Market

Platform

Monitoring Map

Control Map

Technology

CLICK ME

CLICK ME

CLICK ME

CLICK ME

EMEA

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Surfing around the document just by clicking on icons, button topics and more.
Discover how to increase your knowledge accessing to specific documents, videos and websites. Enjoy your digital experience!

Controls

Energy efficiency

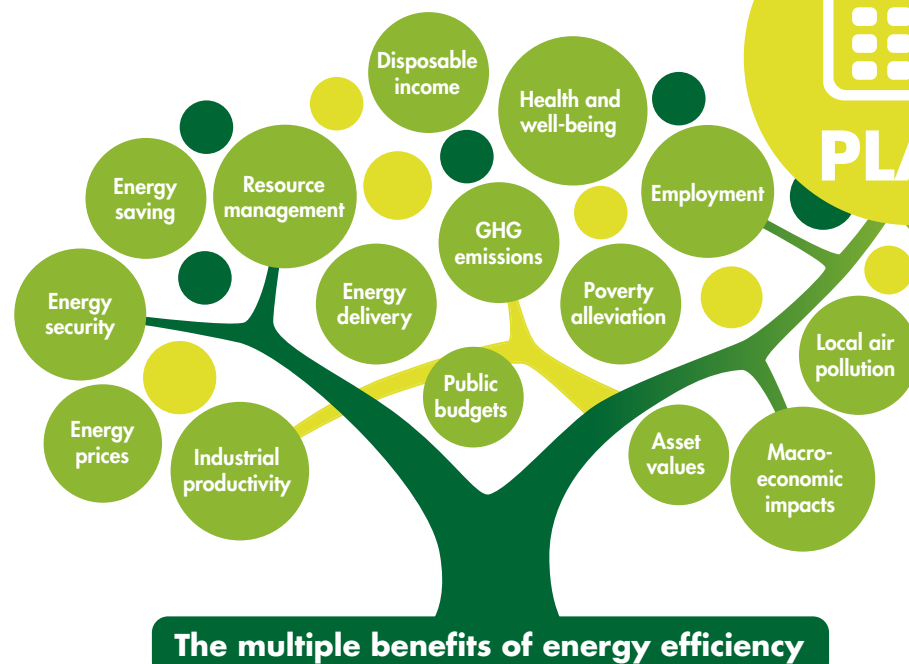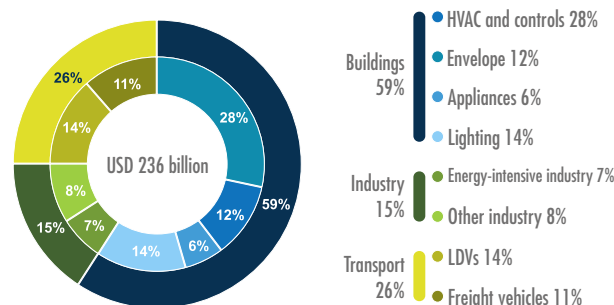## From a cultural change the energy saving

■ The new challenges for the energy sector

As stated by IEA, the International Energy Agency, "Energy efficiency is a vital component to meet the challenges faced by the energy sector, which range from ever global increasing energy demand, to concerns about energy safety, climate change, local air pollution, and the affordability of energy supply". In this respect, monitoring of energy matters, as a first step, for the achievement of energy efficiency goals.

Energy efficiency is "the first fuel": it is the key for cost effective energy transitions and the single energy resource that all countries own in abundance. Strong energy efficiency policies are vital to achieving the key energy-policy goals.

■ Global spending on energy efficiency

Spending related to energy efficiency improvements has grown strongly in recent years. A total of USD 236 billion was invested in energy efficiency across the buildings, transport and industry sectors. The increase was largely due to investments in heating, cooling and lighting. *See the picture below, source: IEA – World Energy Investments 2018 (HVAC = heating, ventilation and air conditioning; LDV = light-duty vehicles).*

USD 236 billion

Buildings 59%
- HVAC and controls 28%
- Envelope 12%
- Appliances 6%
- Lighting 14%

Industry 15%
- Energy-intensive industry 7%
- Other industry 8%

Transport 26%
- LDVs 14%
- Freight vehicles 11%

The multiple benefits of energy efficiency

- Disposable income
- Health and well-being
- Energy saving
- Resource management
- Employment
- GHG emissions
- Energy delivery
- Poverty alleviation
- Energy security
- Public budgets
- Local air pollution
- Energy prices
- Industrial productivity
- Asset values
- Macro-economic impacts

DO

CHECK

PLAN

ACT

IEA
International Energy Agency

■ Why the plan-do-check-act cycle

To be able to respect Energy Efficiency mandatory regulations and goals, and therefore to achieve both Energy and cost savings, it is important to plan a proper "Energy Efficiency Plan", which has to be based on a PDCA (Plan-Do-Check-Act) cycle.

