



EV charging and PV storage monitoring solutions

Controls

Climate neutral

From carbon to renewable energy

■ What is carbon neutrality?

Consist in achieving a balance between emissions and carbon uptake. When carbon dioxide is removed from the atmosphere it is called carbon immobilization.

To achieve this goal, the emission of greenhouse gases (GHG) will have to be offset by the absorption of carbon emissions.

Another way to reduce emissions is to offset emissions in one sector by reducing them in another. This can be done by investing in renewable energy and clean technologies. The EU Emissions Trading System is an example of a carbon offsetting scheme.

■ Reduction of greenhouse gases

The European Union is the third largest producer of carbon dioxide in the world but with an ambitious goal: to prevent climate change, reduce emissions by 2030 until reaching the goal of net zero emissions by 2050.

The system was launched in 2005 and is aimed specifically at industries and transportation.

■ Transportation and pollution

The European Union approved measures aimed at drastically reducing CO₂ emissions and encouraging the use of electric cars.

Cars and vans produce 15% of CO₂ emissions, the transport sector is the only one where greenhouse gas emissions are higher than 1990 levels.

Source: European Parliament

■ Renewables

Renewable energies, including solar, wind, hydro, biofuels, are at the centre of the transition to a less carbon-intensive and more sustainable energy system.

Renewables have grown rapidly in recent years, driven by policy support and sharp cost reductions for solar photovoltaics and wind power in particular. The electricity sector remains the brightest spot for renewables with the strong growth of solar photovoltaics.

But electricity accounts for only a fifth of global energy consumption, and the role of renewables in the transportation and heating sectors remains critical to the energy transition.

Source: IEA - Renewables

■ Clean Planet for All

The European Union has been at the forefront of addressing the root causes of climate change and the strengthening a concerted global response in the framework of the Paris Agreement. The European Union strategy for the reduction of greenhouse gas emissions, as requested by the European Council in March 2018, confirms the lead in global climate action.

The agreement presents a plan to achieve climate neutrality by 2050, through a fair transition encompassing all sectors of the economy. It underlines the opportunities that this transformation offers to European citizens and its economy.

Europeans consider climate change to be the most serious problem facing the world.

Controls

CARLO GAVAZZI Automation Components. Specifications are subject to change without notice. Images are for illustrative purposes only.



■ Climate neutral economy

Reaching a climate neutral economy by 2050 is feasible from technological, economical and social perspective, but it requires profound social and economic transformations.

Fully decarbonising Europe's energy supply

Electrification of the energy system with use of renewables will decarbonise our energy supply and reduce our dependency on third country suppliers.

Embracing clean mobility

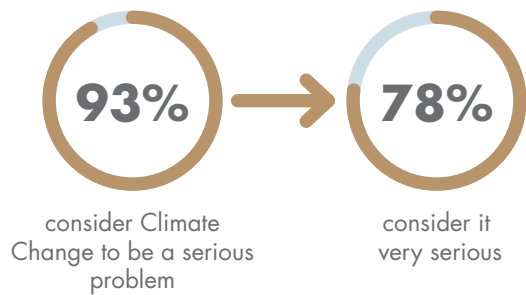
Decarbonising the transport sector by using alternative means of transport with the roll-out of electric vehicles and enhanced use of alternative fuels.

Putting industrial modernisation at the centre of economy

Modernising existing installations and investing in new carbon neutral systems.



SURVEYED PEOPLE



To know more: European Union - Eurobarometer Survey



Climate-neutral

European Green Deal

■ Ready for climate neutral

The climate change and the environmental unconcern are threatening Europe and the whole world.

The European Commission wants to block this environmental degradation establishing the European Green Deal, a set of rules capable of guiding the planet towards a new life, creating a modern, resource-efficient and competitive economy.

The European Green Deal ensuring by 2050:

- CLIMATE NEUTRAL
- GOOD USE OF RESOURCES
- NO PERSON AND NO PLACE LEFT BEHIND



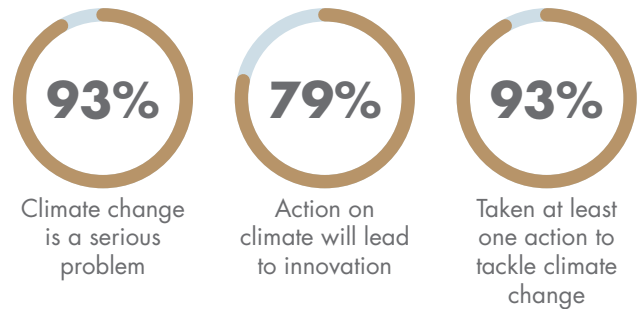
Setting all actions for the next target

Making Europe climate-neutral will be good for people, planet and economy.

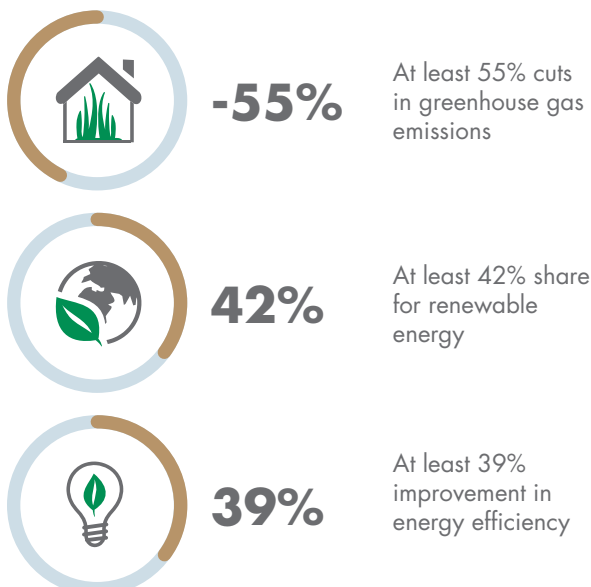
This is what is stated the European green Deal:

- BECOME climate-neutral
- PROTECT life by cutting pollution
- HELP companies become world leaders in clean products and technologies

Europeans think and do



■ That's what is expected for 2030



To know more: European Commission - 2030 climate & energy framework

The European Commission adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

This will enable Europe to move towards a climate-neutral economy and implement its commitments under the Paris Agreement by updating its Nationally Determined Contribution.

The 2030 climate and energy framework includes Europe wide targets and policy objectives.



To know more: the benefits of the European Green deal and the actions

■ Europe will be the first continent with zero climate impact!

All together for this new challenge, economic, environmental and social.

We need climate action now, climate change is happening so fast that many plants and animal species are struggling to cope.

The Commission is proposing an European Climate Law that will transform political promises into a binding legal obligation, and send a strong political signal to all partners and business. It will write the climate neutrality target for 2050 into law, and propose the path to get there.

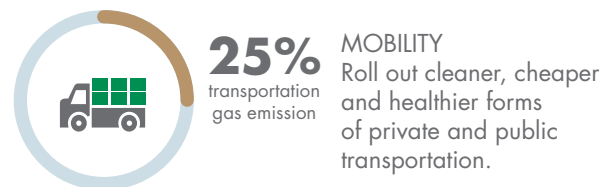
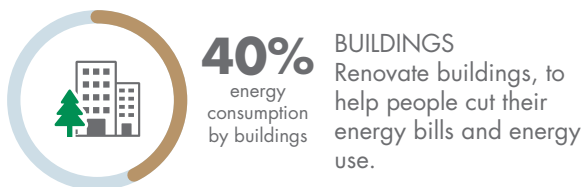
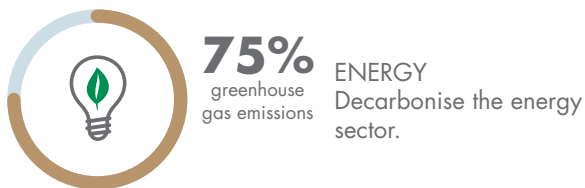
Greenhouse gases-neutral solutions

The European Union is expected to build strong value chains by enabling technologies such as new materials, digitalization, artificial intelligence, high performance computing and biotechnology.

Focus on:

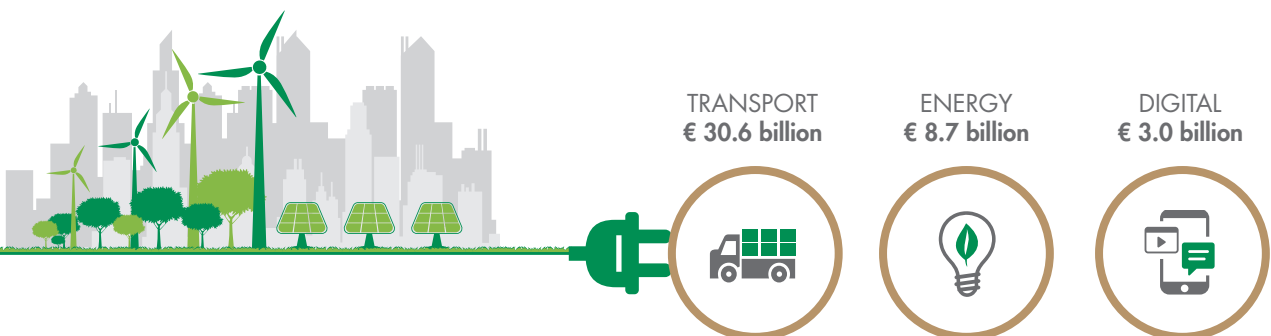
- Smart networks and batteries
- Hydrogen and fuel cells
- Energy storage
- Carbon-neutral transformation of energy industries
- Circular economy

■ Europe will require actions on all economical sectors starting from today:



GOOD to know

For the European budget of 2021-2027, the Commission proposed € 42.3 Billion to support investments in the European infrastructure networks.



EV charge

Green mobility

■ Need a green planet for all

Carbon dioxide continues to rise every month. Greenhouse gas levels are so high because humans have released them into the air by burning fossil fuels. The gases absorb solar energy and keep heat close to Earth's surface, this trapping of heat is known as the greenhouse effect.

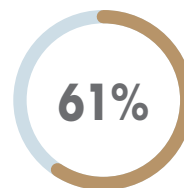


■ Efficient & green mobility

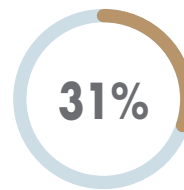
The new Urban Mobility Framework will benefit transport users and all the people around them.

Today's proposal addresses some of the mobility challenges stemming from this intense economic activity – congestion, emissions, noise.

The main focus will be on public transport. The proposal also prioritizes zero-emission solutions for urban fleets, including taxis and ride-hailing services.



CO₂
The carbon dioxide represents 61% of the greenhouse gases released into the atmosphere in 2022.



TRANSPORT
The transport represents the 31% of total carbon dioxide emissions in 2022.

To know more: [EPA - Greenhouse gas emission](#)

■ Carlo Gavazzi and the mobility plan

The mobility plan is also a part of European Green Deal action. For road transport, the European Green Deal sets the objective of having at least 1 million publicly accessible recharging and refuelling stations in place by 2025 that establishes a springboard for the necessary much larger roll out of such infrastructure until 2030.

Carlo Gavazzi with its almost 50 years of experience in metering contributes to this project by supplying high-accuracy meters in various formats and characteristics for measuring the energy consumed upstream of the charging stations but also very specific meters for installation inside the charging poles.



■ Europe ready to plug

What comes first, the electric vehicles or recharging infrastructure?

The uptake of electric cars and vans in Europe significantly increased in 2021. Electric car registrations for the year were close to 1.729,000 units, up from 1.061,000 units in 2020.

The limited availability of public recharging can undoubtedly be a psychological barrier to EV uptake for drivers of conventional vehicles.

In Europe ten states with less than one electric charging station every hundred kilometres, the electric car is growing but there is a serious lack of columns along the road networks of the European Union.

It is clear that a rapid growth of the charging points installed is needed to reach the objectives of the Green Deal by 2030.



2.3
million

In Europe, electric car sales increased by nearly 70% in 2021 to 2.3 million, about half of which were plug-in hybrids

To know more: [IEA - Electric Vehicles](#)

■ Significant increase

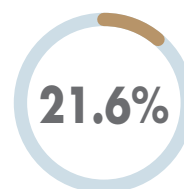
The uptake of electric cars (BEVs - Battery Electric Vehicle + PHEVs - Plug-in Hybrid Electric Vehicle) and vans in Europe significantly increased in 2022

In 2022, the share of electric vehicles in national new car registrations increased in all EU27 countries compared with 2021, from 1.74 million to almost 2 millions.

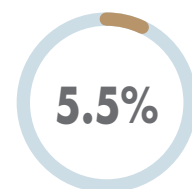
Further growth in Europe's electric vehicles could help the EU meet emissions reduction targets and ensure 2050 objective to being climate neutral

To know more: [European Environment Agency - New registrations of EV in Europe](#)

Total new car registrations in 2022



Total new vans registrations in 2022



EV charge

Infrastructure for EV charging

■ AC or DC electric vehicle charging?

• AC CHARGING

is the leading type of plug-in vehicle charging. This technology is dominant in domestic charging.

• DC CHARGING

is picking up. The major charging station suppliers testing and developing solutions up to 500 kW, which would allow to charge large batteries to at least 80% within a few minutes.

Charging stations to be placed in dense urban centres and in motorways, public charging stations is not only for cars but also for vans and trucks. DC charging involves all vehicles, although the diffusion of DC fast chargers is still low.

Despite their low number, DC fast chargers and their deployment are increasingly significant in the consumer acceptance of EV ownership. They are also somewhat future proofed, with only high performance and luxury vehicles expected to utilize 350 kW of charging – the mass market is expected to require around 150 kW.

■ Slow or rapid EV charging?

• SLOW CHARGING

can be found in urban areas where they can be used primarily to address the needs of electric vehicle owners that do not have access to private parking.



• Long-term parking



• From 3 to 10 hours to recharge



• AC charging

• FAST CHARGING

can be found along main routes and highways, is essential for drivers to complete journeys beyond the range of their vehicle. It also acts as a psychological safety net enabling drivers to travel longer distances and further from their usual charging location. Fast chargers can be split, according to the power limit in different subcategories:

- rapid chargers (also AC type up to 22kW);
- ultra-rapid chargers (only DC type up to 350kW).

The connectors are mainly:

- type 2 when the power rating is from 3 to 43kW three-phase (rapid charging);
- Type 4 - Combo CCS when the power rating is from above 50kW DC (ultra-rapid charging).



• Along main routes and highways



• From 15 to 20 minutes to recharge

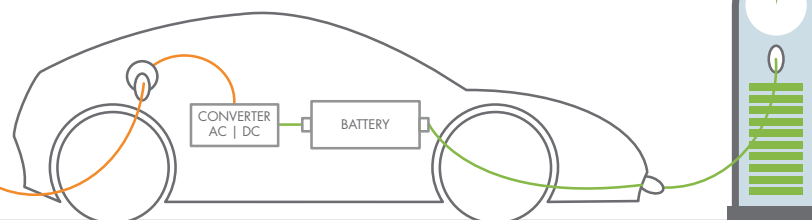


• DC charging (mostly)

GOOD to know

SLOW CHARGING AC

AC current is drawn from the charging station and subsequently converted into direct current in the car



FAST CHARGING DC

DC current is drawn from the charging station to charge the battery, improving its overall efficiency



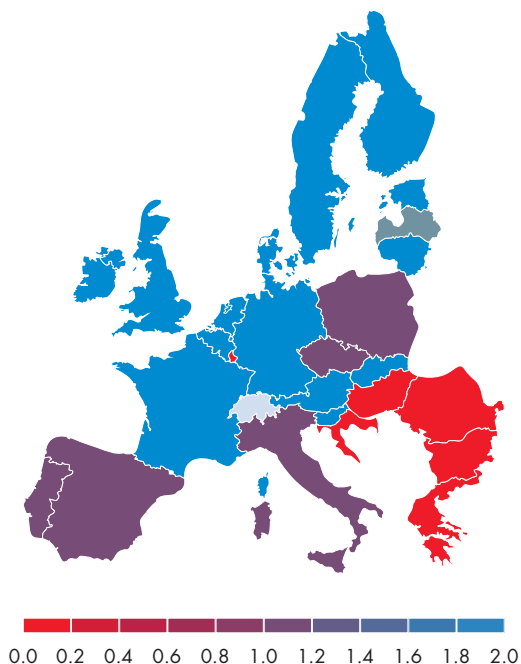
■ Infrastructure availability

By the end of 2020, there were 225,000 public charging points across the EU. More than 60,000 new charging points were installed in 2020, expanding the network by 37%.

This is in line with the Commission guidelines of having one charger per 10 vehicles. In reality only 5% of recharging happens at public sites so the current volumes are sufficient to kickstart the market. Fast charging accounts for a growing share of the public charging (now 11% of the public chargers) and around 1,000 ultra-fast (150-350 kW) charging sites – or one site every 34 km on average on the strategic EU road network.

Such network allows drivers to charge up the equivalent of 400 km driving in just 15 minutes.

Fast charging sites per 60 km motorway



The map shows that most countries already have a good coverage of charging sites

BEVs per high power charger



The map shows the number of BEVs per fast charger in each country. The huge majority of Member States have a low number of BEVs per high power charger

GOOD to know

One in every 8 cars sold in the EU in 2022 was fully electric as EV sales were boosted by EU CO₂ targets for the second year running.

In the second quarter of 2023, sales of battery electric vehicles continued to expand in the EU, accounting for 14.8% of total passenger car registrations up from 14.1% of the year before.

Plug-in hybrid cars accounted for 8.2% of market share, down from 8.9% in the second quarter of 2022.

Electric vehicles market share in European countries in the first 6 months of 2023. (BEVs + PHEVs)

1	Norway	83.1%
2	Sweden	37.3%
3	Finland	32.6%
4	Denmark	31%
5	Netherlands	28,9%
6	Luxembourg	19.9%

To know more: [Electric vehicles market share in Europe](#)

PV storage

Photovoltaic storage

■ Let's look even further

Installing a photovoltaic system with charging station is good for saving energy and also for recharging the electric vehicle. Photovoltaic systems for the production of electricity are increasingly widespread. The electricity produced by these plants is used for variable needs and the surplus is often fed back into the grid. So combination of a photovoltaic system and electric vehicle charging could not be more appropriate.

