WHITE PAPER

Electrical power distribution for Electric Vehicle Charging Infrastructure (EVCI)

Build efficient and reliable AC Distribution Boards for electrified parking lots

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Build efficient and reliable AC Distribution Boards for electrified parking spaces

As the world moves towards reducing carbon emissions, the need for a robust electric vehicle charging infrastructure has become increasingly important. From public charging stations to fast-charging corridors along highways, this infrastructure is transforming the way we travel and helping to minimize environmental impacts. Explore how ABB can help you design an efficient and reliable Electric Vehicle Charging Infrastructure (EVCI).

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Electric Vehicle Charging Infrastructure (EVCI)

An Electric Vehicle Charging Infrastructure (EVCI) is a network of charging stations and supporting infrastructure designed to facilitate the charging of Electric Vehicles (EVs).

The electrical infrastructure of EV Charging typically includes the following components:

POWER SOURCE
This can be the electrical grid, a renewable energy source, a battery backup system, a genset to supply the electricity needed for charging, or a combination of all these elements.

TRANSFORMER
Normally used to step down the voltage from the grid supply to a suitable level for the charger.

CHARGING SUPPLY EQUIPMENT
This equipment connects to and charges the EV battery using AC or DC power.

DISTRIBUTION SWITCHBOARD
This component distributes the power to the individual chargers and incorporates switching and protection functions.

Supply Distribution in Electric Vehicle Charging Infrastructure (EVCI)

Power distribution within the Electric Vehicle Charging Infrastructure occurs at the distribution board level.
This board consists of electrical switchgear, which is typically connected to the main power supply, and distributes power to the individual EV supply equipment.

Every time an EV is connected to a charging station, it impacts the electrical grid. Depending on the power draw and the specific location the power is drawn from, EV charging, like other electrical loads, can lead to operational challenges and require improvements.

These effects can be categorized into three main areas:

CAPACITY LIMITS OF EXISTING GRID COMPONENTS
The various components of the electricity grid, such as lines, transformers, and feeders, may experience capacity limitations due to the additional load from EV charging.

POWER QUALITY FOR END USERS
EV charging can influence the power quality experienced by end users, potentially causing voltage fluctuations or harmonics.

SYSTEM-WIDE IMPACTS
EV charging can contribute to peak demand points, putting strain on the entire electrical system.

To ensure the safe and reliable distribution of power within the EV Charging Infrastructure, careful selection of switching and protection devices is crucial. Proper installation and maintenance of these devices are also essential for efficient and secure operation.
When choosing a complete switchboard, a thorough analysis of system requirements and evaluation of available options is necessary to ensure that the selected switchboard meets safety, reliability and performance criteria. Additionally, incorporating digital solutions can strengthen energy efficiency, enable rapid fault detection and clearance, and enhance overall system performance.

Design Criteria for Electric Vehicle Charging Infrastructure (EVCI)

The essential criteria to be taken into consideration when designing the supply distribution for electrical vehicles are outlined below:

EXISTING ELECTRIC INFRASTRUCTURE
Upgrade existing electric infrastructure for facilities with an existing grid connection, MV/LV transformer, and main distribution boards. It should meet the minimum number of available EV charging points as required by local authorities for the existing infrastructure.

NEW ELECTRIC INFRASTRUCTURE
Design new electric infrastructure for facilities, whether individual or collective, considering all connected loads. All new infrastructure from 2023 onward should be prepared for Vehicle-to-Grid (V2G) technology. It is common that requirements for new facilities to be more restrictive in terms of the minimum number of available EV charging points.

CHARGING SPEED AND CAPACITY
Determine the types of charging stations to be deployed, such as Level 2 AC chargers (1) for slower charging and DC fast chargers for rapid charging. Assess the power capacity required to support simultaneous charging without overloading the local grid.

SCALABILITY AND FUTURE-PROOFING
Anticipate the growing demand for Electrical Vehicles and ensure that the infrastructure can be easily expanded to accommodate increasing numbers of vehicles. Future-proof the design by considering emerging charging technologies.

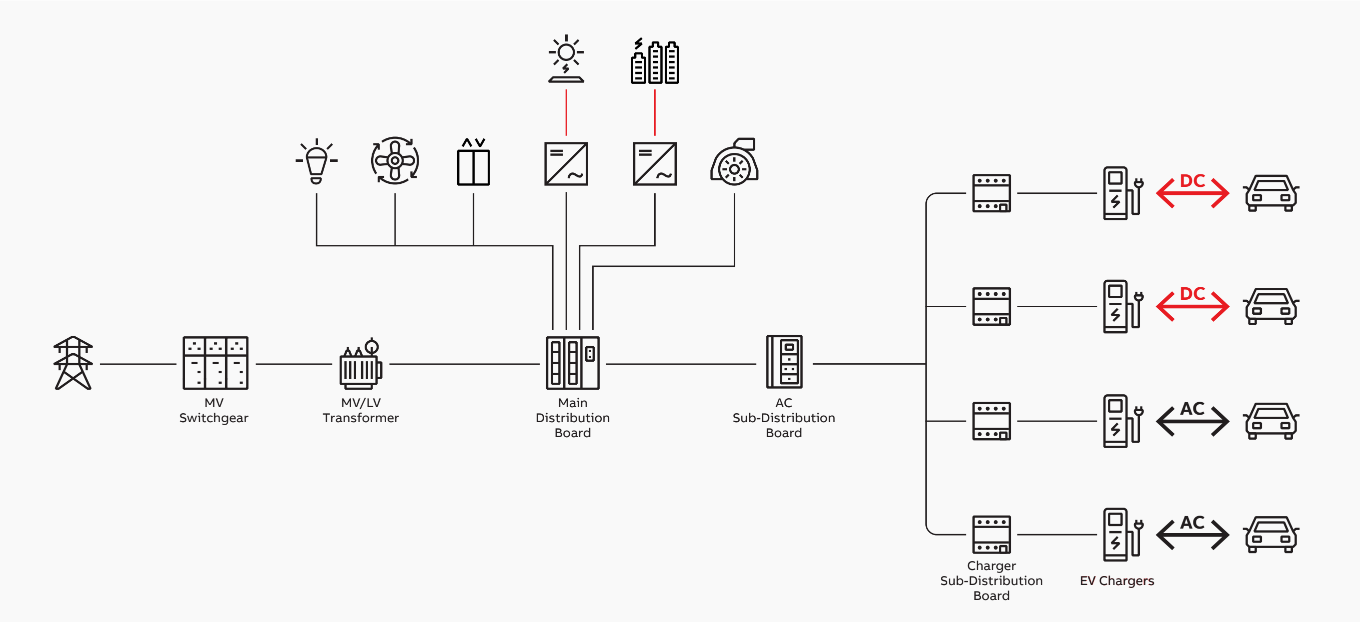
INTEGRATION WITH RENEWABLES
Explore the possibility of incorporating renewable energy sources, like solar to power the charging stations.

APPLICABLE STANDARDS AND REGULATIONS
EV charging stations installed in existing or new buildings must meet minimum requirements, such as those set forth by the European Union. This means ensuring compliance with both the Electrical Infrastructure standards outlined in IEC 60364-7-722, as well as the EV charger standards detailed in IEC 61851*. All member states must adhere to these standards in order to promote interoperability and ensure safe and efficient operation of EV charging infrastructure.

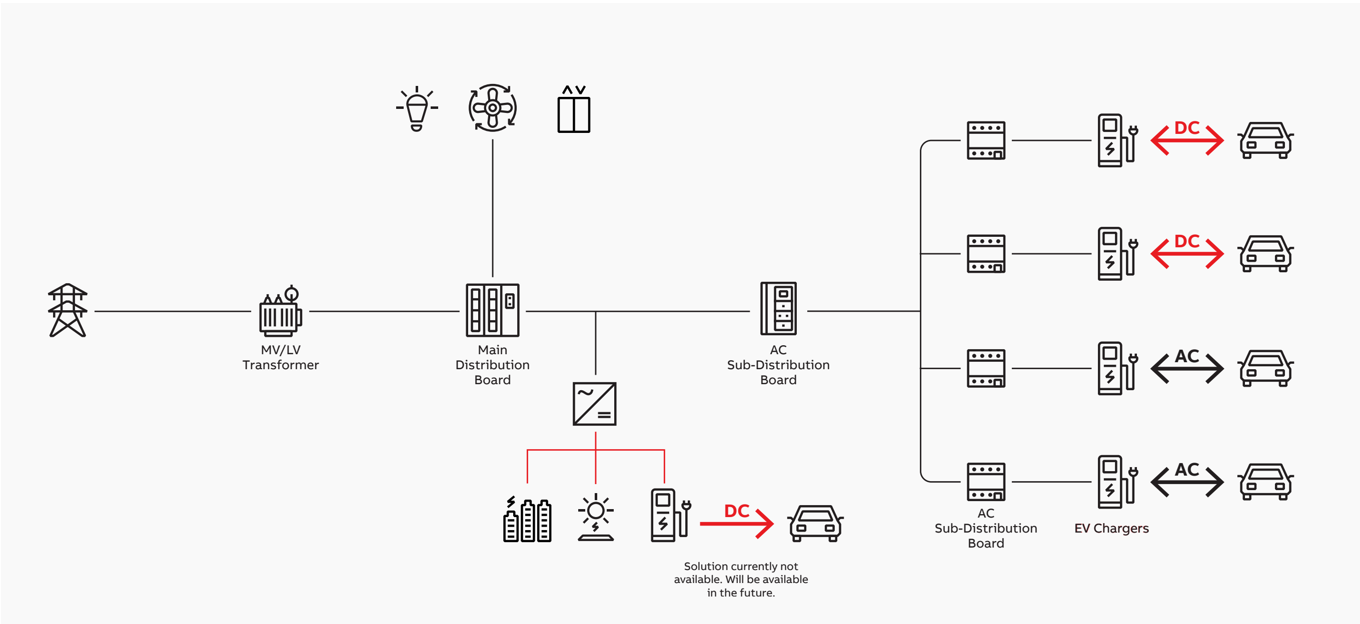
(1) EV chargers vary in size, power and voltage, depending on their charging speed. Level 3 (L3) DC "fast chargers" use direct current for impressively quick charging, but tend to be more expensive. On the other hand, AC Level 2 (L2) chargers (240V single phase or 400V three phase) offer respectable charging times and are cost-effective for both commercial and residential use. The Level 2 (L2) charger is often used in "destination" type settings such as offices, hotels and residences; e.g. where the user will be stationary for several hours, allowing sufficient time for an electric vehicle to charge.

* In most countries, electrical installations must comply with more than one set of regulations, issued by National Authorities or by recognized private bodies. It is essential to take into account these local constraints before starting the design.

Typical architecture for AC distribution in EV Charging Infrastructure



Typical architecture for AC distribution including a DC microgrid in EV Charging Infrastructure



Storage may be used to reduce power demand to the public AC grid
Several AC/DC and DC/AC conversions will be required in this case, with extra power losses.

Main components
- Switching and protective devices
  - Air circuit breaker
  - Moulded case circuit breaker
  - Miniature circuit breaker
  - Switch-disconnector
- Residual current device
- Surge protection device
- Power supply for auxiliary circuit

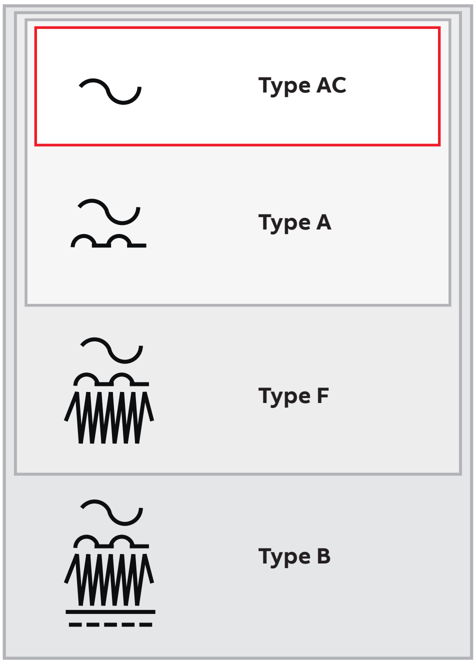
Optional components
- Arc flash mitigation solution
- Energy meter
- Temperature monitoring relay

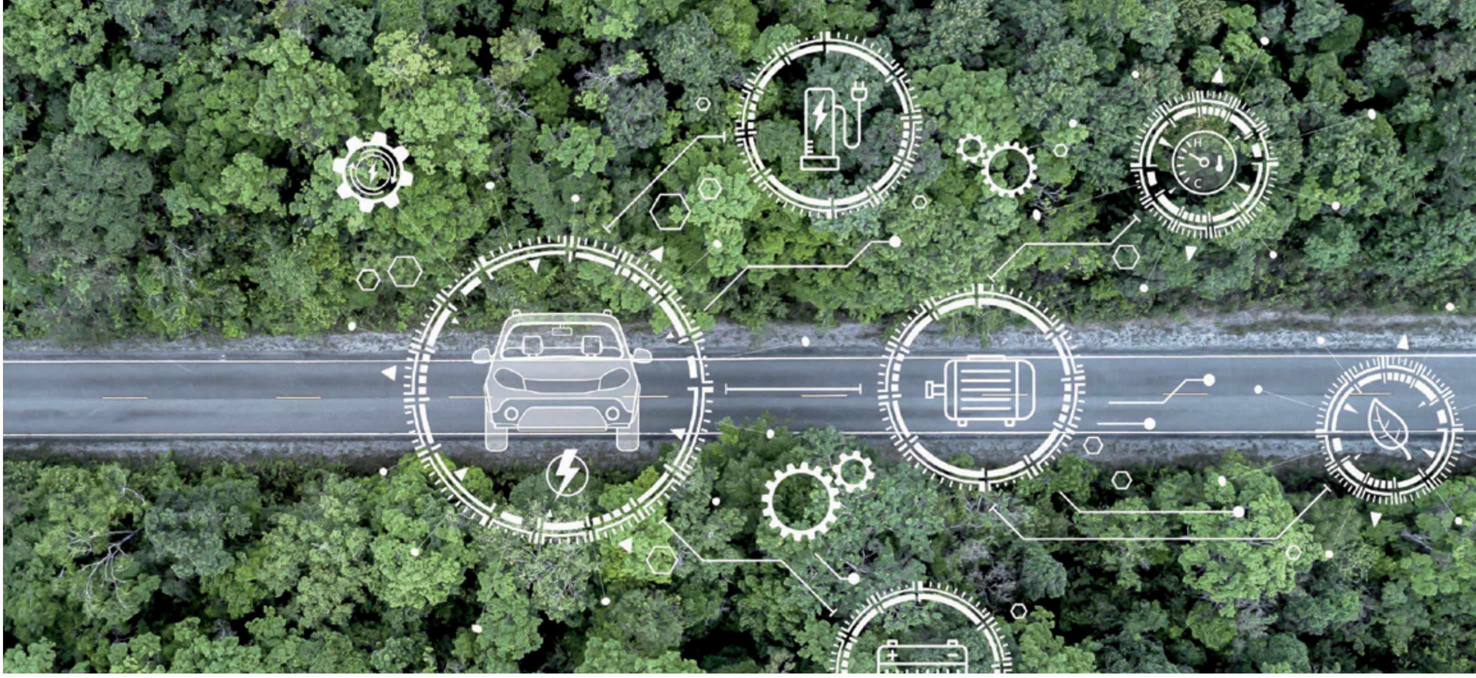
Selection of Residual Current Devices

When designing the EVCI system, it is important to select residual current devices correctly. These protect both the EV charging infrastructure and users.

