Interaction Healthcare facilities are designed to offer various health services to the community. Person visiting healthcare facility may interact with different healthcare areas/staff and it is highly dependent on services offered by healthcare facility and patient condition. Irrespective of healthcare services used, care received by incoming patient fall under 2 major categories i.e. inpatient care and outpatient care.

Inpatient Care

Inpatient care requires overnight hospitalization. Depending on procedure patient has undergone, he/she must stay in healthcare facility of at least one night. Stay in hospital depends of complexity of procedure and care required. Most of the patient enter inpatient care from hospital emergency room (ER), through pre-book Complex and routine surgeries, childbirth, rehabilitation services or treatment requires substantial monitoring.
Inpatient may directly or indirectly use medical rooms, Treatment Units, Critical care areas, Ward areas, Specialist support and not medical spaces of health care facilities.

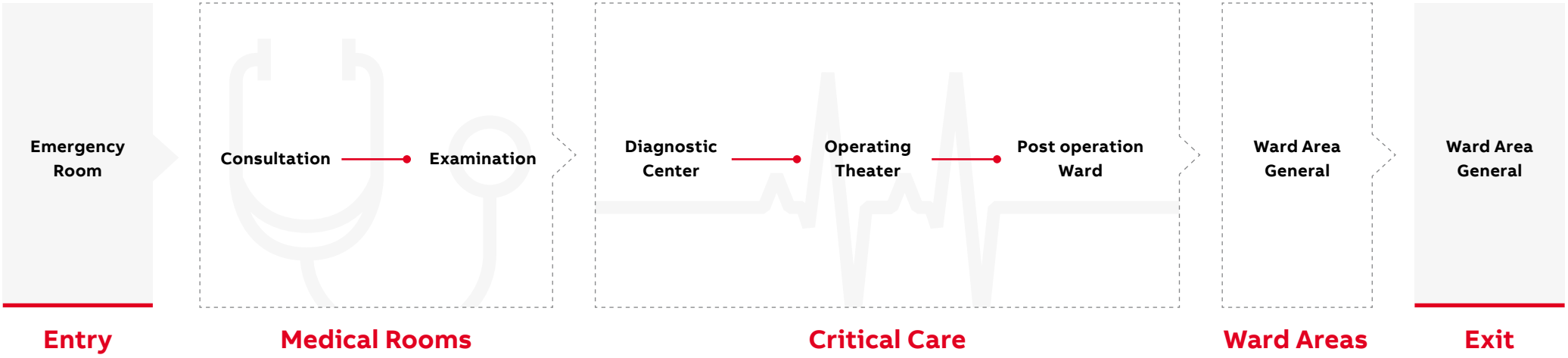
Outpatient Care

On contrary to inpatient care, outpatient care provided without admission into the hospital. Outpatient care facilities can be part of overall healthcare facilities, or they can operate independently like a clinic. Procedures within an outpatient care include consultations, rehabilitation, tests, etc.
Outpatient may directly or indirectly use Circular area, medical rooms, Treatment Units, Specialist support and non-medical spaces of health care facilities.

Points of interaction

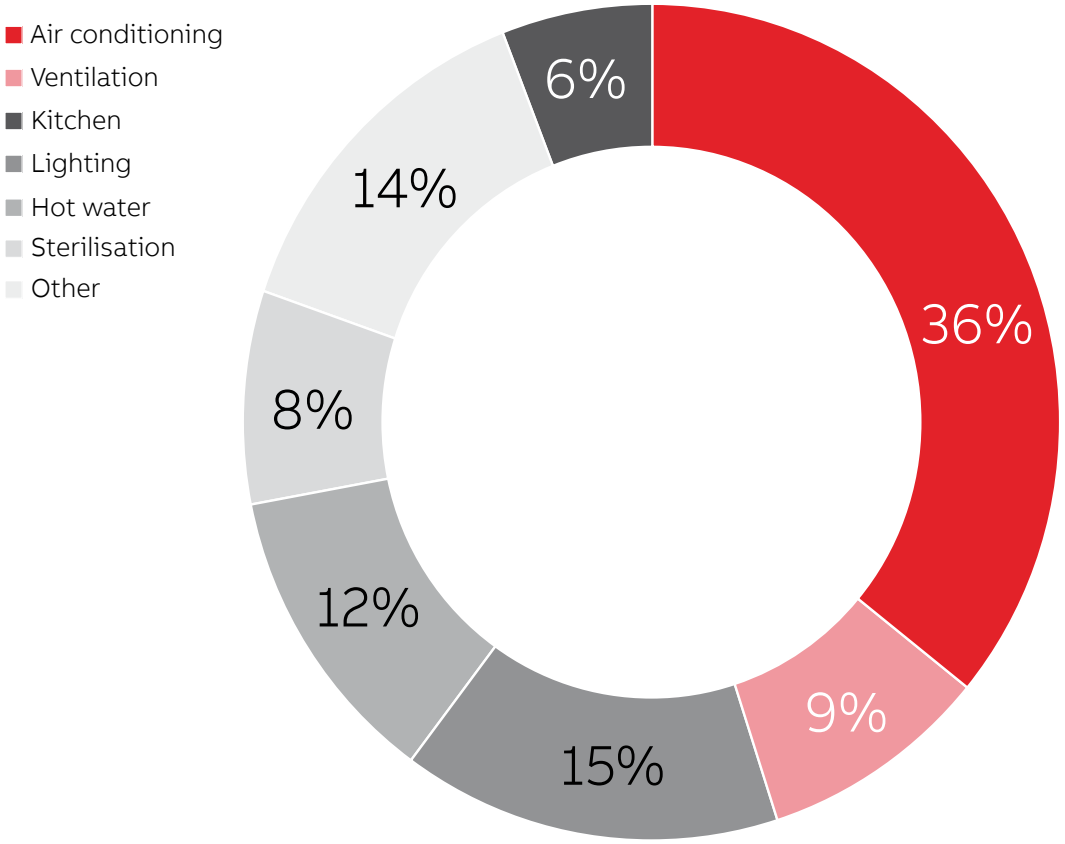
For both Inpatient and outpatient care, healthcare facility touchpoints are highly depending on treatment and care patient required in healthcare facility.
Below is an example of healthcare area/staff touchpoints for a patient recently met an accident and primary visual investigation suggest he might have some serious injuries on his head.

Healthcare facility touchpoints



Points of interaction

Hospital energy use

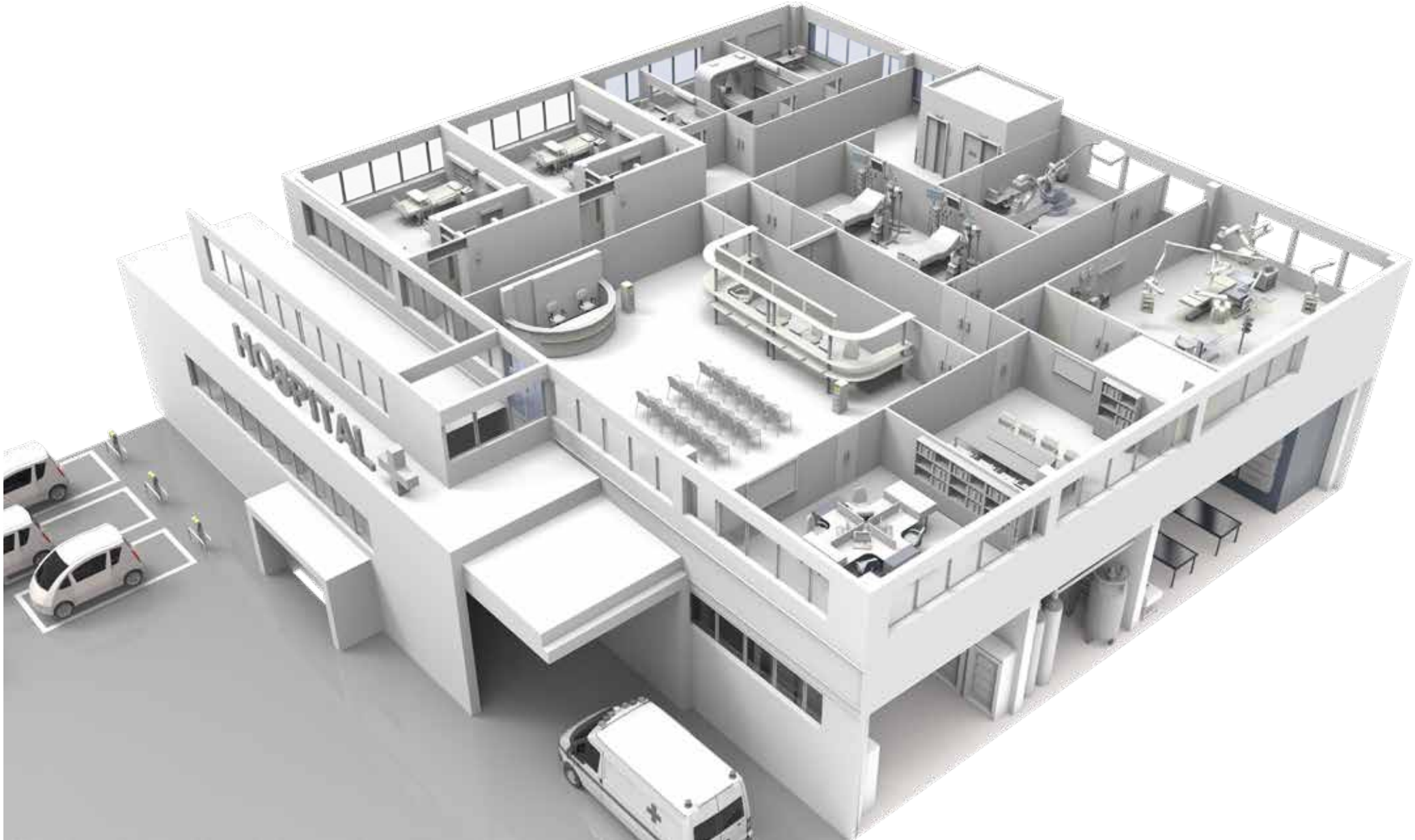


On average, HVAC system account for about 50% of hospital energy use.

Investing in HVAC system energy efficiancy and reliability significantly cuts maintenance and energy related operating costs.

Points of interaction

Clean room application example

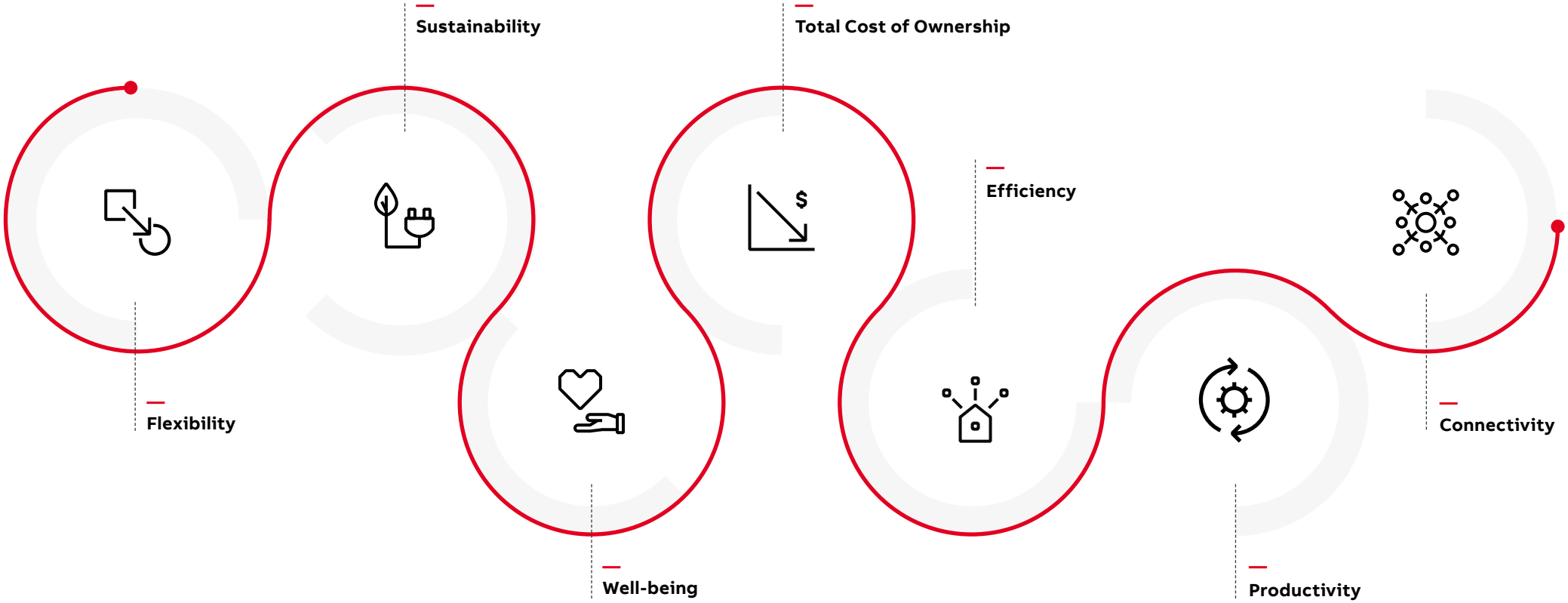


Points of interaction
Clean room application example

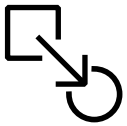
- A&E suite
- Audiology
- Birthing Unit
- Cafés
- Cardiac Unit (Angiography)
- Consultation
- Coronary Care Unit (Epidemic Room)
- Corridors
- Counselling
- Crèches
- CSSD sterilization
- Diabetics unit
- Diagnosis
- Diagnostic Centre (X-ray, MRI's, endoscopy etc.)
- Education
- Electrical switch rooms
- EMU
- ENT Ear, Nose & Throat
- Examination
- Fracture clinic
- Generator rooms
- Hand and Wrist unit
- Hematology
- High dependency Care
- High dependency units
- Incinerators and disposal
- ITU intensive care unit
- Laboratories (microbiology, Phlebotomy)
- Laundry (medical)
- Libraries
- Lobby
- Medical equipment
- Medical gases
- Minor Treatment rooms
- Mobile Health Unit
- Mortuary
- Occupational therapy
- Offices
- Operating theatres
- Opthalmy
- Orthodontics
- Orthopedics
- Pain management
- Pathology
- Patient Kitchens
- Pharmacy
- Physiotherapy
- Podiatry
- Pre & post operation wards
- retail pharmacies
- Specialist therapy
- Stairs
- Urology
- Waiting areas
- Ward areas general
- ward areas premium single room

Building segment performance for healthcare

The 7 building performances exist to ensure that the solutions deployed in hotels are holistic and cater to the core needs of involved stakeholders. In other words, this is a people & planet first approach, and the careful selection of ABB building technology serve the purpose of enabling the performances to achieve our common goals.

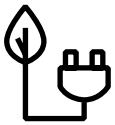


Building segment performance for healthcare



Flexibility

Change the function of the spaces without major reconstruction or investment is a key advantage for proactive hospital operation. The ability to adapt quickly to challenging situations, including major crises like Covid is crucial, generating significant pressure on the sector for staff and patients. Reduce lead times to implement changes in the building space use, and sanitary requirements.



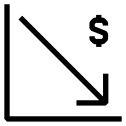
Sustainability

Reduction of the carbon footprint of healthcare operations, with future patients and generations in mind. Taking lead in the market with building performance certifications. New emerging healthcare facilities are trying to achieve green or LEED's certification.

Well-being

Comfortable treatment and healing spaces for patients. Indoor environmental quality for medical staff and daily occupiers.

Building segment performance for healthcare



Total Cost of Ownership

Giving the building owner full transparency of operational and maintenance costs over the building lifecycle. Strategic investment, staffing and utilities cost forecasting. Proper energy and water management systems enable to maintain and troubleshoot issues quickly.

Efficiency

Building systems and key medical assets operate using the least amount of electricity, water and other utilities. Measuring, implementing and monitoring energy saving measures. The building could be said to be autonomous and continually optimizing efficiency inevitably leading to reduced cost.

Productivity

Medical and support staff benefit from streamlined processes, reliable building systems and high quality working environment. The building sets the right condition levels enabling a productive operation.

Building segment performance for healthcare

Connectivity

Enables buildings and associated intelligent components to be connected by means of secured flow of data. Integration of building and medical systems to facilitate operations. Digital data repositories for information sharing across disciplines.

Features expected from healthcare solution

ABB held a number of Ideation sessions to capture from an invited panel of sector experts the most relevant and current issues in Health care buildings. The output of these sessions was a series of 6 problem statements and for each statement, the implications of the problem, a solution proposal and the benefits of our proposed solutions were considered.
The results are set our below and inform the reader of some current high-level issues that could form part of any discussion and the ABB solutions available.

01 Patient Enviroment

What is the problem
- Rising need for social distancing and space segregation, reduced recovery times and higher bed capacity.
- Lack of resources to invest in high-quality care provision in state-financed projects.
- Incidents in medical facilities due to medical staff inefficiency (e.g. manual set up of environment)

Proposed solution
Human centric lighting • Improved air quality and ventilation • Remote monitoring and management of patients environment by medical staff

Implications of the problem
- Negative impact on healing process: lack of exposure to the sun's spectrum disturbs the Human Circadian System which is fundamental to our physiology and controls much of our behavior.
- Negative impact on medical center reputation and financials

Benefits of Solution
Optimized conditions for improved healing process (experience) • Efficient performance (automated functions) and improved cost profile • Improved intervention time from medical staff in case of unforeseen urgency

02 Maintenance and system monitoring

What is the problem
- The cost of downtime for not delivering healthcare: business continuity
- Cybersecurety (IT and OT layers)
- Overloaded existing electrical system
- Connectivity and interoperability with other systems

Proposed solution
- Data driven real-time monitoring and proactive intervention
- Condition-based maintenance vs time-based maintenance, predictive maintenance.
- Electrical system resilience, redundancy, monitoring
- Remote monitoring capabilities
- M&T, FDD

Implications of the problem
- Overloaded exiting electrical system resultant safety issue
- Unscheduled system fallure where no redundancy is provided

Benefits of Solution
- Reduced intervention time to ensure minimum downtime and first time fix
- Asset life-cycle management
- Proactive and predictive maintenance

Features expected from healthcare solution

03 HVAC management

What is the problem

- Most medical areas will require environmental conditions to be maintained 24/7 requiring dual systems, continuous monitoring and alarm activation
- HVAC set values such as air presure, temperature, air quality and airflow need to be maintained to maintain patient comfort and infection control, requiring continuous monitoring and adjustment

Proposed solution

• Advanced DDC control of HVAC plant, using ABB Cylon coupled with ABB variable speed drives

Implications of the problem

• Spread of airbourne infections
• Patients put at risk while in healthcare environment
• Hospital reputation and financials at risk
• Hospital unable to reconfigure spaces in case of emergency and unforeseen crisis

Benefits of Solution

• Rapid changes in system configuration
• Continuous monitoring, control and recording
• Alarm handling and prioritization
• Asset life-cycle management
• Proof of meeting statory requirements

General HVAC Considerations

Hospitals include different purpose areas, some with specific air treatment requirements. COVID-19 trends include hospital need for clear zoning – separation of “clean” and “dirty” areas, also with the help of HVAC.

- **HVAC play an important role not only by maintaining comfort, but also creating a clean, germ-free environment for patient well-being and prevention if decease spread.**
- **General fresh air treatment occurs for common areas like lobbies or corridors.**
- **Increased filtering is applied for operating theaters. Surgery rooms can also use ultraviolet light to disinfect the air.**
- **Often operating theaters are kept at positive pressure to prevent the leaks of contaminant air from outside.**
- **Hospital units for patients with infectious-contagious diseases are usually kept at negative pressure to prevent the spread of contagious air from inside out.**
- **Hospital infection units also require the filtering of outgoing air before it leaves the building.**

Features expected from healthcare solution

04 CO_2 emissions and Cost Efficiency

What is the problem
- Being able to demonstrate achievements of statutory requirements and local governance
- Budgetary pressure to reduce OpEx
- Governmental programs around carbon neutrality (e.g. UK)

Proposed solution
- Provision of renewables
- EVCI
- ABB Ability Energy and Asset manager

Implications of the problem
- Penalty costs
- Extra running costs
- Local environmental pollution
- Reputational impact
- Long term health

Benefits of Solution
- Long-term sustainability
- Corporate accountability

05 Space Utilization

What is the problem
- Need for optimizing space utilization (extensions and brownfield development)
- Flexibility in space usage, accomodate space requirement changes.
- More equipment and infrastructure required in hospitals, but space availability hasn't grown to accomodate this

Proposed solution
- ABB to optimize space utilization through modular equipment and retrofit packages

Implications of the problem
- Rising trend for extensions to accomodate new technology and digital equipment
- Increased use of temporary hospitals, for instance modular operating theaters, specialized units etc.

Benefits of Solution
- Flexibility to allow adds moves and changes Resilience
- Holistic system management
- Minimal footprint of ABB equipment
- Flexibility at no extra costs

Features expected from healthcare solution

06 Telemedicine

What is the problem
- Day-surgery helps to reduce the need for long-term bed capacity and to optimize recovery times
- Caring for patients recovery and other vulnerable people living in the community

Proposed solution
- Home/room automation to provide real-time data and control
- Environmental monitoring (water flow, electrical loads allowing AI and ML)

Implications of the problem
- Lack of appropriate and monitored environment outside hospital for convalescence, recovery and long term care
- Increased hospital bed requirement where home could be an option

Benefits of Solution
- Patient recovery outside of hospital environment
- Reduced costs and freed up beds Non critical long term care at home could be provided

07 Collaborative Robotics

What is the problem
- Shortage of skilled workers
- Rising costs, affordability of care
- Ageing population
- Rising patient expectations

Proposed solution
- Laboratory and pharmacy automation
- Logistics and intra-logistics management
- Robotic-assisted surgery or recovery

Implications of the problem
- Cost of hiring, turnover, training needs
- Just in time management
- m^2 optimization

Benefits of Solution
- Quality and security
- Productivity
- Efficiency

Testimonials from ABB technology users

Testimonials from ABB technology users

UNITED STATES

MERCY HOSPITAL JEFFERSON

Serving millions of patients annually, the Mercy Health System is the sixth largest Catholic health care system in the United States. A member of this group, Mercy Hospital Jefferson is located 30 miles south of St. Louis and consists of 8 buildings that include a 250-bed acute care facility and 24-hour emergency room care along with a full range of diagnostic, preventative and restorative health care services.

A Smart Building Solution for Effective Healthcare

Challenge
The hospital needed a powerful building automation system that offered an easy to use interface, graphical trending & alarming capabilities, as well as mobile functionality. Mercy Hospital Jefferson already had experience with Cylon Auto-Matrix products, as the facility has been using various controls for over 15 years. To continue forward with the project, the hospital turned to Integrated Facility Services, a Missouri-based System Integrator, for help in bringing their project to fruition.

Solution
After working together to identify the specific needs of the health care facility, Integrated Facility Services and Mercy Hospital Jefferson realized all of their needs would be met with ASPECT.
The system upgrade consisted of an ASPECT-Enterprise front-end, an ASPECT-Matrix, 8 MatrixPNCs, and over 530 various controllers. The hospital relies heavily on these devices functioning properly and effectively as various operating rooms, intensive care units, decontamination rooms, patient rooms, and offices require both comfortable and safe environments.

Scheduling via the iCalendar integration in ASPECT is able to assist Mercy Hospital Jefferson with lead / lag manipulation. Often times, 24/7 facilities have multiple pieces of equipment for the same purpose to keep one device from doing all the work. By setting up a scheduling system, technicians can now be emailed alarms to help control wear and tear on equipment, allowing them to address concerns before they begin to affect patients.

Pairing the multitude of features and resources available with ASPECT and the ease of use of ASG's interface design provided the customer an easy transition to the new installation. Upon completion, the ASPECT map contained a total of over 10,000 points.

Results
The mission of Mercy Hospital Jefferson is to provide compassionate care and exceptional service. Implementing ASPECT has helped Mercy to continue to achieve their mission by providing a solution that can maintain a safe and effective working environment for a facility that is operational 24 hours a day, 7 days a week, and 365 days a year.

Testimonials from ABB technology users

EUROPE - UK

ROYAL PRESTON HOSPITAL

—

Lancashire Teaching Hospitals NHS Foundation Trust

Projekt Overview
Royal Preston Hospital it provides a full range of acute services for the people of Preston from 24-hour accident and emergency facilities to high dependency and coronary care units and maternity services.
The trust also provides a range of specialist services for the wider population of Lancashire and South Cumbria including: neurosurgery and neurology, oncology and complex cancer surgery and renal services. It also provides burns and plastic surgery and disablement services.
The Hospital comprises of 50 buildings and a total area of 114,596 m². It has 1000 beds and serves over 1.2m patients annually. Is linked by a hospital wide Ethernet network, which ensures real time monitoring of all buildings. The annual energy bill stands at £3.4m.
The ABB Cylon® BMS enables powerful central monitoring and control of energy consumption and allows us the flexibility we need to implement cost saving changes.
The ABB Cylon® solution allows effective implementation of the energy management policy.

Central Supervision
System supervisors have overall control of all HVAC systems in the hospital and the remotely located clinics.

Flexible Control
Surgeons and other key staff now can locally control temperature and humidity in critical areas such as operating theatres and x-ray.
The ABB Cylon® BMS controls the boiler plant, ventilation systems and radiant heating panels. The radiant heating system provides the flexibility needed to ensure patient and staff comfort. Building use is varied and includes state of the art delivery suites and operating theatres requiring exact control.
The Trust's local clinics are linked to the main hospital buildings using a Wide Area Network (WAN). The whole system is managed from 3 supervisors in the estates office on the same Ethernet network.
A range of energy saving measures have been successfully implemented including the use of occupancy sensors to step down heating levels when rooms are not in use.

Project Summary
Applications: Monitoring, Heating, Air handling, cooling, Metering
Points: 5,000 points
Number/Type of Building: 50 Buildings over an area of 114,596 m²
Network: Ethernet
ABB Cylon® Hardware
Installed: UC32 UCXX controllers
ABB Cylon® Software
Installed: UEC6 UCC

Testimonials from ABB technology users

AUSTRALIA

PRINCESS ALEXANDRIA HOSPITAL

—

Lancas

Projekt Overview
Medical facilities and hospitals are the bastions of safety and demand emergency lighting solutions up to the task of meeting the most stringent safety requirements.
Set against this backdrop, ABB's Stanilite® Platinum range is in a league of its own, providing measurable value against the priority criteria of these facilities.
With more than 150 hospitals across Australia featuring Stanilite emergency lighting, it is the go-to choice of safety-focused facilities managers.

Demanding criteria drive performance
End-user needs are critical considerations when it comes to medical building emergency lighting, such as easy access and egress providing much-needed peace of mind. However, that is simply where it begins. Operational medical buildings demand the utmost in performance, reliability and compliance to Australian and New Zealand standards. Stanilite's integration of the latest in LED technology – in the Platinum range exceeding 100,000 hours of lamp life – and lithium iron phosphate battery technology, delivers every time. Where reliable, fast egress is a priority, quality is a point of no compromise.

Stanilite's extended warranties are just one show of confidence in the team's high manufacturing standards that are regarded as the best in the industry.
Stanilite's Platinum range now offers the Nexus RF Infinity® monitoring system, an upgrade from the previous Nexus RF system that is available to all existing clients through backwards compatibility with no need for additional hardware.
Infinity allows luminaires to be tested in groups, providing flexibility and efficiency to hospital maintenance staff as it prevents the possibility of luminaires not having enough back-up battery power in the event of a power failure shortly after an emergency light test. It also gives teams the ability to schedule testing to avoid impacts on end users, such as avoiding interrupting clinical procedures.
The combination of high-quality hardware and industry-leading software results in whole-of-life value, such as reduced need for replacements and other maintenance, with the least disruption to day-to-day activities.

Testimonials from ABB technology users

MIDDLE EAST

BADR AL SAMAA HOSPITAL

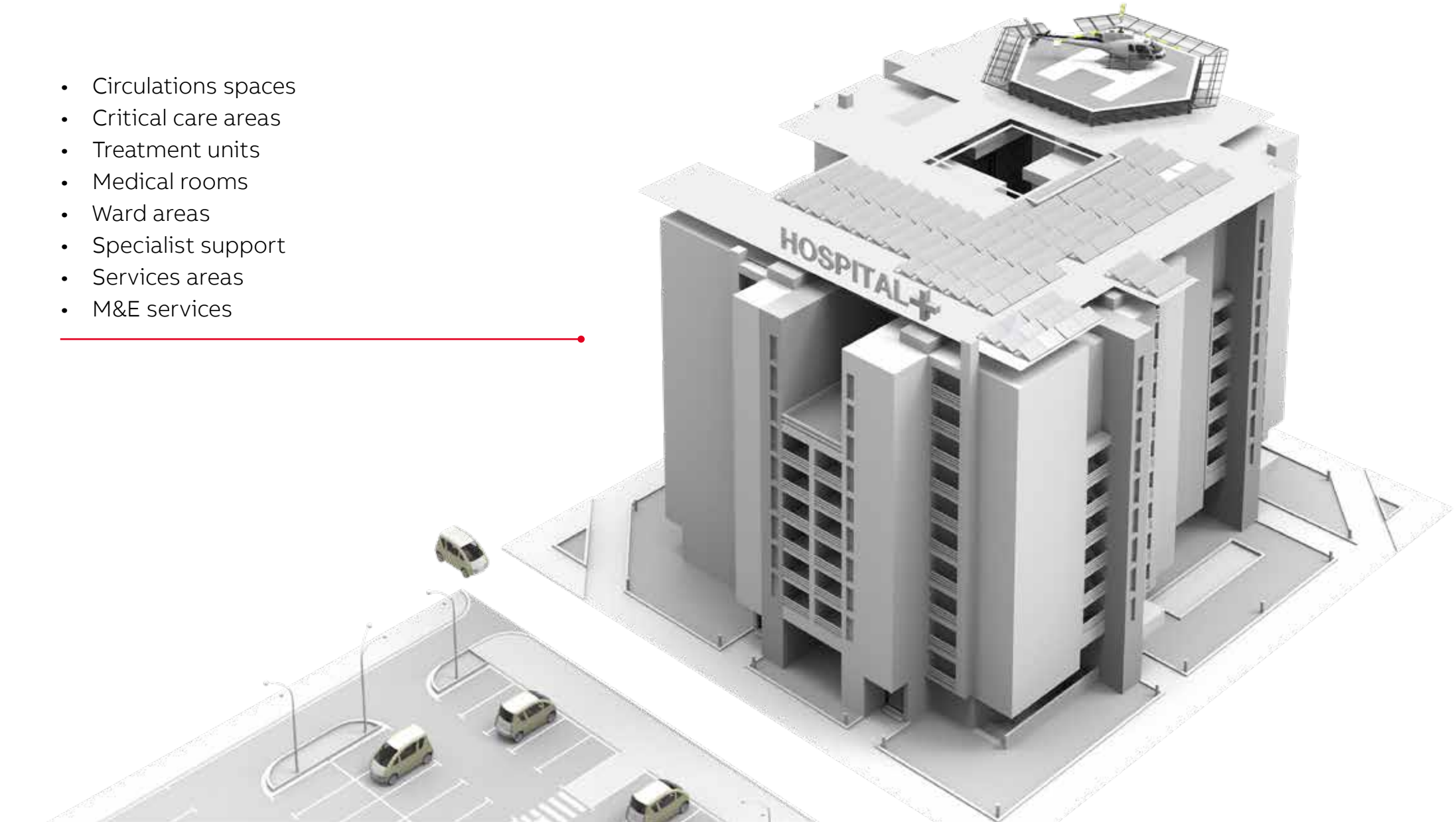
Badr Al Samaa Group of Hospitals & Medical Centres became the largest private healthcare group of Oman. The group spread its wings and became multinational, having presence in UAE, Bahrain, Qatar and Kuwait. Advanced technological know-how and devices are combined together with professional expertise to deliver the best in diagnostic, curative and preventive healthcare. Its superior infrastructure, commitment to operating within the highest standards of safety.

Solution Architecture

Building typology

Hospitals & Healthcare Centers environment

- Circulations spaces
- Critical care areas
- Treatment units
- Medical rooms
- Ward areas
- Specialist support
- Services areas
- M&E services



Building typology
Hospitals & Healthcare Centers environment

Circulations spaces

Areas
- Lobby
- Stairs
- Corridors

Building applications
- Lighting control System
- Shading control System
- Diming control System
- HVAC Control System
- Emergency Lighting/Central Battery System
- Variable speed drives & Motors
- Central Monitoring & Control
- Energy management

Benefits
- Optimized use of energy
- Space occupancy efficiency
- Optimize use external brightness
- Reduced carbon emission
- Reduced fan motor noise
- More comfortable air quality & temperature environment

Critical care areas

Areas
- Operating theatres
- Specialist therapy
- Diagnostic Centre (X-ray, MRI's, endoscopy etc.)
- Pre & post operation wards
- High dependency units
- Birthing Unit
- Cardiac Unit (Angiography)
- Coronary Care Unit (Epidemic Room)
- ITU intensive care unit
- High dependency Care

Building applications
- In room controls
- HVAC Control & alarm monitoring
- Isolation room integration
- Emergency Lighting/Central Battery System
- Variable speed drives & Motors
- Central Monitoring & Control
- Energy management

Benefits
- More comfortable air quality & temperature environment
- Critical equipment monitoring & predective maintanence
- Fireman's override feature making ventilation applications ignore faults and warnings during emergency and run until destruction ensuring smoke extraction and evaluation route maintenance if possible for the hospital occupants' highest safety
- Clean air circulation throughout critical hospital areas
- Tighter control over temperature changes



Building typology
Hospitals & Healthcare Centers environment

Treatment units

Areas
- Minor Treatment rooms
- A&E suite
- Mobile Health Unit
- Audiology
- Orthodontics
- Opthalmy
- Diabetics unit
- ENT Ear, Nose & Throat
- EMU
- Fracture clinic
- Hematology
- Orthopedics
- Podiatry
- Urology
- Hand and Wrist unit

Building applications
- Lighting & Diming Control
- HVAC Control & alarm monitoring
- Emergency Lighting/Central Battery System
- Variable speed drives & Motors
- Central Monitoring & Control
- Energy management

Benefits
- More comfortable air quality & temperature environment
- Simple & user friendly controls (touch screens, scene controls, etc..)
- Critical equipment monitoring & predective maintanence
- Fireman's override feature making ventilation applications ignore faults and warnings during emergency and run until destruction ensuring smoke extraction and evaluation route maintenance if possible for the hospital occupants' highest safety
- Optimized use of energy & Space occupancy efficiency
- Simple & user friendly controls (touch screens, scene controls, etc..)

Medical rooms

Areas
- Counselling
- Consultation
- Examination
- Diagnosis
- Pain management
- Physiotherapy

Building applications
- Lighting & Diming Control
- HVAC Control & alarm monitoring
- Emergency Lighting/Central Battery System
- Variable speed drives & Motors
- Central Monitoring & Control
- Energy management

Benefits
- More comfortable air quality & temperature environment
- Simple & user friendly controls (touch screens, scene controls, etc..)
- Critical equipment monitoring & predective maintanence
- Fireman's override feature making ventilation applications ignore faults and warnings during emergency and run until destruction ensuring smoke extraction and evaluation route maintenance if possible for the hospital occupants' highest safety
- Optimized use of energy & Space occupancy efficiency
- Simple & user friendly controls (touch screens, scene controls, etc..)



Building typology
Hospitals & Healthcare Centers environment

Ward areas

Areas
- Ward areas general
- Ward areas premium single room

Building applications
- In room controls & electrical accessories
- HVAC Control & alarm monitoring
- Isolation room integration
- Emergency Lighting/Central Battery System
- Variable speed drives & Motors
- Central Monitoring & Control
- Energy management

Benefits
- More comfortable air quality & temperature environment
- Simple & user friendly controls (touch screens, scene controls, etc..)
- Critical equipment monitoring & predective maintanence
- Fireman's override feature making ventilation applications ignore faults and warnings during emergency and run until destruction ensuring smoke extraction and evaluation route maintenance if possible for the hospital occupants' highest safety
- Clean air circulation throughout critical hospital areas
- Tighter control over temperature changes

Specialist support

Areas
- Pharmacy
- CSSD sterilization
- Pathology
- Laboratories (microbiology, Phlebotomy)
- Mortuary
- Medical equipment
- Occupational therapy

Building applications
- Lighting & Diming Control
- HVAC Control & alarm monitoring
- Emergency Lighting/Central Battery System
- Variable speed drives & Motors
- Central Monitoring & Control
- Energy management
- Isolation room integration

Benefits
- Critical equipment monitoring & predective maintanence
- Clean air circulation throughout critical hospital areas
- Tighter control over temperature changes
- Real time motinoring & alarm
- Conditional monitoring & Predective mainatance



Building typology
Hospitals & Healthcare Centers environment

Services areas

Areas
- Medical gases
- Electrical switch rooms
- Generator rooms
- Incinerators and disposal
- Laundry (medical)
- Patient Kitchens

Building applications
- Power Protection
- UPS
- Lighting & Diming Control
- HVAC Control & alarm monitoring
- Emergency Lighting/Central Battery System
- Variable speed drives & Motors
- Central Monitoring & Control
- Energy management
- Isolation room integration

Benefits
- Critical equipment monitoring & predective maintanence
- Clean air circulation throughout critical hospital areas
- Tighter control over temperature changes
- Real time motinoring & alarm
- Conditional monitoring & Predective mainatance
- Optimized use of energy
- Reduced carbon emission
- Reduced fan motor noise
- Seamless intergation with healthcare equipements
- Hospital areas
- Tighter control over temperature changes

M&E services

General M&E Areas
- Waiting areas
- Libraries
- Education
- Offices
- Crèches
- Retail pharmacies
- Cafés

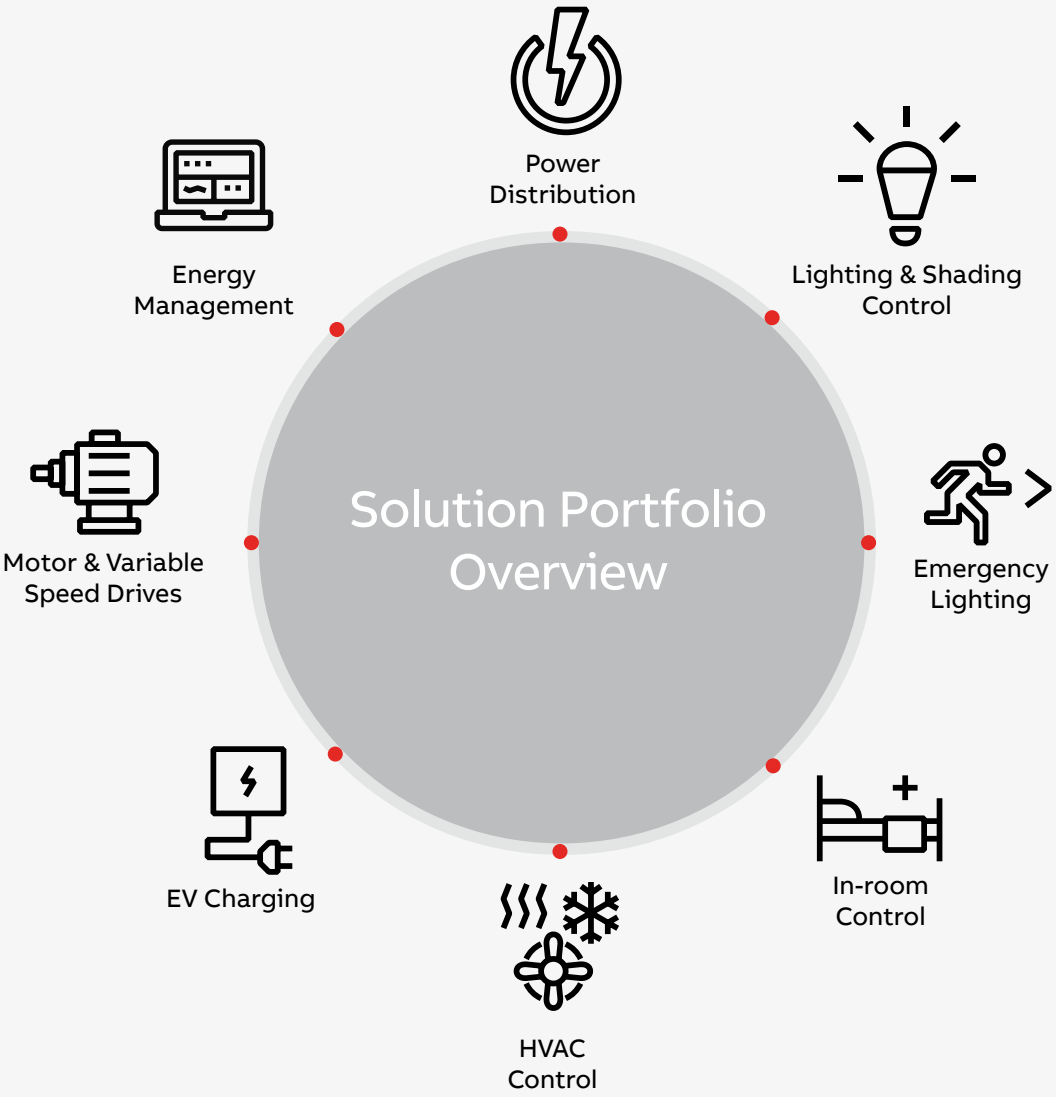
Specific M&E Areas
- Swimming pools
- Gyms
- Kitchens
- Restaurants
- Car parks

Building applications
- Lighting control System
- Shading control System
- Diming control System
- HVAC Control System
- Emergency Lighting/Central Battery System
- Variable speed drives & Motors
- Central Monitoring & Control
- Energy management

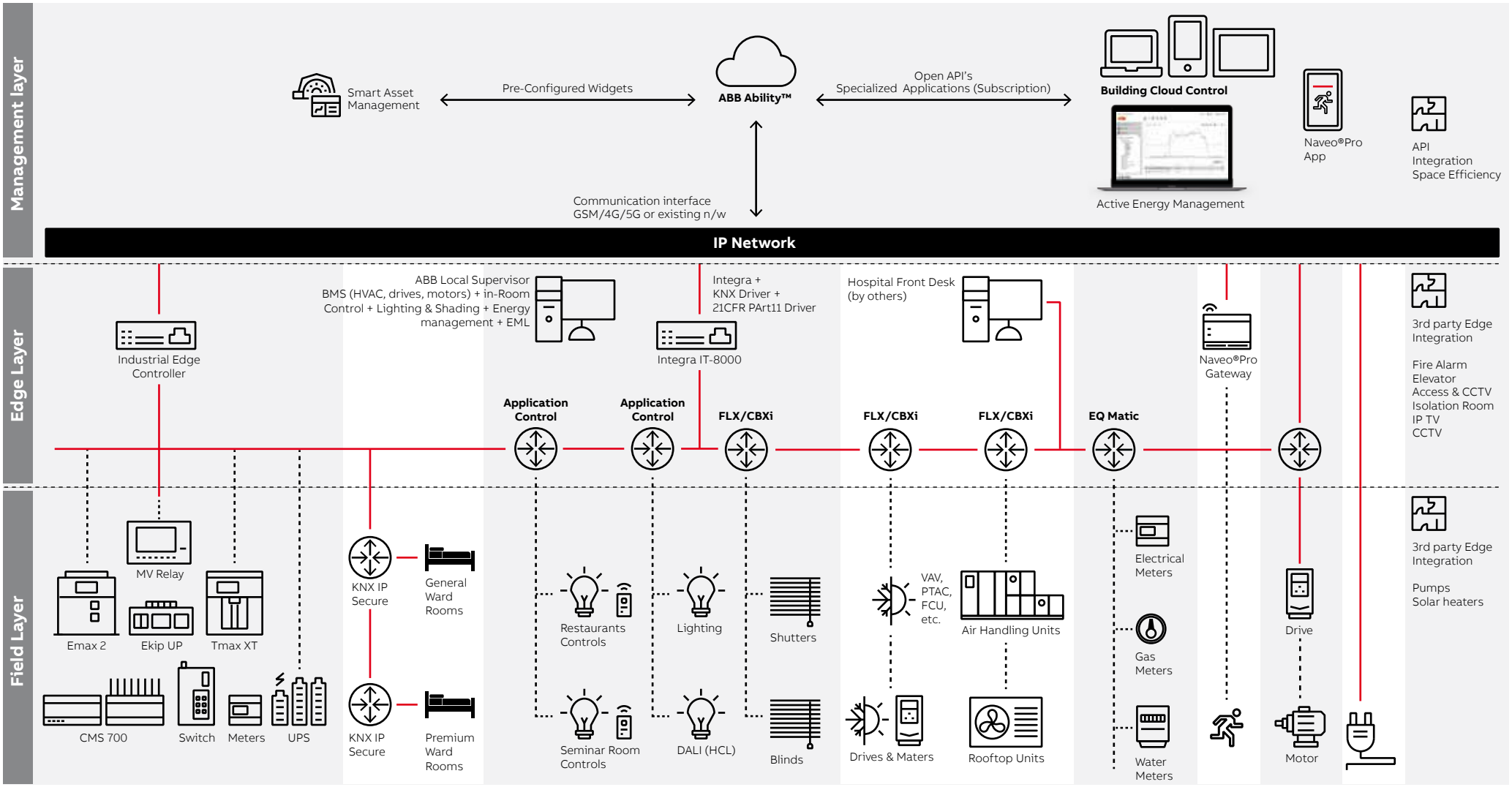
Benefits
- Optimized use of energy
- Space occupancy efficiency
- Optimize use external brightness
- Reduced carbon emission
- Reduced fan motor noise
- More comfortable air quality & temperature environment



Portfolio Overview



HealthCare Architecture



Power Distribution

Healthcare infrastructure is a critical environment, therefore electrical distribution power system shall be carefully planned to provide all specific needs. ABB offers a wide range of electrical distribution devices to protect a building from overloads, short circuits, ground or arc faults as well as meters to monitor the electricity consumption.