There is only one small problem: the energy from the sun is supplied in the central hours of the day, when the car is likely to be used. We therefore need an energy accumulator that allows you to charge the car at night, avoiding the consumption of expensive energy from the network.

■ Electric mobility with photovoltaic

Combining electric car and solar energy naturally can help to reach CO₂-neutral mobility. Electric cars can increase the profitability of solar plant using energy in a better way. Instead of putting electricity into the electricity grid at an unfavourable price, it's possible to recharge the car at advantageous conditions. Only once the car has been recharged, the excess current produced will be fed into the grid.

Advantages of a charging station with photovoltaic:



Increase in direct consumption



Independence from the price of energy



Cheaper electric car charging



Zero-emission of CO₂

A perfect synergy between EV and PV

- EV could use photovoltaic energy and benefit from cheap carbon-free electricity
- Photovoltaic systems could use the bi-directional flexibility of EV batteries to maximize their self-consumption

GOOD to know

The power of sun

- It is the most abundant source of energy on earth
- The cost of solar panels decreased by 99% from 1997
- Solar energy is cheaper than fossil fuels
- Solar is the faster energy source to implement
- Solar power plants can last up to 40 years

Photovoltaic: clean energy

- The ideal production of clean energy is obtained by orienting the plant 30 degrees towards the south
- In a year a photovoltaic plant can reduce CO₂ emissions from a minimum of 1,329 kg to a maximum of 1,772 kg.
- The sun's rays reach the plant whatever the weather

■ Introduction of V2G “Vehicle to Grid”

A new technology, that allows electric cars to be transformed from simple means of transport to energy carriers capable of exchanging electricity with the grid, is called V2G.

Thanks to bidirectional charging technology, the batteries of an electric vehicle will be able to stabilize the grid, storing excess energy and returning it when needed, guaranteeing benefits to the community, energy managers and those who drive an electric car.

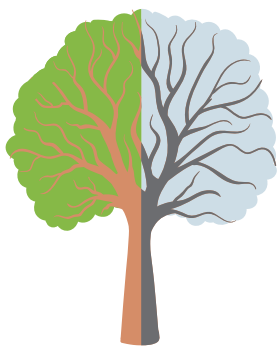
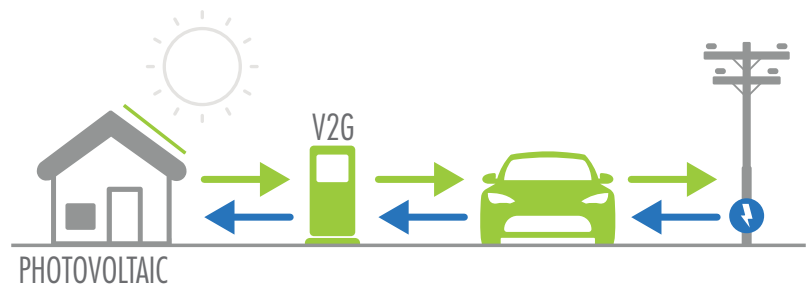
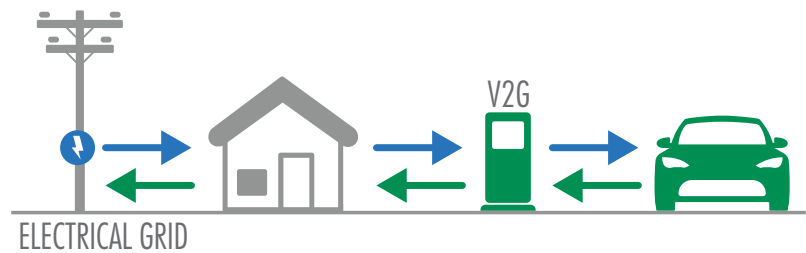
Electric vehicle users will be able to become energy suppliers, because car batteries will be used as energy storage systems connected to the grid.

■ The benefits of V2G technology

The electric vehicle becomes an integral part of the electrical network, thanks to a bidirectional inverter it can store electricity in its batteries.

The benefits are various:

- Improves the electric mobility network
- Makes electric cars more attractive
- Lowers the cost of energy
- Reduces CO₂ emissions
- Reduces the charging costs



EU approves effective ban on new fossil fuel cars from 2035

The European Commission has proposed 2035 as the year which only zero-emission cars can be sold within the European Union.

It is therefore necessary to intervene in several sectors, in particular on transport, which has an important impact on overall emissions. The European Commission has decided to push to make transport much cleaner by setting decidedly ambitious goals.

The Commission has also proposed the creation of a fund intended to provide financing to encourage the spread of zero-emission cars and the energy requalification of buildings.

GOOD to know

The future of transport is electric

Before to think of a fully electric ecosystem, we need to pay attention to the energy factor. In particular, the duration of the batteries and the cost of energy for recharging electric cars. In this context the solution could be the bidirectional charging.

Applied to the world of electric cars, it means that the energy already purchased to recharge the car can also be used to power other devices or sold to the grid.

The electric vehicle batteries have a potential that exceeds their original use: provide energy for mobility.

- Electric vehicles used as energy storage systems
- The network becomes more stable and efficient
- The car owner will be able to increase self-consumption

Load balancing

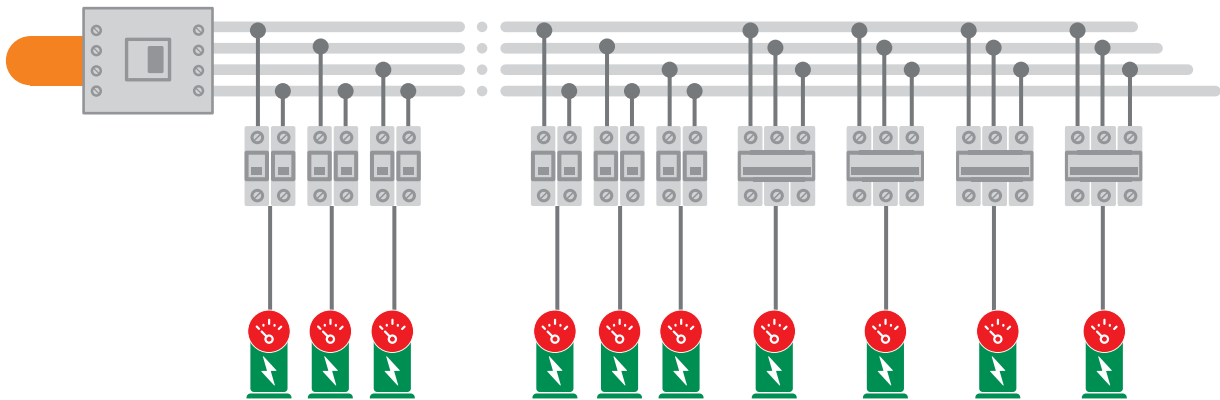
EV charging

■ The availability of charging stations

One of the challenges for the wider adoption of electric vehicles is the availability of charging stations, in all EV charging uses. They need to be improved and smart technologies used, to make existing and new networks and EV infrastructure as efficient as possible.

■ EV charging is highly energy-intensive

EV charging is a high energy application that can quickly put an electrical circuit under strain if not managed properly. Electric circuits have a limited capacity and can get overloaded if too much power is drawn. To protect circuits from overloading, an electricity supply is fitted with circuit breakers which, if power use exceeds safe levels, will cut power. A circuit breaker may trip if you have had multiple high-power loads working at the same time, like charging BEVs and/or PHEVs. Of course, power can be restored by reducing the BEVs and/or PHEVs on the grid, for example, by turning OFF some of them, this might create a bad service to the car drivers.

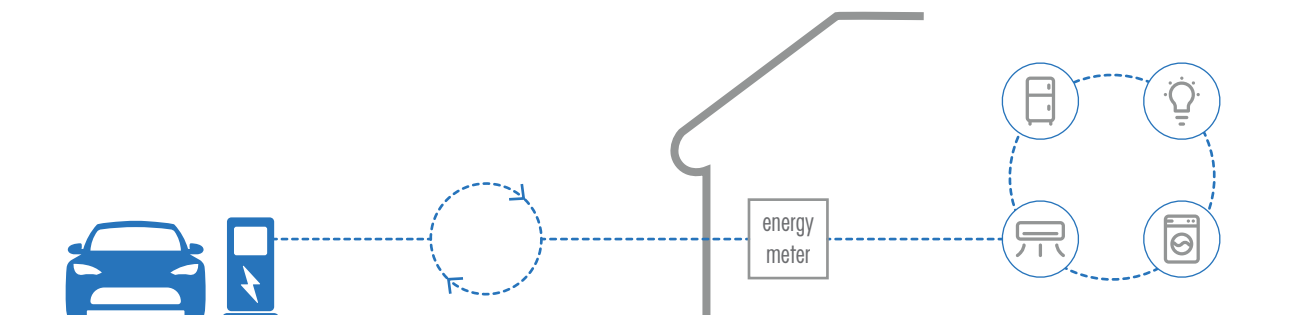


Luckily, there are a number of smart EV charging solutions available to help optimise energy demand and the relevant electricity bill. One available feature is the dynamic load balancing.

Dynamic load balancing plays in electric car charging an extremely important role. By monitoring power loads on the circuit, dynamic load balancing intelligently allocates the available capacity to BEVs that need it the most, allowing them to run simultaneously without overloading the circuit.

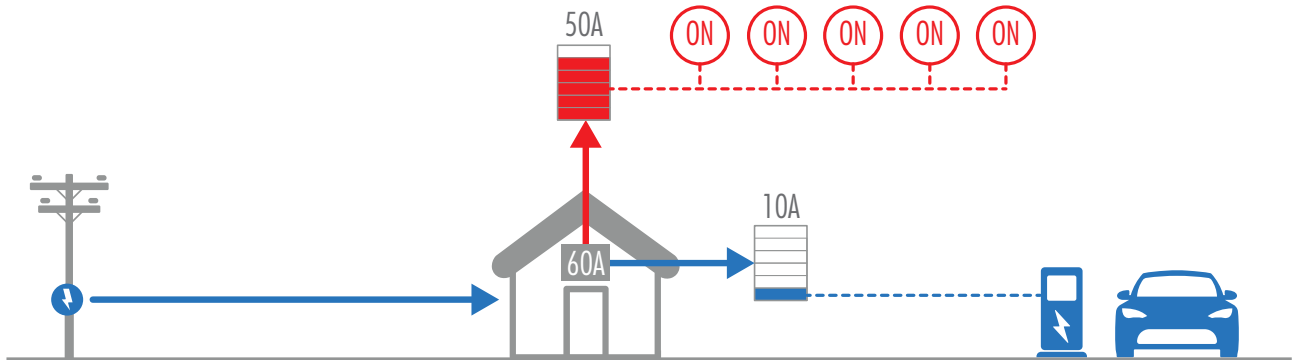
■ Dynamic load balancing can prevent the need to upgrade the existing electrical system

In many cases, the addition of more charging poles in condominiums and public places implies the need to increase the installed power which consequently requires reviewing the electrical design of the system by changing all the cables. Dynamic load balancing solves problems like this by simply redistributing the available power to each individual charging pole intelligently so as not to create any loss of service.



■ Dynamic load balancing for EVs is always a critical function

It is aimed to enable charging stations to divide available power supply between charging vehicles and ensures charge even if the charging station has limited available power supply.



Smart charging

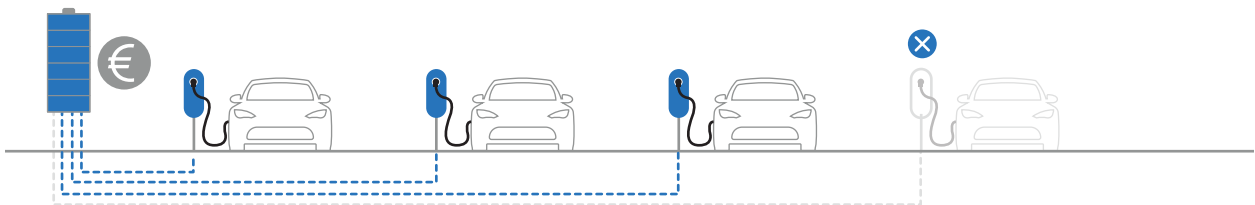
Smart charging is required for load balancing so to set and control the charging management across charging stations avoiding any overload or increase of power supply costs.

Systems that deploy load balancing can be used to manage charging across multiple vehicles in a workplace, scheduling charging for example, overnight, when it is more cost-effective and can even be staggered or alternated without resulting in business downtime.

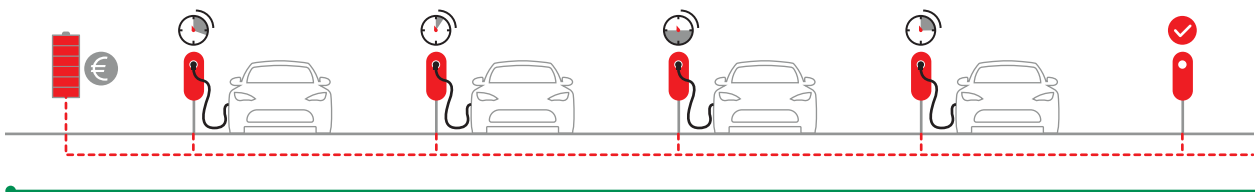
GOOD to know

With or without Dynamic load balancing?

Without dynamic load balancing



With dynamic load balancing



Platform

UWP 4.0 SE the paradigm shift

■ How can you implement an effective Energy Efficiency plan?

Meters are useless if relevant data cannot be collected remotely, and remote collected data is useless if not fully automated and properly filtered for a focused analysis!

Nevertheless, an energy efficiency plan is not effective, and savings cannot be achieved if the automatic data analysis does not act properly on loads. Therefore the paradigm is to be able to generate useful information and to automatically convert it into saving actions. A System Integrator in such a situation would combine components from different suppliers to achieve the requested model. The paradigm shift is to be able to provide to the same user a unique complete, flexible and scalable platform.

■ Why a unique platform?

A System Integrator using a standard monitoring and control architecture would face the following problems: system complexity, cost issues, a long commissioning time, a long learning time. The same System Integrator, using UWP 4.0 SE "Universal Web Platform" as the core of the Energy saving system would benefit of architecture simplicity, short commissioning time, cost reductions, error proof configuration, expandability, and scalability.

The UWP 4.0 SE web platform with full functionalities meets today's Energy Managers and Energy Service Companies requirements to achieve energy efficiency goals.

■ An open system!

UWP 4.0 SE is the heart of a powerful system, it acts as a web server and a gateway which embeds various communication protocols such as Modbus TCP/IP, BACnet, SFTP, Rest API, etc. To meet the growing integration demands of IoT and cloud-based Industry 4.0, UWP 4.0 SE is certified for Microsoft® Azure IoT.

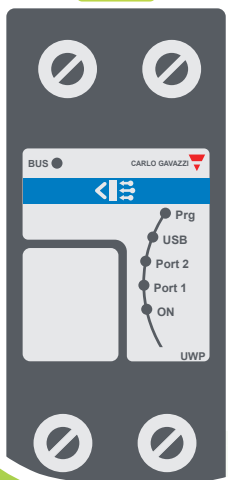
More specifically: FTP, SFTP, FTPS sends data securely and reliably on a schedule to a standard FTP server. Rest API enables the exchange of data with remote systems with the necessary flexibility. Modbus/TCP and BACnet bridges available data points using UWP 4.0 SE as a flexible data hub between fieldbuses.

UWP 4.0 SE is Microsoft® Azure certified for IoT. The available data points are sent via MQTT to the Azure IoT platform allowing users to stream data from multiple UWP 4.0 SE units to a centralized SQL or non-SQL database and from here to leverage the powerful tools from the Microsoft® Azure marketplace to analyse, organize, aggregate, and display data. In order to extend the integration capabilities of UWP 4.0 SE now also AWS IoT Core certification is available with all the advantages provided by the relevant services.

