Retail & Mall Building Solution

Buildings that are modular, eco-friendly and evolve over time. This is best done with ABB Building Solutions for efficient and intelligent spaces.

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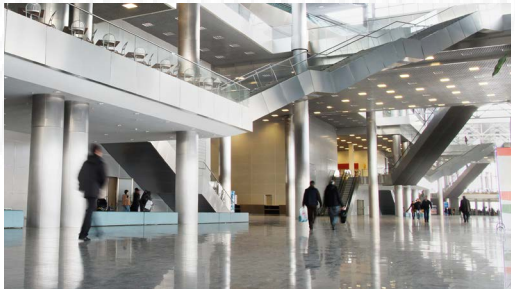


Building Segment Overview

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

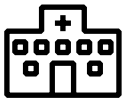
Commercial

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

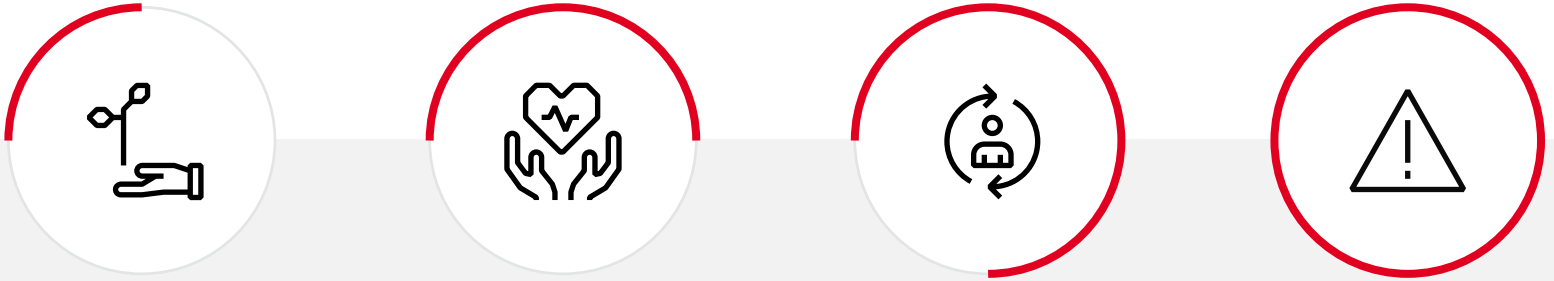
Industrial

Manufacturing
- Factory
- Manufacturing
- Transformation
- Packaging

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

Building Segment Overview
Core needs

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



— Environmental footprint

— Health & comfort

— Life cycle cost and value

— Future proof assets

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 aims to reduce the CO_2 footprint of its operation in accordance global standards for people and planet.

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.

Retail & Mall Solution

Retail & Mall Vertical Profile
Introduction

Although terminology for the Retail & Mall sector varies across regions and markets, establishments can be classified according to layout and size.

Shopping Mall

Also called shopping center, arcade or galleria. Large retail multi-floor complex comprised of a single large building or multiple adjacent buildings. in which stores entrances are found in the interior space. Malls often offer additional services such as restaurants, entertainment and business hosting.

Strip mall

Collection of ground floor stores of various sizes which are adjacent, however not connected by a common interior space, thus the individual entrances to the stores are found outside.

Retail store

Single building providing goods and/or services. Such stores can either be part of larger retail chains, or unique spaces.

Retail & Mall Vertical Profile
Introduction

They key attribute for the categorization of the malls are:

Concept

The defined "concept" captures the theme or market positioning offered by the centers within the broader categories, including features such as convenience, customer orientation, entertainment, merchandise lines and price points.

Size

This attribute provides an indication of the massing of the center, including both anchor tenants and other tenants.

Acreage

This refers to the typical land assemblage required to house the retail space, along with parking and ancillary services necessary to the operation of the respective types of centers.

Typical Anchors

This attribute provides a profile of the type, size and business orientation of the major anchor tenants that are typically housed in the particular type of centers.

Anchor Ratios

This measure provides an indication of the mix of anchor and non-anchor tenants, including in-line retail tenants.

Primary Trade Areas

This element indicates the typical size of the Primary Trade Area from which the respective centers draw the bulk (i.e., 60%-80%) of their customer sales.

Retail & Mall Vertical Profile
Point of interaction

8 distinct types of spaces are required to provide shoppers and staff alike with a quality experience within the mall.

Common spaces

Theses spaces encompass the common areas in which occupiers transit, such as lobby, lift, escalator, corridor and atrium.

Retail spaces

These spaces host retail stores offering a wide variety of goods and services, such as clothing, electronics or commodities.

Entertainment spaces

These spaces are dedicated to providing experiences to visitors in addition to shopping including playgrounds, gaming areas, cinema and food.

Office space

This space contains the offices for facility management and mall administration staff.

Services spaces

These spaces contain mechanical and electrical components that serve the building for power distribution, as well as cooling and ventilation.

Parking spaces

Theses spaces are dedicated for car parking, taxi drop-off areas and connections with public buses.

Public transportation spaces

Theses spaces integrated connections to public mobility infrastructure such as train, tram or metro stations.

Logistics and delivery spaces

These spaces include docks, service entrances and garages, used by suppliers to deliver goods to retail operators. Such spaces are dependent on the size and frequency of deliveries.

Retail & Mall Vertical Profile

Trends post-covid

One of the major consequences of CVOID 19 is to regain consumer trust and for this it's very important to maintain a IAQ (indoor air quality) level for the shoppers, visitors as well as for the. It will be also important to address below points as well.

- **Managing the design and construction process to achieve good IAQ**
- **Controlling moisture in building assemblies**
- **Limiting entry of outdoor contaminants**
- **Controlling moisture and contaminants related to mechanical systems**
- **Limiting contaminants from outdoor.**
- **Capturing and exhausting contaminants from building equipment and activities**
- **Reducing contaminant concentrations through ventilation, UV filtration, and air cleaning.**

Sustainability

Mall owner and retailer are under immense pressure to sustain their business which was hugely impacted during COVID 19 and sustainable retail buildings present a major opportunity to provide improved quality and a better experience for employees, shoppers, and visitors

Some of the key points that are addressed.

- Reduces operating cost as this affect the retail shop business inside the mall. Rent plus services charges are being by retail shop owner.
- Creating attractive environments for the visitor and tourist. Having more retail mix, F&B and entertainment.

Asset Management

Facility managers would be able to locate various assets and to obtain their operating conditions and status to help with maintenance issues plus saving the money from operation cost.

Retail & Mall Vertical Profile
Trends post-covid

Instore and mall digital experince

This include from Smart Parking, way finding, subscription based cashless payment, augment reality mirror, instore traffic pattern provide shopping behavior for retail shop owner which to be used for ads and store layout and same time helps consumer/shopper to help them in product finding inside store.

Omnnichanel Retail

One of the noticeable effects of COVID 19 is increase in the use of online sales and this trend seems to continue even after the pandemic. The retail business owner is now using integrated approach for customer to order item which is referred to as omnichannel.
The item can be ordered through multiple platforms like social media, website, mobile App and order directly calling retail shop.

The item to be delivered at customer door step which mean it heavily rely on the supply chain and keep in mind already very thin margin of retail business it very important to use sustainable to use a supply chain which is very cost effective to compete in the market.

Retail & Mall Vertical Profile
Customer needs

For the Retail & Mall vertical, our research shows 10 key requirements need to be addressed, which are anchored in the 4 customer needs categories.

Environmental footprint

- **Resource efficiency**
  Reduce water and energy consumption and Increase share of renewable sources by using solar and wind. Implementing an intelligent ecosystem for resource conservation, enabling a genuine zero emission in future. Maximize use of natural light and energy efficient lighting system. Use of efficient refrigeration, cooling, and heating system.

- **Reducing carbon emissions and meeting the highest efficiency standards.**

- **Renewables**
  Energy storage from renewable will serve this purpose and identifying in efficiency and improving performance of the connected load. Running non-essential load 100% on renewable and storing energy of renewable source for using it to support EV charging.

Health and Comfort

- **Comfort and well Being**
  Strict hygiene and health protection are still in place commercial building this mean it's very important the malls and retail shop maintain good level of hygiene Indoor air quality and make sure that consumer and visitors are being provided comfortable environment by providing right amount of thermal and cooling comfort and adequate lighting level.

Retail & Mall Vertical Profile
Customer needs

Life cycle cost and value

- **Increased lifespan**
  Increased lifespan allowing the system to be kept in service, efficiently, for as long as possible, mini-mizing CO_2 emissions and use of raw materials.

- **Customized solution**
  Having customized solution to choose option as per budget, need and requirement.

- **Safety and protection**
  Most important aspect is safety down from circuit protection to the utility incoming connection. Overload, ground fault and short protection play an important role in safeguarding the property and people inside the building.

- **Energy management**
  Energy is being consumed in Retail & Mall stores by monitoring multiple energy sources like electricity, gas, and water through meters - providing new insights and identifying potential savings.

Future proof assets

- **Ease of Integration**
  Simplified integration with many third-party systems like refrigeration system and Fire alarm system. system integrates seamlessly across IT networks.

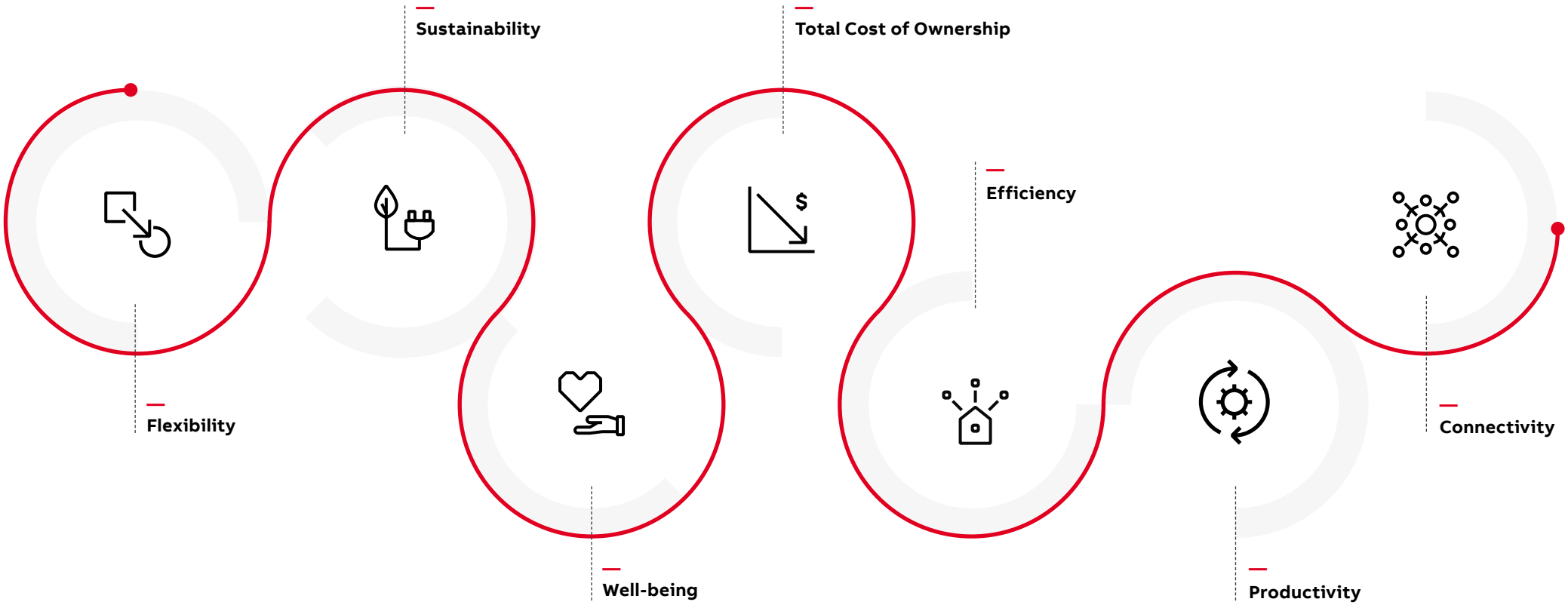
- **Scalable**
  The scalable, future-proof architecture provides native open protocols and support for LON®, KNX / DALI, BACnet®, Modbus®, and IoT solutions based on Web Services and cloud technologies (like ABBAbility) for seamless integration with third-party systems, or other existing and emerging technologies both at local and cloud level.

- **Data security**
  Data security means much more than protection against cybercrime: certainly, connections need to be safe, but the value of that data should also be protected. Customers should not be required to forfeit safety, value, or control in order to realize the benefits of digitization. Big chains (retail, cinemas, restaurants, fast food,...) often have their own cyber security regulations and the mall infrastructure must comply with it.

- **Multi-site retail operation**
  Retail Solution ensures that stores operate efficiently, reduce maintenance costs, optimize staff and customer comfort, and enables centralized management by an Energy Management Team or third-party energy bureau.

Building segment performance for retails and malls

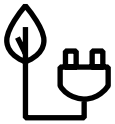
The 7 building performances exist to ensure that the solutions deployed in Retail & Mall is holistic and cater to the core needs of involved stakeholders. In other words, this is a people & planet first approach, and the careful selection of ABB building technology serve the purpose of enabling the performances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



Building segment performance for retails and malls

Flexibility

Build a scheduled lighting system across your Mall for Lighting, HVAC and irrigation system Store Operators can use the simplified store scheduling interface to build, control, and customize systems at each location or in regions.



Sustainability

Supply chain is very important for Retail & Mall business by making it sustainable running entire transportation on EV and power it through solar will have huge impact of CO_2 Emission. Use of rainwater for irrigation, reduction in water consumption, increase the use of renewable in power generation.

Well-being

Healthy built environment is not only beneficial to public health, but also helps with people's well-being and to give confidence in public which effects mall foot ratio. Maintain good air and water quality level and exposure to day light. Providing good comfort level for visitors.
Use cleaning and sanitation robots will ensure health of visitor and staff.

Total Cost of Ownership

Have integrated system is very important for building to do the monitoring and check energy consumption by electrical and mechanical devices. This will lead to increase both operational efficiency, additional opportunities for energy saving and also to take proactive measure against in efficiencies in the, electrical, mechanical and refrigeration system. This would lead to considerable amount of cost saving for Mall and retail.

Building segment performance for retails and malls

Efficiency

Achieve system operational efficiency for example reducing temperatures by just 1 degree Celsius can cut fuel consumption by 8%. To shut down heating or air conditioning an hour before store closing, setting refrigeration system setpoint at optimum level and use of OA without any noticeable difference to staff or customers.

Productivity

Developing strategies that re□ect trading hours and trends in occupancy across the time of day and seasonal shopping pattern. Eliminate heating and cooling running simultaneously and use of Heat recovery ventilation strategies.

Connectivity

Retail business owner are looking for Limitless connections add number of geographical locations spread across the country and different continent that can be connected to the system making it the ideal tool for central monitoring and management of energy consumption for multi-site retail organizations with several building locations.

Features expected from Retail & Mall solution
Automation, control and supervision

Energy and economic saving

Automation systems can play a fundamental role in reducing energy consumption in the tertiary sector which has now become the most energy-intensive sector in the main industrialized countries.

The standard EN 15232 standard allows a simple and recognized estimation of energy and economic savings related to the adoption of an automation system that was previously quite delicate and complex.

The automation classes according to the European standard EN 15232

		Definition of classes							
		Residential				Non residential			
		D	C	B	A	D	C	B	A
EMISSION CONTROL									
Heating control									
The control system is installed at the emitter or room level, far case 1 one system can control several rooms									
0	No automatic control	■				■			
1	Central automatic control	■				■			
2	Individual room automatic control by thermostatic valves or electronic controller	■	■			■	■		
3	Individual room control with communication between controllers and to BACS	■	■	■		■	■	■	
4	Integrated individual room control including demand control (by occupancy, air quality, etc.)	■	■	■		■	■	■	
Control of distribution network hot water temperature (supply or return)									
Similar function can be applied to the control of direct electric heating networks									
0	No automatic control	■				■			
1	Outsider temperature compensated control	■	■			■	■		
2	Indoor temperature control	■	■	■		■	■	■	
Control of distribution pumps									
The controlled pumps can be installed at different levels in the network									
0	No control	■				■			
1	On off control	■	■			■			
2	Variable speed pump control with constant Dp	■	■	■		■	■	■	
3	Variable speed pump control with proportional Dp	■	■	■		■	■	■	

Features expected from Retail & Mall solution
Automation, control and supervision

Energy and economic saving

The savings estimated according to the European standard EN 15232

BUILDING	BUILDING TYPE	$f_{BAC.EL}$				$f_{BAC.HC}$			
		D	C	B	A	D	C	B	A
Non residential	Offices	1.10	1	0.93	0.87	1.51	1	0.80	0.70
	Lecture hall	1.06		0.94	0.89	1.24		0.75	0.5[a]
	School	1.07		0.93	0.86	1.20		0.88	0.80
	Hospital	1.05		0.98	0.96	1.31		0.91	0.86
	Hotel	1.07		0.95	0.90	1.31		0.85	0.68
	Restaurant	1.04		0.96	0.92	1.23		0.77	0.68
	Wholesale and retail trade service buildings	1.08		0.95	0.91	1.56		0.73	0.6*
Residential	Single family houses	1.08		0.93	0.92	1.10		0.88	0.81
	Apartment block								
	Other res. Building or similar								

Features expected from Retail & Mall solution
Automation, control and supervision

Communication

The communication between different sub-systems within the same building or the visualization via the internet of images of the rooms following an alarm, are functions easily achievable in a bus system.

A bus system can satisfy communication needs related to security, control and entertainment such as the activation of video surveillance cameras or the sending via internet of images of the rooms following an alarm, it allows to understand if there is really the issue or if it is just a false alarm.
All the functions implemented in the various systems of a building can also be controlled remotely through the use of web servers or remote controllers on land or mobile networks.
The video system becomes an integral part of the automation system, allowing, among other functions, communication between the different workstations within the same structure.
The different communication solutions between staff and between them and occupants allow for important results, including ease of use, savings in installation and management and improvement of the service offered.

The main points to be considered are:

- **Simplicity of wiring**
  Using bus technology wiring for the connection between the devices, all data and information travel on a simple twisted pair, thus saving on the material and time spent laying the cables. Using a 6-conductor cable, you can also bring power and speech to the various devices.
  The possibility of using a simple 6-conductor cable compared to the considerable bundle of cables (or the large multipolar cable) traditionally used, considerably facilitates installation, reducing installation times.

- **Modularity**
  By turning to systems that use modular technology, it is possible to make the system evolve over time, starting from the basic functions and subsequently adding the other functions, without nullifying the investments already made.

- **Continuity of service and ease of maintenance**
  By taking advantage of the internal self-diagnosis and anomaly recognition functions present in some systems, it is possible to immediately identify any faults. If necessary, the electronic modules can be replaced without having to interrupt the operation of the system, thus ensuring continuity of service. In addition, the electronic room control modules, if installed in the corridor, could be replaced without having to enter the patient's room. In this way, no disturbance is caused to the patients and doctors and nurses can safely continue to operate according to their needs, while the technical maintenance staff can intervene promptly.

Features expected from Retail & Mall solution
Automation, control and supervision

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Access control

MODULAR
Modular architecture with stand alone graphics or that can be integrated into third party scada systems

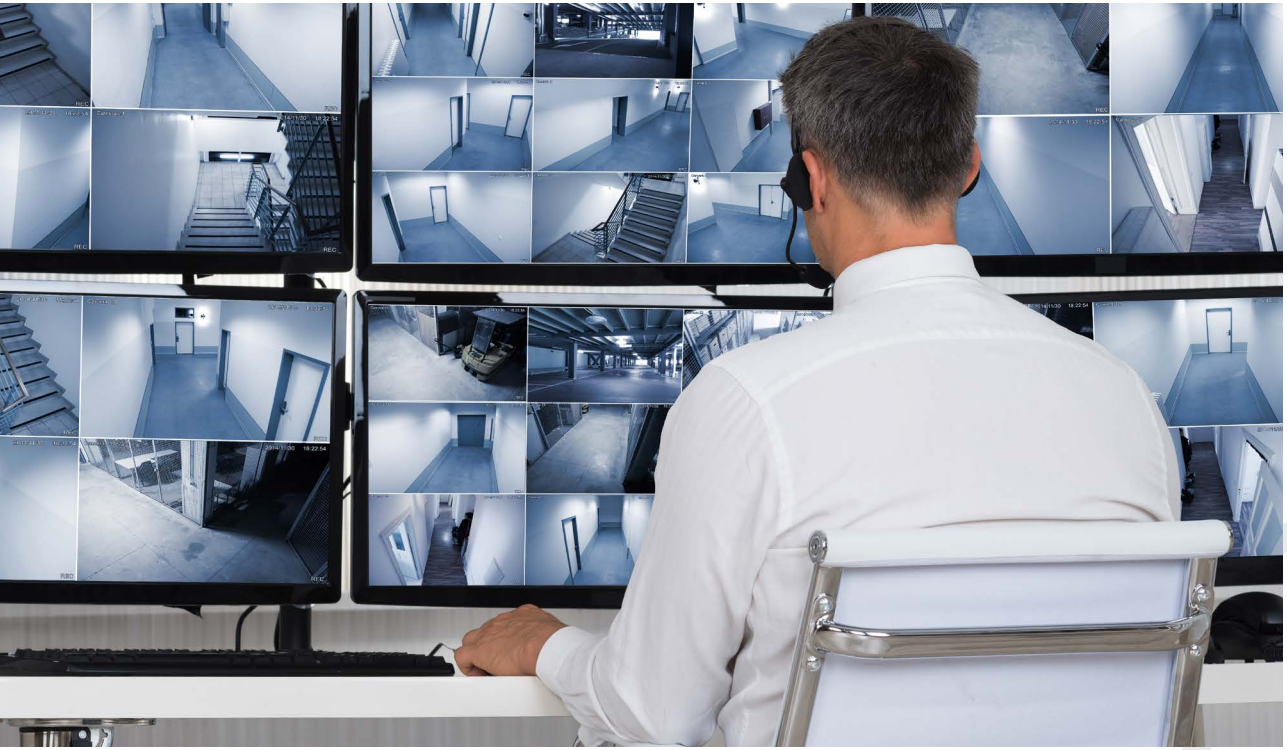
SIMPLE MANAGEMENT
Procedures for assigning access permissions simplified with various levels of user privilege

EXTENSION
Simple and minimally invasive functionality extension

SIMPLE CONFIGURATION
Plug and play system.
Just add the devices on the KNX line

DIAGNOSTICS
Integrated diagnostics for system alarms or faults

Features expected from Retail & Mall solution
Automation, control and supervision



Security

The integration of systems such as the alarm system, video surveillance and technical alarms allows to reduce installation costs without affecting performance.

The presence alarm system can communicate with the video surveillance, lighting and other systems of the structure: the integration of the different systems therefore allows for a higher level of security and lower costs than single stand-alone systems. Many devices can be used multi-functionally by several systems.

Features expected from Retail & Mall solution
Automation, control and supervision

Comfort

The increase in the comfort offered by the building and the quality of living are among the best known advantages of an automation control system.

Lights and shutters of a room or a series of rooms can be grouped so that they can be controlled automatically or autonomously even by fragile people. This allows to conveniently turn off all the lights in an area with a single gesture, close the windows, put all the systems you want in standby condition (e.g. cooling), activate alarms, etc.

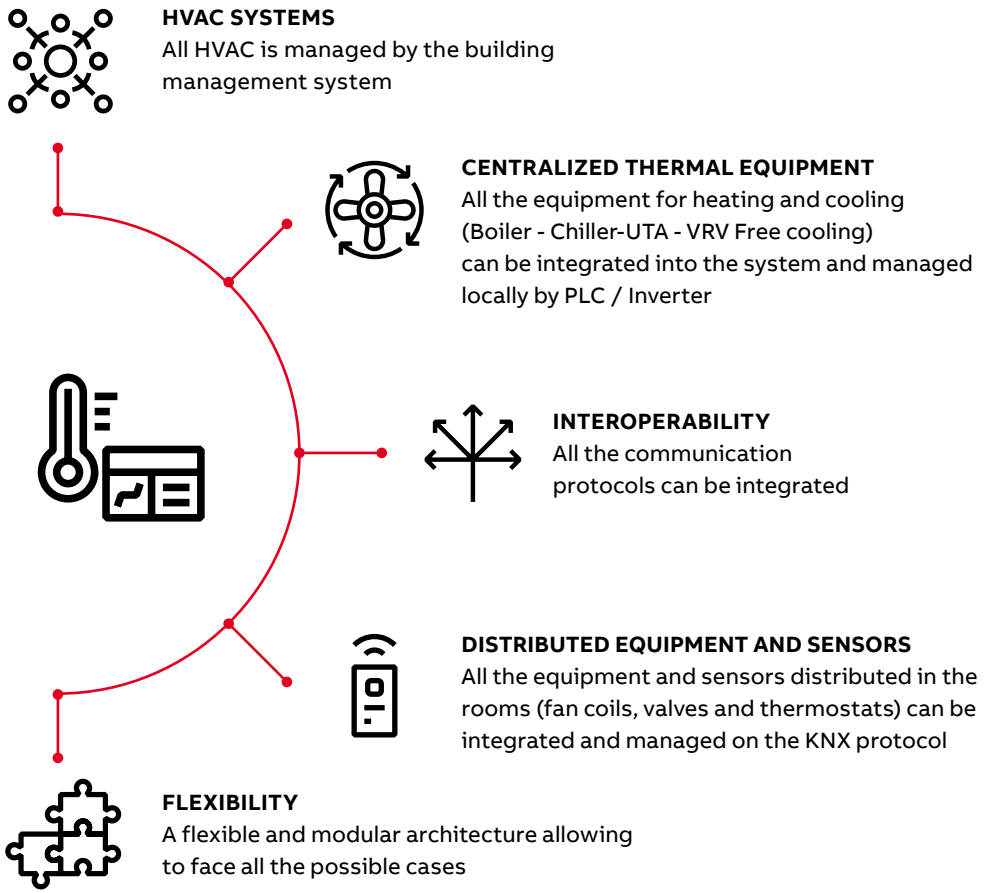
By integrating the traditional functions of an electrical system with the control and automation functions of communication to and from the building, the usability of the structures is increased.

Through thermoregulation, the system plays a fundamental role not only in minimizing consumption, but also in improving comfort.
People with disabilities or with temporary or permanent mobility limitations can receive assistance in using the spaces and their functions.

The solutions that in most cases meet these needs can be:

- video surveillance cameras;
- dedicated voice commands;
- remote controls with specific features such as large illuminated buttons;
- large parade buttons;
- alarms reported on mobile phones in case of detection of flooding, gas leaks, open doors or windows, etc;
- emergency call with dedicated or pull button.

HVAC control - Comfort and efficiency in the same architecture



Features expected from Retail & Mall solution
Automation, control and supervision

Living & Comfort – Energy saving and comfort

LIGHTING
Lighting management is integrated into the system

ENERGY EFFICIENCY AND COMFORT
Natural and artificial light are exploited to ensure the best conditions of comfort and energy efficiency

AUTOMATED MANAGEMENT
The building manages itself thanks to presence, brightness and air quality sensors

INTEGRATION WITH SPECIFIC PROTOCOLS
Management of the lighting system on DALI bus

Features expected from Retail & Mall solution
Automation, control and supervision

Management

The supervision and control systems allow the monitoring of all the vital parameters of buildings, facilitates ordinary and extraordinary maintenance and optimizes the archiving of all data with connection to management software packages.

Features expected from Retail & Mall solution
Energy Management

The tools for managing and controlling building energy consumption

Energy Managers, building owners, and Facility Managers are all too familiar with the pressure to reduce costs and energy consumption while maintaining occupant comfort. Energy management includes planning and operation of energy production and energy consumption units as well as storage and energy distribution. Objectives are resource conservation, climate protection and cost savings, while the users have permanent access to the energy they need. It is connected closely to environmental management, production management, logistics and other established business functions.
In this sense, the choice of tool for managing and controlling building energy consumption and costs together with the BMS and the electrical power distribution scheme constitute the fundamental elements of the design of an electrical system, on which the analysis and development of the solution will depend.

The ideal tool for managing and controlling building energy consumption and costs is user friendly, reporting and charting are so intuitive and easy to understand that it is not limited to use by expert energy managers. The solution shall be tailored to meet the individual requirements of each customer.

The right solution focuses on energy management in order to analyze energy consumption and target savings in a building, enabling energy efficiency improvements and the continuous commissioning of the building.

Building Energy Manager System expected features

Cloud-based BEMS access to the meter and sensor information in the building over the internet. The information is collected from the BAS via a secure fixed IP connection and the end-user accesses their information by logging into a dedicated website using their unique username and password.
No limit to the number of meters and sensor points you can connect to the service across any geographical location is essential for large organizations but useful also for any other context.
The possibility to works with any third-party systems such as Tridium, BACnet, and standalone systems via the SQL or MS Access database where the meter and sensor information is stored is crucial to avoid any limitation in existing building as well as in fully new installations.

Features expected from Retail & Mall solution
Energy Management

Analysis and charting

The BEMS analysis and charting shows how, where, and when energy consumptions are. Energy consumption data can be analyzed in a number of different ways from spectral analysis displays, regression analysis, actual versus target graphing, and lots more.

Charting:
- View real-time energy information in day, week, month, year and 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 cumsum charts
- Analyze energy consumption compared to a smart target for real-time energy management

Reporting

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.
Fully customized reporting feature allows to generate instant or scheduled reports on energy consumption, costs, carbon emissions, performance versus targets, as well as tenant costs reports.

Monitoring and alarms

Alarms viewed via the map based interface are particularly useful for a quick overview of multiple buildings in multiple locations for bureau or monitoring centres:
- Anomalies detected in energy consumed versus expected consumption
- Alarm reports issued via email
- Analysis of historical alarms can help identify potential ongoing issues.

Increasing awareness & encouraging behavioural change

A web-based public information display can communicate information on a building's energy performance and provides tips and recommendations of how employees can assist in reducing energy consumption.
By publically engaging people in energy efficiency behavioural change, there is the potential to improve energy efficiency by a further 5% over other energy efficiency measures in an organization. It also goes beyond the building bringing this positive behaviour into the wider public arena.

- Improve building energy performance
- Energy savings of up to 5% over other energy efficiency measures through behavioural change
- Reduce cost and carbon footprint
- Communicates energy policy & strategy to the public
- According with ISO 50001

Features expected from Retail & Mall solution
Service continuity

General distribution schemes

There are no real specific technical standard references for the choice of the electricity distribution scheme, also in consideration of the fact that this choice is necessarily free and dependent on the process served.

Electricity distribution systems are a fundamental infrastructure for most business processes and help to determine their performance in terms, for example, of energy management, safety, reliability and maintainability. If plant safety is an essential property as a legal requirement, reliability, availability and maintainability are instead characteristics of the plant that directly impact the business.
The possible configurations that an electrical distribution system can assume can generally be traced back to three fundamental schemes:
- the simple radial scheme;
- the double radial scheme;
- the ring.

Characteristic	Scheme		
	simple radial	double radial	ring
Reliability	min	max	avg
Service continuity	min	max	avg[1]
Voltage stability	min	max	avg[2]
Losses	max	min	avg[2]
Initial cost	min	max	avg
Service and maintenance cost	min	max	avg
Flexibility	min	max	avg
Management	max	avg	avg

1 If short interruptions of service are acceptable in case of breakdowns or work on the system.
2 It is a function of the point where the ring is kept open.

Features expected from Retail & Mall solution
E-Mobility

EV charging stations

Hospitality building should be equipped with a modern infrastructure EV charging stations, the access is from a ramp with automatic access control and power supply is configured for EV chargers. The power distribution is dimensioned so that all chargers can operate at the same time at full power; in the future the user will have the possibility to increase the number of EV chargers without modify the installation thanks to reserve designed and to the load management function. Load management makes sure that the available capacity of the building is not exceeded. At times when the current demand is high, the EV charger will pause the charge session. The charge session will start again when there is availability on the grid.

Slow charging is perfect for employee cars staying for the whole day in the parking, while fast chargers are perfect solution for parking place reserved for visitors, enabling re-charge in a shorter time.
The charging unit should be connected to the internet via GSM, WiFi or LAN for perfect integration into smart building system and configuration via app. Simplified authentication via either RFID or App provides flexibility for public-use case applications.

Protection and safety of power supply are ensured by protection devices and automatic switches. Consumptions are kept under control and energy meters are integrated into BMS for the asset management.

Testimonials from ABB technology users

Testimonials from ABB technology users

MIDDLE EAST

MARINA MALL ABUDHABI

The Marina Mall in Abudhabi is one of the largest shopping centres in the world.

What were the challenges in fulfilling thewishes of the customer?
The time frame for installation and commissioning was at a minium.

Why was the decision for a KNX solution made?
The open protocol of KNX allows an easy system integration with other 3rd party products and systems.

Applications

Lighting Control and Regulation
- Switching
- Central Control
- Time Control
- Daylight Dependant Switching
- Light Scenes

Operation, Indication and Visualisation
- LCD Display

Interfacing to other Building Systems
- Connection to other Systems via Analogue or Digital Inputs

Testimonials from ABB technology users

ASIA

EMQUARTIER MALL BANGKOK

"The EmQuartier is a landmark in Bangkok's economic development – and the development of its low-voltage network demanded a different level of innovation and quality. Working closely with ABB from the outset enabled PMK to offer a smarter solution in considerably less time.", said Chanapatt Pattaramaetakul, chief marketing officer of PMK Group.

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ABB installs first smart, connected low-voltage network in new luxury mall

Complete low-voltage solution cuts engineering costs by 60% and project delivery time by 35% for Bangkok's new EmQuartier mall

Zurich, March 11, 2016 – ABB, the leading power and automation group, has installed a smart low-voltage network in a cutting-edge shopping mall in Bangkok, the EmQuartier. The project is the first retail development to use ABB's Emax 2 circuit breakers and Ekip control and connectivity features for remote management of its power grid.

ABB's complete low-voltage solution improved the project's delivery time by 35% and reduced engineering costs by around 60%, due to its integrated SCADA functionality.

Giampiero Frisio, managing director of ABB's Protection and Connection business, said: "The solution developed for EmQuartier demonstrates why ABB is the technology leader in low-voltage energy. Building operators need solutions that make energy management easier and that help reduce total operating costs – ABB's complete solutions simplify the whole process for everybody: panel builders and system integrators save time and money while making the end-user's operations simpler to manage, safer, more reliable and energy efficient. By pioneering the introduction of more integrated, intuitive and connected low-voltage solutions, ABB is taking power and productivity to the next level."

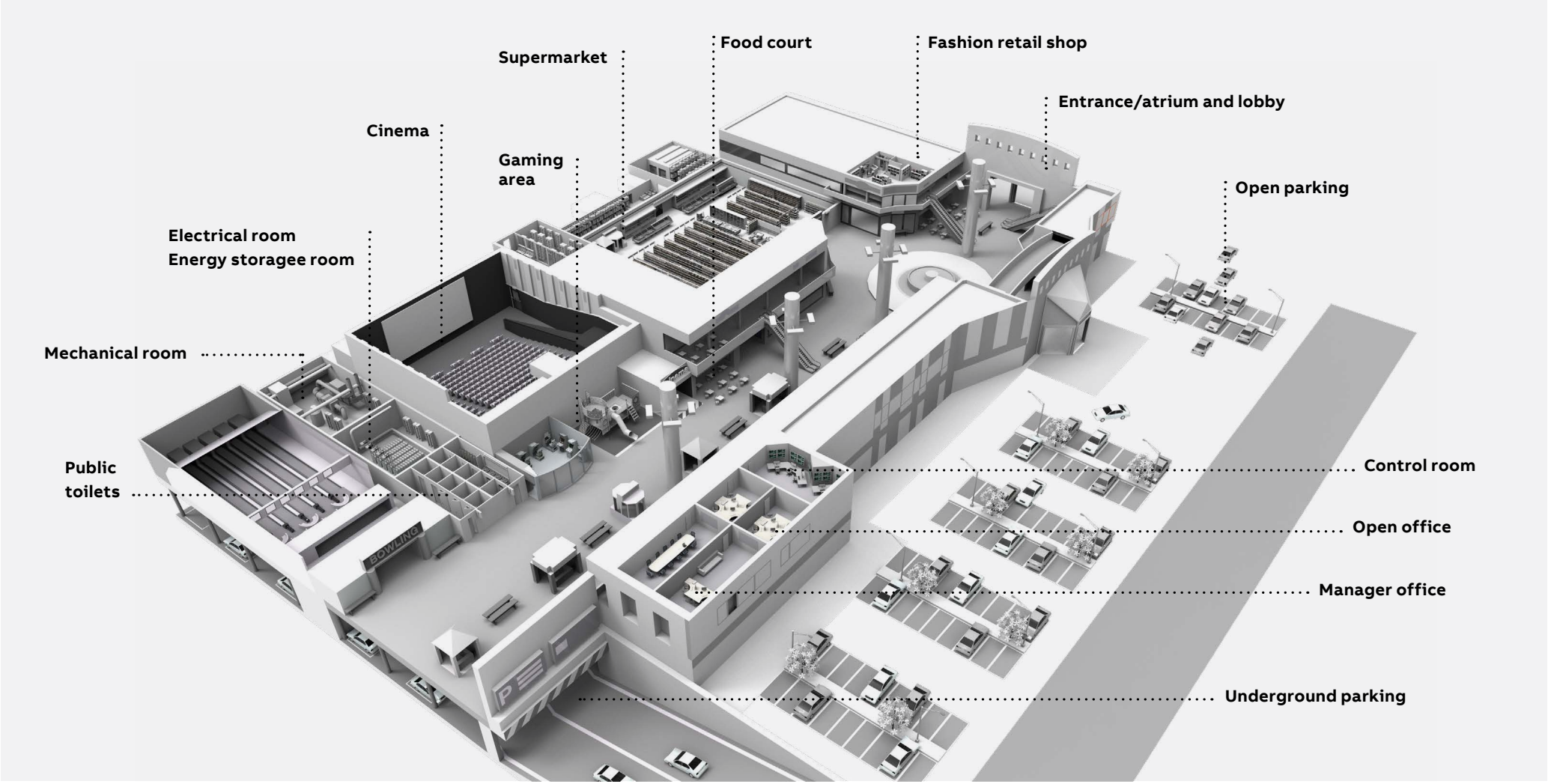
The EmQuartier is a 250,000 m2 luxury shopping and entertainment venue and a key part of the Mall Group's multibillion Baht transformation of Bangkok's business district. ABB developed the center's low-voltage network in partnership with local panel builder PMK Group. Emax 2 circuit breakers' built-in sensors and connectivity, configured with Ekip View supervision software enable remote monitoring, management and control of the low-voltage network at the shopping mall.

With each node in the electrical distribution network connected, everything from energy consumption to trend analysis and testing can be managed remotely. The air circuit breakers' intuitive touchscreen user interface supports ten different languages, including Thai, helping make the network simpler to manage.

Solution architecture

Building typology
Retail & Mall enviroment

The entire Retail & Mall building may or may not contain different areas dedicated to specific functions.



Building typology

Retail & Mall enviroment - Entrance, Atrium and Lobby

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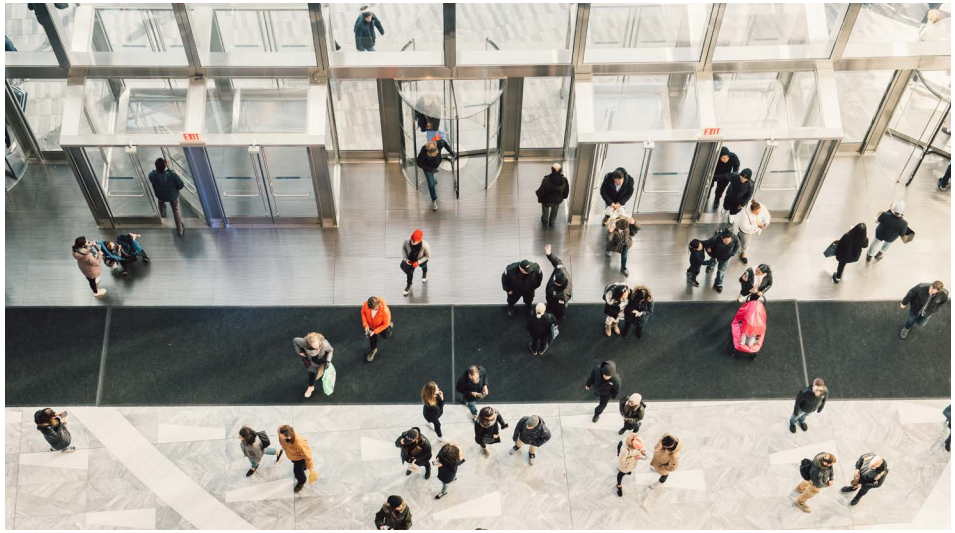
Entrance/atrium and lobby

Mall entrance are is primary used to enter inside the building and is widely used by the people to enter inside the mall as people coming on public transport and taxis can also enter from here . After the entrance we have atrium which is is a large open-air or skylight-covered space. They are popular because the give the building feeling of space and light.
Mall Entrance area and Atrium area are now days design in a way that to expose it maximum day light and also visitor can a idea for the variety of shops located in the mall.



Building typology
Retail & Mall enviroment - Retail Shop Spaces

Supermarket

In hypermarket will have different section which is divided for shopper convivence and as general standardization across supermarket and hypermarket business.
Below is the general categories of the section inside Hypermarket

1. Refrigeration rack areas
2. Vegetable and fruit section
3. Bakery section
4. Deli Section
5. Electronic section
6. Store Counter Section
7. Enclosed offices
8. Loading Deck

Will be identifying application for selected section of Hypermarket.

Fashion retail shop

Retail shops in the mall make majority of the shops in the mall. They retail shop can be of cloth shop, shoe shop, fashion shop, children cloth, book shop and toy shop.
Retail shop can be part of well-known brand which are having multiple across the globe or it can of brand which is only available in that country.
Prime interest of Shop owners are control of Lighting uniform control and RGB lights , HVAC, energy management , cost effective management of multiple retail shop and easy to manage by technicians and more importantly, by non-technical staff.

Building typology
Retail & Mall enviroment - Entertainment spaces

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Food court

COVID-19 pandemic has affected restaurants in the Mall and for the retail shop owner in the food court Area have endured significant decreases in revenue, jobs, and overall profit, radically impacting the industry as a whole. Despite the challenges the restaurant sector, ranging from fast food chains to fine dining establishments, has been adapting by implementing unique solutions to safely serve customers. UVc, or ultraviolet light, is also used as an infection control technology and can be helpful in rendering viruses non-infectious. recommend to aid in both air and surface sanitization.

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Cinema

Cinema are normally located inside the mall normally near to food court and gaming section of the mall .it is used as attract more visitor to the mall thus increasing Mal foot ration which lead to increase in revenue for retail shops. After gradual opening of the cinema during pandemic cinema has also implement strict measure to make health and safety of the cinema visitor and this include the enhanced cleanliness, safe distancing and reduced contamination both through surface and air.
Make visitor comfortable and the same not compromising on health & safety of their visitor is very important for them to retain their business continuity

—
Gaming area

This space provides an opportunity for visitors of all ages to take part into various skill based games. Gaming areas are often coupled with other services such as food & beverage or cinema.