Power Distribution

Overview - Motivation & Key Elements

The Electrical distribution system is designed to be flexible, safe and continuity of supply is provided for IT and critical loads through the provision of uninterruptible power supplies.

Continuous operation

Is one of the most important need, both in terms of patient safety and costs.
The cost of downtime for not delivering healthcare ($) is quite high, it has been estimated that Healthcare organizations face average costs of $690,000 per outage, excluding imponderable loss of lives.
For mission-critical applications, like hospitals, there is nothing else as important as reliability. This equals to safety. Also, the system must be redundant enough to reach sufficient reliability. This in most cases means that an emergency back-up power supply is utilized.

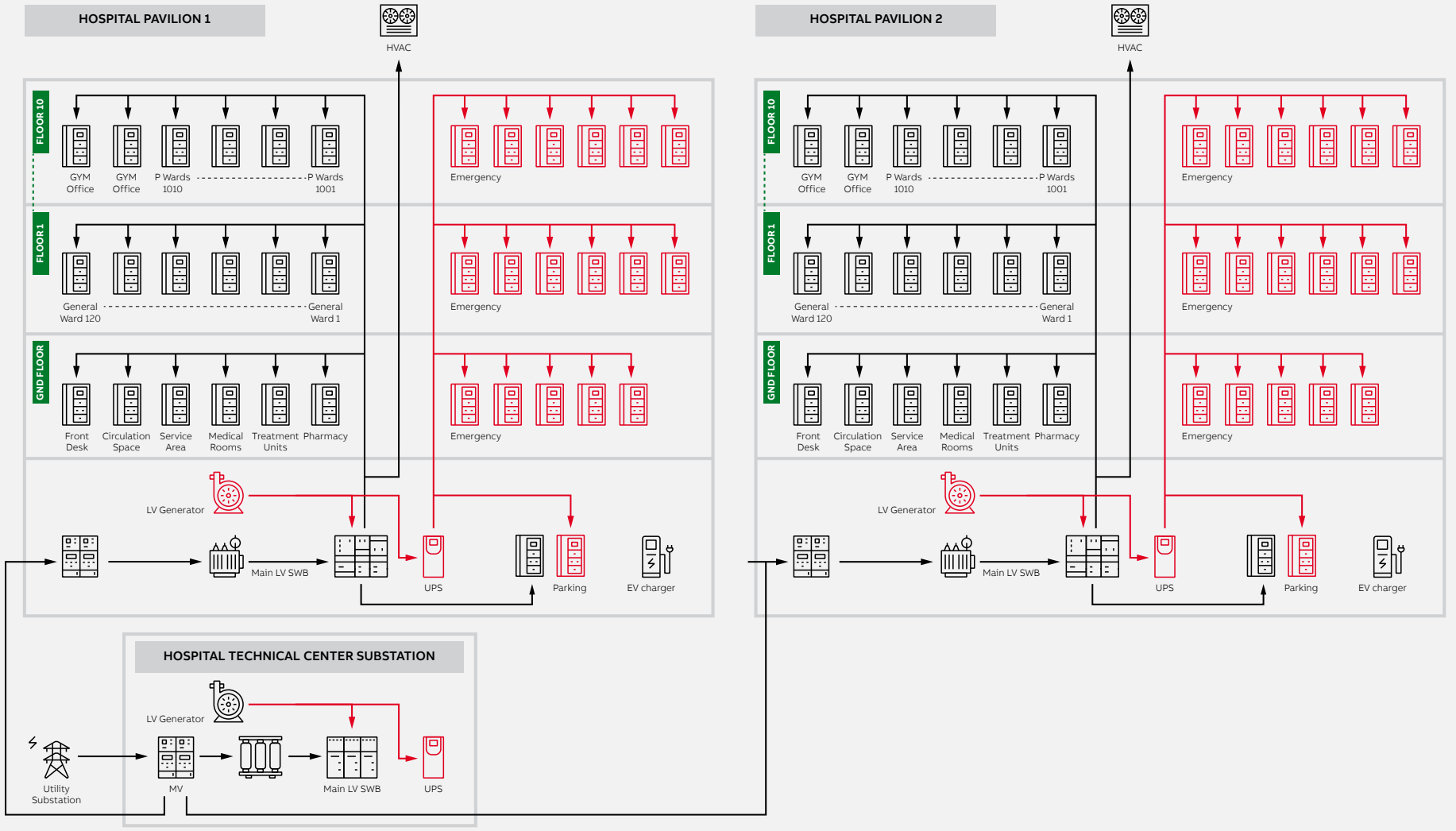
Connectivity and interoperability

Are the way to monitor all consumptions within facility, energy, water and gas efficient usage helps to reduce billings. Connectivity is also fundamental to ensure safety and continuous operation in each area of the building, for example connectivity with dual redundancy of emergency lighting ensure operativity of each department, avoiding risks for patients in case of system failure.

Budgetary

Pressure is increasing each year, to grant high performance level that customers deserve it is essential to keep costs under control trying to reduce operational expenses when possible. Financial savings could be invested in research and additional service for patients.
In some Countries governmental programs impose to hospitals the adoption of energy efficiency program that has as outcome a reduction in operational cost, but in general there is a growing need to make healthcare structure health for human being also for what concern carbon emissions.
Existing hospitals have shown during pandemic period all fragilities, being not able to satisfy the need of flexibility required, for example it has been difficult to respond to a sudden increase of bed capacity implying, and structure expansions.
If we consider also the shift towards digital infrastructure, massive use of data in healthcare has generated high demand in data storage and servers, or small data centers. Any extension of existing layouts sometimes might cause sometimes overloads for old electrical systems, ending into fires. All these aspects have been considered for the preparation of power distribution system of the reference architecture.

Power Distribution



Power Distribution
Medium Voltage Switchgear

Gas-insulated ring main unit SafeRing

Medium voltage (MV) SF6-insulated ring main unit for secondary distribution up to 40.5 kV, 630A.
SafeRing is a ring main unit (RMU) for the secondary distribution network.
It is available in 18 different configurations suitable for most switching applications within the range from 6 to 40.5 kV. The standardized RMU configurations, which are mostly required within a distribution network, can be extensible upon request.
SafeRing is a completely sealed system with a stainless steel tank containing all live parts and switching functions. A sealed steel tank with constant atmospheric conditions ensures a high level of reliability as well as personnel safety and a virtually maintenance-free system.
It offers also a compact design with small footprint and low weight.

Gas-insulated compact switchgear SafePlus

Medium voltage (MV) SF6-insulated switchgear for secondary distribution up to 40.5 kV, 630A.
SafePlus is a metal enclosed compact switchgear system for distribution applications up to 40.5 kV. The switchgear has a unique flexibility due to its extendibility and the possible combination of fully modular and semi-modular configurations.
SafePlus is a completely sealed system with a stainless steel tank containing all live parts and switching functions. A sealed steel tank with constant atmospheric conditions ensures a high level of reliability as well as personnel safety and a virtually maintenance-free system.

Power Distribution
Medium Voltage Switchgear

Air-insulated secondary switchgear UniSec (up to 24 kV)

UniSec is an indoor air-insulated switchgear for medium voltage secondary distribution up to 24 kV, 1250A, 25kA.
UniSec is suitable for a wide range of applications including industry, substations, data centers, small generation systems, buildings & infrastructures and smart grids.

ABB Ability™ Condition Monitoring for switchgear – SWICOM

SWICOM is a monitoring and diagnostic unit which provides mechanical and electrical health status of a fleet lineup. It acquires data communicating with IEC 61850 based protection relays and via sensor bus of additional e.g temperature sensors, and converts the data to diagnostic information.

Power Distribution
Low Voltage Switchgear

System pro E power

System pro E power is a range of primary distribution boards with rated current up to 6300 A and short-circuit current up to 120 kA. These units are designed to meet all electrical system requirements in terms of protection, form of segregation and electrical features,according to the latest international standards in perfect cooperation with ABB's low voltage equipment, modular circuit breakers, molded case circuit breakers, air circuit breakers.

NeoGear™

NeoGear™ is a new switchgear, based on an innovative busbar concept. Combined with the connectivity and digital smartness of the ABB Ability™ platform, it offers maximum safety, highest reliability, more flexibility, better efficiency and measurable ROI.

- NeoGear™ is safer, thanks to its revolutionary busbar system.
- NeoGear™ uses 25% less space than conventional switchgear.
- NeoGear™ saves energy thanks to its excellent thermal performance and sharply reduced heat losses up to 20%.
- NeoGear™ is underpinned by the ABB Ability™ platform, for better energy management, condition monitoring and predictive maintenance to enable up to 30% reduction of operational cost.

Power Distribution
Low Voltage Switchgear

MNS® Power Motor Control Center

MNS® is ABB's low-voltage switchgear and controlgear assembly for power distribution and motor control. The MNS design is verified in accordance with the latest IEC standards, IEC 61439 -1/-2 and IEC TR 61641, up to 690V, up to 6300A, up to 100kA.
MNS® switchgear assembly is of scalable design, enabling ABB to supply integrated solutions for today's challenging business environment. It is the leading technology combining maintenance-free frame structures and busbars, a fully modular construction and the capability to integrate feeder, motor starter, variable speed drives, power factor compensation etc. and even UPS technologies in safety focused,

Power Distribution
Low Voltage Components

Emax 2
Air circuit breakers

SACE Emax 2 air circuit breakers up to 6300A are designed to increase efficiency in different types of systems: from industrial applications to naval applications, to power generation, advanced tertiary uses, including hospitals, datacenters, and commercial buildings. They are the only switches that protect electrical circuits reducing power consumption based on user demand. This series is equipped with integrated breaker release and Power Controller, which measures and assesses power consumption, managing loads to maintain constant power or reduce power surges. The exclusive load management reduces absorbed power by up to 20%. Integrated multimeters measure voltage (0.5% precision), current (1% precision) and power (2% precision), and provide for remote monitoring. Simplified wiring allows time savings up to 30%.
SACE Emax 2 air circuit breakers are available in four different envelopes.

Tmax XT
Series molded case circuit breakers

Tmax XT are moulded case circuit breakers wich guarantee an extremely high performance level while being progressively smaller in size, simple to install and able to provide increasingly better safety. Range is complete with four frame sizes, suitable for applications from 160 A to 1.600 A.

Power Distribution
Low Voltage Components

TruONE
Network/Group switches

This new ATS (Automatich transfert switch) is the first real automatic switch available on the market, especially developed to offer switching and control functions in a single unit. With tested capabilities far beyond the standard, this series always guarantees power supply in critical power applications.
The adopted design solutions significantly reduce the number of wires and connections, guaranteeing rapid installation, reducing the risk of connection errors to a minimum, and offering superior reliability. Diagnostic maintenance and modular components reduce standby times and service costs.
In contrast to other traditional ATS solutions, TruONE allow to perform manual emergency operations under voltage, making it possible to quickly restore power supply in the case of equipment faults.

TVOC-2
Arc Guard system

The Arc Guard System TVOC-2 protects people and equipment in the case of an electrical arc, drastically reducing relative stoppage times.
The TVOC-2 is the most sophisticated Arc Monitor solution by ABB, for protection from arc faults in all applications and with full functional safety, for low and medium voltage power panels. Its features and capabilities guarantee reliability, flexibility, and simplicity. Certified in compliance with the function safety standard (SIL-2).
Pre-calibrated optical sensors, current sensors with Rogowski technology, factory calibrated for both low and medium voltage applications.
High degree of protection, IP54.
Can be expanded with 30 optical sensors.
System configuration based on specific requirements.

Power Distribution
Low voltage sub-distribution

System pro M compact® InSite

System pro M compact® InSite is a solution specifically developed to monitoring and controlling the energy flow in sub distribution boards. The InSite range collects data of devices such as energy and power meters, network analyzers, protection devices like MCBs and RCDs that are equipped with current sensors and the integration of additional digital Input and Output modules. Thanks to its scalability the system can easily be integrated in existing installations without replacing any components.
It can be installed as a standalone solution or integrated into any IT infrastructure, such as the cloud-based ABB Ability™ Energy and Asset Manager.

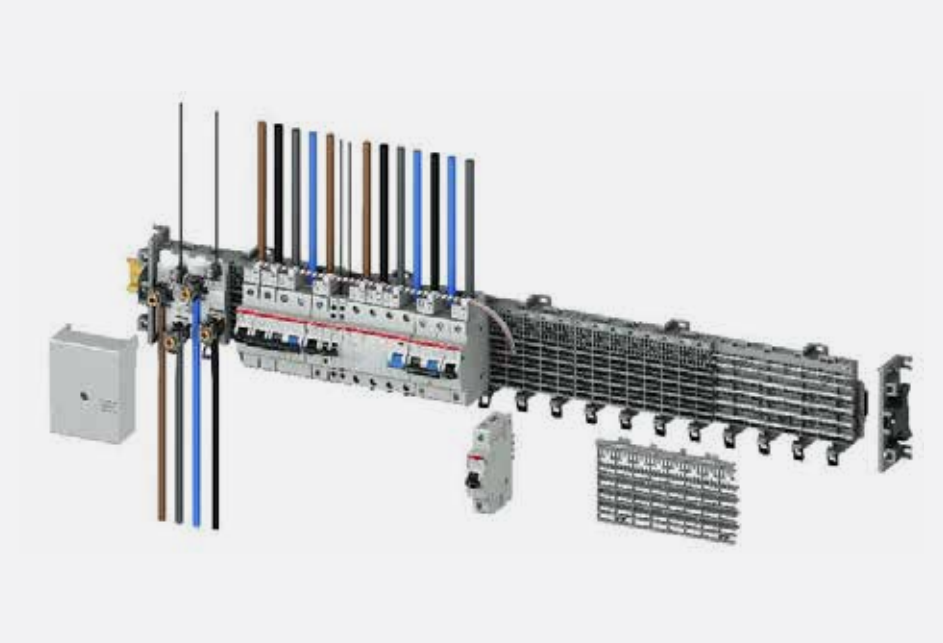
EQmatic Energy Analyzer

The new ABB EQmatic Energy Analyzer is a compact solution for monitoring, logging, visualizing and analyzing energy and consumption data from electricity, gas, water or heat meters via KNX, M-Bus or Modbus RTU.
The configurable dashboard page provides a quick overview of most relevant metering data and analytic charts. The web-based user interface is individually configurable to the respective requirements and makes it possible to identify energy thieves and optimize energy costs sustainably. Various export functions (E-mail, FTP) for further processing of the data and connectivity options (Modbus/TCP, RestAPI) for integration into supervisory systems (SCADA, BMS, etc.) are available.

Power Distribution
Low voltage sub-distribution

SMISSLINE TP
Plug-in connection system

SMISSLINE TP is the complete solution for line protection in applications that require high availability, simplicity, and rapid installation. SMISSLINE TP is the first plug-in connection that allows inserting and disinserting unpowered devices and components without having to use other individual protection devices. The possibility to make changes and additions during ongoing operation or future extensions makes this system ideal for hospitals, especially when changes are required during mission critical situations or emergencies and downtime needs to be minimized. Five different protection devices (breaker switches, differential switches, overvoltage dischargers, softstarter for motors and switches for maneuvering-disconnection) can be directly connected to the system with plug-in terminals. International certifications and approvals. Complete IP2XB protection against accidental contacts.



QSO
Operating room panels

For group 2 surgery centers in addition to the panel for supplying power to ordinary circuit, a panel for supplying power to the IT-M circuits must also be installed, so that when ordinary power is lacking, the panel switches to safety power supply coming from an uninterruptible power supply unit.
All the QSO panels assembled by ABB comply with EIC standards and are accompanied by required certificates of conformity for commissioning.
Available for floor or wall installations with output power of 3kVA, 5kVA, 7,5kVA, 10kVA.
Compact sizes, total selectivity in protection, maximum ergonomics, and simplicity in maintenance operations, they make the QSO range perfect products for guaranteeing uninterrupted service in this sector.

Power Distribution
UPS

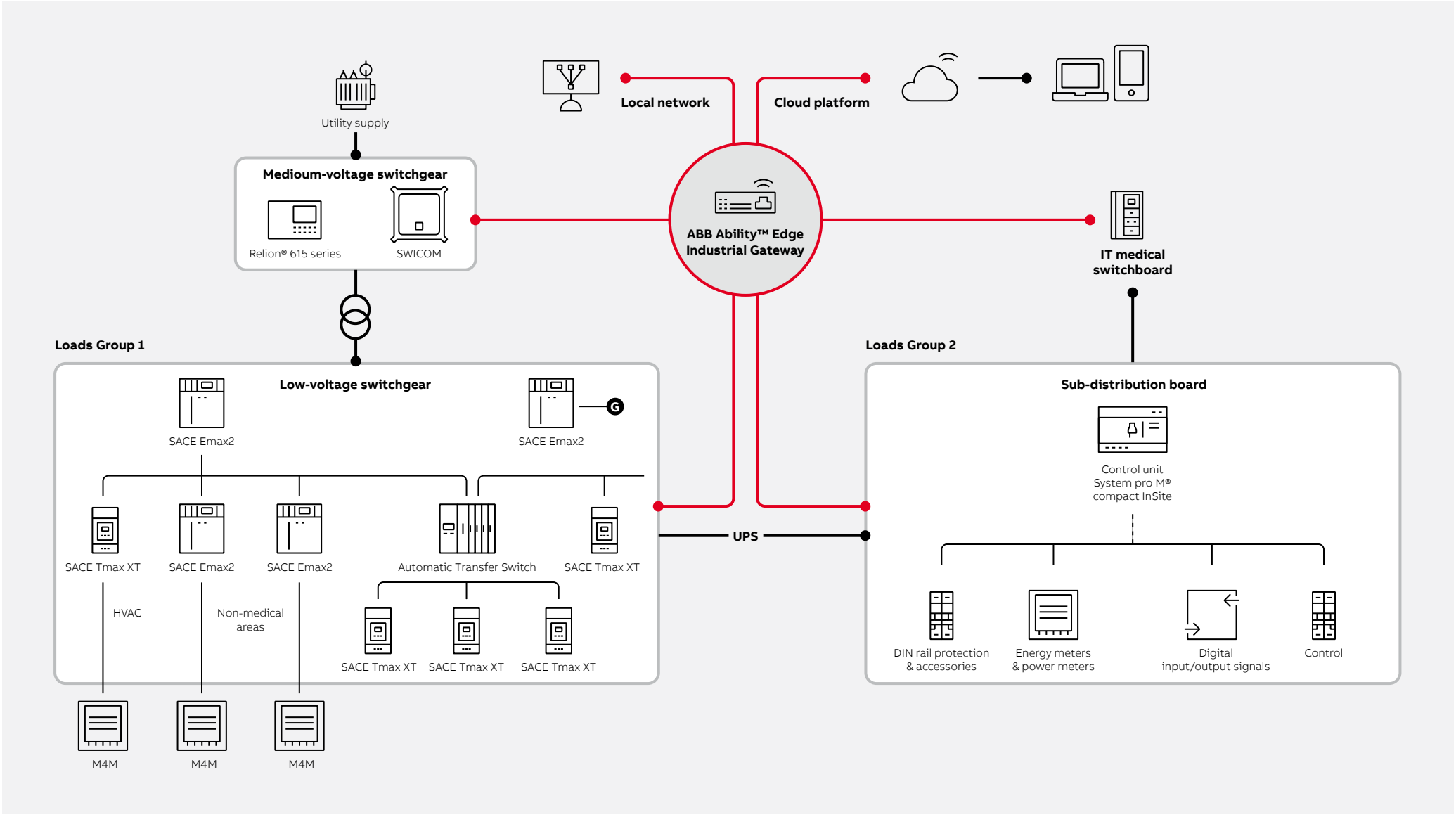
DPA UPScale
High efficiency modular UPS unit

The DPA UPScale UPS system, independent of the rack, is one of the most popular UPS systems customizable on the market and provides the best technical solutions e commercial to meet individual power protection needs.
ABB's DPA UPScale is available for high density applications requiring an all-in-one power protection solution that includes UPS modules, maintenance bypass, batteries, I/O terminals and communications. A single system delivers power protection from 10 kW to 200 kW in 10 kW or 20 kW modular steps. For a continuously growing mid- sized infrastructure, DPA UPScale can be paralleled horizontally to increase the capacity up to 400 kW. The ability to increment the power as the critical load grows optimizes the operating efficiency and reduce the initial cost for installations.

Uninterruptible power supply (UPS)

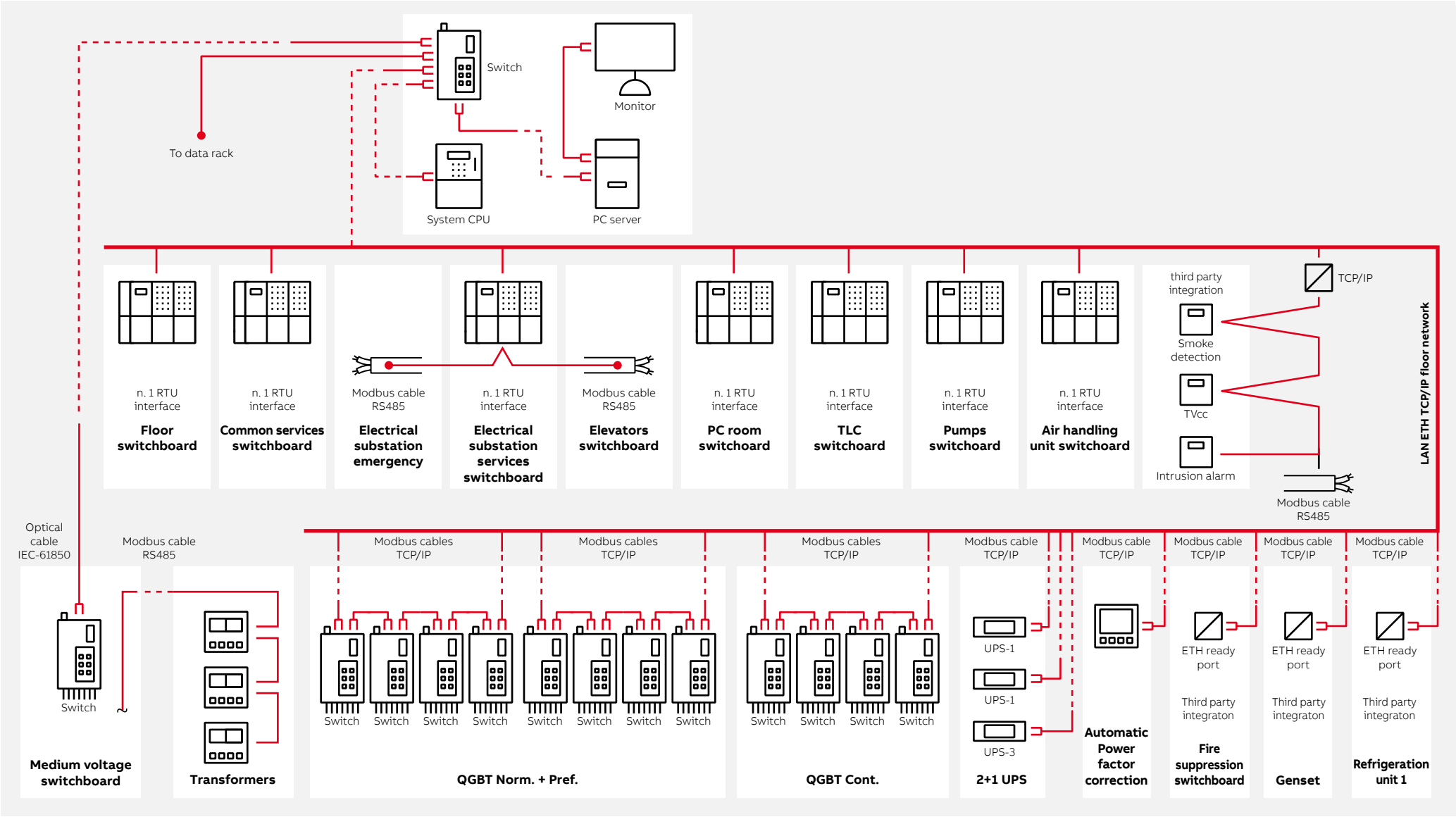
The UPS system guarantees constant and high-quality energy, without power interruption. ABB offers a complete range of UPS for the protection of applications from low to extremely high voltages.
The range includes single-phase UPS, modular
three-phase UPS, three-phase monolithic UPS, industrial UPS and voltage stabilizers and UPS for MV/LV transformer substations compliant with CEI-016 standards.
Thanks to the remote monitoring systems, updated and detailed information on UPS operation can be accessed directly via the web, including setup, internal alarms, and operating conditions. The system notifies alarms and critical events via e-mail or SMS.

Power Distribution
Industrial Edge Gateway



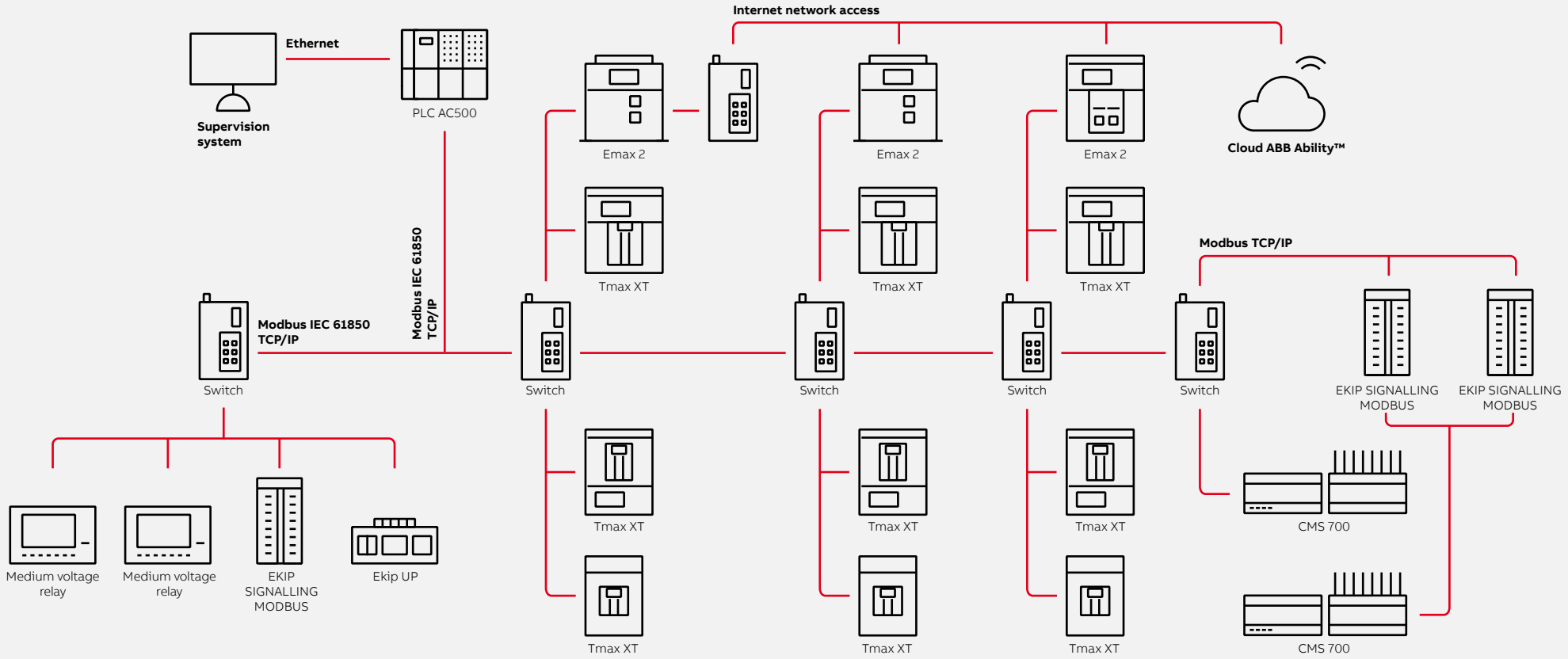
Power Distribution

Control, automation and supervision

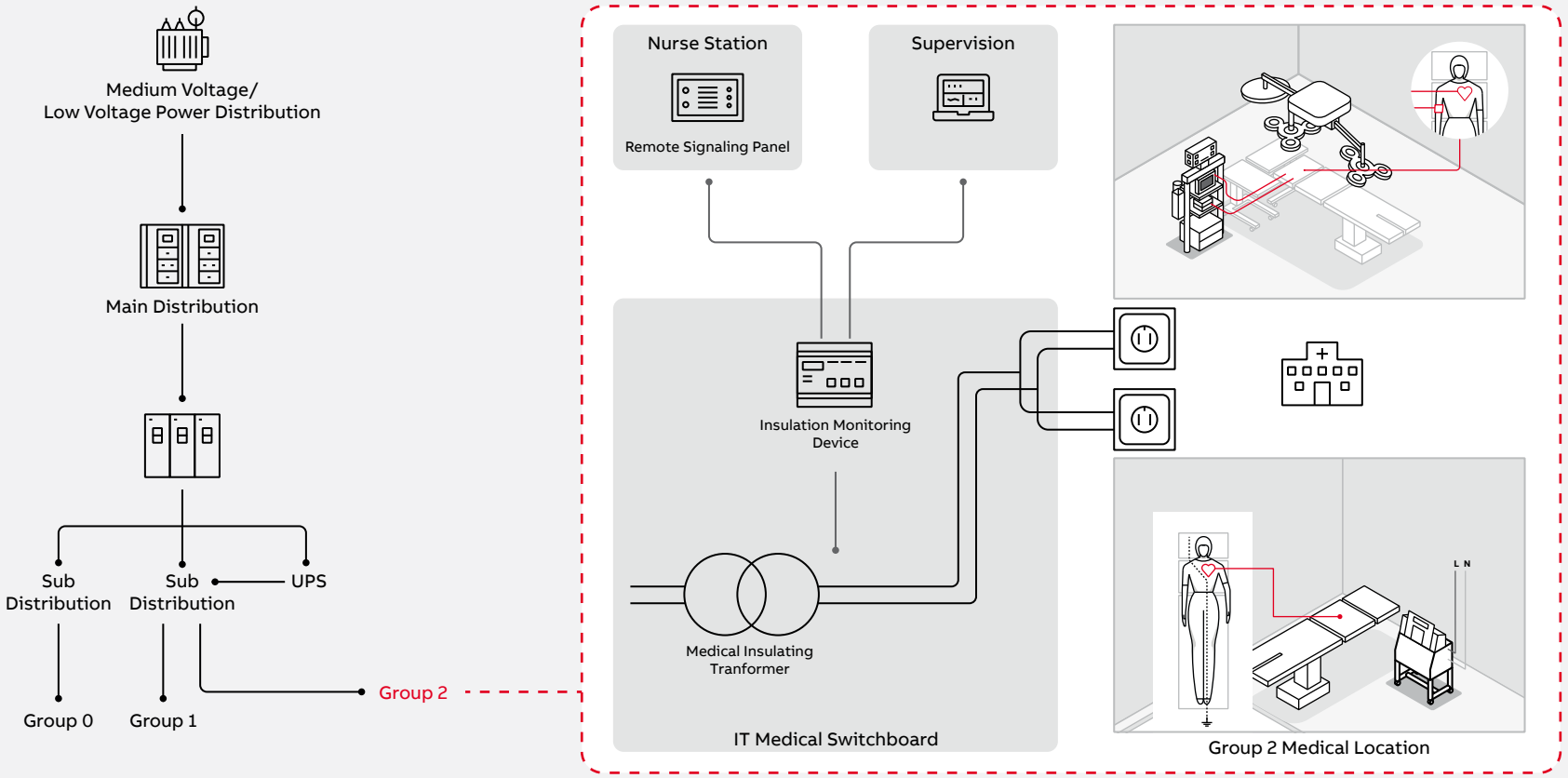


Power Distribution

Control, automation and supervision

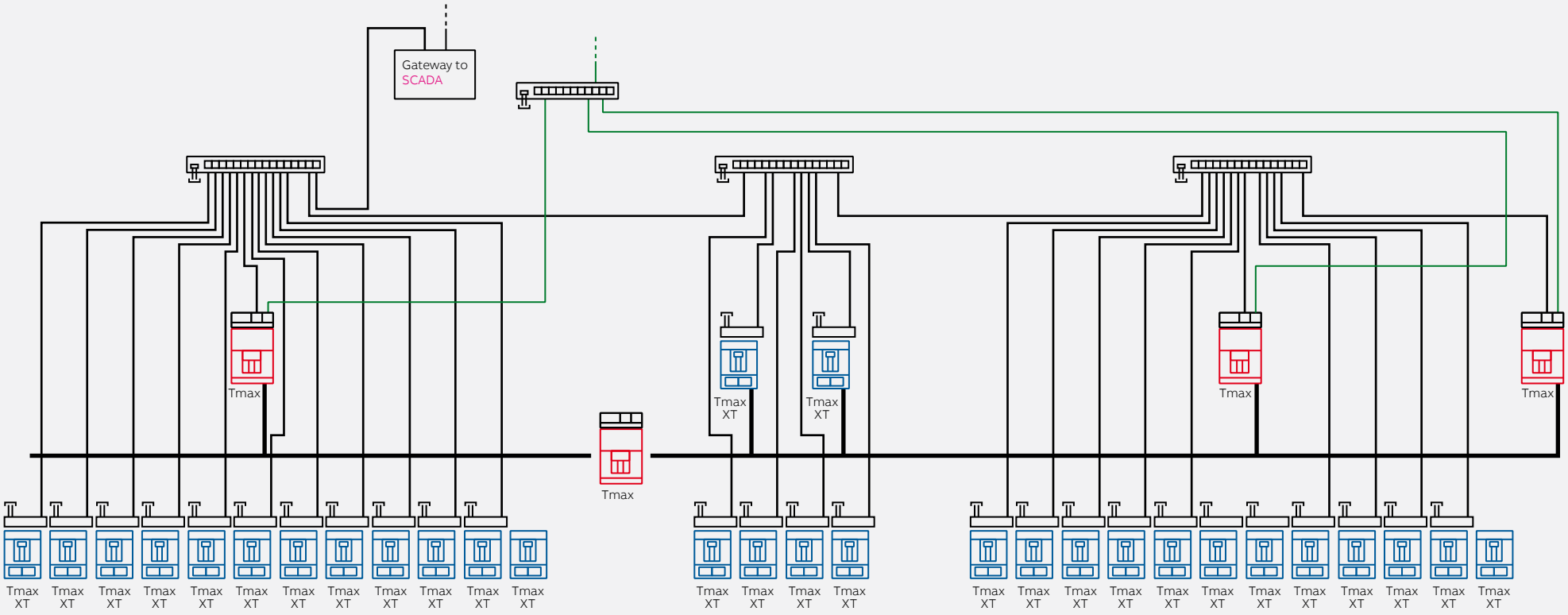


Power Distribution
IT-M Switchboard



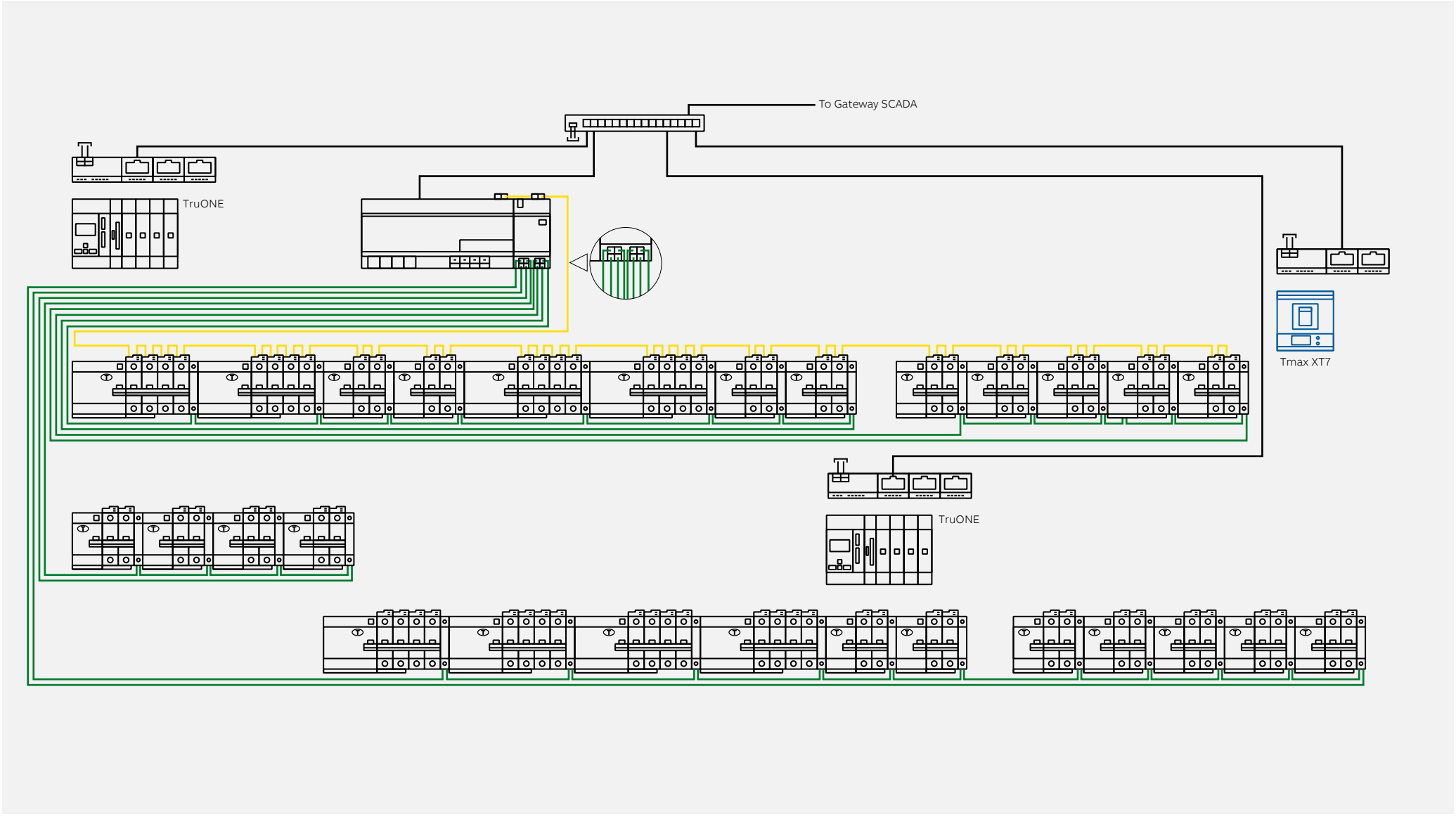
Power Distribution

Sub distribution panel hotel pavillon

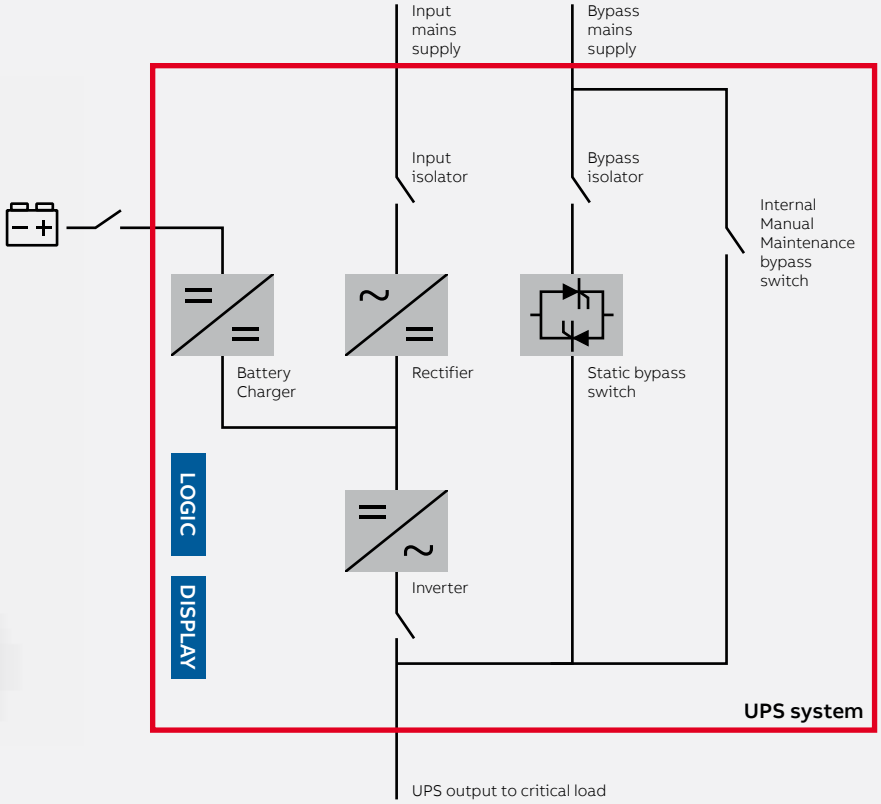


Power Distribution

Sub distribution panel hotel pavillon



Power Distribution
UPS



Power Distribution
Bill of Materials

Main LV Distribution Board - Hospital

Order Code	Description
1SDA073058R1	E2.2S 2500 Ekip Hi-Touch LSI 4p WMP
1SDA073668R1	YO E1.2..E6.2-XT7-XT7M 24 VAC/DC
1SDA073681R1	YC E1.2..E6.2-XT7M 24 VAC/DC
1SDA073722R1	M E2.2...E6.2 24-30 VAC/DC
1SDA073774R1	RTC 24VDC E2.2...E6.2
1SDA073779R1	S51 24V E2.2...E6.2
1SDA074173R1	EKIP SUPPLY 24-48VDC E1.2..E6.2-Tmax XT
1SDA074151R1	EKIP COM MODBUS TCP E1.2..E6.2
1SDA074156R1	EKIP COM IEC61850 E1.2..E6.2
1SDA074166R1	EKIP COM ACTUATOR E1.2..E6.2-XT7-XT7M
1SDA073747R1	YR 24 VDC E2.2...E6.2
1SDA085693R1	Ekip Signalling 3T-1
1SDA073912R1	E2.2 W FP Iu=2500 4p HR HR
1SDA073042R1	E2.2N 2500 Ekip Dip LSI 4p WMP
1SDA073668R1	YO E1.2..E6.2-XT7-XT7M 24 VAC/DC
1SDA073668R1	YO E1.2..E6.2-XT7-XT7M 24 VAC/DC
1SDA073722R1	M E2.2...E6.2 24-30 VAC/DC
1SDA073774R1	RTC 24VDC E2.2...E6.2
1SDA073779R1	S51 24V E2.2...E6.2
1SDA073912R1	E2.2 W FP Iu=2500 4p HR HR
1SDA073020R1	1SDA073020R1
1SDA073668R1	1SDA073668R1
1SDA073681R1	YC E1.2..E6.2-XT7M 24 VAC/DC
1SDA073722R1	M E2.2...E6.2 24-30 VAC/DC
1SDA073774R1	RTC 24VDC E2.2...E6.2
1SDA074173R1	EKIP SUPPLY 24-48VDC E1.2..E6.2-Tmax XT
1SDA074151R1	EKIP COM MODBUS TCP E1.2..E6.2