Disclaimer

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UWP4.0 SE

Gateway

Monitoring, data analysis and reporting

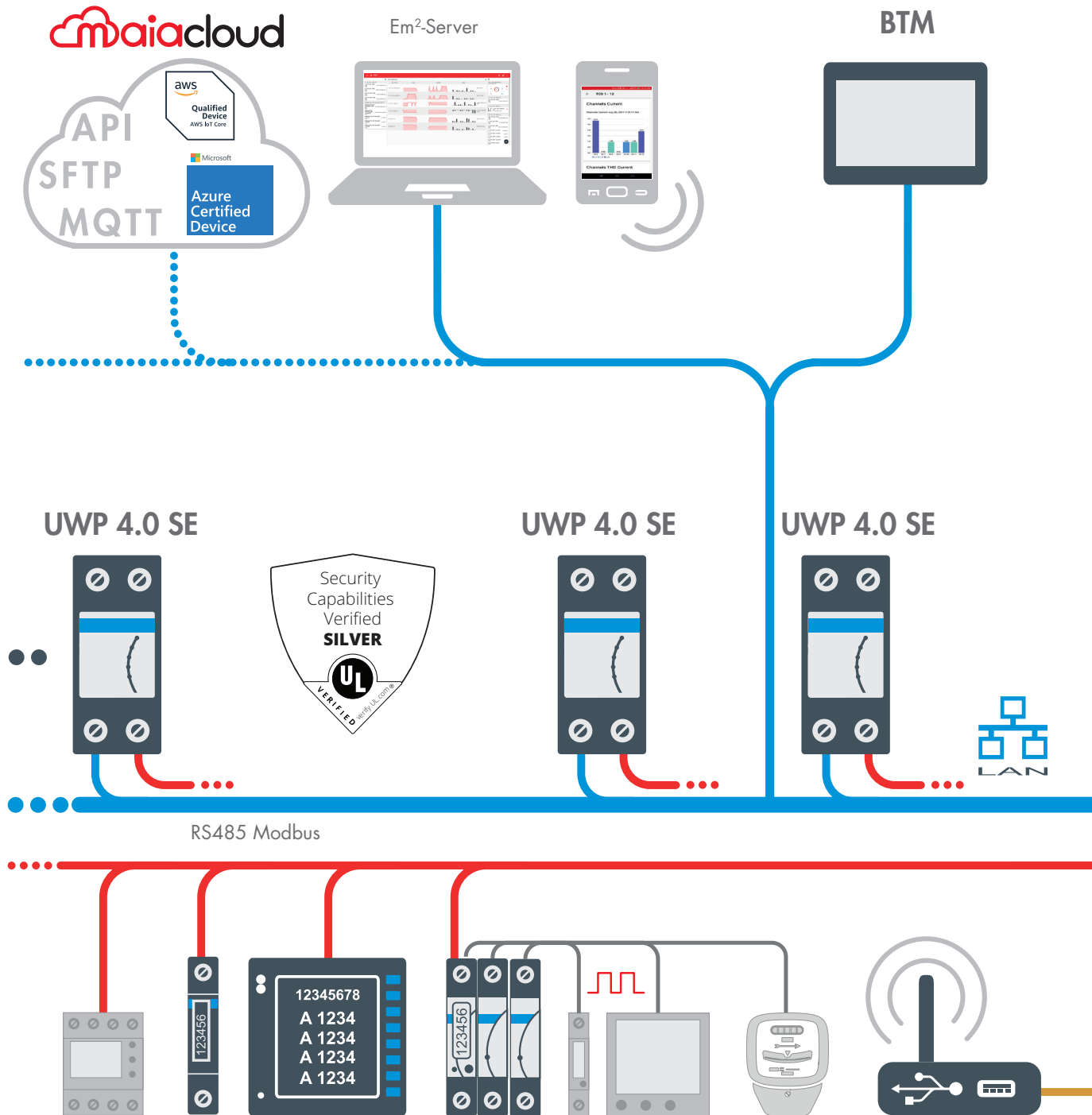
Wide control possibilities

Cost streamlining and energy saving

Active control

The scalable platform based on UWP 4.0 SE

to provide a full integration into a BEMS including also EV charging poles and PV storage



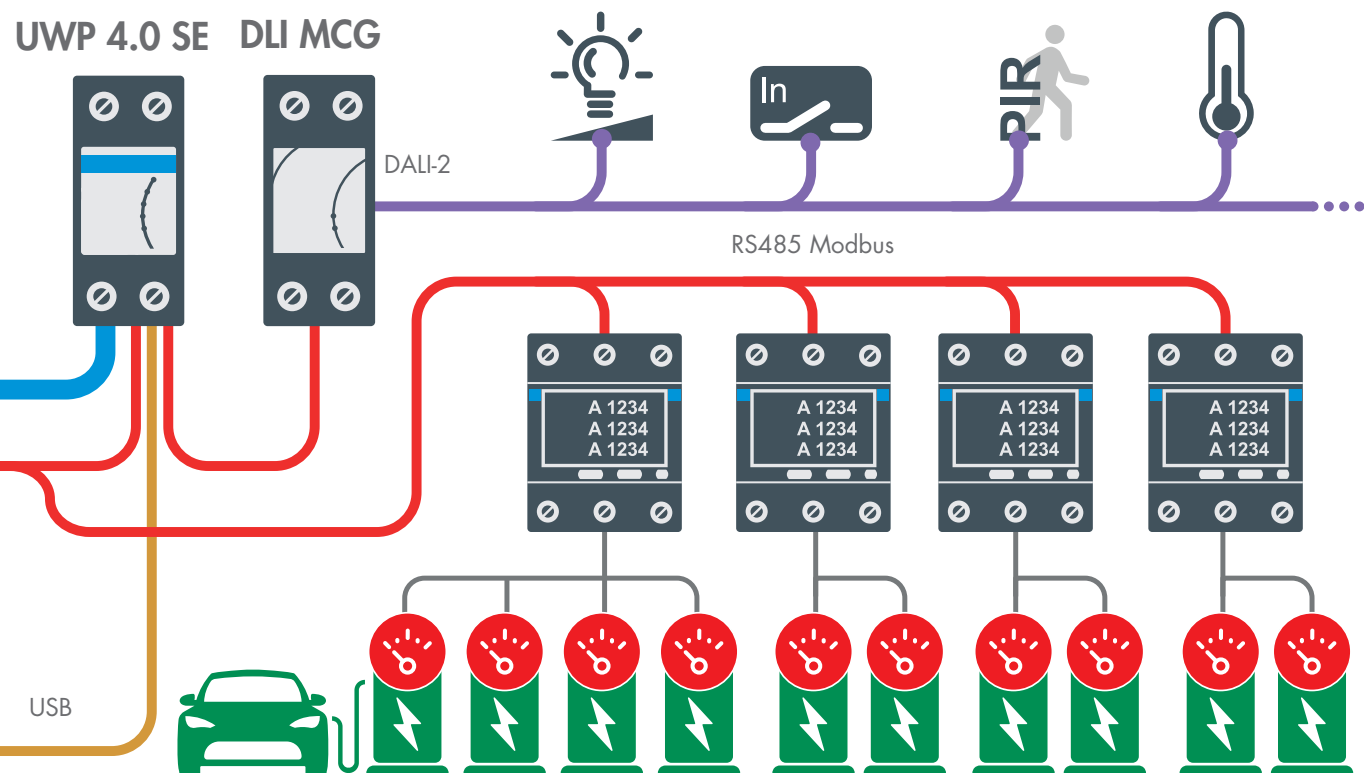
Monitoring system in the main electric panel

Flexibility and energy efficiency

UWP 4.0 SE offers a flexible option with a number of benefits for the more demanding Energy and Building Efficiency applications which include both PV storage systems and EV charging poles. A powerful ecosystem that combines both hardware and software to effectively meet the needs of end users, the energy market, and applications, which may include redesigning of the electrical grid.

Digitalisation and scaling-up capability

Digitalisation is the new buzzword, and IIoT evolution is the key to participating in a market that will increasingly be centred on data management to meet the demands of the future. UWP 4.0 SE Ecosystem provides a full monitoring package for integrators and energy managers who require an easy-to-deploy solution without the need to purchase pricey software and hardware integration from different suppliers.



Monitoring system upstream the EV charging poles

EV charging

The UWP platform and the cybersecurity

■ The Cybersecurity as core part of the UWP web platform

The importance of cybersecurity in Energy Management Systems

A secure system is made up of secure components: how can you claim that your component is secure?

Very often it seems that by adding some extra security software or hardware is the only way to go.

The right advice is based on minimalism: limit the number of components in use to the bare minimum and make sure that all of them are secure enough for the application; the point is how to evaluate cybersecurity of a component.

The best way is to rely on trusted certification or ratings: a product which has undergone a cybersecurity rating or certification by a cyber lab with a good reputation gives you peace of mind that your defences will protect against the vast majority of common cyber attacks.

The EDGE level is possibly the most critical: being at the same time in contact with the operational technology (OT) part in the field and the information technology part (IT) in the cloud, it is the most sensitive brick in the IIoT paradigm. A strong EDGE level is for sure a robust foundation on which to base the whole architecture.



The UWP platform is the IIoT gateway and controller by Carlo Gavazzi for EMS systems. It is the core of an ecosystem of more than 200 meters, sensors, actuators by Carlo Gavazzi. Besides, it can be connected both at field level and at cloud level to other systems so to play as the EDGE tier in an EMS architecture.

Carlo Gavazzi is committed to provide the best security level to customers and users; for this reason UWP 4.0 SE security capabilities have been verified by UL, one of the top worldwide laboratories for cybersecurity assessment and advisory. An official rating represents a solid and secure reference for the product selection. By having solid networking foundations and encouraging customers to protect their system via VPN and passwords, the UWP Web Platform is one of the first EDGE products in the market with an official cybersecurity rating.

The need of remote connection for end-users and system integrators is almost mandatory. Typically, users want to control their devices from their smart phones, and system integrators prefer to connect from their office to their customers' plant for solving problems. This way, they avoid trip and consequently save time and money.

As is already well known, a system where end points are connected to network and each other through smart devices, cyberattacks risks - and in general cybersecurity issues - grow exponentially.

A solution to protect their remote access to the target system is a secure Virtual Private Network (henceforth VPN) tunnelling.

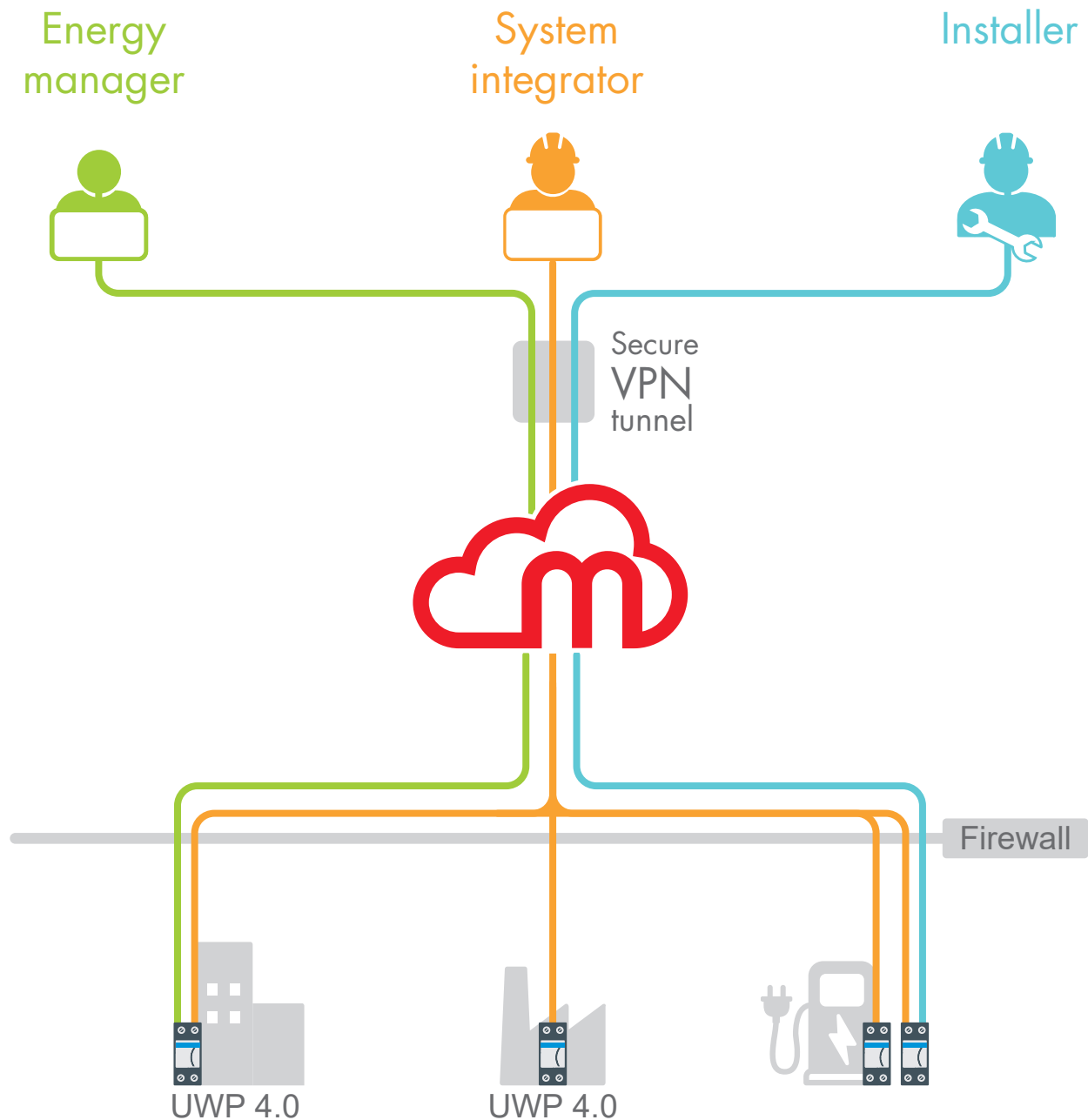
The VPN is the best choice to provide end-users and system integrators of end points with a secure remote access to smart phones, PC and IoT without threatening the network cybersecurity.

The goal is to guarantee the interconnection among devices, from device to external and the access to devices from outside, without mining the IT security and the sensitive data protection. The wellknown Internet services are conceived to be accessed by everyone; the so-called "public network" servers and the sensitive data are subject of fraudulent users' intrusions.

The creation of a private network (VPN) permits isolating a company network by using an IP address unreachable via Internet, with restrictions permitting the access only from external authorized devices. Moreover, the private network can be extended beyond the public network with an encrypted virtual connection.

The Carlo Gavazzi VPN for building efficiency applications including also EV charging and PV storage is MAIA Cloud. It is a PaaS (Platform as a Service) solution that allows a seamless connection of different remote devices, through UWP 4.0 SE gateways, so to develop the necessary energy efficiency monitoring and building automation solutions by connecting and setting the relevant items. Users who have access to the MAIA Cloud can easily reach the gateways and the endpoints, provided they have the necessary access rights, using a PC application called MAIA Cloud Connector.

By connecting to a centralized web portal, with a secure login, users can reach their fleet of UWP 4.0 SE units. Permissions for specific users or groups of users can be set by the organization administrator so to prevent any misuse. The VPN tunneling technology permits to set a secure encrypted channel between users and IIoT devices; the authentication procedure secures the access to the portal endpoint.

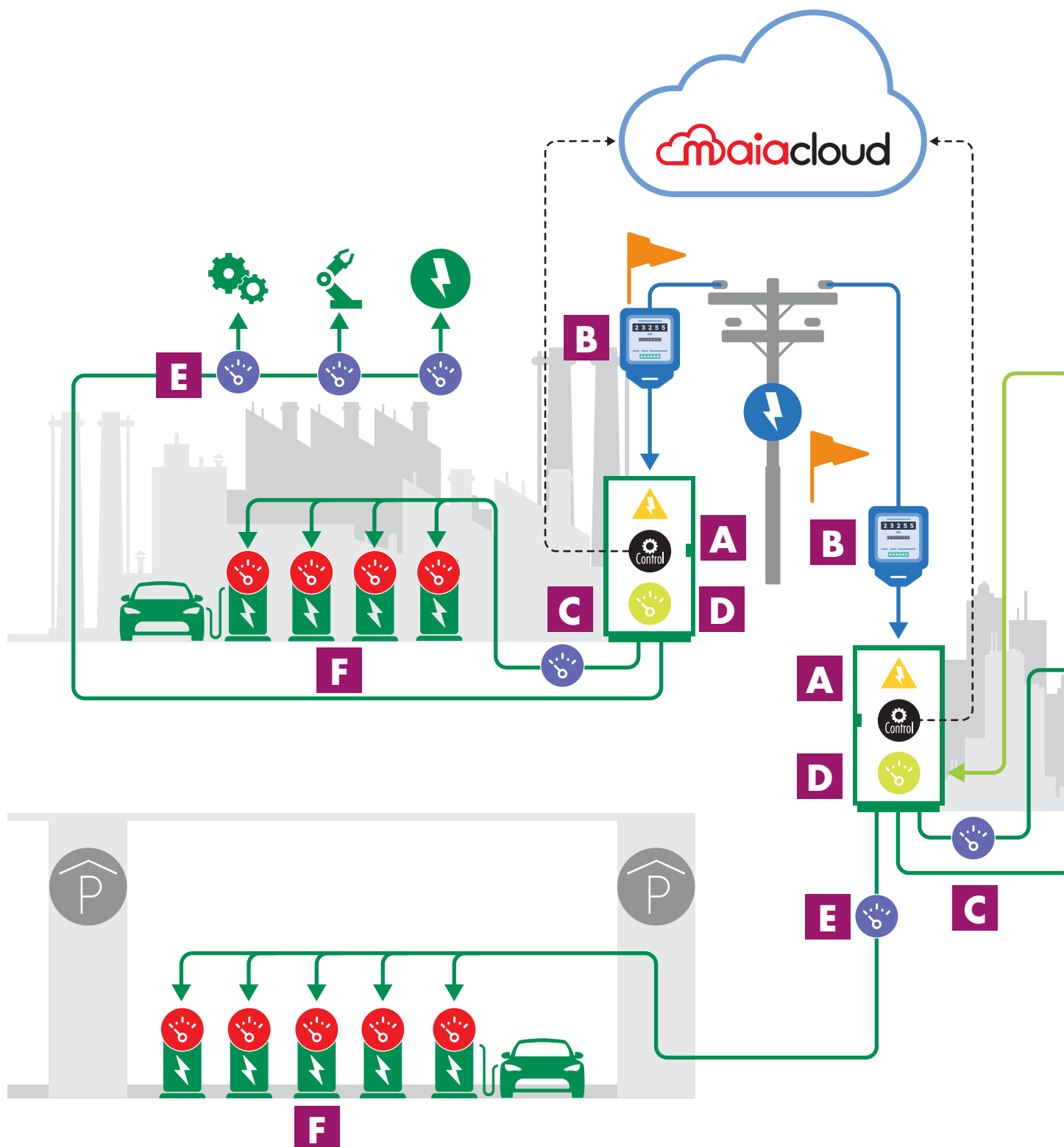


MAIA Cloud in energy monitoring and building automation OT (operation Technology) use case. Users according their roles have access to the endpoints (EDGE or FIELD devices) located in different plants. MAIA Cloud allows users with specific permission to send commands to endpoints or monitoring and manage data remotely.