Building typology
Retail & Mall enviroment - Parking Spaces

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Underground parking

A car park is a cleared area that is intended for parking vehicles. Underground car parks are always fully enclosed and requires mechanical ventilation. The air quality and temperature in a car park needs to be managed to ensure those using the car park are not exposed to unsafe conditions. In the absence of proper ventilation, car parks present several indoor air quality problems. The most serious is the emission of high level of carbon monoxide. Apart from air quality, fully enclosed car parks must maintain appropriate level of light to allow people and vehicles move around easily and safely. Lighting may come from natural or artificial sources, or a combination of both.
Consumer Mall and retail experience begin with convenient parking so it's very important to parking should be simple and easy. Some mall have paid and while some offer free parking that depend upon the occupancy, availability, and retail business performance.
With right infrastructure in place, car parks can be used for opportunity charging for electrical vehicle. The car parking system is in integrated to EV system and if you want to utilize EV Charging once can show the car park ticket at EV charger it can start charging your car.

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Open parking

An open car park is a cleared area that is intended for parking vehicles, bike and motorbike for shorter duration or in some cases longer duration. Open car park does not require any mechanical ventilation, but it must have lighting in place to ensure safe movement of people and vehicle during nighttime. Open car park can also be used for vehicle and motorbike charging.

Most of the new malls have reserved parking for EV Care to promote and these parking are marked with special sign live charging sign.

Building typology
Retail & Mall enviroment - Offices spaces

—
Manager office

This space is primary in use of FM head. The facility manager from his office can also access the central server and look into critical alarm , acknowledgment for raised alarms , health status of different component of electrical and mechanical system .
He can also check overall energy consumption of the building and where the most energy is being utilized.
Look into more critical raised by the system and take proactive action at the system.
Also as its very important for Mall to that visitor health and well being is not comprised and he can check air quality in different part of the building.

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Open office

The open space office is in use of the facility team, security, and Mall Operation team.
It includes workstations for the selected employees but also other services at the disposal of the employee like printer machine, FAX Machine.
The staff here are directly running Mall facility operation from attending complain, security and housekeeping.
It very important to provide them comfortable, secure, and convenient environment so that they work proactively and focus on their work.

Building typology
Retail & Mall enviroment - Services spaces

Mechanical room

A mechanical room is a room or space in a building dedicated to the mechanical equipment and its associated electrical equipment. A small building or home may have at most a utility room but in large buildings, mechanical rooms can be of considerable size, often requiring multiple rooms throughout the building, or even occupying one or more complete floors

Mechanical room can have below mechanical devices
- Chilled Water Circulation – Primary and Secondary
- Heath Exchanger
- AHU & FAHU
- Boilers
- Refrigeration system
- Chillers
- Domestic Water System
- Backup Generator System

Electrical room

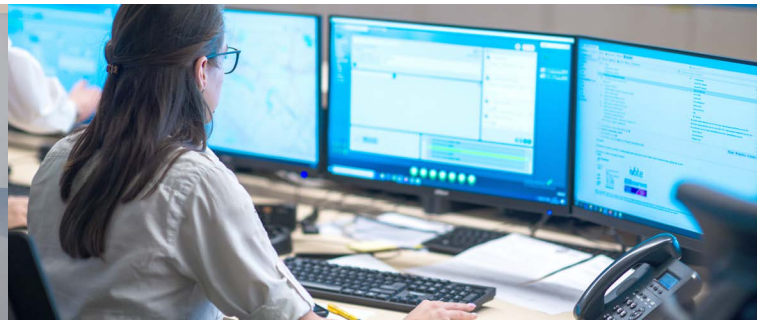
Electricity is vital to building operation Electrical service shall include provision of normal, essential (30 sec.), instantaneous (1 sec.), and uninterrupted (no break) electricity supplies and switchgear and circuit protection to safely operate and control the supplies.

High voltage and low voltage devices are installed in electrical room for distribution of electricity to various part of the Retail & Mall shops .

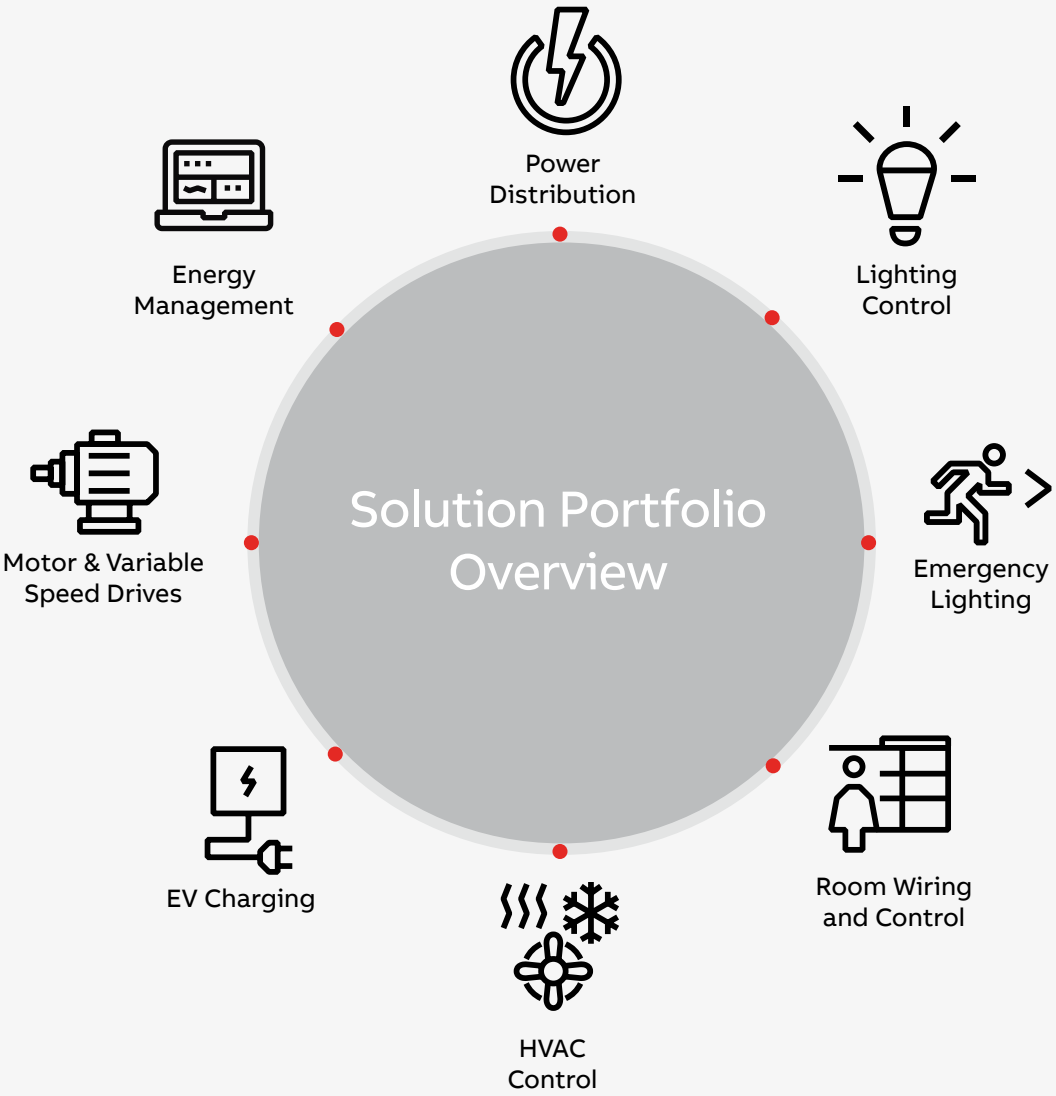
Control room

The control room is space from where facility team run overall operation on the Building.
- They maintain and secures backups for the different systems
- Monitor and controls both electrical and mechanical components of the building by checking from central server.
- They receive and attend different complain from retail customer regarding HVAC electrical system and different type Control system (Lighting , HVAC , Mechanical and emergency Lighting monitoring system)
- From Central sever also monitors power distribution components for critical load management and all alarms, conditional monitoring can be done via cloud as well on premised.

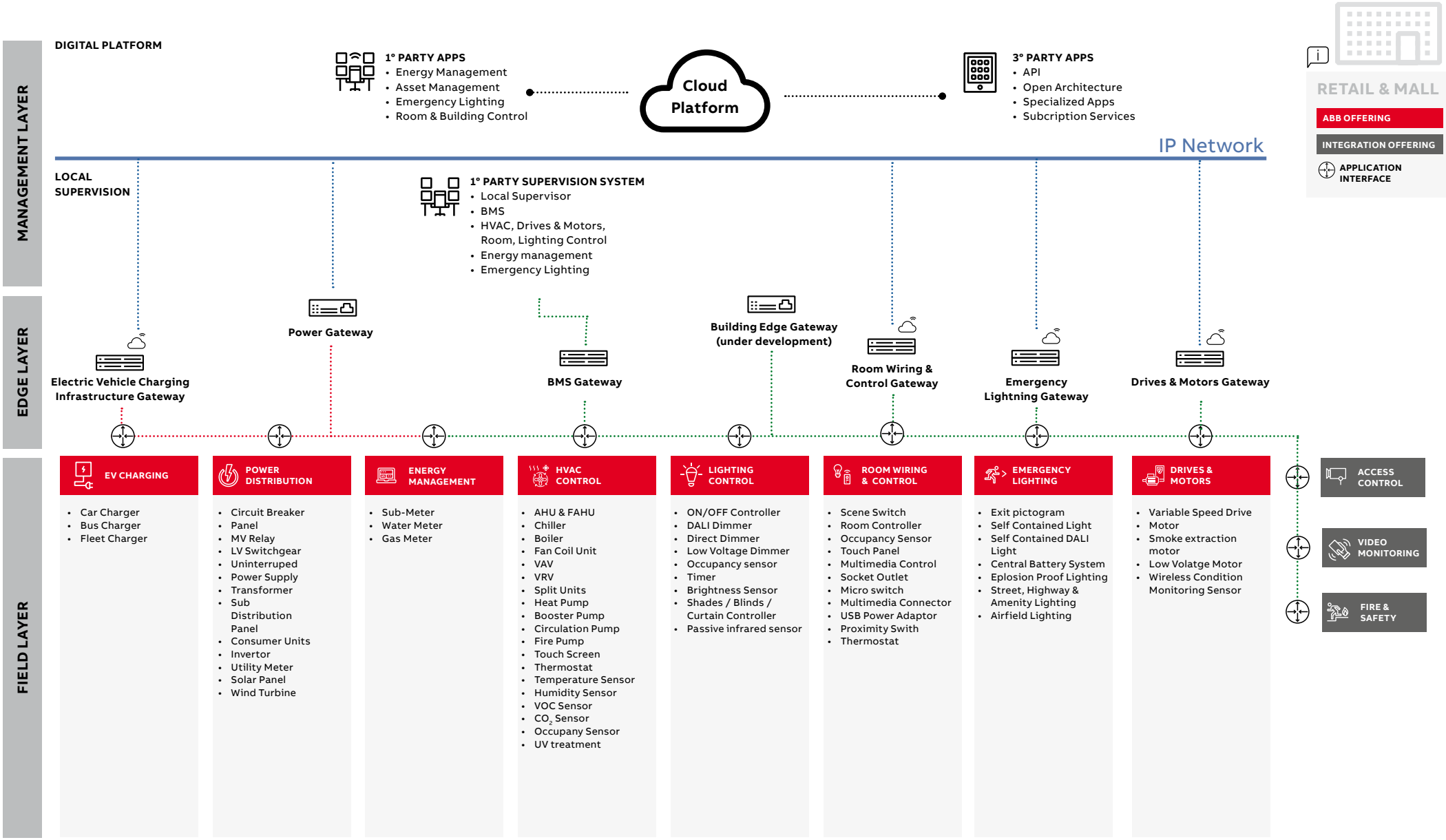




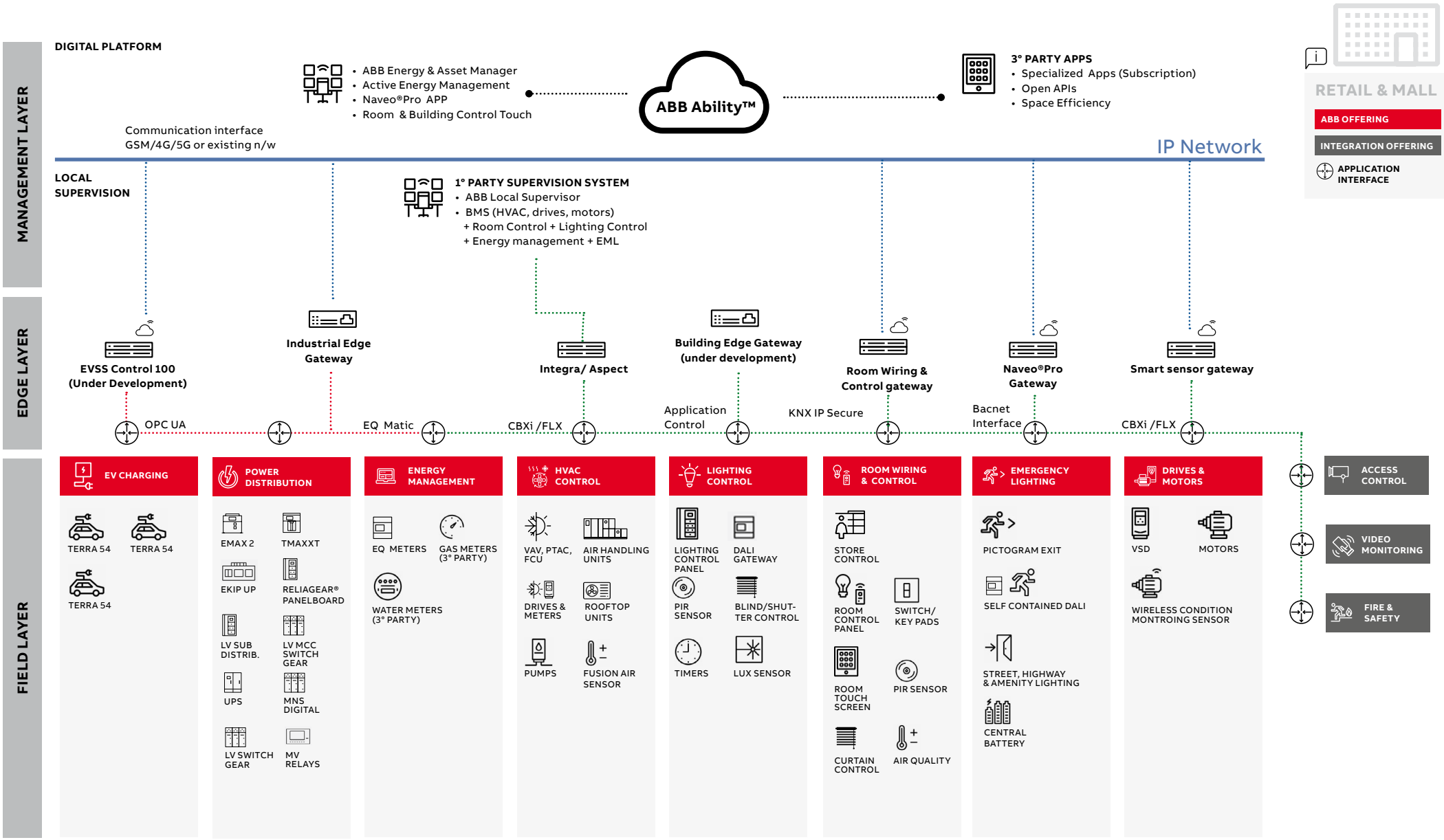
Portfolio Overview



Reference Architecture
Retail & Mall



Reference Architecture
Retail & Mall



Power Distribution

A reliable and energy efficient electrical distribution is needed to keep a building powered, so that computers, lights, heat, and more keep the business running smoothly. 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

Example of power distribution application

Electrical power distribution system might receive power at one or more sources. Power distribution and safety system generally include panel enclosure, bus bar, circuit breaker, fuse, relay, feeder, protection devices, safety devices etc.

Overview - Motivation & Key Elements
Efficiency and consumption monitoring

- Metering systems are provided for each zone and main services such as lighting, heating, air conditioning
- The ABB supervision system makes integration of water and gas meters easy and simple
- ABB Ability Energy and Asset Manager provides a common interface and can use analytics,for real-time understanding of building energy consumption and efficient identification of areas of improvement

Safety

- The office building is designed to hosts hundreds of employees for working activities and visitors, therefore special attention to people safety and protection is important
- One of the most critical exposure happening in electrical system is an electric arc inside a switchboard

Continuity of service

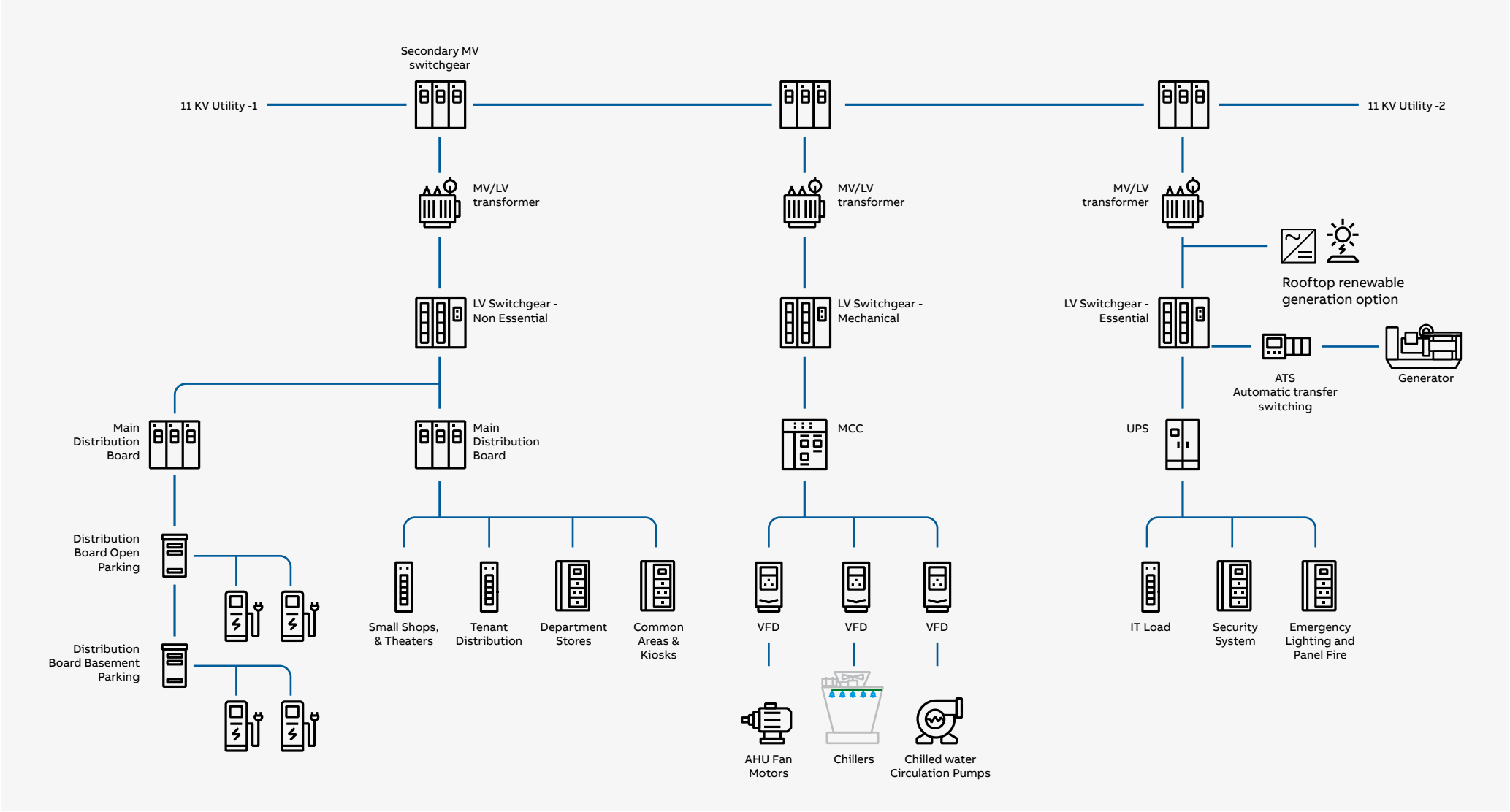
- Protection devices have been selected to ensure total safety
- Redundancy of UPSs for monoblock structures or redundancy at module level for modular UPSs is pro-posed to ensure high reliability

Maintainability

- Monitor performance indicators of protection devices, transformers, generator and automatic transfer switches
- To reduce maintenance cost, it is suggested the adoption of a predictive maintenance program

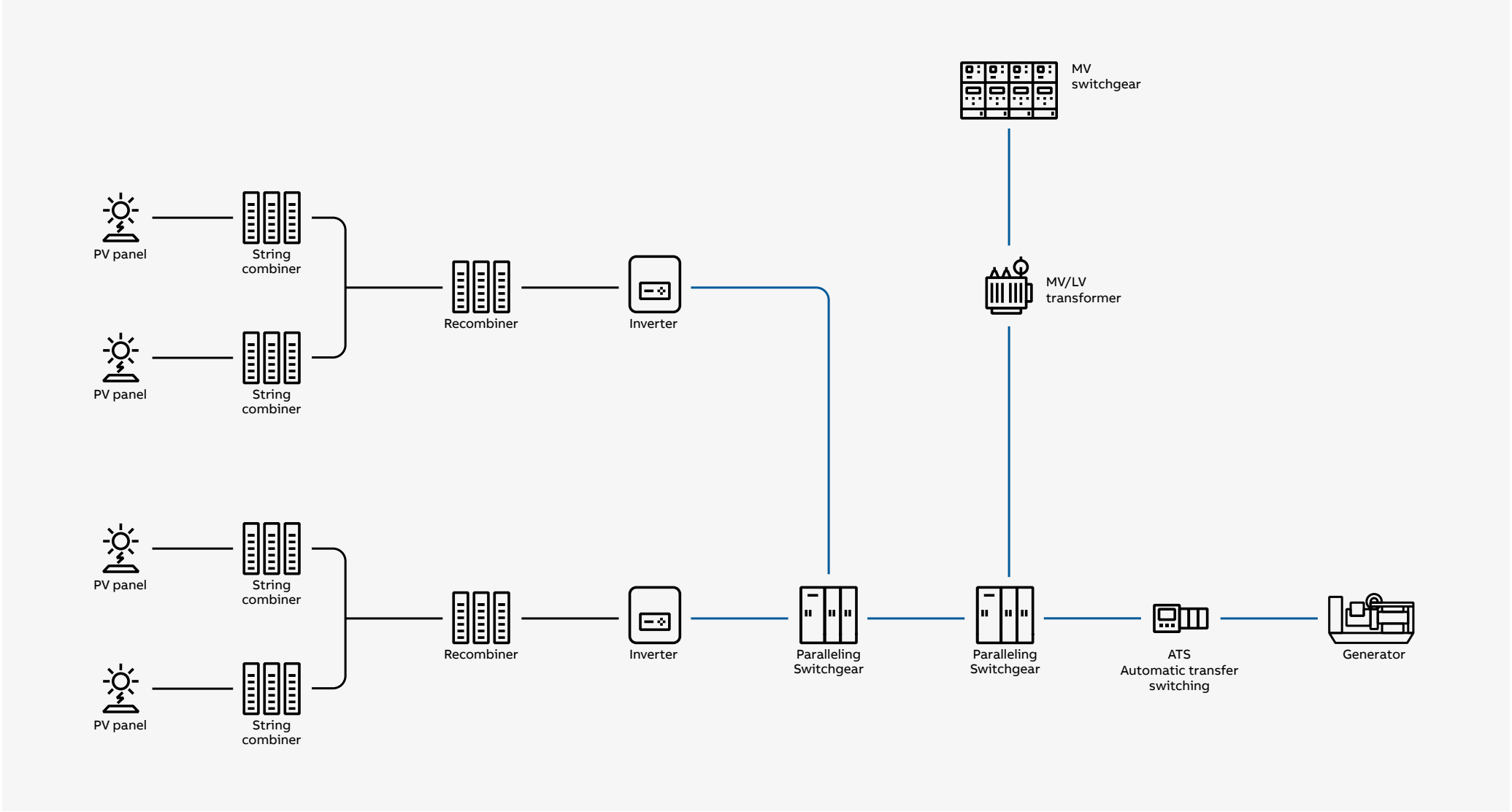
Power Distribution
Overview

Reference Architecture



Power Distribution

Reference Architecture with Renewables and ATS



Power Distribution
Medium Voltage Switchgear and Components

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 and Components

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.

ReliaGear

ReliaGear® ND ANSI narrow design medium voltage switchgear
Indoor air-insulated metal-clad switchgear for primary distribution up to 15 kV, 2,000 A, 31.5 kA with one-high and two-high construction available. Higher kA available in Advance construction.
Measuring in at 26 inches wide, 98 inches tall and 77 inches deep (85 inches deep for two-high), ReliaGear ND is a compact solution.
The Relion® protection relay family offers the widest range of products for the protection, control, measurement and supervision of power systems for ANSI applications.

Power Distribution
Medium Voltage Switchgear and Components

Relion® series protection relays

The Relion® product family is a range of products for the protection, control, measurement and supervision of power systems for IEC and ANSI applications. Relion products have been designed to implement the core values of the IEC 61850 Standard

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
Medium Voltage Switchgear and Components

MV Circuit Breakers

Circuit breakers for indoor and outdoor applications with the world's most successfull range in medium voltage vacuum and SF6 gas.
Across every market, ABB's circuit breakers occupy a leading position thanks to their proven reputation for reliability, performance and long life. CBs from ABB are available for original equipment manufacturers (OEM) to incorporate in their own installations or for use in repair, retrofit and upgrade projects.

Power Distribution
Low Voltage Switchgear and Components

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.

- NeoGearTM is safer, thanks to its revolutionary busbar system.
- NeoGearTM uses 25% less space than conventional switchgear.
- NeoGearTM saves energy thanks to its excellent thermal performance and sharply
- reduced heat losses up to 20%.
- NeoGearTM 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.

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 Switchgear and Components

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.

System pro E Energy

System pro E energy is a complete range of switchboards for standard energy distribution inside any building, from main distribution switchboards to floorboards, to department cabinets. The range is available both for wall installation (up to 400A) and floor installation (up to 800A) with over 400 sizes. The overall dimensions are reduced thanks to a depth of 200 mm for the wall versions and 240 mm for the floor versions. All versions can be placed side by side with other structures or cable housing columns. Kit solutions and a fully open structure simplify all assembly steps.

Power Distribution
Low Voltage Switchgear and 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 at the same time 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 absorbed by users. 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.
These devices offer a complete integration in intelligent networks, buildings, and industrial structures. 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 Switchgear and Components

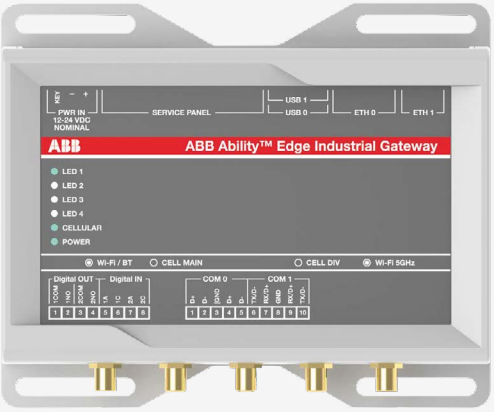
Ekip UP

Ekip UP is the low-voltage digital unit able to monitor, protect and control the next generation of plants. Thanks to the built-in software-based function, Ekip UP is the unit that digitalizes the plant performance. Sharing all the electronics solutions of “all-in-one” platform, Ekip UP completes the ecosystem to fit all the market opportunities. The result is a unit suitable for all the different applications including all the needed functionalities without the need of additional external devices.

Ekip UP in the best way, will be able to:
- UP-date old facility with the latest innovation in the fastest way.
- UP-grade plant and get more functionalities in order to cover all the opportunities.
- UP-load measures and enable true energy management function.
- Maximize UP-time thanks to easy commissioning without impact on switchboard design.

Edge Industrial gateway

Designed to collect all generated field device and parameter data across smart facilities, the ABB AbilityTM Edge Industrial Gateway feeds all data into one simplified and accessible platform to provide a full overview of system and building performance. Using IoT technology, the Edge Industrial Gateway allows facilities to monitor all downstream low- and medium-voltage devices across a range of connections, including Wi-Fi and cellular, either in the cloud or on-premise.
The new ABB AbilityTM Edge Industrial Gateway has been designed to unlock the full potential of equipment and assets from the factory floor to operational teams, for complete and straightforward energy and asset management.



Power Distribution
Low Voltage Switchgear and 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 Switchgear and Components

M4M Network Analyzer

Improve energy efficiency, reduce energy costs and increase power quality: three goals to achieve in order to run sustainable buildings. ‘Internet of Things’ devices -like the new M4M Network Analyzers- allow real-time and accurate energy data monitoring and enable customers to improve performance while reducing impact on the environment.
The new M4M range of network analyzers ensures complete power quality analysis and high-accurate energy efficiency monitoring of electrical parameters and advanced power quality KPIs.

Moreover, energy data gathered by the M4M can leverage on the integration into a common architecture that, together with other smart components, promote the ability to ‘Give Your Buildings a New Dimension’ – a scalable portfolio for energy and asset management solutions.

System pro M DIN-Rail products

TSystem pro M portfolio modular DIN-Rail products
System pro M, is a complete assortment of first-class quality products for controlling and monitoring electricity as well as protection of the end users life, property and for energy efficiency. The portfolio includes miniature circuit breakers, residual current devices, surge protection devices, control, signaling, measuring and smart accessories.

Power Distribution
Low Voltage Switchgear and Components

CMS700 Circuit Monitoring System

The new control unit CMS-700 completes the range of Circuit Monitoring Systems, which enable multi-channel measurement system in alternating (AC) as well as direct current (DC). The CMS consists of a control unit and sensors, allowing easy monitoring of the individual lines of a facility.
CMS-700 enables detailed monitoring of energy consumption of up to 96 sensors (96 single-phase or 32 three-phase lines or a mix of the two up to the limit of 96 sensors).
Easy to install, it is a versatile and efficient solution, which can be integrated into already wired panels.

Using the integrated web server, the CMS-700 control unit provides easy access to data collection, analysis and download in order to optimize energy consumption, efficiency and energy management of the system. All CMS-700 central units can be accessed remotely via different communication protocols.

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.

Power Distribution
UPS

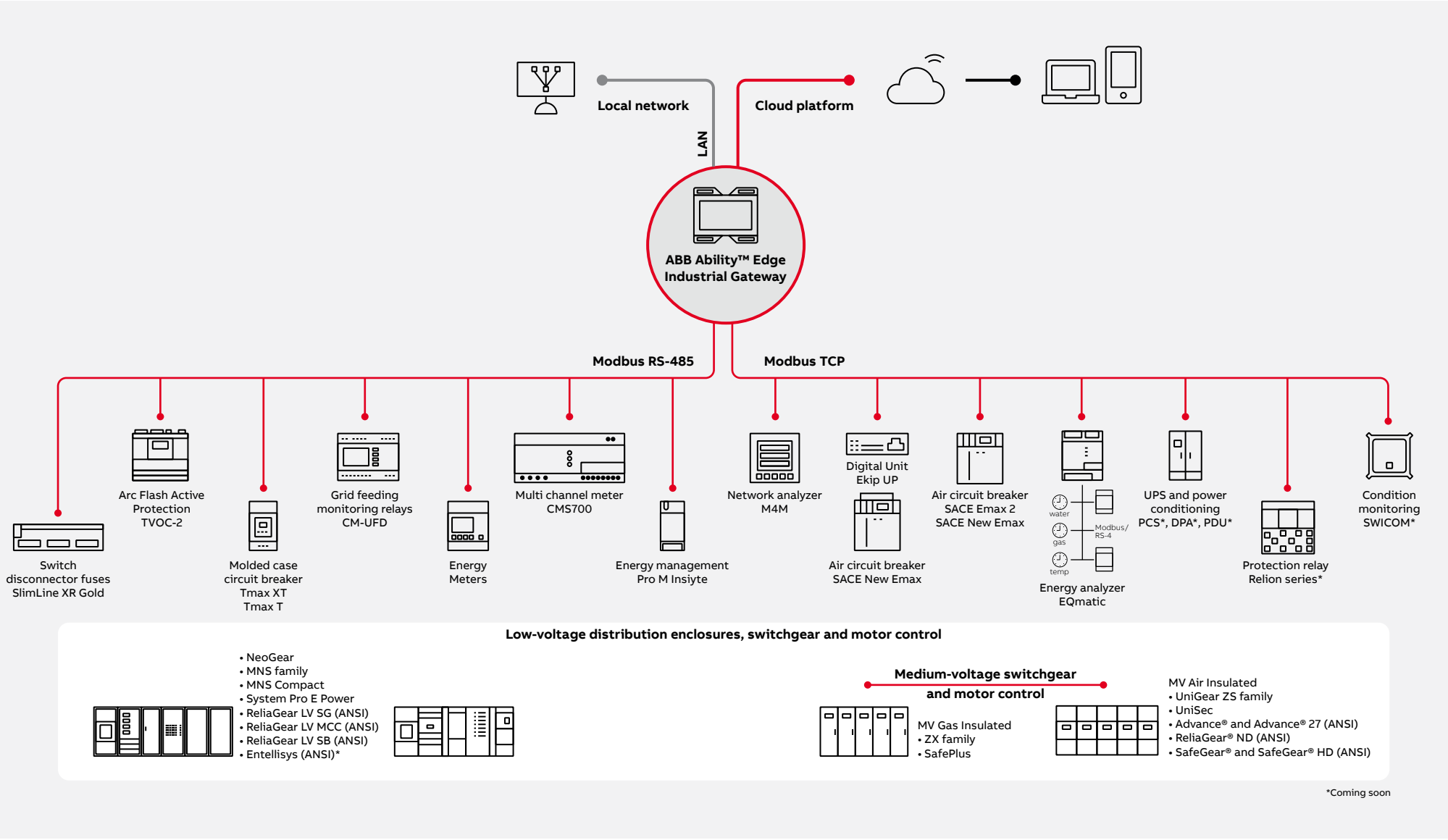
DPA UPScale
High efficiency modular UPS unit

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.

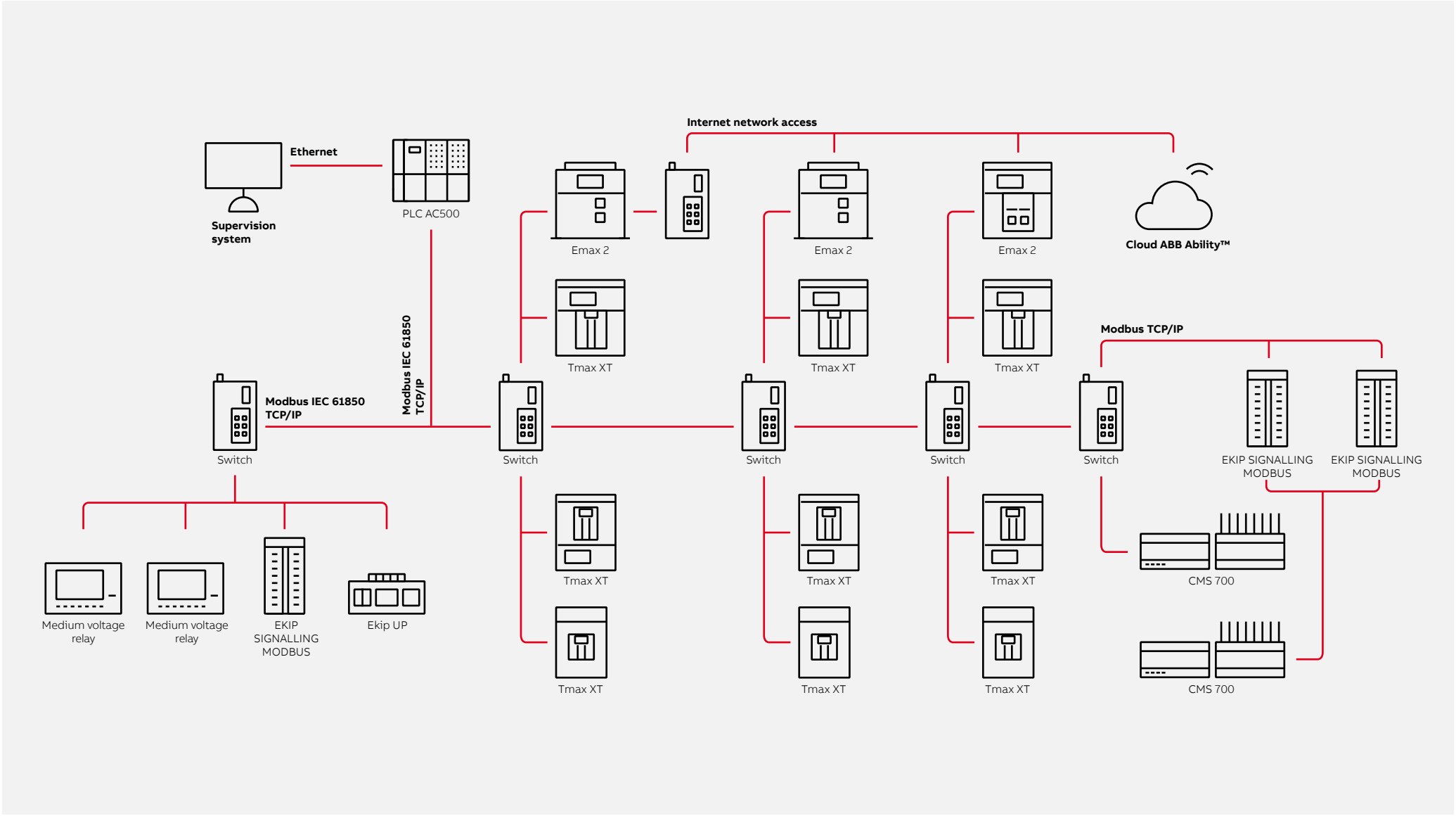
Power Distribution
Edge Gateway



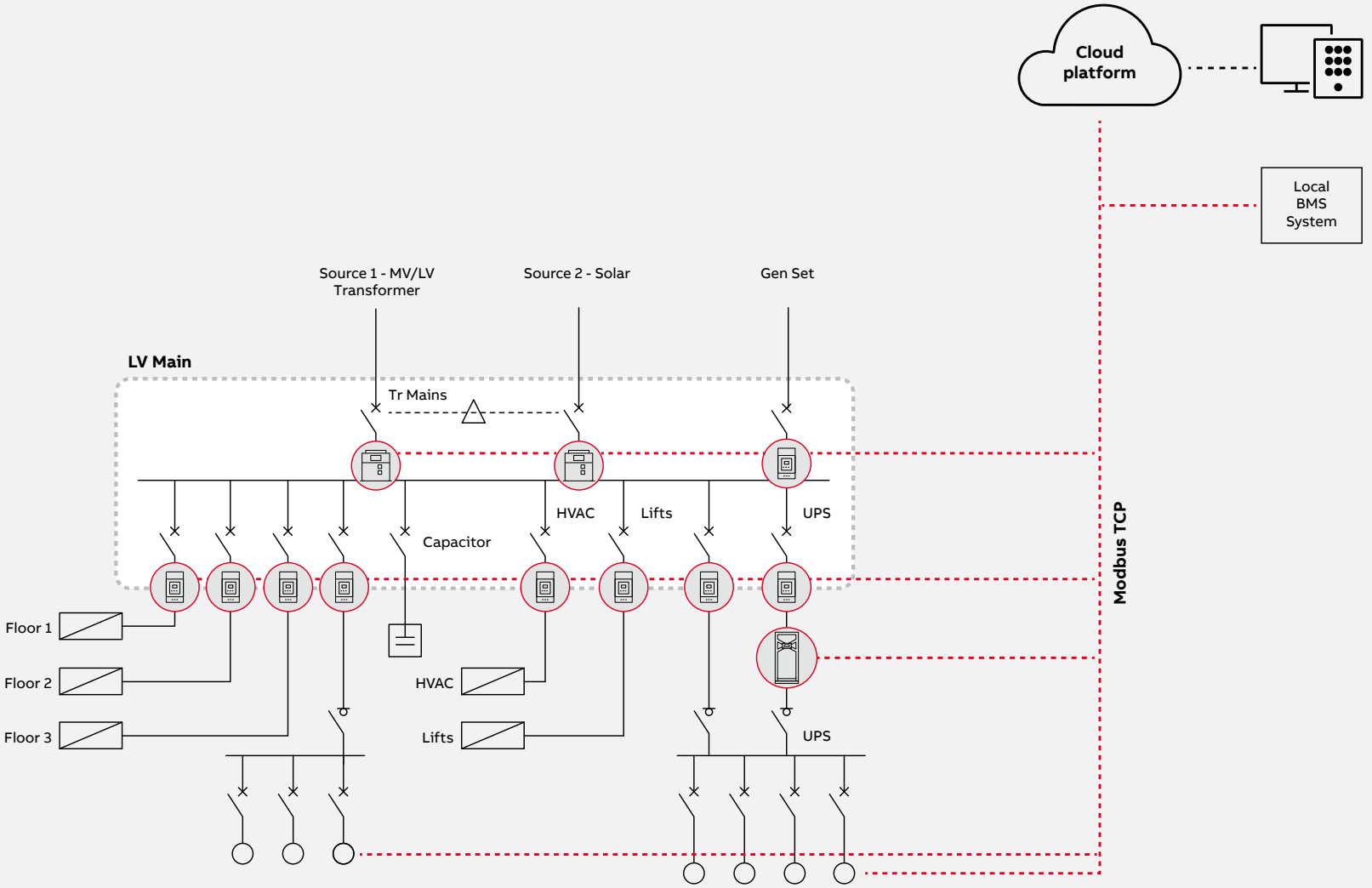
*Coming soon

Power Distribution

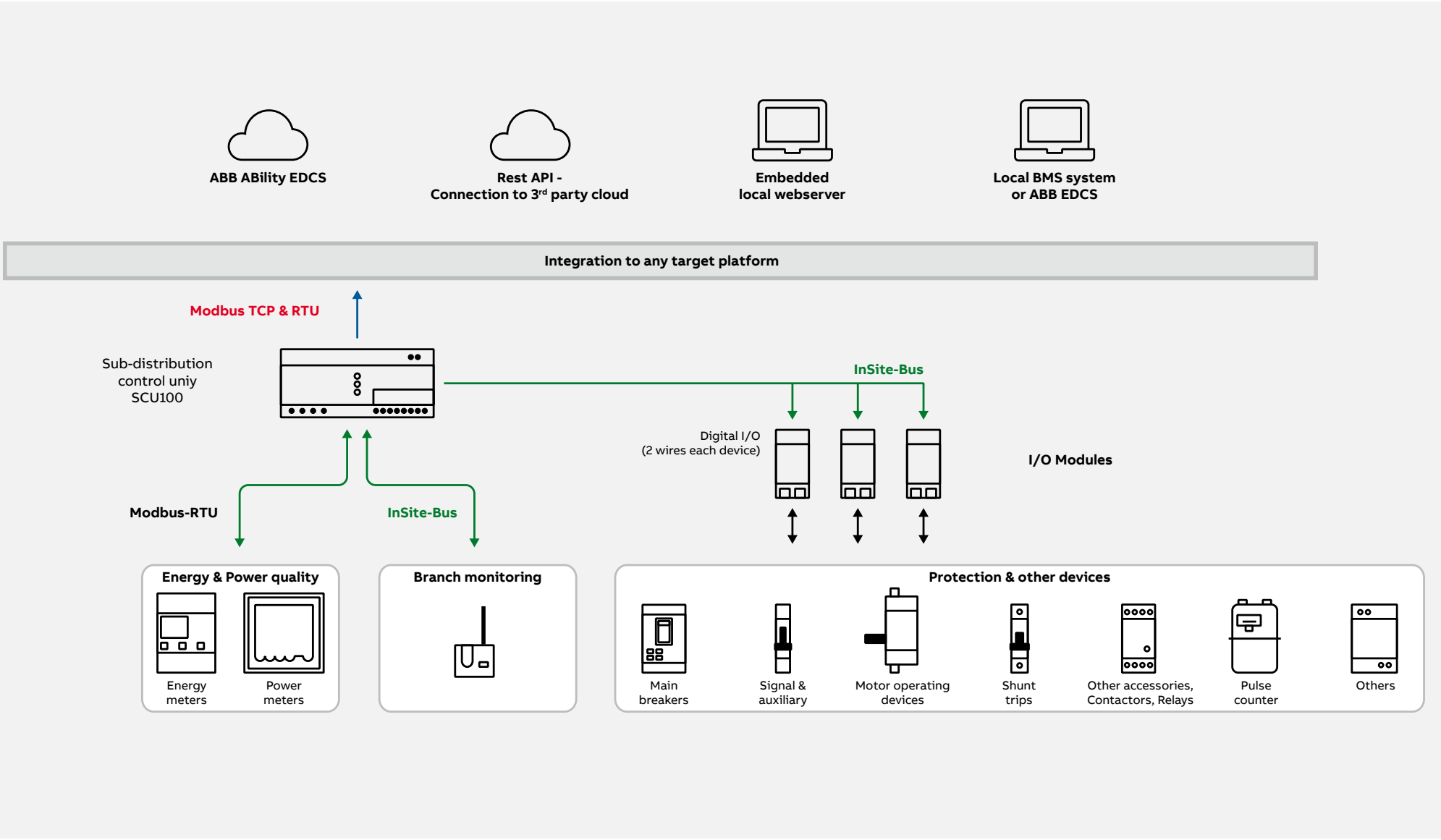
Scheme of the energy management system



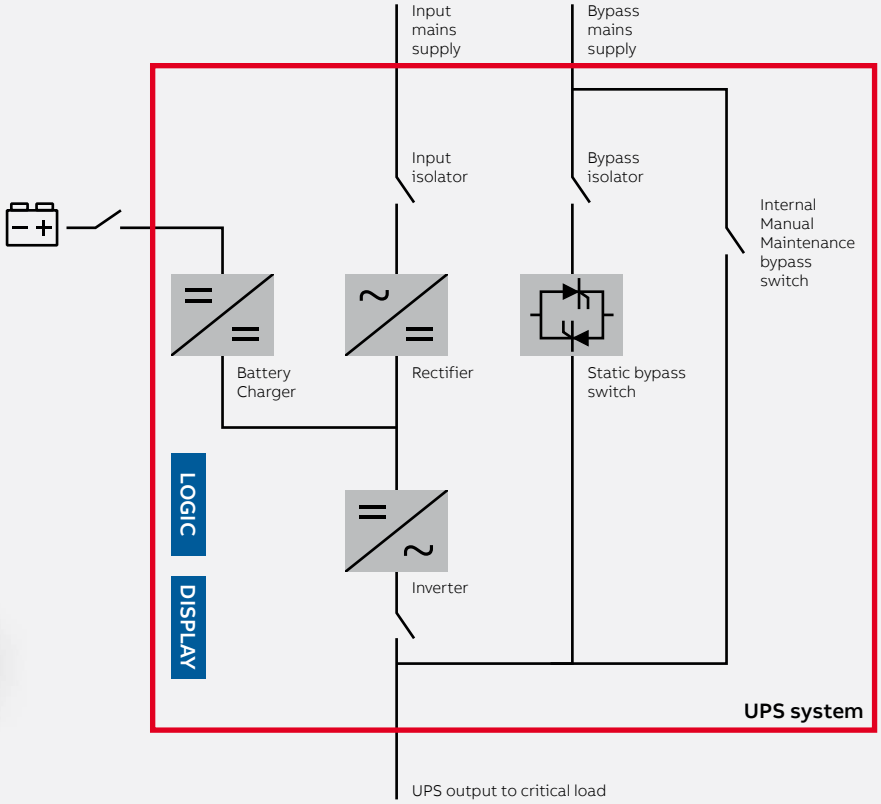
Power Distribution
LV Switchgear



Power Distribution
Sub distribution panel



Power Distribution
UPS



Power Distribution
Bill of Materials

Main Distribution

Order Code	Description	Additional information / assumptions:
Medium Voltage		
	UniGear ZS1 Feeder Circuit Breaker Panels (Type-4)	
	UniGear ZS1 Transformer Circuit Breaker Panel (Type-1)	
	UniGear ZS1 Bus Coupler Circuit Breaker Panel (Type-2)	
Low Voltage Switch Gear Essential		
1SDA104356R1	E2.2H/E9 2000 Ekip Touch LSI 3p FHR	
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	
1SDA073773R1	RTC 250VAC 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	
1SDA074166R1	EKIP COM ACTUATOR E1.2..E6.2-XT7-XT7M	
1SDA073747R1	YR 24 VDC E2.2...E6.2	
1SDA085693R1	Ekip Signalling 3T-1	
1SDA107525R1	SW Measuring package for Emax 2	
1SDA107675R1	Class 1 Power&Energy Metering E2.2 Ex Co	
1SDA104351R1	E2.2H/E9 1250 Ekip Touch LSI FHR	
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	
1SDA073773R1	RTC 250VAC 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	
1SDA074166R1	EKIP COM ACTUATOR E1.2..E6.2-XT7-XT7M	
1SDA073747R1	YR 24 VDC E2.2...E6.2	
1SDA085693R1	Ekip Signalling 3T-1	
1SDA107525R1	SW Measuring package for Emax 2	