Residual current devices (RCDs) detect earth leakage (i.e. residual current), for which the waveform depends on both electric power supply and load characteristics. Depending on the detectable waveforms, RCDs are classified into several types:

- **Type AC** RCDs detect residual sinusoidal alternating currents at power frequencies (50 or 60 Hz). Type AC RCDs, suitable for general use, cover linear loads.
- **Type A** RCDs, in addition to the detection characteristics of type AC RCDs, can also detect pulsating DC residual current. Such waveforms can be caused by modern electronic equipment containing diodes, thyristors, etc. Type A RCDs remain functional in the presence of a smooth direct current of up to 6mA superposed to a sinusoidal or pulsed DC earth current.
- **Type F** RCDs, in addition to the detection characteristics of Type A RCDs, are specially designed to detect composite residual currents caused by singlephase variable speed drives. Type F also offers enhanced immunity against unwanted tripping (non-tripping on surge current). Type F RCDs remain functional in the presence of a superposed smooth direct current of up to 10mA.
- **Type B** RCDs, in addition to the detection characteristics of Type F RCDs, can detect residual currents characterized by non-negligible DC, with or without ripples, and with high harmonic content up to 1 kHz. Type B RCDs are intended for the protection of circuits supplying loads not covered by Type F RCDs.





The type of RCD must be chosen according to the expected earth current, considering the loads that are likely to be connected to the installation. Where necessary, EV charger manufacturers should specify the correct type of RCD required. In fact, certain loads may produce DC earth leakage current not only during a fault, but also under normal operating conditions. In any case, in faulty or normal operation, a DC component in the earth current caused by the loads may impair the protective function of RCDs of type AC, A and F, if its value exceeds the immunity level for which the respective RCD is designed. According to standard IEC 61140 (1), any pluggable electrical equipment with a rated input ≤ 4 kVA must be designed to have an earth current with a smooth superimposed DC current component not exceeding 6 mA.

Remember that type AC RCDs are not designed to operate with DC content of any amplitude. In all the above cases, the risk of "blinding" is related to the internal fault-sensing principle of RCDs. An excessive high level of DC component in the residual current may lead to saturation of the magnetic material constituting the current transformer core, strongly decreasing its responsiveness to a time-varying earth leakage stimulus. Correspondingly, the trip threshold increases, and the correct level of protection cannot be guaranteed.

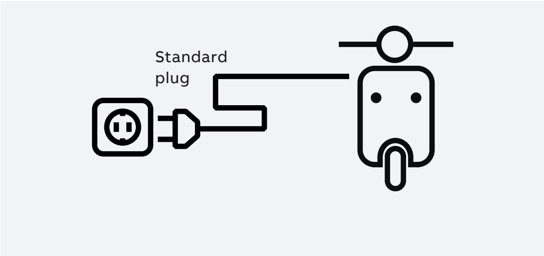
On the contrary, type B RCDs are immune to any risk of blinding: they simply remain operational until tripping, when the earth leakage DC current exceeds the threshold value as per Standards, i.e., 2 × IΔn (e.g., 60 mA DC for a type B RCD with IΔn = 30 mA).

The choice of suitable RCD is related to the charging mode implemented at the charging station of interest. Here is an overview of the charging modes and RCD type requirements.

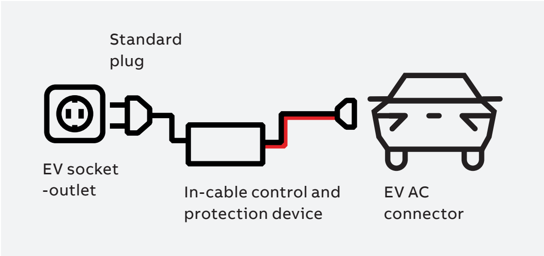
Selection of Residual current devices

1. Standard socket-outlet charging means a connection of an EV to a standard socket-outlet (domestic or industrial) of an AC supply network, with several modes described as follows:

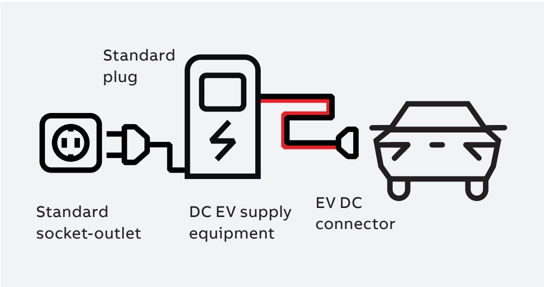
1.1 Mode 1*
means a direct connection utilizing a cable and plug, both not fitted with any supplementary pilot or auxiliary contacts. This is normally used for low power charging.



1.2 Mode 2
utilizes an AC EV supply equipment with a cable and plug, equipped with an AC vehicle connector according to IEC 62196-2, with a control pilot function and system for personal protection against electric shock placed between the standard plug and the EV.



1.3 Mode 4 plug and cable
utilizes a DC EV supply equipment with a cable and plug, equipped with DC vehicle connector according to IEC 62196-3, with a control pilot function that extends from the pluggable DC EV supply equipment to the EV.

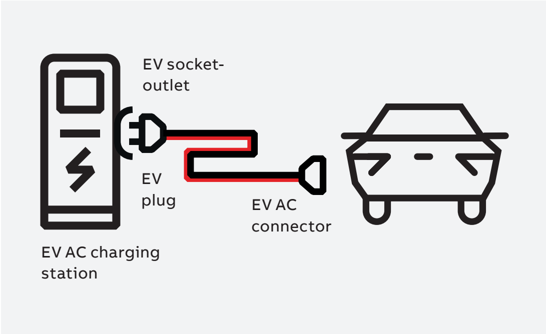


Each AC standard socket-outlet intended for mode 1, mode 2 or mode 4 plug and cable EV charging must be individually protected by an RCD at least of type A with a $I\Delta n \leq 30$ mA. This requirement complies with the standards IEC 61851-1 and IEC 60364-7-722.

Careful attention must be paid to the so-called “InCable Control and Protection Devices” used for mode 2 charging. These cannot be used for fixed charging stations.

* not permitted in certain countries

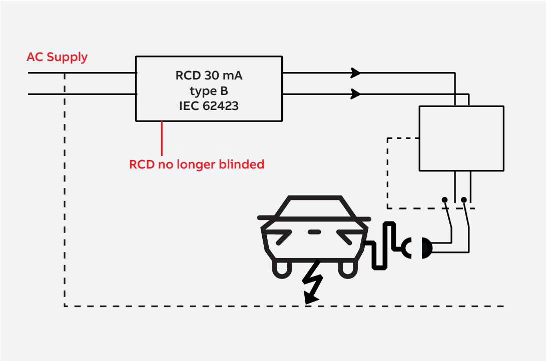
2. Mode 3 AC charging means connection of an EV to an AC EV charging station permanently connected to an AC supply network, with a control pilot function that extends from the AC EV charging station to the EV, equipped with AC EV socket-outlet or AC vehicle connector according to IEC 62196-2.
The connecting cable from the charging station to the EV can be either permanently attached to the charging station or detachable.

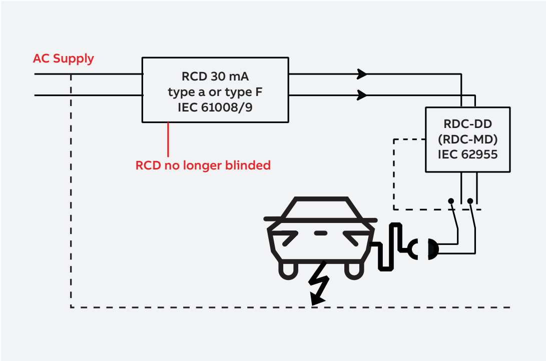


Each AC EV socket-outlet or AC vehicle connector for mode 3 charging must be individually protected by an
- RCD type B with IΔn ≤ 30 mA, or
- RCD type A/F with IΔn ≤ 30 mA in conjunction with Residual DC-Detecting Device (RDC-DD), or

These protection devices may be part of the upstream installation or incorporated in the EV charging station according to information given by the manufacturer, provided that they are compliant with the product standards. The RDC-DD is not an RCD and must always be used in conjunction with an RCD in series.

The two cases are shown here:



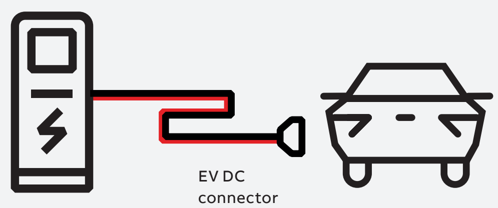


This requirement is aligned with the standards IEC 61851-1, IEC 62955 and IEC 60364-7-722.

The charging station manufacturer may incorporate RCDs. If so, the incorporated RCDs shall fully comply with product standards for RCDs, as required in IEC 6036-7-722. Some charging stations claim to have a “built-in” complete RCD protection (type A or B) rated 30mA AC / 6mA DC. This RCD-like function – even if it has the same trip levels and timing limits as defined for RCDs – does not fully comply with product standards for RCDs (e.g., regarding mechanical requirements, behaviour in case of short-circuit, isolation requirements, marking, ageing, etc). Therefore, it cannot be used instead of an authentic RCD. The information with the product about a “built-in” RCD and not needing an external RCD is deceiving for the customer and for the installer.

Selection of Residual current devices

3. Mode 4 DC charging means the EV is connected to a DC EV charging station, which is permanently connected to a supply network, with a control pilot function that extends from the DC EV charging station to the EV, equipped with DC vehicle connector according to IEC 62196-3.



In this case, if according to installation manual under normal and fault conditions any resulting DC component of the current in the protective conductor can exceed 6 mA, only type B RCDs are allowed to supply DC charging stations for fixed installation.

No RCD at the AC input of a DC charging station can protect the DC output, but it can protect the primary circuit of the charging station.

The installation designer should account for:
- the earthing system of the installation,
- the presence of RCD incorporated in the charging station and what parts are protected
- the need for protection against the risk of fire (RCD with Idn 300 mA)
- any information or requirements from the manufacturer, in particular if the resulting DC component of the current in the protective conductor under normal and fault conditions higher 6 mA (type B) or not (type A/F)
- any applicable local standards.

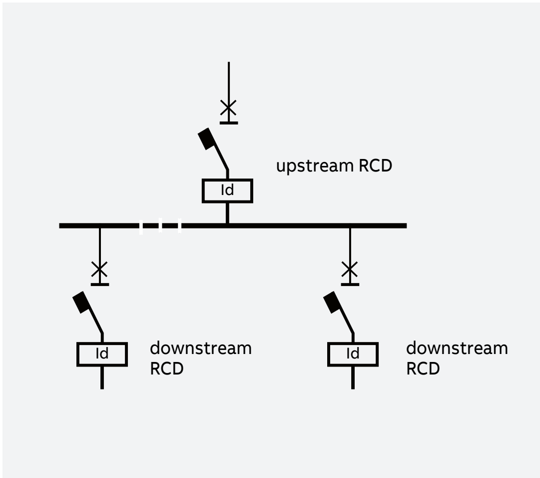
In the case of ABB charging stations, the requirement for the type of external RCD to be chosen is summarized in Table:

ABB Charging Stations	Input AC supply	External RCD	
		Required	Type, Idn
Terra AC WallBox	≤ 40A single-/three-phase	Yes (mandatory by IEC 60364-7-722)	at least type A, 30mA
Terra DC WallBox*	40A three-phase	Yes	at least type A, 30mA
Terra 54/54 HV/24**	≤ 125A three-phase	Mandatory for TT network only	suggested type B selective, 300mA
Terra 94/124/184**	≤ 188A three-phase	Mandatory for TT network only	type B, 100-300mA
Terra 360/180/602	≤ 560A three-phase	Mandatory for TT network and models with CHAdeMO output	type B, 100÷300mA
Terra HP*	350A three-phase per power cabinet 175kW	Mandatory for TT network and models with CHAdeMO output	type B, 100-300mA
HVC-C*	250A three-phase per power cabinet 150kW	Mandatory for TT network only	type B, 100-300mA

* DC leakage limited up to 6 mA according to design of the charger
** Internal 30 mA RCD of type B for AC branch if present

In many installations, two or more RCDs are installed in series: one common upstream RCD protects the distribution circuit and one or more downstream RCDs protect the final circuits; see Figure 1.