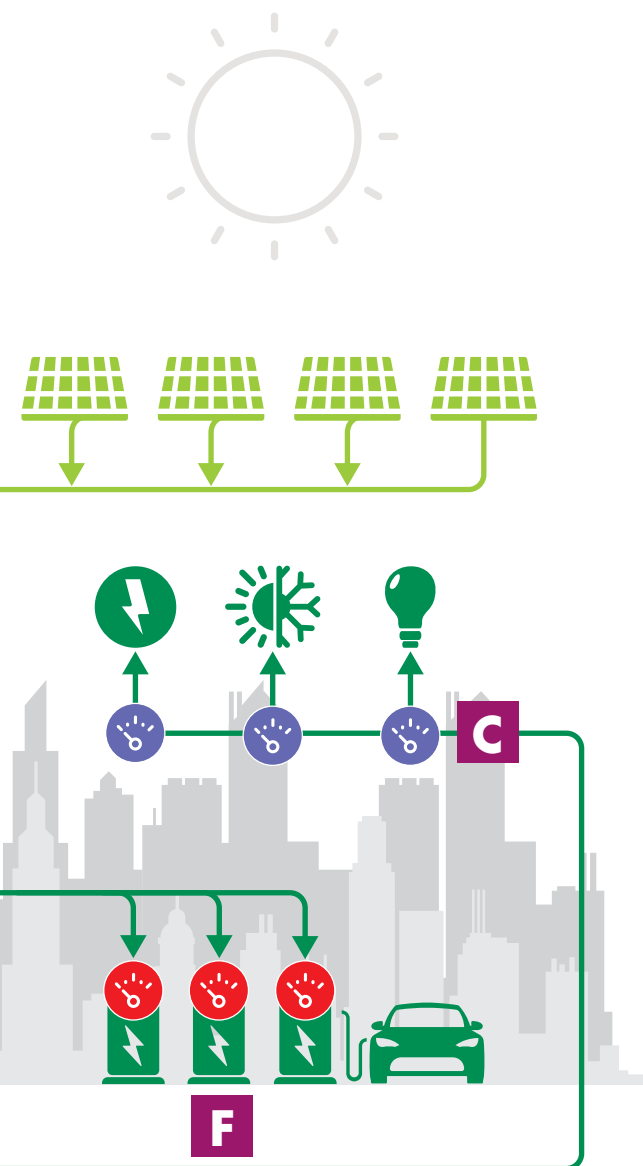
EV charging and The map

■ EV charging, PV storage and main switchgears

This map guides you, in this example, through the Carlo Gavazzi competences and product solutions. A journey through monitoring solutions of main instantaneous variables and energy from main electric panels to charging poles. A combination of different technical solutions aimed to integrate data from utility meters, main and sub-meters in existing or new installations!



PV storage



Utilities meters



Main-meters



Sub-meters



Charging pole meters



Controls

The topics

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A One platform, many integration solutions	22-23
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Utility, main and sub metering integration	26-27
C Main and sub-metering for existing and new installations	28-29 30-31
D Modular main metering with power analysis	32-33 34-35
E Quick-fit high-density metering solution	36-37
F AC and DC charging pole metering solutions	38-39

All products in this document are both CE and UKCA compliant

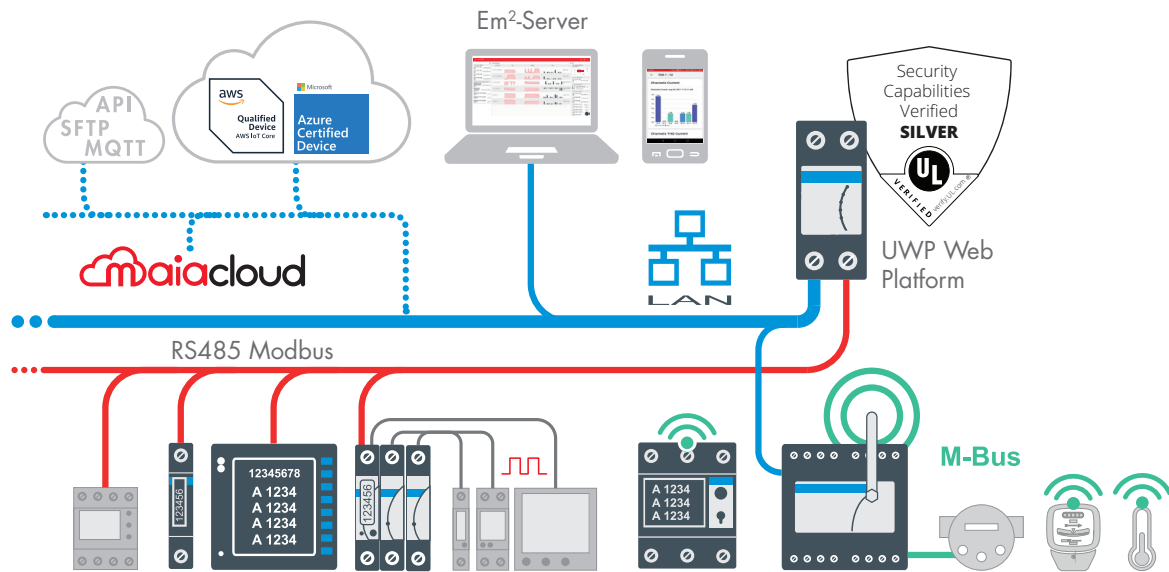
Electric panel

One platform, many integration solutions

Communication, analysis and reporting in one unit

UWP 4.0 SE with UL certified cybersecurity is the core of this web platform and also the unit with the task to analyse the plant variables being managed to achieve the energy efficiency goals.

UWP 4.0 SE is the core of the entire system and can provide, as a first step, all the remote, on-premise, or cloud functionalities. Simple architecture, short commissioning time, cost reductions, error proof configuration, expandability and scalability are the distinctive characteristics of this unit. UWP 4.0 SE is a Web-Server but also a gateway. UWP 4.0 SE is Microsoft® certified for IoT. One or many UWP 4.0 SE pushing their data to the Microsoft® Azure IoT Hub will allow System Integrators to extend the level of integration to other systems. Data can be shared locally via Modbus/TCP or BACnet, while M2M makes integration with other systems possible via Rest-API or standard FTP, SFTP, FTPS communication. Excel® reports can be generated online or via the embedded scheduler. Whenever ESCos and Energy Managers need a solution for taking control to achieve their Energy Efficiency goals, UWP 4.0 SE provides a solution to match the existing scenario.



UWP 4.0 SE

- Micro PC with embedded Web Server, WEB services and data logger functions
- Ethernet Modbus TCP master/slave function
- 2 x RS485 ports, both of which support up to 64 Modbus devices
- Data display (charts and tables)
- Real time or scheduled data export to Excel, CSV and HTML formats
- 4GB internal memory, Back-up memory on micro SDHC and USB
- Energy analysis of each load
- Configurable dashboards with data analytics and real time display functions
- Embedded Modbus editor for compatibility with any Modbus meter
- Alarm management (e-mail or SMS by means of SH2-DSP)
- 2-DIN module housing
- 12 – 28 V dc power supply

The advanced functions of UWP 4.0 SE

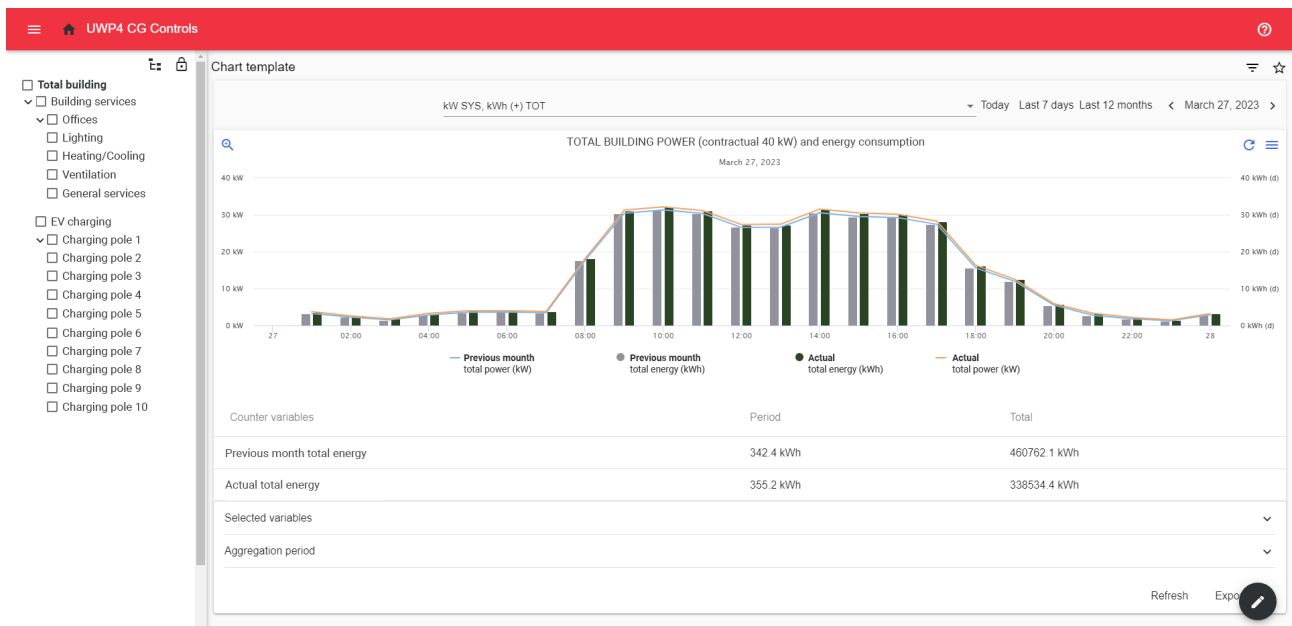
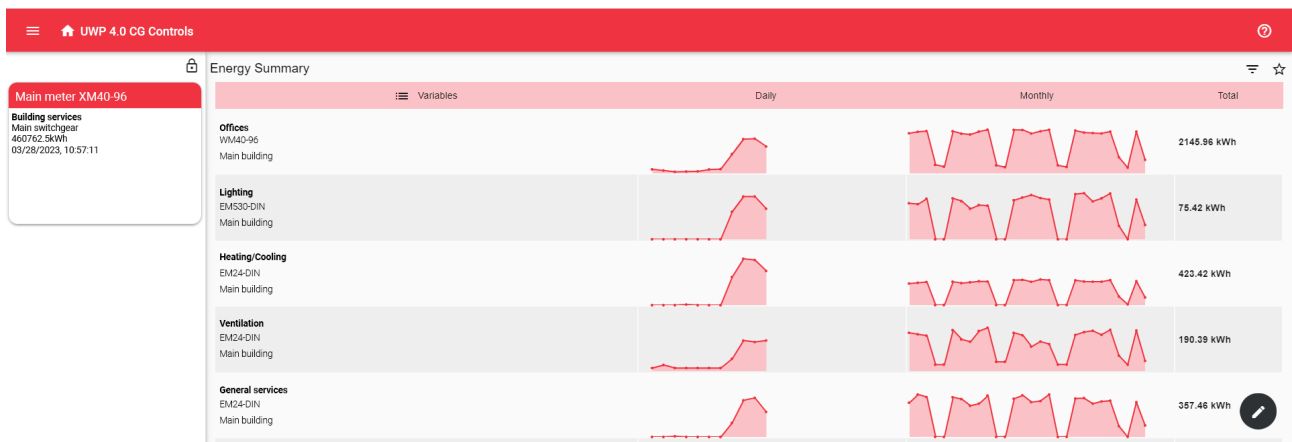
- Embedded automation server allows data to be exchanged locally or remotely via standard Internet protocols such as: FTP, SFTP, FTPS, SMTP, Rest-API, MQTT, Modbus and BACnet
- Complete lighting control system based on DALI-2
- BACnet/IP gateway operation
- Up to 5000 managed signals (including variables, I/Os)
- Up to 5 users concurrently connected to the Web-App
- Up to 5 concurrent M2M connections (API connections, BACnet clients, Modbus masters)
- BTL certified (max 1000 BACnet points for used BACnet objects)
- USB port for external modem management



Tools to properly display the key variables

The UWP 4.0 SE unit allows you to automate the process of collecting data points from multiple meters and other sensing units.

The embedded Web-Server allows both system integrators and Energy Managers, by means of Dashboards, to mix both history and real time data. This means, to display the key plant variables using analysis tools such as tables, trends, histograms, pies, comparison functions, which can be used also to perform diagnostics on both communication and data during plant commissioning, particularly when UWP 4.0 SE is part of a complex management architecture which may include EV charging and PV storage. Multiple user access, with authentication and granular control, allows to match any use case.



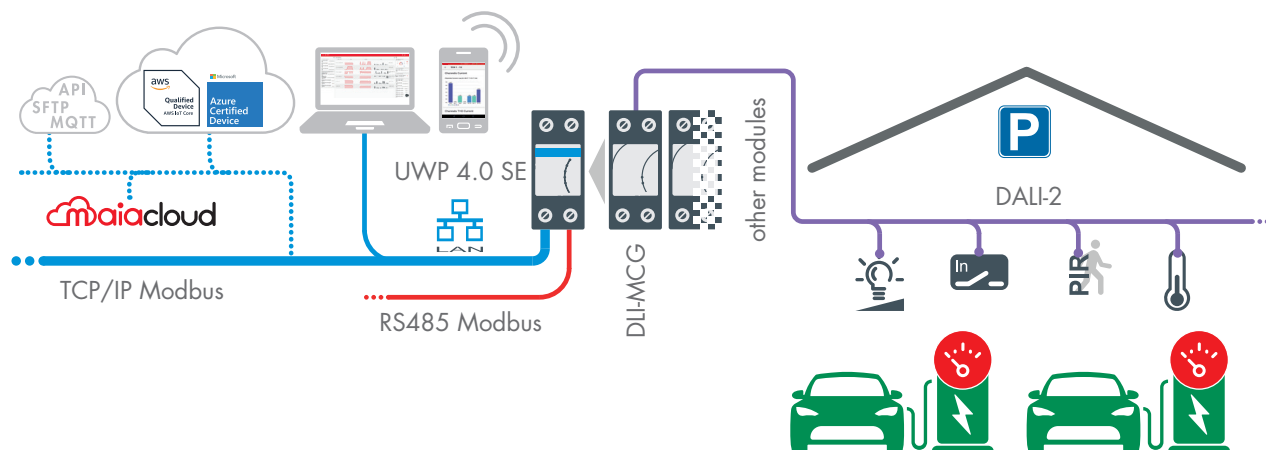
Electric panel

Data collection and displaying

Many ways to collect and display data

DALI-2 technology makes the communication easier and more flexible also in a parking place with EV charging poles

The DALI-2 technology which Carlo Gavazzi has embedded into the DLI-MCG unit is a step beyond an energy efficiency program, since it provides through the commercial LED-based lighting systems but also through other sensors like digital inputs/output, PIRs and temperature, all accessories compatibility to transform a regular indoor car park into a smart one.



■ An indoor car park with charging poles

Car parks are evolving adding also charging poles being the ideal place where to charge both BEVs and PHEVs with a regular charging cycle. In those places there is the need to provide sensors capable to detect people so to switch ON and OFF a lighting system or to manage the ventilation according to the situation so to save energy. That's why Carlo Gavazzi provides a dedicated end-user app to turn a smartphone into a powerful remote controller. It also provides a family of HMI panels with 7", 10" and 15.6" display footprint including also BTM Studio suite which is a powerful integrated development environment to design and manage a wide range of applications so to meet all the energy saving strategies.

■ BTM-T7, BTM-T10

BTM-T7

- 7", 800 x 480 pixel
- Dimensions 187*147*34 mm

BTM-T10

- 10", 1024 x 600 pixel
- Dimensions 282*197*34 mm

BTM-T7 and BTM-T10

- TFT resistive touchscreen, 64 k colours
- 1 Ethernet port, 1 USB port, Multistandard serial port
- Linux operating system
- Fully programmable by IDE software
- IIoT data distribution via MQTT and OPC UA
- BACnet, Modbus communication protocols
- Data logging
- 24 V dc power supply

■ BTM-T15

- 15.6", 1366 x 768 pixel HD
- Dimensions 422*267*64 mm
- TFT capacitive multitouchscreen
- 16 M colours
- 3 Ethernet ports, 2 USB ports, SD card slot, multi-standard serial port
- Linux operating system
- Fully programmable by the IDE software
- IIoT data distribution via MQTT and OPC UA
- BACnet, Modbus, KNX communication protocols
- Data logging
- 24 V dc power supply

■ BTM Studio suite

This Windows suite is made by three licenses:

BTM-PC-IDE software

- large embedded widgets library to design and manage HMI projects
- Wide range of communication protocols to meet all different application requirements
- OPC UA server / client for Industry 4.0 applications to exchange data among HMI, PLC and devices
- MQTT service for IIoT messaging compatible with any MQTT broker
- Unified programming approach for native and web HMI applications with HTML5 and Javascript support
- Easy integration into the UWP 3.0 SE ecosystem through plug and play import of Modbus maps and EDE BACnet files

BTM-PC-RUNTIME: A powerful PC Runtime application turns any Microsoft® Windows® computer into a HMI panel

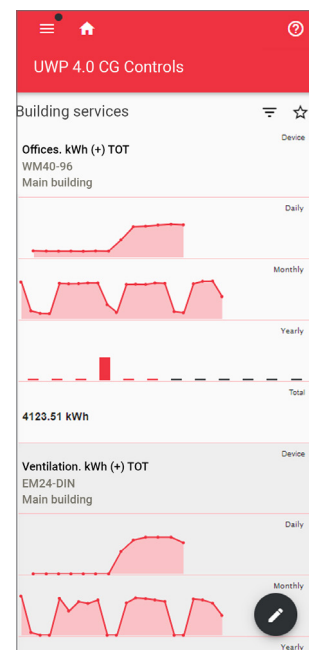
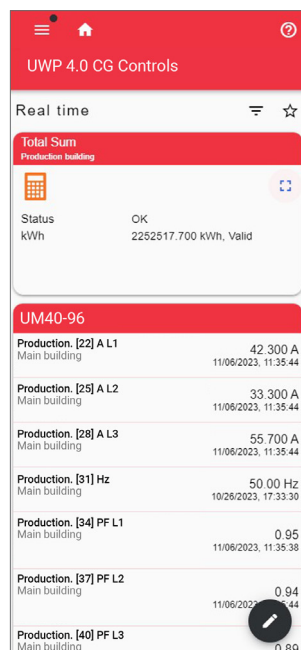
BTM-PC-CLIENT: is a viewer



Right at your fingertips

Apps are essential tools to control a building and its services remotely

The pages of the integrated web app, available both for Android and iOS phones/tablets, can easily be customised with graphs to monitor the consumptions and in a building also the temperature or the level of a light. Many widgets are available to remotely control any function of the system. The Web-App embedded into UWP 4.0 SE does not need a licence fee and can be operated remotely via MAIA Cloud.