An Energy Efficiency plan, if related to a medium or large installation, has to go through an Energy audit which enables to assess:
- **critical issues** within a site;
- **priority** of the corresponding resolution;
- **areas of action** to be developed which can be implemented either during the design phase of a new system or during the renovation of an existing one.

■ The three major steps

An Energy audit and subsequently an Energy efficiency plan is split in three major steps: checking, monitoring, and analysing the actual use of Energy. If the statement: "do not estimate when you can calculate, do not calculate when you can measure" is obvious, the logical consequence is splitting the whole plant into main and sub-metering to identify the electrical energy wastes.

■ All areas have to be fully implemented

But such a plan is not complete if the identified areas of actions are not fully implemented. This means that lighting, cooling, space heating controls and a proper BACnet communication capability to an HVAC system are mandatory conditions to achieve the needed Energy and cost savings.

■ The right solution

Thanks to its comprehensive solutions, including meters, data analysis, communication technologies, and controls, Carlo Gavazzi provides all the information necessary to implement, by means of functions like KPIs (key performance indicators), benchmarking, reporting, and the management of the base line, all the automatic tools necessary for the measurements provided by the energy efficiency implementation plan.

UWP3.0 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 3.0 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 3.0 platform with full functionalities meets today's Energy Managers and Energy Service Companies requirements to achieve energy efficiency goals.

■ **An open system!**

UWP 3.0 is the core of a powerful system, but also a Web-Server, a gateway which embeds different communication protocols, such as Modbus TCP/IP, BACnet, SFTP, Rest-API, just to mention some of them. To meet the Industry 4.0 rising integration demand based on IoT and Cloud technologies, UWP 3.0 is Microsoft® Azure Certified for IoT.

More in detail: FTP, SFTP, FTPS for pushing data to standard FTP servers, in a secure and reliable way according to a schedule. Rest-API to inter exchange data with a remote system with all the necessary flexibility.
Modbus/TCP and BACnet bridging of the available data points, using UWP 3.0 as a flexible data-hub among field-buses.

UWP 3.0 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 3.0 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. UWP 3.0 + Microsoft® Azure IoT HUB + Microsoft® PowerBI allow to share and publish online a scalable dashboard focused on the desired KPIs without the need for a software developer.

Disclaimer
Microsoft®, PowerBI, Azure, SQL Server are registered trademarks of Microsoft®. Carlo Gavazzi has no commercial relationship with Microsoft®. Therefore all the Microsoft® solutions mentioned in the document must be purchased and supported through the Microsoft® commercial channels.