First, the correct types for downstream RCD(s) must be selected, based on load characteristics. This implies that the installation must be properly designed, so that protecting RCDs are operated within their intrinsic limits.
Then, the upstream RCD must be selected accounting for the total DC earth fault expected at the upstream point of installation, when the loads are in both faulty and compliant conditions.



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01

Selecting the right combination of RCDs and Circuit Breakers involves understanding the specific requirements of the charging station, the power rating of the charger and the anticipated usage patterns.

Starting out from the minimum requirements of the standards and local regulations, the selection of the RCD and circuit breaker combination can be determined by different factors, such as the type of installation, placement of the distribution boards or the distance from the charging stations to the boards.

To better understand the selection of RCDs connected in series, please consult this document.

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Selection of upstream RCD type allowed when using ABB RCDs

Case	Downstream RCD (s)			Upstream ABB RCD	
	Type	$I_{\Delta n,dw}$	Max quantity	Type	$I_{\Delta n,up}$
1	B	30 mA	1	A or F, general use (*)	100 mA
2			2	A or F, selective (S) (**)	100 mA
3				A or F, general use (*)	300 mA
4			5	A or F, selective (S) (**)	300 mA
5			No limit	B	//
6	A or (F + charger embedding RDC-DD, e.g. ABB Terra AC)	30 mA	10	A or F, general use (*)	100 mA
7			20	A or F, selective (S) (**)	100 mA
8				A or F, general use (*)	300 mA
9			50	A or F, selective (S) (**)	300 mA
10			No limit	B	//

(*) RCDs for general use (instantaneous non-selective) are allowed but not recommended for this use.
(**) Time-delayed industrial type ABB residual-current circuit breakers, including cases with a separate toroid (MRCD), according to Annex B or Annex M of IEC 60947-2, are equivalent to selective, if non actuating time is ≥ 0.06 s.

Selection of Surge Protection Devices (SPDs)

Surge Protection Devices (SPDs) must be installed as close as possible to the origin of the installation. For protection against the effects of lightning and against switching overvoltages, class II tested SPDs must be used. Where the structure is equipped with an external lightning protection system or protection against the effects of direct lightning strikes is otherwise specified, class I tested SPDs must be used.

If the EV Charging Infrastructure is non-portable and connected via cable, then the installation is under the scope of IEC 60364 standards.
60364-4-44 clause 443 specifies when SPDs must be installed. 60364-5-53 clause 534 specifies which surge protection devices must be chosen and how to install them.

The **selection of SPDs** must be based on the following parameters:

- Voltage protection level (Up) and rated impulse voltage (Uw) of the EV charger to be protected.
- Continuous operating voltage (Uc) according to supply system
- Nominal discharge current (In) and Impulse discharge current (Iimp)
- Expected short-circuit current
- SPD coordination with upstream protection

The communication lines of EV chargers must also be protected to avoid any damage to the internal electronics.

Residential EV Chargers:
if the wallbox installed < 10 m from a protected Distribution Board then installation is within the range of protection.
If the wallbox installed > 10 m from protected Distribution Board then additional protection is required.

For Main Distribution Board in residential buildings with or w/o external lightning:

- OVR T1-T2 3N 12,5-275s P TS QS
- ESP 180H (communication lines)

For wallbox located >10m from Low Voltage Distribution Board:

- OVR T2-T3 3N 20-275 P TS QS
- OVR Cat-6 PoE (for Ethernet connection)
- ESP 30SE/PT (for twisted-pair signal lines)

EV charging stations and bus charging stations:
An external lightning protection system is recommended
as well as SPDs protecting the different charging points.

For Power distribution boards in the C&I building:

- ESP 30SE/PT
- OVR T1-T2 1L 25-255 P TS or OVR T1-T2 3N 100-255 P TS

Electrify parking spaces with ABB solutions

From Brownfield to Greenfield installations, and E-Stations in public spaces, ABB's solutions are catered to different settings, addressing the challenges faced in each scenario in order to build efficient and sustainable EV Charging Infrastructures.

In the following pages we take a deeper look at a solution for each of the following scenarios:

1

SCENARIO 1
Brownfield

Starting from an existing commercial or industrial user plant, the goal is to install EV chargers for employees and visitors supplied by the already installed MV/LV transformer, without overloading it. Usually the transformer's rated power is selected in order to allow the transformer to work at its maximum efficiency point, namely 75-80% of the rated power. Hence, the transformer can deliver an additional 20-25% of the rated power without being overloaded.
In order not to overload the transformer, the Power Controller feature will be used to reduce the power drawn by the whole EV charging infrastructure. (only for Terra AC 3 phases Chargers)

2

SCENARIO 2
Greenfield

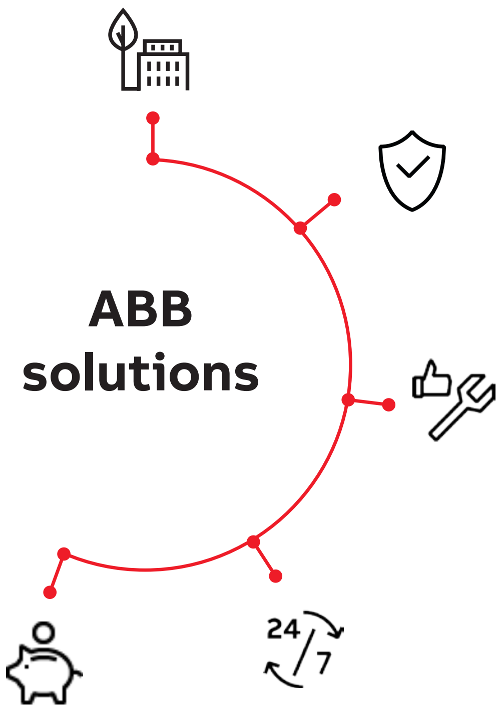
New installation of both user plant and EV Charging Infrastructure. Thanks to the Power Controller, it will be possible to reduce the size of the transformer, the main cables/busbar system, and the switching/protection devices, offering cost savings. (only for Terra AC 3 phases Chargers)

3

SCENARIO 3
E-Station

E-Stations are dedicated stations for charging EVs quickly. In order to prevent AC Utility overload and reduce grid power draw, local energy resources, such as photovoltaics and battery systems, will be installed. This is necessary due to the large amount of power delivered.

Why ABB Solutions are the right choice



Reliability
Designed and built to provide reliable and consistent operation over the expected life of the system

Safety
Designed to meet all relevant safety standards and regulations

Compatibility
Compatible with the charging stations and other electrical equipment used in the EV Charging Infrastructure system

Continuous Operation
Prevent downtime and costly service interruptions by safeguarding the entire electrical circuit with our solutions featuring advanced specifications.

Cost Optimization
60% less commissioning time than conventional cabling, thanks to ABB's Intelligent Distribution

EV Charging Infrastructure in an Existing Building
Brownfield scenario

1

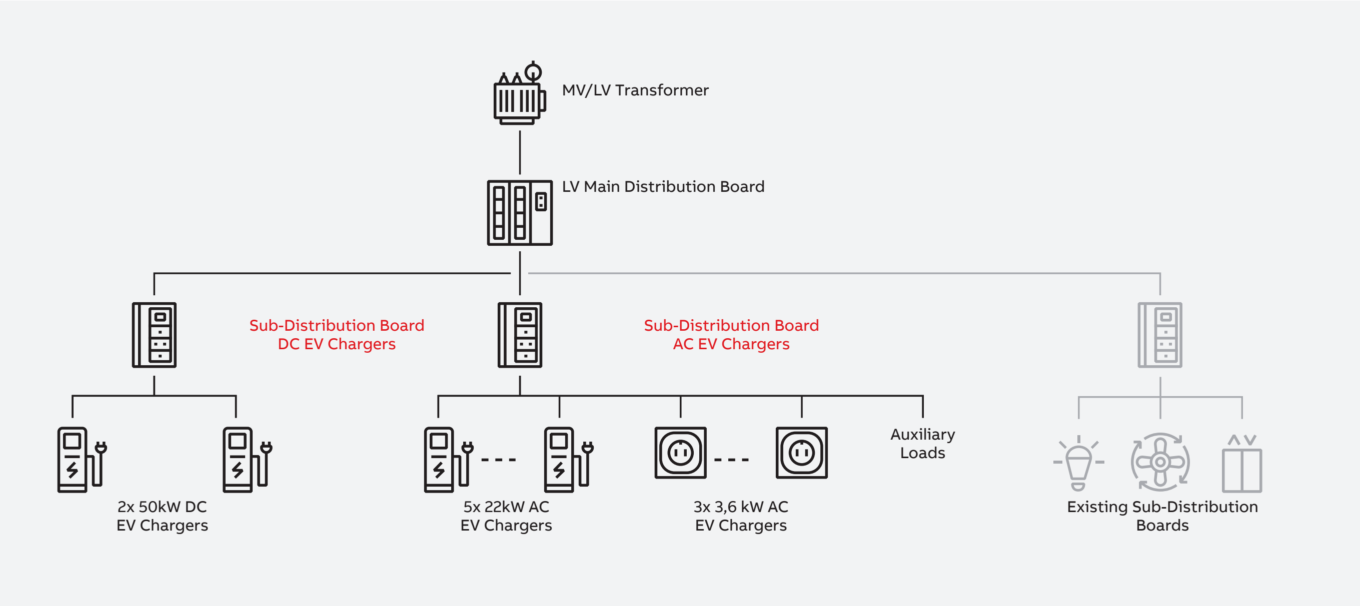
SCENARIO
Brownfield

Scenario:
- Office building with 50-space indoor car park for employees, and ten outdoor spaces for visitors and company pull-in cars
- Estimated need for five EV charging stations and three wired connections for indoor parking, and 2 charging stations for visitor parking
- Local TN-S Distribution system

Electric Chargers selection:
Indoor: Recommended slow charging stations, with parking time aprox 8h
5 x 22 kW – 3 Phase AC EV charging stations
3 x 3.6 kW – pre-wired installed with socket-outlet

Visitors:
Recommended fast charging stations, with parking time less than 1h also for commercial pull-in cars.
2 x 50 kw DC fast Charging stations

EV Charging Infrastructure configuration (IEC) – Principle electrical diagram



EV Charging Infrastructure in a New Building

Greenfield scenario

2

SCENARIO

Greenfield

Scenario:

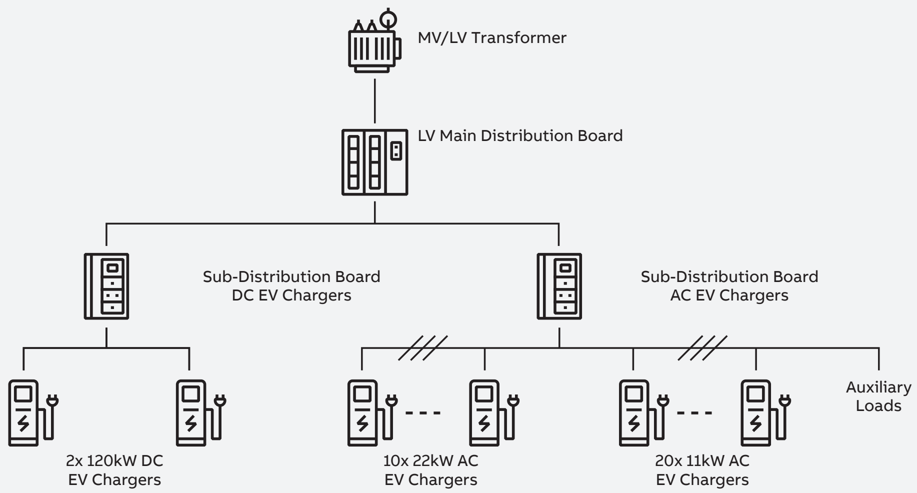
- New building with 50 indoor parking spaces for employees and ten outdoor spaces for visitors and company pull-in cars
- According to local regulations (i.e. …), 10 EV chargers and 20 wired connections must be installed for indoor parking, and two chargers for visitor parking
- Local TN-S Distribution system

EV Charger selection:

Indoor
Minimum requirements: 10x EV chargers
20 pre-wired installed
ABB Recommended slow chargers, with parking time approx 8h
10 x 22 kW – 3-Phase AC EV chargers
20 x 11 kW – 3-Phase AC EV chargers

Visitors
Minimum Requirements: 2 x EV chargers
ABB Recommends fast chargers, with parking time lower than 1h for commercial pull-in cars as well.
2 x 120 kW DC fast chargers