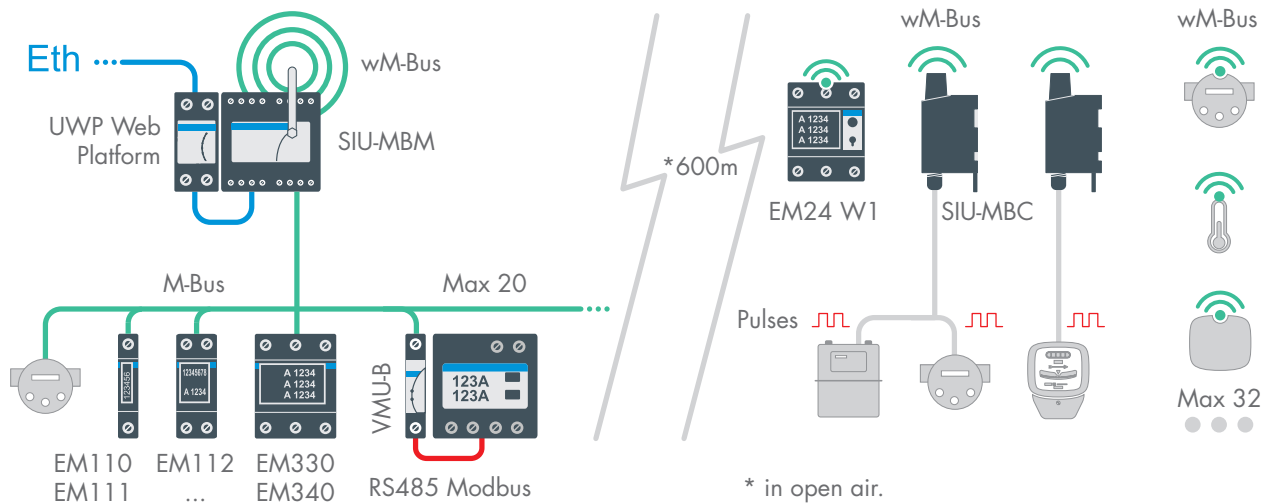
Electric panel

Utility, main and sub meter integration

Existing utility metering

The utility meters are sources of valuable, unexplored, frequently unavailable information.

If the utility meters are M-Bus (EN13757) wired or wireless based, then SIU-MBC can be used as a dual pulse counter or directly via SIU-MBM which acts as a gateway. These add-on solutions make this valuable information available for your Automatic Energy Monitoring System. More specifically: if the utility meter has only a pulse output, no available auxiliary power supply, and the meter itself is far from your nearest distribution board, the solution is the wireless SIU-MBC. It is self-powered by an internal battery lasting up to 12 years, and is perfectly suited to outdoor applications; if the utility meter is wired or wireless M-Bus-based, the solution is SIU-MBM. All devices with the exception of SIU-MBC can be configured using UCS, the Universal Configuration Software for Carlo Gavazzi meters and accessories.



SIU-MBM 01, SIU-MBM 02

SIU-MBM 01 and 02

- Collects data from multiple M-Bus and wireless M-Bus devices
- Converts data from M-Bus and wireless M-Bus into Modbus TCP/IP
- Up to 20 connected M-Bus devices (300 to 38,400 bps), daisy chain or star connection
- Ethernet Modbus TCP/IP output
- 15 – 21 V ac, 18 – 35 V dc power supply
- On DIN rail or wall-mounted, IP20.

SIU-MBM 02

- Up to 32 wireless M-Bus devices
- Wireless communication antenna
- Frequency 868 MHz

VMU-B

- RS485 Modbus-based meter to M-Bus adapter
- One to one communication
- Meter self recognition: EM210, EM270, EM271, EM280 and WM15
- Universal power supply (18 – 260 V ac/dc)

SIU-MBC

- 2 pulse inputs, selectable scale and engineering unit, like: 1/10/100/1000 (Wh, dm³ or L)
- Wireless M-Bus, 868 MHz
- Data transmission interval: 10 s, 10 min, 12 h
- Operating range up to 600 m in open air
- Battery: lithium, Li-SOCI2 (≥12 years lifetime)
- Mechanical lock with safety seal to ensure protection degree and prevent accidental opening
- Assembly with zip ties on tube/mast or wall-mounted with screws or on DIN rails
- Anti-fraud system, IP67

EM24 W1

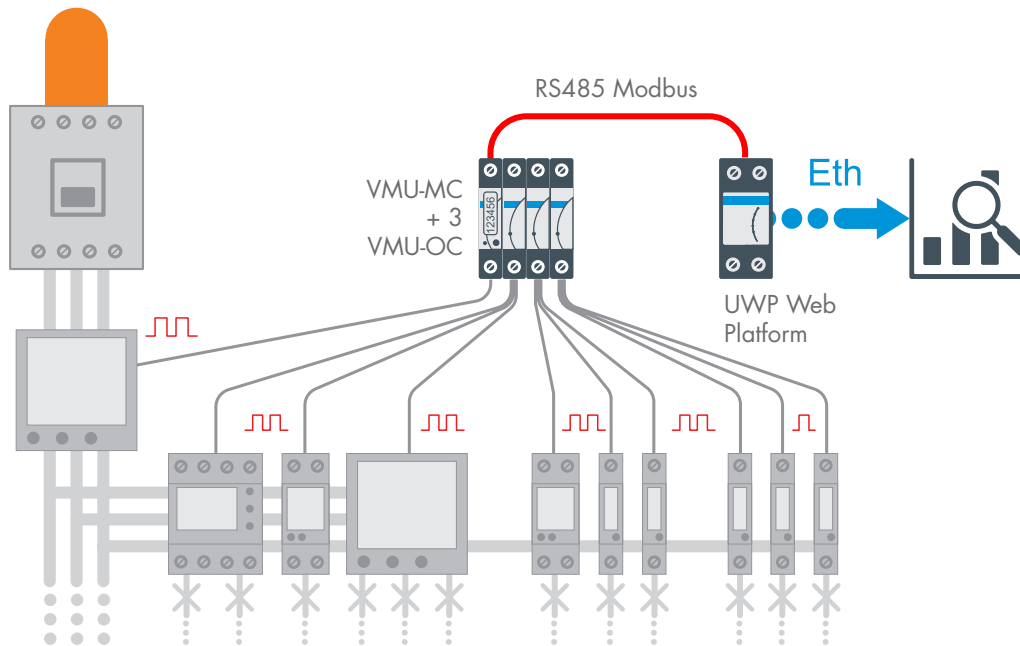
- CT 5 A, 230 – 400 V L-L ac measuring inputs, 115 – 230 V ac power supply
- 65 A, 230 – 400 V L-L ac measuring inputs, self-power supply
- 4-DIN modules housing
- 3 counter digital inputs
- 2*8-digit LCD
- Single and three-phase measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, 4-tariff, 3*1-phase kWh
- Basic accuracy (V/A): ±0.5% RDG
- Bi-directional kWh (cl. B EN50470-3 MID approved)
- wM-Bus wireless communication
- Two antenna options: external or built-in



Existing main and sub metering

Already installed pulse output-based meters can still be part of a data collection system!

In many installations, old fashioned meters are still working properly but energy information is still collected manually with both high data collection costs and potential transcription errors. Now, concentrating on multiple meters' pulse outputs and making them available as RS485 Modbus counters is possible, thanks to the modular VMU-MC + VMU-OC solution ranging from 2 to 11 pulse inputs (counters). Pulse to Modbus conversion is the key to automatic data collection, which ensures quality, granularity, and full management of data.



VMU-MC, VMU-OC

- 1-DIN module housing
- Modular
- RS485 communication port
- 11 total inputs available
- Unit of measure: kWh, kvarh, kVAh, kJ, kcal, m³, Nm³, h, pcs, kg

VMU-MC:

- LCD display for: status, counter, any active tariff
- 2 inputs available (for pulses counting or for up to 4 tariffs selection)

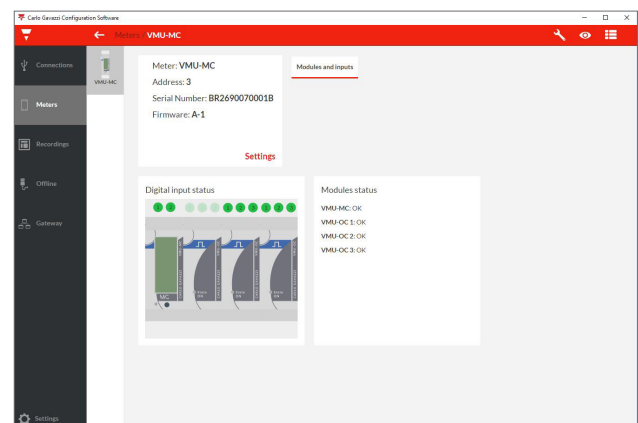
- 15 – 24 V dc power supply

VMU-OC:

- 3 inputs available (for pulses counting only)

■ The UCS software configuration advantages extended also to VMU-MC and VMU-OC!

UCS features for configuring devices, storing configurations into a database, sharing configurations and logs among users, and checking the device status are available also for VMU-MC/OC. Therefore the two VMU-MC inputs can be set as counters, or one as a counter and one to sense tariff change as a digital input, managing automatically the energy increase for both tariff 1 and tariff 2. Every counter input and function has an independently configurable pulse weight.



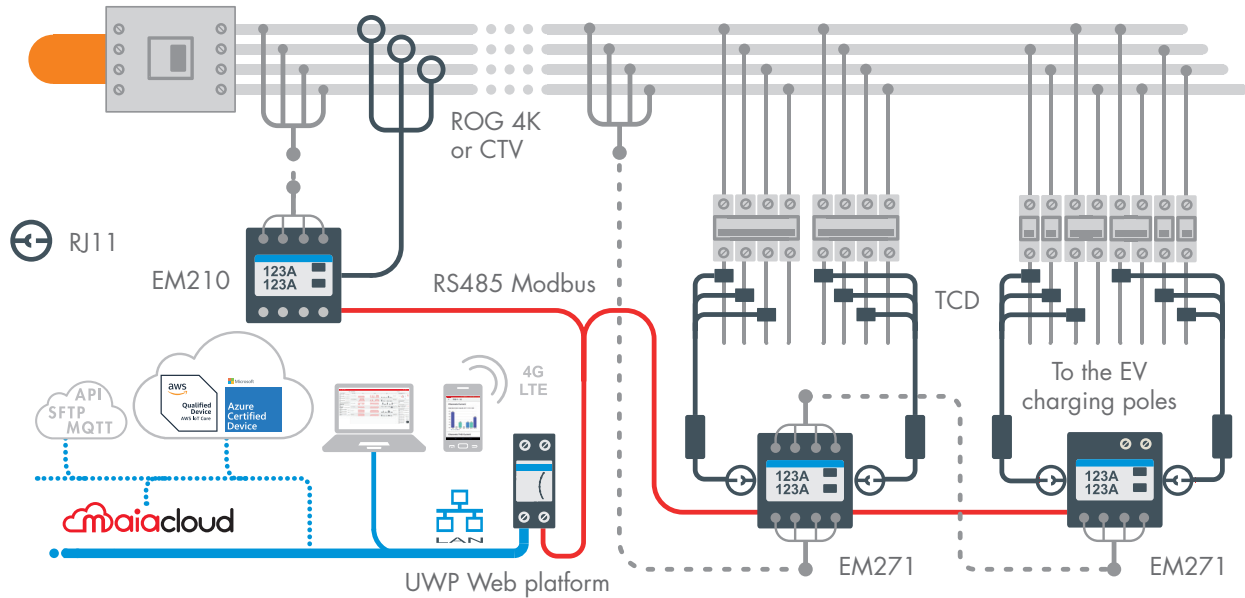
Electric panel

Quick-fit metering solutions

Main and sub-metering for existing installations

Non-invasive installation solution

EV charging poles are often installed in existing installations. A metering system is needed to monitor all electrical variables so to keep the whole installation under control. The EM200 series has been designed to perform a quick installation providing on the same meter two different mounting modes but also no need of current busbars modifications because all current inputs are for split-core current transformers with quick-connection types.



EM210, main metering solution

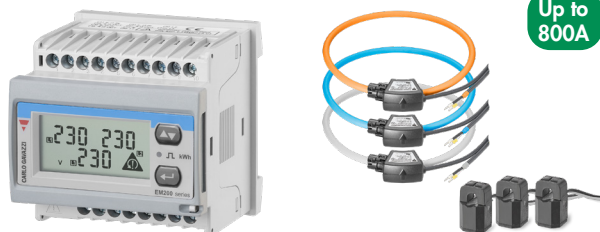
- Patented meter, 4-DIN and 72x72 mm solution in the same housing for DIN-rail or panel mounting. Detachable 3*3-DGT/7-DGT display
- Up to 415 V L-L ac and CT/CTV/ROG-based current measuring inputs
- 5 A CT (AV version), 333 mV from CTV 1X-2X-3X-4X-6X-8X sensors (MV version), Rogowski current sensors (MV version)
- Measurements: V, A, Hz, PF, W, VA, var, bi-directional kWh
- An (calculated), THD up to 15th harmonics
- Pulse output and RS485 Modbus RTU (up to 115 kbps) port
- Self powered (230 V ac)
- Basic accuracy (V/A): $\pm 0.5\%$ RDG, kWh class 1 (IEC/EN 62053-21)
- Class B (EN50470-3), MID approved (AV version only)

CTV and ROG 4X series, sensing solutions

- **CTV 1X-2X-3X-4X-6X-8X.** Split-core current sensing unit, 333 mV output.

Model	Primary (A)	Hole size (mm)
CTV 1X and CTV 2X	60 and 100	9.6 and 15.5
CTV 3X, CTV 4X and CTV 6X	200 and 400	15.5, 20.5 and 36
CTV 8X	800	50*89.8

- **ROG 4X.** Rogowski coil current sensors. Primary: 20 to 4000 A, diameters: 90, 120, 200, 290 mm



Up to 800A

EM271, sub metering solution

- Patented meter, 4-DIN and 72x72 mm solution in the same housing for DIN-rail or panel mounting. Detachable 3*3-DGT/7-DGT display
- Up to 415 V L-L ac and TCD-based current measuring inputs
- Current measurement by two basic TCD units with quick RJ11 plugs (see TCD xM series)
- Quick configuration by automatic recognition of TCD units
- 2*3-phase energy analysers with sum function in the same unit
- Measurements: V, A, Hz, PF, W, VA, var, bi-directional kWh
- RS485 Modbus RTU. 2 pulse outputs (loads 1 and 2)
- Self powered (230 V ac)
- Basic accuracy (kWh): $\pm 2.0\%$ RDG (meter + TCD xM unit), kWh: class 1 (IEC/EN 62053-21)

TCD 0M-1M-2M-3M, MM sensing solutions

- Combination of three single split-core current sensing units

Model	Primary (A)	Hole size (mm)
TCD 0M and TCD 1M	60 and 100	9.6 and 15.5
TCD 2M and TCD 3M	200 and 400	15.5 and 20.5
TCD MM	Up to 10000(*)	See CTV series

- Basic TCD xM unit (connected to three current sensors) for panel and DIN-rail mounting (*) Compatible with current sensors with 333 mV output

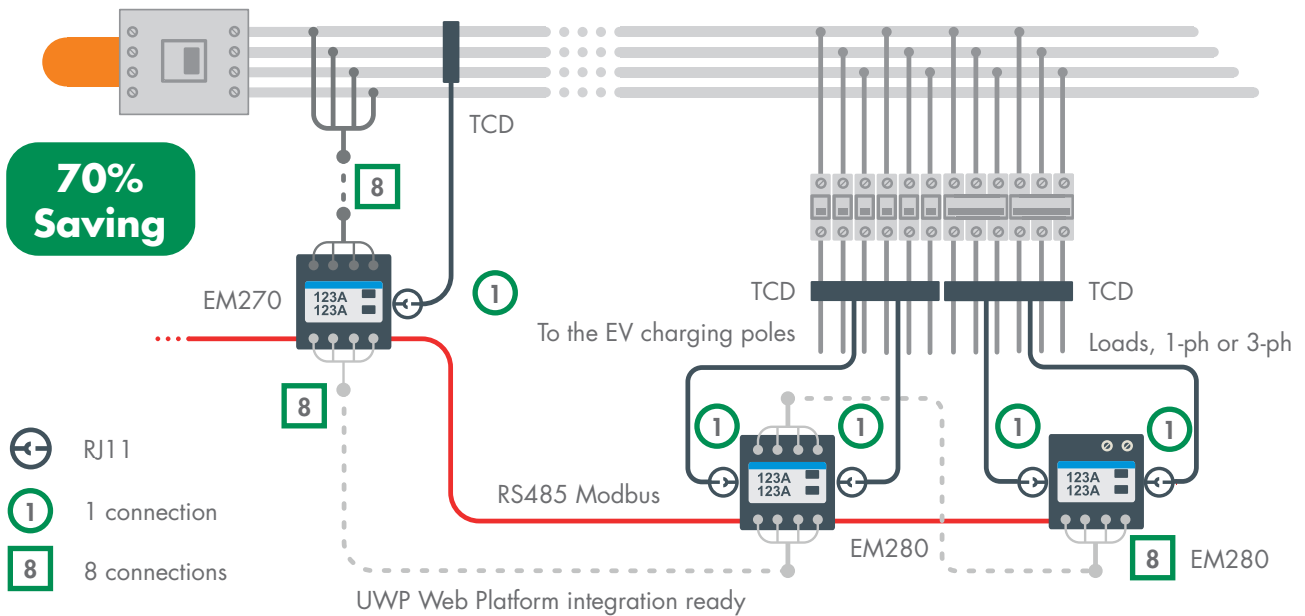


Up to 10kA

Main and sub-metering for new installations

Short-time installation solution

While in an existing installation the metering integration is a concern, in a new installation it is the need to streamline investments and costs, therefore Carlo Gavazzi with its EM200 series - Quick-fit is the solution. In an installation where EV charging poles have to be monitored upstream, EM270 and EM280 depending on the installation position can measure by every single unit, two three-phase EV charging poles or up to six one-phase EV charging poles. This solution will avoid to install single meters reducing the installation time about 70% and will limit meters investments.