UWP3.0

Gateway

Monitoring, data analysis and reporting
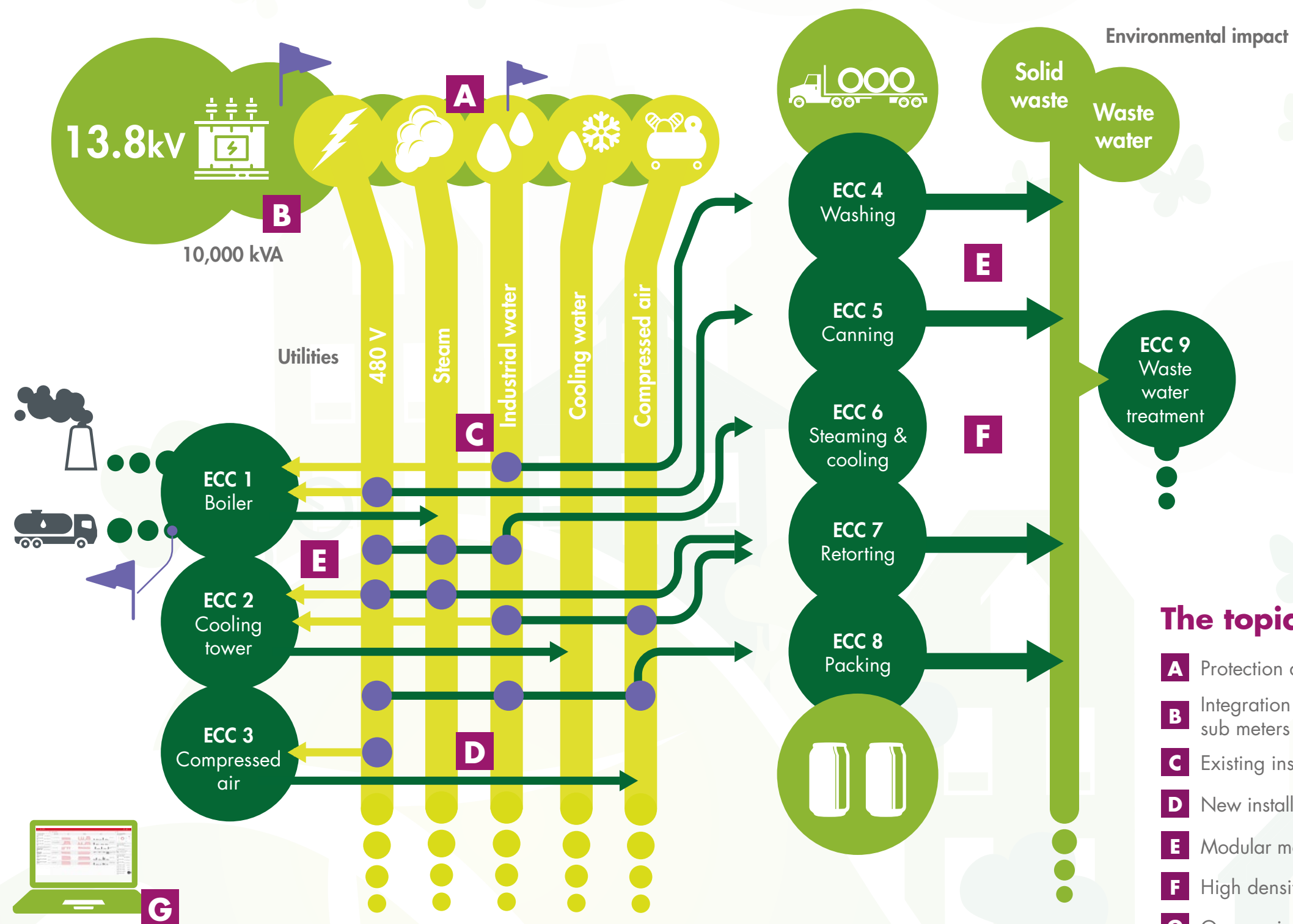
Wide control possibilities

Parking guidance

Cost streamlining and energy saving

The Carlo Gavazzi Energy Efficiency Monitoring competences

This map guides you, in this example, through the Carlo Gavazzi competences and product solutions. A journey through protections, ESCo analysis tools, core units, utility meters data acquisition and integration solutions, integration of main and sub-metering systems in existing and new installations!

Environmental impact

13.8kV

A

B

10,000 kVA

Solid waste

Waste water

ECC 4 Washing

ECC 5 Canning

E

Utilities

480 V

Steam

Industrial water

Cooling water

Compressed air

ECC 9 Waste water treatment

ECC 6 Steaming & cooling

F

C

ECC 1 Boiler

ECC 7 Retorting

E

ECC 2 Cooling tower

ECC 8 Packing

ECC 3 Compressed air

D

G

Utilities meters

Main-meters

Sub-meters

ECC: Energy Cost Center

The topics

Protection and monitoring
### Electrical safety as part of the EEM solution

Why installation protection?