EV Charging Infrastructure configuration (IEC) – Principle electrical diagram



Infrastructure for EV Charging in a New E-Station

E-Station scenario

3

SCENARIO

E-Station

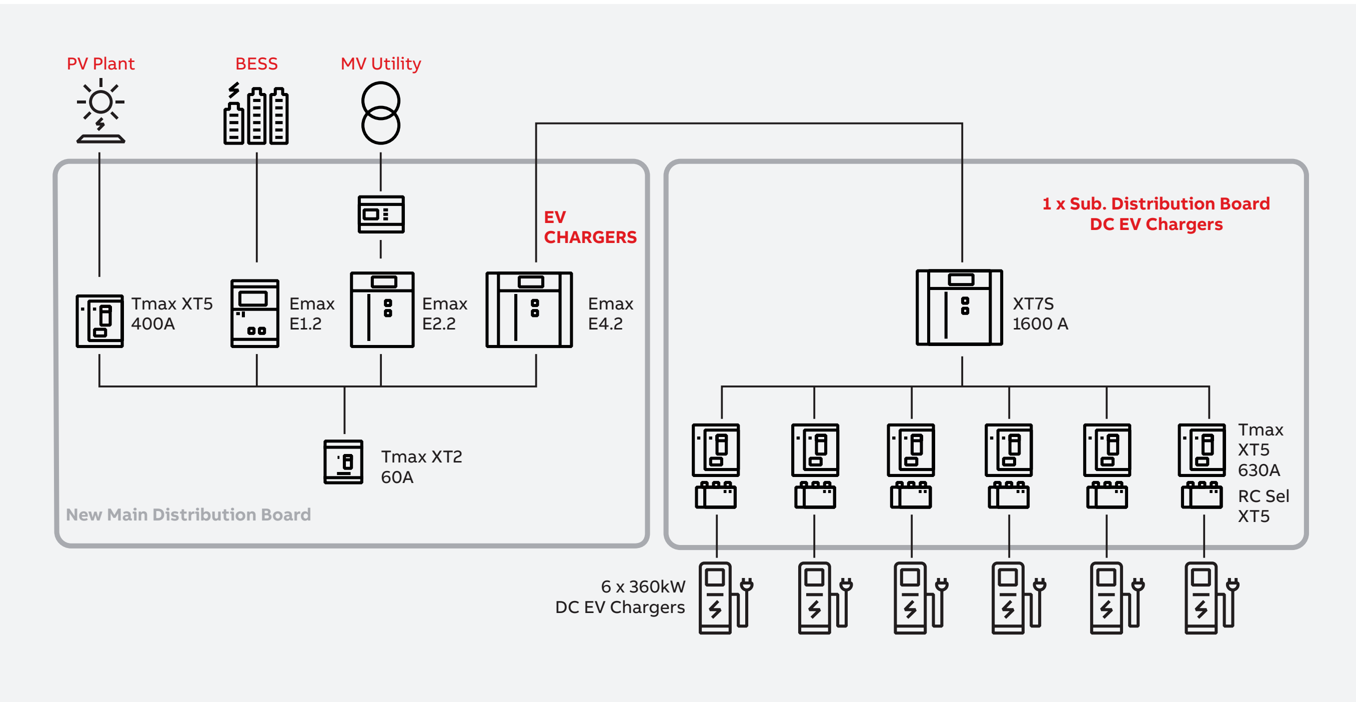
Scenario:

- E-Station connected to the MV Utility, with DC Super-fast Chargers.
- Local renewables, namely PV plant and Energy storage system to reduce the energy drawn from the Grid and to mitigate the peak power demand drawn from the Grid
- Local TN-S Distribution system

System main components:

Electric Chargers selection: 6 x 360 kW DC Super-fast Charging stations
MV/LV Transformer: 1.5 MVA dry-type transformer
Energy Storage system: 1 MWh Li-ion Batteries
PV plant: 250 kW made up of 250 W panels installed as carport shelters above the parking spaces
Facility: 30 kW

Principle electrical diagram



* For DC charging stations, RCDs, i.e. Type A or B, are not strictly required (at least in TN systems where fault protection is provided by PE + overcurrent protection).
Nevertheless, an RCD with a rated residual current ≤ 300mA is always advisable (also in TN systems), incorporated in the charging station or upstream, to cover the case of non-bolted fault and/or fire protection.

Simultaneity in Electric Vehicle Charging Infrastructure (EVCI)

Simultaneity of EV chargers refers to the concept of the simultaneous charging demand at a specific location or charging station.

The simultaneity factor measures the likelihood of multiple Electric Vehicles being connected and charging at the same time.
This concept is essential for planning and designing charging infrastructure, as it helps estimate required capacity and ensure that the infrastructure can handle the potential load during peak times. A higher simultaneity means a greater likelihood of multiple EVs charging simultaneously, necessitating higher capacity and proper management of charging resources.

Factors to be considered during the design:

DEMAND FACTOR
The demand factor represents the ratio of the maximum demand of a system or circuit to the total connected load on the system. More simply, it indicates how much of the total connected load is expected to be used simultaneously at any given time. Demand factors are crucial for designing electrical systems, as they help determine the size of equipment, such as transformers, cables, and switchgear to meet peak demand without unnecessary oversizing, which can lead to increased costs and inefficiency.

SIMULTANEITY FACTOR
The simultaneity factor is a ratio used to analyze the relationship between loads in a system. Specifically, it refers to the ratio of the sum of the individual maximum demands of various components or circuits to the maximum demand of the entire system, considering that these maximum demands do not necessarily occur at the same time. Understanding the simultaneity factor is important for designing electrical systems and infrastructure in a way that optimizes utilization of resources, while ensuring that the system can handle peak demands efficiently without unnecessary overloading.

DIVERSITY FACTOR
The diversity factor represents the ratio of the sum of individual maximum demands to the maximum demand of the entire system. In other words, it indicates how much the peak demand of individual components or circuits differs from the peak demand of the entire system. Understanding diversity factors is crucial for designing electrical systems and sizing equipment appropriately to handle peak loads without overloading the system unnecessarily. It enables more efficient use of resources and helps prevent the need for excessive capacity. The diversity factor is the reciprocal of the simultaneity factor.

According to the requirements of IEC 60364-7-722: the demand factor of the final circuit supplying the connecting point is equal to 1, since it shall be considered that in normal use each single connecting point is used at its rated current unless the connecting point is configured at a maximum current lower than the rated current of the related charging station. Configuration of the maximum charging current must only be carried out using a key or a tool and must only be accessible to skilled or instructed persons. Hence, according to the Case Studies in this document, the demand factor will be considered equal to 1 for each charging station and socket-outlet.
According to the requirements of IEC 60204-1: he diversity factor of the distribution circuit shall be taken as equal to 1 unless load control is incorporated in the EV supply equipment or installed upstream, or a combination of both. In the Case Studies in this document, both such scenarios will be evaluated.

SCU200 and C-kit: two solutions for EV chargers monitoring and controlling

ABB offers two solutions, the SCU200 and the C-kit, to achieve simultaneity in EV Charging Infrastructure.

The SCU200 and the C-kit are both solutions from ABB designed for energy management and control, with specific use cases for electric vehicle charg-ing infrastructure. The SCU200 is a smart controller that provides a comprehensive solution for optimizing energy usage in distribution systems. It offers robust monitoring, control, and automation capabilities, supporting branch monitoring for individual loads and can read meters over Modbus RTU and Modbus TCP.
It helps monitoring and controlling AC Modbus-based small charging stations and can integrate other energy consumption and production points using the Modbus protocol and its proprietary branch monitoring features.

On the other hand, the C-kit is an ABB solution based on the AC500 hardware platform that enables monitoring and control of electric charging point loads. It acts as a local supervisor of electric vehicle meters and charging points, managing and monitoring their operation in real time and allowing some of their settings to be changed. It uses the OCPP protocol for communication between charging points and the central system and the Modbus protocol for communication between meters and the central system. It can integrate up to 30 AC chargers communicating via OCPP and up to 13 Mod-bus TCP/RTU metering devices.

The choice between the two solutions depends on the specific requirements of the user, which are summarized in the following table and analyzed into more details in the next sections of this document.

Comparison between SCU200 and C-kit

Features	SCU200	C-Kit
Number of charging points	10	30
Type of charging point	AC	AC
3rd party chargers	yes*	n.a.
Number of metering points	16 TCP + 16 RTU **	13
Communication protocol to the chargers	Modbus (RTU / TCP)	OCPP
Communication protocol to the metering devices	Modbus (RTU / TCP), wireless Mbus	Modbus (RTU / TCP)
Communication protocol to upstream system	Modbus TCP, REST API	Modbus (RTU / TCP)
Reference standard	IEC61010-1, IEC61362-1	IEC 61131-2, 61010-12, 61000-6, 63000 and ANSI/ISA-12.12.01 & CAN/CSA C22.2 No. 213-16
Dynamic load management	n.a.	Yes

* Open platform. Can be integrated by the user.
** the meters slots are shared with the chargers. E.g. if there are 10 TCP chargers connected, then there is space for 6 TCP meters

Electric Vehicle Charging Infrastructure (EVCI) with SCU200

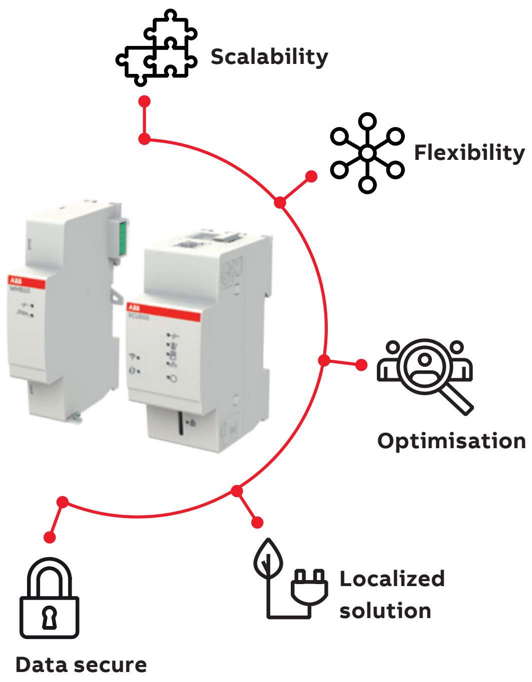
The SCU200 is a state-of-the-art smart controller from ABB's InSite range, designed to enhance smart energy and load management.

It provides a comprehensive solution for optimizing energy usage in both sub and final distribution systems. The SCU200 can read up to 16 meters over Modbus RTU and 16 more over Modbus TCP, and it communicates with ABB current sensors via a proprietary flat cable system. The control unit supports branch monitoring for individual loads and can be expanded with metering modules. In specified countries like Sweden, Netherlands and France, utility meter data can be integrated through a USB module, and data is accessible via the "SCU200" local webserver, ABB Ability™ Energy & Asset Manager[1], or any third-party application.

[1] available from Q1 2025

The SCU200's modular design allows seamless integration and easy installation in any distribution unit. It offers robust monitoring, control, and automation capabilities. By capturing the potential of its Modbus communication capabilities, the system can efficiently manage various aspects of energy distribution and consumption. The local web server interface enables visualization and control of all collected data, while data export features facilitate further analysis and integration with other systems.

In electric vehicle charging infrastructure (EVCI) setups, the SCU200 excels in monitoring and controlling AC Modbus-based small charging stations. It can manage up to ten chargers, making it ideal for small-scale EVCI deployments. Additionally, the system can integrate other energy consumption and production points using the Modbus protocol and its proprietary branch monitoring features. This capability enhances energy efficiency and operational control, providing detailed insights into energy consumption patterns. The SCU200 also supports integration with higher-level energy management systems, thanks to its Modbus TCP and REST API capabilities.



Scalability
Expandable ecosystem with new modules for different communication protocols

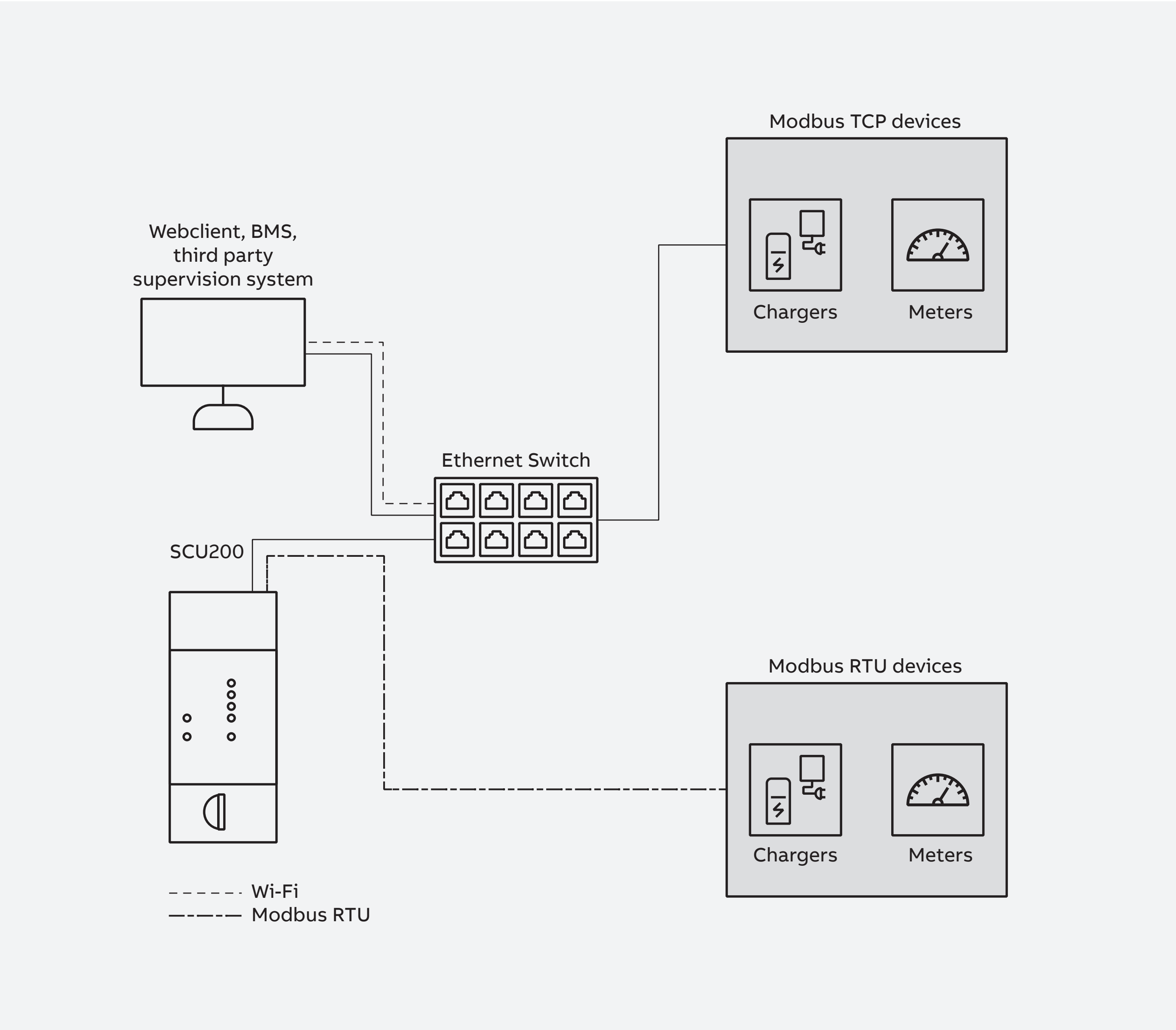
Flexibility
Open system to integrate any kind of device

Optimisation
Completely customizable according to requirements, tailor focused solutions that can solve different problems

Localized solution
Intuitive webserver enabling load monitoring control and cost management at local level without any cloud support

Data secure
Cyber security for internet facing

Principle electrical diagram



SCU200 in EVCI Applications

Data Export
The SCU200 facilitates the export of metering data and charger data collected via Modbus RTU/TCP to higher SCADA/BMS systems. The process is straightforward, supported by an intuitive web server that ensures all necessary information is accessible.