EM270, main metering solution

- Patented meter, 4-DIN and 72*72 mm solution in the same housing for DIN-rail or panel mounting. Detachable 3*3-DGT/7-DGT display
- Up to 456 V L-L ac and TCD-based current measuring inputs
- Current measurement by two triple solid-core sensing units with quick RJ11 plugs (see TCD X series)
- Quick configuration by automatic recognition of TCD units
- 2*3-phase energy analysers with sum function in the same unit
- Measurements: V, A, Hz, PF, W, VA, var, bi-directional kWh
- Basic accuracy (kW): $\pm 1.25\%$ RDG (meter + TCD x unit). kWh: class 1 (IEC/EN 62053-21)
- RS485 Modbus RTU. 2 pulse outputs (loads 1 and 2)
- Self powered (230 V ac)

TCD 1X-2X-3X, sensing solutions

- Triple solid-core current sensing unit

Model	Primary (A)	Bus-bar sizes (mm)	Centre-to-centre distance (mm)
TCD 1X	3*160	15.5*25	25
TCD 2X	3*250	21*25	35
TCD 3X	3*630	31*31	45

EM280, sub metering solution

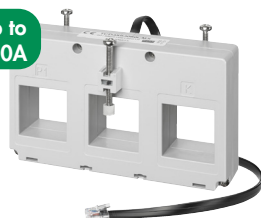
- Patented meter, 4-DIN and 72*72 mm solution in the same housing for DIN-rail or panel mounting. Detachable 3*3-DGT/7-DGT display
- Up to 456 V L-L ac and TCD-based current measuring inputs
- Current measurement by one 6-channel solid-core sensing unit with quick RJ11 plugs (see TCD 06 series)
- Quick configuration by automatic recognition of TCD units
- 2*3-phase/6*1-phase energy analysers with sum function in the same unit
- Measurements: V, A, Hz, PF, W, VA, var, kWh
- Basic accuracy (kW): $\pm 1.25\%$ RDG (meter + TCD-06 unit). kWh: class 1 (IEC/EN 62053-21)
- RS485 Modbus RTU. 2 pulse outputs (loads 1 and 2)
- Self powered (230 V ac)

TCD 06BX-06BS, sensing solutions

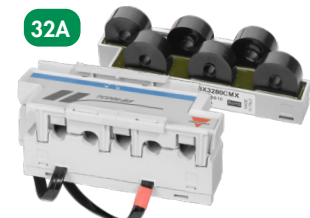
New installation, TCD 06BX	Retrofitting, TCD 06BS
6-channel solid-core current sensing unit	6-channel split-core current sensing unit
• Primary: 6*32 A, hole size: 7 mm. Centre-to-centre distance: 17.5 mm. RJ11 cable length: 80, 150 or 200 cm	



Up to 630A



32A



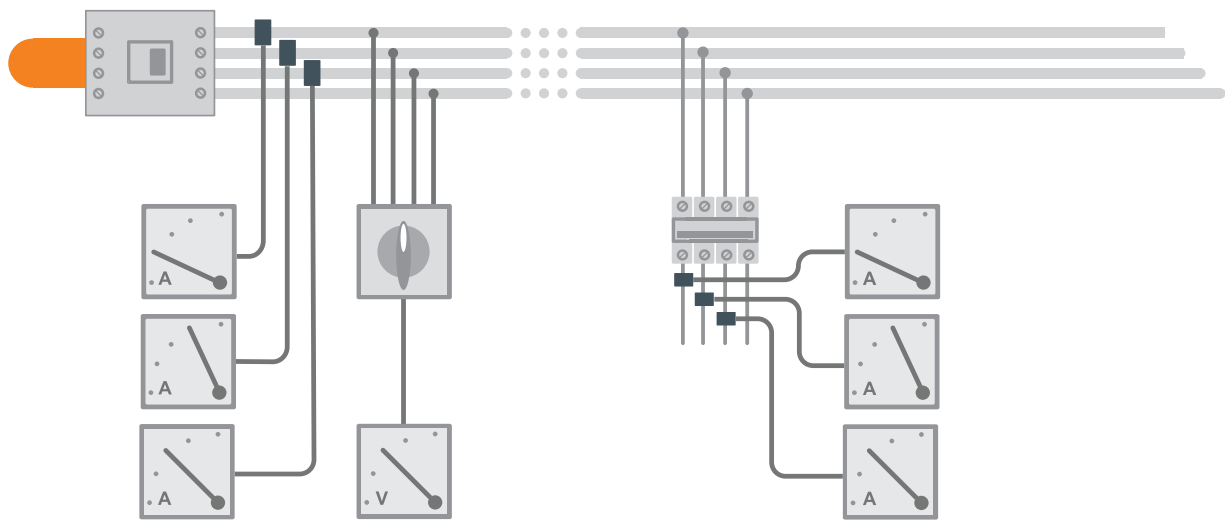
Electric panel

Panel mount meters

The evolution of user needs

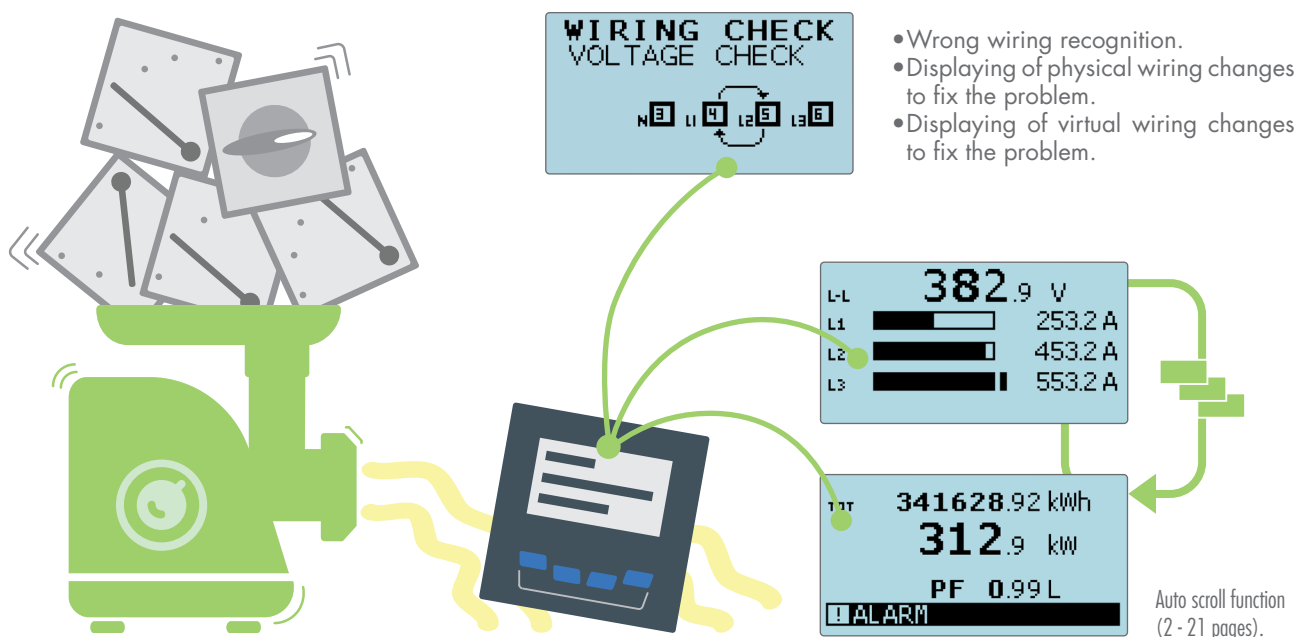
The use of analogue panel meters is not only linked to cost reasons

Even today, analogue ammeters and voltmeters are frequently installed in distribution boards. The choice is almost always dictated not only by cost reasons, but by the need to make any anomalies visible at a glance. The maintenance personnel in fact need to have immediate feedback on the main operating parameters in order to operate in optimal conditions both in routine and emergency situations.



Users' needs change and with them the technical solutions proposed

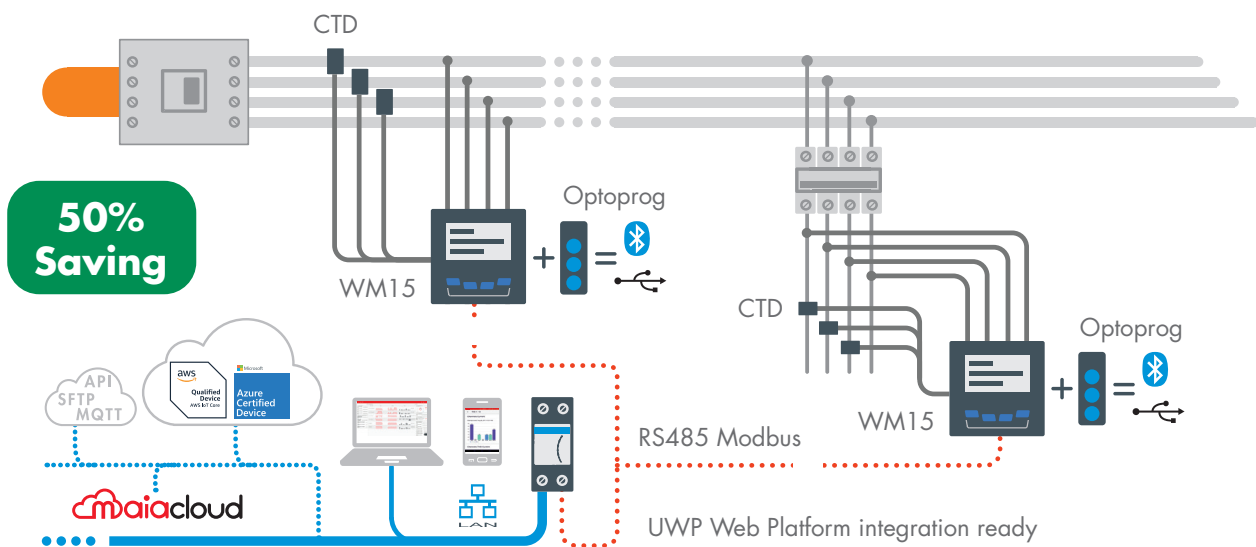
The position of the pointer in the analogue scale and the comparison among other analogue panel meters on the same distribution board is preferred for the reduced effort of the user in processing the information he is voluntarily searching for (intrinsic cognitive load). But we know that the world evolves, becoming more complex and demanding. The ideal answer to this change is to offer a solution that allows an analogue comparative displaying, allowing a rough but immediate understanding of the variable being measured but also, by means of a digital display, a proper accurate visualization of the same variable.



Immediacy of visualisation and integration

The answer to the traditional use of analogue panel meters is WM15.

WM15 is also the answer to the growing need for additional electrical variables to make more in-depth analysis. This solution condenses the information of four analogue panel meters into a single meter, but also provides an accurate measurement of power and energy thanks to the continuous and simultaneous sampling of all phases. When it is installed on a distribution board, it can relate the energy consumption to the time the EV charging pole is operating. Moreover, if an alarm is set, it can display it locally and transmit automatically and remotely all needed variables to advice about anomalies or to provide data to start a preventive maintenance plan instead.



How to reduce installation and commissioning costs

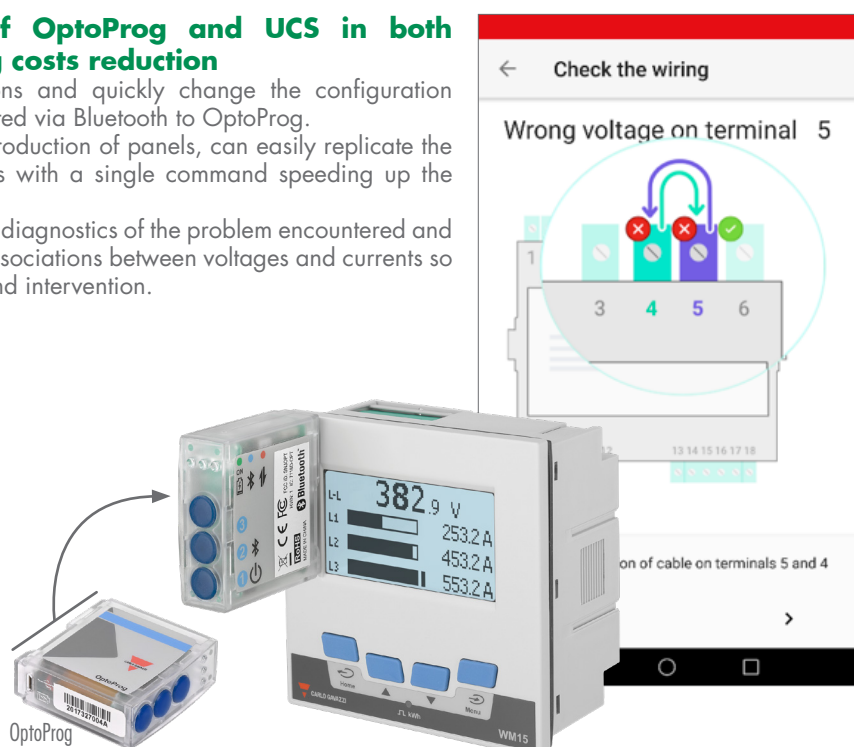
Installation and commissioning of advanced panel meters often have additional and hidden costs compared to standard analogue panel meters. WM15 reduces these costs by 50% compared to a standard 4 analogue meters installation and even more versus a standard power analyser installation thanks to its advanced wiring-control algorithm and its improved usability.

The additional benefits of OptoProg and UCS in both installation and commissioning costs reduction

- The installer can check the connections and quickly change the configuration parameters using a smartphone connected via Bluetooth to OptoProg.
- The panel builder, in case of a series production of panels, can easily replicate the same configuration on all WM15 units with a single command speeding up the production process.
- In case of wiring errors, UCS provides a diagnostics of the problem encountered and can virtually correct the proper phase associations between voltages and currents so to fix the error without requiring a second intervention.

WM15

- 5 A current inputs for current transformers
- Up to 477 V L-L measuring inputs (self-power supply)
- Up to 690 V L-L measuring inputs (auxiliary power supply 120 - 240 V ac/dc)
- 96*96 panel mounting, 59 mm depth
- 4*4-DGT + 3-bargraph backlit matrix display
- Bidirectional kWh and kvarh, run hour meter
- System and phase: V L-L/L-N, A, W, var, VA, PF, Hz, THD (V-A)
- Current and power demand calculation
- Static output for pulse transmission or alarm
- RS485 Modbus RTU port (100 ms data refresh)
- Basic accuracy (V/A): $\pm 0.5\%$ RDG, kWh class 1 (IEC/EN 62053-21)
- MID approved (on request)



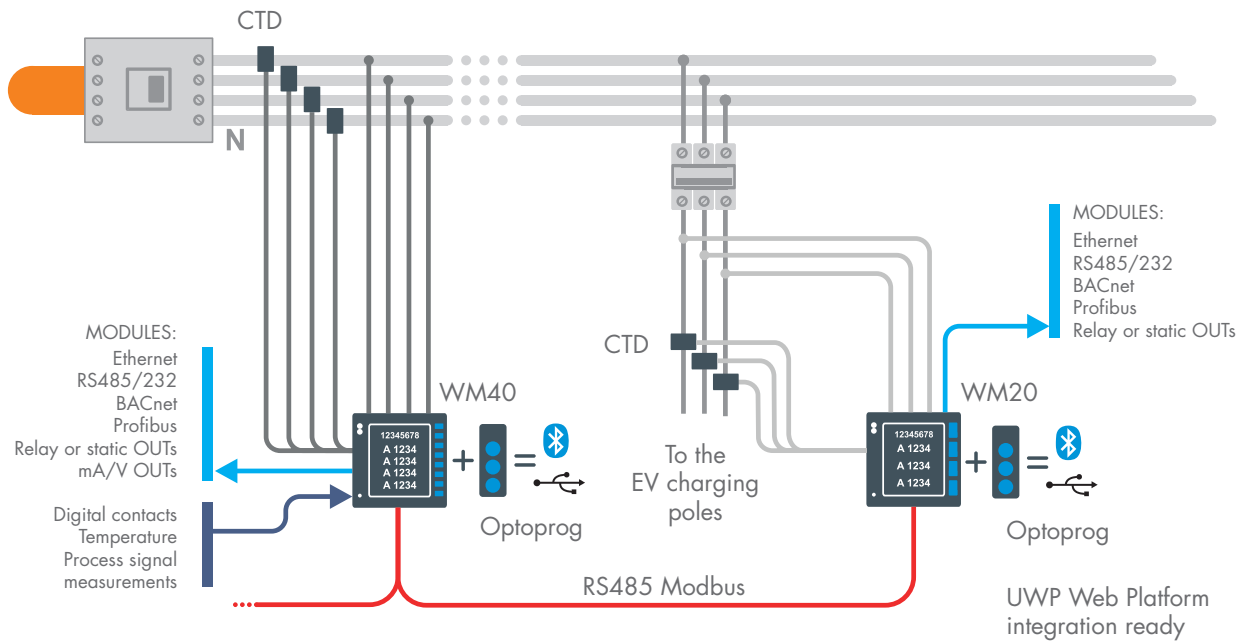
Electric panel

Beyond panel mount meters

Modular main metering with power analysis

A high-spec meter is often time demanding due to its installation and commissioning complexity: how can you make it time and cost effective?

Yes, by selecting the most appropriate device to meet the different installation and application needs among the three available power analyser models. Metering capabilities, and control functions, as well as a common modular system are the key features. Panel Builders, System Integrators and Installers enhance and speed up their activities of initial meter configuration, communication diagnostics and commissioning with the help of the combination of new and innovative tools like OptoProg, UCS desktop, and UCS mobile.