Order Code	Description
1SDA074156R1	EKIP COM IEC61850 E1.2..E6.2
1SDA073747R1	YR 24 VDC E2.2...E6.2
1SDA085693R1	Ekip Signalling 3T-1
1SDA073910R1	E2.2 W FP Iu=2000 4p HR HR
1SDA100470R1	XT5S 400 Ekip Dip LSI In=400 4p F F
1SDA104708R1	Kit P MP XT5 400A 4p
1SDA104674R1	XT5 P FP 400A 4p HR HR IEC
1SDA068169R1	XT2S 160 BREAKING PART 4p F F
1SDA066279R1	KIT P MP XT2 4p
1SDA066314R1	SOR XT1..XT4 24-30 Vac/dc
1SDA066472R1	MOE-E XT2-XT4 220..250V ac/dc X REM.CONT
1SDA100164R1	Ekip Hi-Touch LSIG In=100A XT2 4p
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
1SDA068191R1	XT2 P FP 4p HR
1SDA068169R1	XT2S 160 BREAKING PART 4p F F
1SDA066279R1	KIT P MP XT2 4p
1SDA100165R1	Ekip Hi-Touch LSIG In=160A XT2 4p
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
1SDA068191R1	XT2 P FP 4p HR
1SDA068179R1	XT4S 250 BREAKING PART 4p F F
1SDA066283R1	KIT P MP XT4 4p
1SDA100335R1	Ekip Hi-Touch LSIG In=250A XT4 4p
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
1SDA068199R1	XT4 P FP 4p HR
1SDA068179R1	XT4S 250 BREAKING PART 4p F F
1SDA066283R1	KIT P MP XT4 4p
1SDA066325R1	SOR-C XT1..XT4 F/P 220-240Vac-220-250Vdc

Order Code	Description
1SDA066469R1	MOE-E XT2-XT4 24V dc X REM.CONTR.
1SDA100335R1	Ekip Hi-Touch LSIG In=250A XT4 4p
1SDA105204R1	Ekip Cartridge 4 slots XT2-XT4-XT5
1SDA074173R1	EKIP SUPPLY 24-48VDC E1.2..E6.2-Tmax XT
1SDA085693R1	Ekip Signalling 3T-1
1SDA068199R1	XT4 P FP 4p HR
1SDA068169R1	XT2S 160 BREAKING PART 4p F F
1SDA066279R1	KIT P MP XT2 4p
1SDA100164R1	Ekip Hi-Touch LSIG In=100A XT2 4p
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
1SDA068191R1	XT2 P FP 4p HR
1SDA100557R1	XT5S 630 BREAKING PART 4p F F
1SDA100694R1	Ekip Hi-Touch LSIG In=630 XT5 4p
1SDA104926R1	YO XT5-XT6 110..240 Vac - 110..250 Vdc
1SDA104885R1	MOE XT5 220...250V AC/DC
1SDA105189R1	EKIP COM MODBUS TCP XT5 INT
1SDA105199R1	EKIP Maintenance Module XT5 INT F/P
1SDA104694R1	XT5 W FP 630A 4p HR HR IEC/UL
1SFA664001R1004	TVOC-2-48-C Arc Monitor
1SFA664003R1060	TVOC-2-DP6 Detector
1SFA664003R1040	TVOC-2-DP4 Detector
1SFA664003R1020	TVOC-2-DP2 Detector
1SFA664002R1001	TVOC-2-E1 Extension
2CSG524000R2021	TMD-T4/96 temperature monitoring
1SVR360663R1001	CP-C.1 24/10.0

Power Distribution
Bill of Materials

Patient Room 1 bed
Room Patient Switchboard (one per each room)

Order Code	Description
2CDS252001R0104	S202-C10
2CDS252001R0164	S202-C16
2CSR252101R1254	DS202 A-C25/0,03

Patient Room 2 bed
Room Patient Switchboard (one per each room)

Order Code	Description
2CDS252001R0104	S202-C10
2CDS252001R0164	S202-C16
2CDS252001R0254	S202-C25
2CSB202101R1250	RcdBlock

Treatment Area - Normal Supply
Treatment Area Switchboard (one per each room)

Order Code	Description
2CCS894001R0504	S804N-C50 High Performance MCB
2CCS800900R0021	S800-AUX/ALT Auxiliary/signal contact
2CSB804201R3630	DDA804 A S-63/0,3 - RCD Block
2CDS252001R0164	Miniature Circuit Breaker - S200 - 2P - C - 16 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB202101R1250	DDA202 A-25/0,03 - RCD Block
2CDS254001R0254	Miniature Circuit Breaker - S200 - 4P - C - 25 ampere
2CSB204101R3250	DDA204 A-25/0,3 - RCD Block
2CDS252001R0104	Miniature Circuit Breaker - S200 - 2P - C - 10 ampere
2CSM200953R1801	E 92/20 Fuse switch disconnector
1SDA068168R1	XT2N 160 BREAKING PART 4p F F
1SDA100157R1	Ekip Touch Measuring LSIG In=160A XT2 4p
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
OXB250E3S3QT	OXB250E3S3QT AUTOMATIC TRANSFER SWITCH
OXEA1	OXEA1 AUXILIARY POWER SUPPLY MODULE
1SDA104052R1	Ekip Com Modbus TCP-OX
2CCG000244R0001	Connector set (35pcs)
2CCG000243R0001	Flat Cable 5 m
2CCG000242R0001	SCU100 Sub-Distribution Control Unit
2CCA880211R0001	CMS-121PS Sensor

Treatment Area - Emergency Supply
Treatment Area Switchboard (one per each room)

Order Code	Description
1SCA153457R1001	OXB250E3S2QT AUTOMATIC TRANSFER SWITCH
1SCA022456R7410	OA3G01 Auxiliary contact
2CDS274001R0324	Miniature Circuit Breaker - S200M - 4P - C - 32 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB204101R3400	DDA204 A-40/0,3 - RCD Block
2CDS274001R0324	Miniature Circuit Breaker - S200M - 4P - C - 32 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB204101R3400	DDA204 A-40/0,3 - RCD Block
2CDS274001R0324	Miniature Circuit Breaker - S200M - 4P - C - 32 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB204101R3400	DDA204 A-40/0,3 - RCD Block
2CDS252001R0164	Miniature Circuit Breaker - S200 - 2P - C - 16 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB202101R3250	DDA202 A-25/0,3 - RCD Block
2CDS274001R0164	Miniature Circuit Breaker - S200M - 4P - C - 16 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB204101R3250	DDA204 A-25/0,3 - RCD Block
2CDS274001R0164	Miniature Circuit Breaker - S200M - 4P - C - 16 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB204101R3250	DDA204 A-25/0,3 - RCD Block
2CDS252001R0104	Miniature Circuit Breaker - S200 - 2P - C - 10 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB202101R1250	DDA202 A-25/0,03 - RCD Block
2CSM200953R1801	E 92/20 Fuse switch disconnector

Power Distribution
Bill of Materials

Patient Ward- Normal Supply
Patient Ward Switchboard (one per each room)

Order Code	Description
1SCA153458R1001	OXB250E3S3QT AUTOMATIC TRANSFER SWITCH
1SCA148926R1001	OXEA1 AUXILIARY POWER SUPPLY MODULE
1SDA104052R1	Ekip Com Modbus TCP-OX
2CCS894001R0504	S804N-C50 High Performance MCB
2CCS800900R0011	S800-AUX Auxiliary contact
2CSB804201R3630	DDA804 A S-63/0,3 - RCD Block
2CDS252001R0164	Miniature Circuit Breaker - S200 - 2P - C - 16 ampere
2CDS200922R0001	Signal/Auxiliary contact
2CSB202101R1250	DDA202 A-25/0,03 - RCD Block
2CDS284001R0254	Miniature Circuit Breaker - S200P - 4P - C - 25 ampere
2CSB204101R3250	DDA204 A-25/0,3 - RCD Block
2CDS252001R0104	Miniature Circuit Breaker - S200 - 2P - C - 10 ampere
2CSM200883R1801	E 92/32 Fuse switch disconnector
1SDA068168R1	XT2N 160 BREAKING PART 4p F F
1SDA100152R1	Ekip Touch Measuring LSI In=160A XT2 4p
2CCG000244R0001	Connector set (35pcs)
2CCG000243R0001	Flat Cable 5 m
2CCG000242R0001	SCU100 Sub-Distribution Control Unit
2CCA880211R0001	CMS-121PS Sensor

Technical Substation
Technical Substation LV Switchboard

Order Code	Description
1SDA073128R1	E4.2N 3200 Ekip Hi-Touch LSI 4p WMP
1SDA073668R1	YO E1.2..E6.2-XT7-XT7M 24 Vac/dc
1SDA073724R1	M E2.2...E6.2 100-130 Vac/dc
1SDA074172R1	Ekip Supply 110-240VAC/DC E1.2..E6.2-XT
1SDA074151R1	Ekip Com Modbus TCP E1.2..E6.2
1SDA074156R1	Ekip Com IEC61850 E1.2..E6.2
1SDA074166R1	Ekip Com Actuator E1.2..E6.2-XT7-XT7M
1SDA085693R1	Ekip Signalling 3T-1
1SDA100561R1	XT5H 630 BREAKING PART 4p F F
1SDA100682R1	Ekip Touch Measuring LSI In=630 XT5 4p
1SDA104899R1	MOE-E XT5 24V CC
1SDA105189R1	EKIP COM MODBUS TCP XT5 INT
1SDA068170R1	XT2H 160 PARTE INTERRUTTIVA 4p F F
1SDA066469R1	MOE-E XT2-XT4 24V dc X COM. A DISTANZA
1SDA100156R1	Ekip Touch Measuring LSIG In=100A XT2 4p
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
1SDA068170R1	XT2H 160 PARTE INTERRUTTIVA 4p F F
1SDA066469R1	MOE-E XT2-XT4 24V dc X COM. A DISTANZA
1SDA100152R1	Ekip Touch Measuring LSI In=160A XT2 4p
1SDA105203R1	Ekip Cartridge 2 slots XT2-XT4-XT5
1SDA074173R1	Ekip Supply 24-48VDC E1.2..E6.2-Tmax XT
1SDA068180R1	XT4H 250 PARTE INTERRUTTIVA 4p F F
1SDA066469R1	MOE-E XT2-XT4 24V dc X COM. A DISTANZA
1SDA100329R1	Ekip Touch Measuring LSIG In=250A XT4 4p
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
1SDA101734R1	XT7H M 800 Ekip Touch Meas.LSIG 800 4pFF
1SDA104919R1	M XT7M 24-30 V CA/CC
1SDA074173R1	Ekip Supply 24-48VDC E1.2..E6.2-Tmax XT
1SDA105167R1	EKIP COM MODBUS TCP Tmax XT
1SFA664001R1004	TVOC-2-48-C Arc Monitor

Order Code	Description
1SFA664003R1060	TVOC-2-DP6 Detector
1SFA664003R1040	TVOC-2-DP4 Detector
1SFA664003R1020	TVOC-2-DP2 Detector
1SFA664002R1001	TVOC-2-E1 Extension
2CSG524000R2021	TMD-T4/96 temperature monitoring
1SVR360663R1001	CP-C.1 24/10.0

Patient Ward- Emergency Supply
Patient Ward Switchboard (one per each room)

Order Code	Description
OXB250E3S3QT	OXB250E3S3QT AUTOMATIC TRANSFER SWITCH
OXEA1	OXEA1 AUXILIARY POWER SUPPLY MODULE
1SDA104052R1	Ekip Com Modbus TCP-OX
S550789	Miniature Circuit Breaker - S200M - 4P - C - 32 ampere
A563819	Signal/Auxiliary contact
B428002	DDA204 A S-63/0,3 - RCD Block
S550758	Miniature Circuit Breaker - S200M - 4P - C - 16 ampere
A563819	Signal/Auxiliary contact
B427986	DDA204 A-25/0,3 - RCD Block
S465700	Miniature Circuit Breaker - S200 - 2P - C - 10 ampere
A563819	Signal/Auxiliary contact
B427954	DDA202 A-25/0,03 - RCD Block
S465908	Miniature Circuit Breaker - S200 - 2P - C - 16 ampere
A563819	Signal/Auxiliary contact
B427960	DDA202 A-25/0,3 - RCD Block
M200883	E 92/32 Fuse switch disconnector
M200883	E 92/32 Fuse switch disconnector

Power Distribution
Bill of Materials

Laboratory- Normal Supply
Laboratory Switchboard (one per each room)

Order Code	Description
OXB250E3S3QT	OXB250E3S3QT AUTOMATIC TRANSFER SWITCH
OXEA1	OXEA1 AUXILIARY POWER SUPPLY MODULE
1SDA104052R1	Ekip Com Modbus TCP-OX
S120470	S804N-C40 High Performance MCB
A120680	S800-AUX Auxiliary contact
B429262	DDA804 A S-63/0,3 - RCD Block
S120471	S804N-C50 High Performance MCB
A120680	S800-AUX Auxiliary contact
B429262	DDA804 A S-63/0,3 - RCD Block
S465908	Miniature Circuit Breaker - S200 - 2P - C - 16 ampere
A563819	Signal/Auxiliary contact
B427954	DDA202 A-25/0,03 - RCD Block
S590808	Miniature Circuit Breaker - S200P - 4P - C - 25 ampere
A563819	Signal/Auxiliary contact
B427988	DDA204 A-63/0,3 - RCD Block
S465700	Miniature Circuit Breaker - S200 - 2P - C - 10 ampere
A563819	Signal/Auxiliary contact
B427954	DDA202 A-25/0,03 - RCD Block
M200953	E 92/20 Fuse switch disconnector
1SDA068168R1	XT2N 160 BREAKING PART 4p F F
1SDA100152R1	Ekip Touch Measuring LSI In=160A XT2 4p
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
2CCG000244R0001	Connector set (35pcs)
2CCG000243R0001	Flat Cable 5 m
2CCG000242R0001	SCU100 Sub-Distribution Control Unit
2CCA880211R0001	CMS-121PS Sensor

Laboratory- Emergency Supply
Laboratory Switchboard (one per each room)

Order Code	Description
OXB250E3S3QT	OXB250E3S3QT AUTOMATIC TRANSFER SWITCH
OXEA1	OXEA1 AUXILIARY POWER SUPPLY MODULE
1SDA104052R1	Ekip Com Modbus TCP-OX
S550789	Miniature Circuit Breaker - S200M - 4P - C - 32 ampere
A563819	Signal/Auxiliary contact
B428002	DDA204 A S-63/0,3 - RCD Block
S550796	Miniature Circuit Breaker - S200M - 4P - C - 40 ampere
A563819	Signal/Auxiliary contact
B428002	DDA204 A S-63/0,3 - RCD Block
S550758	Miniature Circuit Breaker - S200M - 4P - C - 16 ampere
A563819	Signal/Auxiliary contact
B427986	DDA204 A-25/0,3 - RCD Block
S465700	Miniature Circuit Breaker - S200 - 2P - C - 10 ampere
A563826	Auxiliary contact 1CO S2C-H6R
B427954	DDA202 A-25/0,03 - RCD Block
S465908	Miniature Circuit Breaker - S200 - 2P - C - 16 ampere
A563819	Signal/Auxiliary contact
DDA202A2530V1	DDA202 A-25/0,03 110V - RCD Block
M200953	E 92/20 Fuse switch disconnector

Office
Office Switchboard (one per each room)

Order Code	Description
2CSF204101R1250	F204 A-25/0,03 Residual Current Circuit Breaker
2CDS251001R0104	Miniature Circuit Breaker - S200 - 1P - C - 10 ampere
2CSR255140U1164	DS201 C16 A30 U - RCBO
2CDS251001R0065	Miniature Circuit Breaker - S200 - 1P - B - 6 ampere
2CDD284101R0040	SD204/40 Switch Disconnector 4P, 40A
2CDS251001R0164	Miniature Circuit Breaker - S200 - 1P - C - 16 ampere
2CDS273001R0164	Miniature Circuit Breaker - S200M - 3P - C - 16 ampere
2CCG000244R0001	Connector set (35pcs)
2CCG000243R0001	Flat Cable 5 m
2CCG000242R0001	SCU100 Sub-Distribution Control Unit
2CCA880211R0001	CMS-121PS Sensor

Entrance
Entrance Switchboard

Order Code	Description
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT
1SDA068199R1	XT4 P FP 4p HR
2CDS251001R0105	iniature Circuit Breaker - S200 - 1P - B - 10 ampere
2CDS251001R0104	Miniature Circuit Breaker - S200 - 1P - C - 10 ampere
2CSR255140U1164	DS201 C16 A30 U - RCBO
2CDS251001R1165	Miniature Circuit Breaker - S200 - 1P - B - 16 ampere
2CDS251001R0065	Miniature Circuit Breaker - S200 - 1P - B - 6 ampere
2CDD284101R0040	SD204/40 Switch Disconnector 4P, 40A
2CCA880211R0001	CMS-121PS Sensor
2CCG000244R0001	Connector set (35pcs)
2CCG000243R0001	Flat Cable 5 m
2CCG000242R0001	SCU100 Sub-Distribution Control Unit

Power Distribution
Bill of Materials

Kitchen and Restaurant
Restaurant Switchboard (one per each room)

Order Code	Description
1SCA022712R0800	OT200E03P switch-disconnector
2CSF204101R1250	F204 A-25/0,03 Residual Current Circuit Breaker
1SCA120513R1001	OT160EV03K switch-disconnector
2CSF204101R1400	F204 A-40/0,03 Residual Current Circuit Breaker
2CDS251001R0164	Miniature Circuit Breaker - S200 - 1P - C - 16 ampere
2CDS251001R0104	Miniature Circuit Breaker - S200 - 1P - C - 10 ampere
2CSR255140U1164	DS201 C16 A30 U - RCBO
2CDS251001R0064	Miniature Circuit Breaker - S200 - 1P - C - 6 ampere
2CSR274101R1254	DS204 M A-C25/0,03 - RCBO
2CDD284101R0063	SD204/63 Switch Disconnector 4P, 63A
2CDS251001R0065	Miniature Circuit Breaker - S200 - 1P - B - 6 ampere
2CDD284101R0040	SD204/40 Switch Disconnector 4P, 40A
2CCA880211R0001	CMS-121PS Sensor
2CCA880210R0001	CMS-120PS Sensor
2CCG000244R0001	Connector set (35pcs)
2CCG000243R0001	Flat Cable 5 m
2CCG000242R0001	SCU100 Sub-Distribution Control Unit
1SDA068126R1	XT2N 160 BREAKING PART 3p F F
2CDS273001R0324	Miniature Circuit Breaker - S200M - 3P - C - 32 ampere
2CDS273001R0164	Miniature Circuit Breaker - S200M - 3P - C - 16 ampere
2CDS251001R0254	Miniature Circuit Breaker - S200 - 1P - C - 25 ampere
2CSG202160R1101	R4M-80
2CSG202461R4051	M4M 30 ROGOWSKI

Parking
Parking Switchboard

Order Code	Description
2CSF204101R1250	F204 A-25/0,03 Residual Current Circuit Breaker
2CDS251001R0104	Miniature Circuit Breaker - S200 - 1P - C - 10 ampere
2CSR255140U1164	DS201 C16 A30 U - RCBO
2CDS251001R0064	Miniature Circuit Breaker - S200 - 1P - C - 6 ampere
2CDS251001R0065	Miniature Circuit Breaker - S200 - 1P - B - 6 ampere
1SCA120513R1001	OT160EV03K switch-disconnector
2CDS273001R0324	Miniature Circuit Breaker - S200M - 3P - C - 32 ampere
2CDS273001R0164	Miniature Circuit Breaker - S200M - 3P - C - 16 ampere
2CDD284101R0063	SD204/63 Switch Disconnector 4P, 63A
2CDS273001R0064	Miniature Circuit Breaker - S200M - 3P - C - 6 ampere
2CDS273001R0504	Miniature Circuit Breaker - S200M - 3P - C - 50 ampere
2CSR274101R1404	DS204 M A-C40/0,03 - RCBo
2CDD284101R0040	SD204/40 Switch Disconnector 4P, 40A
2CCG000244R0001	Connector set (35pcs)
2CCG000243R0001	Flat Cable 5 m
2CCG000242R0001	SCU100 Sub-Distribution Control Unit
2CCA880211R0001	CMS-121PS Sensor
1SDA068179R1	XT4S 250 BREAKING PART 4p F F
1SDA066283R1	KIT P MP XT4 4p
1SDA100335R1	Ekip Hi-Touch LSIG In=250A XT4 4p

Surgery Room
Surgery Room Switchboard (1 per each room)

Order Code	Description
2CSM273552R1551	QSO 10L Premium

Intensive care
Intensive Care Switchboard (one per each room)

Order Code	Description
M990417	SD202/63 Switch Disconnector 2P, 63A
M206573	E 91HN/32S Fuse holder
M093935	E219-D220 Indicator Light
EB 250 8	ISOLTESTER-DIG-RZ Insulation monit. device for insulated network
EB 252 4	SELVTESTER-24 Insulation monit. device for insulated network
OVR231N20275	OVR T2-T3 1N 20-275 P QS Surge Protective Device
OVR231N20275	OVR T2-T3 1N 20-275 P QS Surge Protective Device
S465700	Miniature Circuit Breaker - S200 - 2P - C - 10 ampere
A563826	Auxiliary contact 1CO S2C-H6R
S465908	Miniature Circuit Breaker - S200 - 2P - C - 16 ampere
A563826	Auxiliary contact 1CO S2C-H6R
S466103	Miniature Circuit Breaker - S200 - 2P - C - 25 ampere
A563826	Auxiliary contact 1CO S2C-H6R
S466202	Miniature Circuit Breaker - S200 - 2P - C - 32 ampere
A563826	Auxiliary contact 1CO S2C-H6R
M420290	M1175-C Socket outlet
S551175	Miniature Circuit Breaker - S200 - 2P - K - 63 ampere
DS2CLC10A30	DS202C L C10 A30 - RCBO
A563826	Auxiliary contact 1CO S2C-H6R
DS2CLC16A30	DS202C L C16 A30 - RCBO
A563826	Auxiliary contact 1CO S2C-H6R
EH 517 4	TI 30-S Insulating Transformer for medical location
TS1624	TS16/24 Non-inherently short-circuit proof bell transformer
M200953	E 92/20 Fuse switch disconnector

In-room Controls

Creating a hospital environment involves knowing how to choose and install products with adequate characteristics. ABB offers a complete range of products with which to set up every single environment, from operating theaters to service rooms to ensure optimal organizational conditions in hospitals, clinics and retirement homes that allow healthcare workers to perform their duties efficiently and provide patients with constant high-quality assistance in an environment of total safety.

In-room Controls

Room Control Solution

The proposed Room Control Solution is built on an Open Standard, Event Driven, Communication Protocol to ensure future expandability and further upgrades. Which comply with ISO/IEC14543-3, (KNX, KNX/IP-Secure).

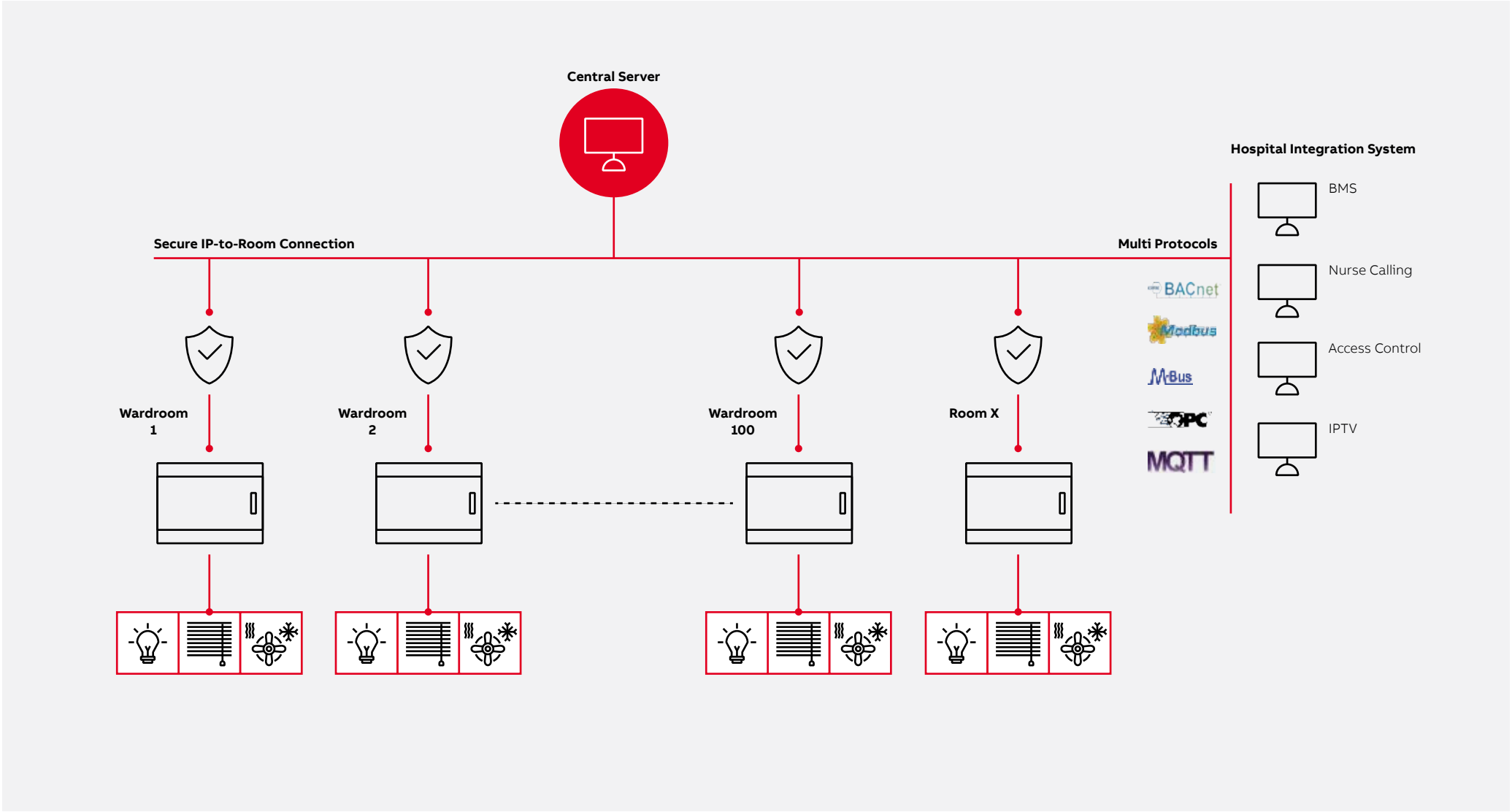
This secure protocol enables devices from 500 manufacturers to be compatible and interoperable with secure communication in field level without the need of server/PC integration.
Main purpose of the Room Automation is to provide maximum patient comfort thru easy-to-use operation, reliable room control products as well as to reduce the consumed energy during patient occupancy and reduce the operational cost for the operator.
The Room Automation system are completely decentralized and locally or remotely programmable. Each device has its own intelligence to ensure operational flexibility thru the modular concept. In case of power failure all the configuration and status information are stored and retained in a non-volatile memory storage.
This data are pushed back to the device once electrical supply is returned.

The Room Automation helps to automate the room functions including but not limited to:

- Lighting (Switching on/off and dimming)
- Air conditioning
  (Controlling Room temperature and maintaining air quality)
- Curtains / blinds control.
- Integration with Access Control
- Room electrical loads and non-essential power sockets.
- Nurse Calling System (For Specific Countries)
- Integration with Building management system

In-room Controls

Reference Architecture



In-room Controls

Room master

The Room master controller provides an integrated modular DIN rail device to control power to the lighting circuits, power sockets, Fan Coil Unit and shades dedicated in each care units.
The integrated Room master Controller controls up to three fan speed via a stage switch or two-way connection. Electronic outputs are protected against short-circuit.
The fan coil controller regulates the fan speed as required to maintain the room temperature at the desired set-point in care units providing comfort in every care.
The three-level fan speed control is operated via a changeover switch actuator inbuilt with the controller depending on the required cooling demand.
Also depending on the balcony & window status the AC in care units can be set to standby mode to provide maximum energy saving.

Imput and Output controller

Inputs
- Processing binary and analogue signals
- ABB i-bus® KNX inputs serve as an interface for the operation of KNX systems via conventional push buttons and switches as well as for processing binary and analogue signals. In addition, weather data can be transmitted to the KNX bus for further evaluation via an appropriate weather sensor.

Output
- Switching and controlling loads in all application areas
- ABB i-bus® KNX actuators enable the reliable switching and controlling of different electrical loads in the KNX system.
- ABB offers a comprehensive range of actuators covering all application areas.

In-room Controls

Heating, Ventilation and Air Conditioning

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 cooling control to generate the optimum temperature and air quality.

Main benefits
- More efficient and precise room climate control
- Increases potential savings in energy consumption through the combination of room climate control and central HVAC control
- Quick, efficient and detailed device analysis without ETS software, even remotely, thanks to the ABB i-bus® tool

Main features
- From individual room control right up to full control of the entire building
- Control of valve drives, fan coil units, blowers and heating and cooling circuits
- Accurate measurement of CO_2 concentration, air temperature and humidity

Tenton®

The ABB Tenton® sensors are easy-to-use, high quality sensors. A surface-mounted and flush-mounted installation is possible, all versions can be connected via a FM box.

Main benefits
- High quality display with illumination for excellent readability
- Room device with three functionalities in one device: control element, room temperature control and CO_2 / humidity sensor
- Control of all room functions from HVAC to shading and lighting
- Clean and elegant design that fits perfectly into modern commercial buildings
- Now also in black matt, studio white matt and aluminium silver

Main features
- CO_2 / Humidity sensor, RTC and control element
- Large Labelling field to make the buttons easier to control
- Separate anti-theft protection (same like ABB tacteo®)

In-room Controls

PIR/motion sensors

PIR/motion sensors ceiling or wall mounted with/without override button are provided for toilets and washroom to provide ease for patients with automatic off functionality when no presence. All these sensors are on KNX bus and their status monitored from central sever. In additional these sensors can be also enabled or disabled depending on the time of the day from timer or from central sever.

ABB RoomTouch® KNX

ABB RoomTouch® KNX is a capacitive device for multiple control.
It allows intelligent control of all active and inactive functions in a room or area of a building, such as lighting, shutters, curtains, scenarios, temperature, external inputs, and so on. Every interaction can be easily controlled and managed from a single device. Up to 30 functions distributed on 10 pages can be supported.
Icons can be associated to switches, dimmers, sliders, actuators, thermostats, and complex commands like scenarios, display of a value, audio control, split unit control and more. Beyond integrated logic and timing functions, it features a temperature sensor, proximity and brightness sensors, binary input, and analog input.

In-room Controls

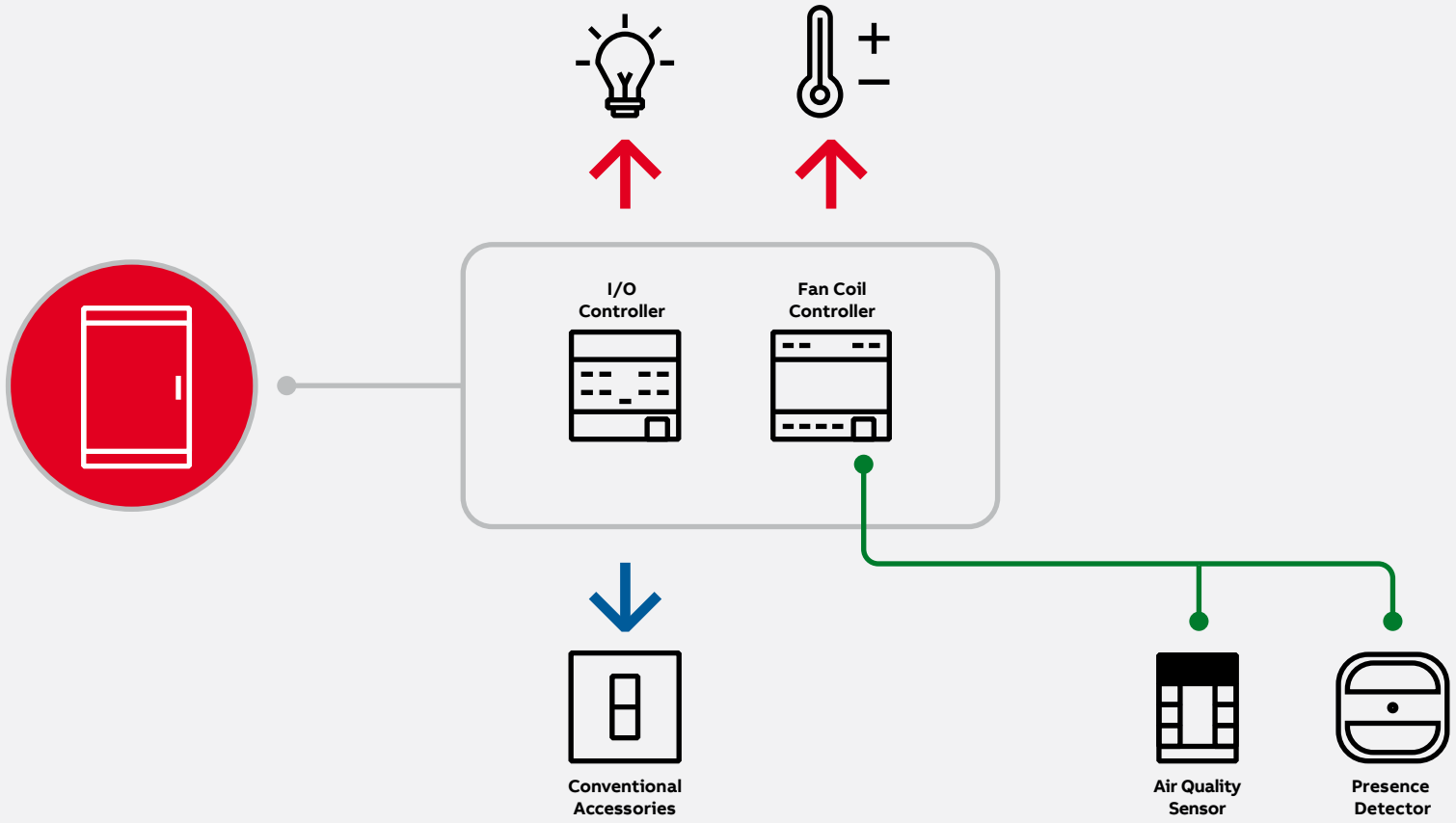
Wiring accessories

There are many wiring accessories that can complement the other offering from global standard ranges to suit local installation habits, with colors to match or combine in aesthetically pleasing ways to visitors.