Order Code	Description	Additional information / assumptions:
1SDA107675R1	Class 1 Power&Energy Metering E2.2 Ex Co	
1SCA153435R1001	OXB200E3X3QT Automatic Transfer Switch	
1SCA148926R1001	OXEA1 Auxiliary power supply module	
1SDA104052R1	TCP-OX Ekip Com Modbus for Level 3 and Level 4 controllers	
1SDA068173R1	XT4N 250 BREAKING PART 3p F F	
1SDA100281R1	Ekip Touch LSI In=250A XT4 3p	
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT	
1SDA105208R1	Measuring for XT2-XT4	
Low Voltage Switch Gear Non Essential		
1SDA104356R1	E2.2H/E9 2000 Ekip Touch LSI 3p FHR	
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	
1SDA073773R1	RTC 250VAC 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	
1SDA074166R1	EKIP COM ACTUATOR E1.2..E6.2-XT7-XT7M	
1SDA073747R1	YR 24 VDC E2.2...E6.2	
1SDA085693R1	Ekip Signalling 3T-1	
1SDA107525R1	SW Measuring package for Emax 2	
1SDA107675R1	Class 1 Power&Energy Metering E2.2 Ex Co	
1SDA068163R1	XT2N 160 BREAKING PART 3p F F	
1SDA100103R1	Ekip Touch LSI In=160A XT2 3p	
1SDA105177R1	EKIP COM MODBUS TCP XT2-XT4 INT	
1SDA105208R1	Measuring for XT2-XT4	
1SDA100551R1	XT5N 630 Breaking part 3P	
1SDA100601R1	Ekip Touch Measuring LSI In=630 XT5 3p	
1SDA104925R1	YO XT5-XT6 24...60 Vac/dc	
1SDA074172R1	EKIP SUPPLY 110-240VAC/DC E1.2..E6.2-XT	
1SDA105167R1	EKIP COM MODBUS TCP Tmax XT	

Power Distribution
Bill of Materials

Executive Office Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Lighting , HVAC , Shutter , Emergency Lighting)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Lighting
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For HVAC
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Shutter - Curtain
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Emergency Lighting
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	For Workstation
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	
4NWP100102R0001	11 RT 3kVA B UPS PowerValue	

Open Space Office Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CDD284101R0040	SD204/40 4P, 40A Switch Disconnector	HAVC
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Lighting Shutter , Emergency Lighting)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Lighting
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For HVAC
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	ForShutter - Curtain
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Emergency Lighting
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	For Workstation
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	
4NWP100102R0001	11 RT 3kVA B UPS PowerValue	

Entrance/Lobby and Atrium Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CDD284101R0040	SD204/40 4P, 40A Switch Disconnector	HAVC
2CDD284101R0040	SD204/40 4P, 40A Switch Disconnector	External Lights
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Lighting , HVAC , Shutter , Emergency Lighting)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Lighting
"2CDS251001R0204"	S201-C20 Miniature Circuit Breaker - 1P - C - 20 A	For HVAC
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	ForShutter - Curtain
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Emergency Lighting
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	Sokets Outlet
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	

Power Distribution
Bill of Materials

Outside Area Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Dimming and On-off Lights)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For DALI Lighting
2CDS251001R0204	S201-C20 Miniature Circuit Breaker - 1P - C - 20 A	For On Off Type Street Pole
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	Sokets Outlet
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	

Food Court Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CDD284101R0040	SD204/40 4P, 40A Switch Disconnector	HAVC
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Lighting , HVAC , Shutter , Emergency Lighting)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Lighting
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For HVAC
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	ForShutter - Curtain
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Emergency Lighting
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	Sokets Outlet
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	

Supermarket Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CDD284101R0040	SD204/40 4P, 40A Switch Disconnector	HAVC
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Lighting , HVAC , Shutter , Emergency Lighting)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Lighting
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For HVAC
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	ForShutter - Curtain
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Emergency Lighting
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	Sokets Outlet
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	

Power Distribution
Bill of Materials

Retail Shop Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CDD284101R0040	SD204/40 4P, 40A Switch Disconnector	HAVC
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Lighting , HVAC , Shutter , Emergency Lighting)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Lighting
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For HVAC
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Emergency Lighting
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	Sokets Outlet
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	

Control Room Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
1SDA115508R1	" ABB Ability™ Edge Industrial Gateway runs ABB Ability™ Energy and Asset Manager solution"	
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CDD284101R0040	SD204/40 4P, 40A Switch Disconnector	HAVC
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Lighting , HVAC , Shutter , Emergency Lighting)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Lighting
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For HVAC
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Emergency Lighting
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	Sokets Outlet
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	
4NWP100102R0001	11 RT 3kVA B UPS PowerValue	

Basement Sub Distribution Board Conponents

Order Code	Description	Additional information / assumptions:
2CDS273001R0634	S203M-C63 Miniature Circuit Breaker - 3P 63 A	For Three Phase Load - 1 Per DB
2CDD284101R0040	SD204/40 4P, 40A Switch Disconnector	HAVC
2CSF204101R1250	F204 A-25/0.03 Residual Current Circuit Breaker 25 A	For Each type of Load (Lighting , HVAC , Shutter , Emergency Lighting)
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Lighting
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For HVAC
2CDS251001R0104	S200 -1P -C -10 Miniature Circuit Breaker	For Emergency Lighting
2CDS251001R0065	S200 - 1P - B - 6 ampere Miniature Circuit Breaker	Sokets Outlet
2CSR255140U1164	DS201 C16 A30 U RCBO	For CMS Contoller
2CCG000244R0001	INS135 Connector set (35pcs) - InSite pro M compact	
2CCG000243R0001	INS105 Flat Cable 5 m	
2CCG000242R0001	SCU100 Sub-Distribution Control Unit	
2CCA880211R0001	CMS-121PS Open-Core Sensor 40A	
2CCG000245R0001	DM11 Digital input modules	
2CDS200912R0001	S2C-H6R Auxiliary contact 1CO	

Lighting 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 Control

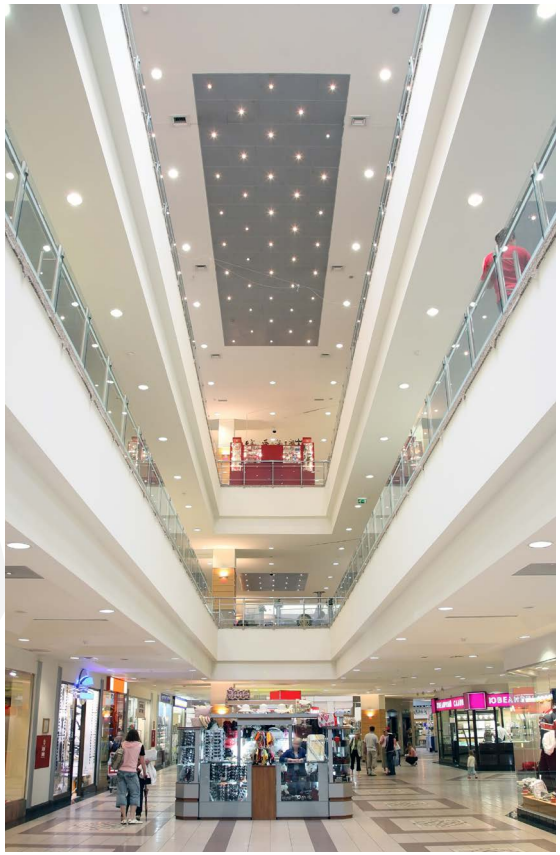
The bus-based control system based on the KNX standard will allow the following control types:

Switching & Dimming of open space inside the enclosed like entrance

The dimming control system is ideally based on DALI (Digital Addressable Lighting Interface) according to the technical standard IEC 62 386 in combination with KNX. To control DALI equipment, such as ballasts, transformers, LED converters, etc., a KNX/DALI Gateway is used. DALI allows the addressing of 64 ballasts which can be freely assigned to 16 DALI lighting control groups or controlled individually. Up to two DALI lines with each up to 64 ballasts in one KNX/DALI Gateway must be possible. The DALI control line can be installed together with the mains cable (e.g. by using a 5-wire standard cable). Functionalities achieved by DALI: light scenes, day light control, feedback regarding the connected DALI equipment (e.g. lamp or ballast failure), light scenes, tunable white functions like Dim2Warm or Human centric Lighting (HCL), etc. These functions can be extended with constant light control, in this case the ceiling-mounted presence detectors work in addition also as light sensor and light controller.
Furthermore to save electrical energy standby shutdown is adjustable, means DALI ballasts switched off when all ballasts are in standby mode.

Lighting controls for office, meeting rooms, food court, cinema and gaming area

As an additional benefit to users in a building, “human centric lighting” (HCL) can be enabled in areas, where people work and enjoy their breaks. Because human’s physiological response to light depends on the properties of light such as color spectrum, intensity and timing, the impact of artificial light in building environments are of great importance. Solutions with Human Centric Lighting can promote the circadian rhythm, improve the ability to concentrate, prevent sleep disorders and increase the general well-being, motivation, and productivity. The proposed DALI-Gateways in the reference architecture feature applications to enable human centric lighting & is also compatible with self-contained emergency lighting.
Furthermore to save electrical energy standby shutdown is adjustable, means DALI ballasts switched off when all ballasts are in standby mode.



Lighting Control

Self-contained emergency lighting (Country specific DALI with self-contained Emergency lighting)

It shall be feasible to integrate self-contained emergency lighting to provide minimum brightness in case of malfunction of the general artificial lighting in a building. To reduce cost and installation effort this must be based on DALI technology, as the DALI Gateways Premium are emergency lighting capable together with emergency converter according to IEC 62386. Function- and duration test as well as partial duration test can be triggered by the KNX DALI Gateway, test results are to be transferred to the superior Building Management System for further processing. Route escape signs can be also integrated in this solution.

Time-based and occupancy-dependent control for stairs, car parks, lift lobbies, etc...

For further automation, the lighting shall be controlled via predefined time schedules according to the usage of the building. A dedicated KNX radio time switch shall execute this with the possibility to change time schedules directly on the device without programming tools. The time can be obtained via a connectable GPS sensor or a DCF signal receiver. If a BMS/visualization software is used, the time program can be realized on software basis.
An occupancy-dependent control is a control form that uses motion or presence detectors. It detects the movement of persons in the building or in external areas and switches the corresponding lighting. If dimmable lighting circuits are used, the light value can be reduced to a certain level (e.g. 30%), if no movement is detected (optional). The presence detector shall have a KNX interface in order to connect it to the KNX bus directly. The KNX bus then transmits the appropriate signals to switch actuator channels carrying out the command.

Lighting Control

Blind/Curtain/Shutter Control for Common Areas near the windows

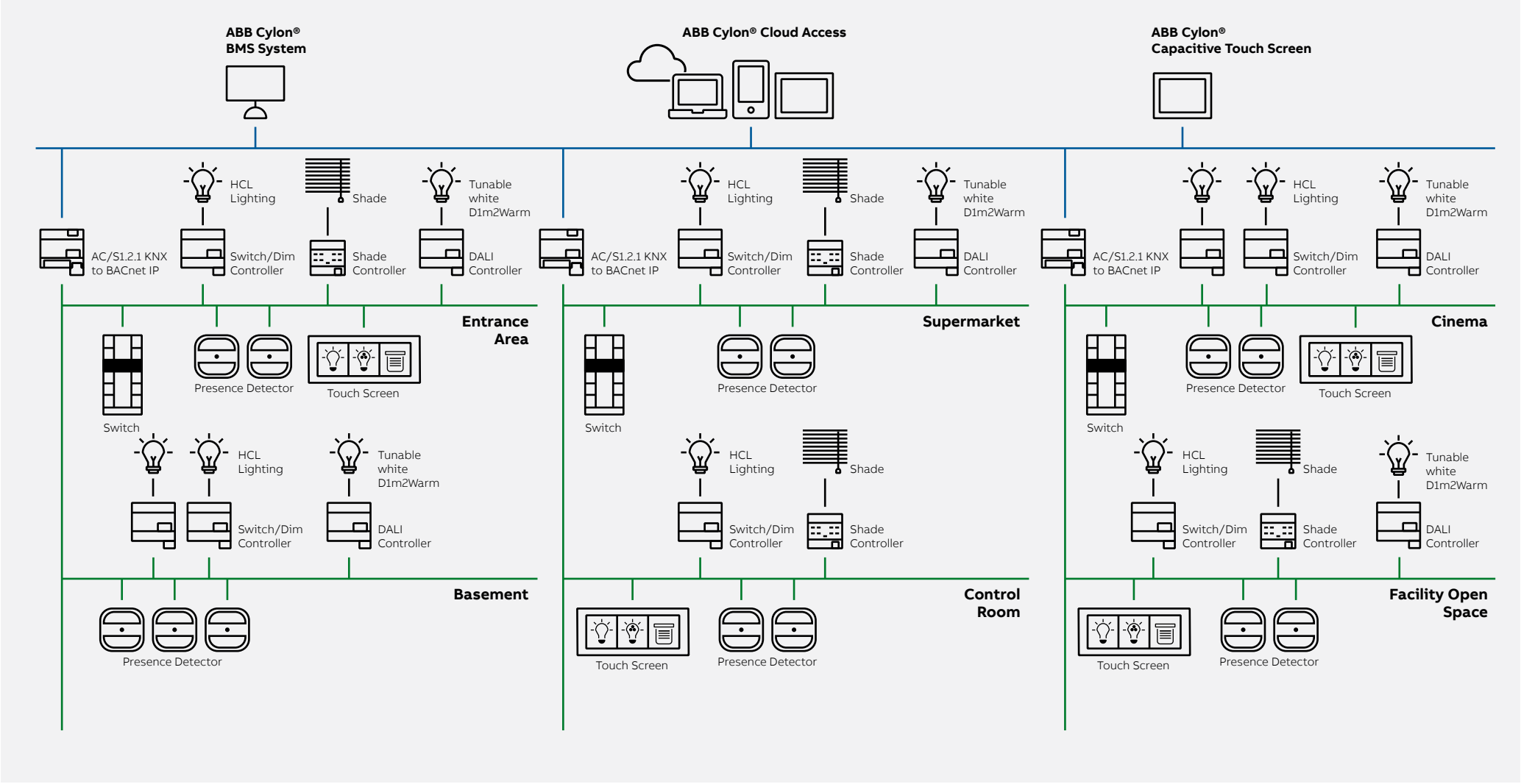
Curtain and blind control shall be possible bases on needs ad LUX Level required inside the builing they can controlled manally from the touch screen inside the control room or through central software . They are interfaced to the appropriate actuators. Furthermore, the integration into scenes shall be possible. The system shall also be capable of integrating values of a KNX weather system in order to react on a wind alarm, for example. Furthermore, the outside brightness value provided by the brightness sensor of the weather system can be used to realize basic automated shading functionality. This can be also used to optimize HVAC for example in summer by lowering blinds, which can help to reduce cooling demand and hence saving energy

Operation via PIR Sensors for stairs, lift lobbies& underground car parks, etc...

PIR/motion sensors ceiling or wall mounted with/without override button are provided for stair, lift lobbies with detection range from 8m to 24m (24-30m for corridor sensor) depending on the area of application sensors can be IP20 or IP55 (for underground car parks). 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.
These sensors also provide Constant Brightness Control for diming loads LUX thresh-hold (between 5-1000 LUX) for various offices, stairs, lobbies can be defined, so that at any time of the day/night the same LUX level will be maintained by dimming UP/ DOWN either Fluorescent dimmers or Direct dimmers light levels to the required brightness value

Lighting Control

Reference Architecture



Lighting Control

High quality presence detector 6131/31 a nd Dali DG/S gateway

This group of devices can perfect the lighting levels in different work 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 Control

KNX Switch Actuator

Flexibility combined with compact design – the Combi Switch Actuators offer switching and shading functionality in a device half the size. Ideally suited to meet the dynamic requirements of modern residential projects.

The Combi Switch Actuators feature high channel density, freely selectable switching and shading functionality in a single device, increased safety and intuitive usage thanks to the unified manual operation concept – offering customers maximum flexibility and comfort in planning, installing and commissioning.

KNX Lighting Control

ABB i-bus® KNX ensures optimum lighting of industrial and office buildings as well as private dwellings. The illuminance is monitored and remotely controlled depending on the lighting requirements. In addition, subsystems (such as 1 - 10 V lighting control and DALI) and their interfaces are supported.

Main benefits

- Increases energy efficiency by constant lighting and presence dependent control
- Maximum flexibility in lighting design, improved comfort and wellbeing with light scenes and sequences
- More flexibility through reprogramming or adding devices while in operation to meet changing needs

Lighting Control

KNX Shading Control

Sensor controlled roller shutters, windows and blinds with sun position controlled louvres not only provide pleasant shading, they also allow optimal lighting and room climate conditions and assist in responsible use of energy.

Main benefits

- Eases the work of the intergrator thanks to the automatic travel detection and front-end control buttons
- More energy efficiency with the effective use of daylight and external temperature
- Quick, efficient and detailed device analysis without ETS software, even remotely, thanks to the ABB i-bus® tool

KNX Power Supply

ABB i-bus® KNX power supplies provide the safe bus voltage for the connected KNX devices. Three versions for bus loads of 160, 320 and 640 mA are available, each with integrated choke and wide range mains input for worldwide usage. In addition, the 320 mA and 640 mA versions are available with expanded diagnostics for monitoring, e.g. bus voltage and current.

Main benefits

- Less space in the distribution board required due to compact device width
- Worldwide usage due to wide range of inputs for supply voltages from 85 to 265 V AC at 50/60 Hz
- Premium range with expanded diagnostics for quick and efficient commissioning and monitoring

Lighting Control

KNX Room Display

Networked structures work much more efficiently than individual systems. In residential buildings and on business premises, they reduce energy consumption and operating costs. At the same time, they provide added comfort and security. Busch-Jaeger KNX control elements form the interface between this state-of-the-art technology and the user.

Main benefits
- Control and monitoring of functions for the entire room
- Control of light, heating, blinds and scenes
- The integration of media technology and the internet is also possible

Presence Detection

Knowing if people are in or moving around the building is a valuable asset for the efficient automation of any property. The ABB i-bus® KNX range of innovative motion and presence detectors helps to control and manage daily tasks in every sector of the building – indoors and outdoors. Whether lighting, heating, air-conditioning or security related functions, this portfolio of premium design, high quality detectors can significantly improve levels of safety, efficiency and comfort throughout the building.

Main benefits
- Reliable and comprehensive detection
- Unique and ageless design, seamlessly integrating into the design ranges
- Flexible functionality providing highest comfort levels for users

Lighting Control
Room Automation

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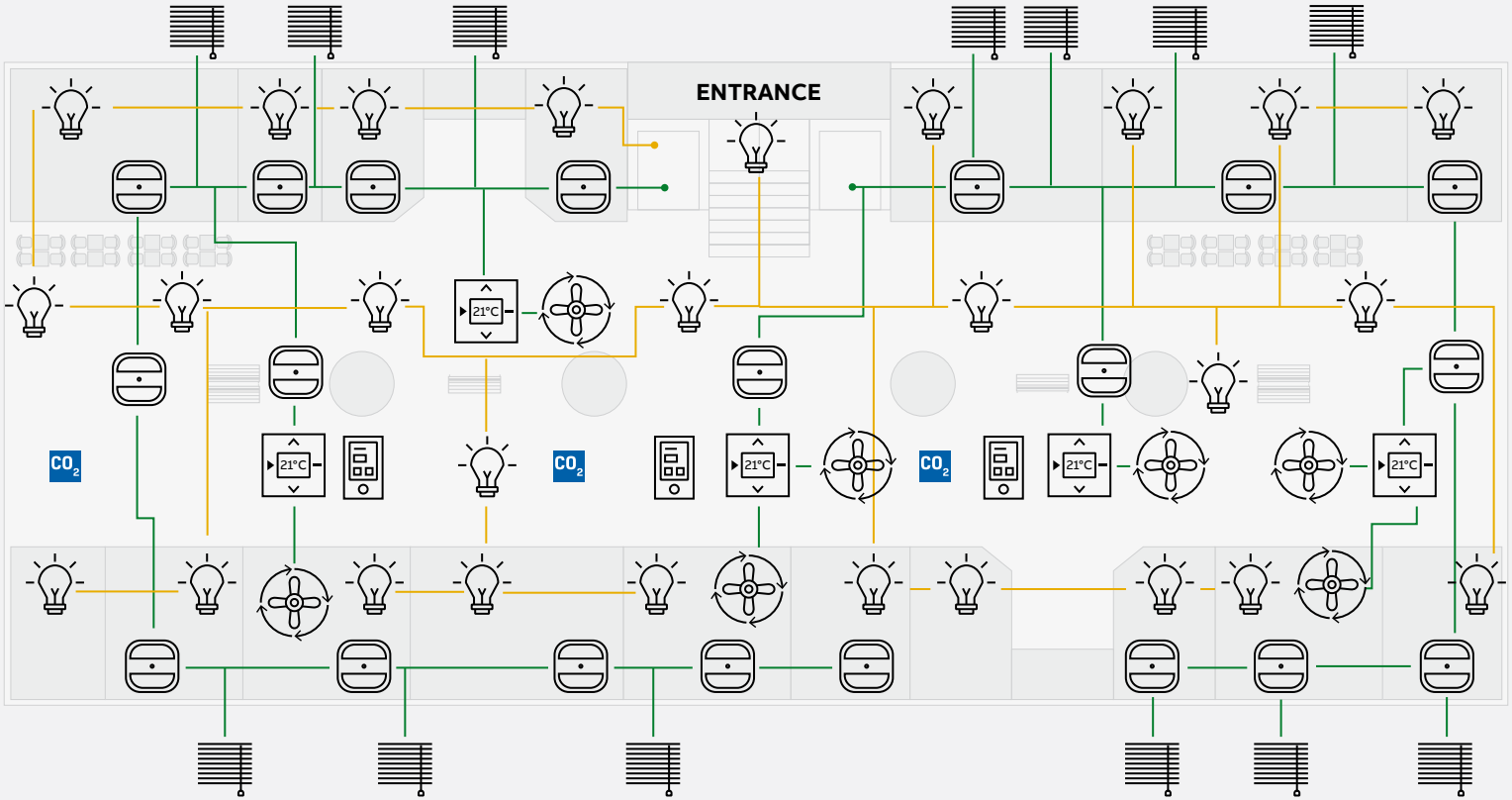
Application example



Curtains control

Presence and light sensors

Thermostats

Control via Smartphone/Panel

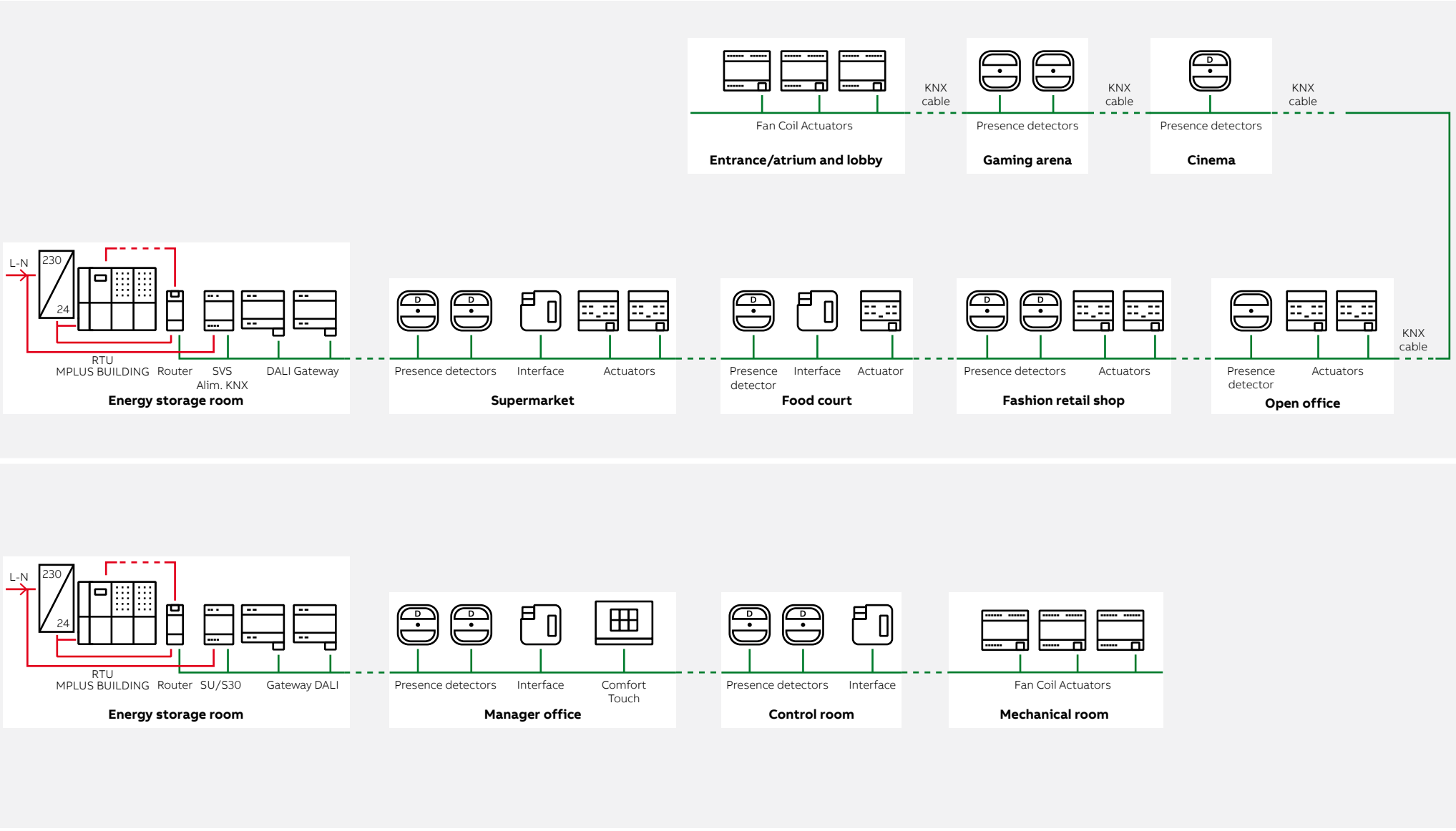
Fancoil control

Air quality

Lighting fixtures

Lighting Control

Control, automation and supervision of the enviroment



Lighting Control

Control, automation and supervision of the enviroment

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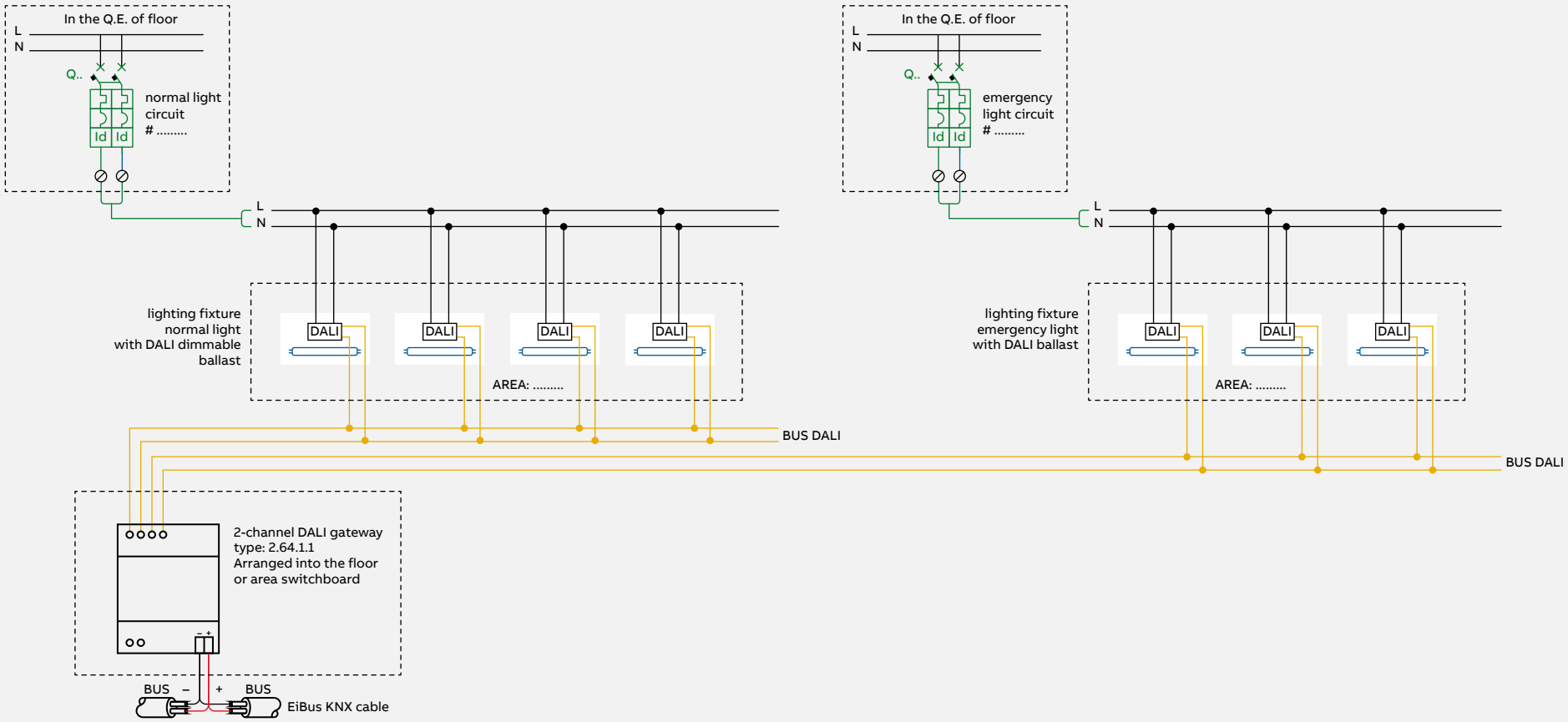
"DALI" light device controller



Lighting Control

Control, automation and supervision of the enviroment

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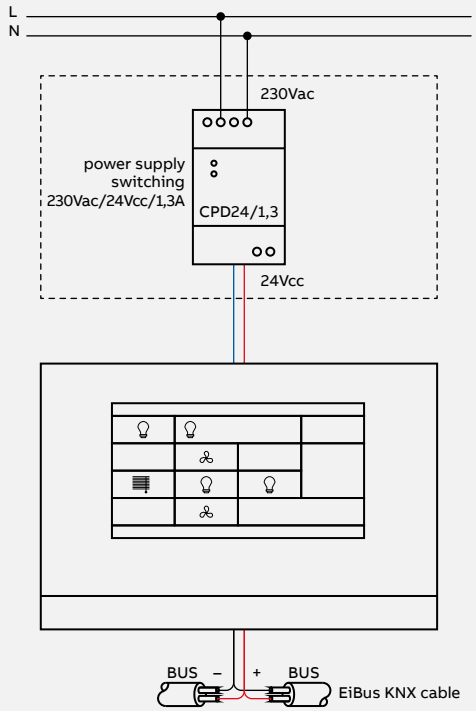
Touch Screen Device



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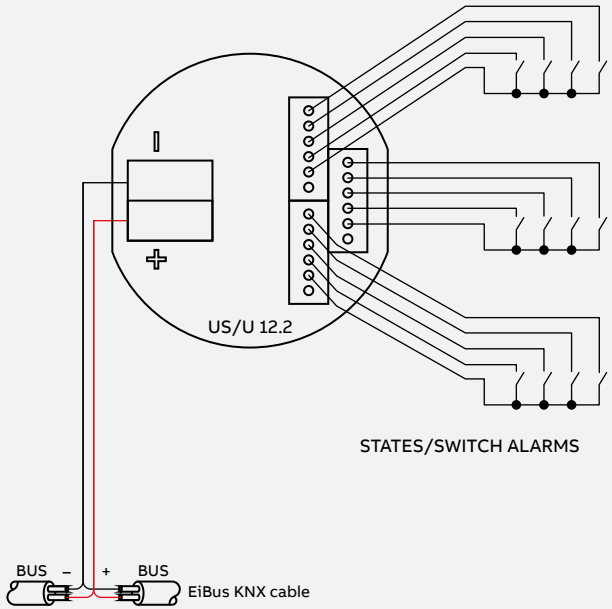
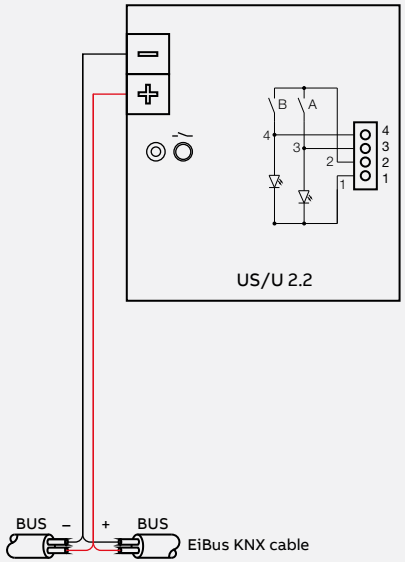
Interfaces



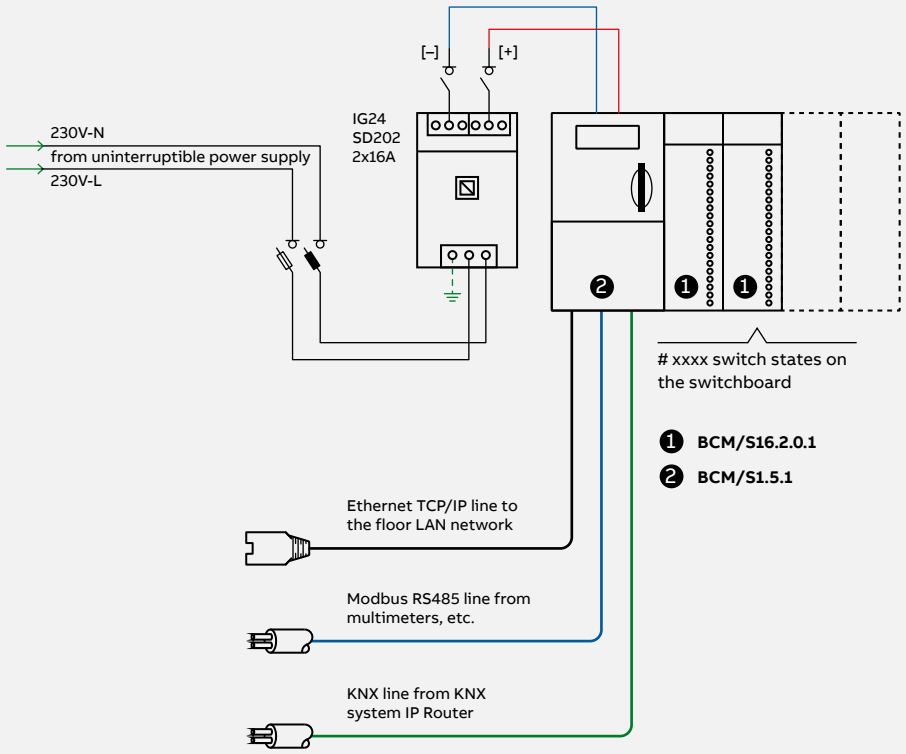


Lighting Control

Control, automation and supervision of the enviroment

—

Floor switchboard concentrator



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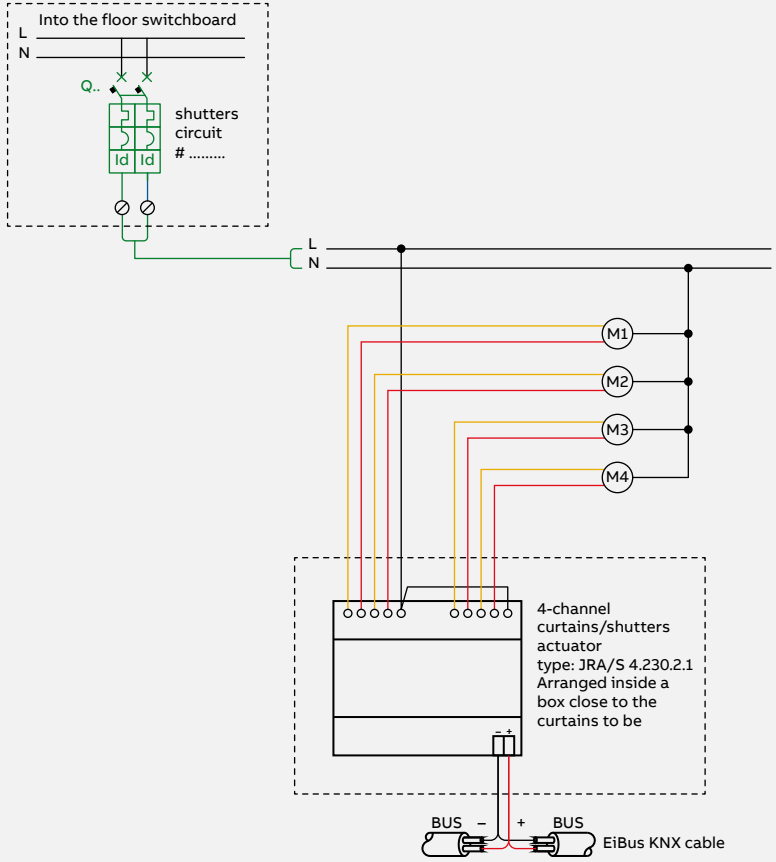
Curtain actuator



Lighting Control
Bill of Materials

The bill of material for the Lighting Control equipment in the reference architecture is summarized in the following tables:

Order Code	Description	Additional information / assumptions:
Executive Office		
2CDG110090R0011	BE/S 4.20.2.1 Binary Input, 4-fold, Contact Scanning, MDRC	Binary Inputs
2CDG110125R0011	JRA/S 4.230.5.1 Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC	Shutter Control
Open Space Office		
2CDG110146R0011	SV/S 30.640.5.1 Power Supply with Diagnostics, 640 mA, MDRC	KNX Power Supply
2CDG110176R0011	IPR/S 3.5.1 IP Router Secure, MDRC	IP Router
2CDG110206R0011	AC/S 1.2.1 Application Controller with BACnet Gateway, MDRC	Application Controller
2CDG110274R0011	DG/S 2.64.5.1 DALI Gateway Premium, MDRC	Lighting Control
2CDG110259R0011	SA/S8.10.2.2 witch Actuator, 8-fold, 10 A, MDRC	Switching Control (On / Off)
2CDG110090R0011	BE/S 4.20.2.1 Binary Input, 4-fold, Contact Scanning, MDRC	Binary Inputs
2CDG110125R0011	JRA/S 4.230.5.1 Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC	Shutter Control
GHQ6310084R0111	JSB/S 1.1 Shutter Control Unit, MDRC	Shutter Control
2CDG110191R0011	WS/S 4.1.1.2 Weather Station, 4-fold	Weather Station
Entrance/Lobby and Atrium		
2CDG110146R0011	SV/S 30.640.5.1 Power Supply with Diagnostics, 640 mA, MDRC	KNX Power Supply
2CDG110176R0011	IPR/S 3.5.1 IP Router Secure, MDRC	IP Router
2CDG110206R0011	AC/S 1.2.1 Application Controller with BACnet Gateway, MDRC	Application Controller
2CDG110274R0011	DG/S 2.64.5.1 DALI Gateway Premium, MDRC	Lighting Control
2CDG110259R0011	SA/S8.10.2.2 witch Actuator, 8-fold, 10 A, MDRC	Switching Control (On / Off)
2CDG110090R0011	BE/S 4.20.2.1 Binary Input, 4-fold, Contact Scanning, MDRC	Binary Inputs
2CDG110125R0011	JRA/S 4.230.5.1 Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC	Shutter Control
GHQ6310084R0111	JSB/S 1.1 Shutter Control Unit, MDRC	Shutter Control
2CDG110191R0011	WS/S 4.1.1.2 Weather Station, 4-fold	Weather Station

Order Code	Description	Additional information / assumptions:
Outside Area		
2CDG110274R0011	DG/S 2.64.5.1 DALI Gateway Premium, MDRC	Lighting Control
2CDG110259R0011	SA/S8.10.2.2 witch Actuator, 8-fold, 10 A, MDRC	Switching Control (On / Off)
2CDG120044R0011	HS/S 4.2.1 Outside Light Sensor Interface	twilight switch
2CDG110191R0011	WS/S 4.1.1.2 Weather Station, 4-fold	Weather Station
Food Court		
2CDG110146R0011	SV/S 30.640.5.1 Power Supply with Diagnostics, 640 mA, MDRC	KNX Power Supply
2CDG110206R0011	AC/S 1.2.1 Application Controller with BACnet Gateway, MDRC	Application Controller
2CDG110274R0011	DG/S 2.64.5.1 DALI Gateway Premium, MDRC	Lighting Control
2CDG110259R0011	SA/S8.10.2.2 witch Actuator, 8-fold, 10 A, MDRC	Switching Control (On / Off)
2CDG110090R0011	BE/S 4.20.2.1 Binary Input, 4-fold, Contact Scanning, MDRC	Binary Inputs
2CDG110125R0011	JRA/S 4.230.5.1 Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC	Shutter Control
GHQ6310084R0111	JSB/S 1.1 Shutter Control Unit, MDRC	Shutter Control
2CDG110191R0011	WS/S 4.1.1.2 Weather Station, 4-fold	Weather Station
Supermarket		
2CDG110146R0011	SV/S 30.640.5.1 Power Supply with Diagnostics, 640 mA, MDRC	KNX Power Supply
2CDG110176R0011	IPR/S 3.5.1 IP Router Secure, MDRC	IP Router
2CDG110206R0011	AC/S 1.2.1 Application Controller with BACnet Gateway, MDRC	Application Controller
2CDG110274R0011	DG/S 2.64.5.1 DALI Gateway Premium, MDRC	Lighting Control
2CDG110259R0011	SA/S8.10.2.2 Actuator, 8-fold, 10 A, MDRC	Switching Control (On / Off)
2CDG110088R0011	LR/S4.16.1 Light Controller, 4-fold, 1-10 V,	Dimming Control 0-10 VDC
2CDG110089R0011	LF/U2.1 measure the brightness level in rooms.	light sensor
2CDG110090R0011	BE/S 4.20.2.1 Binary Input, 4-fold, Contact Scanning, MDRC	Binary Inputs
2CDG110125R0011	JRA/S 4.230.5.1 Blind / Roller Shutter Actuator with Travel Detection and Manual Operation, 4-fold, 230 V AC, MDRC	Shutter Control
GHQ6310084R0111	JSB/S 1.1 Shutter Control Unit, MDRC	Shutter Control
2CDG110191R0011	WS/S 4.1.1.2 Weather Station, 4-fold	Weather Station

Lighting Control
Bill of Materials

Order Code	Description	Additional information / assumptions:
Retail Shop		
2CDG110146R0011	SV/S 30.640.5.1 Power Supply with Diagnostics, 640 mA, MDRC	KNX Power Supply
2CDG110176R0011	IPR/S 3.5.1 IP Router Secure, MDRC	IP Router
2CDG110206R0011	AC/S 1.2.1 Application Controller with BACnet Gateway, MDRC	Application Controller
2CDG110274R0011	DG/S 2.64.5.1 DALI Gateway Premium, MDRC	Lighting Control
2CDG110259R0011	SA/S8.10.2.2 Actuator, 8-fold, 10 A, MDRC	Switching Control (On / Off)
2CDG110088R0011	LR/S4.16.1 Light Controller, 4-fold, 1-10 V,	Dimming Control 0-10 VDC
2CDG110089R0011	LF/U2.1 measure the brightness level in rooms.	light sensor
Control Room		
2CDG110274R0011	DG/S 2.64.5.1 DALI Gateway Premium, MDRC	Lighting Control
2CDG110259R0011	SA/S8.10.2.2 Actuator, 8-fold, 10 A, MDRC	Switching Control (On / Off)
Basement		
2CDG110274R0011	DG/S 2.64.5.1 DALI Gateway Premium, MDRC	Lighting Control
2CDG110259R0011	SA/S8.10.2.2 Actuator, 8-fold, 10 A, MDRC	Switching Control (On / Off)

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. Modern buildings require smart HVAC systems that create comfortable, healthy and safe environments for the occupants, while minimizing energy consumption and increasing sustainability.