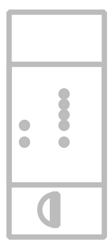
Customizable Visualization
The web server enables users to create customizable widgets for real-time data monitoring. This feature allows for a detailed and user-friendly visualization of almost any data point, enhancing operational oversight and decision-making.

Local Contracts and Cost Tracking
It provides extensive cost management capabilities, allowing users to set different tariffs for each charger, configure alarms and notifications, and generate automatic reports via FTP and SMTP protocols. Users can establish individual contracts for each charger or combine different contracts to manage overall costs effectively.

Historical Data Analysis
It supports longterm data storage and analysis, with expandable memory up to 256 GB via an SD card. This feature enables users to analyze consumption data and cost/contract data over extended periods, aiding in energy efficiency and cost management goals.

Direct Control
It allows direct writing to the writable registers of different chargers through a dedicated control section. Users can also write via REST API, providing precise control over charging currents, power status, and other operational parameters.

Automations
It offers extensive automation possibilities, enabling customized control based on specific conditions. Users can set actions for different scenarios, such as peak times or specific energy thresholds, ensuring optimal performance and energy use.



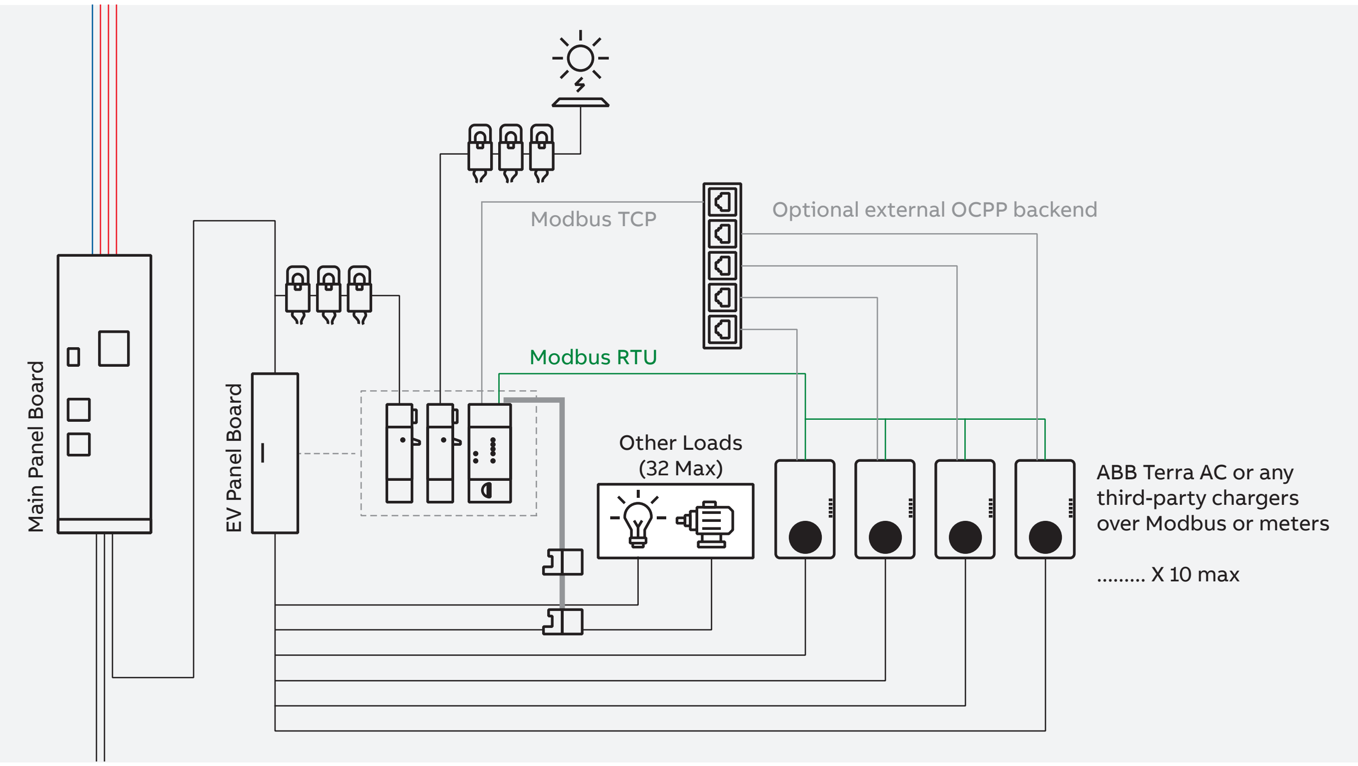
SCU200 in EVCI architecture

The SCU200 provides the possibility for the integration of up to 32 Modbus input points, comprising 16 Modbus RTU and 16 Modbus TCP connections. Up to 10 chargers can be connected via Modbus RTU/TCP. The remaining Modbus input points can be utilized for the integration of main meters, sub meters, battery inputs, solar inverter inputs, and more, via Modbus RTU/TCP.

Additionally, the SCU200 features 32 digital input points dedicated to current sensors, digital modules, and smart auxiliary devices from ABB InSite's energy management portfolio.

These devices are connected via an ABB flat cable. The current sensors, known for their market-leading compactness, enable energy recording for each load and comprehensive branch monitoring in the sub-distribution board.

Through digital input and output modules, as well as smart auxiliaries, it is possible to remotely control and monitor the status of loads or implement specific automations developed within the SCU200's web server.



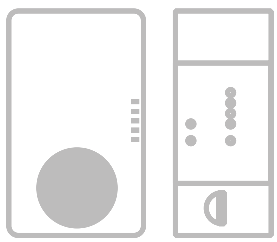
Data points supported by SCU200

The SCU200 is designed to read and write to all registers that allow these functions over Modbus. This makes it possible to seamlessly integrate third-party chargers, inverters, battery systems, and more. All variables and real-time values can be conveniently visualized under the Custom Values widget in the dashboard. Notably, all integrations can be performed via the webserver without the need to connect via cloud or third-party service, offering a simple, intuitive, and standard platform for these integrations.

For ABB Terra AC chargers of all ratings, complete integration is predefined within the SCU200. Upon the physical connection between ABB Terra AC chargers and the SCU200, the recognition of all the data points of ABB Terra AC chargers in the SCU200 takes just seconds.

The following registers are integrated to the SCU200 for ABB Terra AC chargers. Along with the webserver overview, these points can be exported or controlled via Modbus TCP or REST API:

- serialNumberRaw
- firmwareVersionRaw
- socketLockStateRaw
- chargingStateRaw
- chargeCurrentLimit
- chargingCurrentL1
- chargingCurrentL2
- chargingCurrentL3
- voltageL1
- voltageL2
- voltageL3
- activePowerTotal
- activeEnergyImportTotalSession
- chargeCurrentLimitbymodbus
- setChargingLimit
- lockUnlockSocket
- startStopCharging



Flexible Monitoring and Energy Management Solutions for EV Charging Infrastructure using SCU200 – Typical use case

The SCU200 caters to a variety of use cases, including residential or commercial spaces with charging points or dedicated parking lots, community parking lots, hospitals, and school buildings. By connecting the chargers via Modbus, the SCU200 is free to seamlessly link to any backend operating system (CPOs) via OCPP.

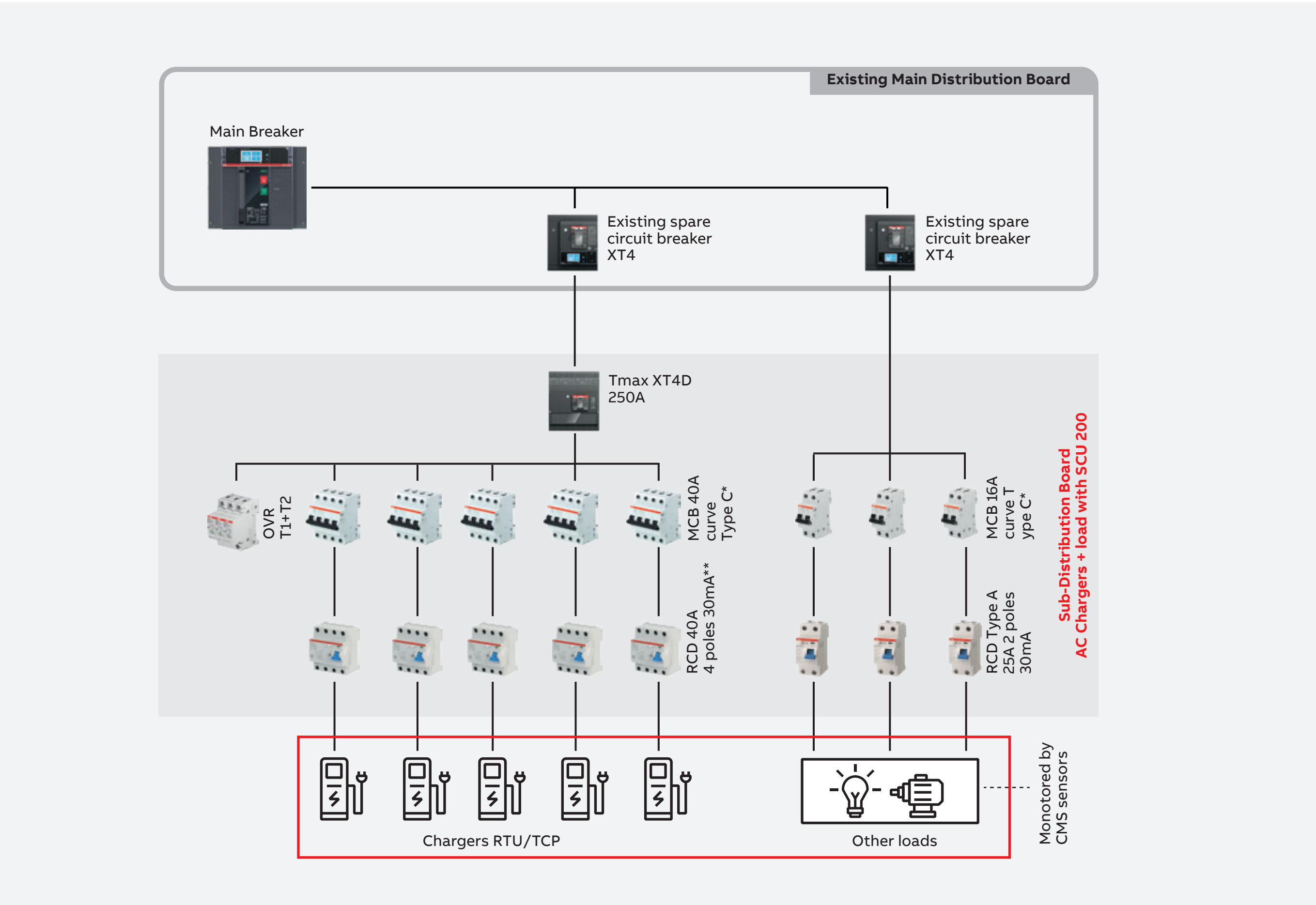
Target users encompass energy managers of buildings, condominium managers, and facility managers, with the infrastructure typically involving 1 to 10 AC destination chargers.

Power flow is effectively managed from the main distributor to sub or final distribution boards, or a dedicated distribution board for the parking area.

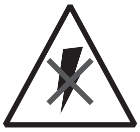
The infrastructure includes meters, communication devices, and network devices such as routers, PV inverters, and local storage systems.

In the subdistribution board, the design of the SCU200, with its compactness and simplicity, allows for seamless monitoring or controlling of chargers, regardless of whether the infrastructure is brownfield or greenfield. Furthermore, for an improved accuracy (0.5%) in greenfield installations, solid core sensors can be selected for monitoring other loads through CMS sensors connected to the SCU200. For brownfield installations, open core sensors (1% accuracy) can be used without any disassembly of the wirings and breakers.

Main electrical diagram



Other Possible Use Cases

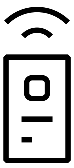


The SCU200 can be programmed to reduce charging currents or switch off chargers if the main meter exceeds certain limits, preventing fuse blowouts and maintaining safety.

For ABB Terra AC chargers, automations can be set up to regulate the current flow. For third-party chargers, this is also possible, provided the current limit data point is writable over Modbus.