- Microswitches for use with room control unit
- USB Outlets high current applications for charging mobile phones, tablets
- Presence Detectors to add Safety and security in rooms and washroom areas
- Proximity sensors to switch loads by close sensing of hands
  (to avoid any touch because of anti-bacterial and anti-viral environment)

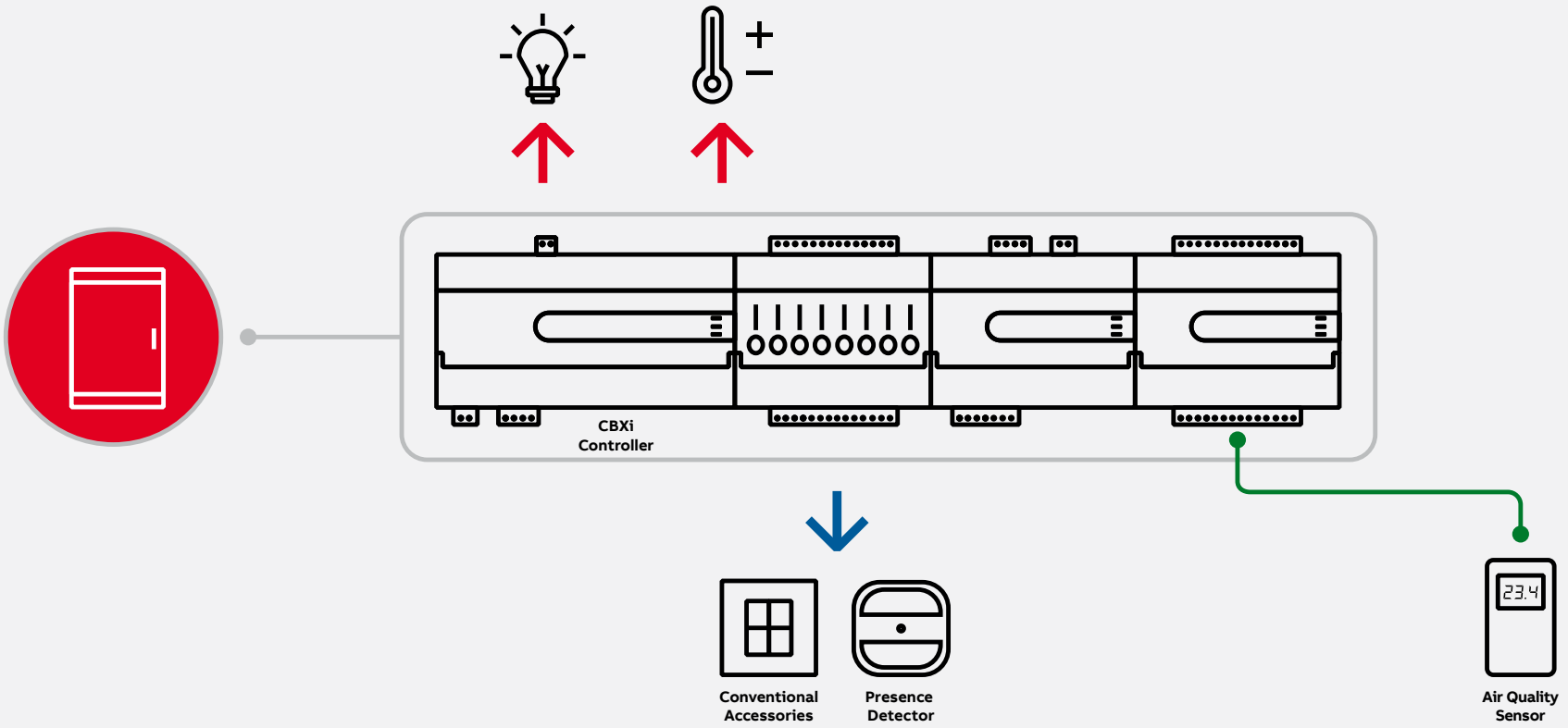
In-room Controls
Care units

General Ward Room



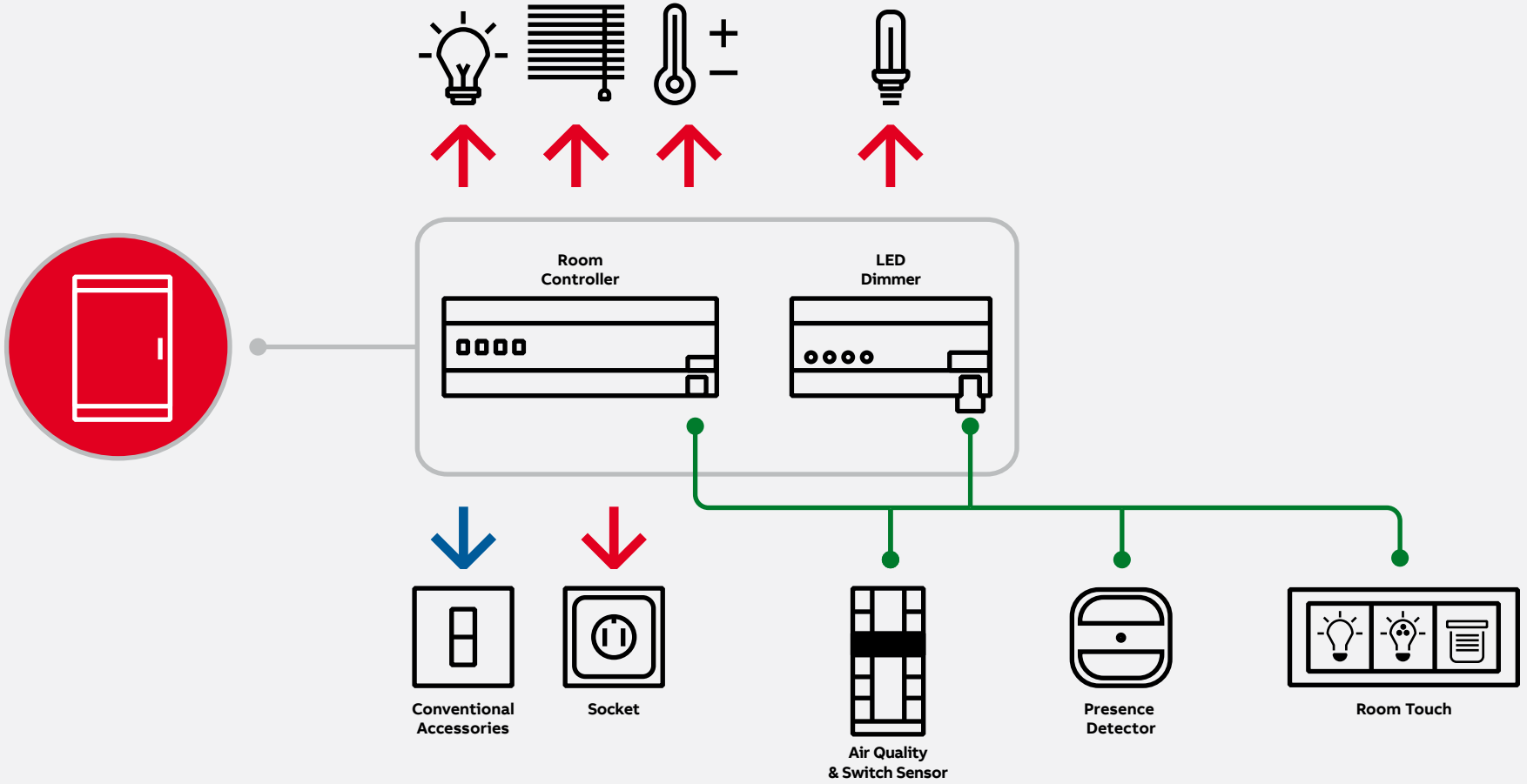
In-room Controls
Care Units

General Ward Room using Cylon



In-room Controls
Care units

Premium Ward Roo



In-room Controls
Bill of Materials

The bill of material for the In-room Controls equipment in the reference architecture is summarized in the following tables:

General Ward Room- Critical Rooms, Treatment Rooms, Medical Rooms, Intensive care

Purpose	Type	Order Code	Description
KNX Power Supply	SV/S 30.640.5.1	2CDG110146R0011	Power Supply with Diagnostics, 640 mA, MDRC
IP Router	IPR/S 3.5.1	2CDG110176R0011	IP Router Secure, MDRC
Application Controller	AC/S 1.2.1	2CDG110206R0011	Application Controller with BACnet Gate-way, MDRC
I/O Control	IO/S 4.6.1.1	2CDG110273R0011	I/O Actuator, 4-fold, MDRC
Presence Detection	6131/31-24-500	2CKA006132A0348	Presence Detector Premium, FM, 12 m
Temperature Control and operation	SBC/10.0.1-84	2CKA006330A0012	ABB-Tenton RTC with CO_2/Humidity Sensor and Control Element 10-fold
Fan Coil Controller	FCA/S1.1.2.2	2CDG110194R0011	Fan Coil Actuator, PWM, Manual Operation, MDRC

(I/O's can change depending on single or multiple bed ward room)

Premium Ward Room- Critical Rooms, Treatment Rooms, Medical Rooms, Intensive care (for single bed rooms)

Purpose	Type	Order Code	Description
KNX Power Supply	SV/S 30.640.5.1	2CDG110146R0011	Power Supply with Diagnostics, 640 mA, MDRC
IP Router	IPR/S 3.5.1	2CDG110176R0011	IP Router Secure, MDRC
Application Controller	AC/S 1.2.1	2CDG110206R0011	Application Controller with BACnet Gateway, MDRC
Room Master	RM/S2.1	2CDG110095R0011	Room Master, Premium, MDRC
Presence Detection	6131/31-24-500	2CKA006132A0348	Presence Detector Premium, FM, 12 m
Temperature Control and operation	SBC/10.0.1-84	2CKA006330A0012	ABB-Tenton RTC with CO_2/Humidity Sensor and Control Element 10-fold
LED Dimmer	UD/S4.315.2.1	2CKA006197A0057	LED dimmer 4 x 315 W/VA
ABB RoomTouch	RT/U 30.0.1-811	2TMA200050W0007	ABB RoomTouch® 5", SM
Installation Box	BOX/U 5.1	2TMA200160B0003	ABB RoomTouch® Installation Box, FM
Power Supply	53011PS	2TMA130160W0029	Plug-in power supply 24 VDC

Lighting & Shading Control

Lighting management is a key part for safety and comfort of a building.
By automatically adjusting the temperature and light intensity, occupants are more alert and less error prone.
This is an issue for all human activities but is crucial in certain situations.

Lighting & Shading Control

Overview - Motivation & Key Elements

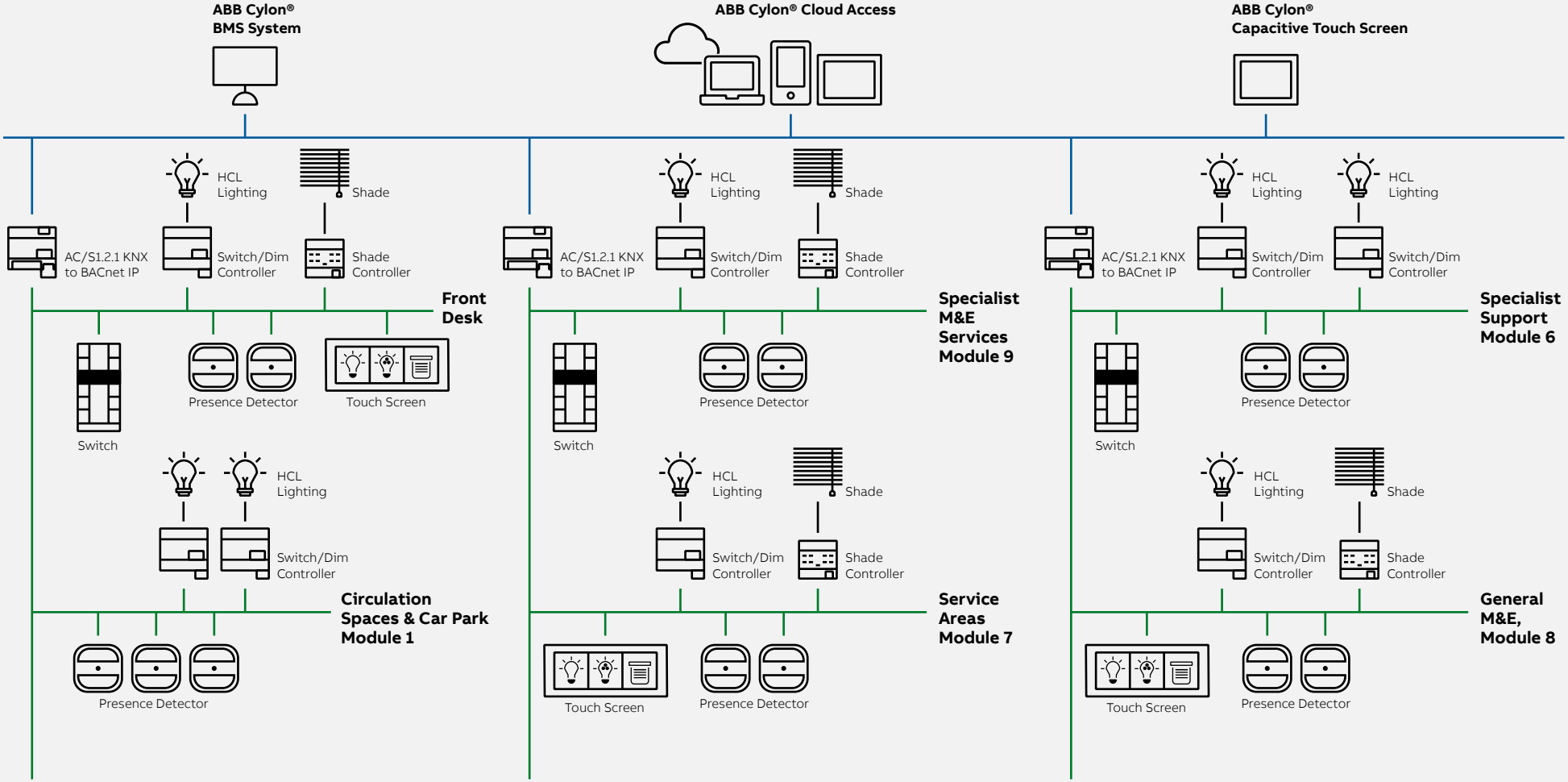
Lighting, Dimming & shading System are provided for the specified common areas of hospital like the hospital lobby, lift lobbies, stairs Meeting & office rooms, restaurants, receptions area, coffee shops, catering & canteen, Prayer Room, laundry room, underground car park etc.

The proposed building automation system for lighting, diming and shading control in the reference building enables the realization of a complete solution according to the wishes of project partners and customer, whether they are developers, tenants, or operators. Deploying a single system instead of separate control solutions will yield more comfort, more economy, and more safety. Cost advantages can be realized throughout the entire lifetime of the building: from planning and implementation, through the building phase, sale, or rental right up to operations and administration.

The proposed building automation system is based on the KNX protocol which is the first open worldwide standard for home and building control. Utilizing a truly open bus technology and being supported by more than 500 KNX manufacturers worldwide, thousands of KNX products enable several fully compatible applications.
In addition to lighting and shading control, the KNX system has a wide applicability in other areas, e. g. energy monitoring. The respective components are listed in the Bills of Materials below.

Lighting & Shading Control

Reference Architecture



Lighting & Shading Control

Busch-VoiceControl® KNX

Busch-VoiceControl® KNX allows the management and activation of building functions through voice commands, thanks to the perfect integration with Apple Siri, Amazon Alexa and Google Assistant.
Designed to manage a wide range of systems, including lighting, heating, and shutters/blinds, Busch-VoiceControl® KNX can manage up to 150 functions.
It is fully configurable in a secure and effortless way from the ABB Ability MyBuildings web portal. With Busch-VoiceControl® KNX it is also possible to receive information on the building status, such as temperature, brightness, and humidity.
Busch-VoiceControl® KNX also detects any movement or presence inside the rooms, improving the safety of occupants.

Automated daylight control

The JSB/S controller, the FW/S programmer, the WZ/S weather station or the HSS twilight sensor and the WES/A weather sensor offer a complete platform to control shutters, windows and blinds based on the position of the sun.
The system supports the best lighting and climatic conditions of the areas, also contributing to a responsible use of energy. These devices avoid direct solar glare and at the same time guarantee the best level of diffused lighting.
Different brightness requirements can be set based on objects that can shadow specific areas of the building during the day or climatic data acquired by sensors or meteorological stations.

Lighting & Shading Control

High quality presence detector 6131/31 and Dali DG/S gateway

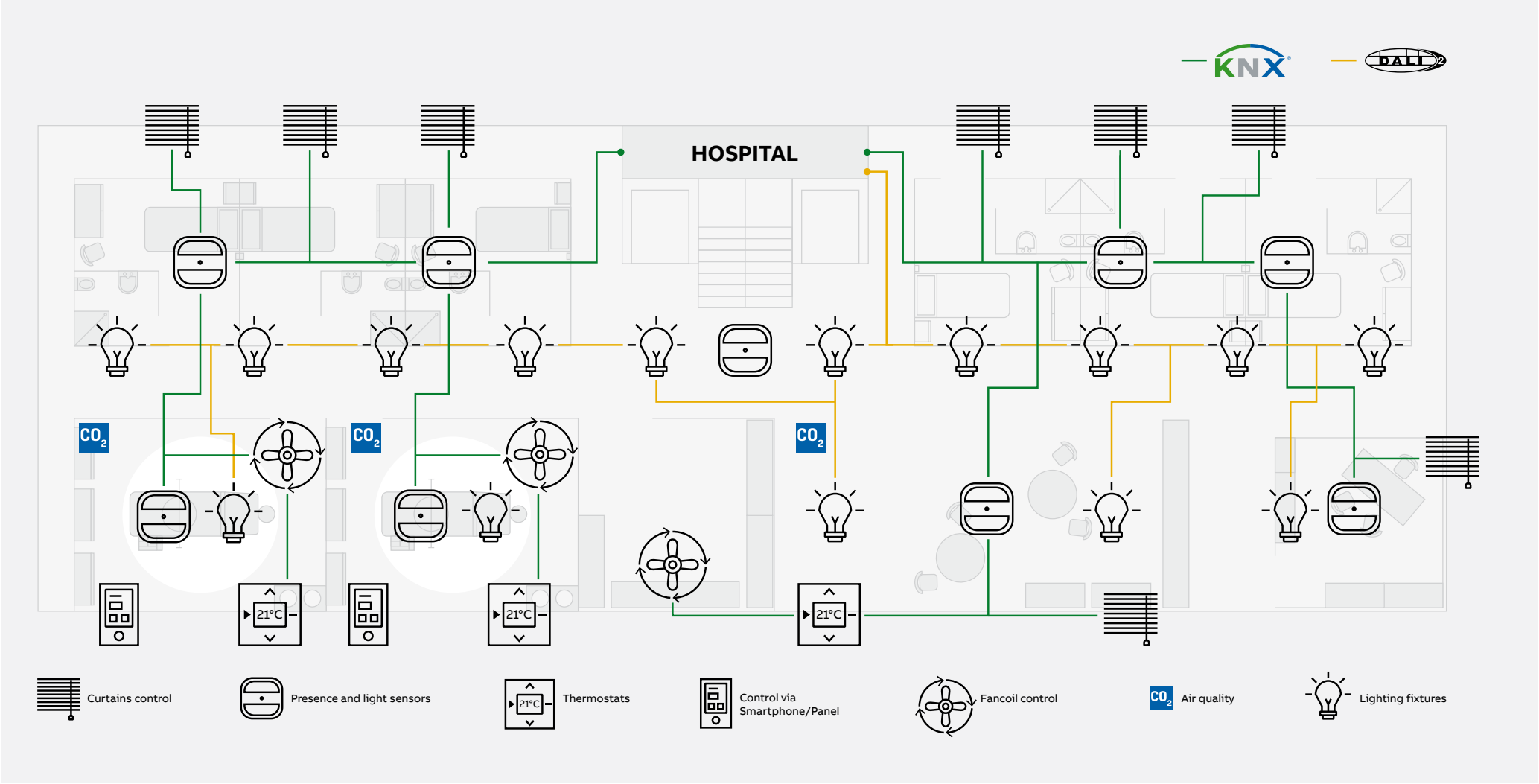
This group of devices can perfect the lighting levels in different environments by adjusting the system based on the presence of occupants or on different distribution of the light within the environment itself.
This ensures the best level of lighting comfort and a significant reduction in consumption. It can be supported with a thermoregulation system which activates or deactivates the cooling or heating function based on the same parameters.
The platform can be integrated with the anti-intrusion systems to switch automatically off all the lights when the alarm system is activated.

Premium DALI Gateway

Together with the KNX building automation systems, this unit offers the most innovative solution for lighting control and management in all buildings during normal activities.
ABB's Gateway Premium allows for variable adjustment of the color temperature of artificial light according to natural light variation over the day.
When the color temperature and illuminance are correctly dosed, artificial light can improve people's well-being for all day. The system also allows to track the working period of the lamps, programming maintenance cycles in advance.

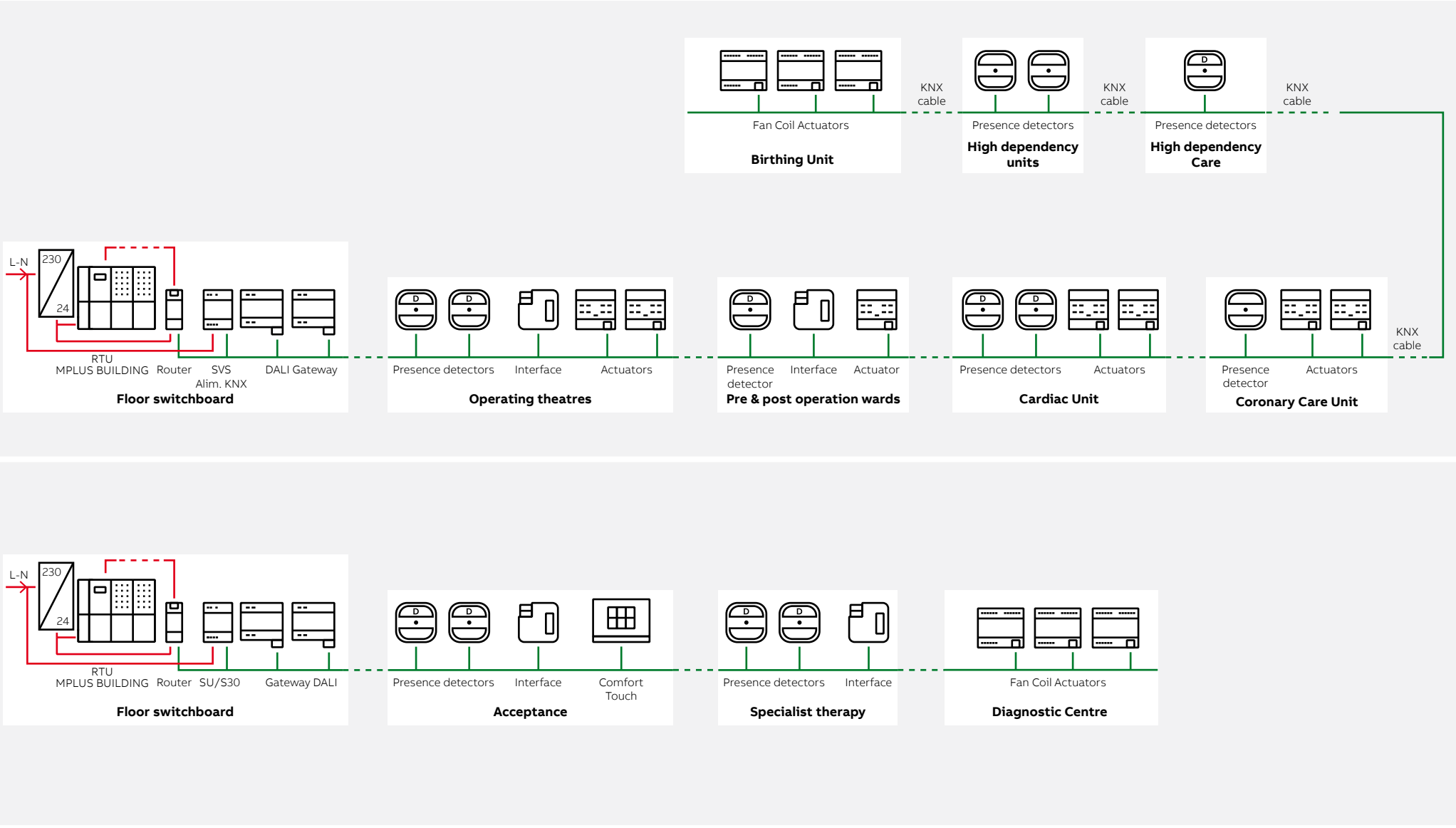
Lighting & shading control
Room Automation

—
Application example



Lighting & shading control

Control, automation and supervision of the environment

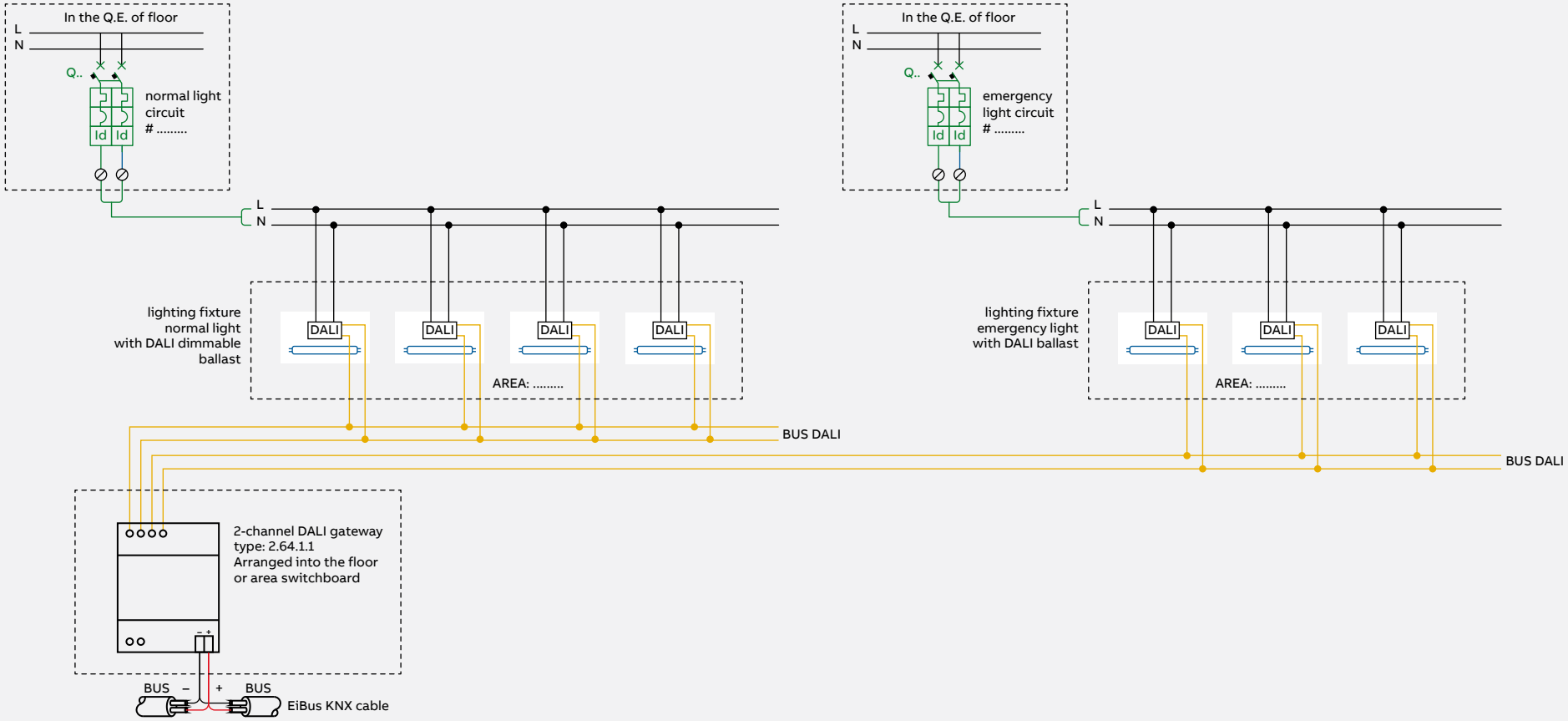


Lighting & shading control

Control, automation and supervision of the environment

—

“DALI” light device controller



Lighting & shading control

Control, automation and supervision of the environment

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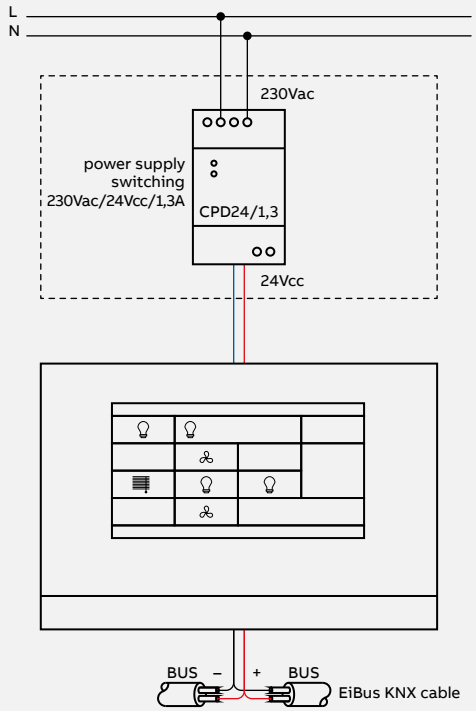
Touch Screen Device



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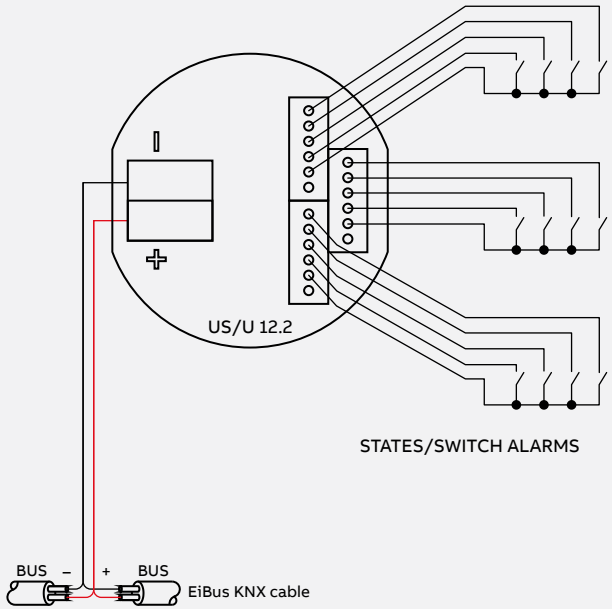
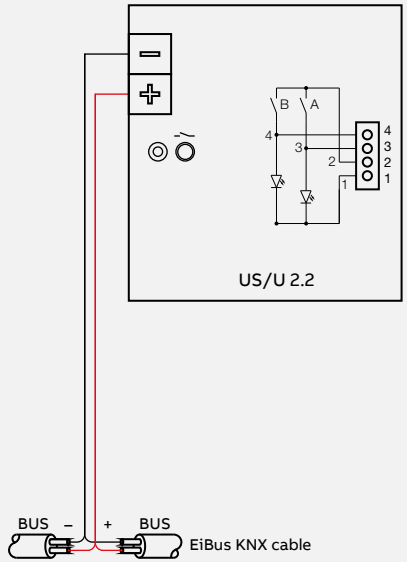
Interfaces



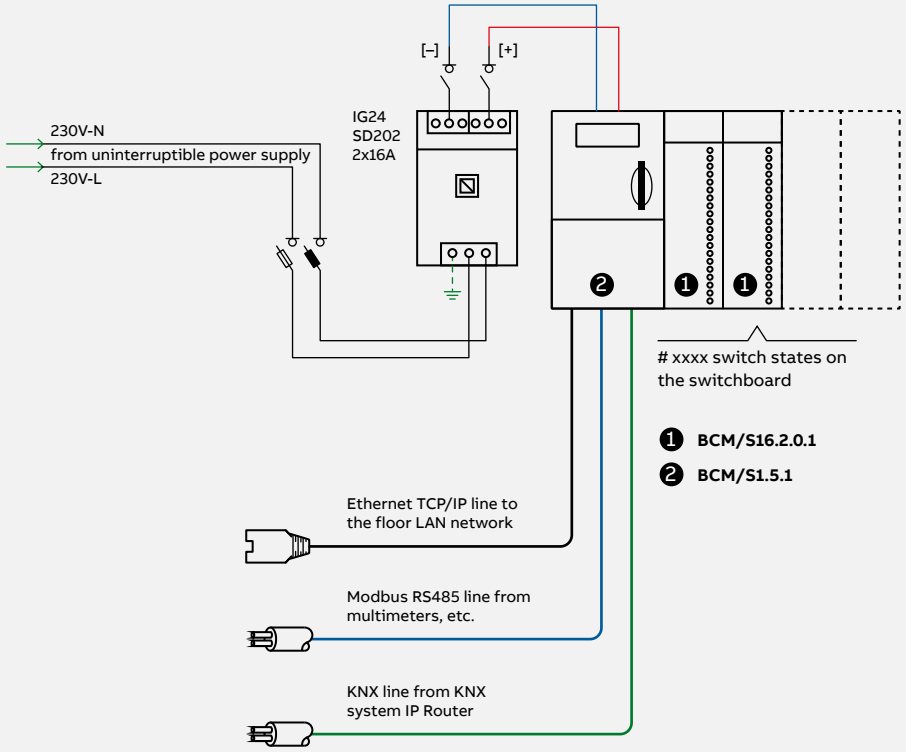


Lighting & shading control

Control, automation and supervision of the environment

—

Floor switchboard concentrator



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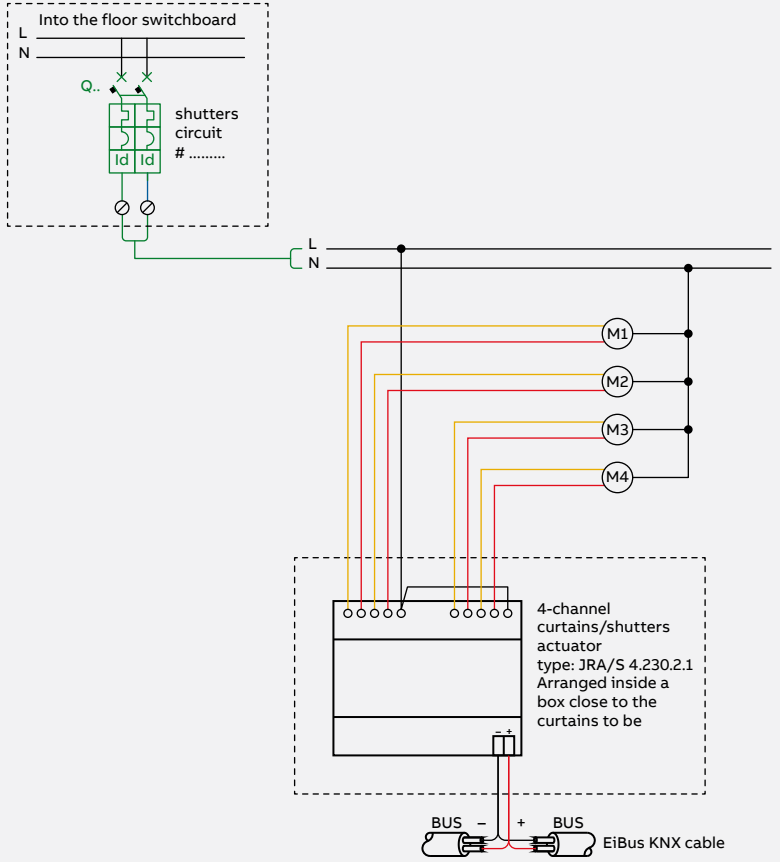
Curtain actuator



Lighting and shading control
Bill of Materials

The bill of material for the In-room Controls equipment in the reference architecture is summarized in the following tables:

Components relevant to all modules

Purpose	Type	Order Code	Description
KNX Power Supply	SV/S 30.640.5.1	2CDG110146R0011	Power Supply with Diagnostics, 640 mA, MDRC
IP Router	IPR/S 3.5.1	2CDG110176R0011	IP Router Secure, MDRC
Application Controller	AC/S 1.2.1	2CDG110206R0011	Application Controller with BACnet Gate-way, MDRC
Lighting Control	DG/S 2.64.5.1	2CDG110273R0011	DALI Gateway Premium, MDRC
Presence Detection	6131/31-24-500	2CKA006132A0348	Presence Detector Premium, FM, 12 m
ABB RoomTouch	RT/U 30.0.1-811	2TMA200050W0007	ABB RoomTouch® 5", SM
Power Supply	53011PS	2TMA130160W0029	Plug-in power supply 24 VDC
Installation Box	BOX/U 5.1	2TMA200160B0003	ABB RoomTouch® Installation Box, FM

Additional infrastructure components like IP routers & Power Supplies will be needed depending on the size and the topology of the actual installation.

Components for module 1 - Circulation spaces

Purpose	Type	Order Code	Description
DIN rail components			
Lighting Control	DG/S 1.64.5.1	2CDG110273R0011	DALI Gateway Premium, MDRC
Binary Inputs	BE/S 4.20.2.1	2CDG110090R0011	Binary Input, 4-fold, Contact Scanning, MDRC
	BE/S 8.20.2.1	2CDG110092R0011	Binary Input, 8-fold, Contact Scanning, MDRC
Shutter Control	JRA/S 4.230.5.1	2CDG110125R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC
	JRA/S 8.230.5.1	2CDG110126R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 8-fold, 230 V AC, MDRC
	JSB/S 1.1	GHQ6310084R0111	Shutter Control Unit, MDRC
Presence Detection	6131/31-24-500	2CKA006132A0348	Presence Detector Premium, FM, 12 m
	6131/21-24-500	2CKA006132A0344	Presence Detector Mini Premium, FM, 8 m
Window Contacts	MRS/W	GHQ3201972R0001	Magnet Reed Contact
Temperature Control and operation	SBC/10.0.1-84	2CKA006330A0012	ABB-Tenton RTC with CO_2/Humidity Sensor and Control Element 10-fold
ABB RoomTouch	RT/U 30.0.1-811	2TMA200050W0007	ABB RoomTouch® 5", SM
Installation Box	BOX/U 5.1	2TMA200160B0003	ABB RoomTouch® Installation Box, FM
Power Supply	53011PS	2TMA130160W0029	Plug-in power supply 24 VDC

Lighting and shading control
Bill of Materials

The bill of material for the In-room Controls equipment in the reference architecture is summarized in the following tables:

Components for module 6 - Specialist support

Purpose	Type	Order Code	Description
DIN rail components			
Lighting Control	DG/S 1.64.5.1	2CDG110273R0011	DALI Gateway Premium, MDRC
Binary Inputs	BE/S 4.20.2.1	2CDG110090R0011	Binary Input, 4-fold, Contact Scanning, MDRC
	BE/S 8.20.2.1	2CDG110092R0011	Binary Input, 8-fold, Contact Scanning, MDRC
Shutter Control	JRA/S 4.230.5.1	2CDG110125R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC
	JRA/S 8.230.5.1	2CDG110126R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 8-fold, 230 V AC, MDRC
	JSB/S 1.1	GHQ6310084R0111	Shutter Control Unit, MDRC
Operating elements			
Presence Detection	6131/31-24-500	2CKA006132A0348	Presence Detector Premium, FM, 12 m
	6131/21-24-500	2CKA006132A0344	Presence Detector Mini Premium, FM, 8 m
Window Contacts	MRS/W	GHQ3201972R0001	Magnet Reed Contact
ABB RoomTouch	RT/U 30.0.1-811	2TMA200050W0007	ABB RoomTouch® 5", SM
Installation Box	BOX/U 5.1	2TMA200160B0003	ABB RoomTouch® Installation Box, FM
Power Supply	53011PS	2TMA130160W0029	Plug-in power supply 24 VDC

Components for module 6 - Services areas

Purpose	Type	Order Code	Description
DIN rail components			
Lighting Control	DG/S 1.64.5.1	2CDG110273R0011	DALI Gateway Premium, MDRC
Binary Inputs	BE/S 4.20.2.1	2CDG110090R0011	Binary Input, 4-fold, Contact Scanning, MDRC
	BE/S 8.20.2.1	2CDG110092R0011	Binary Input, 8-fold, Contact Scanning, MDRC
Shutter Control	JRA/S 4.230.5.1	2CDG110125R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC
	JRA/S 8.230.5.1	2CDG110126R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 8-fold, 230 V AC, MDRC
	JSB/S 1.1	GHQ6310084R0111	Shutter Control Unit, MDRC
Operating elements			
Presence Detection	6131/31-24-500	2CKA006132A0348	Presence Detector Premium, FM, 12 m
	6131/21-24-500	2CKA006132A0344	Presence Detector Mini Premium, FM, 8 m
Window Contacts	MRS/W	GHQ3201972R0001	Magnet Reed Contact
Temperature Control and operation	SBC/10.0.1-84	2CKA006330A0012	ABB-Tenton RTC with CO_2/Humidity Sensor and Control Element 10-fold
ABB RoomTouch	RT/U 30.0.1-811	2TMA200050W0007	ABB RoomTouch® 5", SM
Installation Box	BOX/U 5.1	2TMA200160B0003	ABB RoomTouch® Installation Box, FM
Power Supply	53011PS	2TMA130160W0029	Plug-in power supply 24 VDC

Lighting and shading control
Bill of Materials

The bill of material for the In-room Controls equipment in the reference architecture is summarized in the following tables:

Components for module 8 - M&E Services
General M&E Services

Purpose	Type	Order Code	Description
DIN rail components			
Lighting Control	DG/S 1.64.5.1	2CDG110273R0011	DALI Gateway Premium, MDRC
Binary Inputs	BE/S 4.20.2.1	2CDG110090R0011	Binary Input, 4-fold, Contact Scanning, MDRC
	BE/S 8.20.2.1	2CDG110092R0011	Binary Input, 8-fold, Contact Scanning, MDRC
Shutter Control	JRA/S 4.230.5.1	2CDG110125R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC
	JRA/S 8.230.5.1	2CDG110126R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 8-fold, 230 V AC, MDRC
	JSB/S 1.1	GHQ6310084R0111	Shutter Control Unit, MDRC
Operating elements			
Presence Detection	6131/31-24-500	2CKA006132A0348	Presence Detector Premium, FM, 12 m
	6131/21-24-500	2CKA006132A0344	Presence Detector Mini Premium, FM, 8 m
Window Contacts	MRS/W	GHQ3201972R0001	Magnet Reed Contact
Temperature Control and operation	SBC/6.0.1-84	2CKA006330A0010	ABB-Tenton RTC with CO_2/Humidity Sensor and Control Element 6-fold

Components for module 8 - M&E Services
Specialist M&E Services

Purpose	Type	Order Code	Description
DIN rail components			
Lighting Control	DG/S 1.64.5.1	2CDG110273R0011	DALI Gateway Premium, MDRC
Binary Inputs	BE/S 4.20.2.1	2CDG110090R0011	Binary Input, 4-fold, Contact Scanning, MDRC
	BE/S 8.20.2.1	2CDG110092R0011	Binary Input, 8-fold, Contact Scanning, MDRC
Shutter Control	JRA/S 4.230.5.1	2CDG110125R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC
	JRA/S 8.230.5.1	2CDG110126R0011	Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 8-fold, 230 V AC, MDRC
	JSB/S 1.1	GHQ6310084R0111	Shutter Control Unit, MDRC
Operating elements			
Presence Detection	6131/31-24-500	2CKA006132A0348	Presence Detector Premium, FM, 12 m
	6131/21-24-500	2CKA006132A0344	Presence Detector Mini Premium, FM, 8 m
Window Contacts	MRS/W	GHQ3201972R0001	Magnet Reed Contact
Temperature Control and operation	SBC/10.0.1-84	2CKA006330A0012	ABB-Tenton RTC with CO_2/Humidity Sensor and Control Element 10-fold
ABB RoomTouch	RT/U 30.0.1-811	2TMA200050W0007	ABB RoomTouch® 5", SM
Installation Box	BOX/U 5.1	2TMA200160B0003	ABB RoomTouch® Installation Box, FM
Power Supply	53011PS	2TMA130160W0029	Plug-in power supply 24 VDC

Components for module 6 - Parking Garage

Purpose	Type	Order Code	Description
DIN rail components			
Lighting Control	DG/S 1.64.5.1	2CDG110273R0011	DALI Gateway Premium, MDRC

Only lighting is considered in the parking garage, which is operated via the touch panel in the lobby. Local regulations for lighting in parking garages must be obeyed.

HVAC Control

Heating, ventilation and air conditioning (HVAC) systems have a significant impact on both comfort and costs in any building. In the Mid-Size building they represent about 50% of total energy cost. hospital system require smart HVAC systems that providing an environment that caters to patient, while minimizing energy consumption and increasing sustainability.

HVAC Control

Overview - Motivation & Key Elements

HVAC system is an important part of a hospital system providing an environment that caters to patient well-being and comfort and running general medical services, places unique demands on energy usage for hospitals and healthcare facilities.