HVAC Control

Overview - Motivation & Key Elements

Customer experience is the foremost consideration for any retail and mall.

Space temperature and air quality are significant factors in occupant comfort for both guests and staff and furthermore account for 50% of total energy cost in typical buildings. HVAC control in hotels needs to optimize the comfort levels of the internal environmental whilst minimizing energy usage.

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 hotels and conference facilities.

ABB Cylon can help you integrate smart building solutions into the new hotel planning phase, or through retrofitting to upgrade an existing facility to optimize return on investment. With an ABB Cylon HVAC control system, hotel environment performance can be quickly accessed, viewed, and modified including trends, setpoints, schedules, and more from any web-enabled device anywhere, any time.
ABB Cylon ensures your hotel's systems are operational only when needed versus expectation with HVAC and lighting scheduling and the application of intelligent sensor feedback.

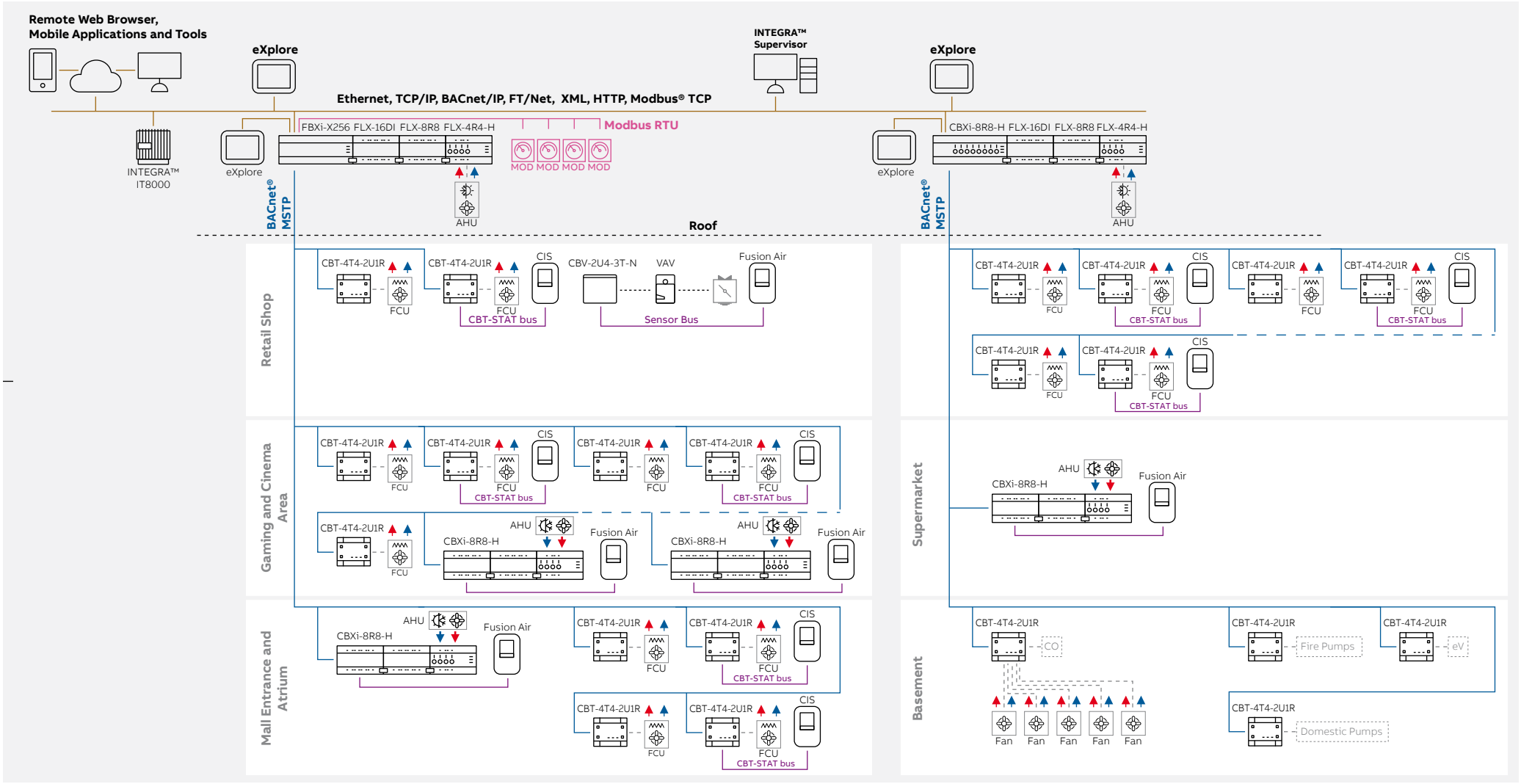
ABB Cylon Smart building solutions provides simple integration through an open protocol solution supporting: BACnet/IP, BACnet MS/TP, Modbus TCP and Modbus RTU.

This can be used to integrate other systems like:

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

HVAC Control

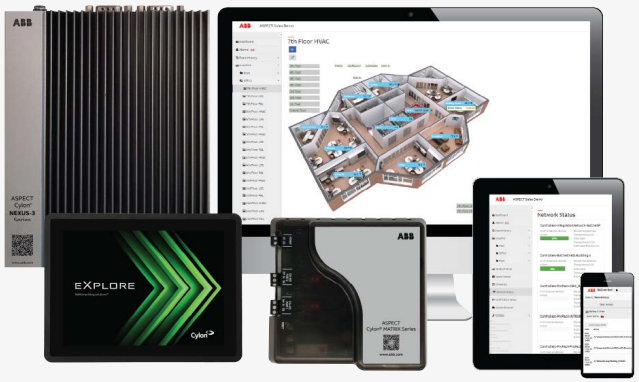
Reference Architecture



HVAC Control

ASPECT®

ASPECT® is an award-winning scalable building energy management and control solution designed to allow users seamless access to their building data through standard building protocols (BACnet, Modbus, Ethernet, etc.) and common IT technologies, available on a wide array of computers and smart devices, both iOS, and Android.
ASPECT® provides all the tools to gain intelligence into buildings' performance with the ability to rapidly react to any situation that may adversely affect energy costs and business performance. eXplore touchscreen display provides users an intuitive experience to view system status, override setpoints and schedules, and much more.



INTEGRA©

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.

HVAC Control

ABB CYLON® NEXUS-3 Series

The NEXUS-3 is an Internet of Things (IoT) integrated ASPECT® control engine designed to provide flexible site control applications for medium to large building automation systems. It can be used for connection to the Cylon CB series and AAM NB series of BACnet® MS / TP field level controllers. The NEXUS-3 supports serial communication protocols such as BACnet®, AAM PUP and Modbus®. Additionally, TCP / IP communications using Cylon's FT / Net, BACnet®, Modbus® and Unitron protocols (when used with UC32.netK) are available when using the RJ-45 connection.
When implemented with the integrated ASPECT® Runtime Engine, the NEXUS-3 is capable of performing supervision-based control functions, including but not limited to energy management routines, custom sequences, alarm and event announcements, alarms and trends history and planning of the main control. ASPECT® uses secure web technologies to enrich the user experience through common Internet applications for the announcement and programming of alarms.

ABB CYLON® MATRIX Series

MATRIX is an Internet of Things (IoT) integrated ASPECT® control engine designed to provide flexible site control applications for medium to large building automation systems. It can be used for connection to the Cylon CB series and AAM NB series of BACnet® MS / TP field level controllers. MATRIX supports serial communication protocols such as BACnet®, AAM PUP and Modbus®. Additionally, TCP / IP communications using Cylon's FT / Net, BACnet®, Modbus® and Unitron protocols (when used with UC32.netK) are available when using the RJ-45 connection.
A capacity-based licensing model makes the MATRIX controller family scalable for medium to large building applications, including a campus environment when combined with ASPECT®-Enterprise server software. When implemented with the integrated ASPECT® Runtime Engine, MATRIX is capable of performing supervision-based control functions, including but not limited to energy management routines, custom sequences, alarm and event announcements, historical alarms and trends, and planning main control. In addition, streaming of connected data in real time is displayed in rich HTML5 graphics using a web browser.

HVAC Control

ABB CYLON® CBXI Series

The CBXi Series is a freely programmable range of BACnet® Controllers with native BACnet/IP communications support. The controllers are BTL listed BACnet Building Controller (B-BC) and are ideally suited for a wide range of applications for intelligent control of HVAC equipment, and electrical systems including lighting control and metering applications.

The CBXi-8R8 and CBXi-8R8-H controllers support multi-protocol communications simultaneously including BACnet/IP, BACnet MS/TP, Modbus® TCP and Modbus RTU. Part of Cylon's CB Line of BACnet field controllers, the CBXi-8R8 controller features 8 UniPuts™ with Relay, 8 Universal Inputs, as well as support for up to five FLX (Field Level eXpansion) series extension modules providing up to 96 points of control, and a dedicated input for Cylon's CBT-STAT or UCU Room Display intelligent room sensors.

ABB CYLON® CBX Series

CBX-8R8 and CBX-8R8-H are fully programmable BTL-listed BACnet® Advanced Application Controllers (B-AAC) that communicate on an RS-485 local area network using the BACnet MS/TP and feature support for Modbus® RTU devices. Modbus allows the integration of devices into control strategies such as motor drives, meters, and other sensors.

HVAC Control

ABB CYLON CBT Series

The CBT-4T4-2U1R is a freely programmable BACnet® Unitary Controller with native MS/TP communications support. The controller is BTL listed as a BACnet Advanced Application Controller (B-AAC) and is ideally suited for the control of Fan Coil Units with ECM motors, Heat Pumps, Unit Ventilators, Unit Heaters, Chilled Ceilings/Beams and custom unitary equipment.

The HVAC field controller accommodates available pre-engineered strategies or can be tailored to custom applications using the CXpro programming software.

This controller provides the connectivity and flexibility needed for unitary applications as well as automation of miscellaneous points such as exhaust fans and unit heaters and provides operators the tools they need to help reduce energy consumption, improve occupant comfort and achieve sustainable building operations.

ABB CYLON® CBV Series

The CBV-2U4-3T features 2 UniPutsTM, 4 Universal Inputs, 3 Digital (Triac) Outputs, 1 on-board Airflow Sensor and an integrated Belimo Actuator with brushless DC motor. The CBV-2U4-3T can be used in new building or retrofit applications.
The fully programmable CBV-2U4-3T and CBV-2U4-3T-N controllers are designed to control any variable air volume box application with a pre-loaded and configurable application shipped from the factory pre-programmed into the controller.

With the CBV-2U4-3T and CBV-2U4-3T-N controllers you can add a demand ventilation application, and occupancy sensors or lighting control to further enhance your energy savings.
The CBV Series is part of ABB Cylon's CB line of controllers. The new VAV controllers are designed to work as part of our dual-platform offering and can be used as a field level BACnet® MS/TP controller for the ASPECT® Control Engine (MATRIX™ and NEXUS™) or INTEGRA™ N4 (IT-8000).

HVAC-Control
Bill of Materials

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

Order Code	Description	Additional information / assumptions:
Executive Office		
	24 AC Power Supply	
Open Space Office		
	24 AC Power Supply	
2CQG201309R1021	CBT-3T6-5R 3 UniPuts™ with Triac outputs , 6 UI and 5 Digital (Relay) Outputs	FCU Controller
	FA-THC-D Temperature + RH + CO2 + Display	Fusion Smart Sesnor
Entrance/Lobby and Atrium		
	24 AC Power Supply	
2CQG201003R1021	CBX-8R8	AHU
2CQG200706R1021	FLX-8R8	AHU Expansion Unit
	FA-THV Temperature + RH + VOC sensor No Display	Fusion Smart Sesnor
Food Court		
	24 AC Power Supply	
2CQG201003R1021	CBX-8R8	AHU
2CQG200706R1021	FLX-8R8	AHU Expansion Unit
	FA-THV Temperature + RH + VOC sensor No Display	Fusion Smart Sesnor
Supermarket		
	24 AC Power Supply	
2CQG201309R1021	CBT-3T6-5R 3 UniPuts™ with Triac outputs , 6 UI and 5 Digital (Relay) Outputs	FCU Controller
	CBT-STAT-CYL Back-lit LCD Display with temperature sensing. Cylon Logo.	FCU Termostat
2CQG201003R1021	CBX-8R8	AHU
2CQG200706R1021	FLX-8R8	AHU Expansion Unit
	FA-THV Temperature + RH + VOC sensor No Display	Fusion Smart Sesnor
Retail Shop		
	24 AC Power Supply	
2CQG201309R1021	CBT-3T6-5R 3 UniPuts™ with Triac outputs , 6 UI and 5 Digital (Relay) Outputs	FCU Controller
2CQG201003R1021	CBX-8R8	AHU
2CQG200706R1021	FLX-8R8	AHU Expansion Unit

Order Code	Description	Additional information / assumptions:
Control Room		
	24 AC Power Supply	
2CQG201309R1021	CBT-3T6-5R 3 UniPuts™ with Triac outputs , 6 UI and 5 Digital (Relay) Outputs	FCU Controller
	CBT-STAT-CYL Back-lit LCD Display with temperature sensing. Cylon Logo.	FCU Termostat
2CQG100103R2021	Nexus-264 Aspect Control Engines (ACE)	Bacnet Router and In Built in Aspect Installed
2CQG202003R2021	eXplore-c7	Touch screen
Basement		
	24 AC Power Supply	
2CQG201003R1021	CBX-8R8	FAHU
2CQG200706R1021	FLX-8R8	FAHU Expansion Unit
2CQG201003R1021	CBX-8R8 Controller features 8 UniPuts™ with Relay outputs	Basment Ventilation Fan and Smoke Exhasut fan Control
2CQG202003R2021	eXplore-c7	Touch screen
Mechanical Room		
	24 AC Power Supply	
2CQG201001R1021	CBXi-8R8 BACnet IP Controller	AHU
2CQG200706R1021	FLX-8R8	AHU Expansion Unit
2CQG202003R2021	eXplore-c7	Touch screen
2CQG201001R1021	CBXi-8R8	Chiller water system control
2CQG200706R1021	FLX-8R8	
2CQG205601R1021	FLX-PS24	
2CQG202003R2021	eXplore-c7	Touch screen
Electrical Room		
	24 AC Power Supply	
2CQG201309R1021	CBT-3T6-5R 3 UniPuts™ with Triac outputs , 6 UI and 5 Digital (Relay) Outputs	FCU Controller
	CBT-STAT-CYL Back-lit LCD Display with temperature sensing	FCU Termostat

Room Wiring & Control

Creating retail and shopping center environments implies knowing how to choose and install products with suitable characteristics. ABB offers a complete range of products with which to set up every single environment, from the supermarket to the shops, up to the service rooms to ensure optimal organizational conditions.

Room Wiring & Control

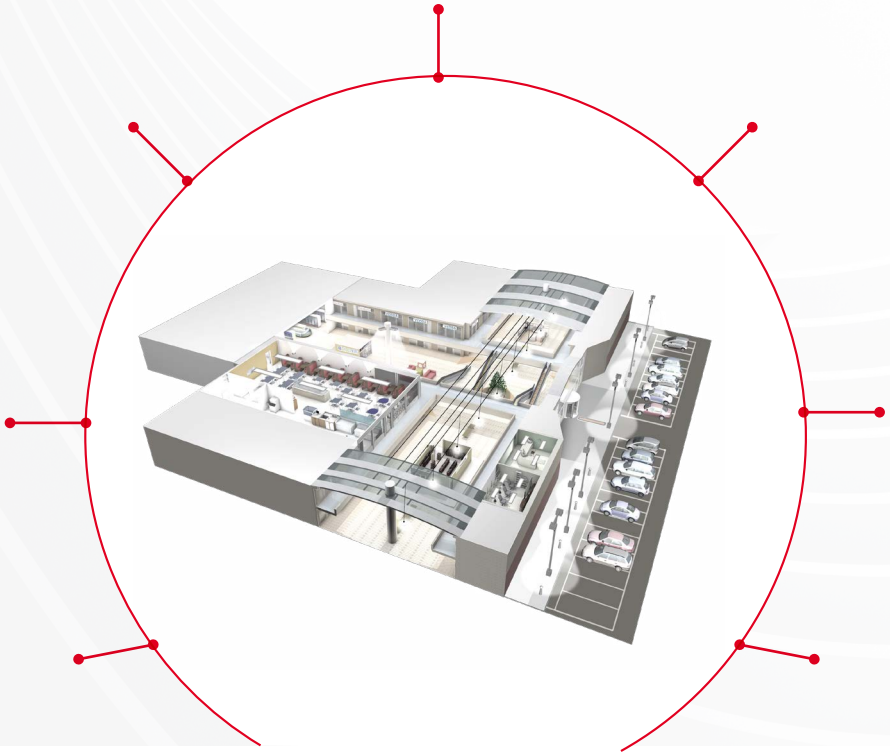
Store control architecture is based on below components

Lighting Control and Regulation
- Switching
- Dimming
- Time Control
- Daylight Dependent Switching
- Constant Light Regulation
- Light Scene
- Panic Lighting

Central Automation
- Complex Logical Operation

Remote Access and Control
- Remote Control via Internet
- Messaging via eMail / SMS / FAX

Energy and Load Management
- Consumption Measurement
- Circuit Monitoring



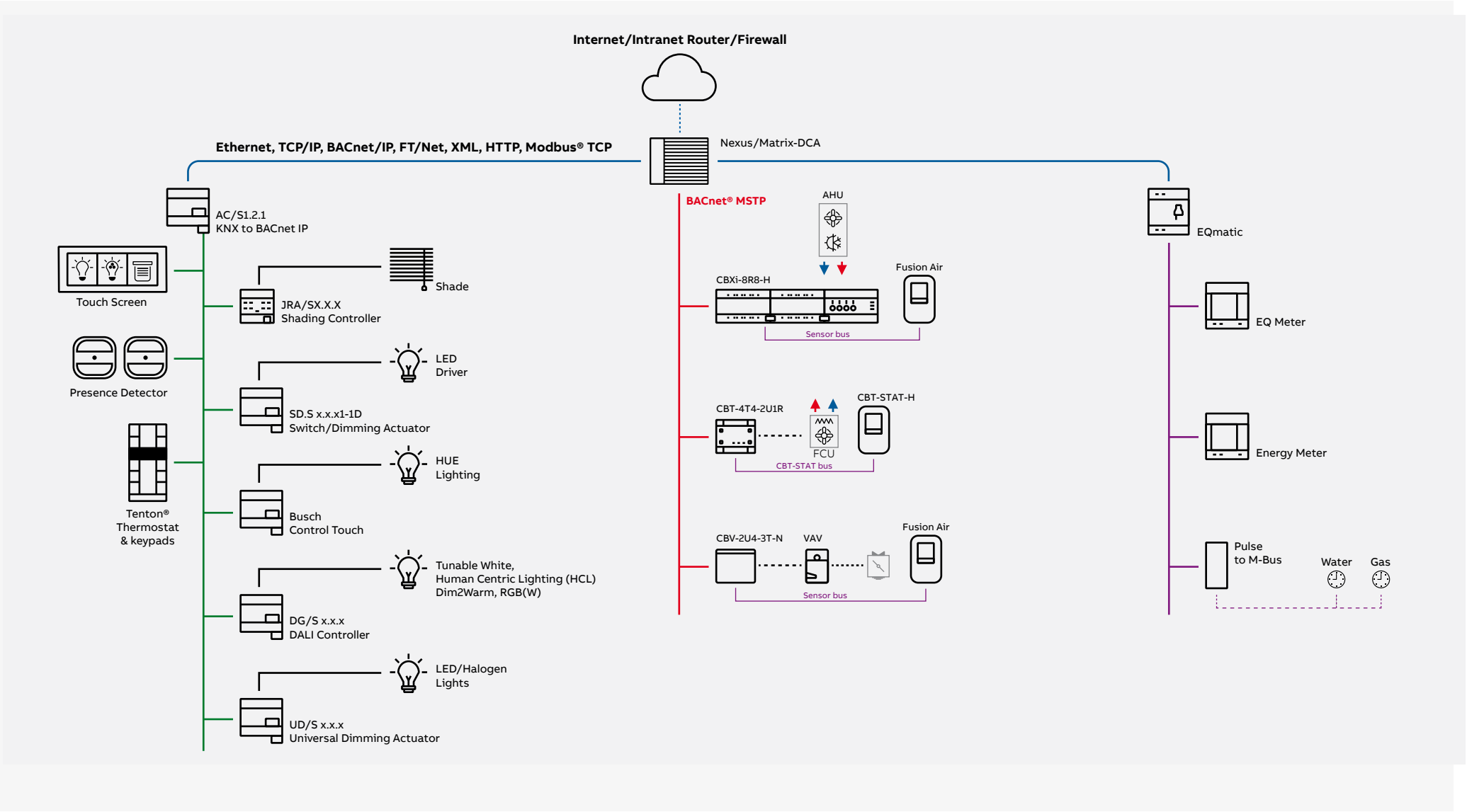
Heating, Ventilation and Air Conditioning (HVAC)
- Time Control
- Heating / Cooling System:
- Heat pumps / air-conditioning units

Operation, Indication and Visualization
- Visualization via Touch screen
- Centralized visualizationvia PC

Interfacing to other Building Systems
- Interface through bacnet and Modbus
- Connection to other Systems via Analogue or Digital Inputs

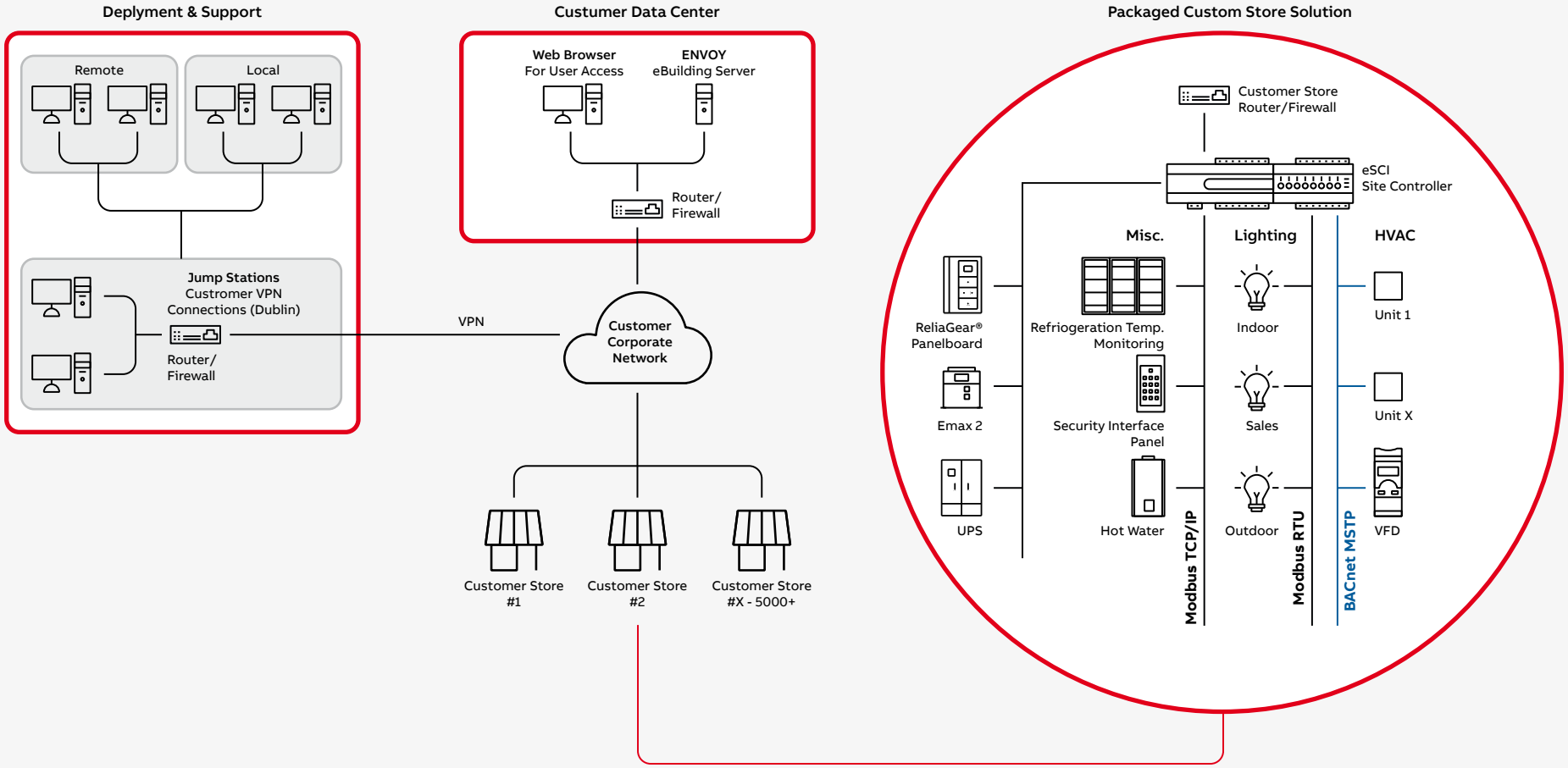
Room Wiring & Control

Architecture for Multistore and Shop – EU, MEA and Asia



Room Wiring & Control

Architecture for Multistore and Shop – North America



Room Wiring & Control

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.

Room Wiring & Control

Busch-ControlTouch®

Simple KNX visualization for smartphones, tablets and Windows computers. MDRC devices with associated IOS and Android apps. Application for Windows computers. Easy control using intuitive navigation concept. Representation of individual operating pages with list view. Display of individual control pages with room images with small controls. Fully web-based commissioning with wizard function. Home automation, switching, dimming, blind, RTC control, scene/sequences, Sonos control element, timing, Philips Hue. Entertainment: Sonos - KNX bridging, multimedia integration via UPnP. Infotainment: monitoring of usage data for up to 3 years. Security: Video surveillance with IP cameras, notification via push notifications or e-mail (including a picture from an IP camera). Time programs and scenes can be created by the end customer. Presence simulation.

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.

Room Wiring & Control

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®

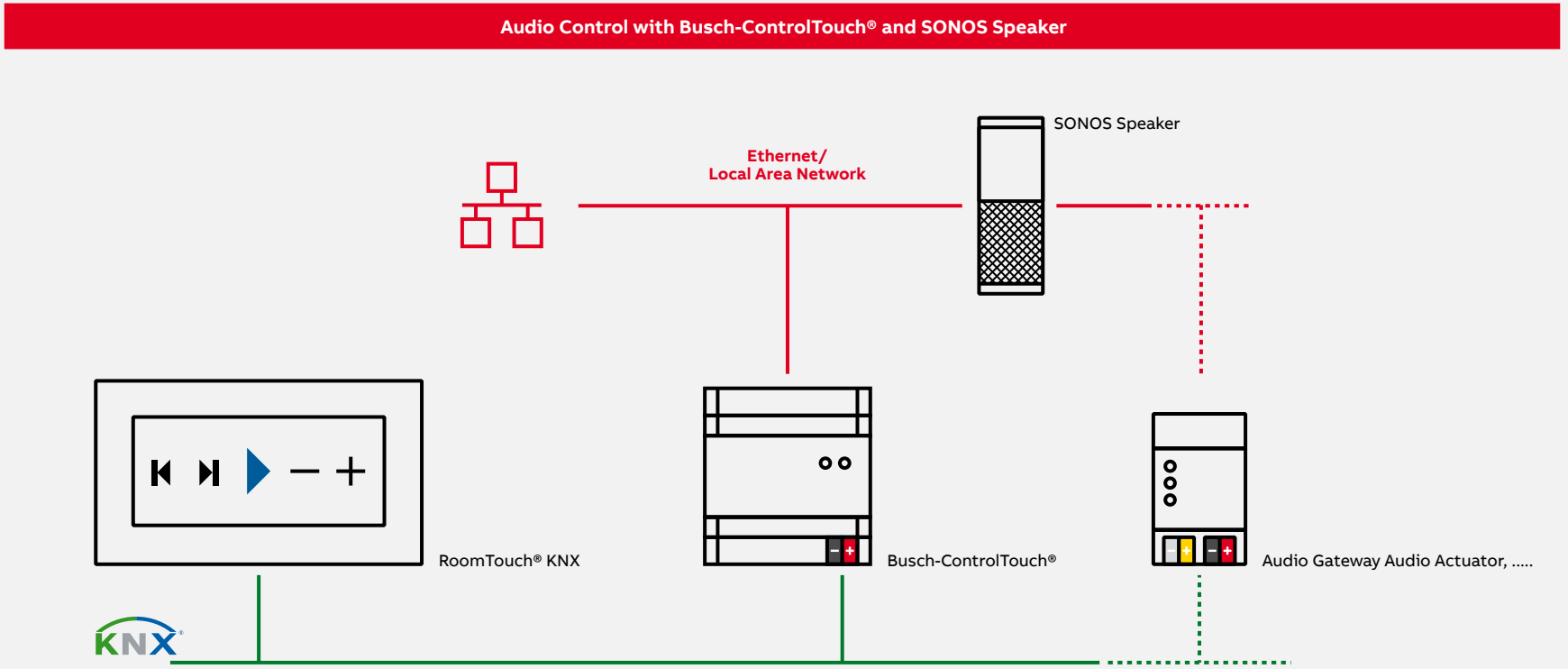
The ABB Tenton® sensors are easy-to-use, high quality sensors. A surface-mounted and flush-mounted installation is possible, all versions can be connected via a FM box.

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®)

Room Wiring & Control
Store Lighting Control

Audio Control with Busch-ControlTouch® and SONOS Speaker



Room Wiring & Control
Bill of Materials

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

Order Code	Description	Additional information / assumptions:
Executive Office		
2CKA006132A0344	6131/21-24-500 Presence Detector Mini Premium, FM, 8 m	Presence Detection
GHQ3201972R0001	MRS/W Magnet Reed Contact	Window Contacts
2CKA006330A0004	SBR/U6.0.1-84 Room temperature controller with control function 6gang ABB Tenton®	Temperature Control and operation
Open Space Office		
2CKA006132A0344	6131/21-24-500 Presence Detector Mini Premium, FM, 8 m	Presence Detection
GHQ3201972R0001	MRS/W Magnet Reed Contact	Window Contacts
2CKA006330A0004	SBR/U6.0.1-84 Room temperature controller with control function 6gang ABB Tenton®	Temperature Control and operation
Entrance/Lobby and Atrium		
2CKA006132A0344	6131/21-24-500 Presence Detector Mini Premium, FM, 8 m	Presence Detection
Food Court		
GHQ3201972R0001	MRS/W Magnet Reed Contact	Window Contacts
Supermarket		
2CKA006132A0348	6131/31-24-500 Presence Detector Premium, FM, 12 m	Presence Detection
2TMA200050B0005	RT/U30.0.1-825 Multifunctional HD IPS KNX touchdisplay	Touch screen
Retail Shop		
2CKA006132A0344	6131/21-24-500 Presence Detector Mini Premium, FM, 8 m	Presence Detection
2CKA006330A0004	SBR/U6.0.1-84 Room temperature controller with control function 6gang ABB Tenton®	Temperature Control and operation
2CKA006136A0218	CT/S2.1 Busch-ControlTouch	
Control Room		
2CKA006132A0344	6131/21-24-500 Presence Detector Mini Premium, FM, 8 m	Presence Detection
2CKA006330A0004	SBR/U6.0.1-84 Room temperature controller with control function 6gang ABB Tenton®	Temperature Control and operation
Basement		
2CKA006132A0344	6131/21-24-500 Presence Detector Mini Premium, FM, 8 m	Presence Detection
2CKA006330A0004	SBR/U6.0.1-84 Room temperature controller with control function 6gang ABB Tenton®	Temperature Control and operation

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 visitors and employees.
ABB solutions provide harmony with the interior and reduced total cost of ownership throughout the building 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)

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.

Function tests
A function test is a test that simulates a mains failure and checks the operation of the emergency light from the battery supply If there is a failure during a function test the local indicator LED changes its status.

Duration tests
A duration test simulates a mains power failure and checks the operation of the emergency light from the battery supply for the rated duration of product e.g. 3hrs

Local testing
Function and duration tests are initiated by the emergency light fitting itself. It performs automatic self-testing according to the locally stored settings.

Central testing
Function and duration tests are initiated by the ELDCS1/DALI if the automatic self-testing is disabled.