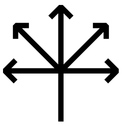
The reference data points for automation initialization can be taken from the metering module of the SCU200 itself or any other meter or charger point communicating over Modbus RTU.
The following data points can be used:
From main consumption meter
- Active power input
- Current input

From chargers (the data points should be writable in the charger models)
- Set charging current limit
- Start charging
- Stop charging

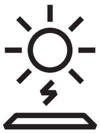


Local visualization and Remote Control
For use cases that require a local overview of the entire dataset in addition to exporting data for billing purposes, the SCU200 web server is the perfect solution. It allows users to visualize and manage the data locally, not just from the charger but also from any other meters measuring consumption of buildings, solar production, etc. Alarms can be set on power limits and current limits for all the chargers integrated downstream, and automatic data export for historical values can be created on set frequencies.

For specific charge points that require exclusive control over charging or power limits, the SCU200 enables centralized control, eliminating the need to access each charger individually.



Unified data export and buffering capabilities
The SCU200 serves as a single point for data export, acting as a local proxy to transport data via Modbus TCP to external building efficiency management platforms, while simultaneously ensuring data export via OCPP for billing applications. In case of export interruptions, the SCU200 can buffer data using its expandable storage options, ensuring uninterrupted and robust data transfer capabilities.



Enhanced Smart Charging with ABB Terra AC Chargers* : leveraging Solar Energy
The SCU200's smart charging feature optimizes the use of solar energy for electric vehicle charging. When surplus solar power is available, the SCU200 can automatically adjust the charging current to maximize the utilization of this renewable energy source, ensuring that the charging process is both eco-friendly and cost-effective.

*This feature is applicable for only one selected charger among the group..

Electric Vehicle Charging Infrastructure (EVCI) with C-kit

C-kit is the new dynamic load management solution that allows EV chargers' simultaneity.

This solution avoids main supply failure due to operation of main (incomer) protective fuses/breakers through momentary reduction of the power drawn by the EV Charging infrastructure. This type of system is suitable only with Terra AC chargers, and can act in four different ways:

1. FIRST IN, FIRST CHARGE
It assigns charging priority based on the chronological order of requests. On the first request, all the available power is allocated; on the next request, a current budget is reserved to avoid exceeding the defined area or zone limits. If the minimum charging rate can no longer be guaranteed, the last request is put on hold until sufficient power is available.

2. EQUAL SHARE
It is based on equal allocation of available current according to the defined area or zone limits. If the minimum charging rate cannot be guaranteed, the last request is put on hold until sufficient power is available.

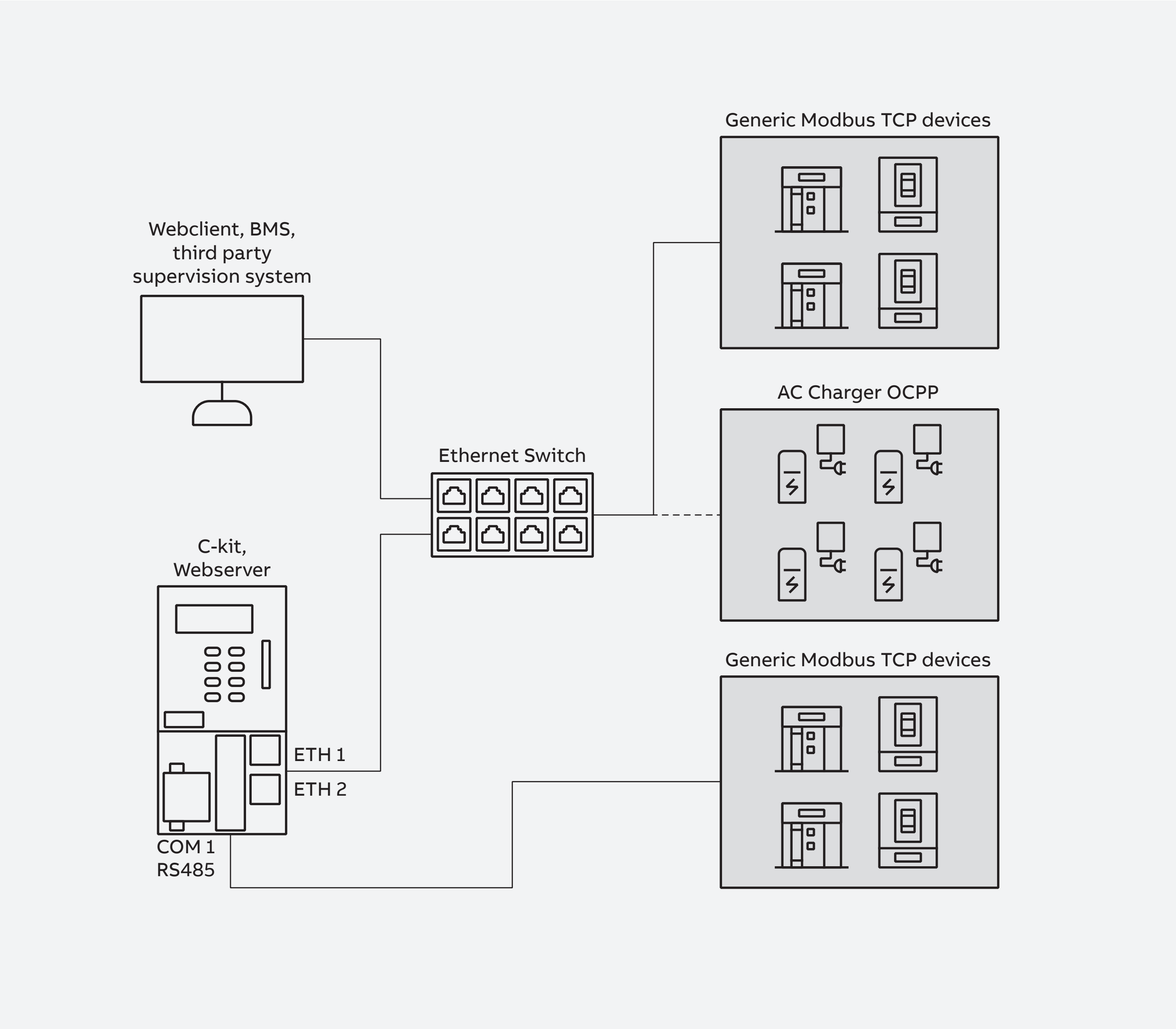
3. MANUAL PRIORITIZATION
It manages 4 priority levels, where level 1 indicates the highest priority. Each charging point has a priority level set by the user.
If the minimum charging rate is guaranteed, all charging requests are satisfied. Otherwise, priority is assigned to the level or levels with the highest priority until the available power is sufficient.

4. PRIORITY TOKEN
With this approach, also utilizing four priority levels where level 1 holds the highest priority, priority levels are determined based on user preferences. As with manual prioritization, if the minimum charging rate is ensured, all charging requests are met. Conversely, if it cannot be maintained, priority is allocated to the level or levels with the highest priority until the available power meets demand.

For Terra AC chargers and those with similar functionality, the C-kit function will allow the selection of a Simultaneity factor lower than 1, but this depends on country-specific regulations (in these Application scenarios it will be set to 0.3 for the first and second Scenario and 0.5 for the third).

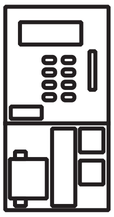
For DC fast chargers, the Simultaneity factor shall be 1, assuming all loads can be connected at the same time because, for these types of chargers, the C-kit is not yet available (coming soon).

Principle electrical diagram



C-kit dynamic load management system

C-kit is an ABB solution based on the AC500 hardware platform that enables monitoring and control of electric charging point loads to ensure efficient and safe use of charging infrastructures C-kit is a local supervisor of electric vehicle meters and charging points.
It manages and monitors their operation in real time and allows some of their settings to be changed.
Through a series of graphical pages, the web server allows summary and analytical information on the system to be represented.



To monitor and regulate the flow of current delivered to the charging points, C-kit uses the following functions.

- **Constant monitoring:** C-kit receives the measurement of the current delivered by each charging point.
- **Limit set by the user:** C-kit intervenes if the sum of currents delivered and loads monitored through the meter exceeds the limit set for the area or zone.
- **Automatic adjustment:** C-kit automatically adjusts the charging power for each charging point to avoid overloading.
- **Customizable algorithms:** C-kit intervenes depending on the charging algorithm chosen by the user.

If there is no meter connected, C-kit reads the absorbed currents directly from the charging points.
The value of these currents is in modulus, that is, without indication of phase shift. In this situation, C-kit considers the sum of the absolute value of the phase currents, and therefore could disconnect non-priority loads even if not necessary.
To improve accuracy in reading currents, a meter must be connected.

The C-kit allows you to simultaneously integrate:

Up to 30 AC chargers communicating via OCPP
C-kit uses OCPP protocol (version 1.6), a standard and open protocol for communication between charging points and the central system following the server-client architecture. In this specific case, C-kit is the OCPP Server to which the client charging stations connect for using a certain service.

Up to 13 Modbus TCP/RTU metering devices.
C-kit uses the Modbus protocol, a standard and open protocol for communication between meters and the central system, according to the server-client architecture. In this case, C-kit acts as a Modbus client by querying electrical devices that act as Modbus servers.

C-kit also acts as a Modbus server concerning any supervision device that acts as a Modbus Client, to retrieve data relating to electrical devices or charging stations.

To function correctly, C-kit and charging stations must therefore be connected to the same LAN/ VLAN data network made available by the customer's corporate infrastructure; the network must be made up of at least the following devices:

- Computer or other similar terminal to access the C-kit web HMI (it must be connected via data cable in the same network/subnet as C-kit with an IP address belonging to the same use pool.
- Ethernet switch to physically connect charging stations with C-kit.

C-kit Architecture

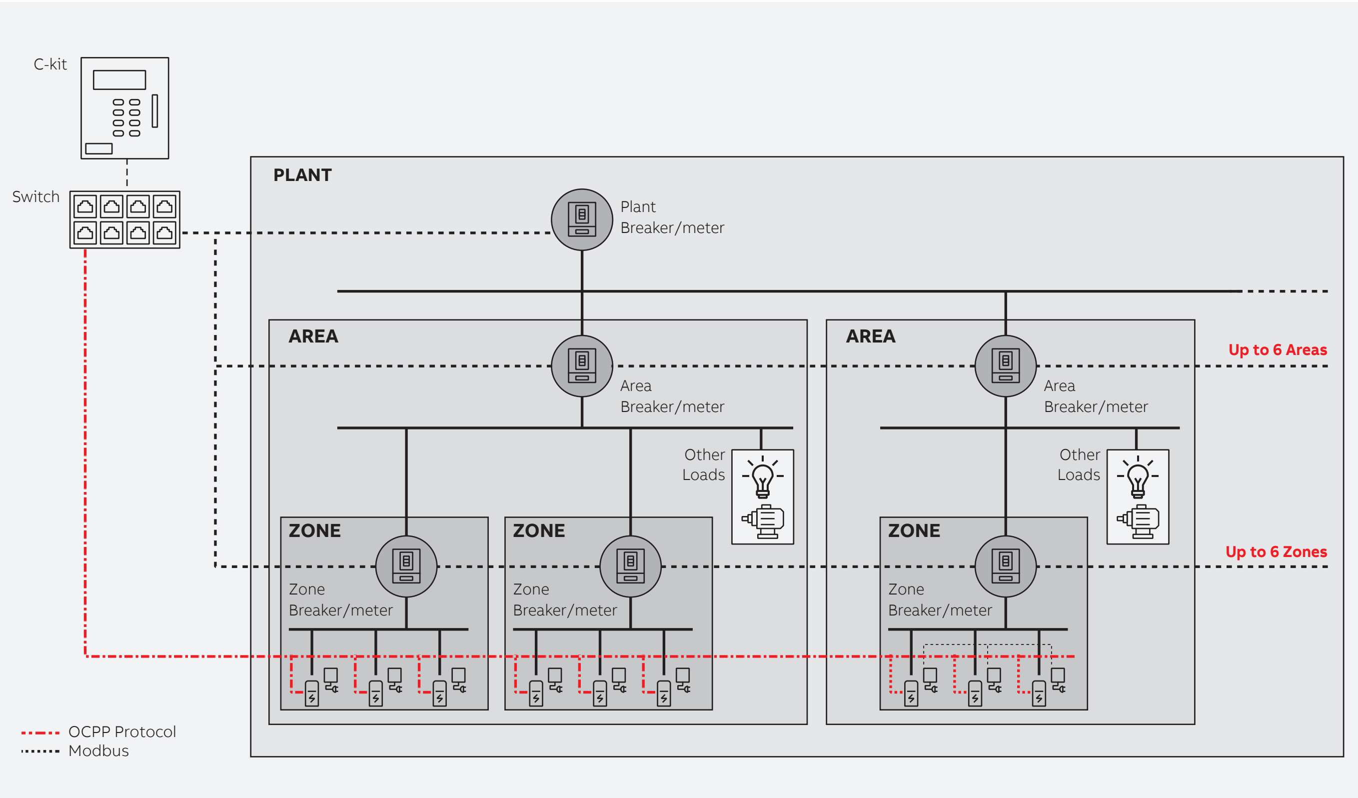
The C-kit is based on Area & Zone.

Definition of Plant:
- A Plant is generally considered as the energy delivery point given by the utility.
- With the C-Kit you can configure and read measures from only one Plant.

Definition of Area:
- An Area identifies a general low-voltage circuit breaker from which it draws power for all loads in the Plant (including switchgear to power the charging points).
- The maximum number of Areas that can be inserted in C-kit is 6.

Definition of Zone:
- A Zone identifies a meter that supplies power exclusively to the charging points.
- The Zone is supplied by the general meter in the Area.
- The maximum number of Zones that can be inserted in C-kit is 6.