Space temperature and air quality are significant factors in occupant comfort for patients, visitors, and staff and furthermore account for 50% of total energy cost in typical buildings. HVAC control in Hospital needs to optimize the comfort levels of the internal environmental whilst minimizing energy usage. Some critical areas/rooms like isolation rooms where there is specialized type of equipment's needs to be interfaced with common area HVAC system. As much as 30% of the energy consumed in hospitals is used unnecessarily. Considering energy is approximately 50% of a health care facility manager's budget, hospitals can dramatically reduce their operating costs by using energy more efficiently. (source: EPA)

ABB Cylon delivers scalable, front-end building automation solutions, open protocol building controls, and cloud-based energy analytic tools to meet the need of high-performance, green-conscious hospital and other circulation spaces.
ABB Cylon can help you integrate smart building solutions into the new hospital planning phase, or through retrofitting to upgrade an existing facility to optimize return on investment. With an ABB Cylon HVAC control system, hospital environment performance can be quickly accessed, viewed, and modified including trends, setpoints, schedules, and more from any web-enabled device anywhere, any time and controlled and monitored from central server.
ABB Cylon ensures your hospital's systems are operational only when needed versus expectation with HVAC and lighting scheduling and the application of intelligent sensor feedback.

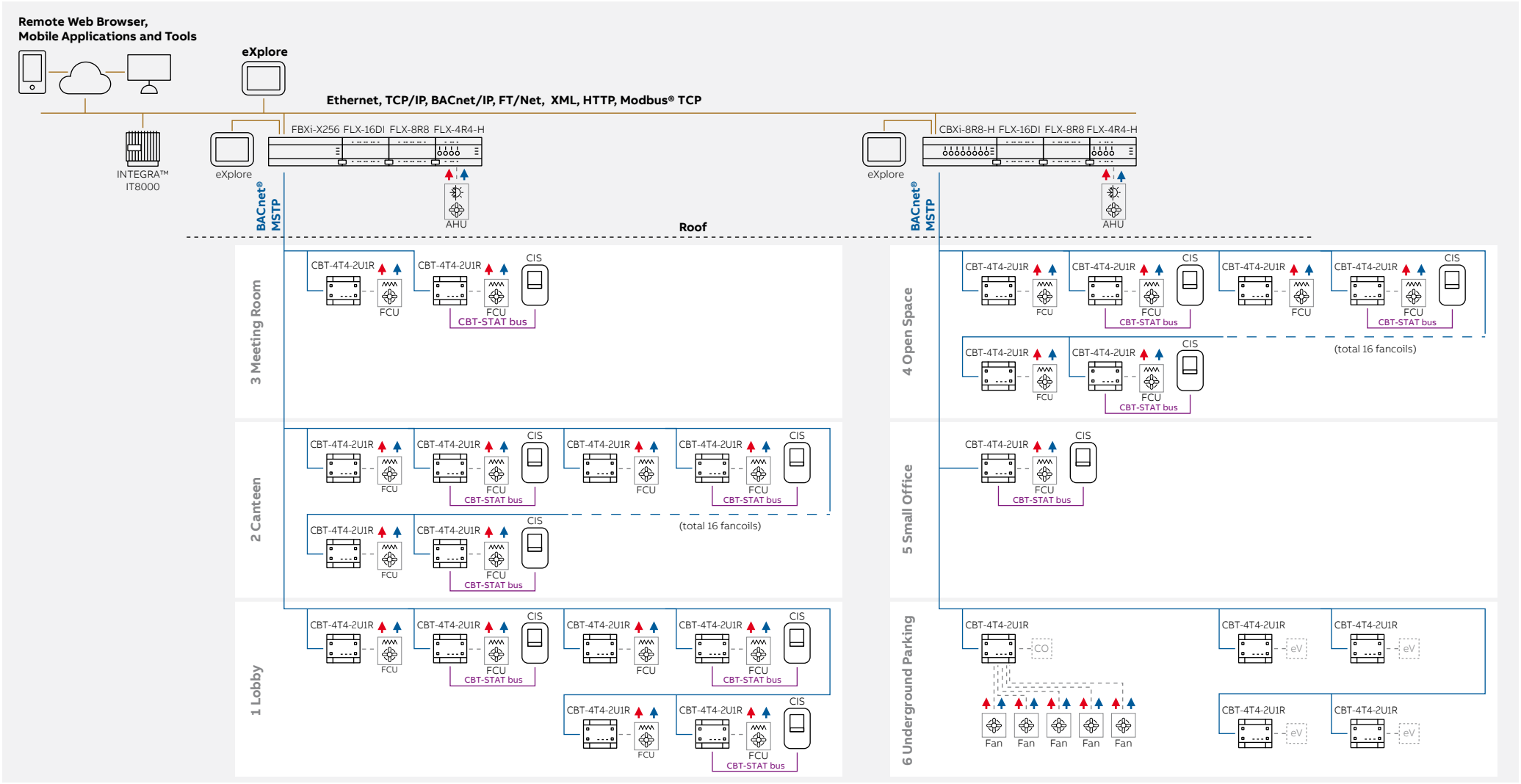
ABB Cylon Smart building solutions provides simple integration through an open protocol solution supporting: BACnet/IP, BACnet MS/TP, Modbus TCP and Modbus RTU.
This can be used to integrate other systems like:

- Access Control
- Fire Alarm System
- IP Television & Audio Video Systems
- Park Guidance System

ABB's product range offers flexibility in strategy changes and maximized control utilization ideally suited to the changing demands of healthcare facilities. Our Energy Management tool ensures control of energy usage and delivers alerts and alarms to the facility management team when anomalies are detected, allowing facility teams to provide consistency of service while managing energy usage and costs.
As sophisticated needs and extended uptime lead to the high energy consumption of most hospitals and clinics, the healthcare sector offers an unparalleled opportunity for facility managers to optimize and increase energy savings.
Ranking 2nd behind the food-service sector, the healthcare industry exceeds typical per-building energy costs of similar building sizes by nearly a factor of 10, with an energy intensity of approximately 250 kBTU or 74 kWh per square foot, nearly three times that of a typical office building. Managing A BMS efficiently could yield savings of up to 20% in energy usage while still maintaining patient comfort

HVAC Control

Reference Architecture



HVAC Control

INTEGRA©

Advanced digital technologies to reduce energy and maintenance costs of buildings

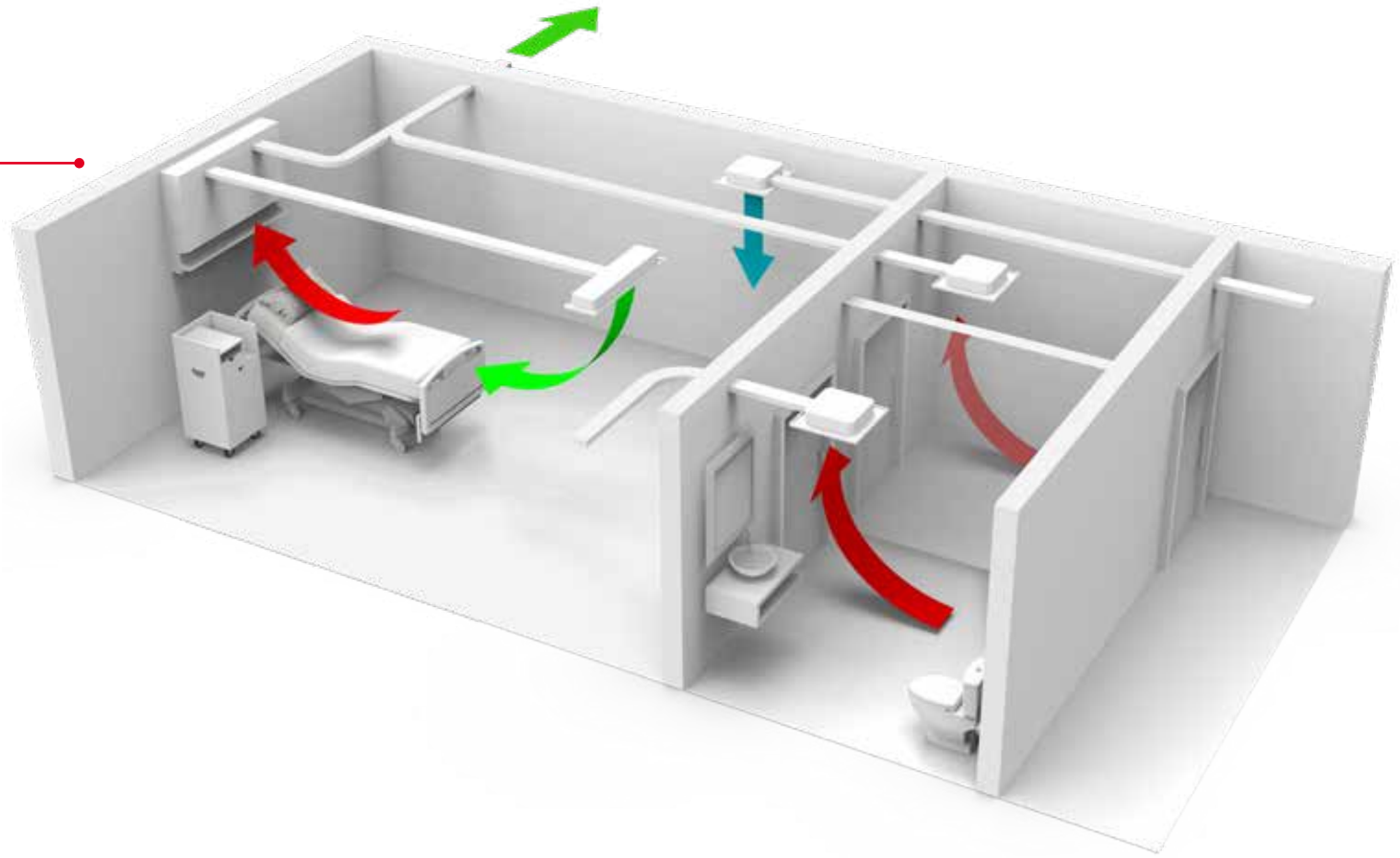
The INTEGRA™ brings extended performance and notable improvements to help businesses take full advantage of the IoT. Part of the INTEGRA family, the IT-8000 is an embedded Internet of Things (IoT), BTL-listed BACnet® Building Controller (B-BC) that connects to Cylon's BACnet field controllers. The IT-8000 is also capable of connection to and network management of a variety of diverse devices and subsystems using various protocols including, but not limited to, Modbus™ and LonWorks™. When connected to an Ethernet or wireless LAN, the IT-8000 uses Internet connectivity and web-serving capability to provide integrated control, supervision, network management, scheduling, data logging, alarming, and rich graphical displays through a standard Web browser. INTEGRA™ brings provisioning tools for common processes including updating distributions, and security settings including certificates.through a standard Web browser. INTEGRA™ brings provisioning tools for common processes including updating distributions, and security settings including certificates.

BACnet

BACnet MS/TP is a data communication protocol mainly used in the building automation and HVAC industry (heating, ventilation and air-conditioning).
The protocol allows equipment such as air conditioning machines, pumps and ventilation devices to communicate with a PLC.
This creates buildings with a high degree of automation.

HVAC-Control

- **Isolation Rooms** to minimize the spread of infectious diseases.
- **Designed** to contain and safely dispose the transmissible air by using specialized electronic room pressure controls.
- **Control dampers** that maintain a negative supply pressure in the room and exhaust the infectious air to the outdoors.
- Companies that specialize in Isolation Room controls include, but are not limited to:
  - Triatek (Johnson Controls)
  - Air Monitor
  - TSI
  - Setra



HVAC Control

Product Offering

Main Plants Controller	
CBX System	**CBXI-8R8(-H)**
CBXI Series + FLX Series	FLX-4R4(-H), FLX-8R8(-H), FLX-16DI, FLX-PS24
CBXI Series + FLX Series	CBX-8R8(-H)
	FLX-4R4(-H), FLX-8R8(-H), FLX-16DI, FLX-PS24
FLXeon	FBXI-X256
Variable Air Volume Controller	
CBX System	**CBXI-8R8(-H)**
CBV Series	FBVI-2U4-3T
	CBV-2U4-3T/-N
Unitary Controller, Fan Coils	
CBX System	**CBXI-8R8(-H)**
CBT Series	CBT-3T6-5R
	CBT-4T4-2U1R
TRC Series	BACnet ROOM Thermostats
Room and Panel Displays	
CBX System	**CBXI-8R8(-H)**
Intelligent Room Sensors	FusionAir Sensor (H2 2021
	CBT-STAT (Room Sensor)
	UCU Room Display
eXplore Series	eXplore Series Touchscreen
Programming & Productivity	
CBX System	**CBXI-8R8(-H)**
CB Line	Cxpro^{HD} AERO^{BT}

Edge Layer

Add-on components 21 CFR Part 11 compliant

	IT-8000 E-Signature Applications
IT8-ESIGN-250	IT-8000 E-Signature Application with 250 secured points
IT8-ESIGN-UNL	IT-8000 E-Signature Application with unlimited secured points
IT8-ESIGN-UP-250	IT-8000 E-Signature Appl 250 secured point upgrade
	INTEGRA N4 Supervisor E-Signature Applications
ITS-ESIGN-1000	INTEGRA N4 Supervisor E-Signature Application with 1000 secured points. Niagara Station Proxy Points for Jace secured points are not covered & do not count against this limit
ITS-ESIGN-UNL	INTEGRA N4 Supervisor E-Signature Application with unlimited secured points. Niagara Station Proxy Points for Jace secured points are not covered & do not count against this limit.
ITS-ESIGN-UP-1000	INTEGRA N4 Supervisor E-Signature Application upgrade to add 1000 additional secured points. Niagara Station Proxy Points for Jace secured points are not covered & do not count against this limit.
	Training and Support
TRN-N4-ESIGN-WBT	INTEGRA Niagara 4 E-Signature Certification (eLearning)

HVAC Control
Bill of Materials

The bill of material for the HVAC Control equipment in the reference architecture is summarized in the following table:

	Electrical & Plant room	Circulation space	Service Area	General M&E Areas	Specific M&E Areas	Washroooms Toilets	Underground Parking
Integra	1						
Explore	2	1	1	1	1		
CBXi-8R8-H	4						
FLX-16DI	4						
FLX-8R8	4						
FLX-4R4	4						
CBT-4T4-2U-1R		16	16	16	8	2	5
CIS-TH		5	4	4	4	2	

Emergency Lighting

The emergency lighting concept of ABB offers reliable and complete solutions for safe evacuation.
The buildings emergency lighting provides 24-7 protection to doctors and patients.
ABB solutions provide harmony with the interior and reduced total cost of ownership throughout the hospital life cycle.

Emergency Lighting

Overview - Motivation & Key Elements

Emergency lighting is a vital and effective life safety tool, providing reassurance and guidance to people at critical times when they need to escape quickly and safely from a building.

Escape route signalization and lighting

- Escape route signalization uses pictograms to show the direction to the nearest (emergency) exit. These exit signs have different geometries, dimensions and colors to comply to local standards
- Escape route lighting illuminates this route to the (emergency) exit so that people can escape safely in the event of an emergency, as there is a high risk of damaging someone when the mains is off. Escape route luminaires can be permanently on or off

Central battery systems or self-contained lighting

- The power system must provide a secure power source in case of emergency to supply the evacuation systems
- A central battery system will normally be located in the basement of the building or in centralized place in each floor

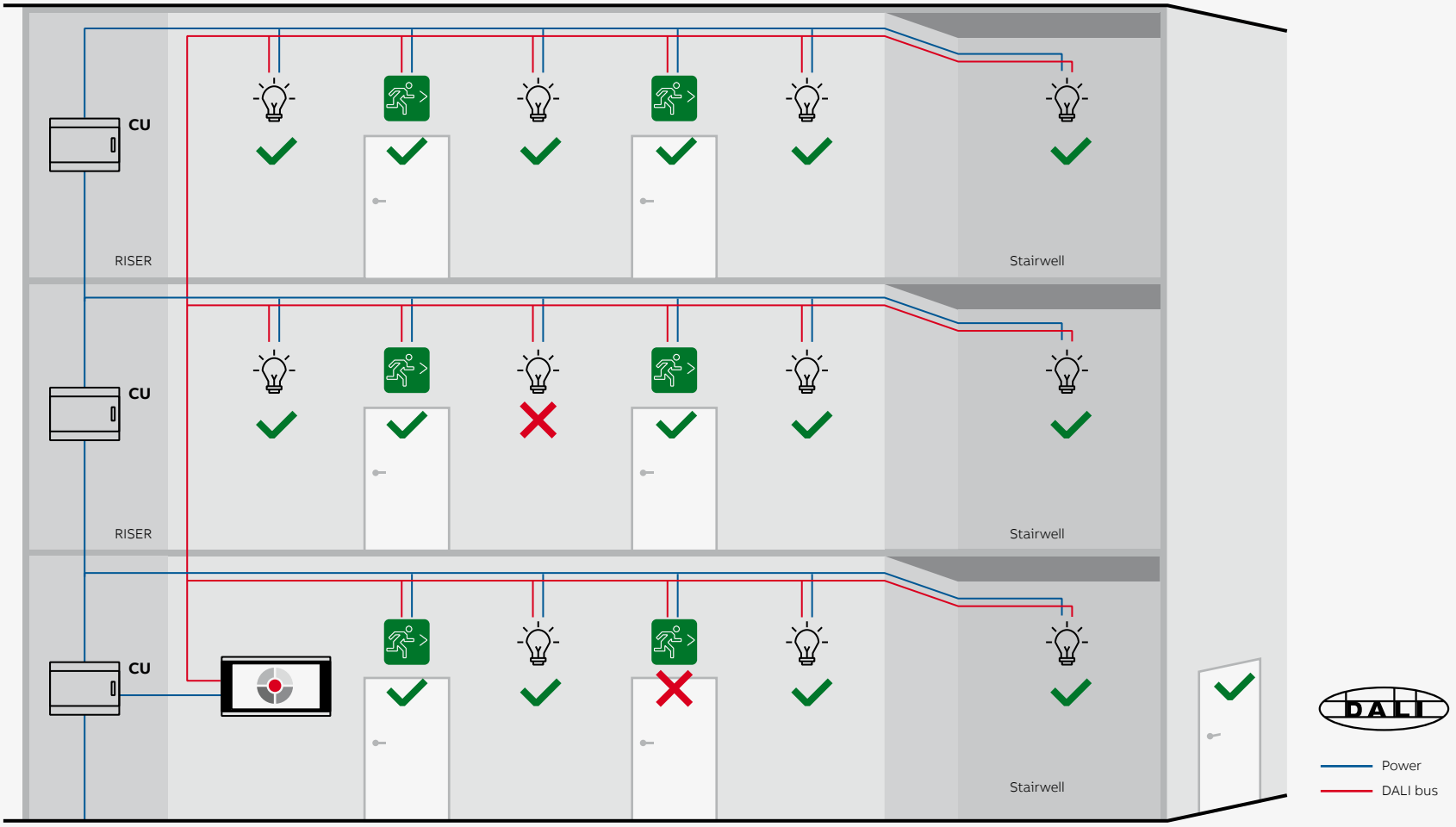
Monitoring, testing and connectivity

- Advanced monitoring systems bring the benefit of a constant 24/7, 365 days per year monitoring scheme
- The automatic testing system comprises the light and the battery duration. Data logging software will keep the test results for up to four years, so that there is evidence to local regulators
- Connected luminaires allows for a remote installation, diagnostic and testing of the luminaires that translates into time and resource savings as well as safer buildings assuring the functionality of each luminaire

Emergency Lighting

DALI Emergency Lighting (Europe)

Reference Architecture



Emergency Lighting
DALI Emergency Lighting (Europe)

Integration for safe monitoring in smart buildings DALI emergency lighting from ABB can easily provide a safe and reliable solution to meet smart building emergency lighting requirements. Automatic testing to ensure your building is safely lit. With status information and test reports available to download. Low-cost installation with low-cost maintenance. ABB and DALI: the smart way to install emergency lighting. Ensuring building occupant safety, Touch screen to control, test and monitor emergency lighting. Simple to group and easy to install

Emergency Lighting has dedicated DALI codes for testing, monitoring and reporting of emergency luminaire status.

Advantages of using DALI with emergency lighting

1. Proven DALI technology specific for emergency lighting

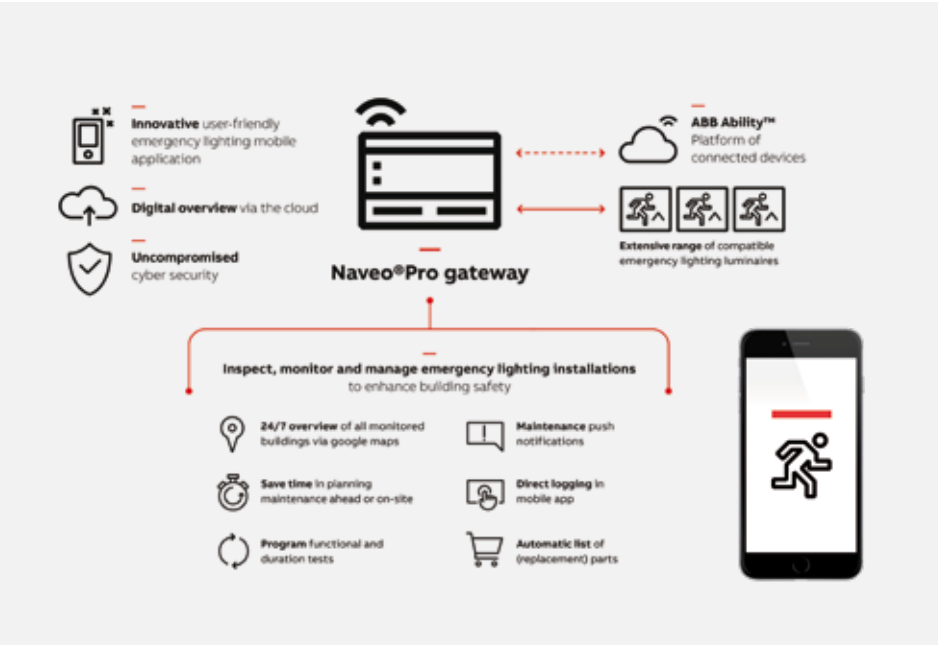
2. Our DALI solution is based on non-proprietary systems. As long as all component of a system are DALI compliant, they will be able to communicate with each other

3. Cost-effective solution with reduced maintenance costs after commissioning

4. With the addiction of the ABB gateway, we can connect our DALI luminaires with KNX systems and BMS

5. DALI (DHA) Certified

Naveo®Pro
Naveo®Pro ensures to maintain and record the health status of emergency lighting in all types of buildings. Naveo®Pro is a way to install, monitor and maintain emergency lighting systems with the mobile device. The system provides a digital overview via the cloud, giving instant information to assist resource planning and enhance building safety.
Emergency luminaires can be easily installed and programmed into a building in a fast and intuitive way, offering various functionalities to reduce time and costs on inspection and maintenance.
Being part of the ABB Ability™ platform, this solution offers uncompromised cybersecurity and allows secure integration of data that enables key benefits for all users of the system.



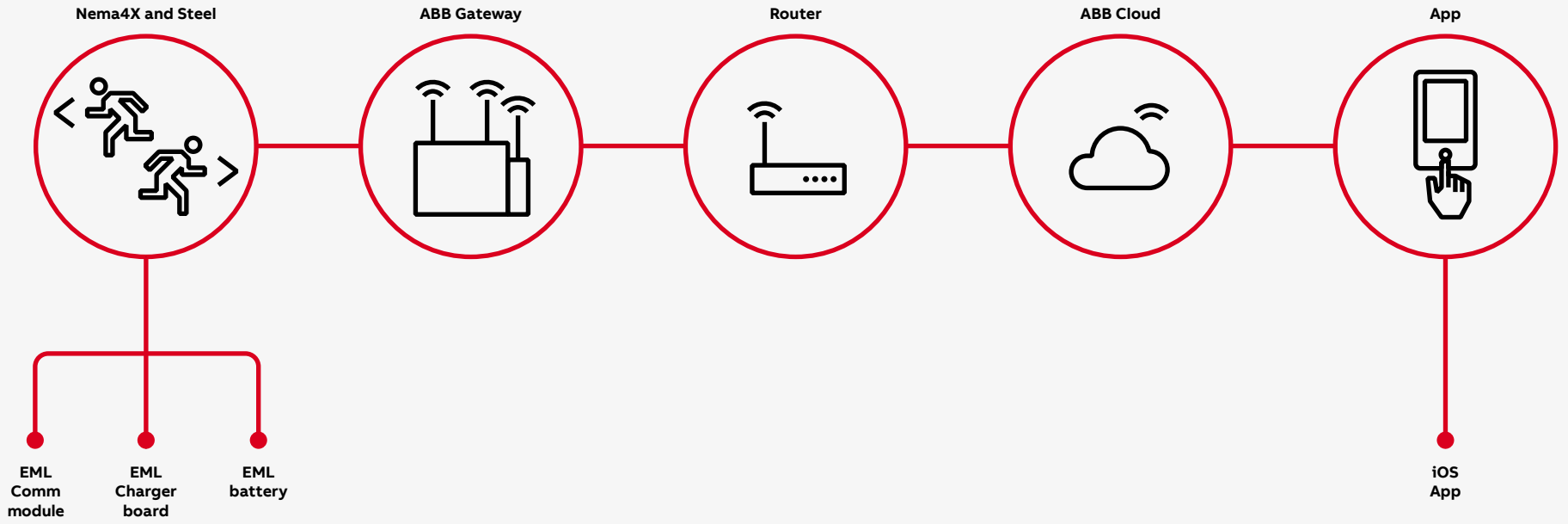
Emergency Lighting
Bill of Materials

The bill of material for all luminaires and required accessories in the reference architecture is sum-marized in the following table:

Line	Qty	Part Code	Ref	Description
(1)				Naveo Emergency Luminaires
(2)	177	SR2-DAD-M3	E1	Serenga 2 Self-Contained Open Area IP42 Self-Test Recess
(3)	21	SR2-DEA-M3	E2	Serenga 2 Self-Contained Escape Route IP42 Self-Test Recess
(4)	122	SR2-SAM3-D1	E1S	Serenga 2 Self-Contained Open Area IP54 Self-Test Surface
(5)	20	SR2-SEM3-A1	E2S	Serenga 2 Self-Contained Escape Route IP54 Self-Test Surface
(6)	33	STLU3LB1E	E3W	Lutia Self-Contained IP65 Self-Test Surface
(7)	21	STLU3LB1E	E3C	Lutia Self-Contained IP65 Self-Test Surface
(8)	32	STWWA3LS1	Ex	W/force Self-Contained OPAL IP65 Self-Test Surface
(9)	32	RSEN5120	Ex	W/force ISO7010 Up Arrow Legend
(10)	8	STWWA3LS1X	Ex1	W/force Self-Contained 27M IP65 Self-Test Surface
(11)	8	XEN3/6DV32	Ex1	W/force ISO7010 Left & Right Arrow Legend & Diffuser
(12)	10	STWWA3LS1X	Ex2	W/force Self-Contained 27M IP65 Self-Test Surface
(13)	10	XEN5/0DV32	Ex2	W/force ISO7010 Up & Blank Arrow Legend & Diffuser
(14)	69	EG3LS1-S22	Ex3	Guideway Self-Contained 22M IP40 Self-Test Surface/Wall
(15)	tbc	EGR3LS1-S32	Ex3	Guideway Self-Contained 32M IP40 Self-Test Recess
(16)	1	EG3LS1-S32	Ex4LR	Guideway Self-Contained 32M IP40 Self-Test Surface/Wall
(17)	tbc	EGR3LS1-S32	Ex4LR	Guideway Self-Contained 32M IP40 Self-Test Recess
(18)	1	XEN3EG32	Ex4LR	Guideway ISO 7010 Left Arrow Legend 32M
(19)	1	XEN6EG32	Ex4LR	Guideway ISO 7010 Right Arrow Legend 32M
(20)	tbc	EG-TKIT50		Pendant Suspension Kit 0.5M
(21)	tbc	EG-TKIT100		Pendant Suspension Kit 1M
(22)	tbc	EG-WKIT150		Wire Suspension Kit 1.5M

Emergency Lighting
Nexus®Pro (USA and Canada)

Reference Architecture



Emergency Lighting
Nexus®Pro (USA and Canada)

Building owners or managers cannot afford uncertainty when it comes to their building safety including their emergency lighting fixtures that need to be working properly so that people can easily be guided out to safety in case of an emergency evacuation. With the Nexus®Pro system, you can concentrate on what matters: letting your smart emergency lighting system manage itself and reduce monitoring and testing times. This will quickly reduce maintenance costs, allowing you to focus on problems quickly and as they happen right from your smart device.

Safety and protection
Reduce human error while enhancing safety for all building occupants by meeting code and compliance and 24/7 monitoring.

Cost-saving
Simple, user-friendly app makes emergency lighting management easier and more efficient while reducing maintenance costs.

Robust cybersecurity
Wireless ABB Gateway keeps fixtures secure with Bluetooth mesh technology to exchange data between emergency lighting devices.

Remote monitoring
Designed to easily maintain and test emergency lighting right from your smart phone, without the need to visually verify performance or disrupt the power supply.

Scalable and flexible
Gateway can establish a secure wireless connection with up to 200 units. Available offering for institutional, architectural, healthcare and industrial applications.

Nexus®Pro Value proposition:

Set-Up
Easily install and add new devices on your building through a or map

Maintain
Defective devices are automatically and reported on your interface in addiction to push notifications

Test
Run test instancly or program them to ensure that all your devices are working property

Share
Easily share the results of tests with team members, maintenance staff and technicians

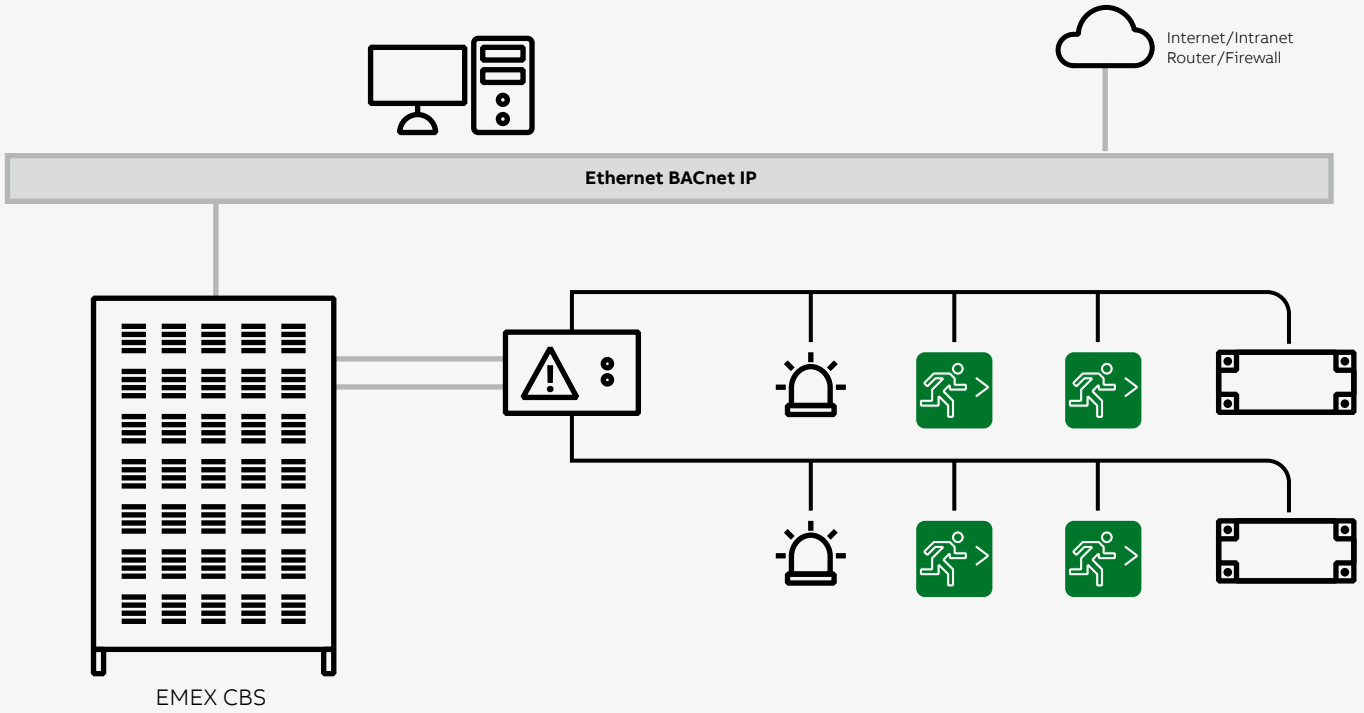
2d floorplans make it easier to find emergency lighting devices that are not functioning

Schedule tests in advance and get reports sent straight to your smart devices

Get push notifications sent to your smart device when malfunctions

Emergency Lighting
EML-Central Battery (UK, MEA)

Reference Architecture



Emergency Lighting
EML-Central Battery (UK, MEA)

Reducing your total cost of inspection & maintenance
In addition to our portfolio of dedicated emergency lighting products, we offer a comprehensive range of central power supply systems that offer advantages for specific building types where inspection & maintenance time is critical and needs to be minimized.

With our central power supply system's, we offer reliable and high-quality products for AC/AC applications with advanced commissioning and testing functionality for easy operation

Static Inverter Systems (AC/AC)
Static Inverter Systems (AC/AC) Static inverter systems operate in a similar manner to AC/DC Central Power Supply Systems, with the exception that the system constantly gives a 230V AC output.
The advantages of this approach are numerous. Firstly, luminaires do not need to be converted, as any slave 230V luminaire can be used (there are some restrictions to this on the grounds of suitability for emergency lighting). Luminaires also operate at full light output, as they are being fed from a full mains voltage supply, meaning fewer luminaires are required for equivalent light outputs.

Advantages:
- Suitable for medium to large installations.
- Almost any luminaire may be used
- Easy to maintain • 10-to-25-year design life batteries
- Distribution is standard 230V AC (standard DBs)
- Reduced volt-drop problems on output cabling
- Luminaires operate at full light output • Ideal for modern LED lighting installations to capitalize on energy reduction

Constraints
- Bigger systems are physically large and may require a special battery room
- Smaller installations are ideal for EMEX mini-installations (See EMEX mini section for suitable solution)

Reference Projects:
- Riyadh metro - Saudi Arabia,
- Oman Hospital
- Doha Marriot Hotel – Qatar…

Product line Emergi-Lite

Emex Mini
Space saving & high performance central power supply system

Emex Power
Modular AC/AC central power supply system

Emex 110
110 volt AC/AC power supply system

Emel
110, 50 & 24 volt AC/DC central power supply system

Emex Test
Introduction

Guideway Serenga Weatherforce Navigator compact

Serenga 2

Hy-LED

Silver-Scape Weatherforce

Cordona Camarque

Emergency Lighting
Stanilite® Nexus®RF Infinity wireless system (APAC)

ABB's Stanilite NexusRF Infinity offers the next quantum leap in monitored emergency and exit lighting

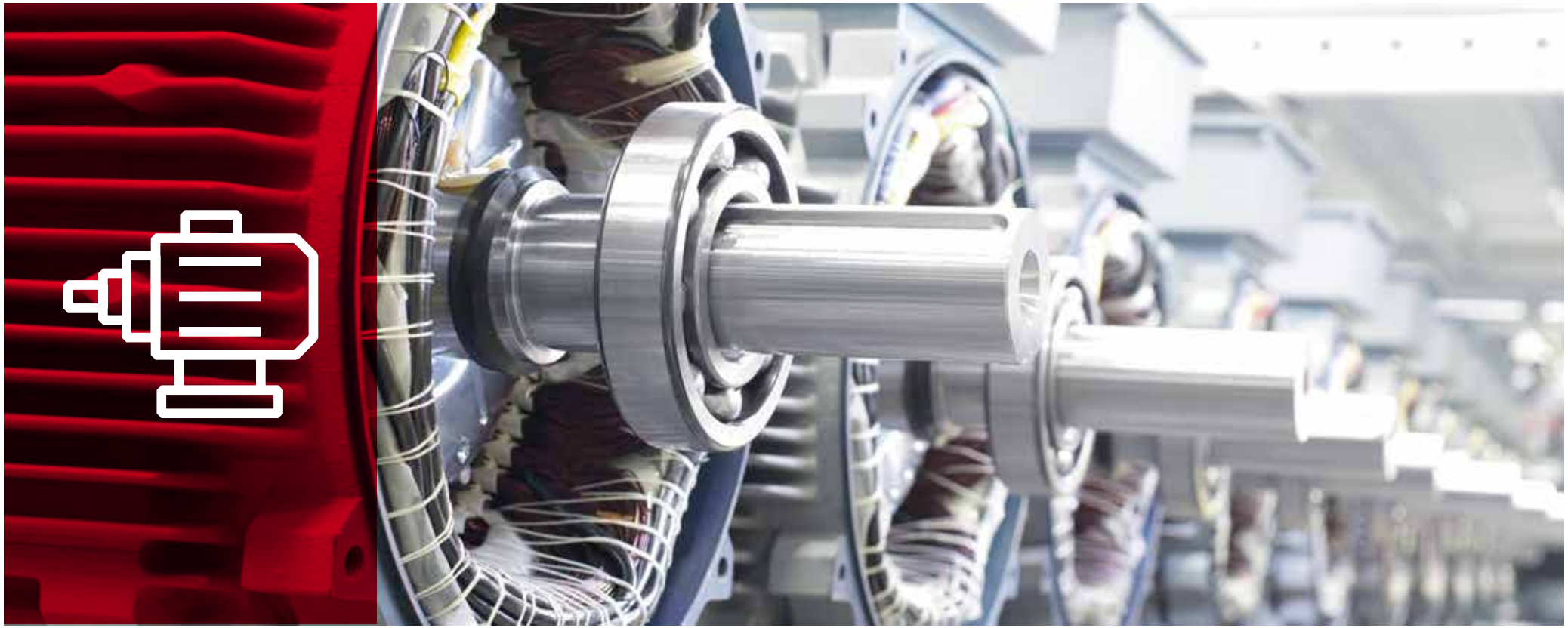
ABB has released its new offering in emergency lighting, Stanilite NexusRF Infinity, that lets customers set-up, maintain, and control their entire emergency lighting installations digitally. It provides a real-time overview of all systems which in turn saves time, enables better maintenance, and enhances building safety.
Locally developed innovation by ABB's Australian emergency lighting R&D team, the NexusRF Infinity builds on the solid foundation of NexusRF wireless system and now incorporates digital enhancements to reduce all aspects of the product life cycle.
NexusRF Infinity also gives a digital overview through a mobile optimized web interface which gives users instant information to assist resource planning and enhance building safety, which can be processed directly from a smart device.
The product also includes dynamic mesh networking. This ensures multiple potential communications paths that form automatically and dynamically, with automatic route optimization to ensure trouble free operation.

The guiding design principals for NexusRF Infinity are to make it as simple as possible to use for both the installer and end user:

- Foolproof installation with tap & scan technology for mobile commissioning
- Commission during construction without power or backbone installation
- No more commissioning spreadsheets
- Backwards compatibility for existing Nexus RF installations
- Report distribution from mobile devices
- Integration with Building Management System (BMS)
- Flexibility and scalability
- 300% increase in router capacity

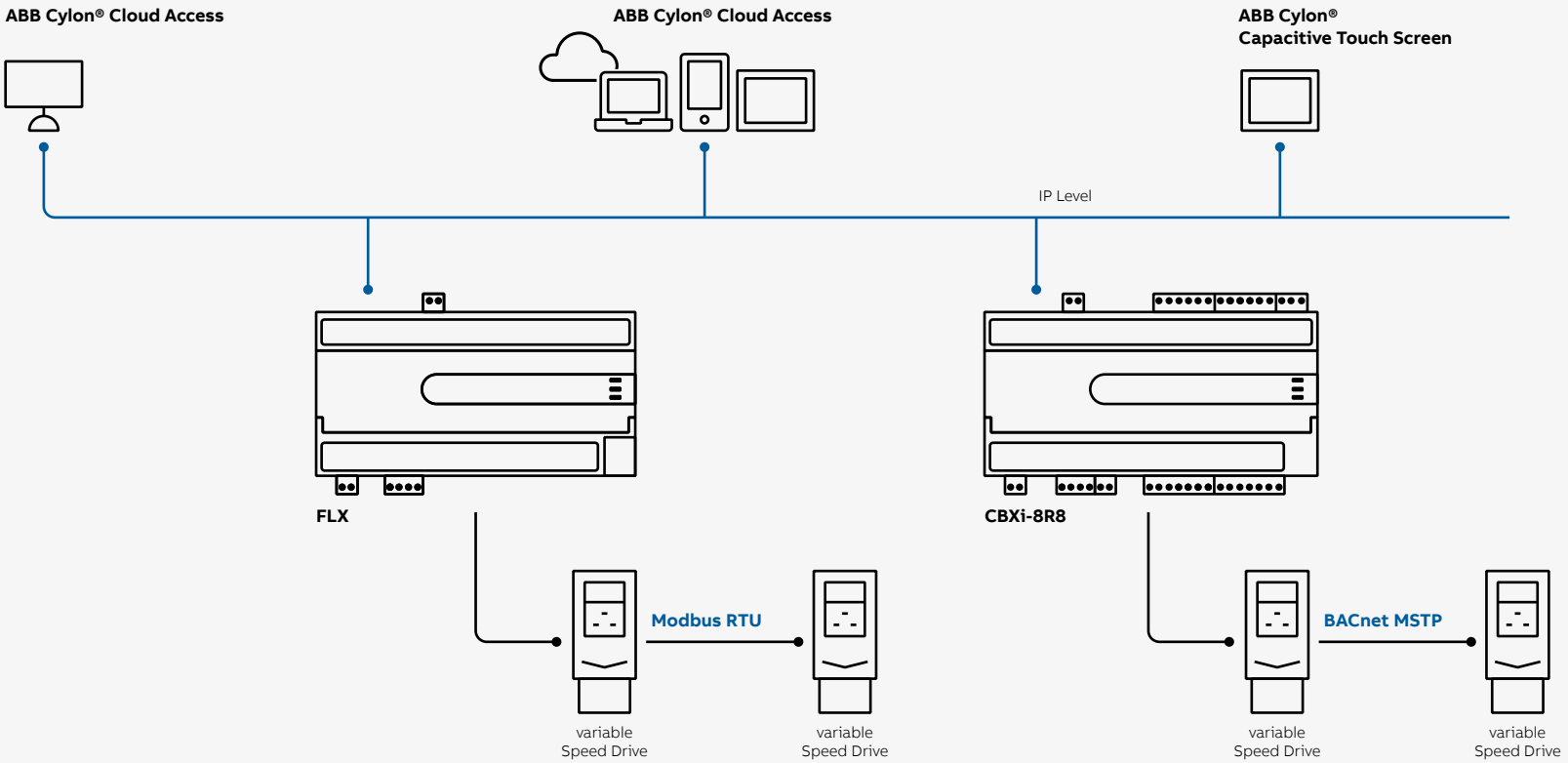
Motor & Variable Speed Drives

ABB drives are flexible to optimize all processes and control, and reliable for less downtime.
Applications such as air handlers, water pumps, cooling towers and chillers - all use electric motors that ABB variable speed drives (VFD) for HVAC, which ensure they run in the most efficient and reliable manner.