DALI Portfolio is suitable in most of the countries in Europe following EN1838, except France, Italy, Russia…. Please verify your local regulation

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

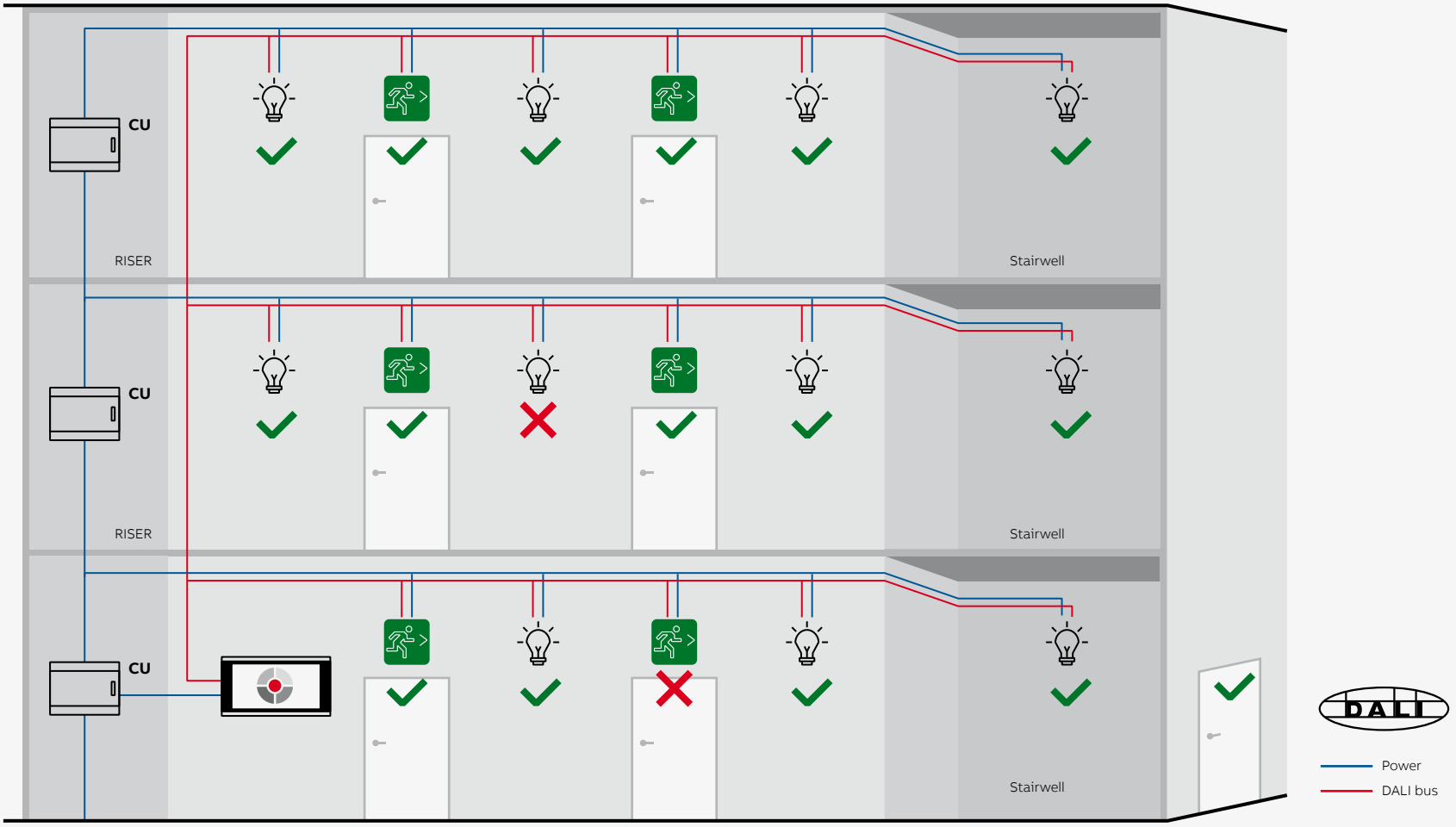
4. With the addiction of the ABB gateway, we can connect our DALI luminaires with KNX systems and BMS

5. DALI (DHA) Certified

Emergency Lighting

DALI Emergency Lighting (Europe)

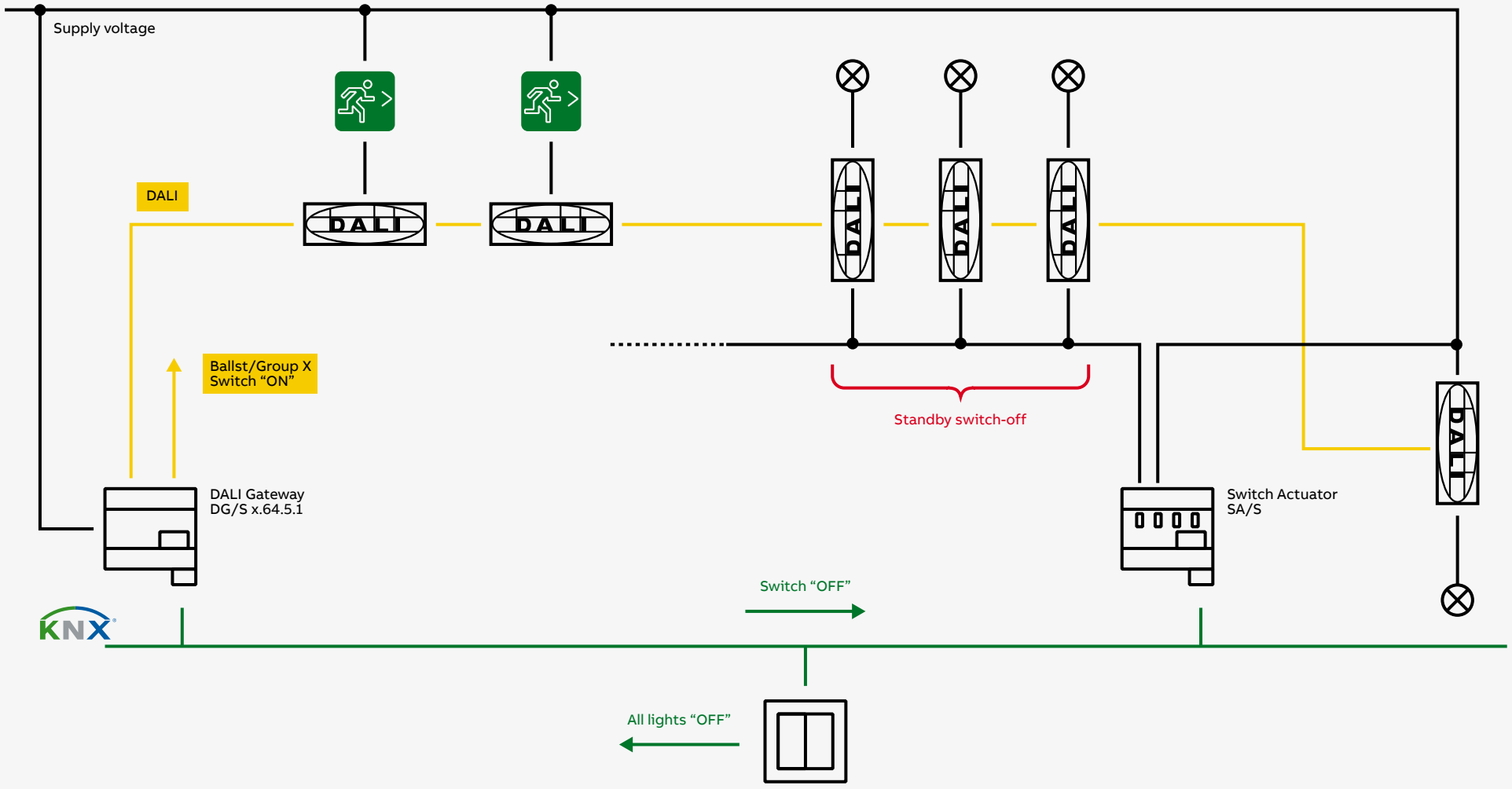
Reference Architecture



Emergency Lighting

DALI Emergency Lighting (Europe)

Reference Architecture



Emergency Lighting
DALI Emergency Lighting (Europe)

DALI Control Unit (DCU)

- Ensuring building occupant saferty
- Touch screen to control, test and monitor emergency lightning
- Simple to group and easy to install

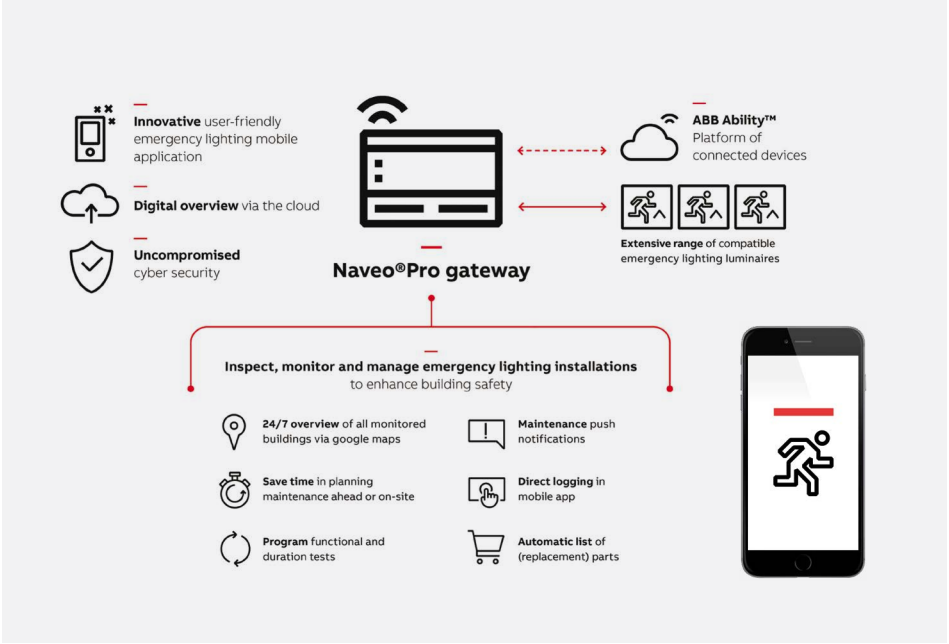
Escape Route Lights

- Compatible with DALI control unit to control, test and monitoring emergency lighting
- Injection moulded - high grade polycarbonate body ang geartray of aluminium die cast
- Specially designed lens for optimised light distribution
- Modular, First-Fix installation

Emergency Lighting
DALI Emergency Lighting (Europe)

Naveo®Pro

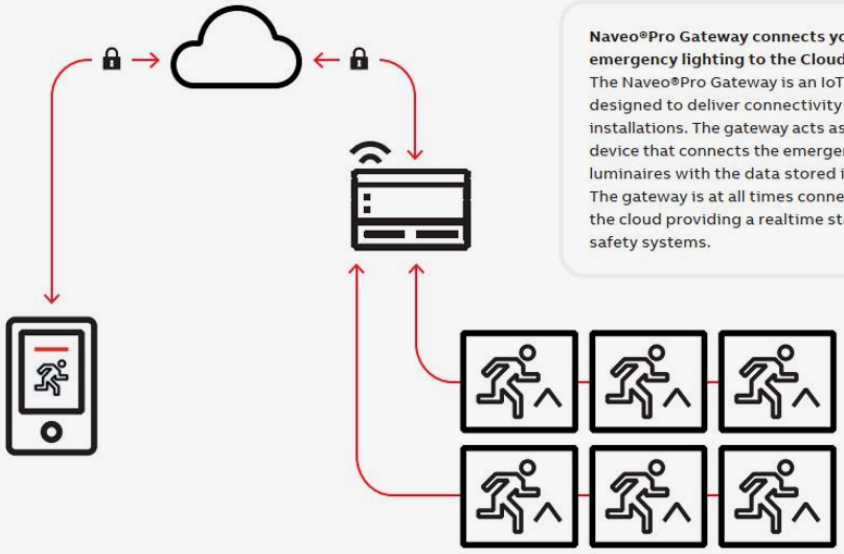
Naveo®Pro ensures to maintain and record the health status of emergency lighting in all types of buildings. Naveo®Pro is a way to install, monitor and maintain emergency lighting systems with the mobile device. The system provides a digital overview via the cloud, giving instant information to assist 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
DALI Emergency Lighting (Europe)

Naveo®Pro Gateway

Naveo®Pro being connected all the time, your emergency lighting system is always fully up to date. You can easily set up the connection. The Gateway continuously receives all luminaires data and pushes this information to the Naveo®Pro app.
On continuous request from the cloud the Gateway automatically sends all (test) data to the Naveo®Pro app. With Naveo®Pro you are therefore constantly in touch with your system status anytime and anywhere.



Naveo®Pro Gateway connects your emergency lighting to the Cloud
The Naveo®Pro Gateway is an IoT Gateway designed to deliver connectivity to all types of installations. The gateway acts as a networking device that connects the emergency lighting luminaires with the data stored in the cloud. The gateway is at all times connected to the cloud providing a realtime status of your safety systems.

02 The Naveo®Pro Gateway.

03 ABB offers an extensive range of compatible luminaires.

02

03

Naveo®Pro system components

Order Code	Description
51000040	Naveo®Pro GW 1.0
758740	Naveo®Pro Gateway mounting plate
51000041	Naveo®Pro GW 1.0 wired and iPad wifi
51000042	Naveo®Pro GW 1.0 wired and iPad cell
758730	Naveo®Pro antenna 5 GHZ wifi

Extensive range of compatible luminaires
ABB offers a broad range of lumininaires which are compatible with the Gateway and can enable your system to join the internet of things with all the benefits that an app and the Cloud can bring.

Emergency Lighting
Bill of Materials

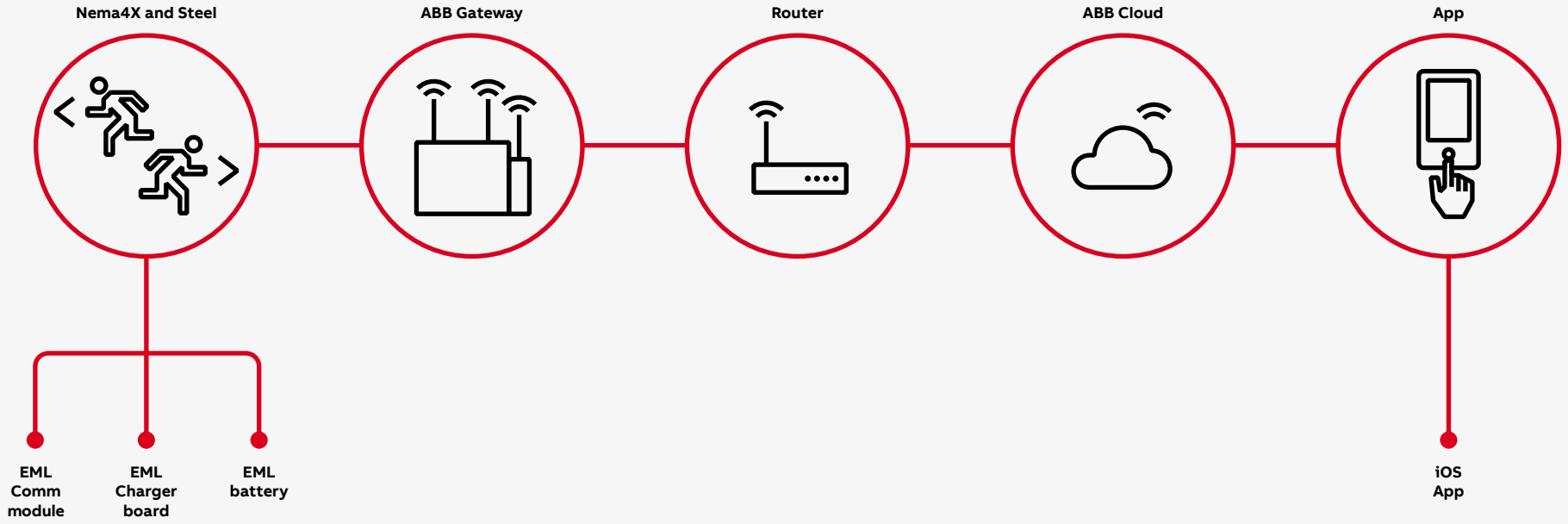
The bill of material for all luminaires and required accessories in the reference architecture is sum-marized in the following table:

Order Code	Description	Additional information / assumptions:
Open Space Office		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire
Entrance/Lobby and Atrium Sub Distribution Board Conponents		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire
Food Court		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire
Supermarket		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire
Retail Shop		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire

Order Code	Description	Additional information / assumptions:
Control Room		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire
ELDCS1/DALI/EL	DALI emergency control unit	
Basement		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire
ELDCS1/DALI/EL	DALI emergency control unit	
Mechanical Room		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire
ELDCS1/DALI/EL	DALI emergency control unit	
Electrical Room		
DASR2-DEA-M3	Serenga 2 Spot LED Recessed IP42 M3 DALI	Escape route lighting
SR2-LENS2	Spot LED Lens for Safety Equipment	Serenga 2 Lens Kit, Lens B, Escape Route
XT230RS/DALI	Ovano exit sign surface mounted ceiling 3hr DALI,	Escape route signage
DASR2-SAM3-D1	Serenga 2 Anti-Panic, Surface Mount Luminaire, M3, DALI Control System	Open Area luminaire
ELDCS1/DALI/EL	DALI emergency control unit	

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
Nexus®Pro (USA and Canada)

Nexus Pro Gateway

IoT Gateway designed to deliver Bluetooth® Mesh connectivity Gateway can be connected wired or wirelessly to WiFi Routers.

Nexus Pro Luminaries

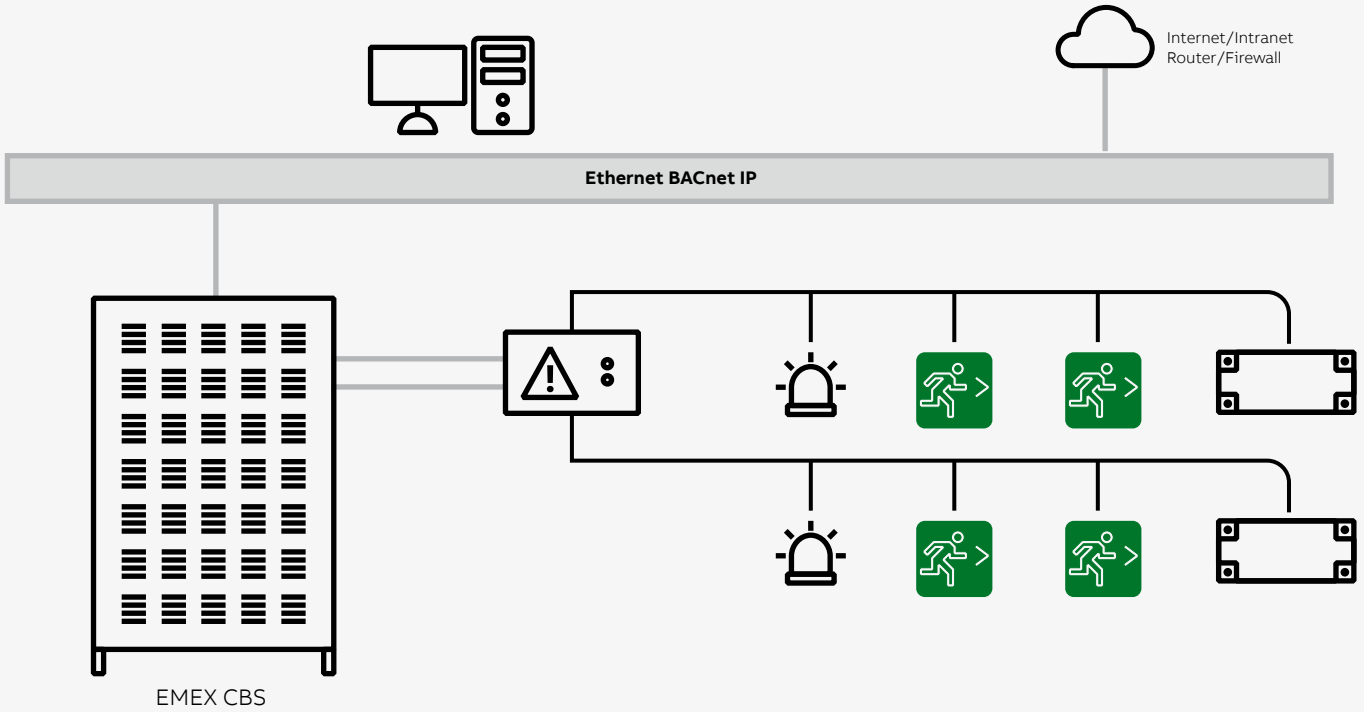
Nexus®Pro is compatible with various emergency lighting devices. Based on the type of environment, you can select the right device for your application. Each device is equipped to act as a node in the Bluetooth mesh network.

Central System

Provide emergency power for multiple lighting units at a remote distance meeting the unique needs of emergency lighting loads with a high-efficiency pure sine wave inverter. Additionally minimizes maintenance and automates code compliance with optional advanced diagnostics and NEXUS® wired and wireless central monitoring system compatibility.

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

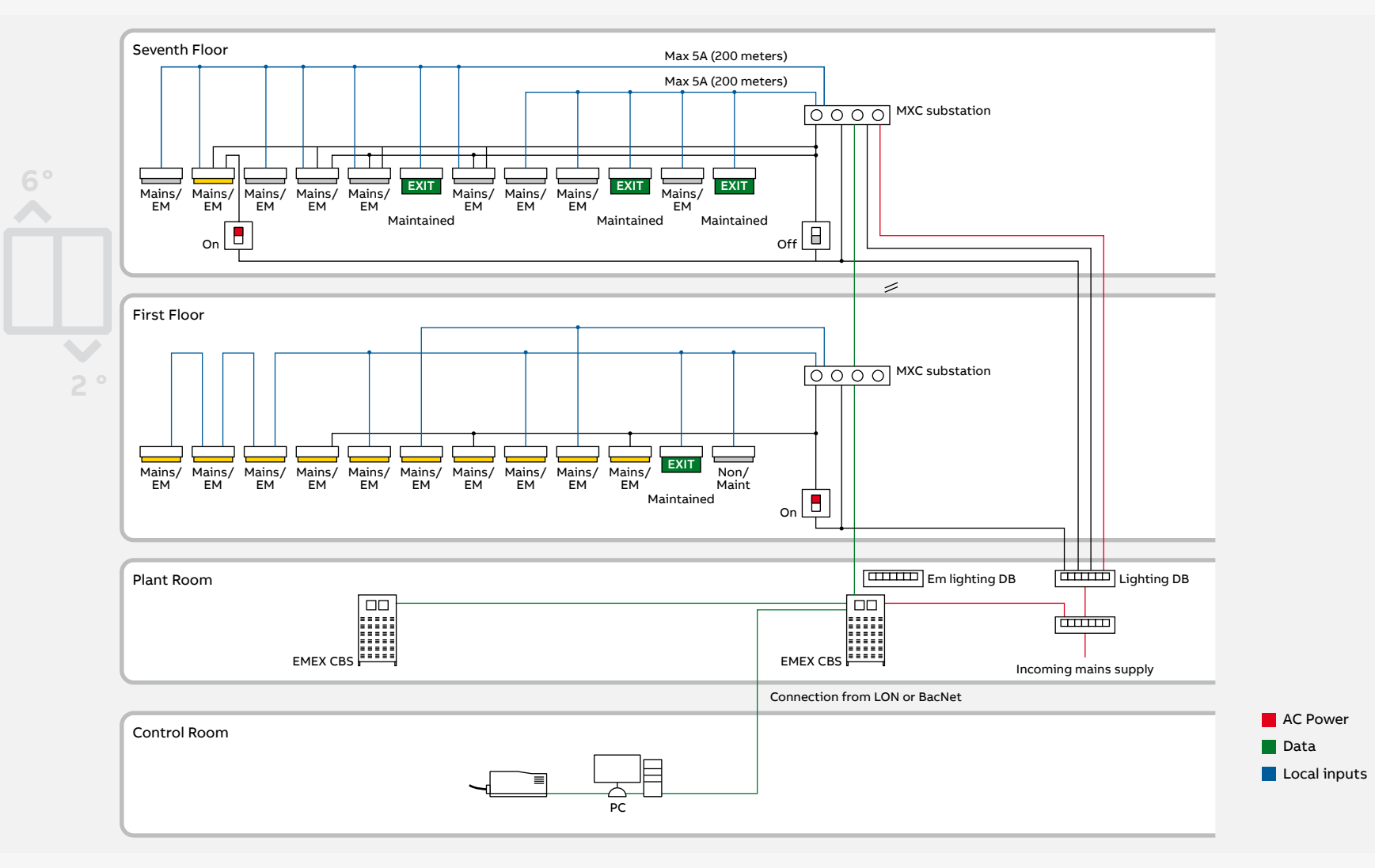
Hy-LED

Silver-Scape Weatherforce

Cordona Camarque

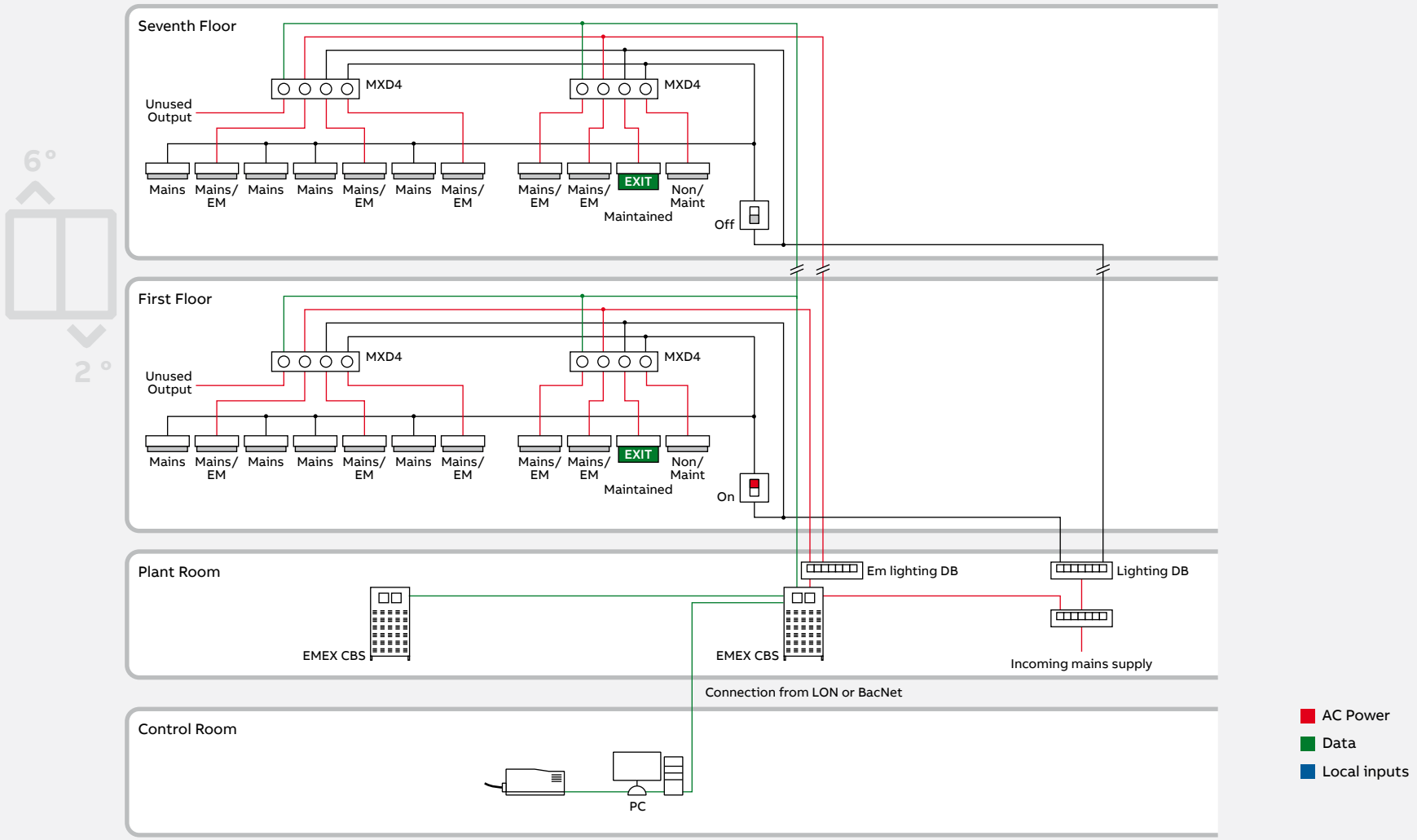
Emergency Lighting
EML-Central Battery (UK, MEA)

Layout schematic - MXD4 substations



Emergency Lighting
EML-Central Battery (UK, MEA)

Layout schematic - MXC substations



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.

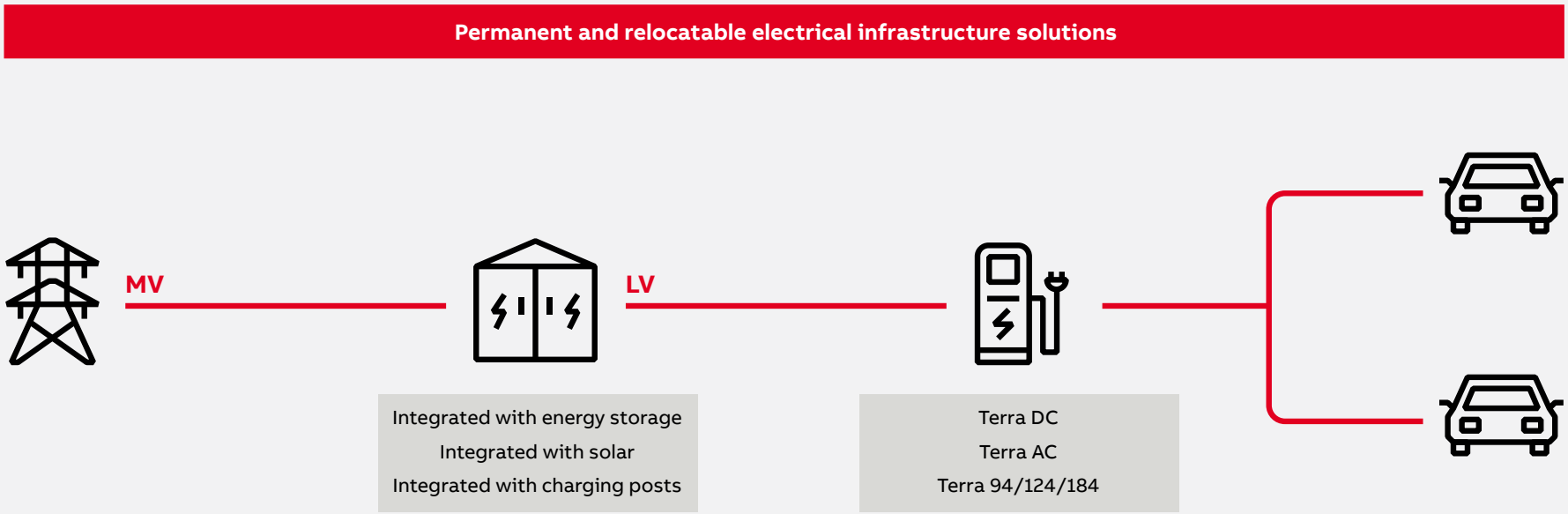
The guiding design principals for NexusRF Infinity are to make it as simple as possible to use for both the installer and end user:

- 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

EV Charging

An electric vehicle charging service is an opportunity to add value to retail and mall buildings and contribute to sustainable mobility.
ABB charging infrastructures can offer an efficient solution at all levels, for both short- and long-term stays.

EV Charging

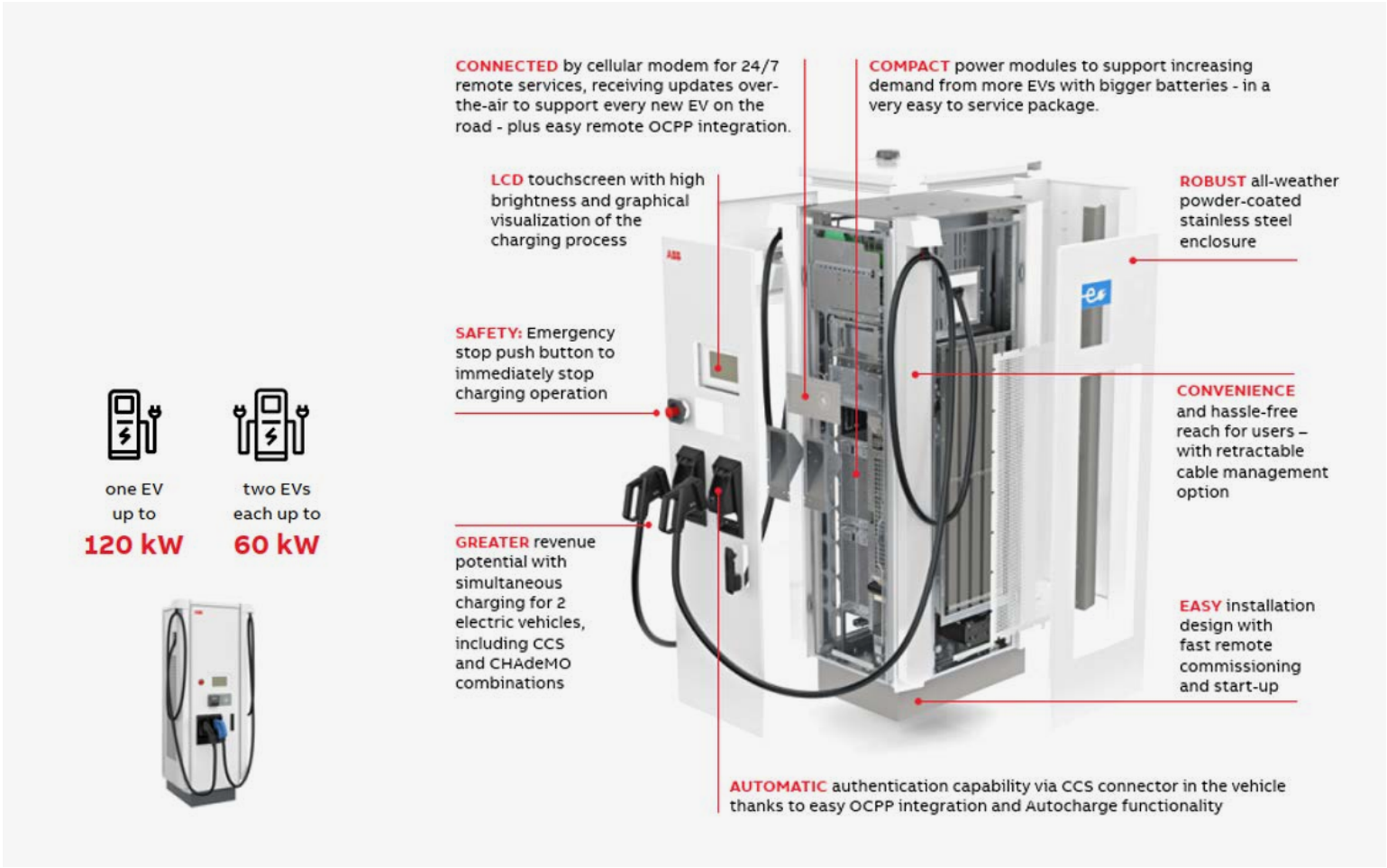

Permanent and relocatable electrical infrastructure solutions
MV
LV
Integrated with energy storage
Integrated with solar
Integrated with charging posts
Terra DC
Terra AC
Terra 94/124/184

EV Charging
TERRA 94 /124/184 DC fast charger

The Terra chargers can provide a quick "refill" adding 100 km (62 mi) of range in as little as 15 minutes (Terra 94).

Terra 124 and Terra 184 charger can provide a full charge to two vehicles simultaneously while shopping or dining plus a third vehicle via the AC outlet (CE models).

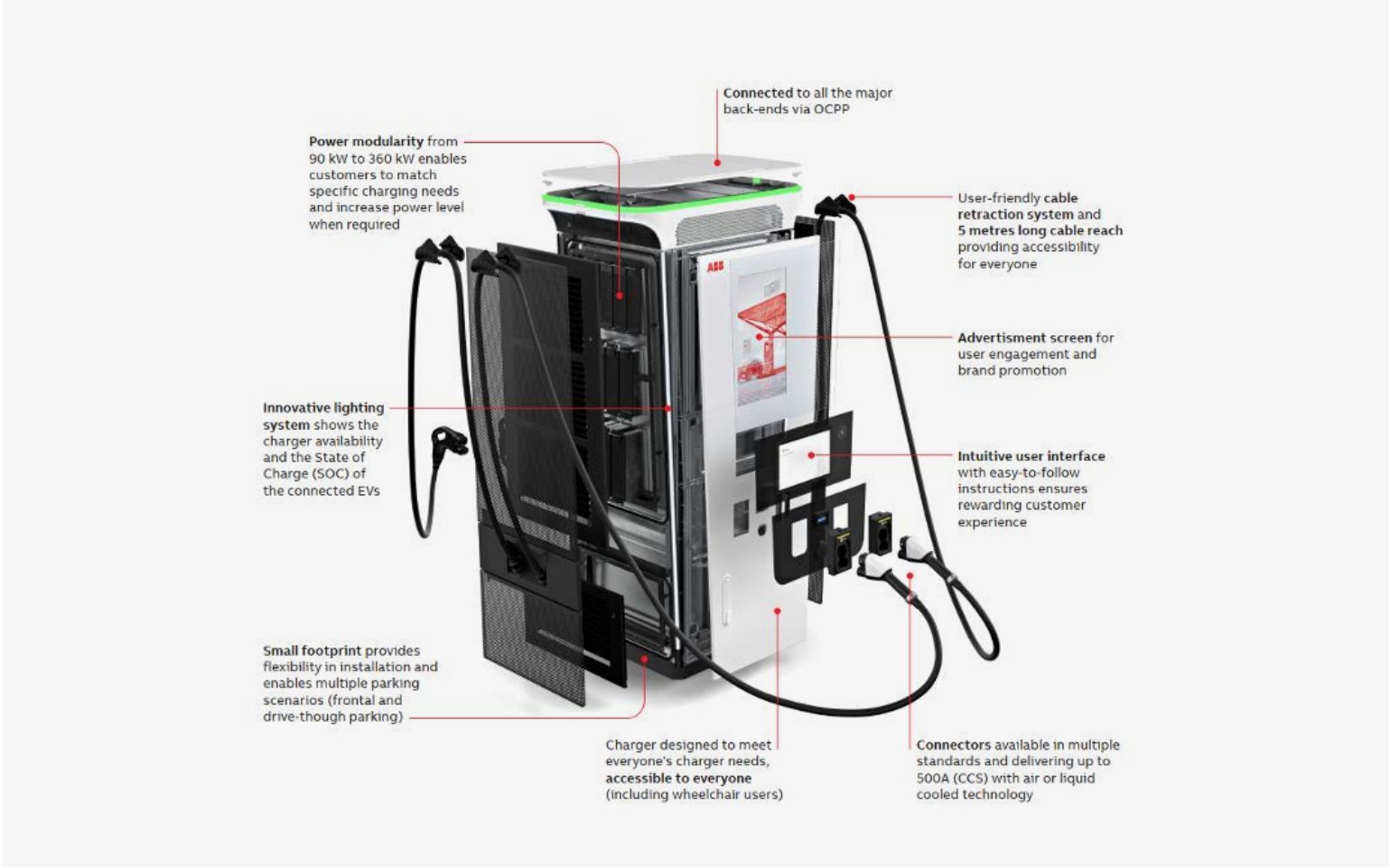
The Terra 124 and Tera 184 charger can provide a full battery charge to two vehicles simultaneously while drivers are shopping, dining or at the movies. Supports all open charging standards in flexible configurations Safety certified to the highest standard



EV Charging
TERRA 360

Terra 360’s unique design enables easy frontal parking and charging, ideal for cities and shopping malls.

Its compact footprint makes the Terra 360 a perfect fit for curbside charging. Terra 360 can serve up to four users at the same time, depending on the parking layout. Terra 360’s distinctive design provides customization options for easy integration of your own brand identity.



EV Charging
TERRA DC Wallbox

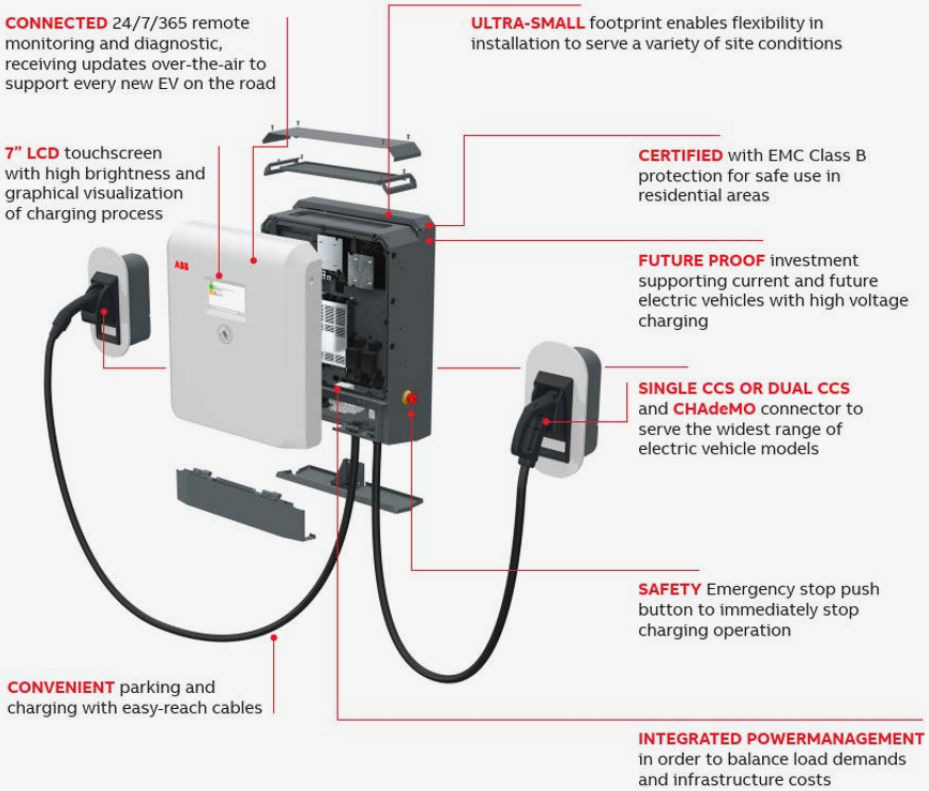
Destination DC offers a faster charging level than what AC chargers can typically achieve, but has a lower power, footprint, installation and investment cost than higher power DC fast charging systems often seen around metro regions and across highways.

Destination DC chargers usually offer 20-24kW in power rating, which falls efficiently between the typical 7-11kW charging power delivered by an AC charger yet below the 50kW to 350kW provided by public DC fast charging stations.

Terra DC wallbox is a futureproof investment supporting current and future EVs with high voltage charging, applicable to a wide variety of use cases, in an ultra-compact footprint, that is safe and reliable.

Main benefit

- Futureproof investment supporting current and future EVs with high voltage charging
- Space-savings with easy-to-install design
- Broad range of connectivity options
- Remote software updates



EV Charging
TERRA AC Wallbox

Terra AC wall box enables a slow charging perfect for employee cars.

The Terra wallbox can be connected to the internet via GSM, WiFi or LAN for perfect integration into smart building system and configuration via app. Simplified authentication via either RFID or App provides flexibility for public-use case applications.

Protection and safety of power supply are ensured by System Pro M compact protection devices and OT switches. Consumptions are kept under control thanks to Insite Pro M and energy meters that perfectly integrates into ABB Ability Energy and Asset Manager. For what concern status and consumption of eV chargers, an intuitive overview is available on website.

Explore the technical features of the Terra AC wallbox

Load management

- Build-in energy meter
- Set up for external energy meter integration for dynamic load management
- Ready for integration with advanced smart building energy system

Built-in safety

- Overcurrent
- Overvoltage and undervoltage
- Ground fault
- Surge protection
- PE (protective earth) continuity monitoring

Connectors

- Type 1 and type 2 cable
- Type 2 socket with or without shutter
- No need of extra hook, attached cable can be wrapped around the charger

Design

- IEC variants:
  - Single phase up to 7.4 kW / 32A
  - Three phase up to 22 kW / 32 A
- UL variants up to 19 kW / 80 A
- NEMA 3 enclosure
- All variants: IP54, IK10

Connectivity

- Ethernet RJ45
- Bluetooth
- Wifi
- 4G variants
- RS485 for connection to energy meter
- OCPP 1.6
- Authentication via ChargerSync™ app and portal or RFID
- Configuration through TerraConfig app and portal

EV Charging
Public Commercial Parking

Offering Charging to your customer offer variety of benefits which include below

- Attracts new, loyal, and typically higher earning, customers to stores
- Increases sales as consumers spend more time in stores while their cars are charging
- Supports new business models, such as a loyalty points program – free charges for points earned from in-store purchases
- Helps to decrease the environmental footprint in the community
- Additional revenue generation possibilities with per- charge pricing or on-charger advertising
- Typical charging time can be between 20 minutes to 3 hours, depending on the type of business
- Typical charging power is between 11kW and 50kW

ABB EV Electrical infrastructure building blocks is combination of below building Blocks this depend on each project , client requirement , deployment time and other conditions

- Standardized eHouses and skids; ex. EcoFlex
- Compact Secondary Substations (CSS)
- Energy Storage Modules (ESM)

Electrical infrastructure

- Built as modular or expandable solutions for future-proofing
- Aesthetically pleasing enclosures to help hide necessary infrastructure in plain sight

Integrated charger solution

- Ideal for turnkey charging solutions that can be commissioned quickly on-site
- Bridges the gap of connecting charging and electrical infrastructure
- Provides flexible solutions from reliable vendor with common products

Battery energy storage

- Available with synchronized charging and is especially important where grid constraints limit charging power
- Ideal for peak shaving especially for fleets where multiple cars charge
- Ideal way to connect solar to local chargers reliably

EV Charging
Distribution Boards

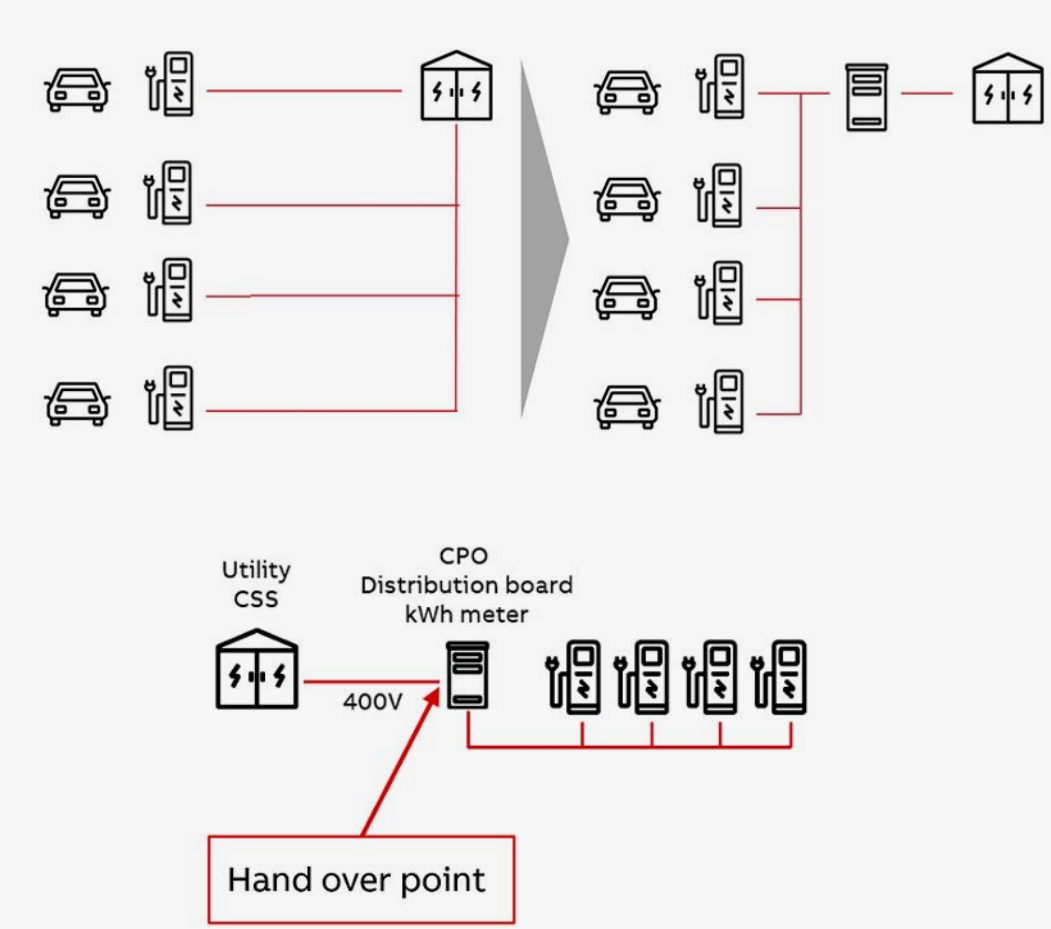
DIstribution boards are specifically designed for outdoor installations and they come as pre-assembled systems, ready to install. They combine the advantages of the flexible IP-system with robust and reliable distribution cabinets, and they deliver efficient use of space, quick installation and significant customer value.