For example, in a system with medium voltage/low voltage substations and two mains, the "Plant" will be associated with the general meter installed upstream or downstream of the MV/LV transformer, or at the medium voltage common point in case of parallel transformers. The "Areas" will be associated with the metering devices of each main distribution board. The "zones" will read the measures of the sub distribution board where the chargers are connected. Area and Zone meters may be installed in the same switchgear or in separate switchgear as long as they are equipped with the Modbus TCP/IP or RTU protocol to provide the electrical quantities to C-kit necessary for load management. In Brownfield scenarios, where switches without communication capabilities are already installed (old generation switches), in order not to replace them, it is necessary to install intelligent meters equipped with Modbus TCP/IP or RTU protocol to provide the necessary metering to the C-kit and the power management.



Data points supported by C-kit

The system acquires and manages up to a maximum of 30 charging points in OCPP, reporting the following information:
- Charging power set point.
- Acquisition of power delivered.
- Display of chargers charge status.
- Detection of field equipment communication alarms.
- Detection of field equipment status alarms.
- Display of the totalizer of the power delivered.

Below are some examples of the 13 instruments that C-kit can acquire in Modbus TCP/RTU:
- Switches.
- Multimeters.
- Analyzers.
- Measurement relay.

The C-kit, with the Modbus TCP/RTU can acquire the following measurements:
- Currents L1,L2 & L3
- Voltage L1 –N,L2-N And L3-N
- Total Active Power (NET)P1, P2 & P3
- Total Reactive Power (NET) Q1, Q2 & Q3
- Total Active Energy (NET)
- Power Factor
- Frequency

The C-kit can read these measurements from any Modbus device with correct configuration. Please note that total active power and total reactive power are calculated by the device and therefore no reference needs to be provided for these measurements.

SD card functions
The SD card supplied in the C-kit allows you to perform the following operations:
- Update the C-Kit software
- Back up the created configuration
- Update the catalog of models supported by C-kit

EV Charging Infrastructure in an Existing Building: Brownfield Scenario

Scenario with C-kit

SCENARIO

Brownfield

Considering the input data given in the table below:

The DC fast chargers can deliver power to visitors' Electric Vehicles simultaneously (simultaneity factor = 1) and they cannot be disconnected in the event of transformer overload.

Thanks to the C-kit, the simultaneity factor of AC chargers and the socket-outlets can be considered equal to 0.3.
As a result, the transformer will not be overloaded even if the existing plant draws its full-rated power value.

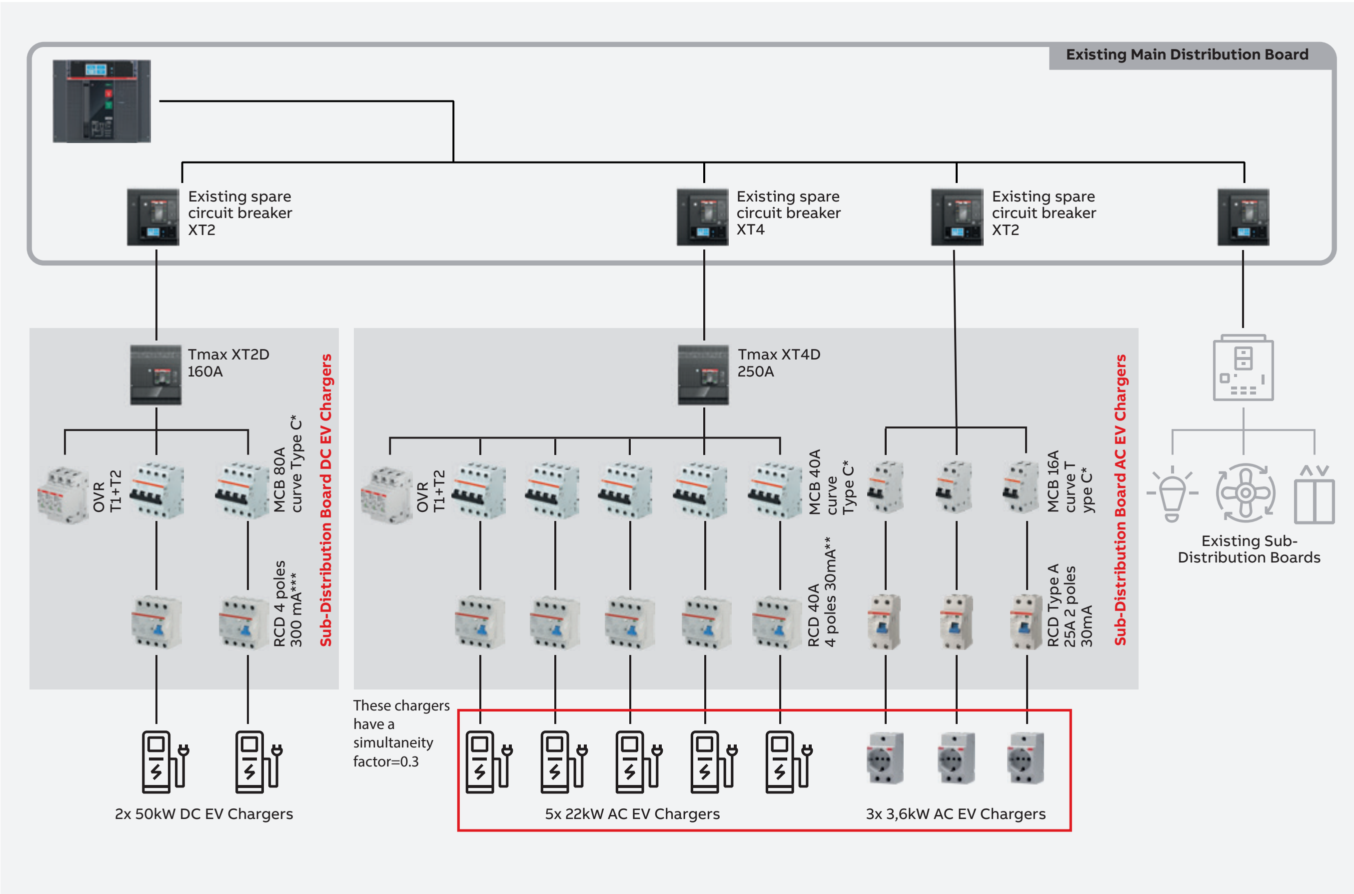
Electrical Parameters for the C-kit solution

FACILITY		Input data (IEC)	
Existing Building Main Electrical data		Rated LVAC voltage [V]	400
		Existing MV/LV transformer rated power [MVA]	2
		Existing installed load active power [MW]	1.7
		Existing installed load power factor	0.95
		Existing installed load reactive power [MVAr]	0.56
EVCI	Design Parameters	EV Charger Power factor	0.96
		EVCI Demand Factor	1
		EVCI Simultaneity Factor for DC fast chargers	1
		EVCI Simultaneity Factor for AC fast chargers	0.3
	DC EV Chargers	Rated DC charger active power [kW]	50
		Rated DC charger reactive power [kVAr]	15
		Rated DC charger current [A]	75
		Number of DC fast chargers	2
		Rated total DC charger active power [kW]	100
		Rated total DC charger reactive power [kVAr]	29
		Rated total DC charger current [A]	150
	22 kW AC EV Charger	Rated AC charger active power [kW]	22
		Rated AC charger reactive power [kVAr]	6
		Rated AC charger current [A]	33
		Number of AC chargers	5
		Rated total AC charger active power [kW]	66
		Rated total AC charger reactive power (kVAr]	9
		Rated total AC charger current [A]	50
	3.6 kW Socket-Outlet	Rated AC socket-outlet active power [kW]	4
		Rated AC socket-outlet reactive power [kVAr]	0
		Rated AC socket-outlet current [A]	16
		Number of AC socket-outlets	3
		Rated total AC socket-outlet active power [kW]	12
		Rated total AC socket-outlet reactive power [kVAr]	0
		Rated total AC socket-outlet current [A]	48
	Total EVCI	Rated total EVCI active power [kW]	145
		Rated total EVCI reactive power [kVAr]	38
		Rated total EVCI current [A]	248
EVCI + building plant		Total active power [MW]	1.9
		Total reactive power [MVAr]	0.6
		Total apparent power [MVA]	2.0

EV Charging Infrastructure in an Existing Building: Brownfield Scenario

Reference Architecture

Main electrical diagram



* Number of poles to be considered according to earthing systems and local regulations
** As specified by IEC 60364-7-722, use type B or type A RCD in conjunction with a residual direct current detecting device (RDC-DD). Device sensitivity of 30 mA is mandatory. It could be already integrated in the charging station, provided it complies with the product standards.
*** For DC charging stations, RCDs, i.e. Type A or B, are not strictly required (at least in TN systems where fault protection is provided by PE + overcurrent protection). Nevertheless, an RCD with a rated residual current ≤ 300 mA is always advisable (also in TN systems), incorporated in the charging station or upstream, to cover the case of non-bolted fault and/or fire protection.

EV Charging Infrastructure in a New Building: Greenfield scenario
Scenario with C-kit

SCENARIO
Greenfield

Considering the input data given in the table below:

- The DC fast chargers can deliver power to visitors' Electric Vehicles simultaneously (simultaneity factor = 1) and they cannot be disconnected in the event of transformer overload.
- Thanks to the C-kit, the simultaneity factor of AC chargers can be considered equal to 0.3. As a result, the transformer, the main circuit breaker and the cable/busbar sizes can be reduced. Nevertheless, the current threshold ultimate protection is present and aligned with the transformer overload protection in the unlikely event of failure of the aforementioned function.

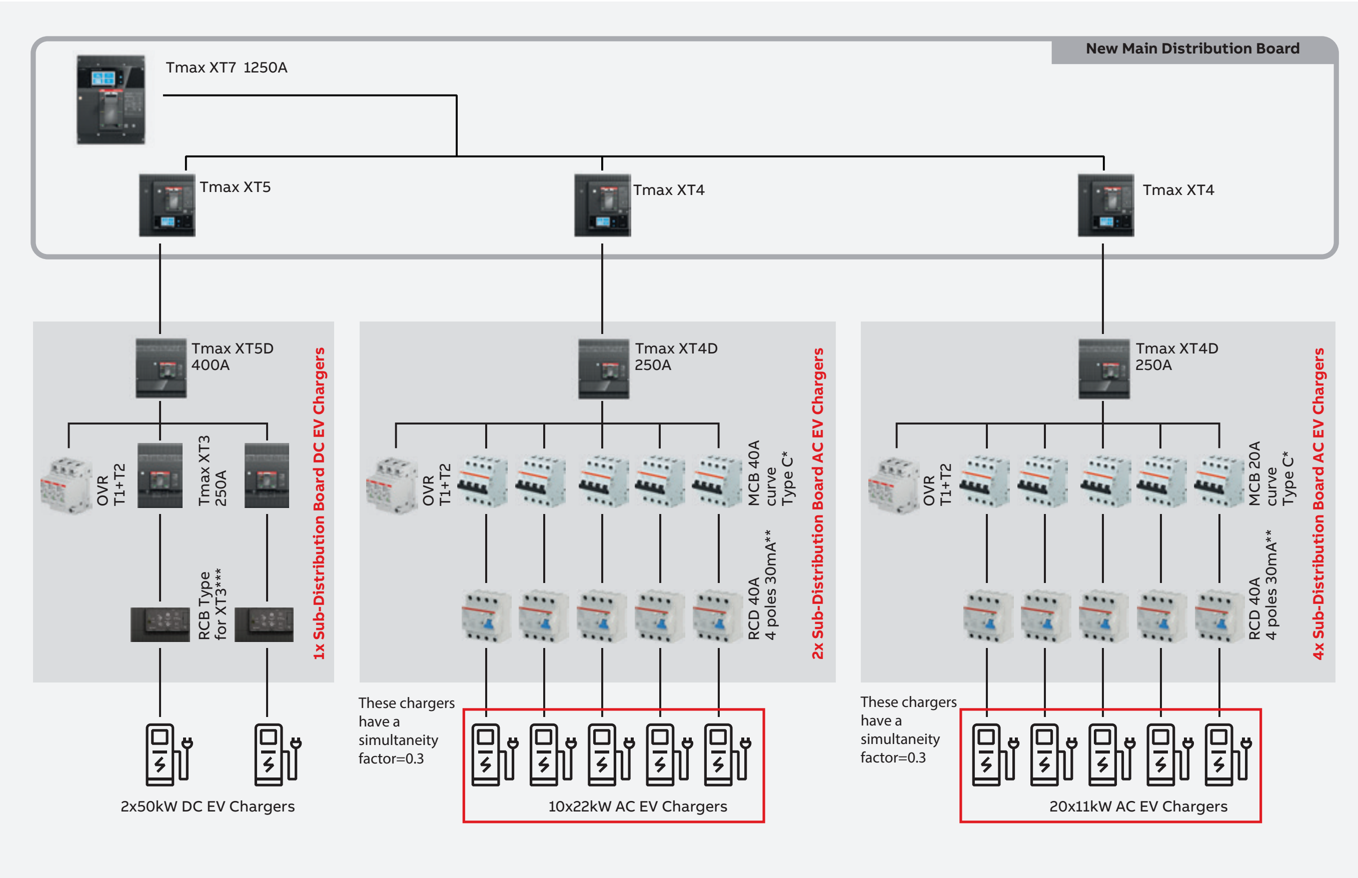
—
Electrical Parameters for the C-kit solution