Motor & Variable Speed Drives

Reference Architecture



Motor & Variable Speed Drives

VSD
Variable Speed Drives

By investing in energy efficient variable-speed drives (VSDs) and high efficiency electric motors to control HVAC systems, hospitals can potentially lower their energy use from 20 to 70 percent, making huge strides toward freeing up valuable funding for further capital investment. These devices control the flow of pumps and fans to eliminate the energy waste that is common with conventional pump and fan control methods.

Benefits:
Comfort of the occupants vital for HealthCare segment
Healthy environment thanks to supplying fresh air and keeping CO_2 concentration low
Reduced fan motor noise and resonance control for increased comfort
Smooth start/stop of HVAC applications to reduce mechanical and electrical stress of the equipment to increase its lifetime and ensure HVAC process continuity
Filter clogging detection to ensure fresh air and avoid extra energy losses in the system

Motor & Variable Speed Drives

IEC low voltage motors for HVAC industry

Motors designed to meet the demands of HVAC applications, from heavy duty industrial designs to commercial applications.
These applications include ventilators, direct drive and belted fans, exhaust fans, unit heaters, air conditioning units, smoke ventilation fans, and commercial refrigeration condensers.

NEMA low voltage motors for HVAC industry

Baldor's line of Heating, Ventilation, and Air Conditioning Motors are designed with dynamically balanced rotors for reduced vibration and quiet operation.

Energy Management

The first and most important step in energy management is to understand your baseline energy consumption. This includes measuring consumption of electricity, natural gas, steam, water, etc., which will enable you to ascertain your building's energy profile and help understand the operational aspects and overall building energy requirements. ABB metering devices connect with the building automation system providing the ability to acquire, store and analyze your key area within your facility.

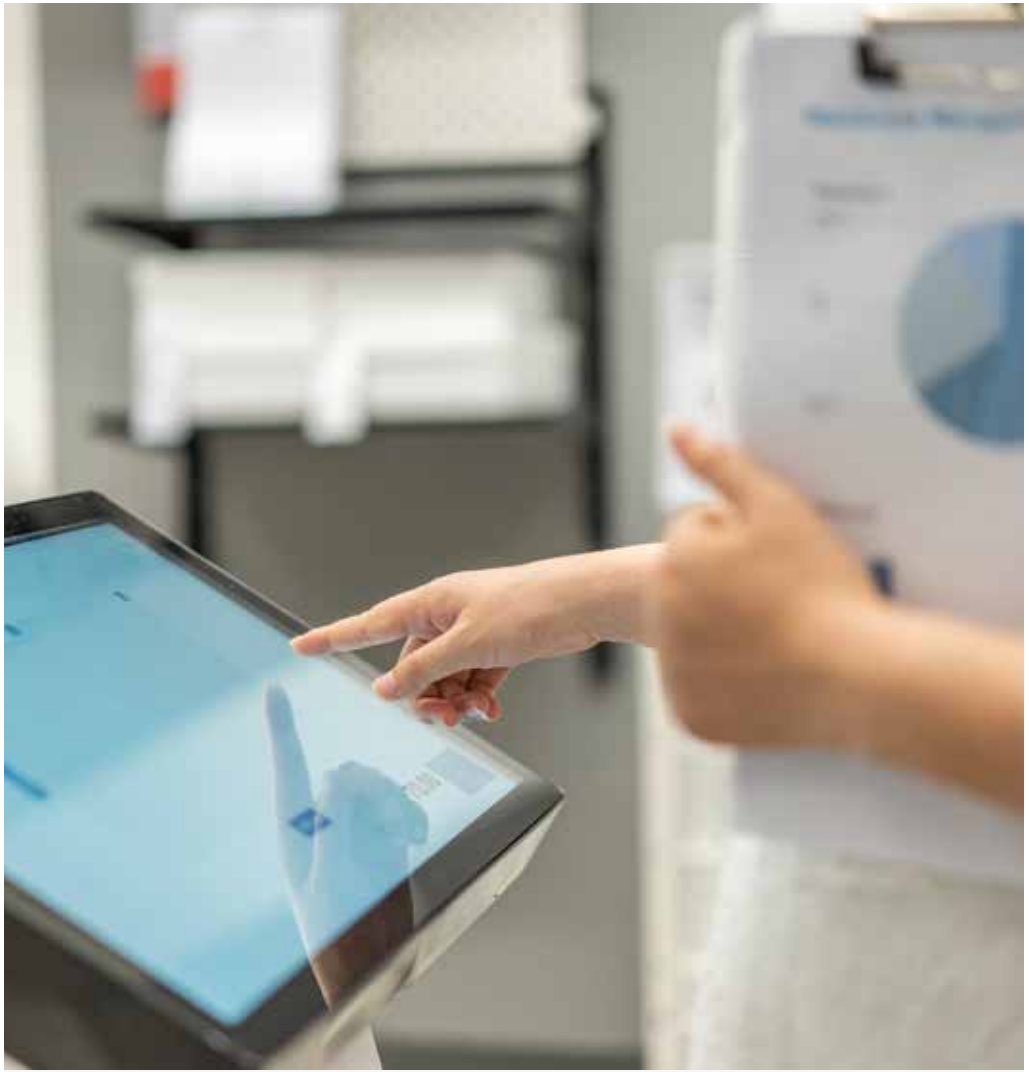
Energy Management

Overview - Motivation & Key Elements

ABB AbilityTM, a single solution for all your asset and energy management needs

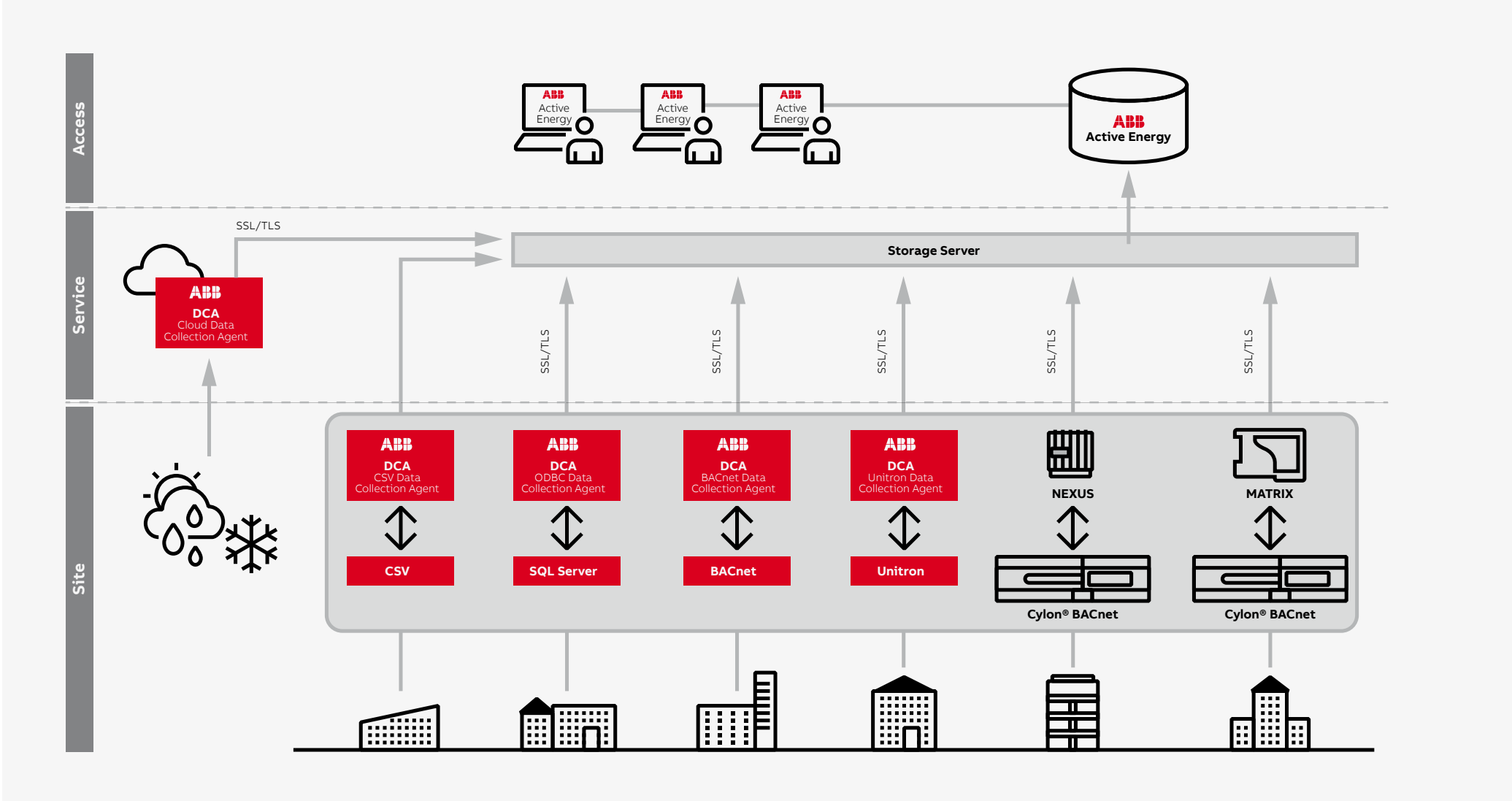
ABB AbilityTM Energy and Asset Manager is a state-of-the-art cloud solution that integrates energy and asset management in a single intuitive dashboard. Providing full remote visibility of asset and electrical-system behavior, ABB AbilityTM Energy and Asset Manager provides insights that help to minimize cost and risk and maximize performance and safety across operations.

A powerful building-management tool that lets stakeholders:
• View, manage, and optimize building systems from anywhere, at any time
• Implement predictive (condition-based) maintenance, ensuring the reliability and availability of your power system and equipment
• Optimize energy-usage in real time to achieve maximum energy efficiency and lower costs
ABB AbilityTM Energy and Asset Manager is a state-of-the-art cloud solution that integrates energy and asset management in a single intuitive dashboard. Providing full remote visibility of asset and electrical-system behavior, ABB AbilityTM Energy and Asset Manager provides insights that help to minimize cost and risk and maximize performance and safety across



Energy Management

Reference Architecture



Energy Management

Features of ABB Ability BE Sustainable with Active Energy

Analysis and charting
Analysis and charting show you how, where, and when you are consuming energy. Energy consumption data can be analyzed in several different ways from spectral analysis displays, regression analysis, actual versus target graphing, and more. Allows you to compare meters, view data by time period, calculate energy costs and carbon emissions, and more. Data can be exported to CSV and Excel for additional analysis and sharing

Charting:
- View real-time energy information in a day, week, month, year, and a custom view
- Compare time periods, meters, and export data

Analysis:
- View energy patterns using the Spectral Analysis tool
- Set targets based on driving factors or fixed parameters
- Compare actual versus target
- Access regression analysis, overspend, and custom charts
- Analyze energy consumption compared to a smart target for real-time energy management

Reports
A fully customized reporting feature allows you to generate instant or scheduled reports on energy consumption, costs, carbon emissions, performance versus targets, as well as tenant costs reports. Export reports in pdf format to share with key stakeholders.
Reports are an important tool for ongoing energy control by helping managers and key decision-makers keep track of energy-saving initiatives, verify if and where savings have been made, and when targets have been achieved.

Monitoring and Alarms
Alarms can be viewed via the map-based interface, particularly useful for a quick overview of multiple buildings in multiple locations for bureau or monitoring centers.
- Set, edit, and monitor alarms on-line
- Receive alarms by email

Reports anomalies detected in energy consumed versus expected consumption. Alarm reports can be issued via email. Analysis of historical alarms can help identify potential ongoing issues.

Data Integrity
Continuously monitors data collection and alerts you if data has not been collected. This ensures full data integrity.

Data Collection
ABB Ability BE SustainableTM with Active Energy is an agnostic energy management platform that can collect data from most BMS, data logging, AMR, and Enterprise Level systems. ABB offers a range of metering and data collection hardware solutions to collect data from a building where no existing data collection solution is available. In addition, historical data can be manually uploaded to the system to enable trend analysis.

EV Charging

An electric vehicle charging service is an opportunity to add value to mid-size office buildings and contribute to sustainable mobility. Company car parking lots are the ideal place for this type of service as they are used during both the day and the night.
ABB charging infrastructures can offer an efficient solution at all levels, for both short- and long-term stays.

EV Charging

Medium size and large hospitals generally include an open parking space, which nowadays shall be equipped with Electric Vehicle (EV) charger, access can be provided to via code or via access card and both visitors, patients and hospital's employee can use them. Refer EV section for more product details. Car parks are also equipped with lighting control system which can be controlled timer or external brightness sensors to provide maximum energy saving.

Either wallbox EV charger and floor standing fast EV chargers can be provided, ABB's Terra DC fast chargers are designed for quick, convenient charging of all electric vehicle models, including those equipped with high voltage battery systems. The Terra's compact size makes it perfect for public and fleet use, while its modularity allows an increase of charging power up to 180 kW and serve up to three electric vehicles at the same time.

The Terra family of DC fast chargers includes the Terra 24 to the Terra 184 (20 to 180 kW), including the Terra 54 – the most deployed 50 kW charging station across Europe and North America.

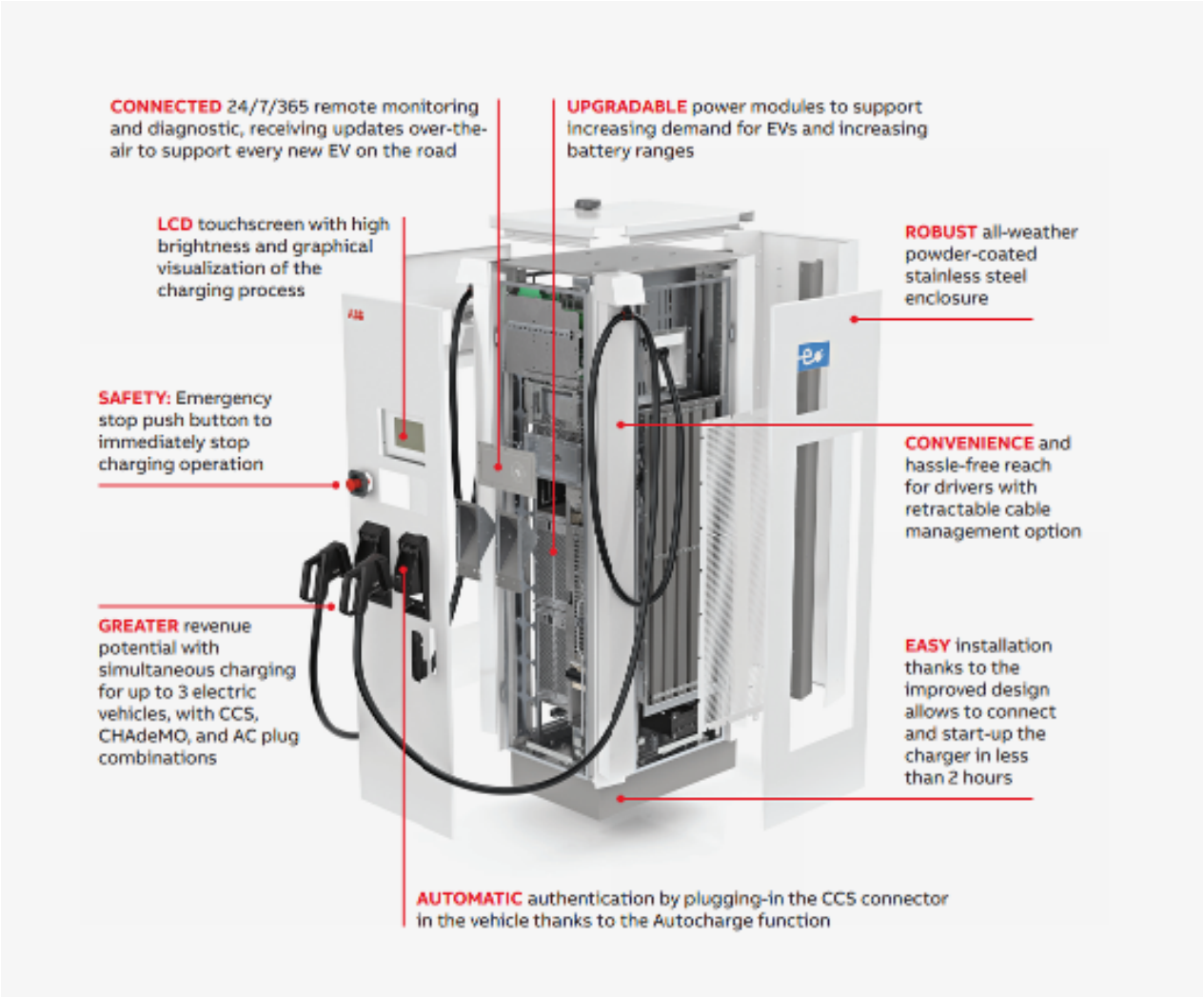


ABB Ability™

A single solution for all your asset and energy management needs

ABB Ability™ Energy and Asset Manager is a state-of-the-art cloud solution that integrates energy and asset management in a single intuitive dashboard. Providing full remote visibility of asset and electrical-system behavior, ABB Ability™ Energy and Asset Manager provides insights that help to minimize cost and risk and maximize performance and safety across operations.

A powerful building-management tool that lets stakeholders:

- View, manage, and optimize building systems from anywhere, at any time
- Implement predictive (condition-based) maintenance, ensuring the reliability and availability of your power system and equipment
- Optimize energy-usage in real time to achieve maximum energy efficiency and lower costs

ABB Ability™

A single solution for all your asset and energy management needs

Energy Manager

Facility Manager

Asset and Maintenance Manager

Field Service

ABB Ability™ Energy and Asset Manager

Energy Manager

- Optimize energy bill
- Avoid energy waste
- Cost allocation

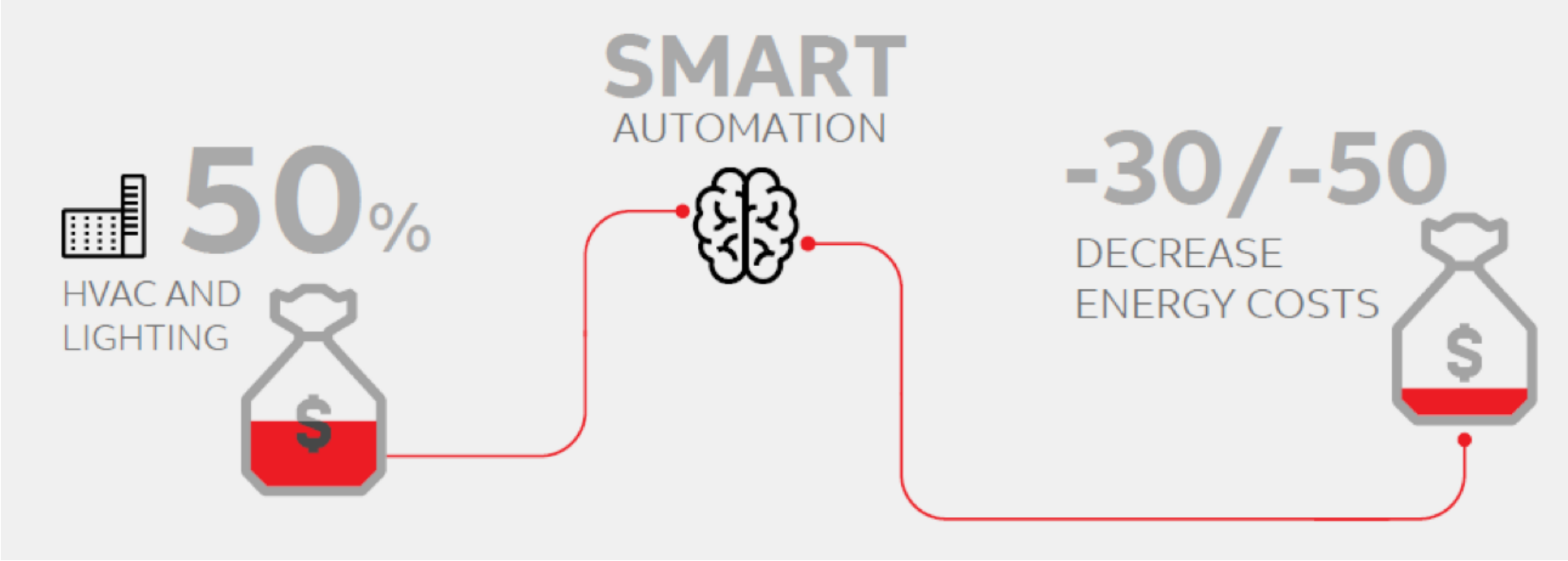
Asset Manager

- Reduce total cost of ownership
- Maximize uptime
- Improve safety

Energy and Asset Manager
The business value of better performance

Proper energy and asset management improves overall performance, savings up to:
- 20% on energy bills
- 100% on unplanned labor
- 40% on maintenance costs
- 30% on operational costs

Monitoring can be segmented down to individual pieces of equipment and/or sub-systems - such as an elevator, a single HVAC system, or a production line.



Energy and Asset Manager
The business value of better performance

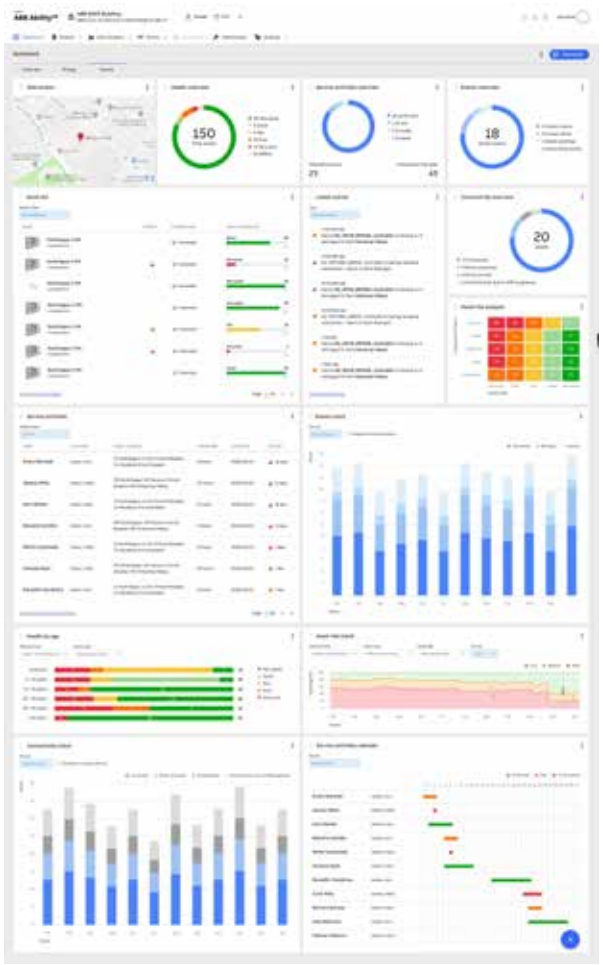
Energy Manager

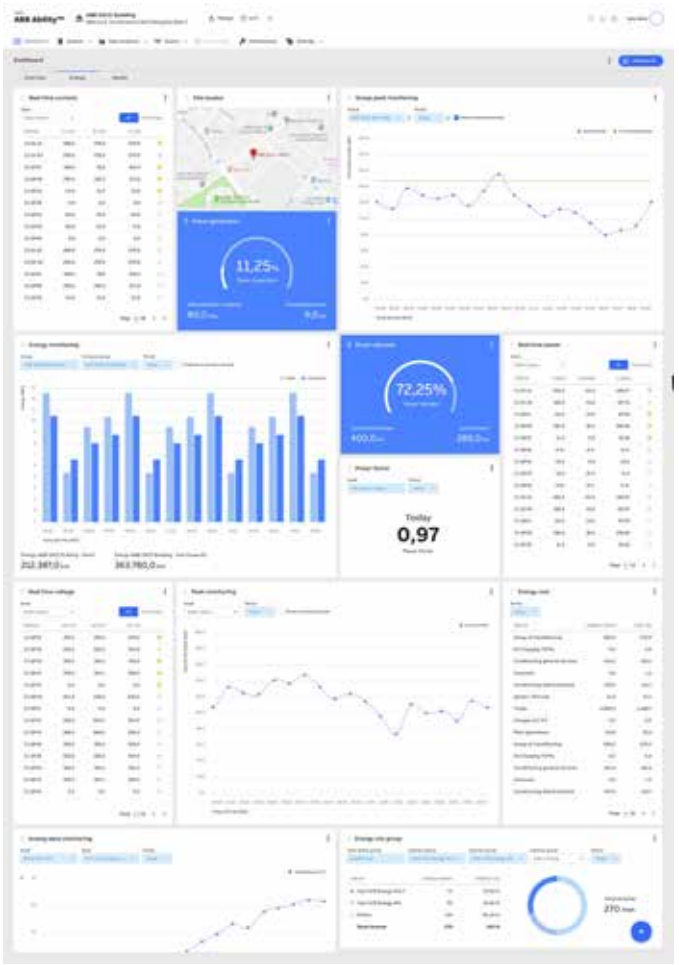
Energy efficiency has become essential to running cost-efficient operations. ABB Ability™ Energy Manager provides real-time understanding of your energy consumption and identifies areas of improvement.
And it's scalable, from a single site to a multi-facility system with hundreds of users.

- **Monitor**
  Discover Site performance, supervise the electrical system and allocate costs.

- **Analyze**
  Schedule automatic data exports, improve the use of assets and take the right business decision.

- **Act**
  Set up alerts and notify to key personnel and remotely implement an effective efficiency strategy to achieve energy savings in a simple way.





Energy and Asset Manager
The business value of better performance

Asset Manager

ABB Ability™ Asset Manager sets a new benchmark for simplicity and flexibility in asset-performance management. It gives you the power of seeing and optimizing your site equipment behavior anytime, anywhere via an intuitive graphic interface, resulting in greater reliability and availability and minimized unplanned maintenance.

- **Condition Monitoring**
  Provide granular visibility of your asset behavior in real time for both LV and MV environments.

- **Predictive Analytics**
  Detect potential faults through condition assessment, performance trends and pre-alarm notifications.

- **Maintenance Planning**
  Root-cause analysis of asset condition enables predictive maintenance that significantly reduces unplanned downtime and operational costs.

Supervision system

Customer can use a third-party control and monitoring system or rely on ABB experience using ABB's ZEE600 SCADA system, which handles real-time monitoring and control, also including energy metering and reporting capability.

ABB ZEE600

ABB ZEE600 integrates all ABB's electrification products and applications, the result being a state-of-the-art product with the advantages of a commercial off-the-shelf product, incorporating several electrification libraries, ready for the user in hospital applications. For example standard displays that provide common look and feel for both ABB Relion medium-voltage relays and ABB Emax 2 intelligent low-voltage circuit breakers, Standardized IEC and ANSI substation symbols for single line diagram displays and standardized pages displaying, for example, alarms, events and reports.
Thanks to this SCADA and advanced communication technology, from medium voltage to low voltage, it is possible to get a more complete view of power distribution to ensure reliable power supply to provide high standards of care to patients, together with the possibility to integrate several other systems such as the automation once.

ABB ABILITY ENERGY MANAGER

ABB Ability Energy Manager is also a perfect solution to support the introduction and development of an energy management system compliant to ISO 50001, enabling definition of energy baseline and key performance indicators, for the entire installation and for single departments.

ABB AbilityTM Energy Manager provides real-time understanding of your energy consumption and identifies areas of improvement. And it's scalable, from a single site to a multi-facility system with hundreds of users.

ABILITY ASSET MANAGER

In the interests of both comfort and safety of customers, it is also important to avoid the occurrence of power outage, hotel operators need to optimize asset management, schedule maintenance to keep the electrical system safe and efficient and constantly monitor it to immediately detect any possible incipient danger.
Thanks to ABB Ability Asset Manager and devices with integrated digital solutions it will become easy to get a granular visibility of asset behaviour in real time for both medium voltage and low voltage systems.

At the same time ABB Ability enables asset optimization, preventive maintenance is the key to ensure the reliability of installed switchgear. Electrical devices in digital switchgear not only protect and control the flow of electrical energy, they also collect a vast amount of condition or condition-relevant data. Through the new ABB Ability Edge Industrial gateway, the same as used for the energy management, the user can monitor the condition of the entire electrical system with its digital medium and low voltage switchgear.

Designing innovative solutions for hospitals

General references
Legislative Framework

Standard IEC 60364 “Low-voltage electrical installations”

The main reference standard for electrical installations in offices is the IEC 60364 standard and its national implementation.
The standard specifies the requirements for the design and construction of a low voltage electrical system. low voltage electrical system.
The standard is composed by 8 main different parts.

EN 12464-1 ”Light and lighting - Lighting of work places - Part 1: Indoor work places”

The standard specifies lighting requirements for people, in indoor workplaces, that meet the visual comfort and visual performance needs of people with normal ophthalmic (visual) ability. All usual visual tasks are considered, including those involving the use of equipment with video display terminals.

EN 1838 “Lighting applications - Emergency lighting”

The standard defines the lighting requirements for emergency lighting systems, installed in buildings or premises where such systems are required. It applies, primarily, to places intended for the public or workers.

EN 15232 “Energy Performance of Buildings - Energy performance of buildings - Part 1: Impact of Building Automation, Controls and Building Management”

The EN 15232 standard specifies:
- a structured list of building control, automation and technical management functions that contribute to a building’s energy performance; the functions have been classified and structured according to building regulations and so called Building Automation and Control (BAC);
- a method for defining minimum requirements or any other specifications for building control, automation and technical management functions that contribute to the energy efficiency of a building, which can be implemented in buildings of varying complexity;
- a simplified method for arriving at an initial estimate of the impact of these functions on representative buildings and use profiles;
- detailed methods for assessing the impact of these functions on a given building.

General references
Group Medical Locations

For the definition of the characteristics of electrical installations in sanitary facilities, the IEC 64-8 section 710 requires premises to be classified in advance according to their intended use and to identify the area to be accommodated the patient. This classification must be requested from the medical staff or in agreement with the health organisation, which must also indicate the medical treatment performed.

—

Group 0 rooms [IEC 64-8/7 Art. 710.2.5]
Medical location where no applied parts are intended to be used. These include outpatients' departments and massage rooms where electromedical devices are not used.

—

Group 1 rooms [IEC 64-8/7 Art. 710.2.6]
Medical location where applied parts are intended to be used externally or invasively to any part of the body, except for the cardiac zone. These are rooms where electromedical devices with parts applied externally or also internally to the patient's body - except for the cardiac zone - are used

—

Group 2 rooms [IEC 64-8/7 Art. 710.2.7]
Medical location where applied parts are intended to be used in applications such as intracardiac procedures, operating theatres and vital treatment where discontinuity (failure) of the supply can cause danger to life. These are premises where electromedical devices with catheters, with conductive fluids or electrodes are applied in the cardiac zone or directly to the patient's heart, with a consequent micro shock hazard. Group 2 rooms also include those in which patients undergo vital treatments, such that the lack of power supply may involve a risk to life, as well as operation preparation rooms, surgical plaster rooms or post-operative waking up rooms for patients who have undergone general anesthesia.

—

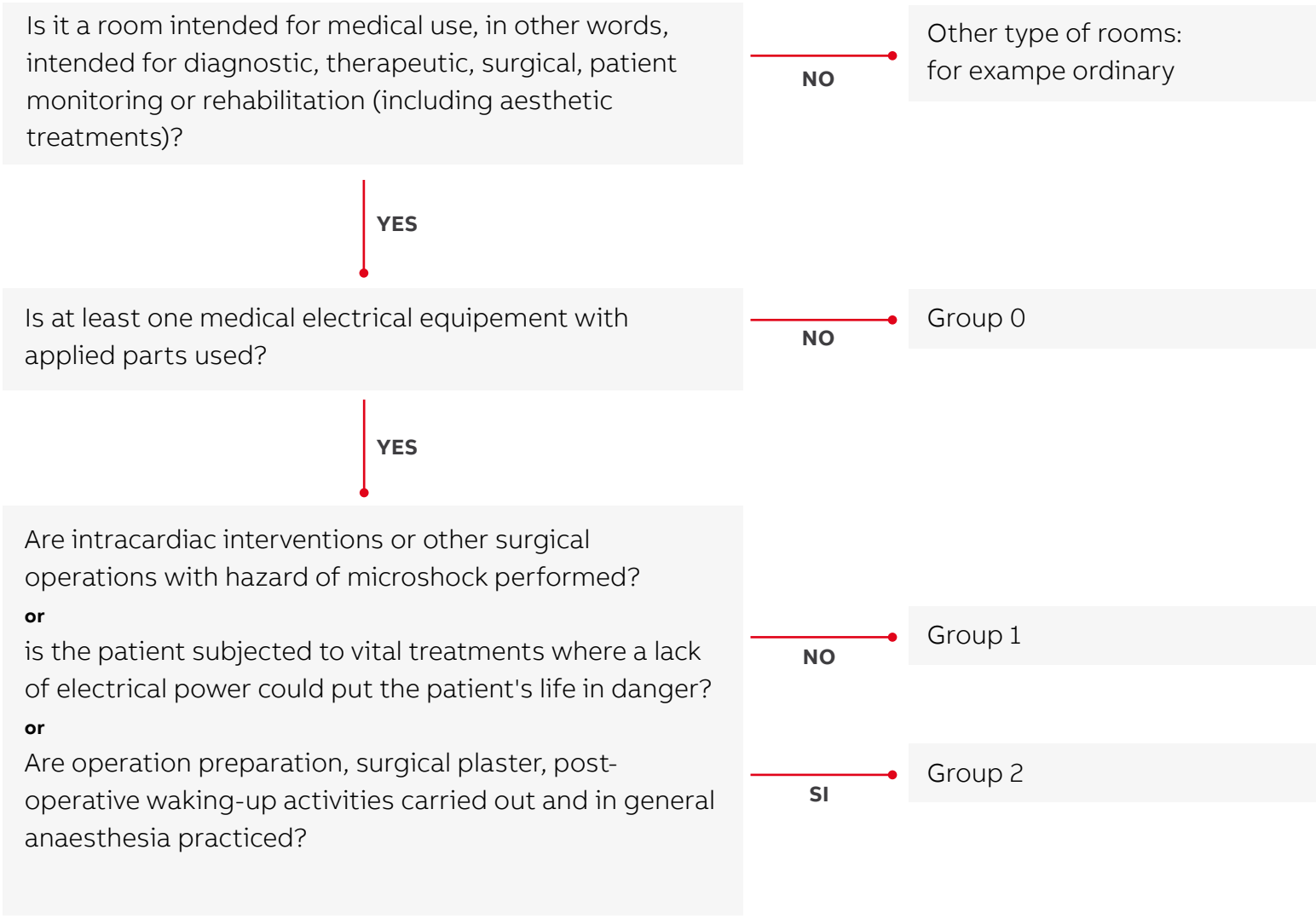
Ordinary rooms
These are service rooms for the medical structure, including offices, personnel rooms (for example, changing rooms, cafeteria, etc.), warehouses, access corridors to recovery rooms, service rooms, bathrooms for personnel, waiting rooms, etc.

—

Patient area [IEC 64-8/7 Art. 710.2.8] is any space where the patient with parts applies can come into intentional or unintentional contact with other electro-medical equipment, or electro-medical systems, with foreign objects or other people in contact with these elements.
The center of reference, for the patient area, can be the operating gurney, the recovery room, or, for example, the chair in a dentist's office. The patient area does not extend beyond 2.5 m from the walking surface and beyond the room unless the patient can turn and extend beyond the normal respective space (1.5 m radius).
The patient area can be a combination of the patient area relative to the positions where the patient can reasonably be located while in contact with applied parts.
Similarly, if the electro-medical devices are more than one and/or can be moved, the patient area is expanded to the entire room.
This considers possible movement that the electro-medical devices or the patient may be subjected to over time.

General references
Group Medical Locations

Flow diagram for classification of premises

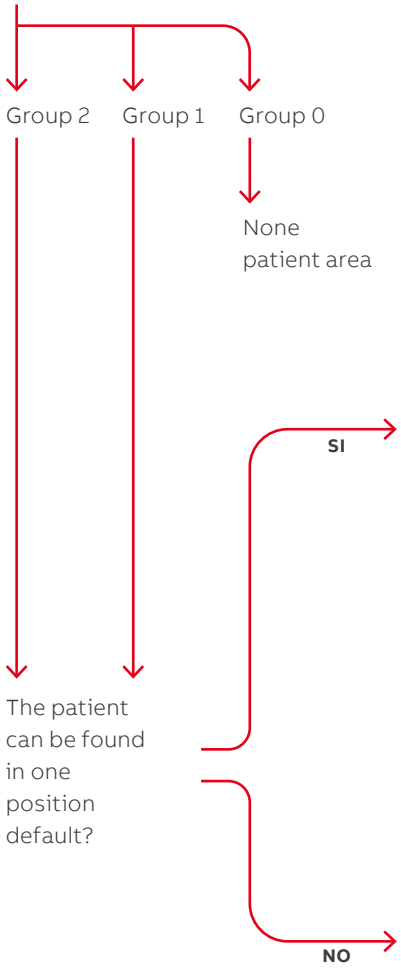


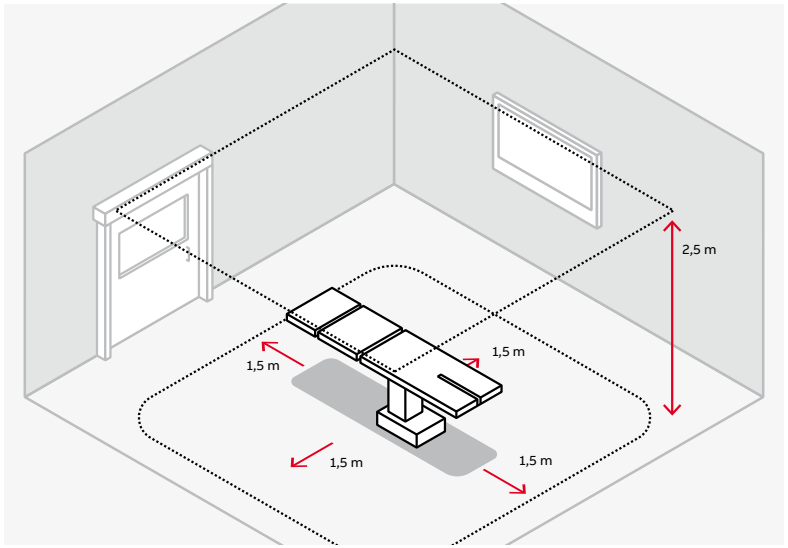
General references
Group Medical Locations

In the design phase, the determination of the patient area prevents connection to the equipotential node of any extraneous earth connections outside of the patient area, reducing the dimension of the node and simplifying installation with subsequent cost reduction.

However, it requires establishing all the possible positions where the patient could be located first, while in contact with an electro-medical device with applied parts; in contrast, if there is a risk of rendering the electrical system inadequate for medical purposes, it is required to move an electro-medical device with applied parts to a different position from its original position.

It may be opportune to consider the entire room as a patient area, allowing for more flexibility of use in the spaces.





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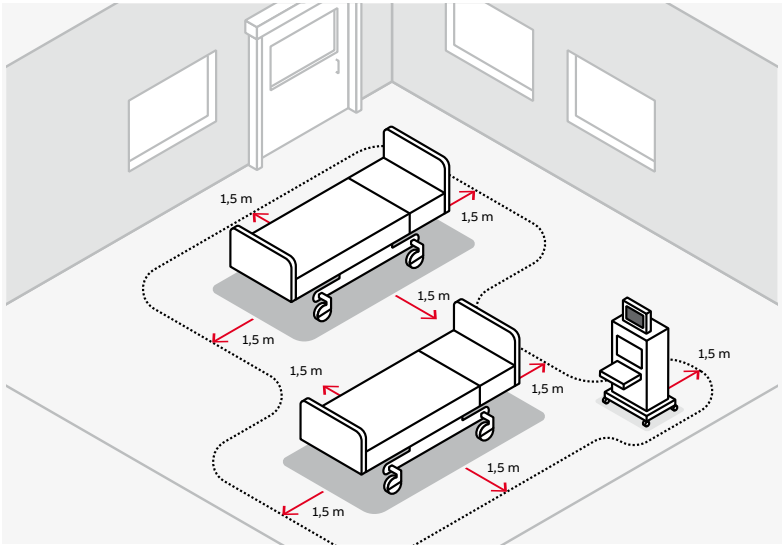
Fixed bed



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Mobile bed

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Patient area identification with fixed bed and mobile bed

General references
Protection Systems

Protection against direct contacts

For protection against direct contact with live parts, only insulation or segregation is allowed using barriers or coverings with protection grades not less than IPXXD (or IP4) for horizontal surfaces within hand's reach and IPXXB (or IP2X) in all other cases.

Protection against indirect contacts

Protection against indirect contact in medical facilities requires, according to the case, one or more combinations of the following:

a) Very low voltage safety systems (SELV and PELV)
b) Use of equipment with Class II insulation
c) Protection through automatic power supply breaking
d) Earth and equipotential connection
e) IT-M system (group 2 medical rooms)

Protection measures	Degree 1	Degree 2
Automatic power supply breaking	•	• For all circuits not powered by the IT-M system
IT-M system	-	•
Supplementary equipotential connection	•	• Conductors' resistance ≤0.2 Ω
Class II equipment	•	• Earth connection to equipotential node
Very low voltage safety systems (SELV e PELV)	•	• Earth connection to equipotential node

System for protection measures against direct contact

General references
IT-M Systems

The IT-M is powered by a specific medical insulation transformer (CEI EN 61558-2-15) that is equipped with a permanent control device according to the provisions set forth in standard CEI EN 61557-8.