Free up floor space
By placing the distribution board outside instead of inside the building, interior floor space can be reserved for valuable uses. Additionally, having the distribution board outside the building makes it easier to access for maintenance.

Convenient and flexible
Pre-assembled Kabeldon solutions come ready for installation directly from the factory, saving time during installation and planning. By complementing the solutions with the required outgoing groups the solution also provides great flexibility.

Cost effective by design
Locating the distribution board outdoors reduces costs for the building owners because there's no need for them to build and maintain a separate electrical room, compared to interior electrical installations.

You can add meter your meter with CTs and add the right number of outgoing Kabeldon fuse switch disconnectors for the number of chargers to be installed. The distribution boards are tested to IEC 61439-1,-5 which approve placement in public environments. It's hot dip galvanized as standard but can also be painted in your choice of color.



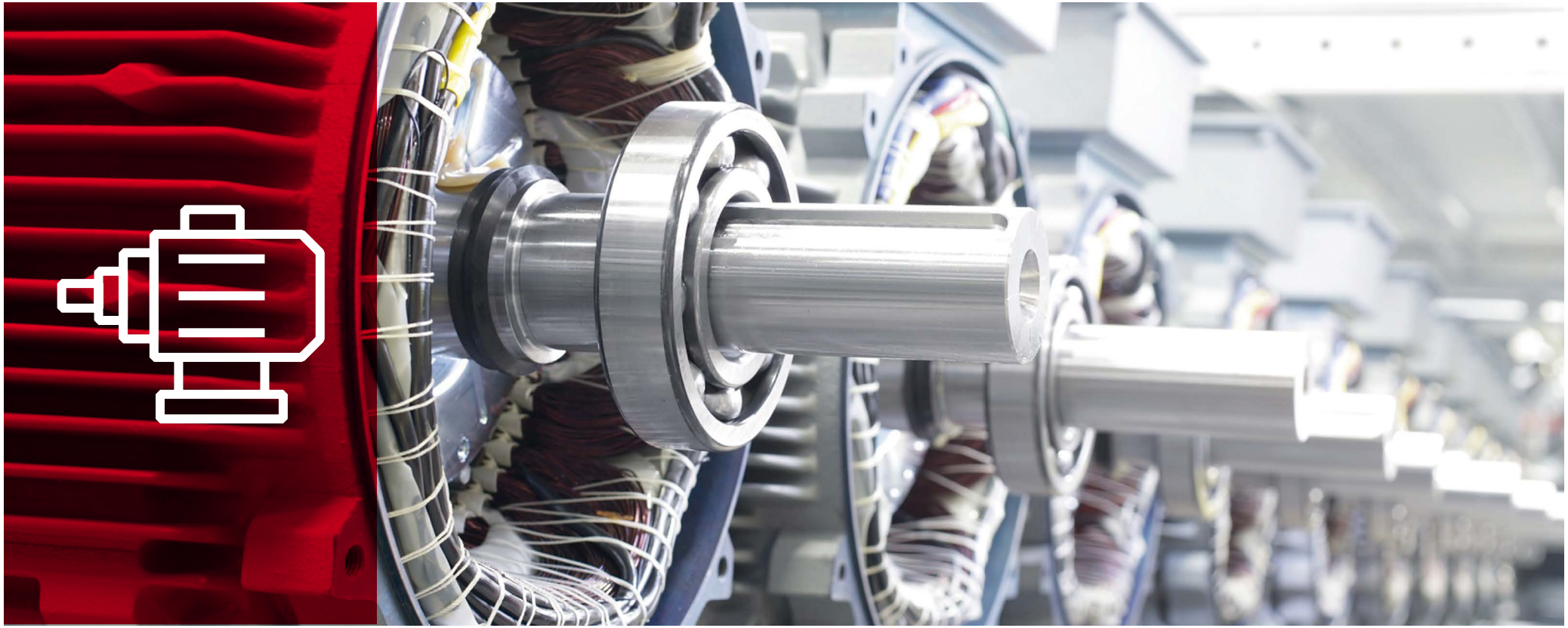
EV Charging
Bill of Materials

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

Order Code	Description	Additional information / assumptions:
Outside Area		
ABB6AGC085472	Terra 184 Charger with CC2-2 and CCS-1 DC Connector and One AC Connector (22kw)	EV Charger Two Connector
6AGC072870	Payment kit CCV Europe (CardProcess)	Accessories with Charger
2CGD000366A1000	SDCS 63026 Distributon Board Items	KLIP DB
2CGX063300549	MARK-S 73 Distributon Board Items	Gound mounted foundation
2CGX063050109	SLD 2 Distributon Board Items	Fuse switch disconnector
2CGD000502A1000	ADU 300 Distributon Board Items	PE+N terminal
Basement		
ABB6AGC081280	Terra AC W22-T-RD-M-0	Terra AC Wall Charger
ABB6AGC082176	RFID card (MIFARE)	Terra AC wallbox accessories
2CGX063301122	CDCS 12515 Distributon Board Items for Terra AC Wall Box you can connect upto 3 Chargers	KLIP DB
2CGX063050106	SLD 000 Distributon Board Items	Fuse switch disconnector

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

Overview - Motivation & Key Elements

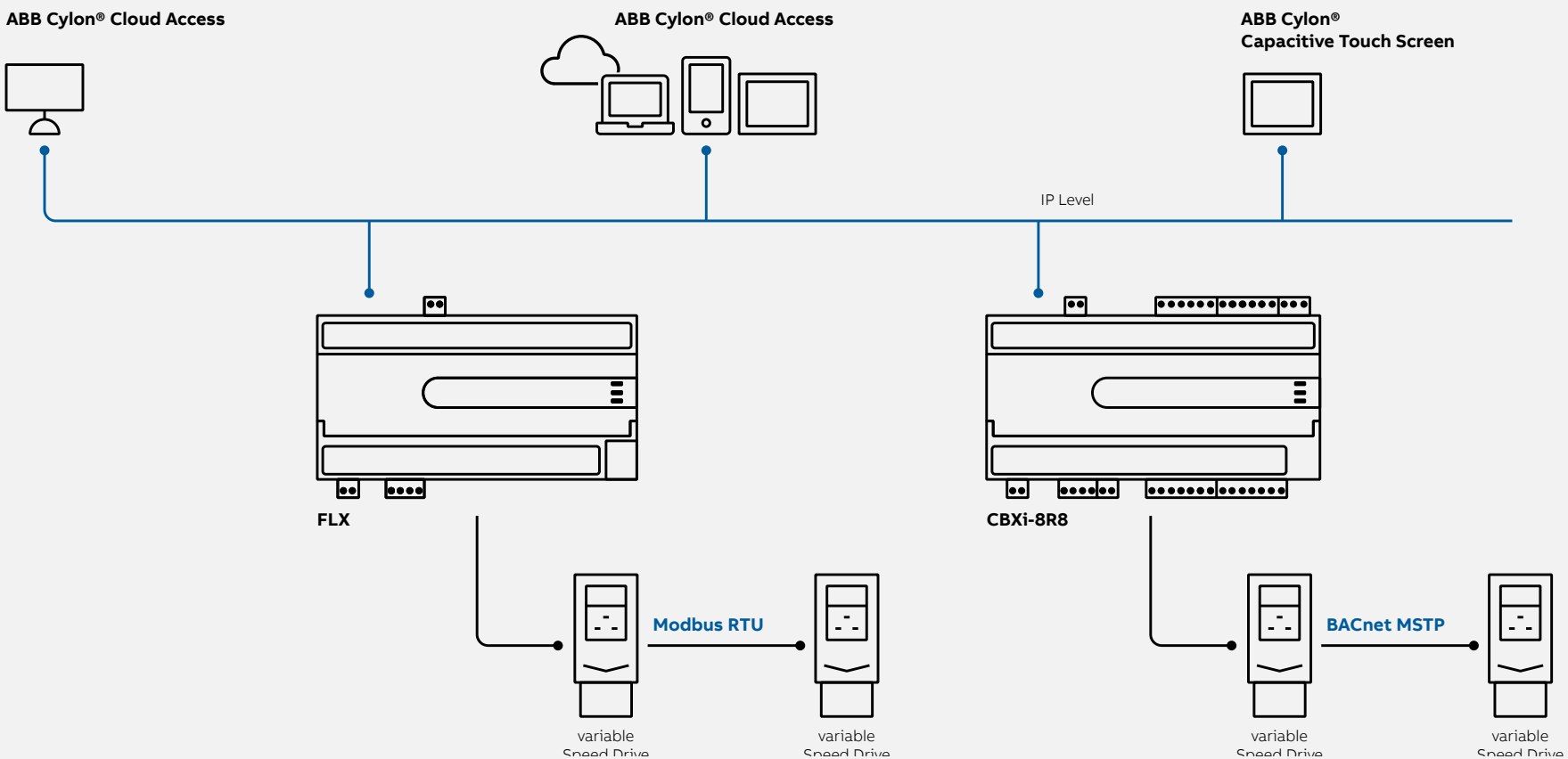
ABB's variable speed drives for HVAC help save on average 20 to 60% of energy. Receiving the information from (Cylon) controllers /temperature, humidity or CO_2 sensors, they adjust the motor speed of fans, pumps and compressors to a current building need.

- Comfort of the occupants vital for hospitality 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

Fireman's override feature making ventilation appications ignore faults and warnings during emergency and run until distruction ensuring smoke extraction and evaquation route maintenance as long as possible for the hotel occupants' highest safety

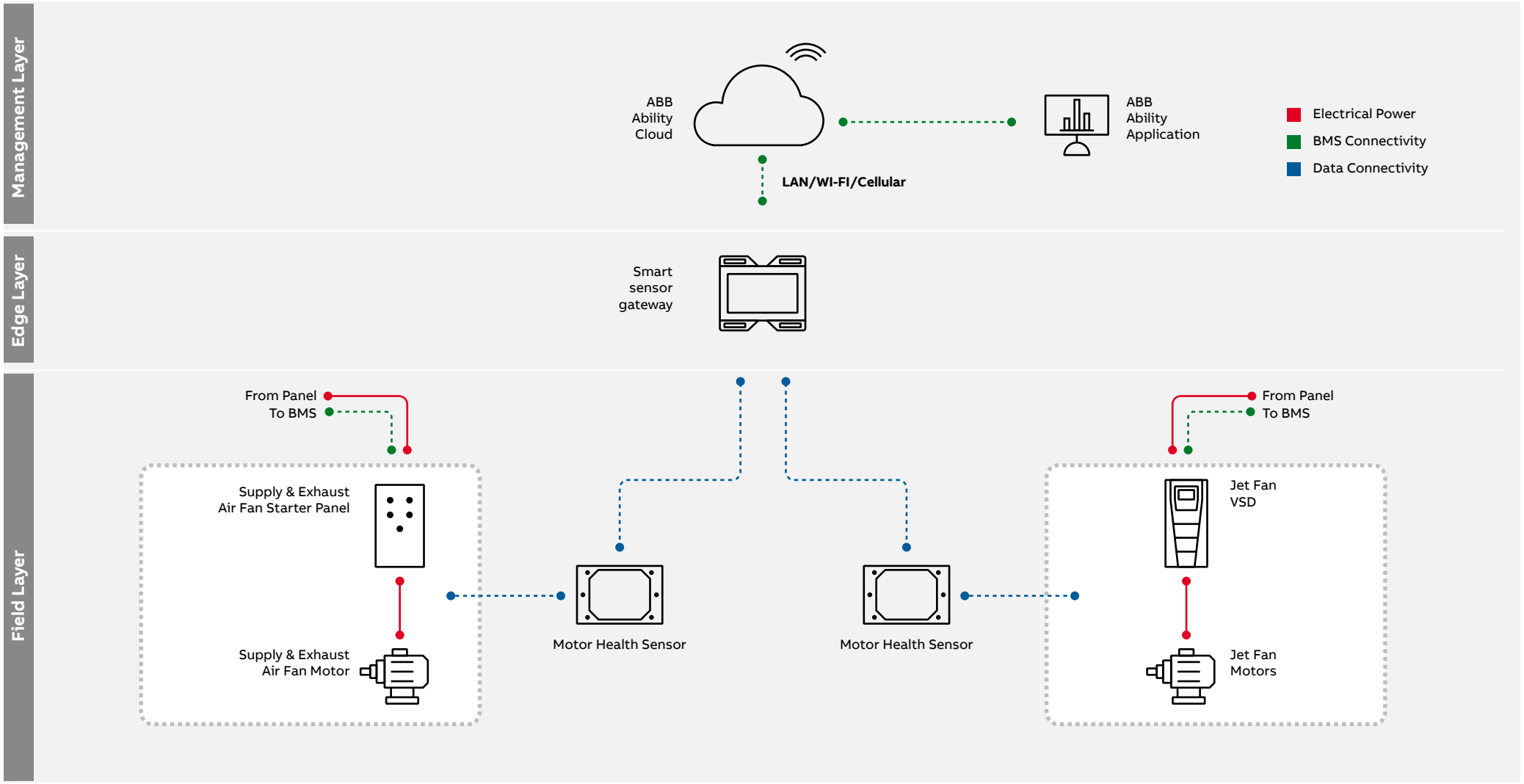
Motor & Variable Speed Drives

Reference Architecture



Motor & Variable Speed Drives
Motor and Pumps

Reference Architecture with Smart Sensors and VFD



Motor & Variable Speed Drives

ABB motors run applications in shopping malls and retail stores – like HVAC, refrigeration, water supply or elevators – reliably and efficiently offering up to IE5 energy efficiency class in the portfolio. ABB drives are flexible to optimize the reliability and efficiency further adjusting the application speed based on the store need and saving massive amounts of energy.

HVAC Drives

Shopping malls and food stores often host large groups of visitors meaning the safe as well as comfortable environment is crucial. At the same time, to operate commercial buildings efficiently and decrease the carbon footprint, high efficiency solutions should be applied.
It is well known, that about 50% of energy consumed by an average commercial building is used in HVAC. In food retail stores, over 50% of energy can go for refrigeration. So, making HVACR systems efficient is a priority.
ABB's variable speed drives help save on average 20 to 60% of energy in HVAC and refrigeration. Receiving the information from Cylon controllers or temperature, humidity and CO2 sensors directly, they adjust the motor speed of fans, pumps and compressors to a current store building need, making the environment comfortable and keeping food fresh, while saving energy.

Drive-based filter clogging detection ensures fresh air and limits the spread of airborne deceases in shopping malls.
Should a fire emergency occur, HVAC drives will act as part of fire suppression system cutting fresh air supply to the areas on fire, while extracting smoke and maintaining evacuation routes. Drive's Override mode allows to run the fans as long as possible ignoring faults and warning like overtemperature.

Multi pump or multi compressor control ensure efficient energy use in water supply and refrigeration. Drives start additional units as the load increases and run those as close to the best efficiency point as possible to maximize food retail store or shopping mall energy savings.

ABB Ability TM condition monitoring digital services increase the system reliability further allowing to track the equipment performance remotely and alarm about the upcoming failures before they occur, so predictive maintenance actions could be taken, and maintenance costs optimized.

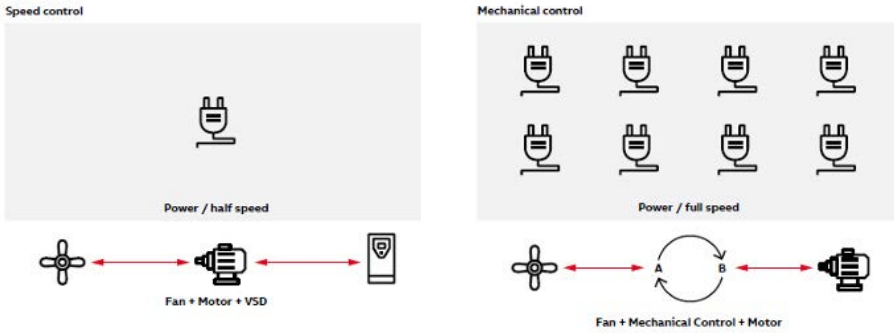
ABB's ultra-low harmonic drives take a special care of power quality in store buildings, reducing power network disturbances to a minimum. This makes building power network reliable and allows to optimize electrical equipment size and go with smaller generators, transformers, switchgears and so on.

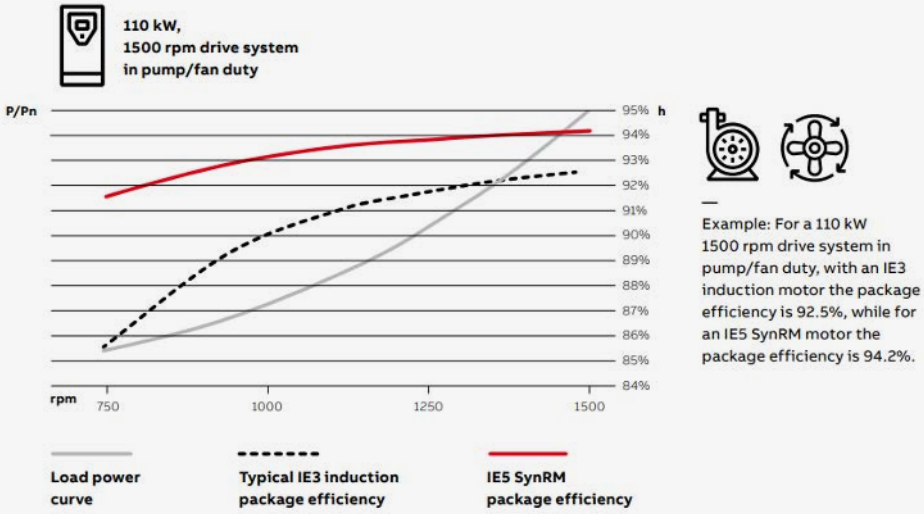
Seamless drive integration into any BMS is possible with extensive support of all common building automation protocols including Modbus and BACnet

Motor & Variable Speed Drives

Motor Technology

Motor technology chosen for store building applications plays a big role as well. 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 losses. This makes SynRMs the new first choice to meet the growing global demand for improved energy efficiency.
Synchronous reluctance motors offer even higher project sustainability in comparison to other motor technologies thanks to no rare earth magnets in the motor design.
The reliability is also increased. SynRM technology offers up to 30°C lower winding temperatures and up to 15°C lower bearing temperatures, which prolongs the motor lifetime and reduces the need for maintenance.





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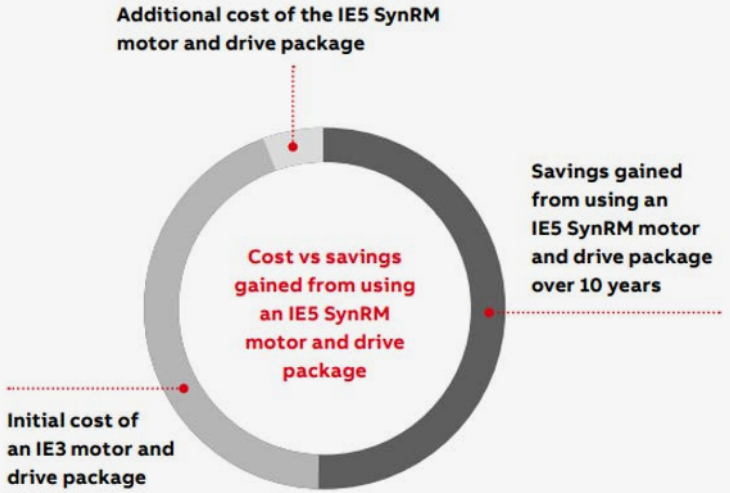
Example: For a 110 kW 1500 rpm drive system in pump/fan duty, with an IE3 induction motor the package efficiency is 92.5%, while for an IE5 SynRM motor the package efficiency is 94.2%.



Motor & Variable Speed Drives

Smart sensor for mounted bearing

ABB Ability Smart Sensor for mounted bearing is an easy-to-use, wireless sensor which monitors the health of your ABB Dodge mounted bearings, allowing users to reduce downtime, improve reliability and operate safely.

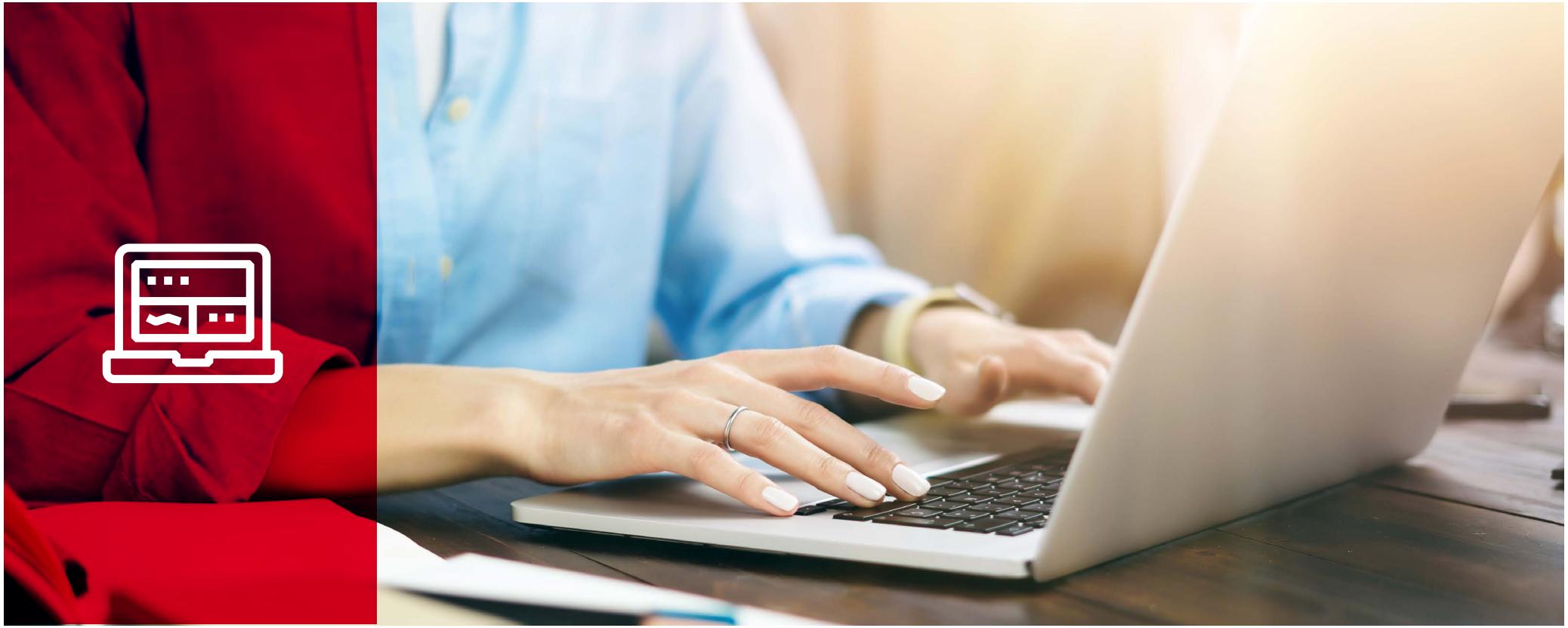
Changes in temperature and vibration can indicate potential problems in mounted bearings. Yet understanding the health of the bearing is usually overlooked, leaving problems unnoticed until the bearing fails. ABB now makes it easier and safer to know how your bearing feels

Smart sensor for motor

The ABB Ability Smart Sensor converts traditional motors into smart, wirelessly connected devices. It enables users to monitor the health of their motors and to plan maintenance in advance.
Unplanned downtime can be avoided, efficiency optimized, and safety improved.

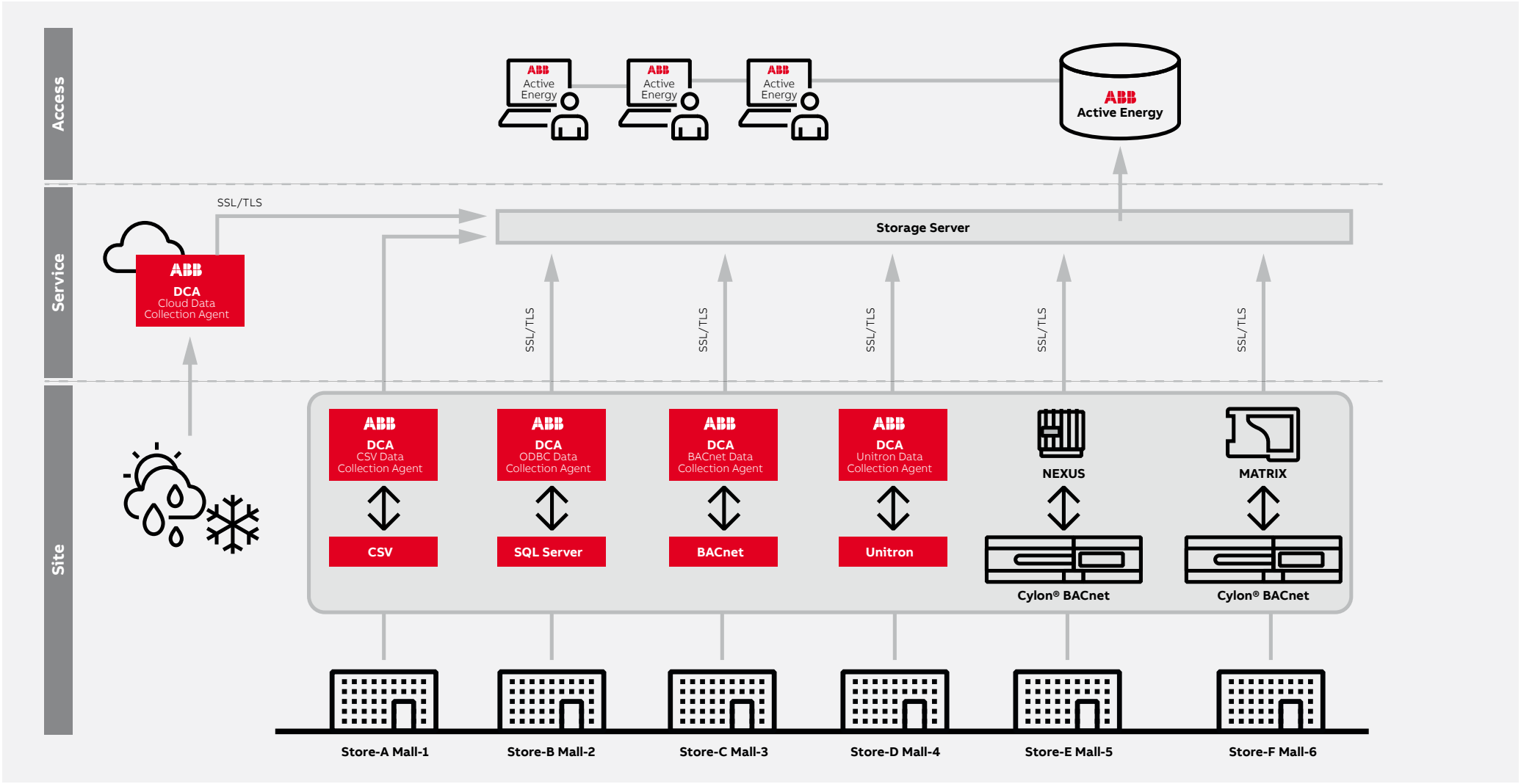
Energy Management

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.



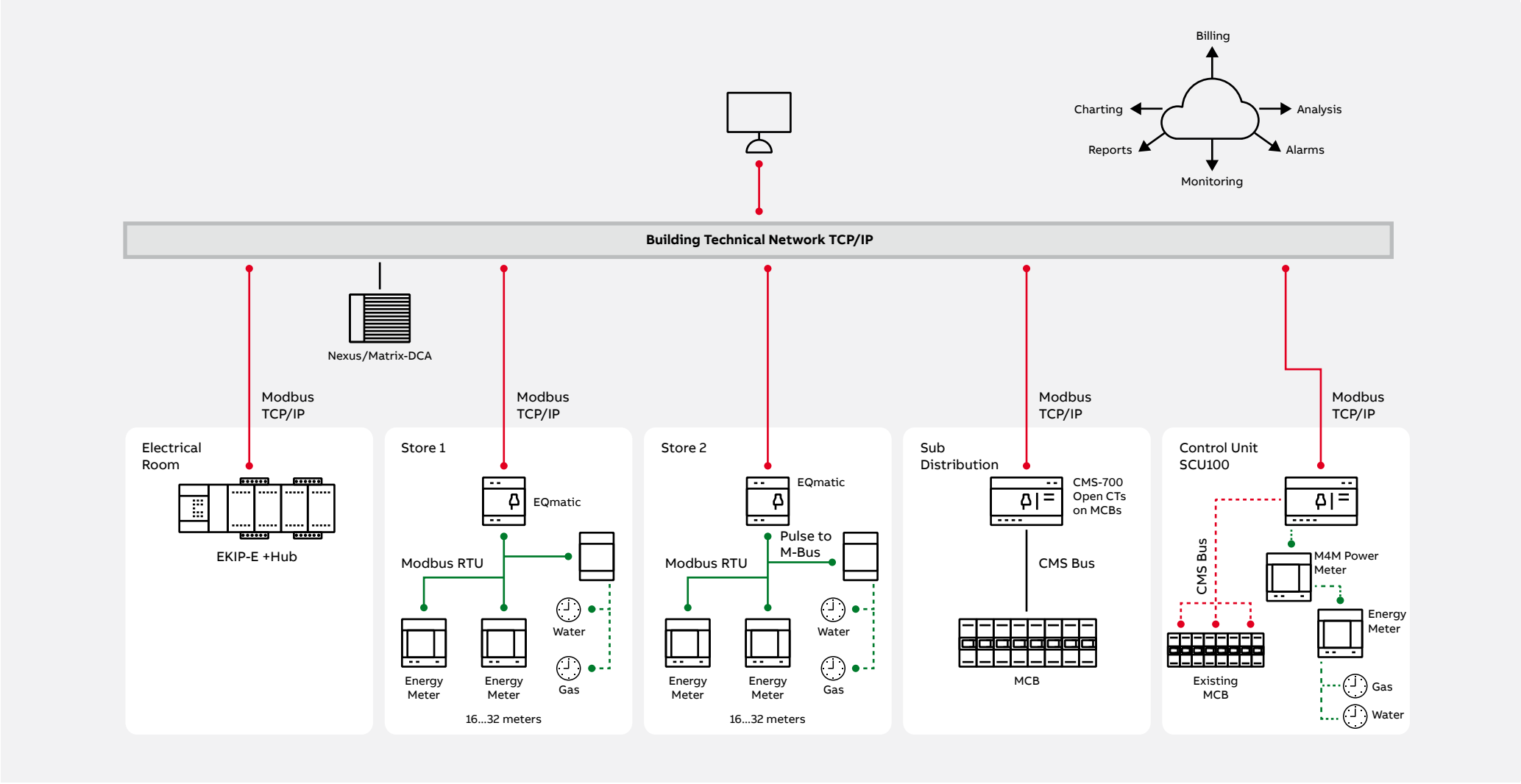
Energy Management
Active Energy Manager (for NAM)

Reference Architecture



Energy Management
Active Energy Manager (for NAM)

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

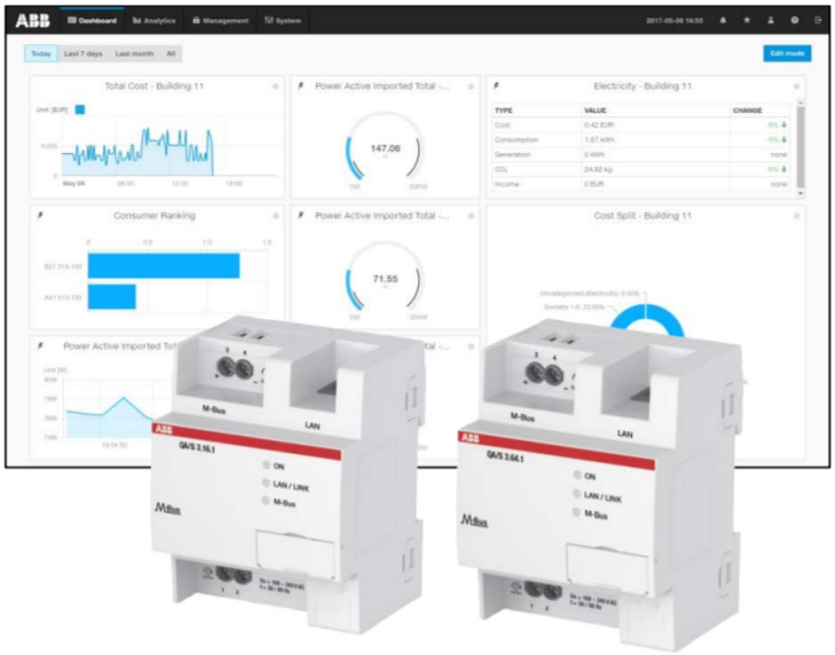
Reports anomalies detected in energy consumed versus expected consumption. Alarm reports can be issued via email. Analysis of historical alarms can help identify potential ongoing issues.

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.

Energy Management
EQ Matic Network Analyzer

ABB EQmatic Energy Analyzers are 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 web-based user interface is individually configurable to the respective requirements and makes it possible to identify energy thieves and optimize energy costs sustainably.



Commissioning and operation are carried out via the web-based graphical user interface. For a detailed monitoring the devices offer several analysis functions such as historical data analysis, benchmark functions, cost analysis according to consumer, instantaneous values, etc. The configurable dashboard page provides a quick overview of most relevant metering data and analytic charts according to customer needs. Various export functions (E-mail, FTP) for further processing of the data and connectivity options (Modbus/TCP, RestAPI) for integration into supervisory systems (e.g. SCADA, BMS, etc.) are available.

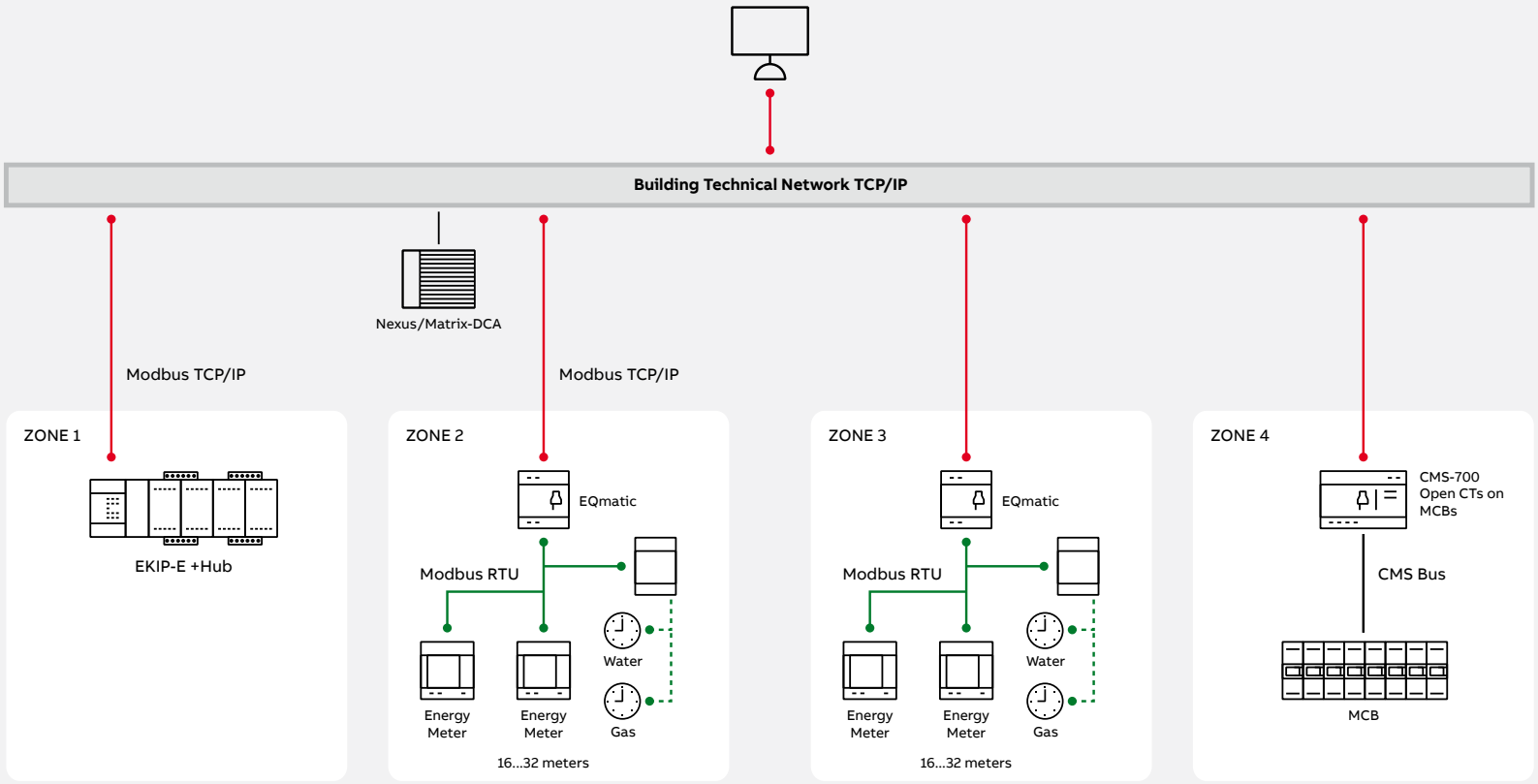
The recording of energy variables and values, as well as their processing, is continually gaining in significance This is not just due to the rising energy costs but also due to the frequently demanded evaluation and reading possibilities via a decentralized reading station The features of the EQmatic series help to meet these requirements and can provide operators and users with convenient, cost-effective solutions for modern energy management ABB offers a wide range of devices and solutions specially designed for these applications.

Important features:

- Automatic detection of ABB EQ meters (A- and B-Series) and M2M network analyzers (QA/S 3.xx.1, M-Bus, and QA/S 4.xx.1, Modbus)
- Load control function, alarm function and monitoring of environmental parameters (QA/S 1.16.1, KNX)
- Local data storage and data sharing options
- Integration into ABB Ability™ Energy and Asset Manager
- Graphical data analysis via dashboard/chart diagrams and data export options

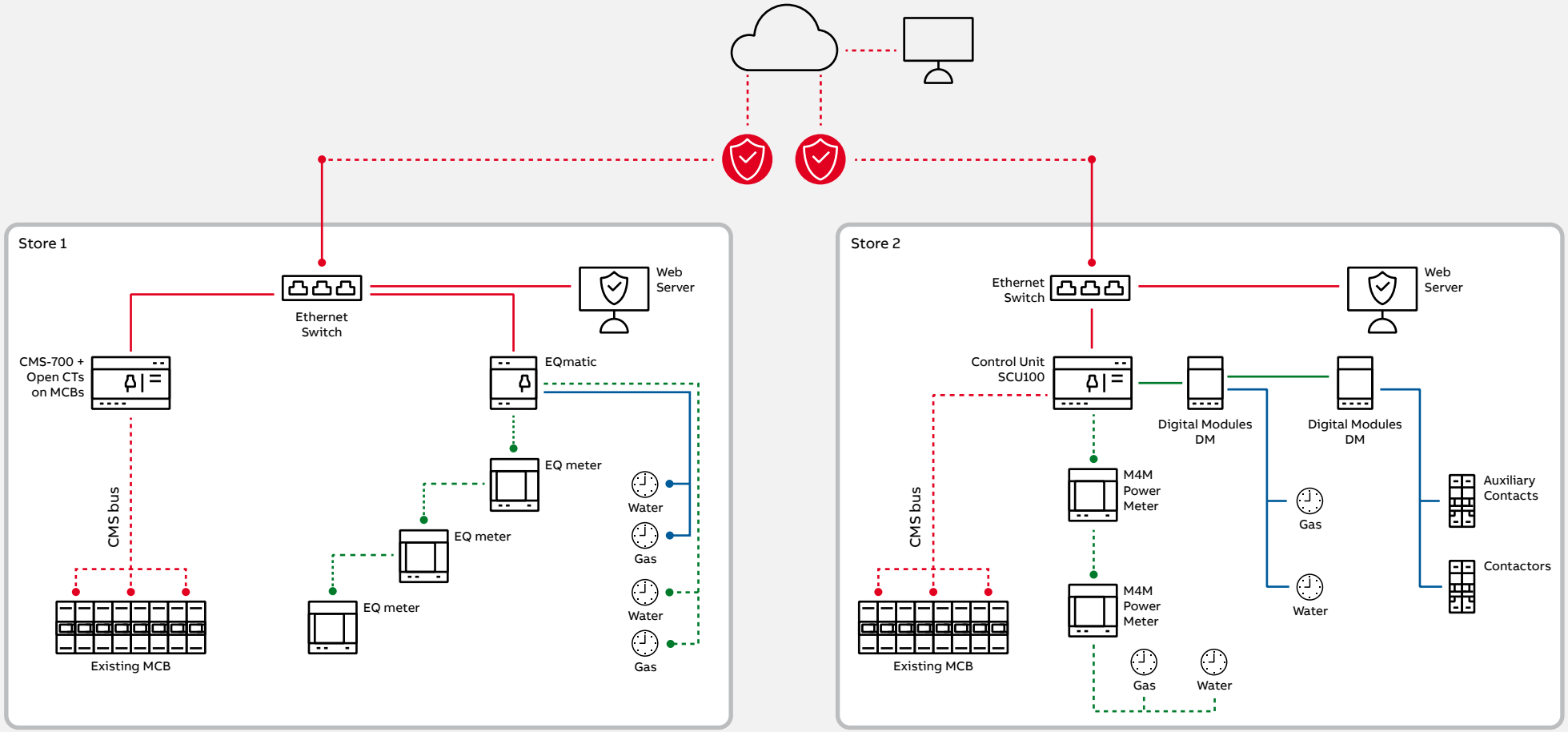
Energy Management

Metering architecture 1



Energy Management

Metering architecture 2



Energy Management
Bill of Materials

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

Order Code	Description	Additional information / assumptions:
Entrance/Lobby and Atrium		
2CDG110228R0011	QA/S 4.16.1 Energy Analyzer Energy Analyzer, Modbus RTU, 16 Devices, MDRC	for water meters of AHU
Outside Area		
2CDG110228R0011	QA/S 4.16.1 Energy Analyzer Energy Analyzer, Modbus RTU, 16 Devices, MDRC	For Less than 16 Meters
2CMA105928R1000	B23 112-500 EQ Meters three Phase	
Food Court		
2CDG110228R0011	QA/S 4.16.1 Energy Analyzer Energy Analyzer, Modbus RTU, 16 Devices, MDRC	for water meters of AHU
Supermarket		
2CDG110228R0011	QA/S 4.16.1 Energy Analyzer Energy Analyzer, Modbus RTU, 16 Devices, MDRC	for water meters of AHU, Gas Meter and Water Meter
Retail Shop		
2CDG110228R0011	QA/S 4.16.1 Energy Analyzer Energy Analyzer, Modbus RTU, 16 Devices, MDRC	for water meters of AHU, Gas Meter and Water Meter
Control Room		
	ABB Active Energy	
Basement		
2CDG110228R0011	QA/S 4.16.1 Energy Analyzer Energy Analyzer, Modbus RTU, 16 Devices, MDRC	for water meters of AHU, Gas Meter and Water Meter
2CMA105928R1000	B23 112-500 EQ Meters three Phase	
Mechanical Room		
2CDG110228R0011	QA/S 4.16.1 Energy Analyzer Energy Analyzer, Modbus RTU, 16 Devices, MDRC	for water meters of AHU, Gas Meter and Water Meter

ABB Ability™
Energy and Asset Manager

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™
Energy and Asset Manager

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

ABB Ability™
Energy and Asset Manager

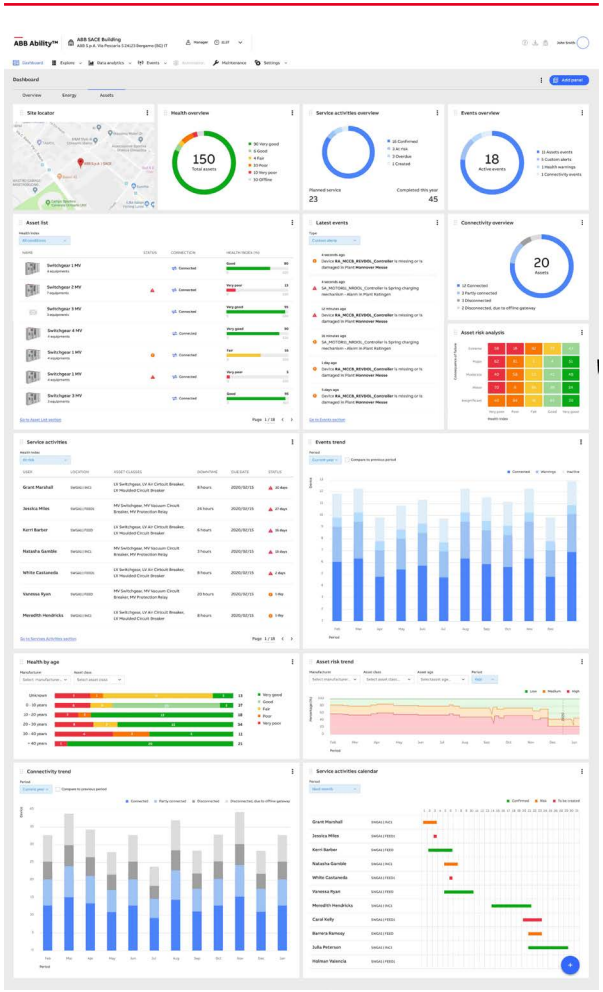
Energy Manager

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.