FACILITY		Input data (IEC)	
New building system		Rated LVAC voltage [V]	400
		Existing MV/LV transformer rated power [MVA]	3
		New installed load active power [MW]	1.5
		New installed load power factor	0.95
		New installed load reactive power [MVAr]	0.49
EVCI	Design Parameters	EV Charger Power factor	0.96
		EVCI Demand Factor	1
		EVCI Simultaneity Factor for DC fast chargers	1
		EVCI Simultaneity Factor for AC fast chargers	0.3
	DC EV Chargers	Rated DC charger active power [kW]	120
		Rated DC charger reactive power [kVAr]	35
		Rated DC charger current [A]	180
		Number of DC fast chargers	2
		Rated total DC charger active power [kW]	240
		Rated total DC charger reactive power [kVAr]	70
		Rated total DC charger current [A]	361
	22 kW AC EV Charger	Rated 22 kW AC charger active power [kW]	22
		Rated 22 kW AC charger reactive power [kVAr]	6
		Rated 22 kW AC charger current [A]	33
		Number of 22 kW AC chargers	10
		Rated total 22 kW AC charger active power [kW]	66
		Rated total 22 kW AC charger reactive power [kVAr]	19
		Rated total 22 kW AC charger current [A]	99
	11 kW AC EV Charger	Rated 11 kW AC charger active power [kW]	5
		Rated 11 kW AC charger reactive power [kVAr]	1
		Rated 11 kW AC charger current [A]	7
		Number of 11 kW AC chargers	20
		Rated total 11 kW AC charger active power [kW]	28
		Rated total 11 kW AC charger reactive power [kVAr]	8
		Rated total 11 kW AC charger current [A]	42
	Total EVCI	Rated total EVCI active power [kW]	334
		Rated total EVCI reactive power [kVAr]	97
		Rated total EVCI current [A]	502
EVCI + building system		Total active power [MW]	1.8
		Total reactive power [MVAr]	0.6
		Total apparent power [MVA]	1.9

EV Charging Infrastructure in a New Building: Greenfield scenario

Reference Architecture

Main electrical diagram



* Number of poles to be considered according to earthing systems and local regulations
** As specified by IEC 60364-7-722, use type B or type A RCD in conjunction with a residual direct current detecting device (RDC-DD). Device sensitivity of 30 mA is mandatory. It could be already integrated in the charging station, provided it complies with the product standards.
*** For DC charging stations, RCDs, i.e. Type A or B, are not strictly required (at least in TN systems where fault protection is provided by PE + overcurrent protection). Nevertheless, an RCD with a rated residual current ≤ 300 mA is always advisable (also in TN systems), incorporated in the charging station or upstream, to cover the case of non-bolted fault and/or fire protection.

Digital Product Range for AC Distribution Boards in EVCI Main components

Monitoring of AC distribution boards for EV chargers is important to ensure that they are functioning correctly and efficiently.

Considering that different brand EV chargers may have their own specific monitoring platforms, only the electrical infrastructure is taken into consideration in this document.

It is possible to detect any potential issues early on and address them before they cause significant problems or downtime. This also helps owners optimize the use of charging infrastructure, allowing them to better understand the charging patterns of their customers and adjust charging rates accordingly. Additionally, maintaining a high level of customer satisfaction is another benefit that comes from intelligent EV Charging Infrastructure, as well as providing consumers with access to reliable and functional charging infrastructure.

ABB's Digital Offering for EV Charging Infrastructure means

OBTAINING MEASUREMENTS OF ELECTRICAL DATA

Monitoring and reporting of complete EV Charging Infrastructure consumption for building energy management systems or compliance with environmental regulations.

ENSURING QUICK DATA AVAILABILITY

Data at your fingertips, thanks to cloud-based web application instead of local manual readings by operators, lowering operational costs.

Easy integration of new infrastructure with existing management systems, such as BMS or SCADA.

AVOIDING DOWNTIME THANKS TO 24/7 REAL-TIME MONITORING AND INSTANTANEOUS ALERTS

Notification of changes in the status of devices.

Remote indication alerts the user to surge events or earth faults, enabling them to reset or replace the protective device, while avoiding costly downtime.

Digital Product Range for AC Distribution Boards in EVCI Main components

Intelligent Distribution (ID) for MV Switchgear

- Due to communication with the relative MV relays, it is possible to see MV circuit breaker status, contact wear, electrical data measurements and diagnostics alarms.
- In the event of overloads, rising temperatures in transformers can be monitored through temperature monitoring relays or Ekip Signalling 3T devices.

Intelligent Distribution (ID) for LV Main distribution boards

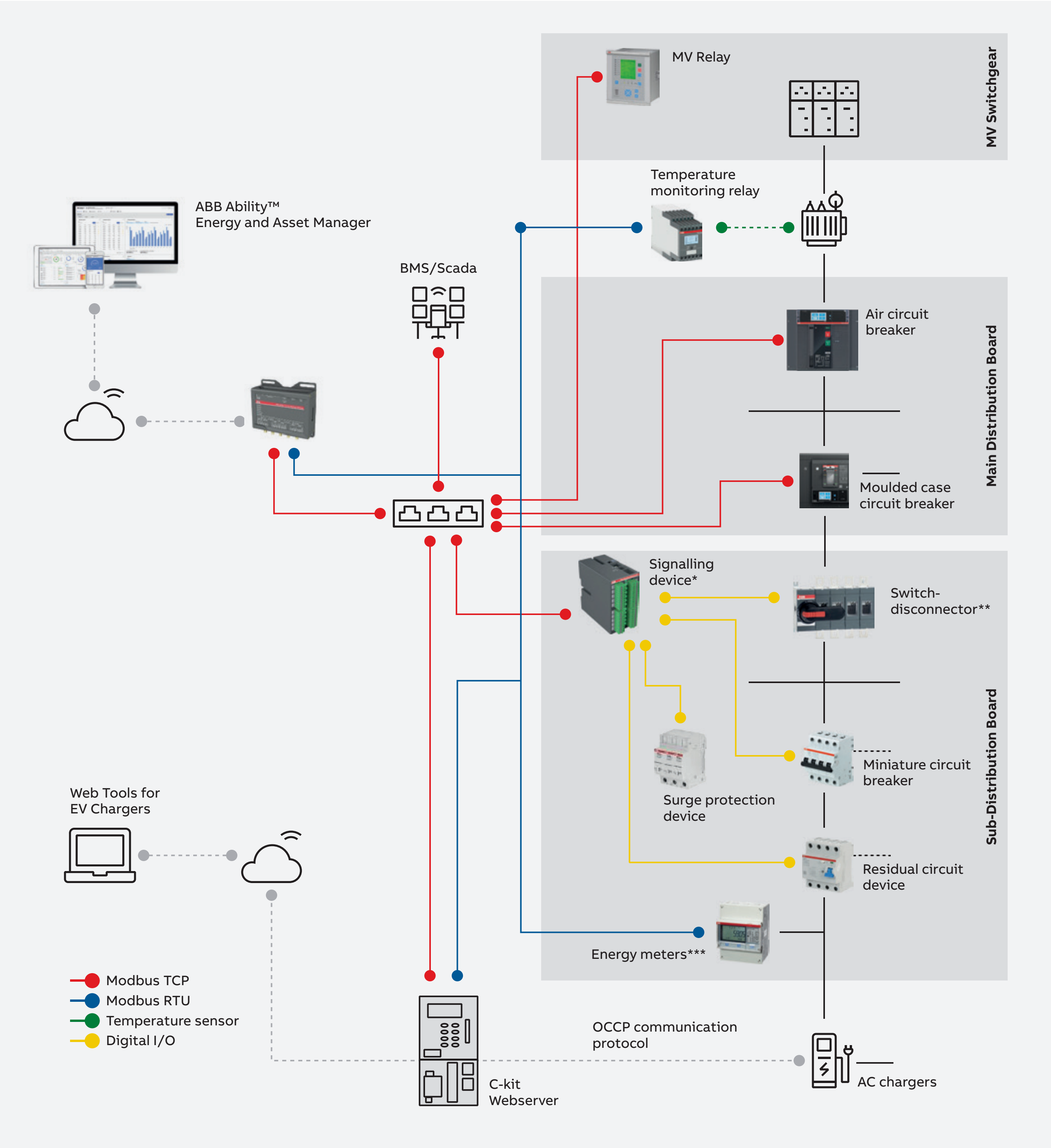
- If a new main distribution board is to be installed, incoming and outgoing circuit breakers can be chosen with embedded measurement functions to enable detailed current measurement and energy usage; easily achieved without additional components.
- Predictive maintenance function for Emax 2 and XT7 circuit breakers increases system reliability while decreasing maintenance costs.

Intelligent Distribution (ID) for LV Sub-distribution boards

- * Ekip Signalling Modbus TCP device can collect status and trip signals from incoming switch-disconnector, surge protection devices, miniature circuit breakers or residual circuit device
- ** Measurement function of incoming sub-distribution board devices is important when extension of LV installation in existing buildings for EVCI is evaluated. In such cases, this device can be chosen as circuit breaker with smart electronic trip units instead of switch-disconnectors.
- *** Power meters for each charger branch may also be needed when EV chargers do not include metering devices.

Digital Product Range for C-kit

Reference Architecture



AWG 16-22 cables with a maximum external diameter of 1.4 mm must be used to connect the power supply signals and the inputs and outputs.

Product Offering

C-Kit

WEB PAGE

Emax 2 – Emax 2 / MS

WEB PAGE

Tmax XT

WEB PAGE

SPD

WEB PAGE

RCD

WEB PAGE

CM-UFD

WEB PAGE

S200

WEB PAGE

Temperature Monitoring Relays

WEB PAGE

Ekip Signalling

WEB PAGE

Ekip 3T

WEB PAGE

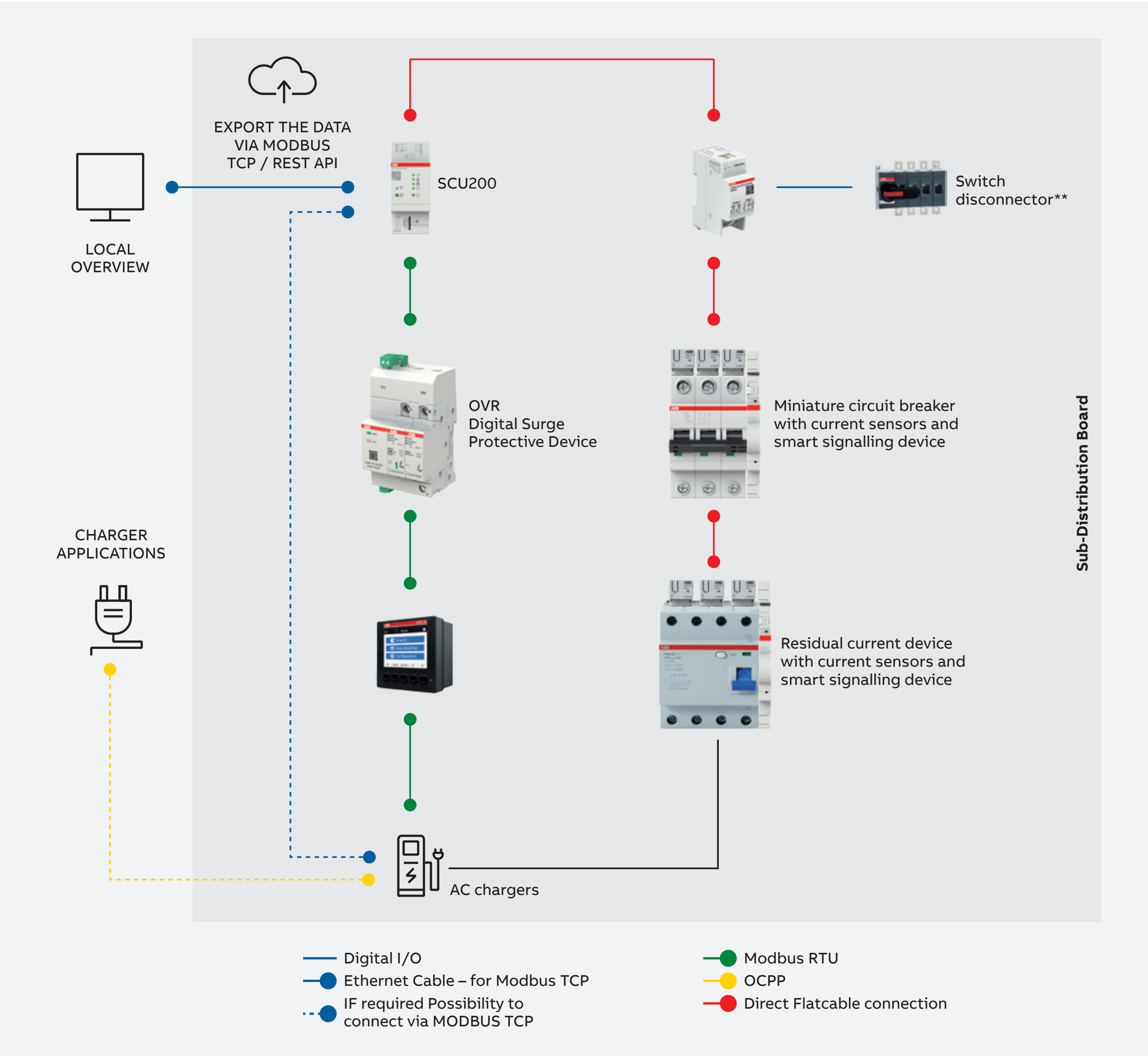
ABB Ability™ Energy Manager – Watching

WEB PAGE

ABB Ability™ Edge Industrial Gateway

WEB PAGE

Digital Product Range for SCU200
Reference Architecture



Product Offering

SCU200

WEB PAGE

M4M 20

WEB PAGE

INS-Digital I/O modules

WEB PAGE

INS-S/H Smart Signalling device

WEB PAGE

OVR

WEB PAGE

RCD

WEB PAGE

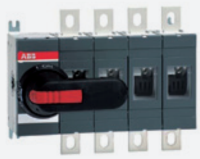
S200

WEB PAGE

CMS-122

WEB PAGE

OT Switch Disconnectors



WEB PAGE

Note

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