The IT-M system is not mandatory but is recommended in the group 0 and 1 room, while in group 2 rooms it is mandatory in the patient area, for the sockets and plug and for the fixed equipment within hand's reach.

IT-M insulation transformers
Standard CEI 64-8/7 states:
- transformers must be installed inside of medical rooms or in the immediate vicinity, outside of medical rooms not more than 30 meters away.
- the nominal voltage Secondary transformers must not exceed 250V A.C.
- the transformers must comply with standard CEI EN 61558-2-15 (CEI 96-16) as applicable.

Moreover, they must respect the following requirements:
- the dispersion current towards the earth of the secondary winding and the dispersion current on the covering, measured empty and with the transformer supplied with power at the nominal frequency, must not exceed 0.5 mA
- for systems with medical insulation transformers, mono-phase transformers cannot be used with nominal output power not less than 0.5 kVA and not greater than 10 kVA
- if three-phase power supply is also required through a system with a medical insulation transformer, there must be a separate three-phase transformer, with nominal secondary voltage not greater than 250 V.

Other rules for transformers:
- They must be air cooled
- They must have double or reinforced insulation between the windings and the earth connection for the equipment;
- A metallic shield may be placed between the two windings to connect to the earth
- The difference between the empty secondary voltage and the loaded secondary voltage must not exceed 5%.
- The primary empty current must not exceed 3%
- The insertion current (peak) must not exceed 12 times nominal current
- The label of the transformer must have the symbol:

The power of the insulation transformer depends on the type of room in consideration, the absorption of the connected utilities, the maintenance needs and continuous service needs. The IT-M system powers an average of at least 6 socket groups:
- 2 socket groups for the surgeon
- 2 socket groups for the anesthesiologist
- 2 wall-mounted socket groups.

For very large cardiac surgery rooms, absorption up to 15 kVA may be installed, which in general uses two 10 kVA insulation transformers to ensure extra power for future expansion.

One transformer can power the wall-mounted sockets, while the other can power the cabinet sockets.
In normal operating rooms or clinics, the transformer power can decrease to 7.5 - 5 - 3.5 kVA. In any case, it is preferable to over-estimate the power to have available power for future expansion without having to alter the system.

The transformer for the IT-M can be installed in a medical room outside of the patient area and its longest powered line must fall within 30 m (art. 710.512.1.1.).
It must be protected upstream by the installer, but only with a short circuit and not overload, for better service continuity. The installer is required to check the currents, while the over-temperature must be monitored by a PTC probe, inserted by the builder, which in the case of need activates an excessive temperature alarm.
Each IT-M line is protected by short circuit and overload and the entire IT-M system must have its own insulation monitor. In the case of an additional upstream transformer (like for the 24 V lines for operating lights), another monitor is required for the new powered system with the usual sensors and alarms.

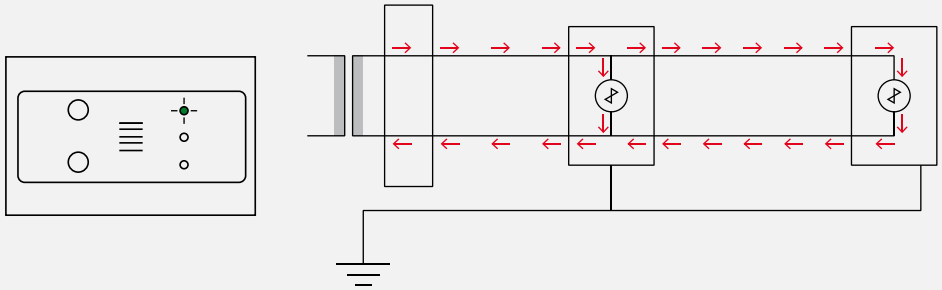
General references
IT-M Systems

Insulation monitor
An IT-M must be powered with a medical insulation transformer and must be equipped with a permanent insulation control device, in compliance with attachments A and B of standard CEI EN 61557-8 (CEI 85-28).

The insulation "monitor" must have some essential requirements:
- internal impedance not less than 100 kΩ;
- alarm circuit voltage less than or equal to 25 V;
- testing current, also in the case of fault, less than or equal to 1 mA in D.C.;
- alarms:
  - green light for normal operations;
  - yellow light and acoustic signal for insulation fault under threshold (acoustic signal can be deactivated, optical is permanent)
  - signal in case of interruption of earth connection or measuring circuit.

The insulation control device must not be able to be removed.

—
No breakdowns.
No dangerous currents circulate on the PE and the user devices work regularly.



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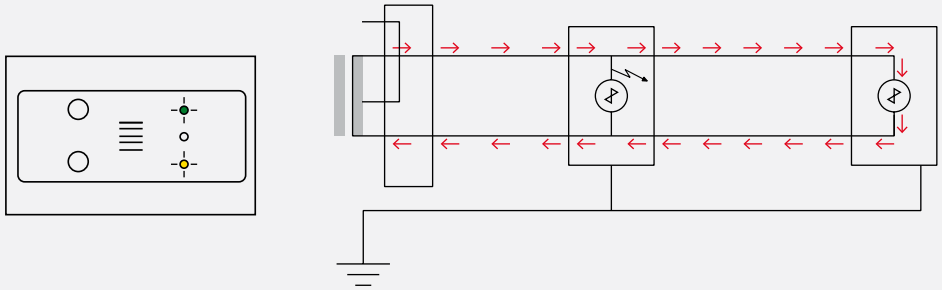
First failure.
There are no dangerous currents flowing on the PE, but the first user device remains outside.



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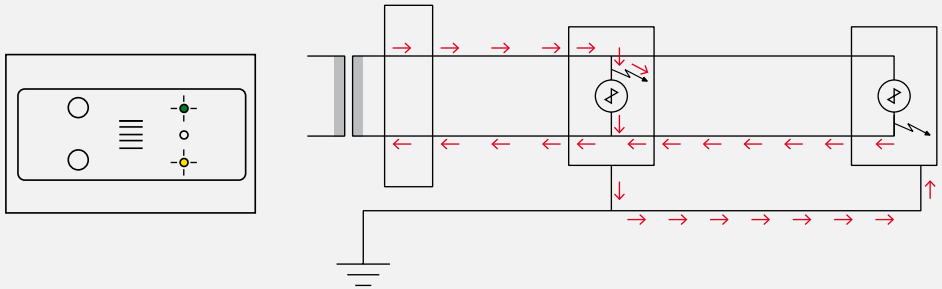
Second failure.
Due to the current flowing on the PE it is necessary to disconnect the power supply to the IT network as the protection obligation cannot be fulfilled.



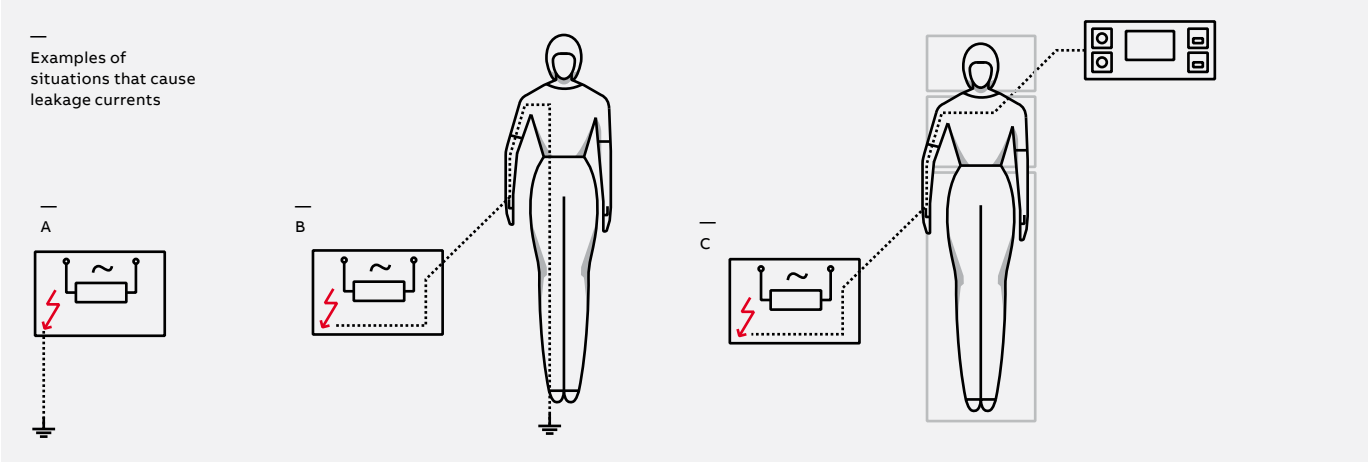
General references
IT-M Systems

Current external from the system, for example:
a circulating dispersion current in an electrical apparatus, caused by greater vulnerability in the patient, can cause elevated damage: in recovery it is sufficient to have current of a few tens of micro-ampere to determine ventricular fibrillation, in contrast to what occurs in "normal conditions", where this value is more acceptable. The dispersion current can be classified into three distinct types:

- dispersion current towards the earth (not part of the protection conductor - Figure A);
- contact current, which crosses through the person in contact with the live covering caused by a fault in the insulation (Figure B);
- dispersion current in the catheterized patient flowing towards the earth (Figure C);

For each of these, there are admissible values that depend on the type of electro-medical equipment in compliance with CEI 62-5 "Electro-medical equipment General safety standards", applied to electro-medical equipment destined for use by qualified persons or under the supervision of the same, in the area surrounding the patient, or in relation with the patient, to directly influence the safety of people and animals in that same area.
The standard specifies requirements for transport, warehouse storage, commissioning, use and maintenance on said equipment in the environmental conditions specified in the standard or by the manufacturer, or set forth in special standards.

The purpose is to establish a satisfactory level of safety for all electro-medical equipment used in the area surrounding the patient and to be used as the basis for safety requirements in special standards for the single types of equipment.



Examples of situations that cause leakage currents

Apparatus with parts applied type B	Less sure
Apparatus with parts applied type BF	Safer
Apparatus with parts applied type CF	Even safer

Types of electro-medical devices with applied parts

Current of dispersion [mA]	Conditions	Type of applied part		
		B	BF	CF
Towards the ground[1]	Normali	5	5	5
	Di primo guasto	10	10	10
Contact	Normali	0,1	0,1	0,1
	Di primo guasto	0,5	0,5	0,5
In the patient[2]	Normali	0,1	0,1	0,01
	Di primo guasto	0,5	0,5	0,05

Admissible values for leakage currents (IEC 62-5)

[1] Vary compared to previous editions of the standard IEC 62-5.
[2] In case of direct current the limits for the applied parts type B and BF are a tenth of those indicated. Furthermore, higher values are allowed for particular conditions.

General references
Load classification

Classification of loads with respect to power availability.

Type	Definition	Power Supply
Ordinary	They affect the smooth operation of all services, but their absence does not lead to situations of danger or serious discomfort	Ordinary
Preferential	They affect the smooth operation of all services, but their absence does not lead to situations of danger	Reserve
Privileged	They affect people safety or essential services	Safety

Example of preferred loads and their power source.

Preferred Loads	Power	Source Supply
Loads that guarantee the operation of the structure	Reserve	MV network, absolute uninterruptible power supply or stand-alone unit, generator set

Example of privileged loads and their power source.

Preferred Loads	Power	Source Supply
MV/LV cabin safety and alarm circuits	Security	Redundant and independent MT network, absolute UPS or stand-alone group
External lighting		
Security lighting		
Smoke and fire detection system		
Fire alarm		
CED utilities		
Office privileged users		

General references
Power quality

The public network of electric power supply is affected in a more or less relevant way by disturbances coming from the distribution networks and from the loads supplied by them that can easily lead to malfunctions and failures.
In other words, the characteristics of the power supply do not always correspond to the expected ideal characteristics.

The increasing diffusion of sensitive components has progressively made previously accepted levels of power quality critical.
Beyond the well-known contractual obligations that exist in the purchase, from the point of view of a user the electrical energy product is requested to have two fundamental characteristics: it should have a high availability and not cause malfunction, degradation or damage to the supplied loads.
The quality of the electric energy that a generic user considers necessary for his activity is not an absolute concept, but it depends on the susceptibility of the users to the phenomena considered (technical aspect) and on the consequences of the inefficiencies (economic aspect) resulting therefore variable from case to case.
In general, responsibility for satisfying this requirement depends only partially on the distribution company.

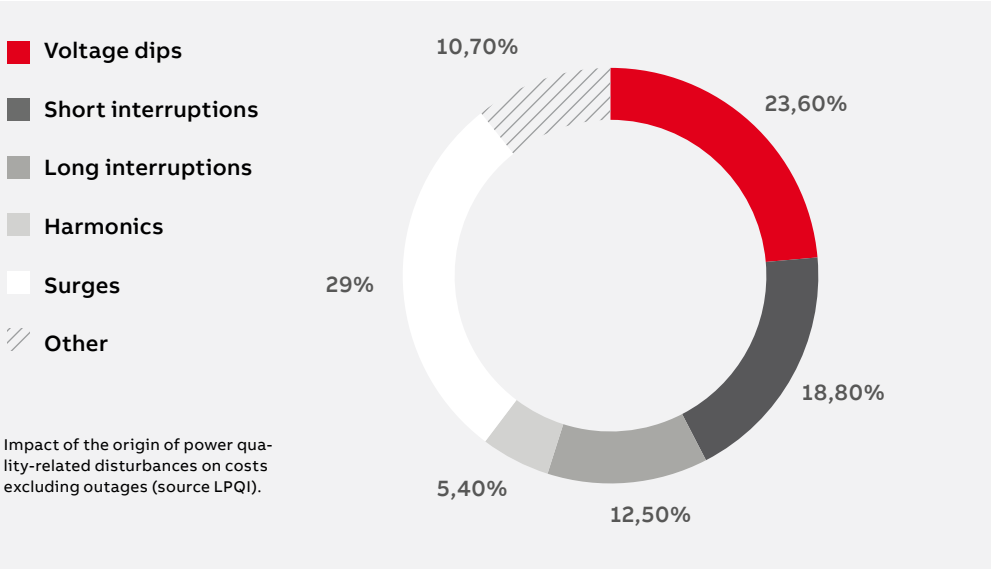
Electricity is in fact a particular product: it is never used as such by those who buy it, but it is always transformed and modified. In general terms, comparing electrical energy with other consumer products, it can be said that while the quality of most of these is completely determined by the producer and his distribution chain, in the case of electrical energy the quality of the final product is determined not only by the above mentioned figures, but also by the final consumer, or rather by the user at the very moment in which he uses it.

Moreover, achieving the best technical-economic compromise is not always easy and must be carefully evaluated.

General references
Power quality

The disturbances of greatest interest affecting the operation of an electrical component or user are:

- long or short duration power interruptions due to faults in the network;
- Voltage variations of short duration due to the insertion of heavy loads or faults in the network;
- dissymmetries in the power supply voltage system;
- flicker due to large intermittent loads;
- the distortion of currents and voltages due to the effect of non-linear loads present in the same system or in the systems of other users, etc.



Impact of the origin of power quality-related disturbances on costs excluding outages (source LPQI).

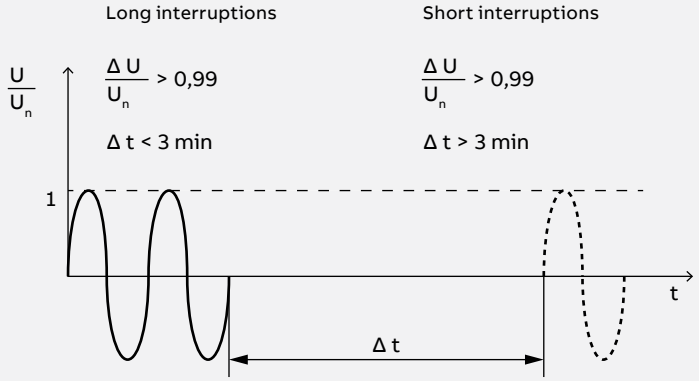
Origin and effects of power quality disturbances.

Disturbance	Origin	Effects
Frequency Variations	Disconnection of large generators Switching of large loads Faults Generator set operation	Speed variation in motors
		Malfunctioning of electronic devices that use frequency
Rapid voltage variations	Insertion of loads Loads with variable absorption Natural overvoltage Interruption and disconnection	Untimely intervention of protections
		Flicker (if the variations are repetitive)
		Malfunctioning of electronic equipment
		Irreversible equipment failures
Voltage dips and short interruptions	Faults Transients	Irregularities in the operation of motors
		Malfunctioning of electronic equipment
		Improper intervention of relays
Harmonics	Non-linear loads Variable speed drives Fluorescent lamps Static converters Arc furnaces Welders	Malfunctioning of protections
		Increase in copper losses
		Increase in dielectric losses
		Increased iron losses in electrical machines
		Unstable operation of motors
		Interference on telecommunication circuits
		Irreversible damage to power factor correction filters
		Aging of components
Dissymmetry	Unbalanced loads	Overheating of rotating machines and rectifiers

General references
Power quality

Interruptions are characterized in terms of duration.

Long duration outages depend on permanent faults occurring in public distribution networks or within the user's facility.
The duration can vary from a few minutes to several hours in the most critical cases.
European standard EN 50160 defines short interruptions as those lasting less than three minutes.
Micro-interruptions are linked to faults occurring on the distributor's networks that are eliminated by automatic reclosure operations. The duration is normally less than one second. Micro-interruptions do not have a regulatory definition.

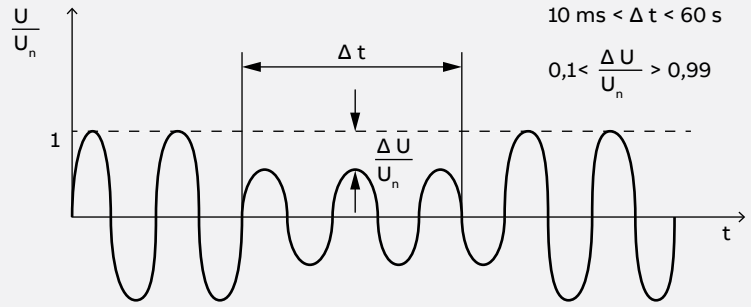


Accidental power outages

All elements of an electrical system are sensitive, in different ways, to long or short voltage interruptions.

Voltage dips are commonly characterized in terms of amplitude and duration.

In addition to the events already mentioned that directly result in a power failure, a load can also be disturbed by events that occur on other lines in the same system, causing voltage drops on the power system. The magnitude of the disturbance may vary within wide limits depending on the distance between the point where the event occurs and the cabin busbars or the switchboard.



Schematic representation of a voltage dip.

Voltage fluctuations cause undesired effects in all those users that require a stable power supply for proper operation. It is worth mentioning among others the whole IT world.

General references
Scheme

Electricity distribution systems are a fundamental infrastructure in the advanced service sector, which contributes to determining its performance in terms of safety, availability, reliability and maintainability.

If the safety of the plant is an essential property as a legal requirement, the reliability, availability and maintainability instead are characteristics of the plant that have a direct impact on the business.
In this sense, the choice of the distribution scheme is one of the fundamental elements of the design of an electrical system, regardless of the greater or lesser complexity of the system on which the analysis and development of the solution will depend.

General references
Scheme

Fundamental diagrams of electricity distribution

The possible configurations that an electrical distribution system can assume can generally be traced back to three fundamental schemes in addition to the mesh scheme typical of distribution companies:

- the simple radial scheme;
- the double radial scheme;
- the ring scheme.

The table shows, in summary form, the main characteristics and a comparative, qualitative assessment of these three schemes.
Qualitative, comparative summary of the main characteristics of the three basic electricity distribution schemes

Features	Scheme		
	simple radial	**double radial**	**ring-shaped**
Reliability	minimum	maximum	average
Service continuity	minimum	maximum	medium (1)
Voltage constancy	minimum	maximum	medium (2)
Energy Losses	maximum	minimum	medium (2)
Initial Investment Cost	minimum	maximum	medium
Cost of operation and maintenance	minimum	maximum	average
Flexibility	minimum	maximum	average
Simplicity (controllability)	maximum	average	average

(1) Provided that short interruptions in service are acceptable in the event of faults or work on the system.
(2) It is a function of where the loop is kept open.

General references
Scheme

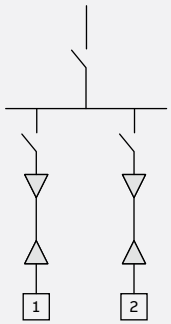
Simple radial scheme

In a simple radial scheme, the power is derived from a system of main busbars, from which the energy is then distributed radially to individual consumers or secondary busbar systems.

The simple radial scheme has the following advantages:
- Minimum material and installation costs;
- extreme simplicity in the operation of the plant (operations, maintenance).

On the other hand, the simple radial scheme has the following disadvantages:
- a failure in any point of the system starting from the supply point causes the total outage of the downstream elements;
- a failure on the power supply or on the main busbars causes total out of order of the plant;
- no flexibility in case of maintenance, checks, modifications, expansions because of the impossibility to temporarily put an element of the plant out of service, without this implying the shutdown of a part or, at the limit, of the whole plant.

Example of simple radial diagram



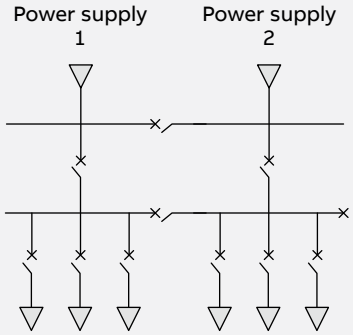
Double radial scheme

The double radial scheme basically consists of the combination of two simple radial systems, which from upstream to downstream extend associated with each other.

The double radial scheme has the following advantages:
- The out-of-service of one element of the system does not cause the downstream elements to be completely out-of-service;
- Flexibility in case of maintenance, verifications, modifications, expansions, since it is possible to temporarily put an element of the system out of service, without stopping a part or, at the limit, the whole system.

On the other hand, the double radial scheme involves the following disadvantages:
- Cost of materials and installation;
- more complex plant operation (operations, maintenance).

The duplication of system components can be extended to a single user, or, more frequently, to one or more distribution nodes. Redundancy must be achieved not only with respect to the power components but also with respect to the components of a possible command and control system.
In a double radial scheme all distribution boards are equipped with two sections of busbars separated by a switch (junction), which can be open or closed army.



Example of double radial diagram

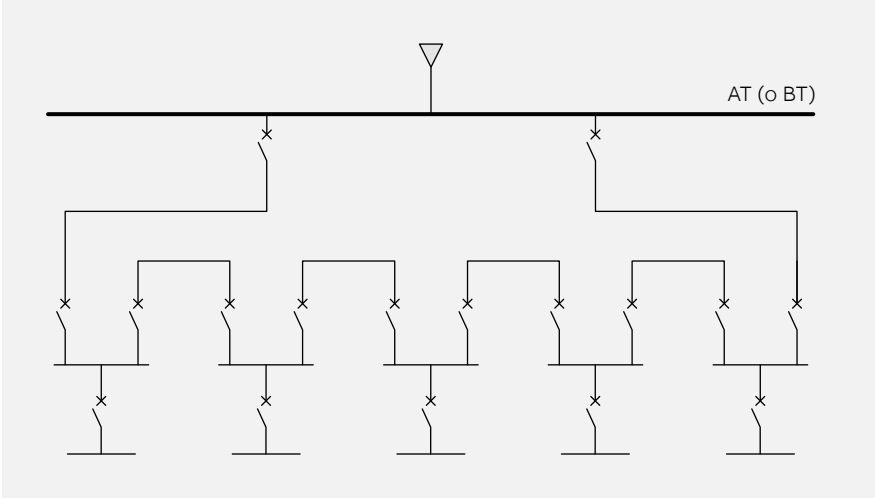
It is therefore clear that, if higher levels of reliability are to be achieved (which is desirable if a dual radial distribution system is to be set up), an alternative power source characterized by a much higher level of reliability than that considered must be provided, such as, for example, a generator set or static uninterruptible power supply system.

General references
Scheme

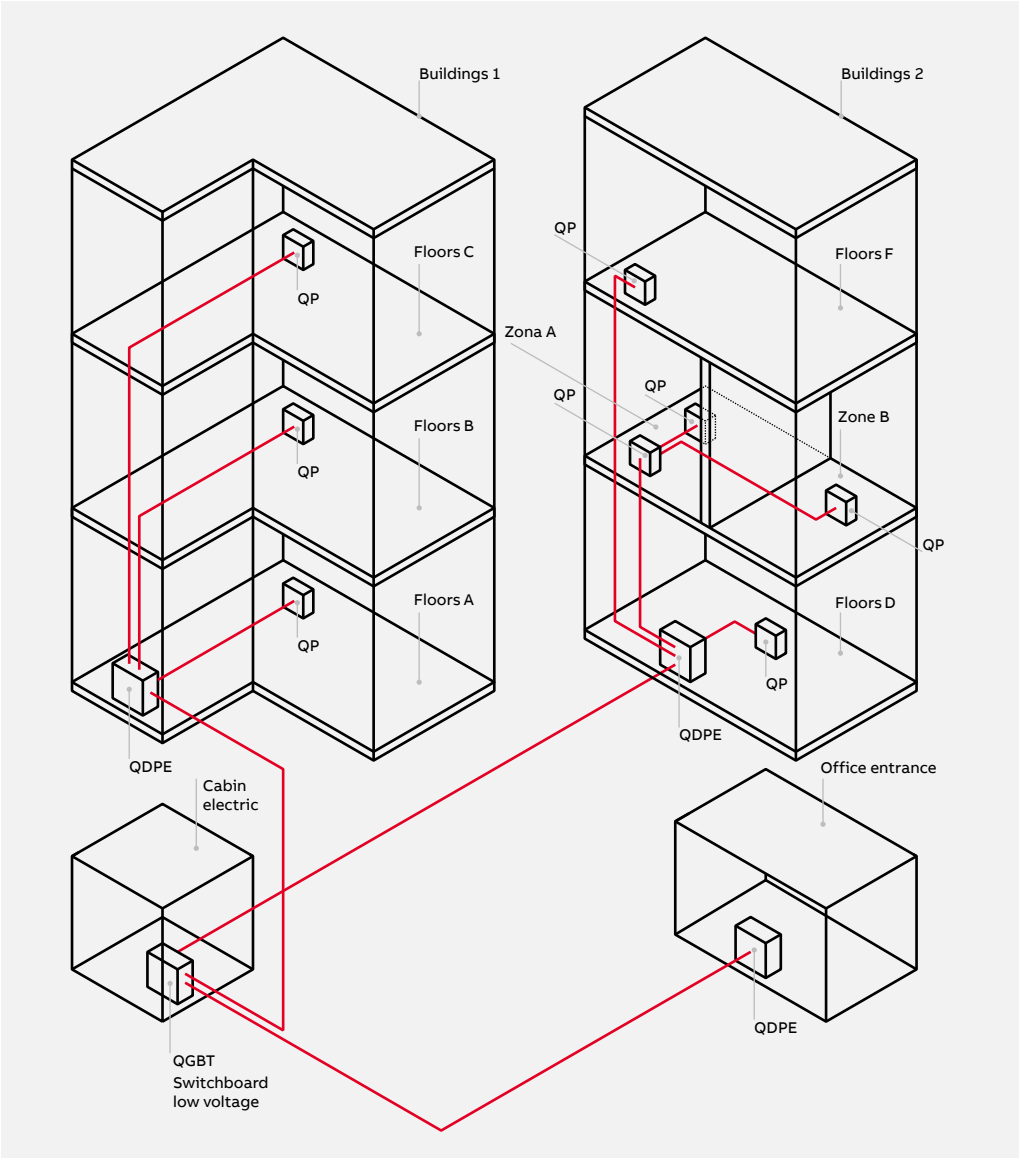
Ring scheme

This scheme connects the various user nodes in a ring, for each of which two alternative supply routes are available.
The ring scheme is a compromise between the previous schemes and as such has the following advantages and disadvantages:

- failure of one element of the supply causes the total outage of the plant, while downstream failures can be managed to keep the remaining part of the plant live;
- flexibility, cost of materials and installation are lower than those of the double radial scheme, but higher than those of the simple radial scheme.



Power Distribution
Electrical Switchboard



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Representation of the star distribution system used in healthcare facilities

All electrical panels must comply with the requirements set forth in standard CEI EN 61439-1 and possibly CEI EN 61439-3 and CEI 23-51.

In medical areas, the following types of panels may be necessary depending on size:
- general low voltage panel (GLVP);
- building distribution main panel (BDMP);
- department panel (DP);
- surgery room panel (SRP).

The main panel and the building distribution panel should be located in dedicated rooms that are not directly connected with areas destined for public use, and not in proximity of flammable structures or flammable substances.

Direct contact protection		External influence protection	
IPXXD (IP4X)	For horizontal surfaces within hand's reach	IPX4	in premises where liquids are usually spread
IPXXB (IP2X)	In all other cases	IPX5	in premises where the use of water jets is foreseen for cleaning

Power Distribution
Electrical Switchboard

Main panel

Panel destined for distribution of ordinary power (mains) where, as an example, the following are installed:

- main protection devices and cut-off devices;
- measuring instruments and possible devices for remote control;
- protection devices for the lines that supply power to, for example: auxiliary cabin utilities; auxiliary power generation utilities; main distribution lines of buildings, distribution lines to external utilities of buildings; technological rooms (air conditioning, heating and water systems).

Building distribution main panel

Panel destined for ordinary and safety distribution (through generator unit), where the following are installed:

- main protection devices and cut-off devices;
- measuring instruments and possible devices for remote control;
- protection equipment, preferably suitable for disconnecting the lines that feed the utilities that require power supply from the generator (fire prevention system, lifting system).

Department panels

The department panels can coincide with the main building distribution panels.

If these panels are located inside of the pavilion or the department, it is preferable that they are set up in a dedicated room. It is recommended that they are equipped with doors in glass (or transparent plastic material) to facilitate checking the condition of the equipment. The destinations of the output lines from the panel depend on the functions carried out in the department.

Power Distribution
Electrical Switchboard

For group 2 surgery rooms, in addition to the power supply panel for the ordinary circuits it is also necessary to install a panel destined for power supply to the IT-M system.

1 Over-voltage discharge
2 Insulation transformer
3 PT100 temperature probe
4 230 V line insulation monitor
5 24 V line insulation monitor
6 220/24 V - 1 kVA transformer

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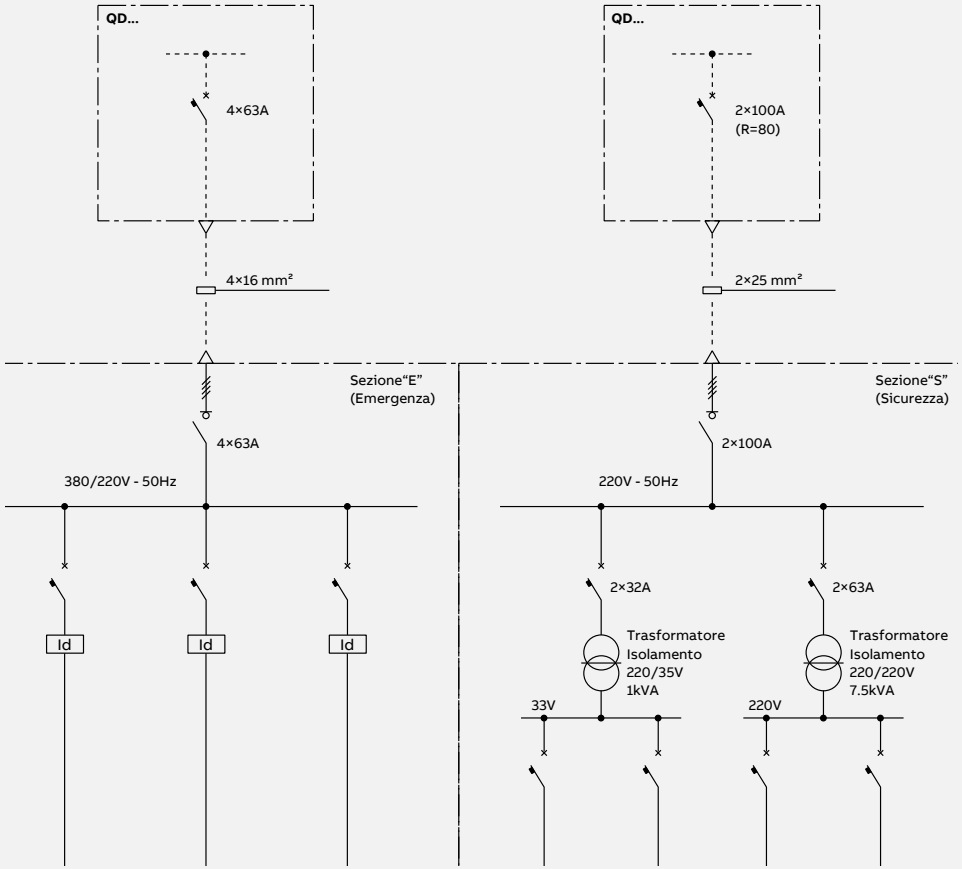
Power supply panel
of the IT-M system

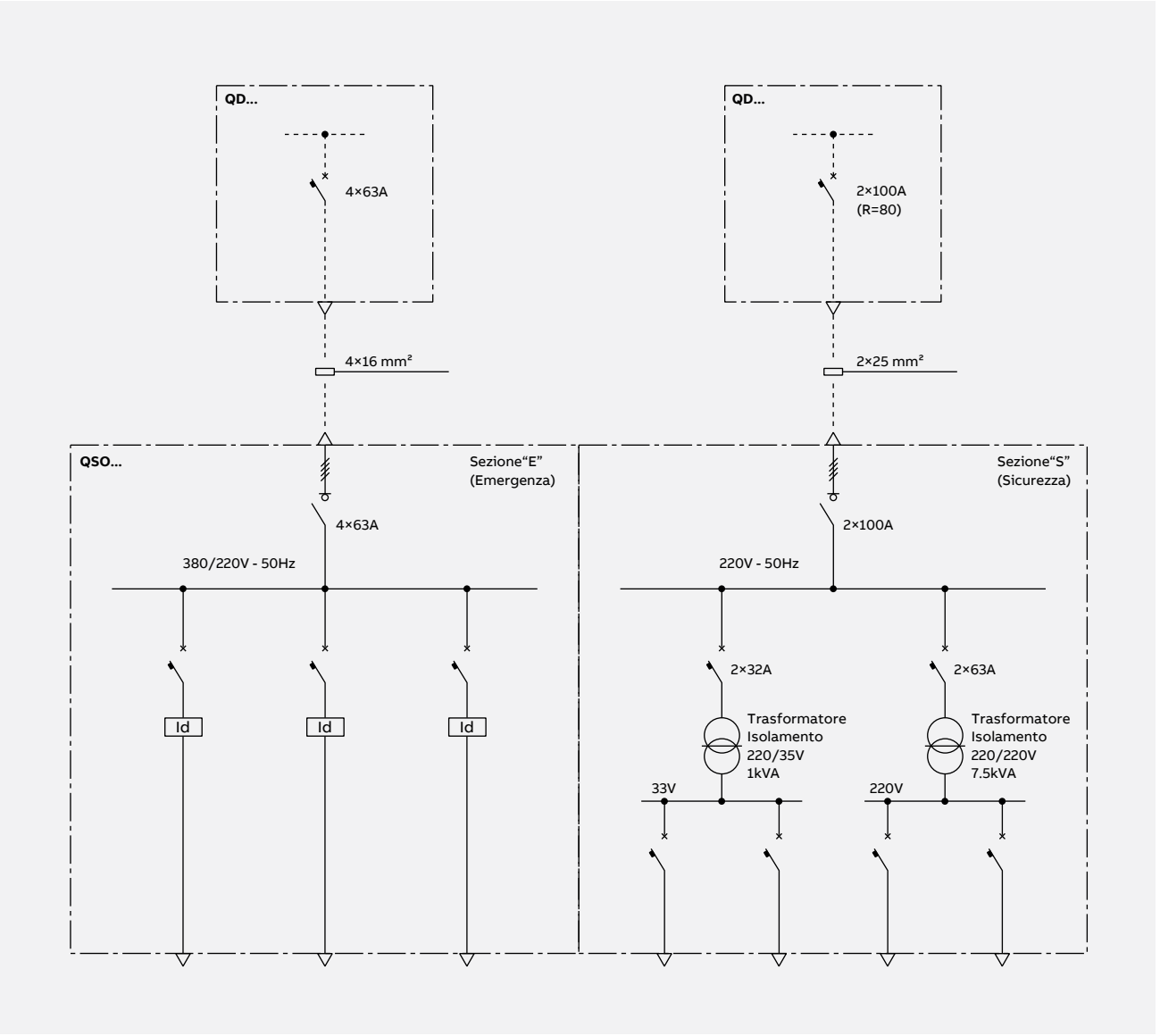


Power Distribution
Electrical Switchboard

The use of a single panel that contained two distinct sections for IT-M system equipment and power supply equipment to the rest of the utilities is allowed.
In the absence or ordinary power supply, the panel must be connected to the safety power supply from the uninterrupted power supply (UPS).
This improves the continuity of service of all the equipment powered by IT-M in the room and guarantees high quality in the power supply to the electro-medical devices that are especially sensitive to frequency and voltage variations.

In the case of a single panel, divided into two sections, the following components are installed:
- a general cut-off device;
- differential switches on every start terminal and with Idn ≤ 30 mA and type A or B for ordinary power supply;
- a protection device against over-currents upstream from the insulation transformer;
- the IT-M system equipment (insulation transformer, permanent insulation control device with optical and acoustic signals).
- •protection devices against over-currents from the lines the feed the sockets and plug and any other fixed equipment in the IT-M system.

The equipotential node of the panel could be used as an equipotential node for the room if it meets regulatory requirements.



Power Distribution
Electrical Switchboard

Protection selectivity

Special care must be taken in the design of effective selectivity in the protection devices against over-currents, to ensure maximum continuity of service.

Horizontal and vertical selectivity must be ensured as far as possible. With horizontal selectivity, subdividing the system in various circuits, service issues are reduced in the case of faults.

The subdivision on several circuits also prevents simultaneous use of numerous devices connected to the same circuit from causing intervention by the breaker switch (for example, caused by capacitive dispersion currents from the devices).

A particular feature of horizontal selectivity regards the group 2 rooms: Regulations require that for each patient treatment area (for example, a socket panel, a wall-mounted power supply unit or cabinet stand) the plug sockets powered by the IT-M system are, alternatively (see the figure):

- connected to two separate power supply circuits (each one equipped with protection device);
- protected against over-currents individually or in groups (at least two).

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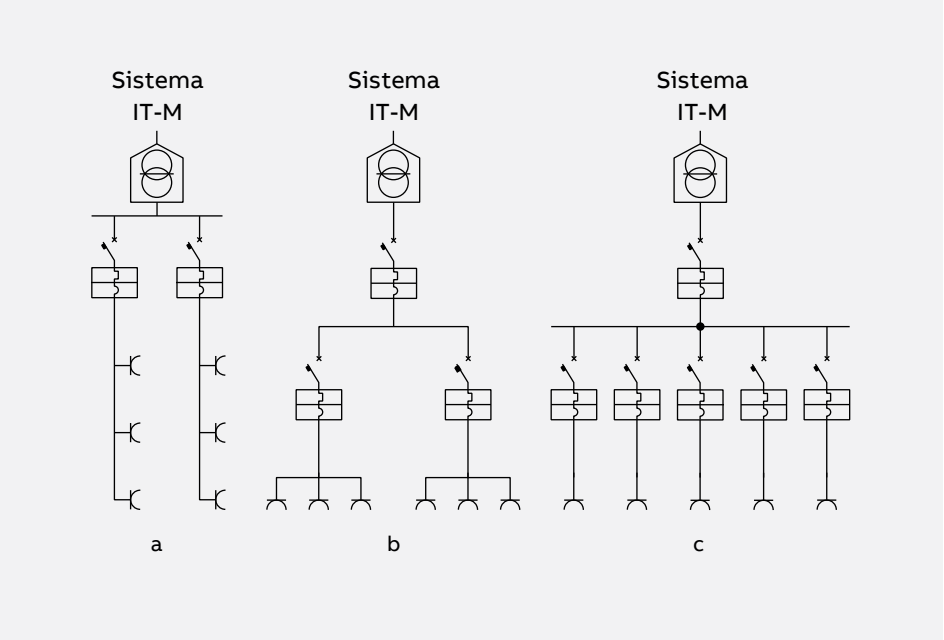
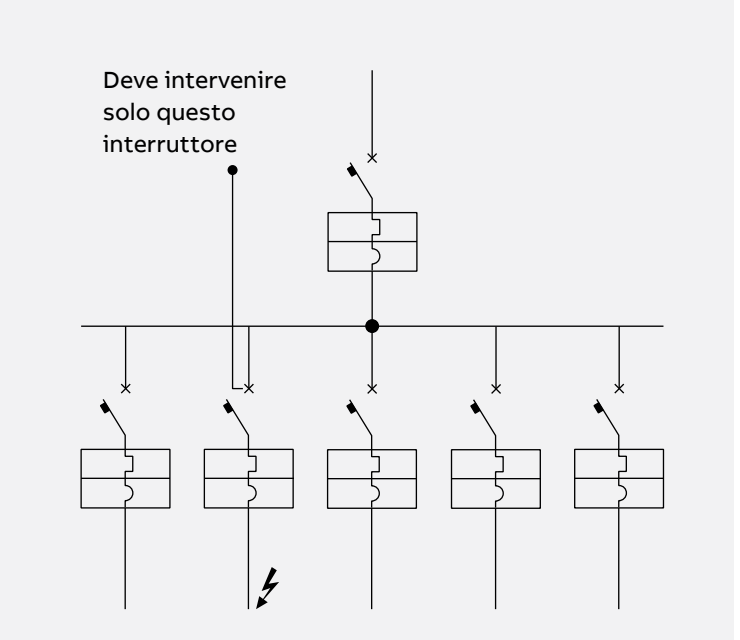
Protection of sockets powered by the IT-M system
a) division into two circuits separate and individually protected
b) group protection
c) single protection





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Vertical selectivity in the presence of circuit-breakers in series

Power Distribution
Electrical Switchboard

The selectivity of the IT-M circuits can be implemented with magneto-thermal switches or appropriately sized fuses.