WM20

- 3*4 DGT instantaneous variables, LCD display
- Max values of all power variables
- Automatic scrolling pages
- 2 freely configurable virtual alarms

WM30

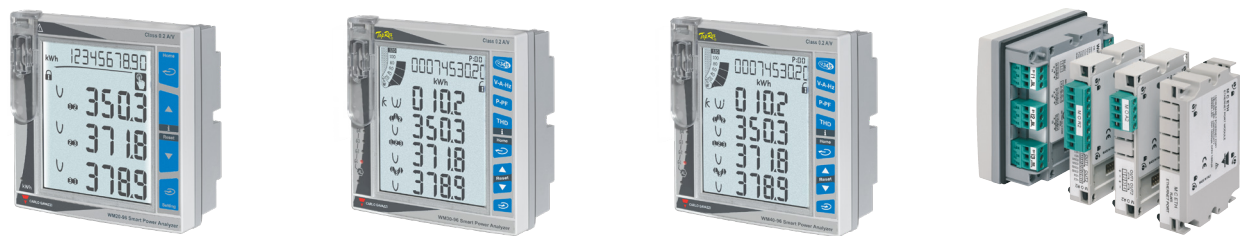
- 4*4 DGT instantaneous variables, LCD display
- Avg and max values of all system and single phase variables
- 4 freely configurable virtual alarms
- Real time clock
- Other features, same as WM20

WM40

- 96*96 mm panel mounting housing with front protection degree IP65
- 5 A current inputs for current transformers
 - Up to 793 V L-L measuring inputs
 - Basic accuracy (V/A): $\pm 0.2\%$ RDG
- Single and three-phase measurements: V, A, An, Hz, PF, W, VA, var, run-hour, kvarh, bi-directional kWh (cl. 0.5s IEC/EN62053-22)
 - 9+1-DGT counter variables, backlit LCD display
 - Modular housing (see the modules list besides)
 - Optical port for fast data reading and configuration
- Universal power supply (90 - 264 V ac/dc, 21 - 55 V ac/dc)
- THD analysis up to 31st harmonics with source detection, single harmonics via Modbus
- 4-tariff management
- Factor K and TDD metering
- 16-alarm PLC logic and digital inputs for utility metering, built-in event and data stamping for instantaneous variables and load profiling
- Other features, same as WM30

Modules

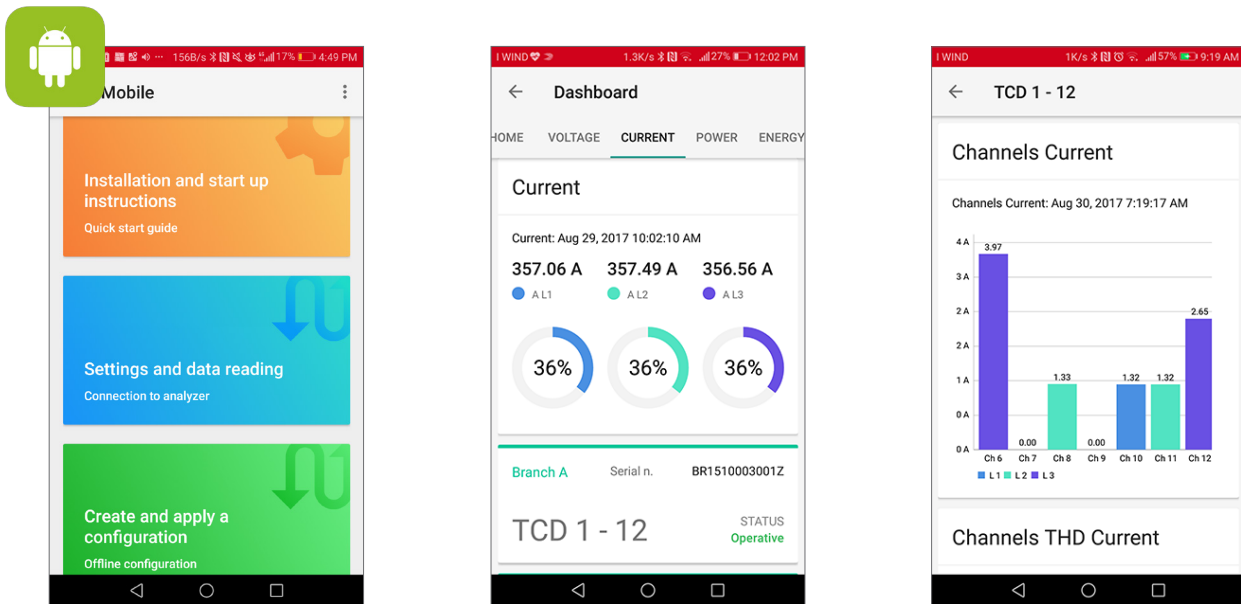
- WM20/WM30/WM40
- RS485/RS232 Modbus RTU
 - BACnet IP
 - BACnet MS/TP
 - Ethernet (Modbus TCP)
 - EtherNet/IP (WM20 excluded)
 - Profibus DP-VO
 - 2-static and relay outputs
- WM30
- 2*20 mA dc or 2*10 V dc outputs
- WM40
- Up to 4*20 mA dc or 10 V dc outputs
 - 6-channel digital inputs, up to 6 relay/8 static outputs + OR/AND alarm logic management
 - Direct An + Temperature + Process signal measurements



Advanced configuration and commissioning tools

An innovative solution to drastically reduce both configuration and commissioning time!

The installation, the configuration, and the commissioning of a power analyser has an intrinsic complexity which is due not only to the product itself, but also to the sequence of events which usually starts in the workshop of a Panel Builder and moves to the plant for the final installation. Hence, one product, which for different reasons and in different contexts moves through different professionals. To be able to be effective, there is the need to be able to supply a tool matching the skills and needs of different people. OptoProg, with its App, or simply as desktop software, is the best answer to simplify the whole process.



How do you do it? OptoProg + UCS is the solution!

OptoProg, the optical port-based coupling unit with built-in rechargeable battery, provided with both USB and Bluetooth communication capabilities to be used in combination with either UCS desktop or UCS Mobile (Android), with its excellent usability, allows the Panel Builder to set all initial metering parameters without physically using the meter front keypad. If the panel is produced in series with the same overall characteristics and meter settings, by using the configuration upload and download function, the process is further shortened and error free. Once the distribution board with the power analyser is on site, the System Integrator using its OptoProg unit and UCS software can download the meter configuration parameters, change them, add alarms and upload the new configuration to the power analyser again to complete the process. With the same UCS it is possible to test the communication to other devices in the same Modbus network. The whole OptoProg process can be performed without opening the distribution board door, making this process more efficient, effective and safe. Once everything is done, just remove OptoProg from the power analyser and install it on another meter.

OptoProg

- Bridge mode use with embedded optical port
- Built-in lithium battery for one month operations
- Sleep mode for energy savings
- Configuration and communication status LED
- Bluetooth 2.0, 2.1, 3.0 and 4.0 connectivity
- Micro-USB B port
- RED 2014/53/EU, FCC and IC approvals



OptoProg is compatible with: WM15, WM20, WM30, WM40, WM50.

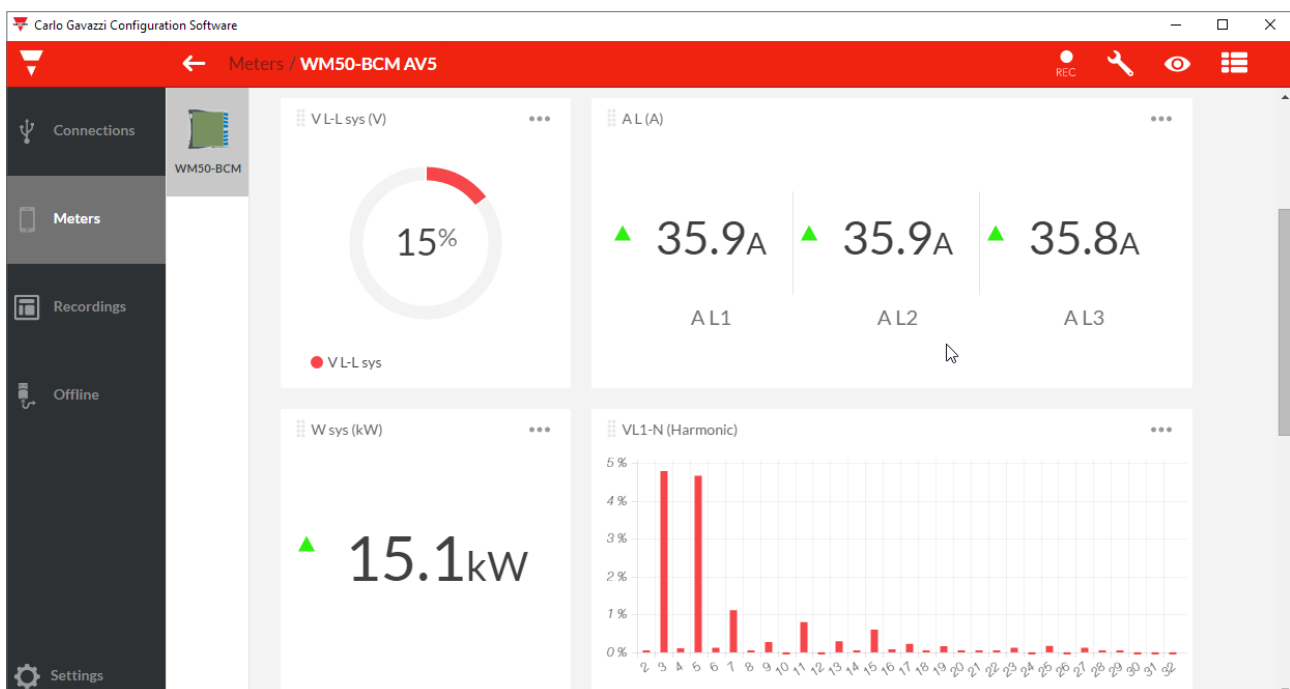
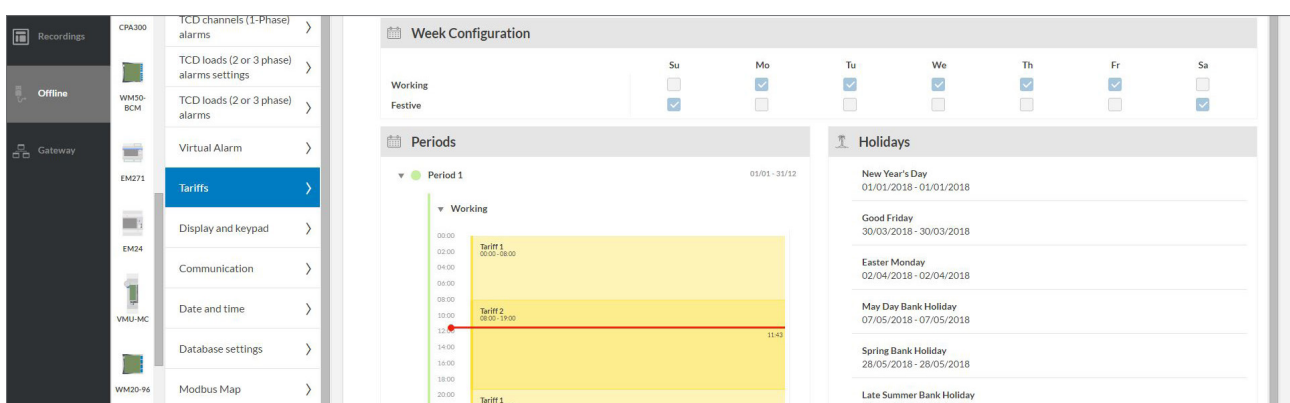
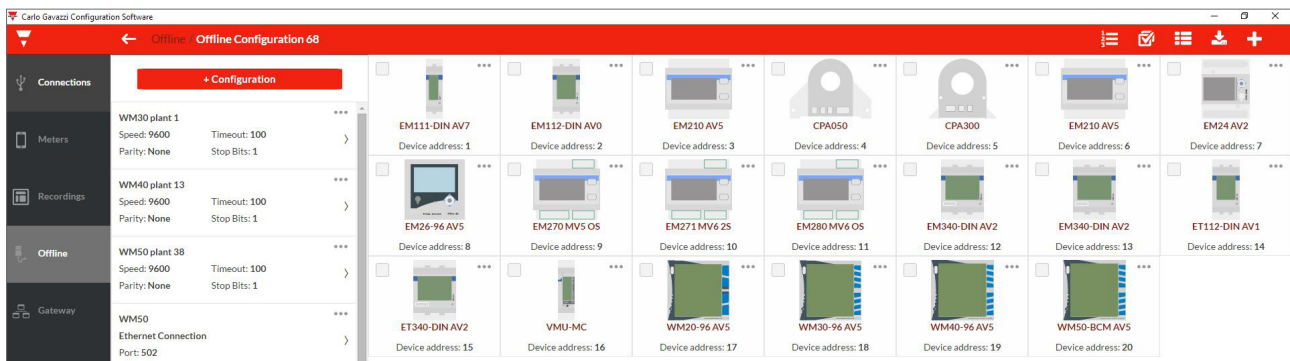
Electric panel

Utility, main and sub meter integration

The universal configuration software

UCS, the universal configuration tool continuously upgraded and compatible with all Carlo Gavazzi meters.

In addition to the standard display of variables, functionality and configuration parameters, it is common the need to be more effective and efficient during first meter configuration (by the Panel Builder) and site commissioning (by the System Integrator). UCS, the Universal Configuration Software, is the answer, providing a full set of effective tools for meter configuration, variable displaying and communication diagnostics. These tools are aimed to be quick and to help the different professionals, such as Panel Builder, Installer, System Integrator, and End-user, to limit and fix any installation, configuration, and commissioning error.



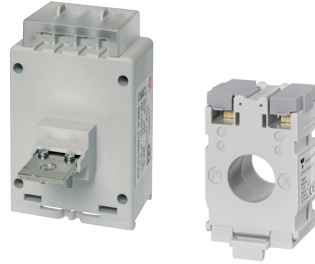
Solid-core and split-core current adapters

From compact sizes to high currents and from solid-core to split-core, these are the current adapters for Carlo Gavazzi meters and the appropriate solution for any kind of installation.

TAD K/K2

TAD	from (A)	to (A)
K	1	40
K2	1	250

- Wound primary/fixed bar
- Secondary: 5 A (standard), 1 A (available upon request)
- Sealable terminal covers
- IEC/EN61869-2 compliant



CTD 1Z

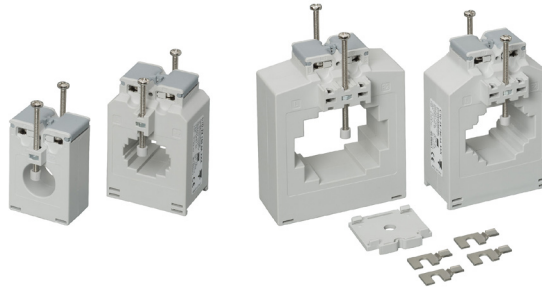
CTD	from (A)	to (A)
1z	50	200

- Solid core for cable or bus-bar
- Cable diameter: 22 mm
- Secondary: 5 A
- IEC/EN 61869-2 compliant

CTD 1/2/3/4-X

CTD	from (A)	to (A)
1x	50	300
2x	40	600
3x	50	800
4x	150	1600

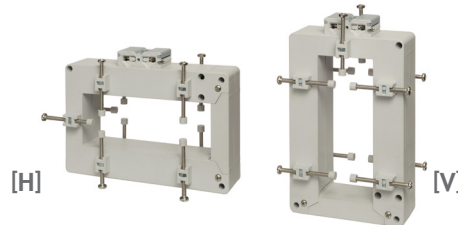
- Solid core for cable or bus-bar
- Cable diameter: 23 mm to 51 mm
- Bus-Bar: 20*5mm to 64*20 mm or 51*43 mm
- Secondary: 5 A (standard), 1 A (available upon request)
- Sealable terminal covers
- IEC/EN61869-2 compliant



CTD 8/9/10/11/12-V-H

CTD	from (A)	to (A)
8 V/H	150	1600
9 V/H	400	2500
10 V/H		3200
11 V/H	1000	4000
12 V/H	1000	4000

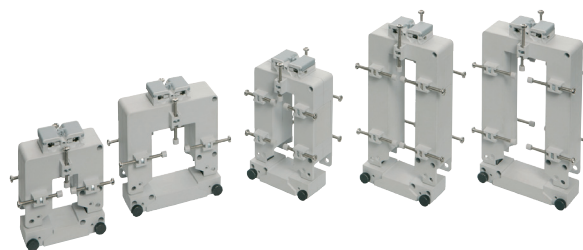
- Solid core for cable or bus-bar
- Bus-Bar: 37*125 mm to 53*125 mm
- Secondary: 5 A (standard), 1 A (available upon request)
- Sealable terminal covers
- IEC/EN61869-2 compliant



CTD 5/6-S

CTD	from (A)	to (A)
5 S	100	400
6 S	150	1000

- Split-core for cable or bus-bar
- Bus-Bar: 26*32 mm, 50*52 mm
- Secondary: 5A (standard), 1 A (available upon request)
- Sealable terminal covers
- IEC/EN61869-2 compliant



CTD 8/9/10-S

CTD	from (A)	to (A)
8 S	150	1600
9 S	400	2500
10 S		3200

- Split-core for cable or bus-bar
- Bus-Bar: 31*81 mm to 50*125 mm
- Secondary: 5 A (standard), 1 A (available upon request)
- Sealable terminal covers
- IEC/EN61869-2 compliant

CTA 5/6

CTA	from (A)	to (A)
5 X	100	300
6 X	200	600

- Split-core for cable
- Secondary: 5 A
- Cable diameter: 24 mm (5x), 36 mm (6X)
- IEC/EN61869-2 compliant



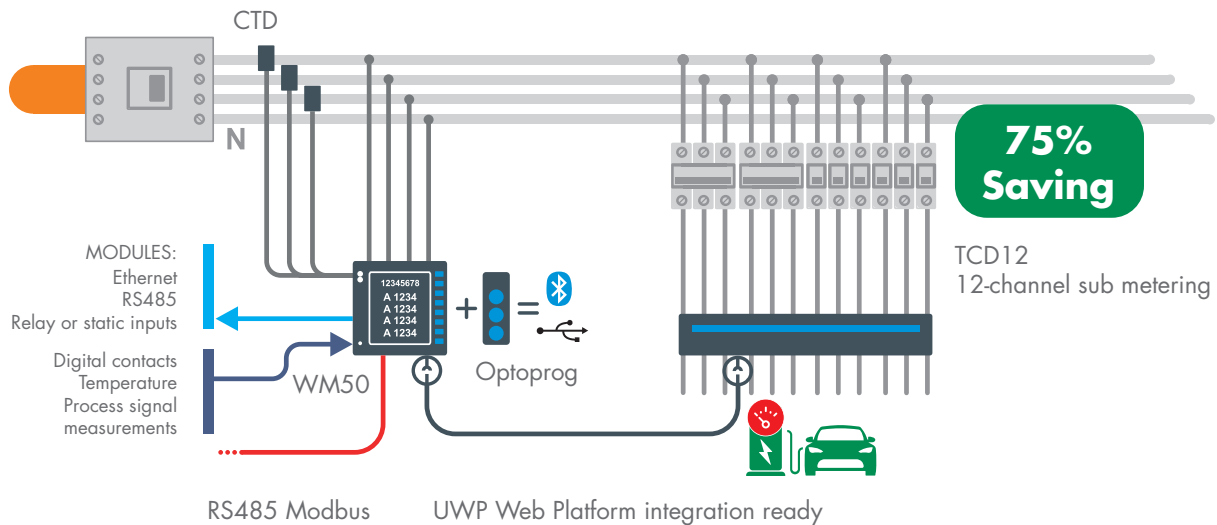
Electric panel

Quick-fit high-density metering solution

Distribution board-based solution

In a single solution the combination of a three-phase main meter with CT inputs and 65A integrated TCD sub-meter units with up to 96 single-phase channels or 32 three-phase channels.