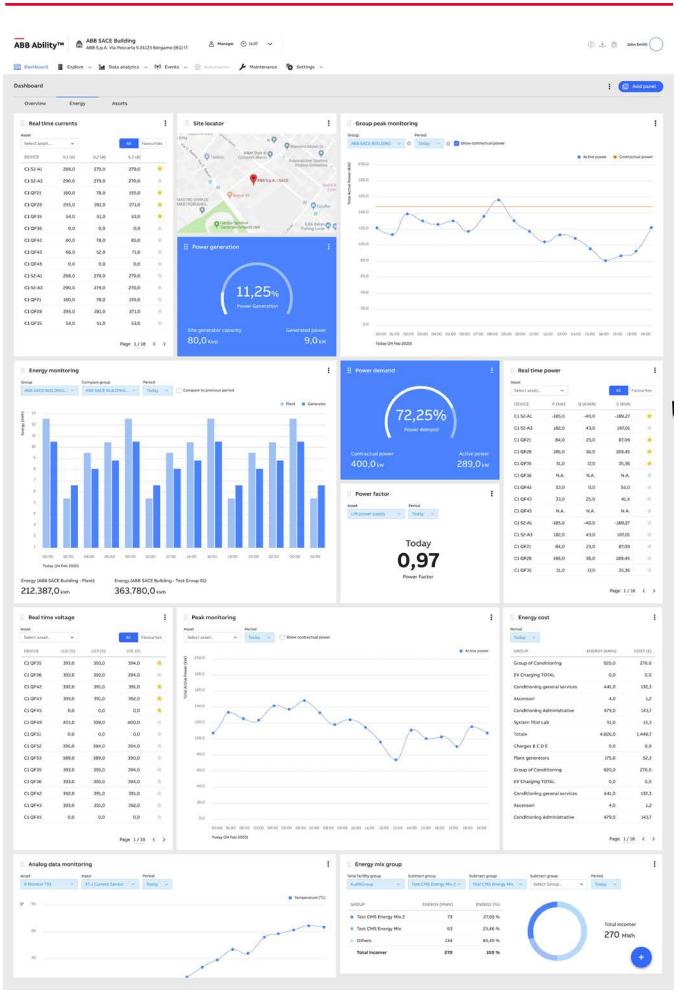


ABB Ability™
Energy and Asset Manager

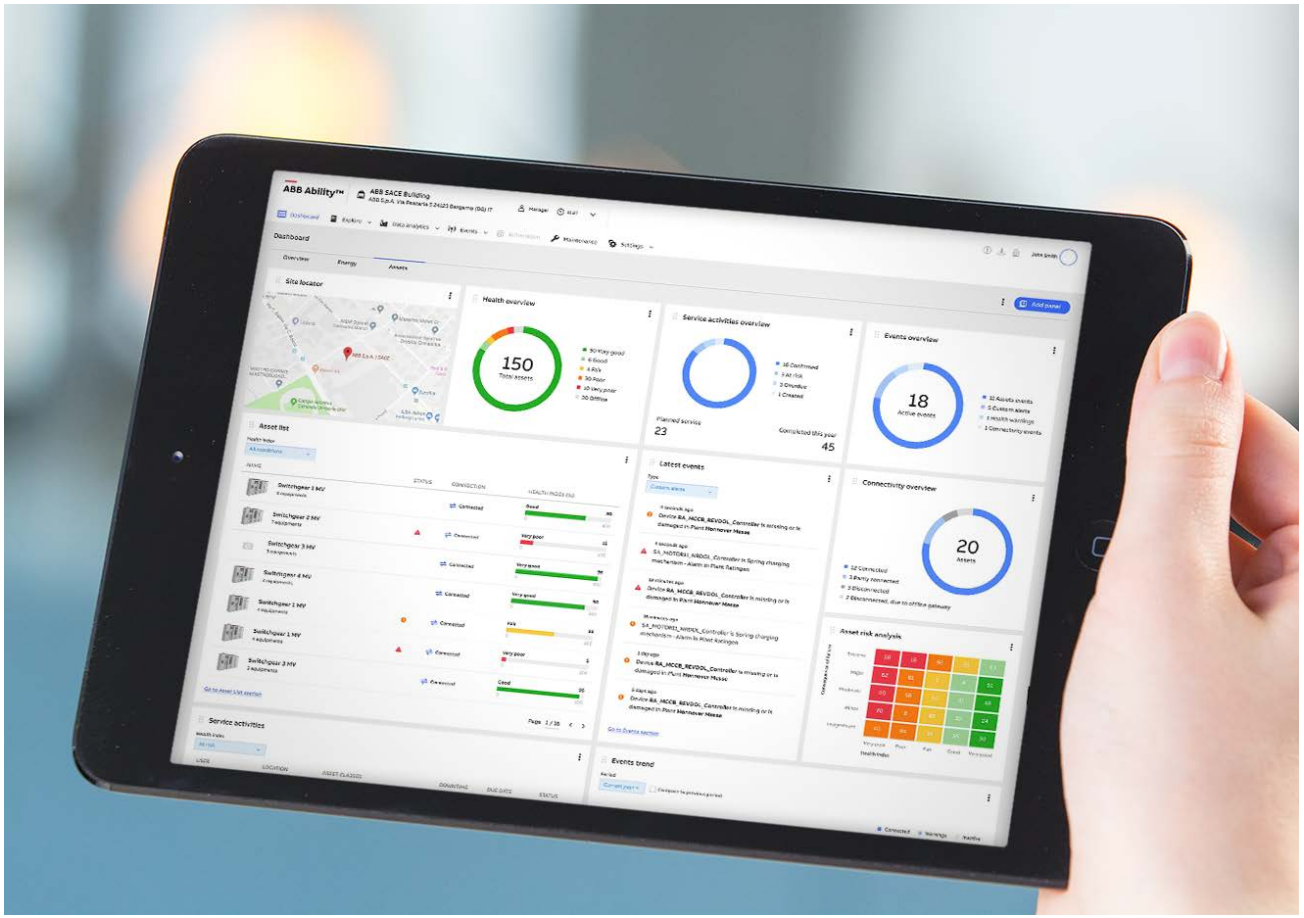
Asset Manager

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.



Designing innovative solutions for retails and malls

General Reference
Main technical normative references

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”

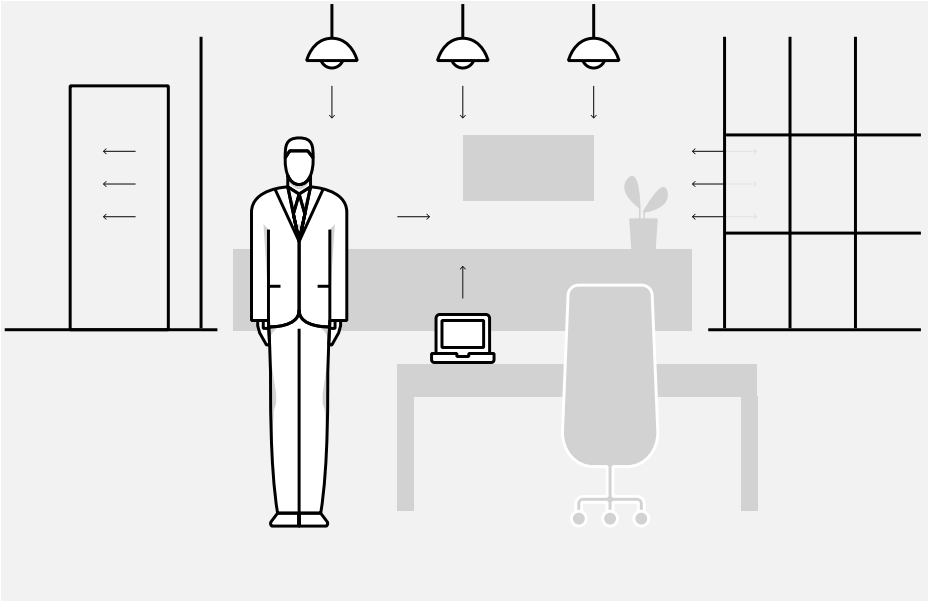
The EN 15232 standard specifies:
- a structured list of building control, automation and technical management functions that contribute to a building’s energy performance; the functions have been classified and structured according to building regulations and so called Building Automation and Control (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 Reference
Load classification

The first information that should be known when setting up the design of an electrical system for an office building is the quality of the power supply to be guaranteed to the various loads, i.e. when the economic consequences of an outage are particularly important or when the power supply cannot fail for safety reasons.

Loads that typically require the most attention are:

- IT (PCs, workstations, data centers)
- networking applications (WAN-LANs, structured cabling, VoIP, ISP centers)
- building management and control
- telecommunications (transmission devices)
- protection and control equipment in the distribution of electrical energy (transformer rooms)
- emergency and security (emergency lights, alarms).



The classification of the loads with respect to the continuity of the power supply can be carried out on the basis of the categories defined in Tabella 1.
On the basis of this classification, preferential and privileged loads can be identified and the right power supply associated with them.

In addition to the ordinary, he power supply can be:

- BACK-UP:
  electrical system intended to guarantee the supply of user appliances or parts of the system for reasons other than the safety of persons (Standard IEC 60364-2 - art. 21.6);

- SAFETY:
  electrical system intended to ensure the supply of power to user appliances or parts of the installation necessary for the safety of persons. The system includes the source, the circuits and the other electrical components (Standard IEC 60364-2 - art. 21.5).

General Reference
Load classification

Classification of loads with respect to power availability.

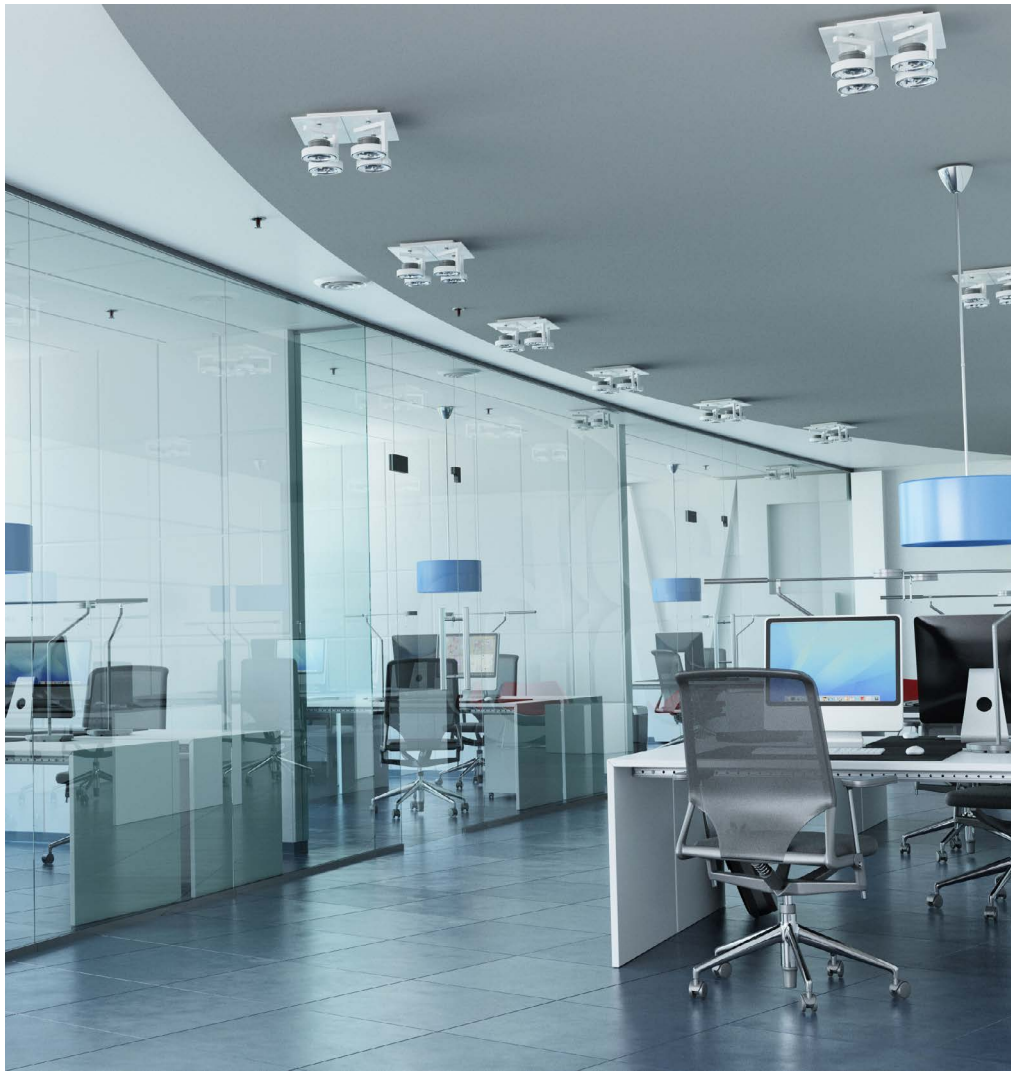
Type	Definition	Power Supply
Ordinary	They affect the smooth operation of all services, but their absence does not lead to situations of danger or serious discomfort	Ordinary
Preferential	They affect the smooth operation of all services, but their absence does not lead to situations of danger	Reserve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

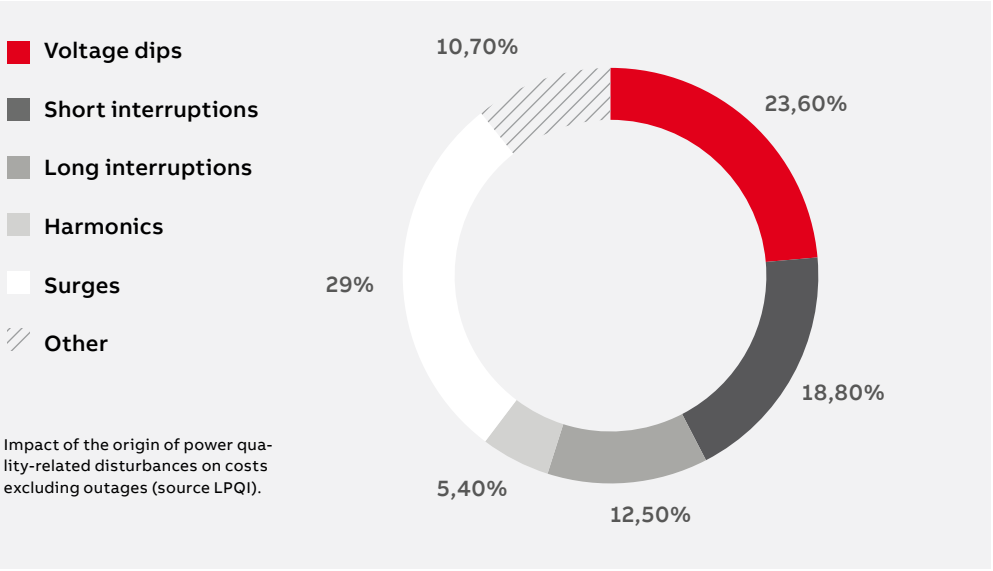
Electricity is in fact a particular product: it is never used as such by those who buy it, but it is always transformed and modified. In general terms, comparing electrical energy with other consumer products, it can be said that while the quality of most of these is completely determined by the producer 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 Reference
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).

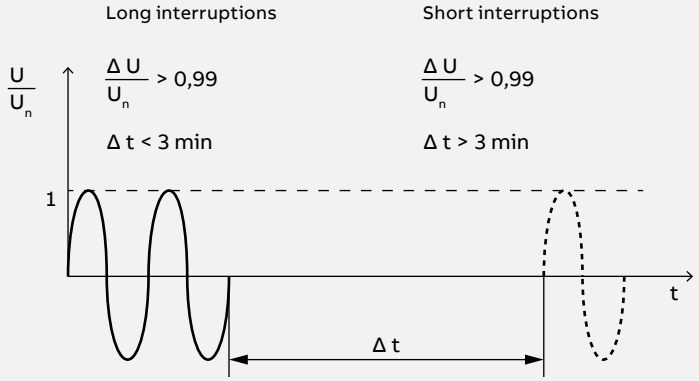
Origin and effects of power quality disturbances.

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 Reference
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.

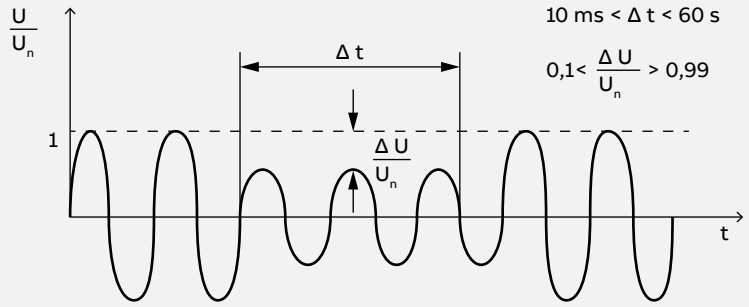


Accidental power outages

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.

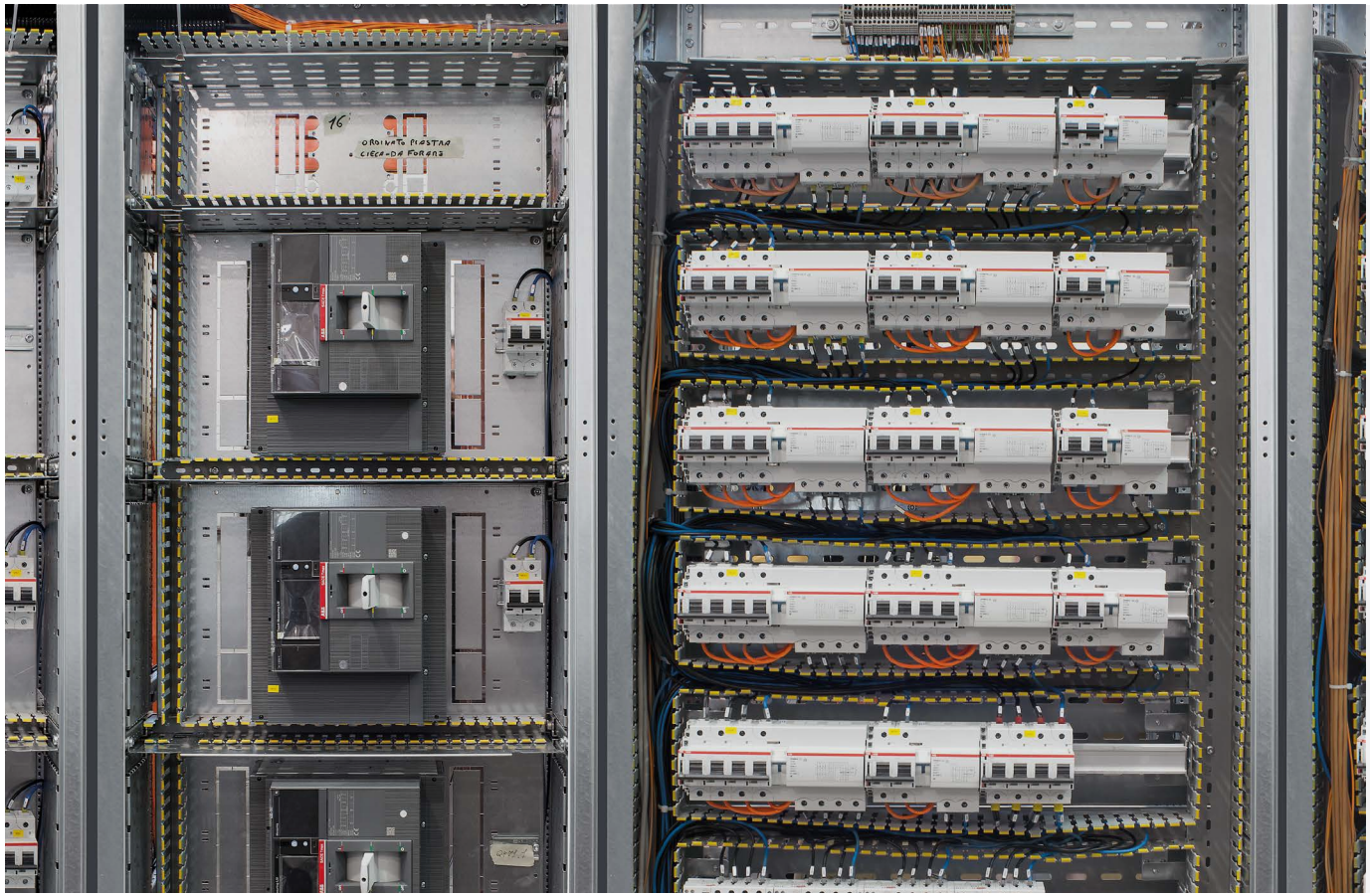


Schematic representation of a voltage dip.

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 Reference
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 Reference
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 Reference
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.

Double radial scheme

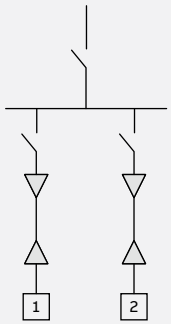
The double radial scheme basically consists of the combination of two simple radial systems, which from upstream to downstream extend associated with each other.

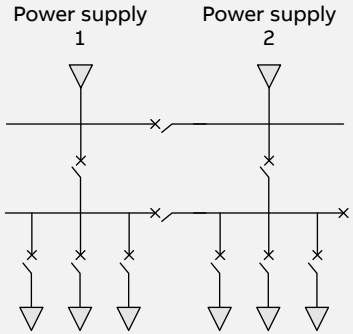
The double radial scheme has the following advantages:
- The out-of-service of one element of the system does not cause the downstream elements to be completely out-of-service;
- Flexibility in case of maintenance, verifications, modifications, expansions, since it is possible to temporarily put an element 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 simple radial diagram





Example of double radial diagram

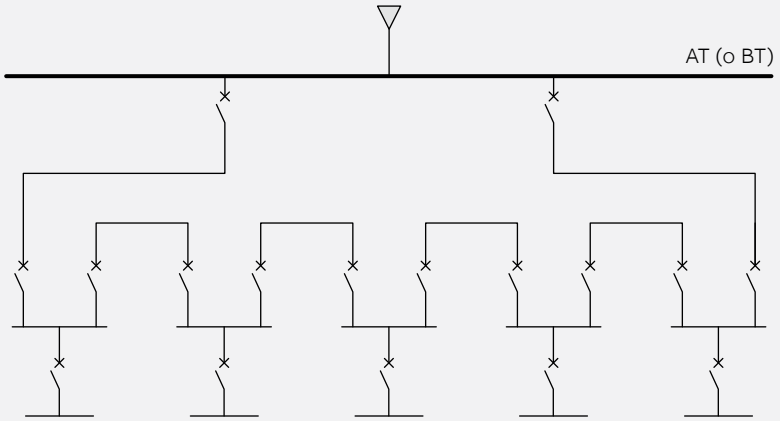
It is therefore clear that, if higher levels of reliability are to be achieved (which is desirable if a dual radial distribution system is to be set up), an alternative power source characterized by a much higher level of reliability than that considered must be provided, such as, for example, a generator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

General Reference
Scheme

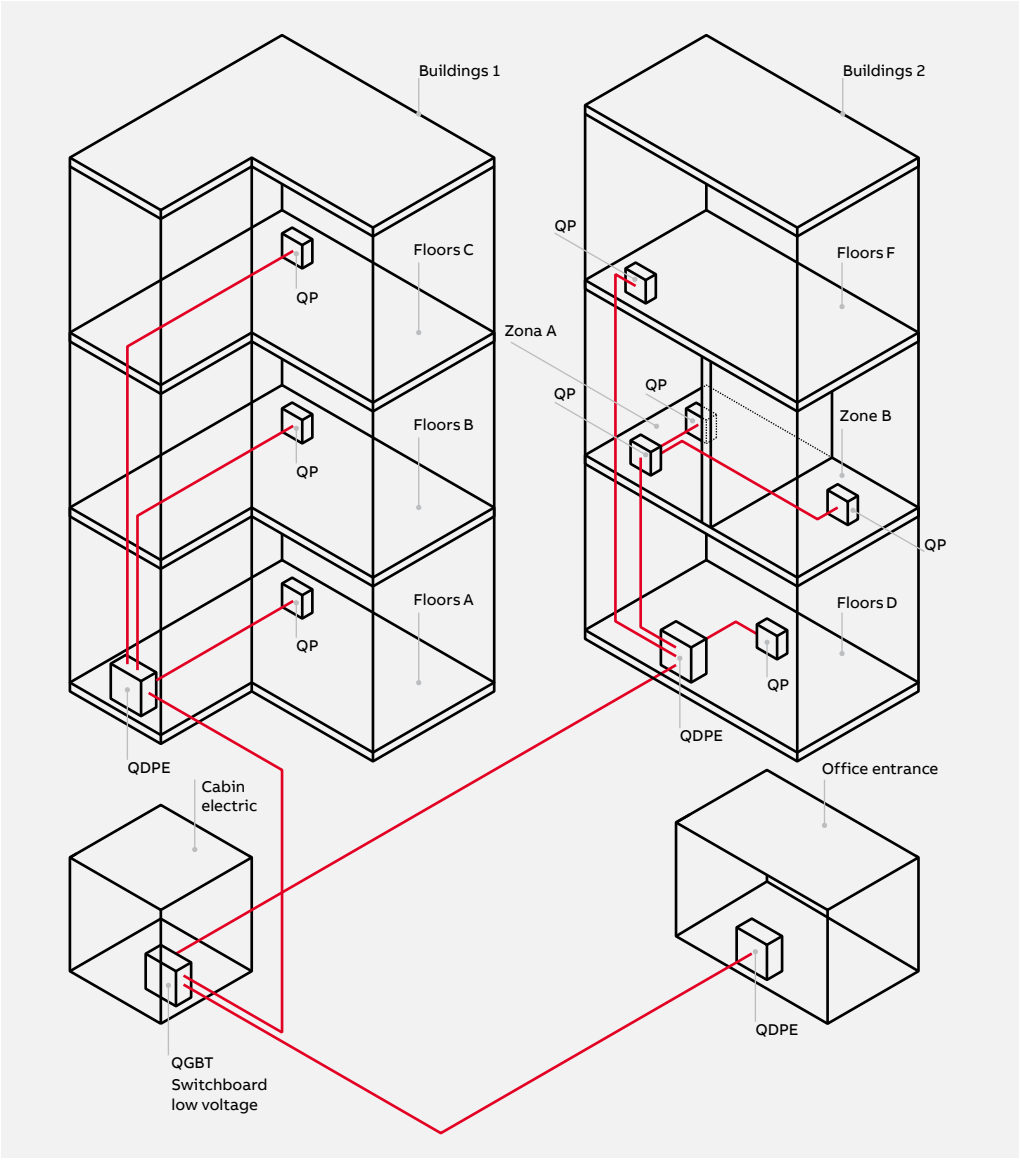
Ring scheme

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

All electrical panels must comply with the safety requirements of EN 61439-1 and, where applicable, EN 61439-3.

In medical environments, the following types of switchboards may be required, depending on their size (reference in the figure):
- general low voltage (QGBT);
- main building distribution (QDPE);
- floor or zone (QP)

The main switchboard and the distribution board of the building should be located in special rooms that are not directly communicating with the public areas and not near combustible structures or deposits of combustible material.

Switchboard protection

For protection against direct contacts		Protection against external influences	
IPXXD (IP4X)	for horizontal surfaces at your fingertips	IPX4	in rooms where liquids are usually spilled
IPXXB (IP2X)	for all other cases	IPX5	in rooms for which jets of water are to be used for cleaning

Power Distribution
Electrical switchboard

LV general switchboard

Switchboard intended for the distribution of ordinary energy (from the grid) in which are installed, for example:
- general protection and isolation devices
- measuring instruments and any devices for remote control;
- protection devices for the lines that supply, for example: auxiliary cabin services; auxiliary generator services; main distribution lines to buildings; distribution lines for services outside buildings; technological plants (air conditioning system, heating and water plant).

Building main distribution switchboard

Switchboard intended for ordinary and safety distribution (through the generator set) in which are installed
- general protection and isolation devices;
- measuring instruments and any devices for remote control;
- protection devices, preferably suitable for isolating the lines that supply the utilities that require power from the generating set (fire-fighting system, lifting systems).

Floor and/or Zone switchboard

When these switchboards are located on the floor being served, it is preferable that they be placed in a special room. It is advisable that they be equipped with glass doors (or transparent plastic material) to facilitate checking the status of the equipment.
In smaller structures, the floor and zone switchboards may coincide.

Power Distribution
Static UPS

Choosing the power of an uninterruptible power supply is an operation that involves elements of various kinds, both functional and normative.

The main elements that must be considered can be summarized as:

- two of the following parameters of the loads to be supplied Active Power (PRL), Apparent Power (SRL) or Power Factor (P.F.);
- type of load power supply (Voltage, Frequency, number of phases);
- coefficient of contemporaneity of the loads;
- required autonomy;
- type of network power supply (Voltage, Frequency, number of phases).

If the load is special and requires a high inrush current, for example, this must be taken into account. Known parameters:

- $\hat{I}_{UPS}$ (maximum current value from the UPS);
- t_{UPS} (the time for which ÎUPS is sustainable);
- $\hat{I}_{load}$ (overload current required by the load);

the sizing apparent power will be:

$$S_{UPS} = S_{RL} \cdot \frac{\hat{I}_{load}}{\hat{I}_{UPS}}$$

Typical values of $\hat{I}_{UPS}$ e t_{UPS} can range from typical current values of 150% of nominal for one minute up to 200% for 100ms in the absence of mains or for non-bypassed UPS systems.
In the event of overloads in the presence of a mains supply, operation will switch to bypass mode with a higher current rating.
In the case of distorting loads, the system is not normally downgraded for non-linear loads normalized according to IEC EN 62040-3 with crest factor less than three (3:1). For higher values, contact the manufacturer.

Power Distribution
Static UPS

Non-linear loads can be among others: electronic and ICT equipement.

The fundamental characteristic of loads consisting of computer equipment, and more generally of all loads equipped with switching power supplies, is the waveform and phase of the current. Since these power supplies absorb current only near the voltage maximum, the typical waveform, far from being sinusoidal, has a rather small base and a vertex at the voltage peak. With the same rms value, this waveform has the peculiarity of having a crest factor much higher than that of a sine wave. The UPS must be able to provide this peak current value, which is normally declared in the technical characteristics of the product as crest factor.

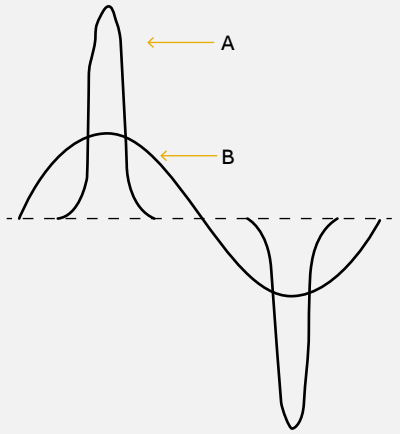
Regarding the current phase, it should be noted that the power factor of the loads in question is capacitive and therefore some special precautions may have to be taken in sizing. The most modern computer loads have an input power factor of up to 0.9 capacitive. It should be noted, however, that there are static uninterruptible power supply systems on the market that are capable of supplying this type of load without derating.

In the specific case of printers, and in particular laser printers, it is necessary to oversize the static unit. In fact, in order to maintain the temperature of some internal components, at relatively long intervals and without any particular relation to the operating status, the current periodically exceeds the nominal value.

Sometimes the power rating of an uninterruptible power supply is confused with terms such as “switching power”, “computer power”, “effective power”.

The origin of these terms is probably inherent in the attempt to find a parameter able to model the power of the group even in conditions of deformation of current and voltage waveforms, however it should be borne in mind that these parameters have no official definition at the regulatory level and therefore can not have any correlation with the apparent power and the rated active power of the static group.

Therefore, they cannot be used for a correct dimensioning of the UPS.



Typical current waveform of computer loads (A) compared with a sinusoidal waveform (B)

Power Distribution
Protection against indirect contacts

Protection against indirect contact is one of the fundamental safety requirements of electrical systems.

Protection against indirect contacts can be achieved in various ways (by automatic protection of the interruption, Class II electrical components or equivalent insulation, etc.), but in office buildings, the automatic interruption of the power supply is definitely the most commonly adopted solution.

The differential circuit breaker plays a key role in the protection against indirect contacts by automatic power interruption with particular reference to the protection in TT and TN systems.

In TT systems, in fact, differential current protection devices must be used for the automatic interruption of the power supply; the use of overcurrent protection devices for protection against indirect contacts in TT systems is in fact not permitted by standard IEC 60364.

In particular, the following condition must be met:

$$R_E \times I_{dn} \leq U_L$$

where:
- R_E is the resistance of the earth electrode in ohms;
- I_{dn} is the rated differential current in amperes.

The use of differential current protection devices for protection against indirect contacts is not compulsory in TN systems, but certainly represents an effective solution in the context under consideration.

The use of residual current devices with a rated tripping differential current not exceeding 30 mA, is recognized by the CEI 64-8 standard as additional protection against direct contacts in the event of failure of other protective measures or negligence on the part of the users.

In particular, additional protection against direct contacts is required:

- in rooms used for residential purposes for circuits supplying plug sockets with a rated current not exceeding 20 A, and
- for circuits supplying plug sockets with a nominal current not exceeding 32 A intended for supplying mobile consumer appliances used outdoors.

Earth leakage circuit breakers can also be used as a means of protection against the ignition of fire, being able to detect the degradation of the insulation of circuits and equipment, prodrome of a short circuit.

Power Distribution
RCD

It is important to choose the type of earth leakage circuit breaker according to the type of application and ground fault current that may occur.

Earth leakage circuit breakers are classified into different categories, as follows, according to their ability to provide protection against different types of earth fault currents:

AC differential circuit breaker

The opening of the circuit breaker is ensured for differential sinusoidal alternating currents applied instantaneously or slowly increasing

Type A differential switch

the opening of the switch is ensured as for the type AC; for unidirectional pulsating currents and for unidirectional pulsating currents, applied instantaneously or slowly increasing

Type B residual current circuit breaker

the opening of the circuit breaker is ensured as for type A and in addition for differential sinusoidal alternating currents up to 1000 Hz, for continuous differential currents without ripples, applied instantaneously or slowly increasing.

Power Distribution
Permanent leakage current at mains frequency

Generally, the permanent leakage currents in a circuit are related to the deterioration of the insulation or to the presence of filters or capacitors between phase and earth.

If the total leakage currents are higher than 0,3 I_{dn}, in order to avoid untimely interventions it is advisable to divide the protected circuit in sub-circuits, each protected by single differential devices. The total leakage current coming from different devices generally does not coincide with the arithmetic sum of the single currents due to phase differences so it is advisable to consider a multiplication factor equal to 0,7/0,8.

For an estimate of the permanent leakage current in the design phase, it may be useful to refer to the IEC 61140 standard which recommends the values shown in the table.

Table 1 – Electrical equipment connected to a single-phase or polyphase system via plug-in receptacles rated 32 A or less.

Rated current (In)	Maximum leakage current
In ≤ 4 A	2 mA
4 A < In ≤ 10 A	0,5 mA/A
In > 10 A	5 mA

Table 2 – Stationary electrical equipment connected to a single-phase or polyphase system permanently or by means of plug-in receptacles having a current rating greater than 32 A.

Rated current (In)	Maximum leakage current
In ≤ 7 A	3,5 mA
7 A < In ≤ 20 A	0,5 mA/A
In > 20 A	10 mA

Table 3 – Typical leakage current levels of common appliances.

Devices	Maximum leakage current
Appliances	da 1 a 2 mA
Computers	da 0,5 a 1 mA
Printers	da 0,5 a 0,75 mA
Small portable devices	da 0,5 a 1 mA
Copiers	da 0,5 a 1,5 mA
Photocopiers	circa 1 mA

Power Distribution
Harmonics and high frequency leakage current

The immunity of residual current devices to high-frequency leakage currents is ensured by compliance with standard IEC 61543 whose requirements are based on standards IEC 61000-4-3; IEC 61000-4-6 and IEC 61000-4-16.

Selectivity

The installation of a residual current circuit breaker upstream of another residual current circuit breaker without special precautions can create selectivity problems: a fault that causes a residual current in a downstream circuit leads to the tripping not only of the residual current circuit breaker that protects the downstream circuit but also of the upstream one, unless the fault lasts longer than a certain period of time.

The general rule for ensuring selectivity is based on two basic conditions:

- the minimum non-intervention time of the upstream residual current device must be greater than the interruption time of the downstream residual current devices;
- the rated tripping differential current of the upstream device must be at least 3 times the rated tripping differential current of the downstream installed earth leakage circuit breakers.

Power Distribution
Overvoltage protection

Surges are the primary cause of electronic device failure and business interruption. The most dangerous surges are caused by lightning strikes, electrical maneuvering on the distribution grid, and parasitic interference.

Surge incidents and damage are of paramount importance in a world where applications that rely on electrical distribution networks and computer systems for their operation have increased dramatically.

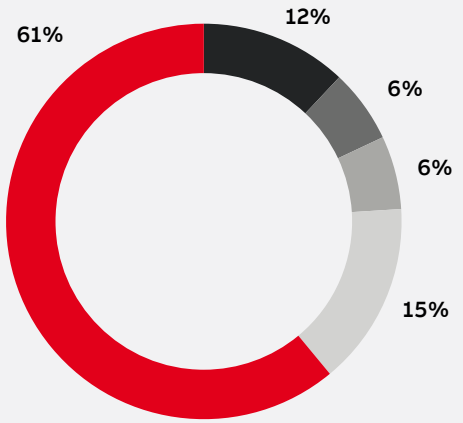
Electronic equipment is increasingly sensitive.

With the process of miniaturization of circuits and components, modern equipment is more prone than ever before to being damaged by surges.
Distribution and telecommunications networks are increasingly interconnected and complex. In densely populated cities, the effects induced by lightning discharges are devastating, as they can propagate for several kilometers.

Surge protection begins at the origin of the electrical system and ends near the most sensitive equipment. The energy of the discharges is reduced in several stages, first with the most robust arresters (Type 1), then with the finest protections (Type 2 or 3). This logic of coordination in protection is represented with the LPZ protection zones, which divide the environment according to the effect of lightning.

For the purpose of protecting equipment and systems against the electromagnetic effects of the lightning current LEMP (Lightning Electromagnetic Impulse), a structure can be divided into protection zones (LPZ: Lightning Protection Zones), understood as homogeneous electromagnetic environments, not necessarily confined (by walls, floor and ceiling), but ideal, in which therefore the protection measures adopted, represented by LPS, shielding and SPDs, are homogeneous. The type of electrical and electronic installations and their vulnerability to LEMP also contribute to the identification of the various zones.

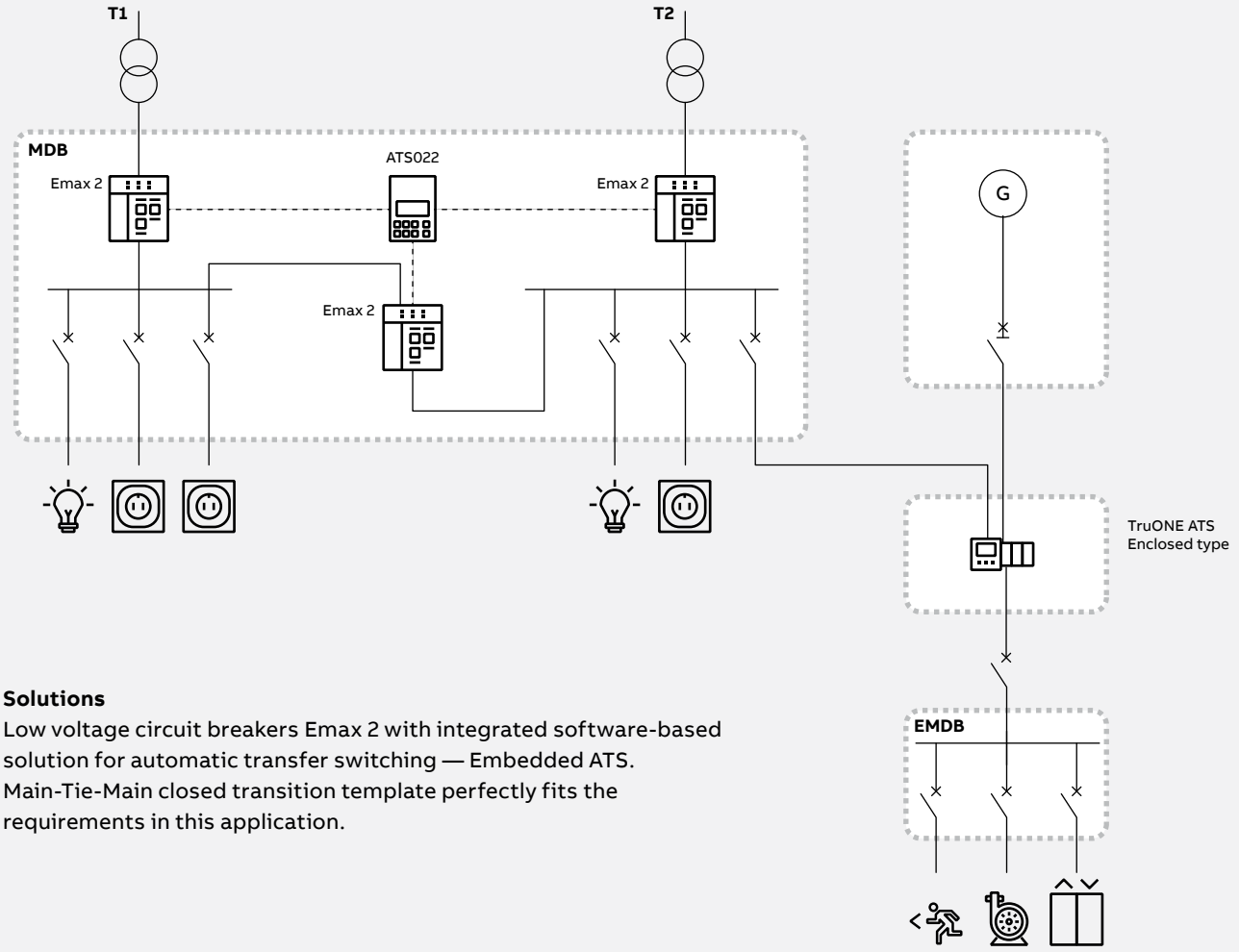
Surge protection is therefore of paramount importance.