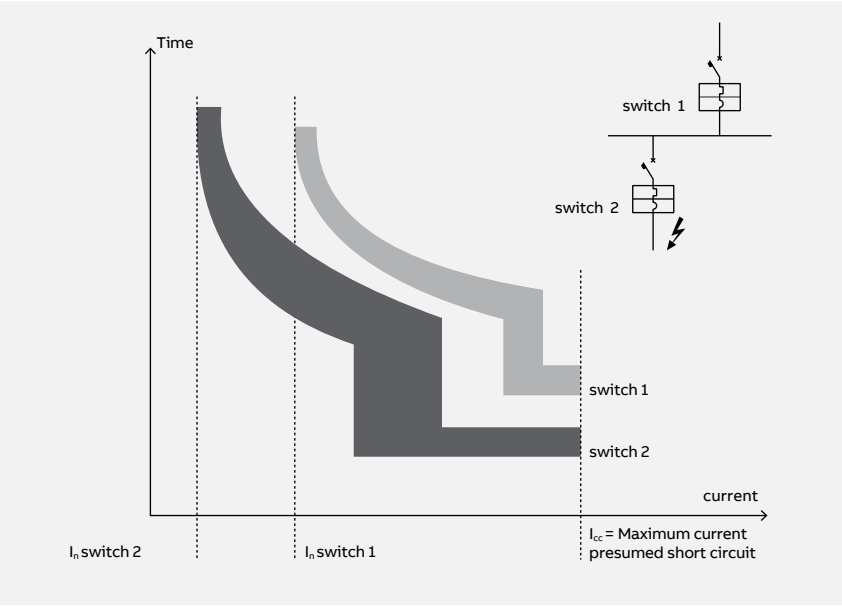
Using fuses, these must be installed to protect each socket of the group, or upstream in the room panel, to protect the power supply conduction of each socket group. Choosing fuses in appropriate sizes and the main switch with very high magneto-thermal switch intervention current creates total selectivity.

The advantages are evident in consideration of a short circuit in an operating room usually occurring because the plugs are removed by pulling the cord and not holding the plug body, or because of liquids that enter into contact with live parts. A short circuit on a socket implies intervention by the respective fuse, so it is possible to use another socket (the sockets are always in excess) without serious service issues.

With the use of automatic switches, selectivity can be obtained by selecting the protection devices so that all of the short circuit current values, up to the maximum fault current allowed in the conduit protected by the downstream switch, and the intervention zones of the switches in sequence do not overlap (amperometric selectivity in the figure).

But in general, selectivity between switches is obtained by also adjusting their intervention times (chronometric selectivity).
Selectivity must also be ensured for the differential switches that protect equipment powered directly by the mains network and not through IT-M. For example, in the recovery rooms (group 1 rooms) there are three circuits (lights, plug sockets, bed sockets), each protected by a 30 mA differential switch; for the protection of power supply circuits for a group of rooms, a 300 mA panel differential switch is installed, and a 500 mA differential switch is installed in the upstream cabin. Total selectivity is obtained by adjusting the differential switch intervention times.

—
Total selectivity between two switches in series.



Lighting and Shading Control

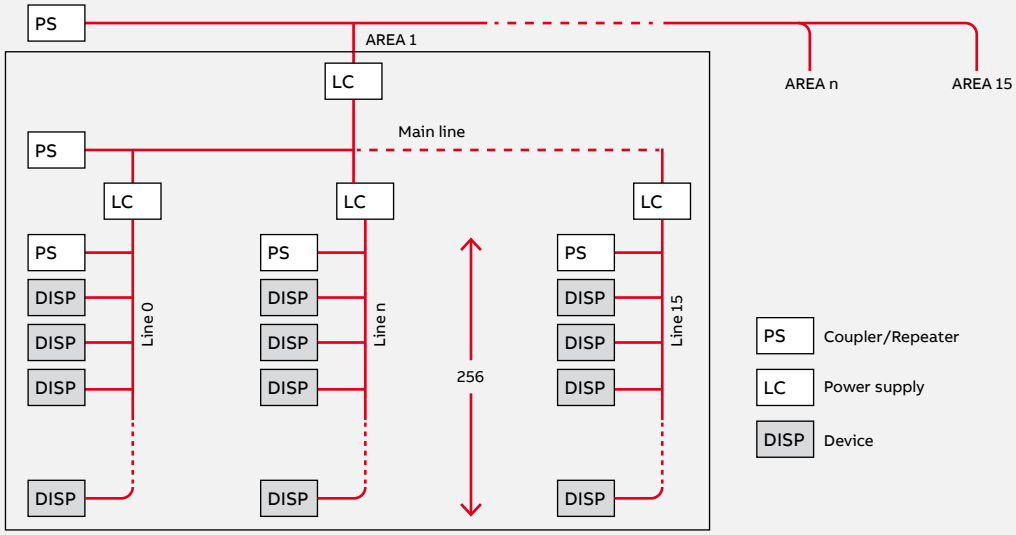
Architecture and configuration of a KNX system

A general automation system and a KNX system in particular, are composed of a series of input/output devices connected to a shared transmission medium called BUS to which are added some system devices necessary for operation. Each device exchanges on the network a series of information containing datapoints, i.e. control and process variables that each device interprets. Datapoints can be inputs, outputs, parameters or diagnostic data.

These simple communication rules together with the characteristics of the transmission medium constitute the architecture of the KNX system.

By looking at the addressing rules and some electrical rules, the overall architecture shown in the figure is obtained for a KNX network.

Overall architecture of a KNX network (*) Each line is composed of 4 segments of 64 devices each, separated by a line coupler



Lighting and Shading Control
Architecture and configuration of a KNX system

Area, line, device

A KNX system is a distributed logic network (i.e. there is no device that centralizes the logic of the entire system) whose nodes have an individual 16-bit address. In total then, theoretically, up to 65,536 devices can be addressed.

The KNX technology, at line level, allows any of the star, tree and bus topologies while the ring topology is not possible.

A set of up to 256 devices constitutes one line. A maximum of 15 lines can be connected by a main/line, constituting an area. A KNX installation can conta in up to 15 areas, connected together by a particular line called backbone line.

Physical Address

Each device in the KNX network, with the exception of power supplies, is uniquely identified by a physical address. The address consists of three numeric fields separated by a dot:
- from 0 to 15, defines the area it belongs to
- from 0 to 15, indicates the line
- from 0 to 255, identifies the device.

Group address

The devices of a KNX system communicate with each other via group addresses. Normally, group addresses are structured according to a 3-level hierarchy:
- The main group, normally this is the system level (e.g. lighting, temperature control, etc.).
- The core group, a particular function of the system under consideration (e.g. switch, dimmer, etc.).
- The subgroup, devices belonging to the same function (e.g. kitchen light, bedroom window, etc.).

The group addresses are represented by separating the numerical fields that define the main group, the central group and the subgroup using the slash character (/) and can be assigned at will even though it is advisable to maintain a principle scheme that is the same for all systems. There is also a version of two-level group addressing, but it is less widely used.

Power supply

The power supply is the device that provides power to devices connected to the bus line. The power supply is normally supplied directly to the mains voltage and provides a DC voltage of 29 V directly to the bus terminals.

Lighting and Shading Control
Architecture and configuration of a KNX system

Coupler (line, field, repeater)

For a bus line equipped with a power supply, a maximum limit of 64 connectable devices is normally considered, taking into account the total power consumption of the devices and the maximum current that can be supplied by the power supply.

However, up to 256 bus devices can theoretically be connected on each KNX line if the line is structured in four segments, each equipped with its own power supply and connected to each other by repeaters.

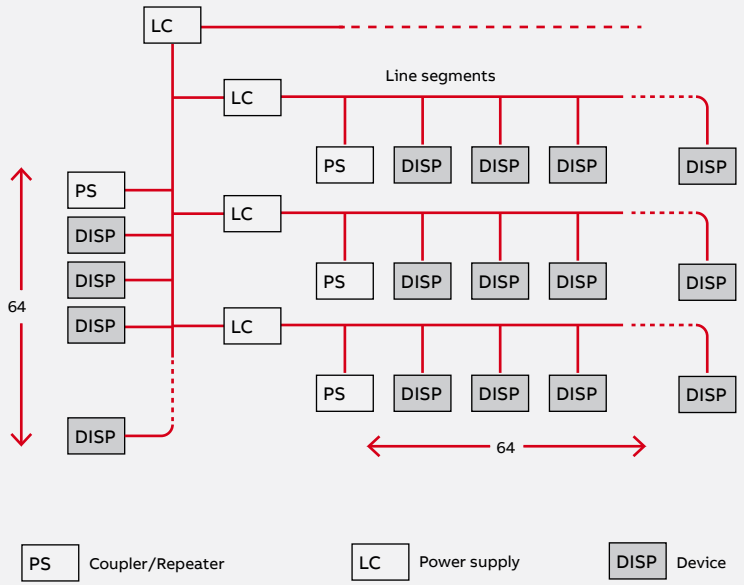
The repeater is a special way of using a system device called a “coupler” which galvanically separates the bus lines, regenerates the signal, prevents an electrical fault in one line from propagating to the other lines and also allows the overall architecture of a KNX system to be extended up to a maximum limit of 65,536 devices.

The coupler device can therefore be used in several ways:

- **area/area coupler:** it connects areas together along the main backbone (backbone line)
- **2 line/area coupler:** connects the lines in an area along the main line (main line)
- **3 repeater:** connects two line segments together, regenerating the signal that could be degraded.
- **4 telegram filter:** the coupler device can be set to block the passage of certain telegrams, thus preventing them from being sent unnecessarily throughout the network; this would in fact limit the communication capacity and increase the probability of errors and collisions between packets.

The couplers must be addressed like any other KNX device, and can be configured with the ETS software.

Maximum extension of a KNX line



Lighting and Shading Control
Architecture and configuration of a KNX system

Twisted pair copper cables (TP)

It is a communication through a twisted two-core cable (helical winding), shielded and with double insulation (main and functional).

In a KNX system, the EIB-derived TP-1 bus is used, with a speed of 9,600 bits/s. By means of this transmission medium KNX and EIB devices communicate and are fully interoperable with each other.

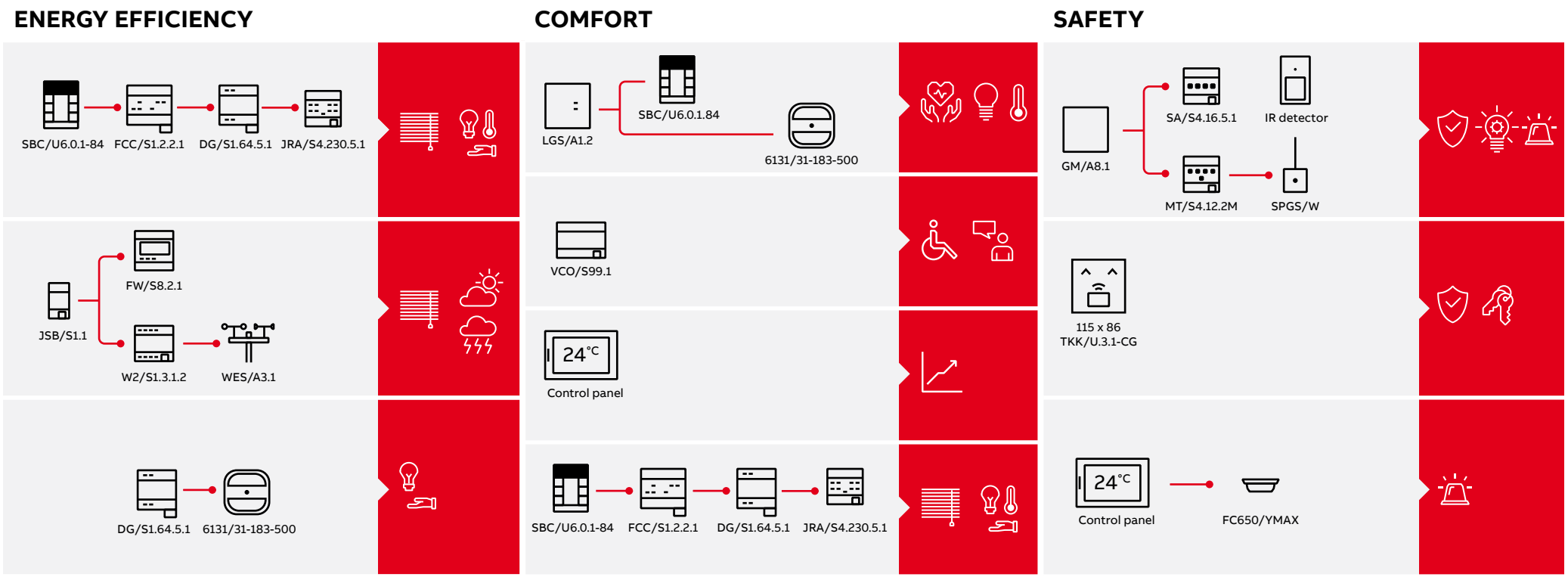
The cable to be used must be KNX-certified of type YCYM 1 x 2 x 0.8 or 2 x 2 x 0.8 mm; in the case of the 4-conductor cable, the red-black pair is dedicated to signal and power transmission and the yellow-white pair to additional SELV applications. Where the use of halogen-free cables is required, KNX-certified cable type J-H(St)H 2 x 2 x 0.8 can be used.

Ethernet

In this case the communication is carried out by transferring KNX telegrams over the Ethernet network “encapsulated” in packets in the widely used IP (Internet Protocol) standard, regardless of the particular transmission medium.

In larger KNX installations, the IP network can therefore be used as a high-speed backbone (Fast-Backbone) to transmit KNX telegrams, according to a procedure known as “KNX/IP routing”.

Lighting and Shading Control
Device Configuration



Lighting and Shading Control
BMS Scenarios

Building Management System

Inverter

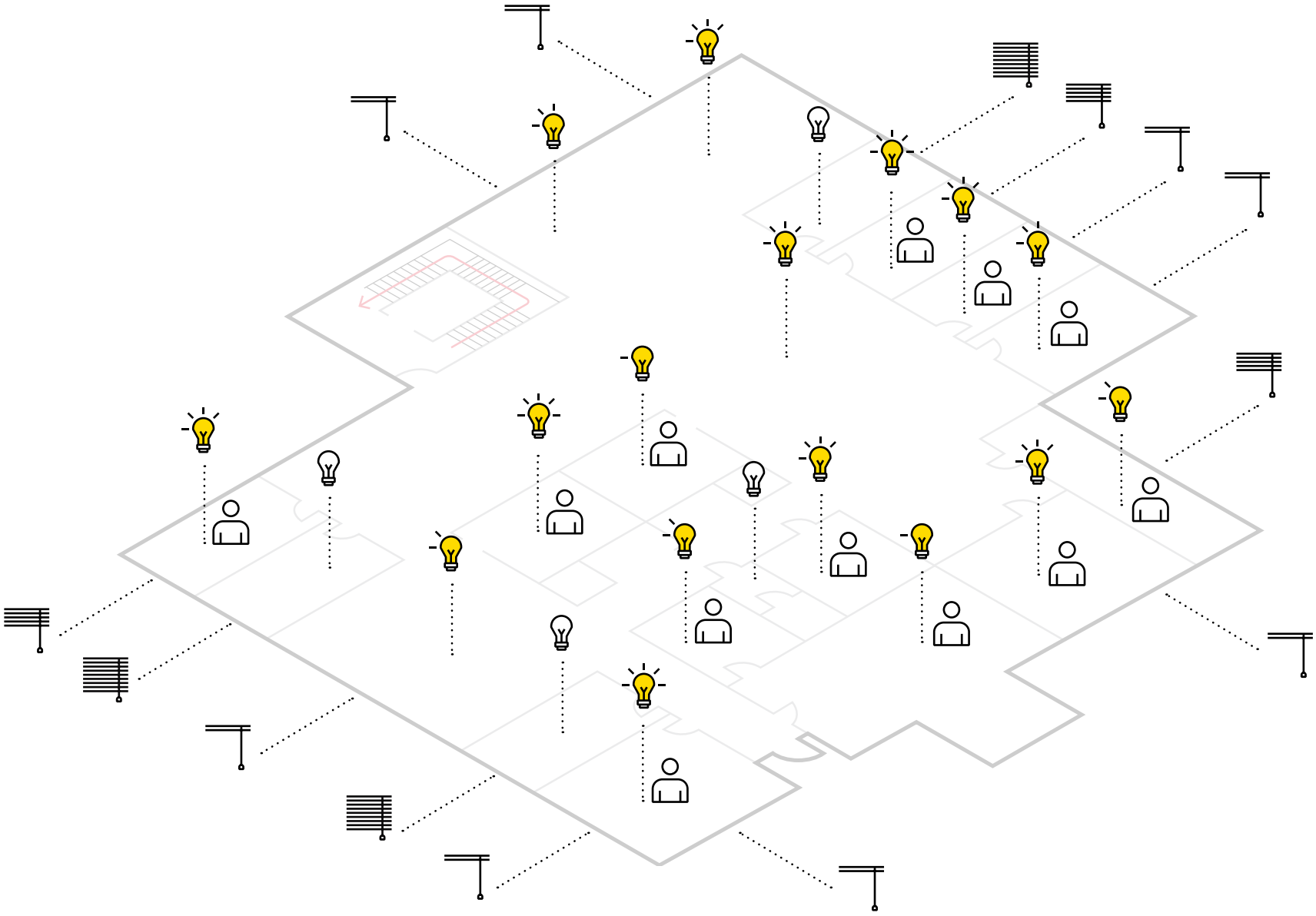
Charging station

Lighting and Shading Control

BMS Scenarios - Building Management System

Legend

- intensity 100%
- intensity 80%
- intensity 60%
- intensity 40%
- intensity 20%
- intensity 0%
- on
- off
- Shutters closed
- Shutters closed
- Shutters open



Lighting and Shading Control

BMS Scenarios - Building Management System

Legend

tvcc

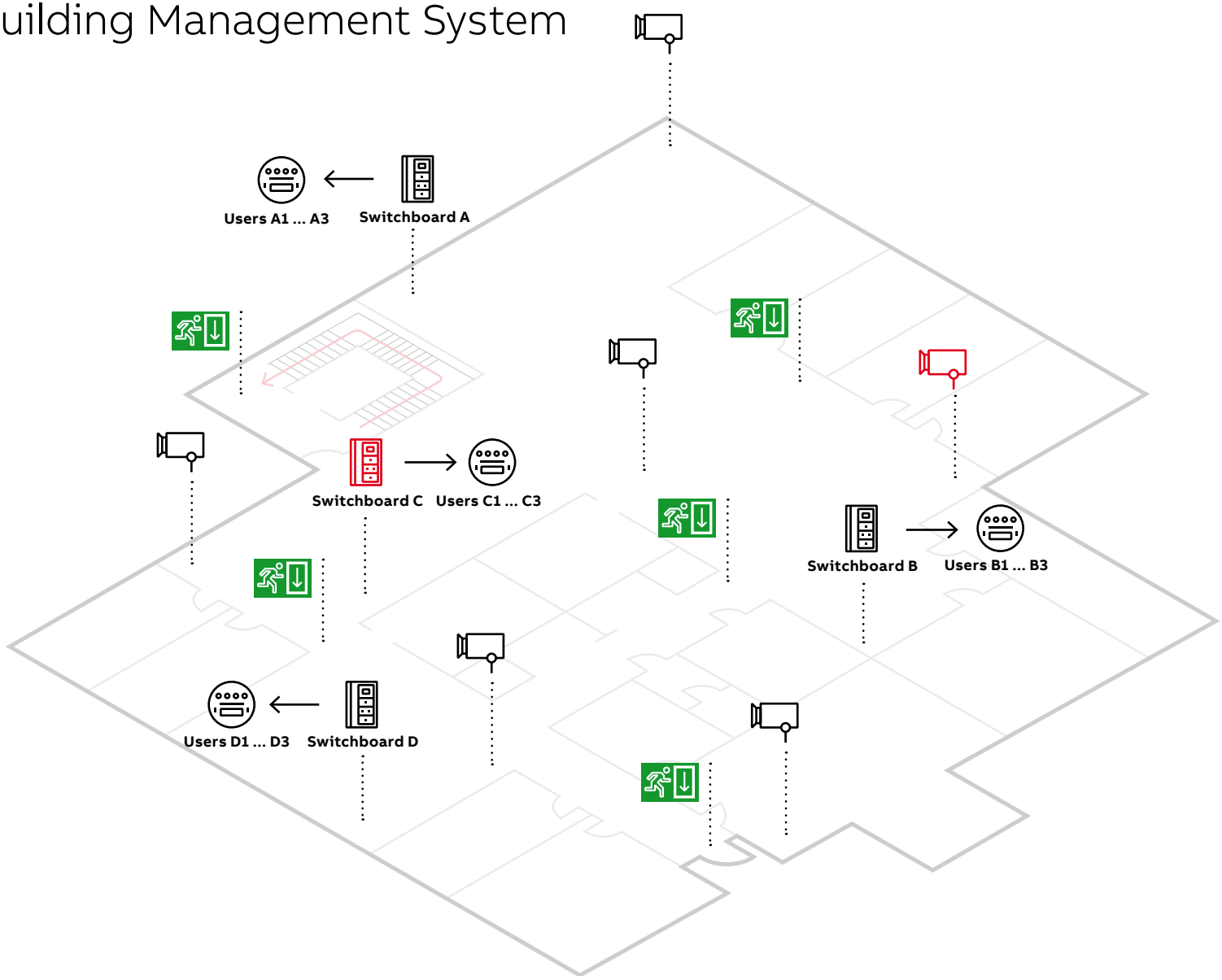
Tvcc alert

electrical Switchboard

Switchboard alert

meter

emergency light



Lighting and Shading Control

BMS Scenarios - Building Management System

Legend

intensity 2

intensity 1

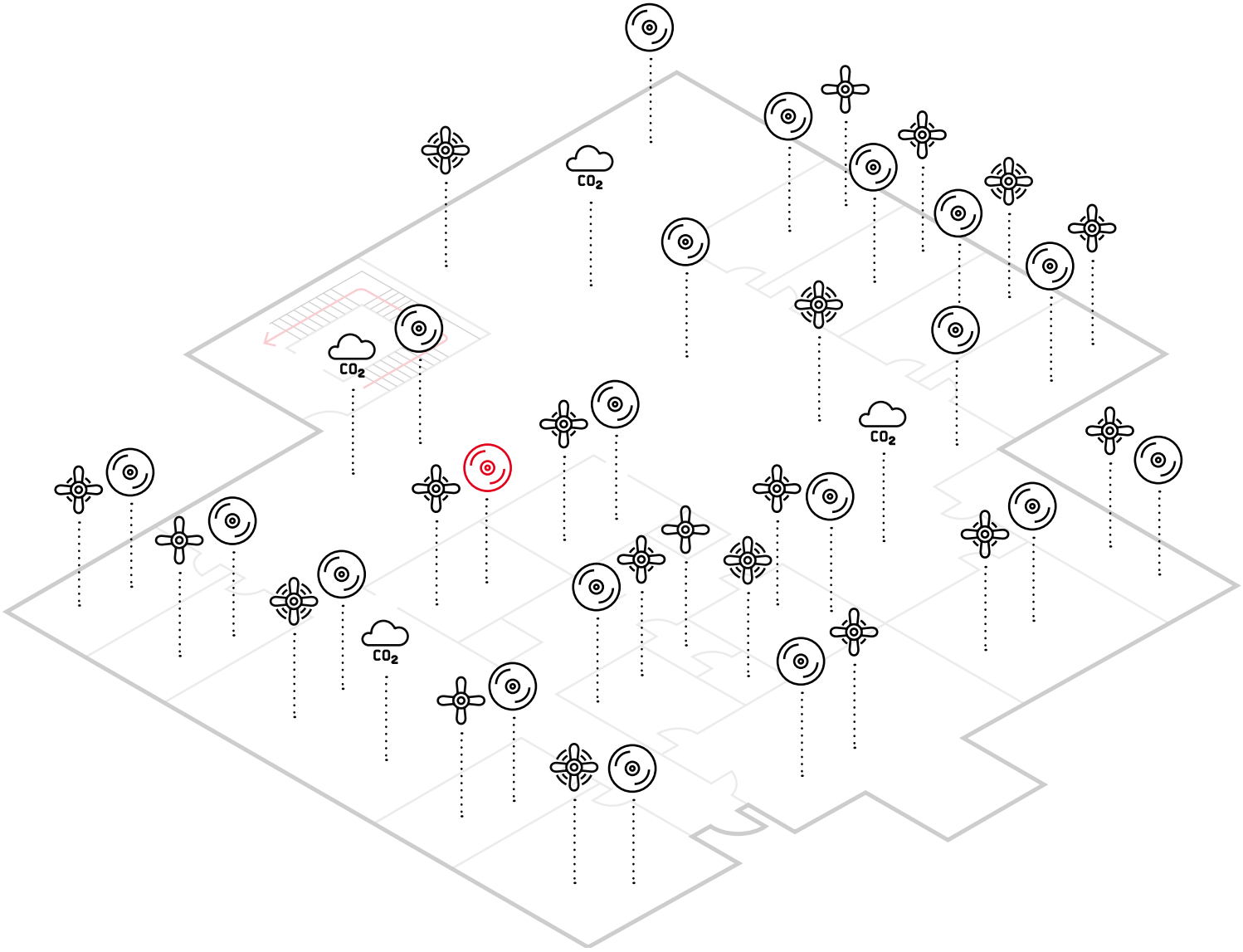
off

CO 1,5mg/m³

set point T. 20,2°

sensor

sensor alert



HVAC Control

Critical environmental BMS control & Third-party Isolation Room integration

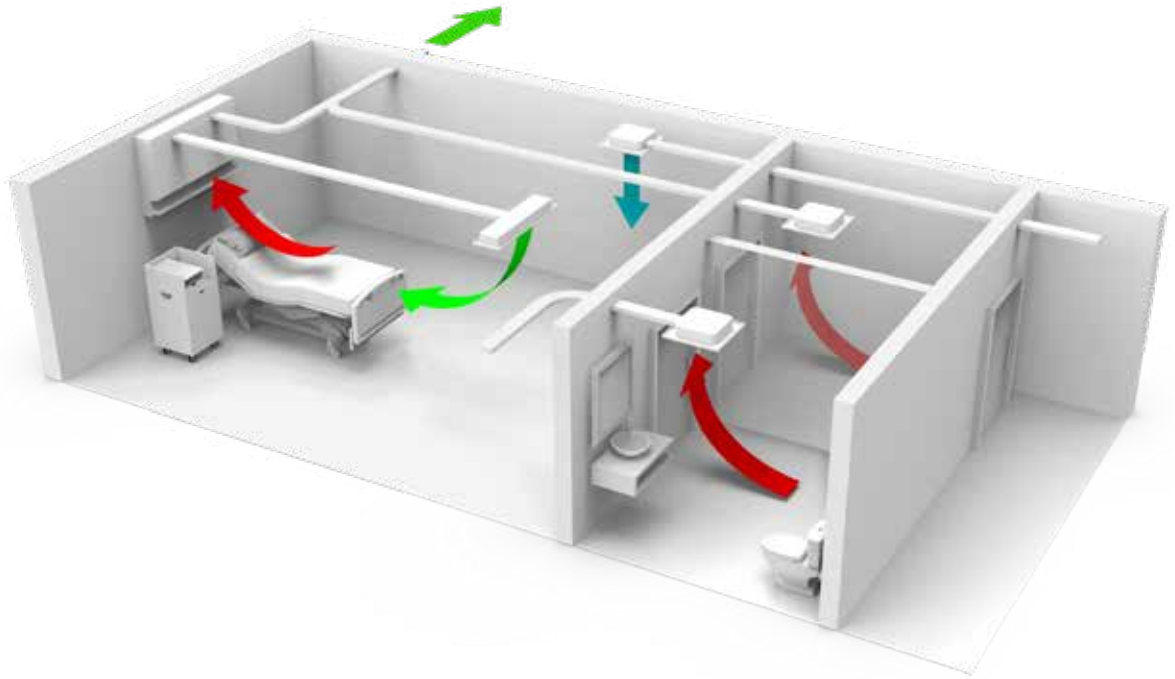
Providing an environment that caters to patient well-being and comfort while running general medical services, places unique demands on energy usage for hospitals and healthcare facilities.
ABB's product range offers flexibility in strategy changes and maximized control utilization ideally suited to the changing demands of healthcare facilities. ABB BE Sustainable with Active Energy ensures control of energy usage and delivers alerts and alarms to the facility management team when anomalies are detected, allowing facility teams to provide consistency of service while managing energy usage and costs.

The air supply to the anterooms and isolation rooms may come from either dedicated or standard patient room air handling units. The air supply is filtered before entering the room. Exhaust fans are specific to each isolation room and dispose of the room's waste air, including the washroom to the outdoors.

Most electronic room pressure controls consist of a wall mounted control panel, differential pressure sensors and control dampers. The control panel is usually located in the corridor at the entrance to the room and displays the differential pressure between the corridor and the anteroom and the anteroom to the isolation room. Additionally, this controller provides audible and visual alarms to warn hospital staff that the room pressurization control is lost. Electronic room pressure controls can be integrated into the ABB Cylon Building Management System (BMS) using the BACnet communication protocol through the ASPECT or INTEGRA platforms.

Integrating the electronic room pressure controls into the BMS provides benefits such as:

- secondary alarm annunciation
- maintenance alerts and workorders, for equipment, sensors, and filters
- failure alarms for equipment and sensors
- occupancy and scheduling of isolation rooms
- integrated lighting controls
- integrated nurse call
- centralized display of all isolation rooms in the facility



HVAC Control
Central Server Monitoring, Maintenance & Control

Centralized supervision simplifies the management of a hospital campus from main buildings and remotely located clinics. Centralized supervision and control enhance operational efficiency proving 24/7 web-enabled access to your BMS. Facility management can view and modify information including trends, setpoints, schedules, and more from any web-enabled device anywhere, any time.
The ABB solution enables hospital staff to schedule room occupancy times in advance, maintaining room temperature at a level that is beneficial to a patient's health. If the room is not being used the system can be easily programmed to switch off. Saving on energy and costs whilst guaranteeing the highest level of patient comfort and a healthy recovery environment.

Key features of central server

Real-time monitoring
The ABB BMS monitors system faults across all zones from a central point, which means maintenance is faster and more responsive. Alerts and alarms are delivered instantly via email, SMS, or PushOver services and accessible on any web-enabled device, enabling quick and efficient essential maintenance.
Technical services managers can monitor all the integrated systems without having to visit various plants or zones.

Reliability & Quality
Quality environmental monitoring in storage settings must be a top priority for hospitals and healthcare providers, everything from medicine and tissue samples to donated blood and food needs to be kept at specific temperature and humidity levels, and a failure to properly monitor storage conditions might cause serious harm to a patient.
ABB's range of controllers is BTL listed and adheres to the highest BMS industry standards.

Security
ABB Cylon HTML5 User Interface can be configured to use SSL encryption, giving a secure HTTPS browser connection, and avoiding the security warning messages that are now common in major browsers. It authenticates users with Microsoft Active Directory or LDAP.
ABB Cylon Audit trail has a "disposition" property associated with every event so that a user-generated log message can be stored to explain why an event occurred.

INTEGRA Life sciences solutions
ABB Cylon's INTEGRA makes compliance easy, while also providing opportunities to lower energy costs, produce less waste, certify instrumentation, and control device calibration and maintenance of HVAC equipment.
More control plus better data – for more informed decision-making, more efficient and compliant operations.
One of the most important regulations relevant to pharmaceutical manufacturing is 21 CFR Part 11, issued by the U.S. Food and Drug Administration. This rule applies to all products manufactured in the United States, and to products manufactured elsewhere but distributed in the United States.
ABB Cylon's INTEGRA platform helps regulated organizations meet the FDA's 21 CFR Part 11 by offering an optional e-signature application (ESIGN) solution that provides procedural and technical controls necessary for a compliant Standard Operating Procedure (SOP) and Method of Procedure (MOP).

HVAC Control – Drives & Motors

Variable-speed drives and electric motors

By investing in energy efficient variable-speed drives (VSDs) and high efficiency electric motors to control HVAC systems, hospitals can potentially lower their energy use from 20 to 70%, making huge strides toward freeing up valuable funding for further capital investment. These devices control the flow of pumps and fans to eliminate the energy waste that is common with conventional pump and fan control methods.

Benefits:

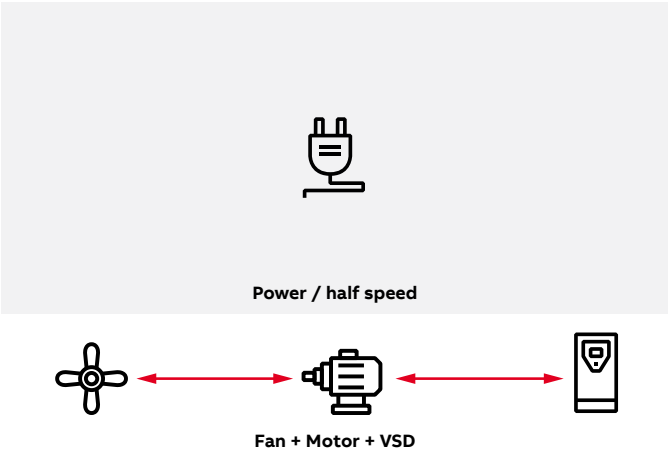
- Comfort of the occupants vital for HealthCare segment
- Healthy environment thanks to supplying fresh air and keeping CO_2 concentration low
- Reduced fan motor noise and resonance control for increased comfort
- Smooth start/stop of HVAC applications to reduce mechanical and electrical stress of the equipment to increase its lifetime and ensure HVAC process continuity
- Filter clogging detection to ensure fresh air and avoid extra energy losses in the system
- Application performance monitoring to alarm about possible upcoming failure so preventive measures could be taken
- Seamless integration into any BMS with extensive support of all common building automation protocols including Modbus and BACnet
- Clean air circulation throughout critical hospital areas
- Tighter control over temperature changes
- More comfortable temperate environment

Hospital HVAC system benefits

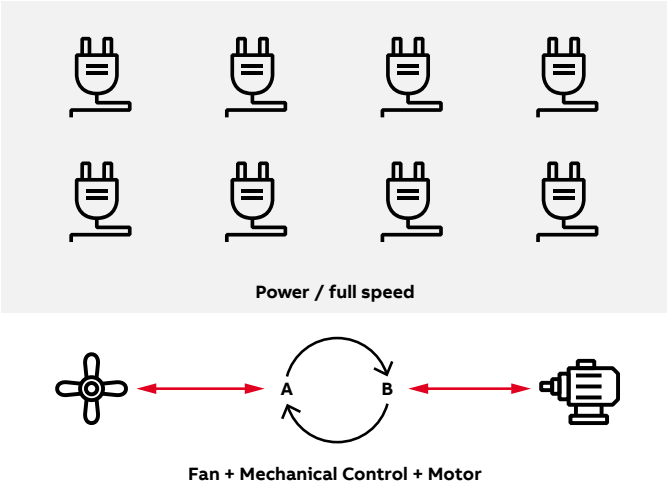
Motors equipped with variable speed drives and controllers that run heating, ventilation and air conditioning applications contribute into clean hospital environment with high level of comfort to ensure patients' and personnel well-being and prevent the spread of disease. But there are many other important and profitable benefits to be gained as well. Variable speed drives help save much energy, but with a small investment savings can be increased further.
The optimal companion to variable speed drive is a high efficiency motor like ABB's IE5 synchronous reluctance motor (SynRM).

Compared to an IE3 energy efficiency class induction motor, it offers up to 40 percent reduced energy loss.
This makes SynRMs the new first choice to meet the growing global demand for improved energy efficiency.
ABB motors & drives provides a cost efficiency and performance driven solution for Hospital buildings. ABB drives are flexible to optimize all processes and control, and reliable for less downtime. Applications such as air handlers, water pumps, cooling towers and chillers - all use electric motors that ABB variable speed drives (VFD) for HVAC, which ensure they run in the most efficient and reliable manner.
They are simple to set up, and the drives integrate seamlessly into building management ion systems.

Speed control



Mechanical control



HVAC Control – Drives & Motors

Abb Ability™ smart sensors for motors, pumps, and bearings

The ABB Ability™ Smart Sensor for general machinery is used to measure and monitor temperature and vibration across a range of general machinery applications, from fans to mechanical skids. It complements the more in-depth health and performance analysis that the Smart Sensor applies to motors, mounted bearings, gearing and pumps.

Minimized unplanned downtime
Failures can be detected well before equipment needs to be shut down, avoiding unplanned downtime.

Reduced maintenance costs
By changing from scheduled to condition-based maintenance, service costs can be considerably reduced.

Improved safety
Eliminate the need for motor/pump/bearings manual check-ups in locations that are hard-to-reach or dangerous.

Integrated motor drive packages

- IE5 efficiency – highly efficient at full load and partial load conditions
- Integrated design saves control cabinet space and reduces wiring costs
- Tune and control flexibility with multiple options including wired keypads and PC tools as well as Bluetooth communication
- Plug and play concept with the pre-programmed drive only requiring two inputs to run out of the box
- High power density with more power available from the same frame size

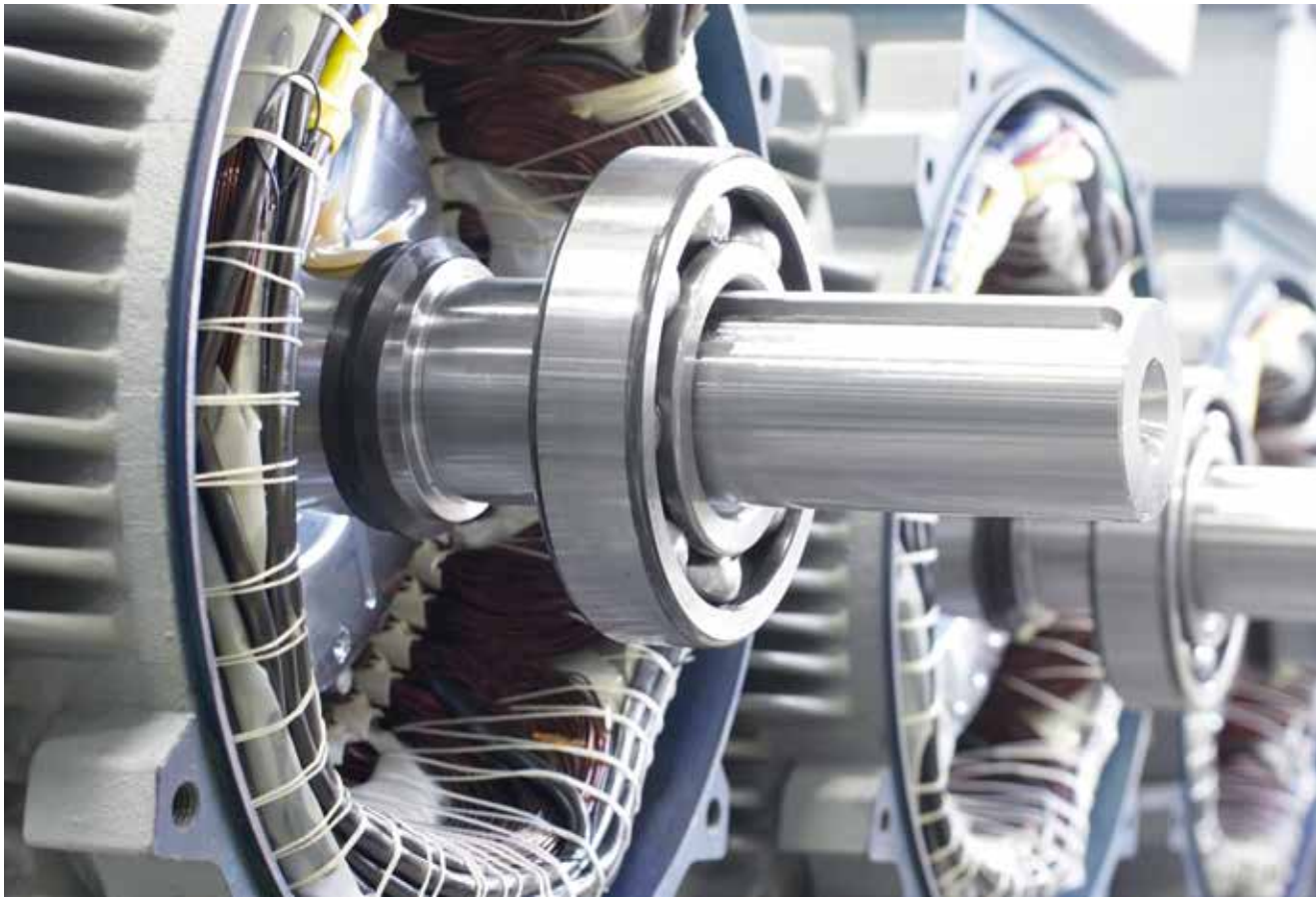
HVAC Control – Drives & Motors
Building Management Solutions integration

Being able to automatically control your building not only adds flexibility to building management, it has a positive effect on efficiency, security and productivity too. With products and services such as movement detectors, harmonious lighting, door communication, automated heating, air-conditioning, ventilation and shutter management, ABB offers a range of possibilities to put building control firmly into your hands.

Flexibility, scalability, ease of integration
- State-of-the-art BTL-certified BACnet IP and MS/TP controllers for hospital building's mechanical and electrical systems control.
- Integration support for Modbus TCP and Modbus RTU without external gateways.
- Replace or extend I/O points quickly and easily, according to the needs.
- Freely programmable controllers for enhanced building automation performance and reduced time on task.
- Support of multi-protocol communications simultaneously.
- Future-proof architecture with upgrade paths.

Better and more cost-efficient energy use
- Cloud-based energy management can greatly increase a hospital building's energy efficiency.
- Access energy monitoring, anytime, anywhere via web enabled smart devices.
- Optimize operational costs.
- Reduce the building's CO_2 footprint.

Improved patients' and medics' well-being
- Embedded schedules and trend logs for tuning the hospital building environment.
- Onsite user control via touch screen.
- Access building controls, anytime, anywhere via web enabled smart devices.



Find out more

OWNERS OR MANAGERS

Innovate your building.
Ask for a free **business advice**.

We build evolution

DESIGNERS AND INSIDERS

Ask for free **design** technical support.

Learn more. Learn better.

06.2021