When the electrical system is different from a bus-bar trunking or bus-duct system, and numerous EV charging poles are fed from a common distribution board, than WM50-96 is the ideal solution for branch circuit monitoring. The solution is based on one core unit WM50, which is usually installed and connected on the mains, and some TCD12 units as combined meters installed downstream the MCBs for single phase or three-phase EV charging poles. As the whole installation cost derives not only from the cost of the components, but even more by installation and commissioning costs, this innovative solution allows you to achieve more than 75% installation and commissioning savings vs. standard solutions.



WM50, main metering solution for distribution boards

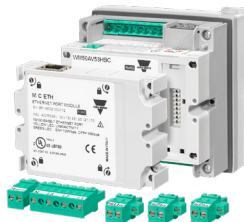
- 96*96 mm panel mounting meter with IP65 front protection degree and modular housing
- Up to 480 V L-L ac and 5 A CT measuring inputs
- Single and three-phase measurements: V, A, An, Hz, PF, W, VA, var, run-hour, kvarh, bi-directional kWh (cl. 0.5S IEC/EN62053-22), THD analysis up to 31st harmonics, single harmonics via Modbus
- Basic accuracy (V/A): $\pm 0.2\%$ RDG
- 9+1-DGT totalized and 4-DGT instantaneous variables LCD display
- Optical port for fast data reading and configuration
- Universal power supply (90 – 260 V ac/dc)
- 4-tariff management
- 16-alarm PLC logic and digital inputs for utility metering, built-in event and data stamping for instantaneous variables

WM50, I/O optional modules

- RS232/RS485
- Ethernet (Modbus TCP)
- 6-channel digital inputs, up to 4-relay/6-static outputs + OR/AND alarm logic management
- Direct An + Temperature + Process signal measurements

TCD12, sub metering

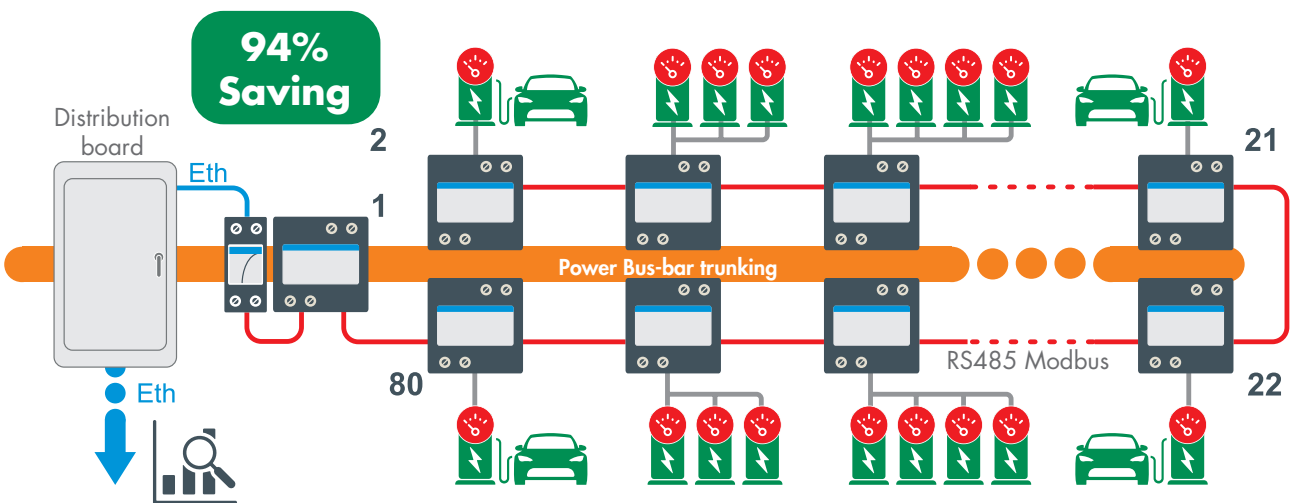
- Primary: 12*65 A
- Hole size: 8.5 mm
- Centre-to-centre distance: 17.5 mm
- RJ cable length: 30 – 500 cm
- 12-channel split-core current sensing unit
- Basic accuracy (V/A): $\pm 0.5\%$ RDG, class 2 (kWh) according to IEC/EN62053-21 (meter + TCD unit)
- Up to 96 channels: kWh, W, var, VA, PF, A, THD A
- Data available via communication module on board of WM50



From main metering to submetering

Why a high-density metering solution?

In an industrial or commercial installation, in the same facility, the purpose of metering is not only load monitoring but also to establish energy cost centres for cost allocation including also EV charging poles to charge employee's cars. When, overall the loads to be monitored are numerous, a standard metering solution is not the best answer. The point is not metering by itself, but more the need to shorten the payback time for this investment. How can you do it? By using a specific solution which has been designed, based on the application conditions mentioned above, to reduce the whole installation and commissioning time. It is the combination of ET272 meters (suitable to be used in both existing or new installations) with VMU-C (which automates meter addressing and in general reduces the whole commissioning process by 94%).



ET272, main and sub metering solution for tap-off boxes

- Patented meter, 4-DIN modules for DIN-rail mounting
- Up to 415 V L-L ac and TCD-based current measuring inputs
- Current measurement by two basic TCD units with quick RJ11 plugs (see TCD xM series)
- Quick configuration by automatic recognition of TCD units
- Self addressing in a Modbus system (in combination with VMU-C)
- 2*3-phase energy analysers with sum function in the same unit
- Measurements: V, A, Hz, PF, W, VA, var, bi-directional kWh
- Basic accuracy (kWh): $\pm 2.0\%$ RDG (meter + TCD xM unit). kWh: class 1 (IEC/EN 62053-21)
- Data format: 3-DGT (instantaneous variables)/7-DGT (totalizers)
- RS485 Modbus RTU. 2 pulse outputs (loads 1 and 2)
- Universal power supply (230 V ac)

TCD 0M-1M-2M-3M-MM, sensing solutions

- Triple split-core sensing unit for panel and DIN-rail mounting

Model	Primary (A)	Hole size (mm)
TCD 0M and TCD 1M	60 and 100	9.6 and 15.5
TCD 2M and TCD 3M	200 and 400	15.5 and 20.5
TCD MM	Up to 10000(*)	-

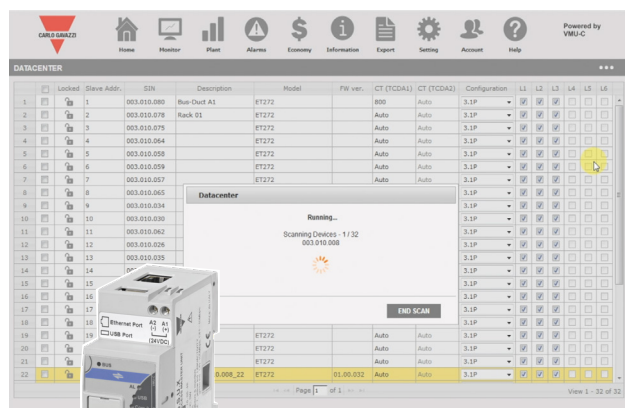
(*) using CTV current sensing units.



Up to 10kA

VMU-C gateway and web-server solution

- VMU-C EM and ET272 are mandatory parts of the bus-duct solution
- 2-DIN module housing. 12 – 28 V dc power supply
- Micro PC with embedded Web Server, WEB services and data logger functions
- Ethernet Modbus TCP master/slave function
- One RS485-Modbus port for the management of up to 80 ET272
- Data display (charts and tables). Real time or scheduled data export to Excel, CSV and HTML formats
- 4GB internal memory, Back-up memory on micro SDHC and USB
- Energy analysis of each load. Costs analysis
- Virtual meter with sum function
- Alarm management (e-mail or SMS by means of SH2-DSP)



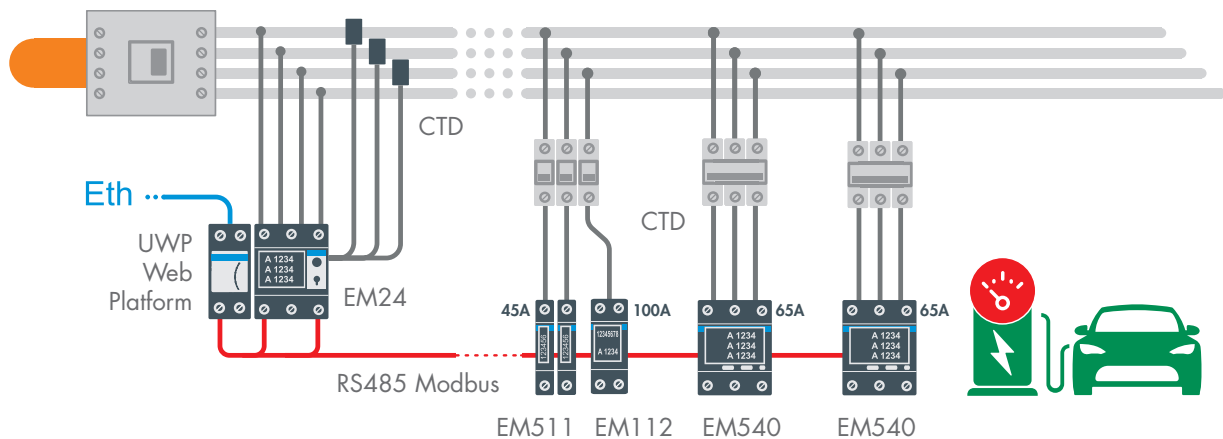
Charging poles

A compact range of DIN rail mount meters

Main and sub-metering for EV charging poles

Full energy analysis capability

This range offers you both CT connection inputs and direct connection capabilities. EM24, EM100 and EM500 series can be provided also with MID (Measuring Instruments Directive 2014/32/UE) approval for fiscal metering (only for the European market). The three key features of this offer are: housing compactness – they can fit wherever you have a minimal space and display data completeness with 0.001 energy resolution – most important variable information available at a glance; full electric variables set availability also through the communication port – capability to know the single EV charging pole behaviour so to perform a concise analysis. In addition, the EM500 series provides, based on Carlo Gavazzi's long design and application expertise, the best meter configuration and installation experience.



EM24, EM24 W1

EM24 and EM24 W1

- CT 5 A, 230 – 400 V L-L ac measuring inputs, 115 – 230 V ac power supply
- 65 A, 230 – 400 V L-L ac measuring inputs, self-power supply
- 4-DIN modules housing
- 3 counter digital inputs
- 2*8-digit LCD
- Single and three-phase measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, 4-tariff, 3*1-phase kWh
- Basic accuracy (V/A): $\pm 0.5\%$ RDG
- Bi-directional kWh (cl. B EN50470-3 MID approved)
- Pulse output or RS485 Modbus RTU, M-Bus port or Ethernet

EM24 W1

- wM-Bus wireless communication
- Two antenna options: external or built-in

EM112

- 100A, 115 -230V ac measuring inputs
- 2-DIN modules housing
- Self-power supply
- Display backup by supercapacitor
- 8-digit backlit touch LCD
- Measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, dual tariff
- Basic accuracy (V/A): $\pm 0.5\%$ RDG
- Bi-directional kWh cl. B EN50470-3 MID approved
- Pulse output or RS485 Modbus RTU or M-Bus port

EM511

- 45 A, 115 -230V ac measuring inputs
- 1-DIN module housing
- Self-power supply
- 6-digit + 3 decimals backlit LCD
- Measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, dual tariff
- V THD and A THD up to 15th harmonics
- Basic accuracy (V/A): $\pm 0.5\%$ RDG
- Bi-directional kWh cl. B EN50470-3 MID approved
- Digital input for tariff management and partial meter: start/pause/reset
- Pulse output or RS485 Modbus RTU or M-Bus port

EM530, EM540

EM530

- CT 5 A, self powered
- Basic accuracy (V/A): $\pm 0.25\%$ RDG
- Bi-directional kWh: cl. 0.5S (IEC62053-22)

EM540

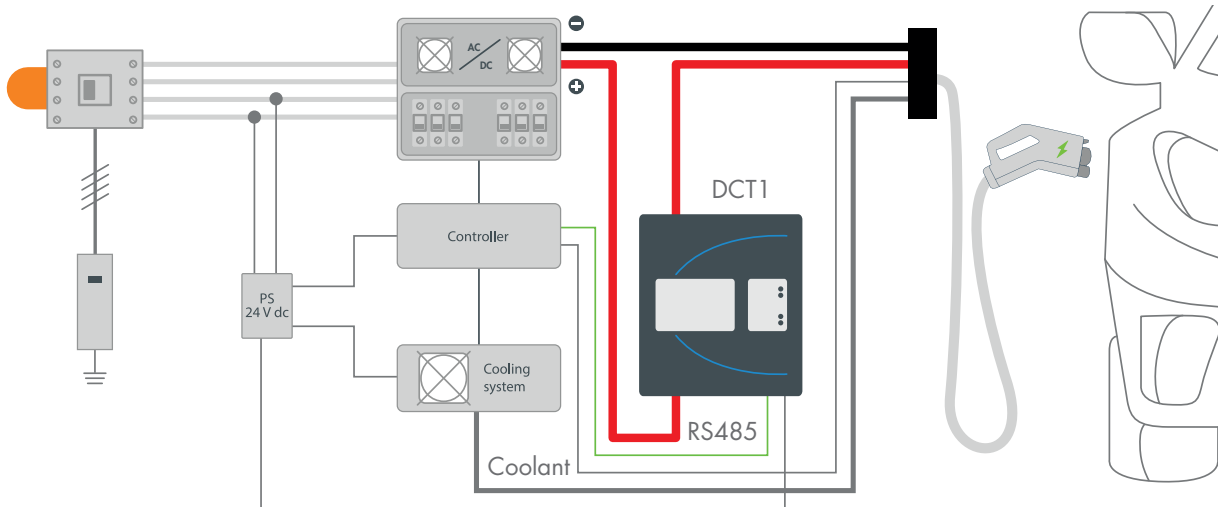
- 65 A, self powered
- Basic accuracy (V/A): $\pm 0.5\%$ RDG
- 3-DIN modules housing
- Backlit 11-digit + 2*10-digit LCD
- 230 – 400 V L-L ac measuring inputs
- Single and three-phase measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, kVAh, dual tariff, 3*1-phase kWh
- THD analysis up to 15th harmonics by current and voltage
- Bi-directional kWh (cl. B EN50470-3 MID approved)
- Pulse/Alarm output or RS485 Modbus RTU or M-Bus port



DC metering solutions for fast EV charging poles

An innovative solution to drastically reduce both configuration and commissioning time!

The manufactures of fast, ultra fast and hyper fast chargers for BEVs need a DC meter capable to measure correctly the amount of energy provided to the battery and transmit data to the controller in a secure way, in order to correctly bill the user. In a high power (up to hundreds of kilowatts) charging pole, an AC meter, because of its nature and its installation, provides on the energy totalizer to the user, both losses given by the AC/DC conversion and losses in the cable. This is one of the reasons to adopt a DC meter which would provide, instead, the real net charged energy to the BEV. The Carlo Gavazzi innovative DC meter is called DCT1 and is compatible with most of DC chargers on the market thanks to the wide voltage and current measuring range. The transducer embeds not only many advanced functions such as cable loss compensation but also an easy to mount solution compatibel with both bus-bars and cables.

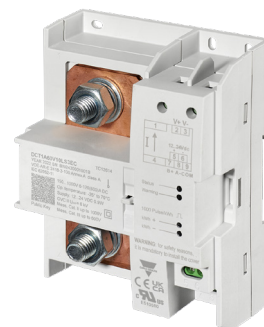


DCT1

- Current inputs: direct connection up to 600 A (DCT1A60) or up to 300 A (DCT1A30)
- Voltage inputs: 150 to 1000 V dc
- Energy measurements: kWh, total imported and exported, partial imported and exported
- Energy accuracy: cl. 1 (IEC 62053-41) or class B according to VDE-AR-E 2418-3-100 Annex A
- Energy resolution: 0.0001 kWh (0,1Wh)
- Instantaneous and real time variables: V, A, W
- Instantaneous variables accuracy: ± 0.5 RDG (current/voltage)
- Other variables: Ah ampere-hour meters (total imported and exported, partial imported and exported). Run hour meters (relevant to both imported/exported energy, total and partial). Total operating time (total/partial)
- Communication protocol: RS485 Modbus RTU (S1 without signature, S2 with 256 bit signature, S3 with 384 bit signature) or SML (384 bit signature)
- Communication data refresh time: 200 ms
- Others: NMI evaluation certificate for Eichrecht approval according to IEC 62052-11, IEC 62052-31, IEC 62053-41, VDE-AR-E 2418-3-100 Annex A, WELMEC 7.2
- Dimensions: 92 x 115 x 58 mm
- Installation: DIN rail and back panel by screw terminals
- cURus approval

Innovation and advanced functions

- Cable loss management with cable resistance parameter to calculate only energy provided to the battery, removing losses in the cable
- Real time shunt temperature monitoring via serial communication without additional sensors
- Compatibility with both busbars and cable lugs, vertical, horizontal or mixed connection
- Sealable measuring inputs and communication port for secure data transmission
- Warning over LEDs or serial communication in case of overtemperature, overcurrent or overvoltage



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