Damage to electronic equipment. Analysis conducted in France for the residential segment by AVIVA, the world's sixth largest insurance company

Power Distribution

ATS – Automatic Transfer Switches



Solutions
Low voltage circuit breakers Emax 2 with integrated software-based solution for automatic transfer switching — Embedded ATS.
Main-Tie-Main closed transition template perfectly fits the requirements in this application.

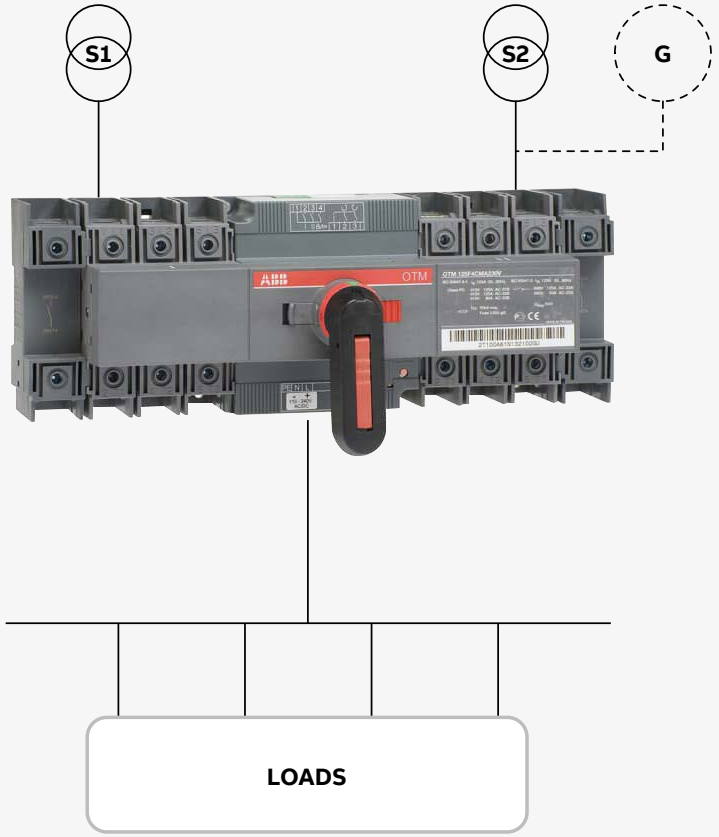
Power Distribution

ATS – Automatic Transfer Switches

Loads:
including lighting, egress lighting,
fire pump, motors, pumps, compressors...

S1: Source 1
S2: Source 2 (Network or genset)

Note: ATS above is with in built Controller



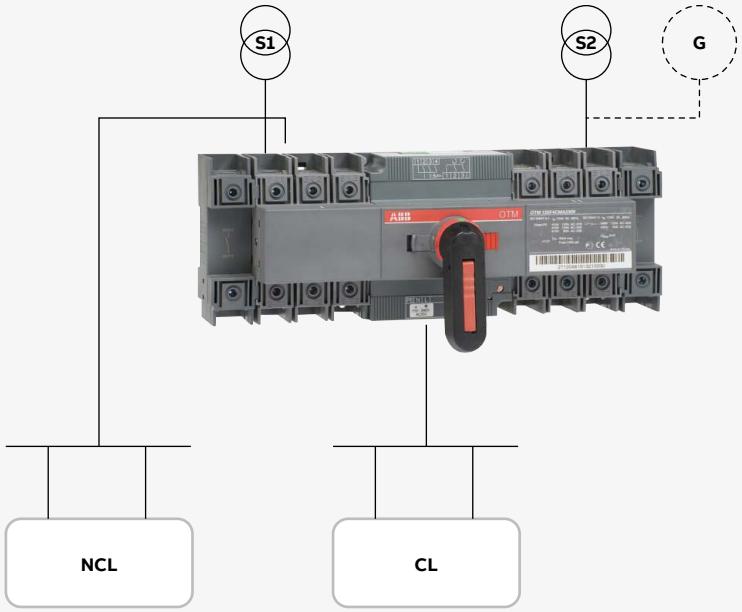
Power Distribution
ATS – Automatic Transfer Switches

Standard back-up application with priority loads.

CL: critical loads (priority loads), including computer or other IT equipment, battery or UPS. Used when secondary source is not able to back-up all lods.

NCL: noncritical loads (nonpriority) including lighting and HVAC.

S1: Source 1
S2: Source 2 (Network or genset)



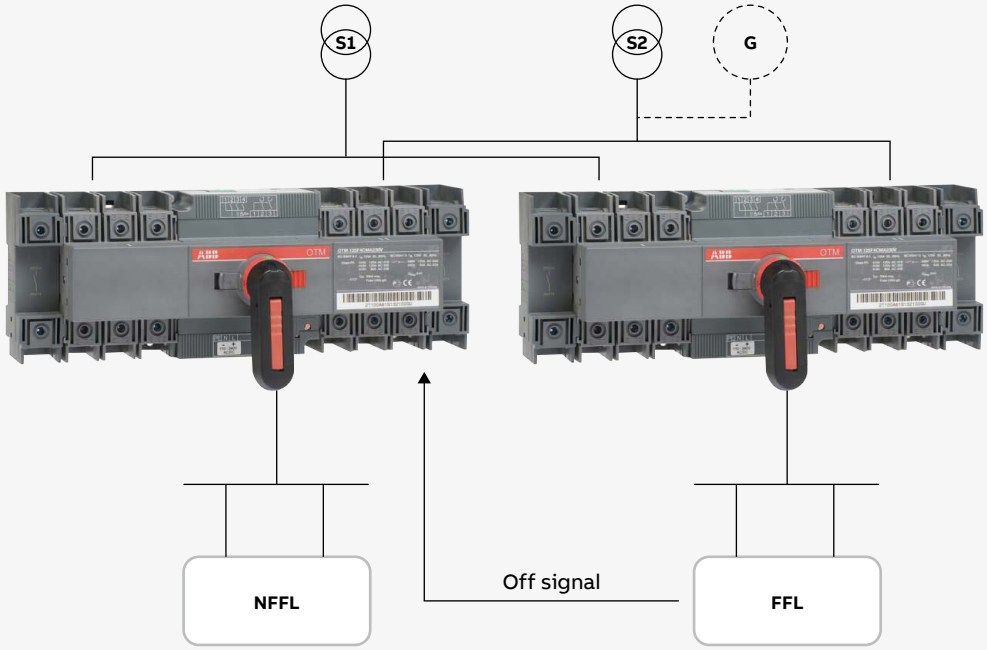
Standard application in fir fighting.

NFFL: non fire fighting loads
FFL: fire fighting loads

Central fire fighting control system (24VDC) is controlling ATS devices.

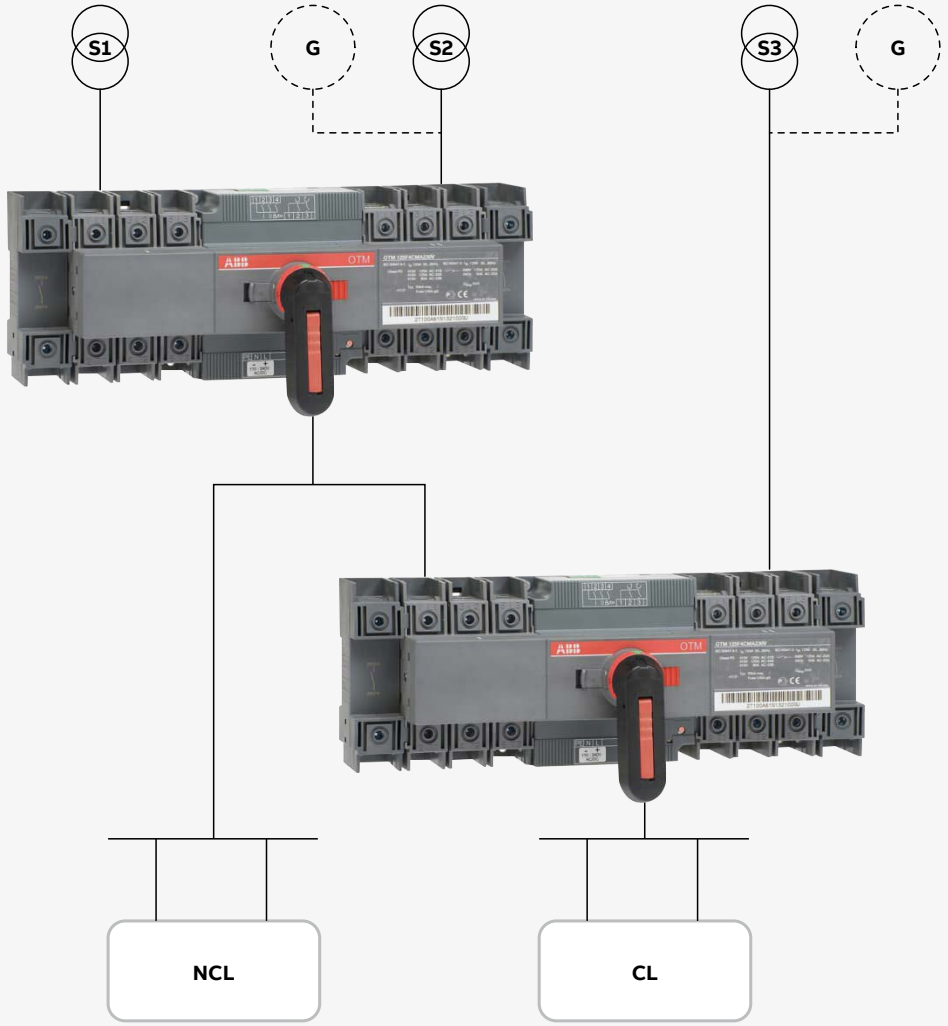
This application is often regulated by a standard.

S1: Source 1
S2: Source 2 (Network or genset)



Power Distribution

ATS – Automatic Transfer Switches



CL: critical loads
NCL: noncritical loads

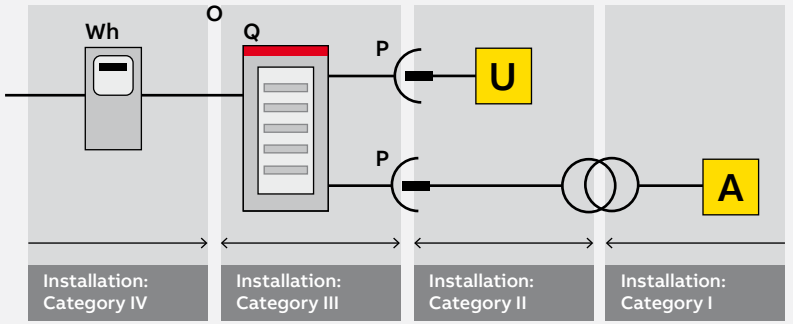
S1: Source 1
S2: Source 2 (Network or genset)
S3: Source 2 (Network or genset)

Power Distribution
Overvoltage protection

The protection level Uprot of the arrester must always be lower than the impulse withstand Uw of the equipment to be protected. The tolerance levels of equipment to impulse overvoltages are classified according to 4 categories (as shown in the table below), in accordance with IEC 60364-4-44, IEC 60664-1 and IEC 60730-1.
For example, in a main switchboard (three-phase 400 V) the protection of category III equipment is ensured if the Uprot value is less than 4 kV. An OVR T1 arrester protects equipment due to the low protection level of OVR T1 (2.5 kV). In distribution boards, the protection of category II equipment requires the installation of a Class 2 arrester with a low protection level (1.5 kV).

Category	U_n			Exemple
	230/400 V	400/690 V	1.000 V	
I	1.500 V	2.500 V	4.000 V	Equipment containing particularly sensitive electronic circuits: - servers, computers, TVs, HiFi, video alarms, etc. - Household appliances with electronic programs, etc.
II	2.500 V	4.000 V	6.000 V	Non-electronic household appliances, power tools
III	4.000 V	6.000 V	8.000 V	Distribution boards, switchgear (circuit breakers, isolators, sockets, etc.), cable trays and their accessories (cables, busbars, junction boxes, etc.)
IV	6.000 V	8.000 V	12.000 V	Equipment for industrial use and equipment such as, for example, fixed motors permanently connected to fixed installations, electric meters, transformers, etc.

For example, for a Type 2 SPD installed near terminal equipment (Category II) in a 230 V single-phase network, the protection level (called Uprot) must be chosen so that the sum of Up and inductive voltage drops on the connections is less than 2.5 kV.



O origin of installation
Wh electrical meter
Q main switchboard
P socket
U user equipment
A electronic equipment

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.

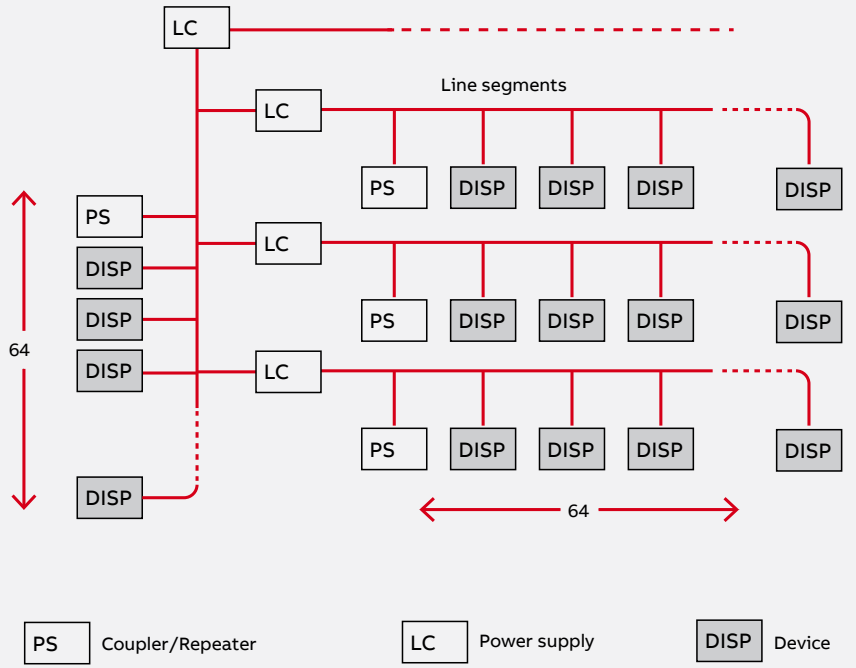
The repeater is a special way of using a system device called a “coupler” which galvanically separates the bus lines, regenerates the signal, prevents an electrical fault in one line from propagating to the other lines and also allows the overall architecture of a KNX system to be extended up to a maximum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

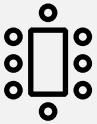
Once the devices have been installed and the bus connected, we must proceed to commissioning, which consists of two distinct phases:

- **the network topology layer**, in which the network addresses (or “physical addresses”) are assigned: basically, in this phase the overall architecture of the system is created.
- **the single node level**, in which the configurations are made on the application of each single node and the group addresses are defined (“binding” between devices). The group addresses are the logical link that is established between two or more devices connected to the KNX network that enable the interaction mechanism between devices. Without this binding all devices receive all messages from the network but cannot distinguish if they are addressed to them.

By guaranteeing the consistency of the protocol and the interoperability between devices, the KNX standard leaves manufacturers free to offer bus devices with different configuration modes in order to meet the different requirements that arise depending on the complexity of the project and the functionality to be implemented.

Specific functions for improving building performances

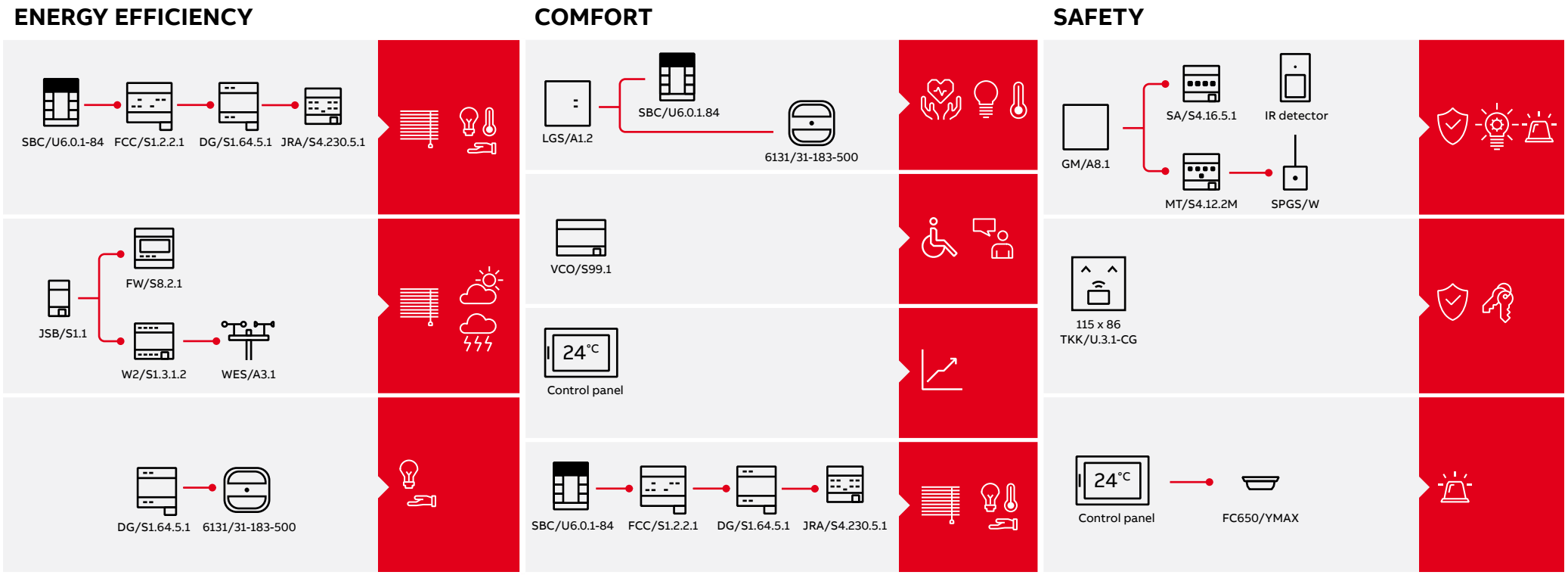
Open spaces
- Constant lighting control according with the set point
- Air quality control
- Temperature control
- Occupancy detection
- Automatic and manual control of blinds
- Manual lighting control



Meeting Room
- Room activation
- Temperature control
- Blackout control
- Presence detection
- Scenarios (e.g. projection)
- Temperature dimming
- Air quality control
- Occupancy room status

Extra
- Scenarios for special spaces (e.g. showrooms)
- Parking status (free spaces)
- Access control
- Third party system integrations
- E-mobility integration
- Measurement and protection status detection

Lighting and Shading Control
Device Configuration



Lighting and Shading Control

BMS Scenarios - Building Management System

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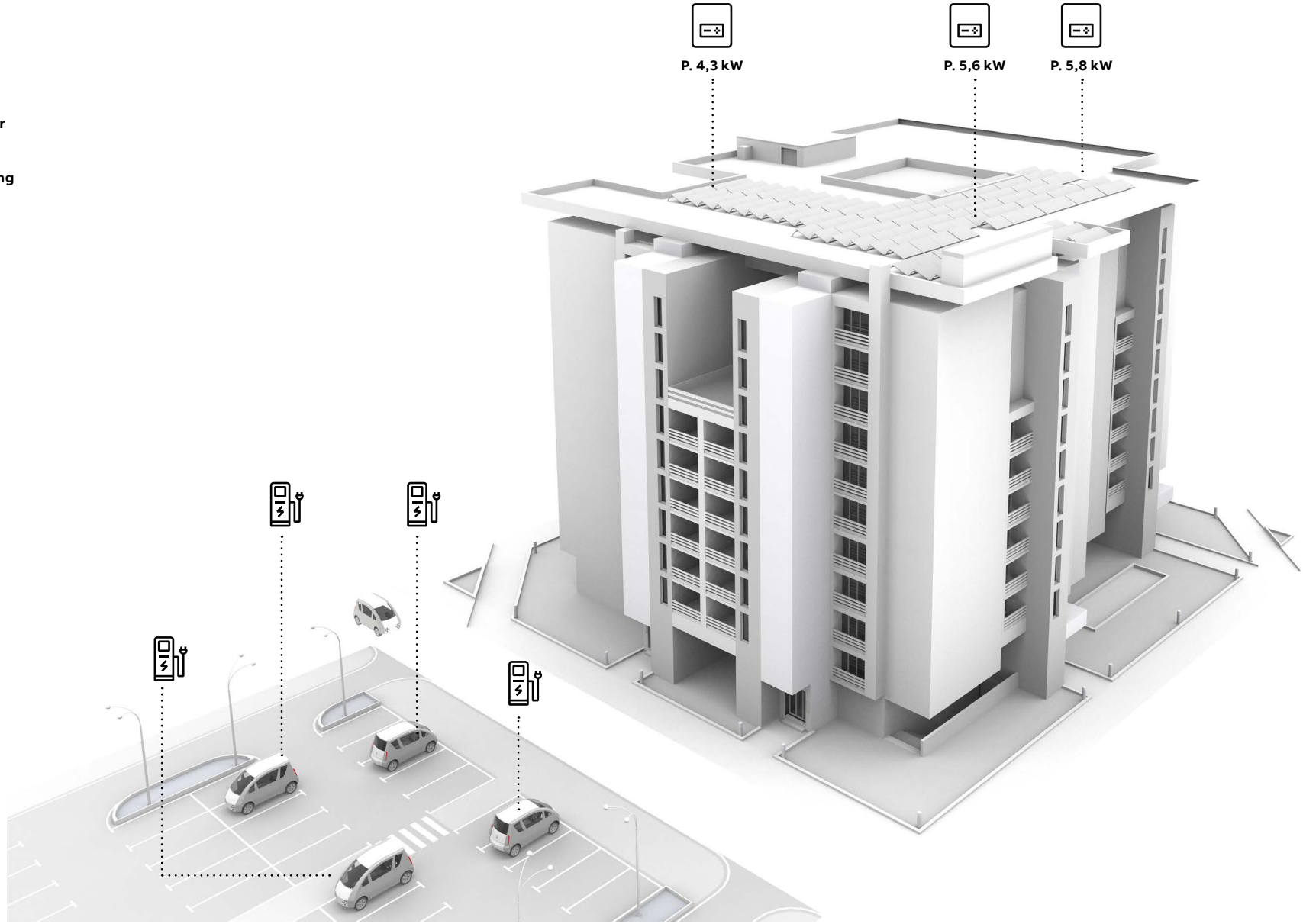
Legend

Inverter

Charging station



Lighting and Shading Control

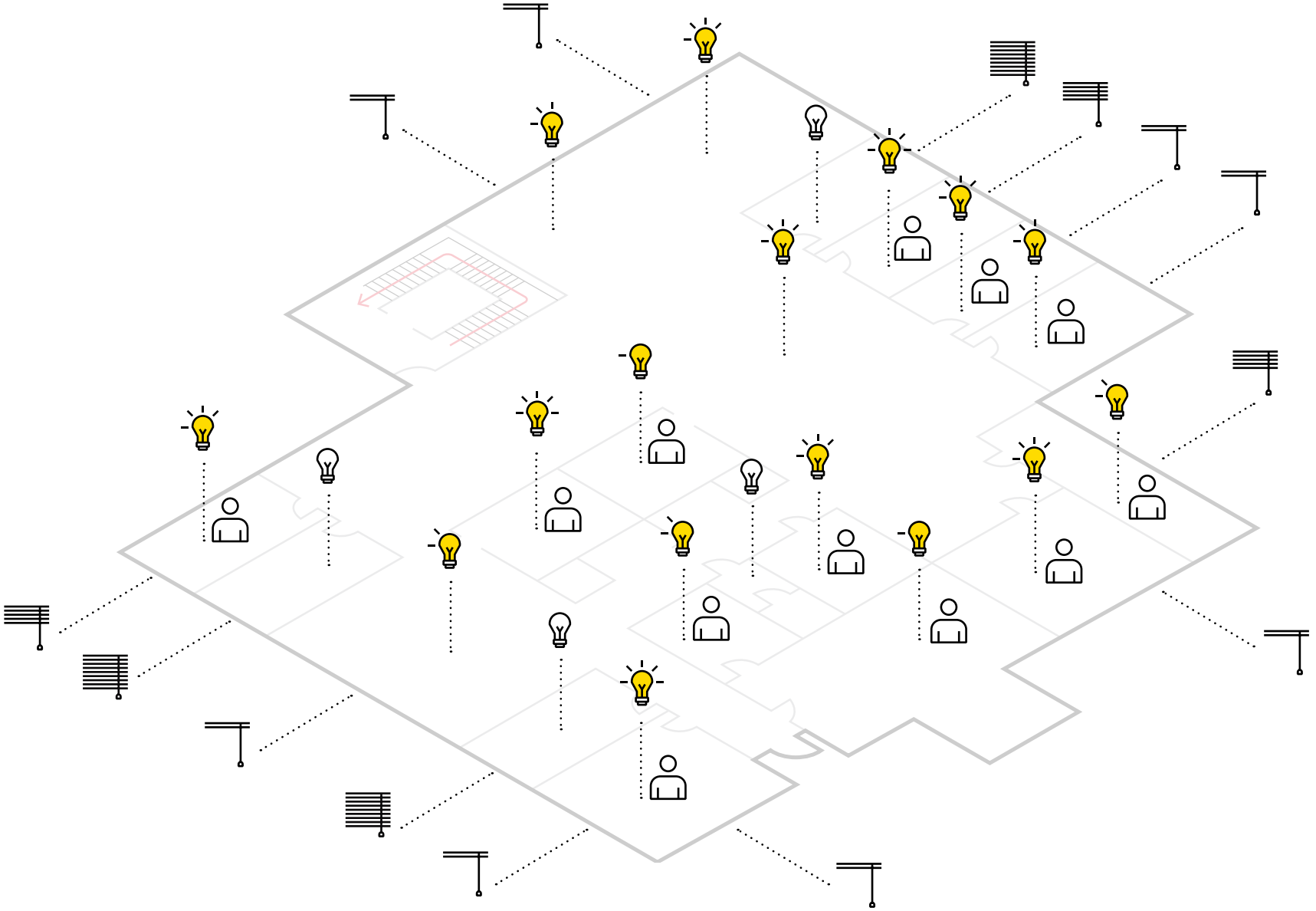
BMS Scenarios - Building Management System

—
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

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Legend

tvcc

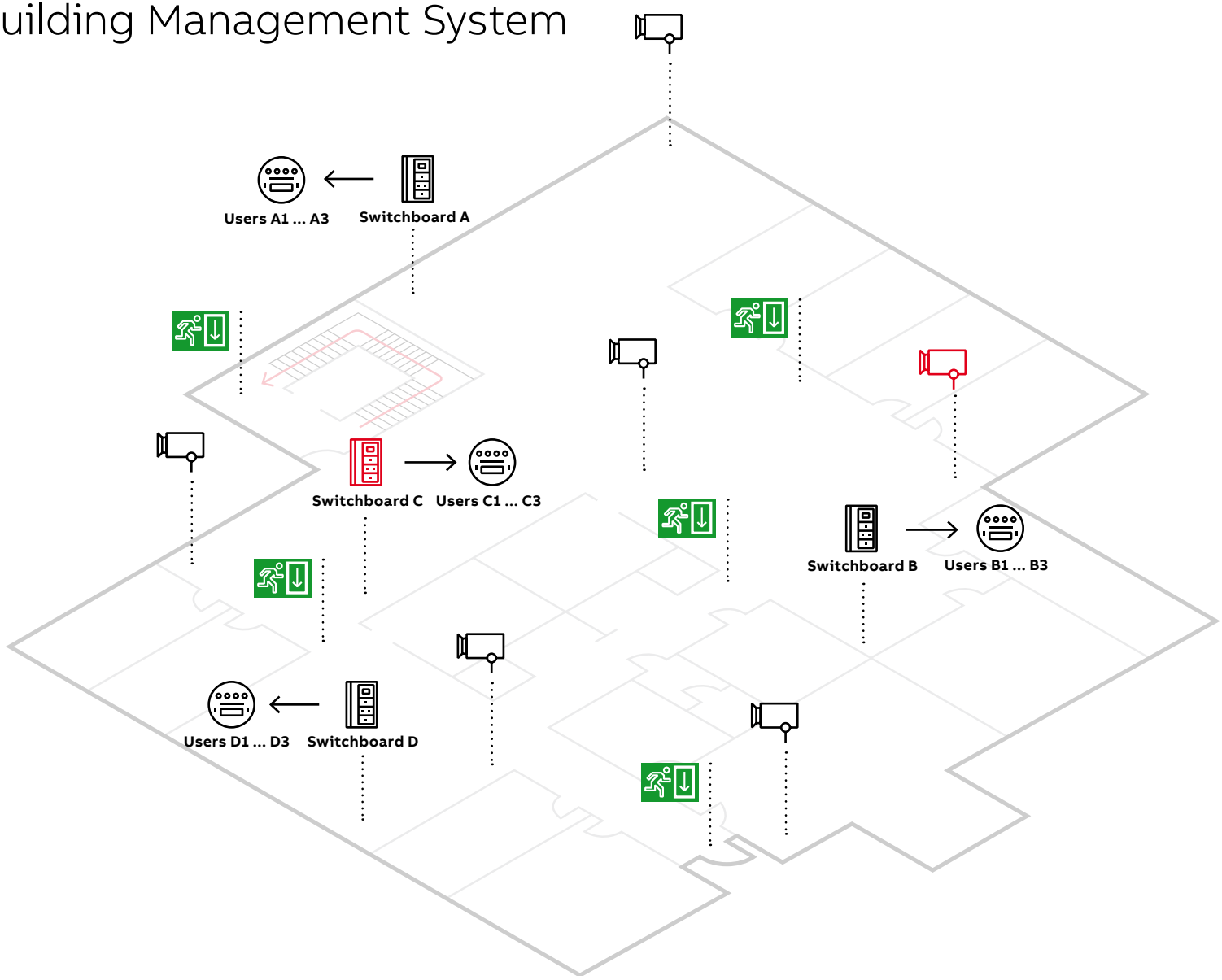
Tvcc
alert

electrical
Switchboard

Switchboard
alert

meter

emergency
light



Lighting and Shading Control

BMS Scenarios - Building Management System

Legend

intensity **2**

intensity **1**

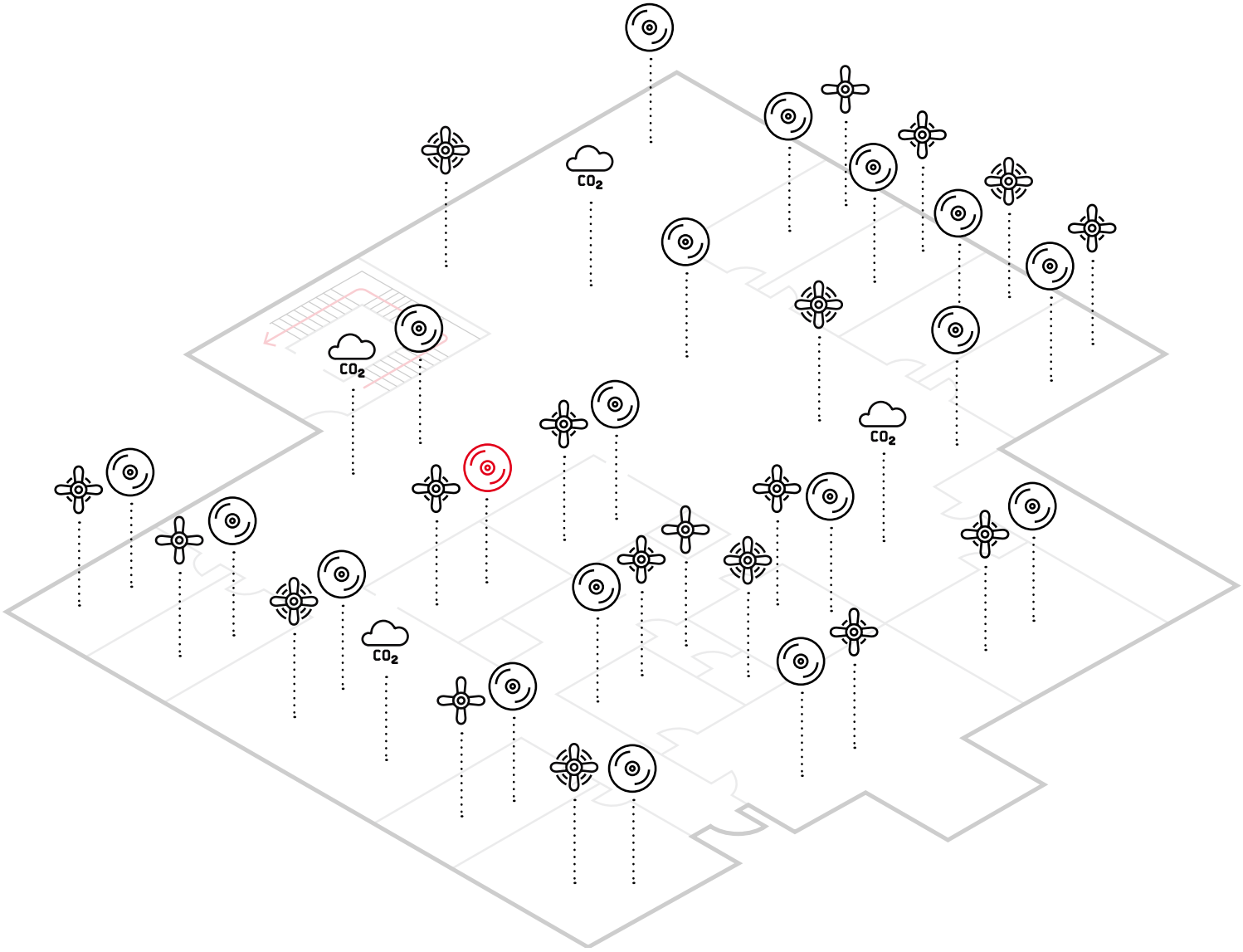
off

CO **1,5mg/m³**

set point T. 20,2°

sensor

sensor **alert**



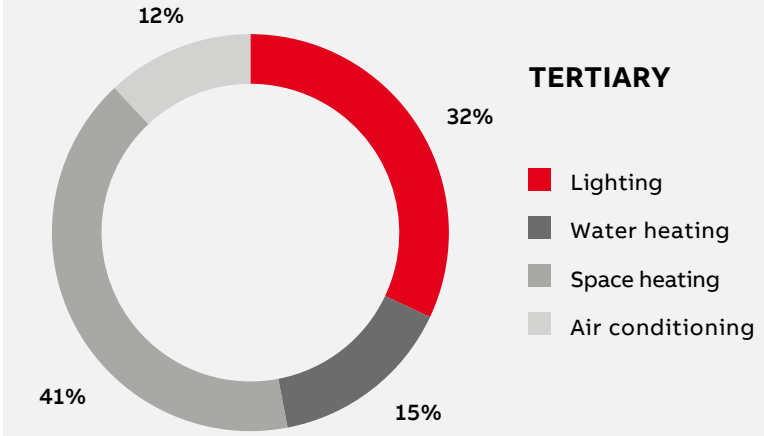
Lighting and Shading Control
Temperature control

Restricting heating or cooling to the periods and conditions in which it is actually necessary makes it possible to achieve significant reductions in energy requirements in both the residential and tertiary sectors.

The main automation functions that can lead to a reduction in consumption by acting on the thermoregulation in contexts sometimes residential sometimes different are:

- Independent microzones with chronothermostats and electrovalves: saving and optimizing comfort and consumption: Advanced configuration with a master chronothermostat and several slave thermostats.
- When the system is for heating only, you can avoid blocking the valves during the long summer shutdown period by setting the protection function that periodically opens and closes the electromechanical devices completely (antisticking).
- Indoor air quality (IAQ): a sensor analyzes the air quality and, once it becomes stale, activates the air exchange system.
- Scheduled air change at times that are not too cold in winter and not too hot in summer to avoid excessive temperature gradients and therefore waste.
- Integration of weather station (rain, wind, brightness) with temperature control to avoid waste and implementation of awnings, blinds, outdoor lighting and irrigation.
- Regulation of climatic comfort conditions for the entire building, zones or individual rooms. Automatic control according to the presence of people or timed, attenuation at the opening of doors or windows to the outside with automatic reset at closure.
- Possibility of local or centralized manual switching between different operating modes (comfort, precomfort, economy, off), timed extension of comfort mode.
- Antifreeze function to protect furniture and systems for rooms with occasional occupation.

Stratification of energy consumption in the Italian tertiary sector



Lighting and Shading Control
Lighting

Limiting artificial lighting to the necessary intensity and to the conditions in which it is actually needed can have an important impact on electricity consumption, especially in the tertiary sector where consumption related to it is more important.

The main automation functions that can lead to a reduction in consumption by acting on lighting in contexts sometimes residential sometimes different are:

- Switching on and off of lighting fixtures with all types of lamps manually (with traditional push-buttons or remote controls) or automatically (by means of timers or presence or twilight sensors).
- Switching on of the marker lamps and/or localization LEDs integrated in the push-buttons and control units connected to the twilight sensor.
- Automatic switching on and off according to movement (in passage areas) or the presence of people.
- Command and control of even very large groups of luminaires
- (zones/floors/whole building).
- Automatic control of external luminaires, luminous signs and shop window lighting with twilight logic.
- Temporary disconnection of non-priority luminaire groups.
- Adjustment of light intensity by means of electronic devices to increase or decrease the illuminance of the rooms by acting on traditional buttons of various kinds (two-position rocker switches, traditional, etc.) or by using twilight or brightness sensors.
- Automatic adjustment to constant brightness with maximum use of natural lighting and integration of the artificial component only if actually necessary.
- Programmed alternation between different groups of luminaires to optimize the life of the sources.
- Possibility of counting the operating hours of the luminaires with optimization of preventive and routine maintenance.
- Replication of the control points (single and group) wherever there is bus wiring.
- Local (push-button) or centralized (on synoptic, Touch-Screen or PC with visualization) status signaling of individual or group luminaires.

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

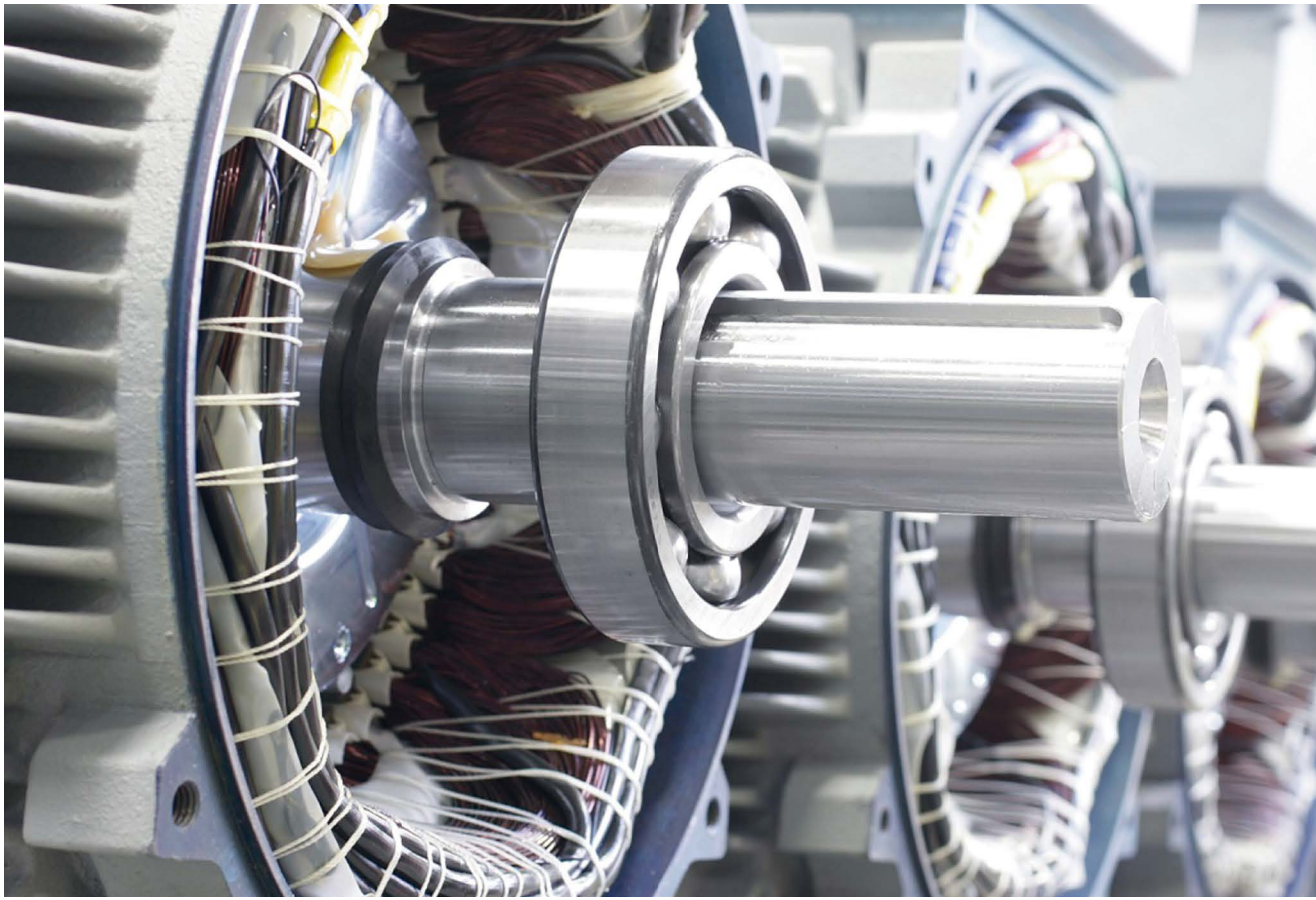
HVAC Control – Drives & Motors
Building Management Solutions integration

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

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09.2021