How to prevent injury? In the wide range of protection devices, there is a family of units called RCD Residual Current Device. The purpose of an RCD is to prevent threats to life by protecting against the risks of electrocution and fire caused by earth faults.
How to detect dangerous earth leakage currents? In industrial and commercial applications, due to their specific requirements, the device used is called an MRCD Modular Residual Current Device. More specifically, it is an earth leakage current relay which can detect by means of an external core balance transformer the earth leakage current.
How to avoid power supply interruption? Both RCDs and MRCDs are prone to nuisance trips from normal harmless earth leakage. Those are due to external factors, such as a high current discharge due to lightning or to an earth rod placed close to a neighbouring earth rod on a building. A nuisance trip would affect the availability of power supply, which for example in a production facility, because of its nature, is not allowed.
The Carlo Gavazzi solution is made of two models: DEA71 and DEB71, combined with CTG, our core balance transformer family. Our MRCDs comply with IEC/EN 60947-2, so to avoid nuisance trips and fulfil the "A" type operating characteristic so to work in case either of presence or absence of dc component of residual currents.
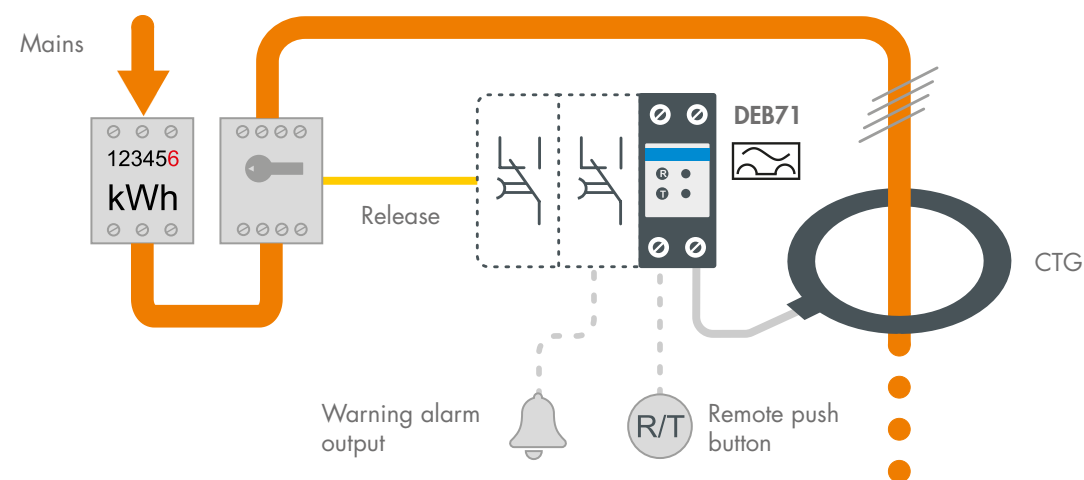
◀ **DEA71**
• Fixed current setting: 30 mA or 300 mA
• 2 relay outputs for warning and alarm
• Input for remote Reset / Test
• 24 – 240 V ac power supply

◀ **DEB71**
• Adjustable setting from 30 mA to 5 A
• Adjustable delay up to 5 s
• Leakage level LED bar
• 2 relay outputs for warning and alarm
• Input for remote Reset / Test
• 24 – 240 V ac power supply

◀ **CTG, core balance transformer**
• Easy installation
• High accuracy and sensitivity

Model	Hole size (mm)
CTG35	35
CTG50	50
CTG70	70
CTG120	120
CTG160	160
CTG210	210
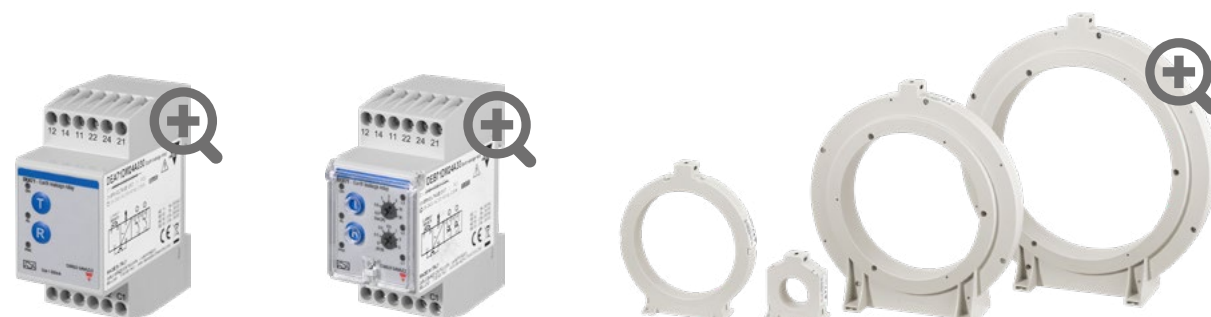
Retrofit main and sub-metering

The "check" part of the PDCA process starts here!

Identifying areas of energy wastage with a quick installation. This solution is suitable for ESCOs, being possible to easily remove equipment from a place where it has been installed, and re-install it somewhere else. But it can also be the ideal solution as a part of a permanent monitoring system in a plant where space and communication capabilities may be restricted.
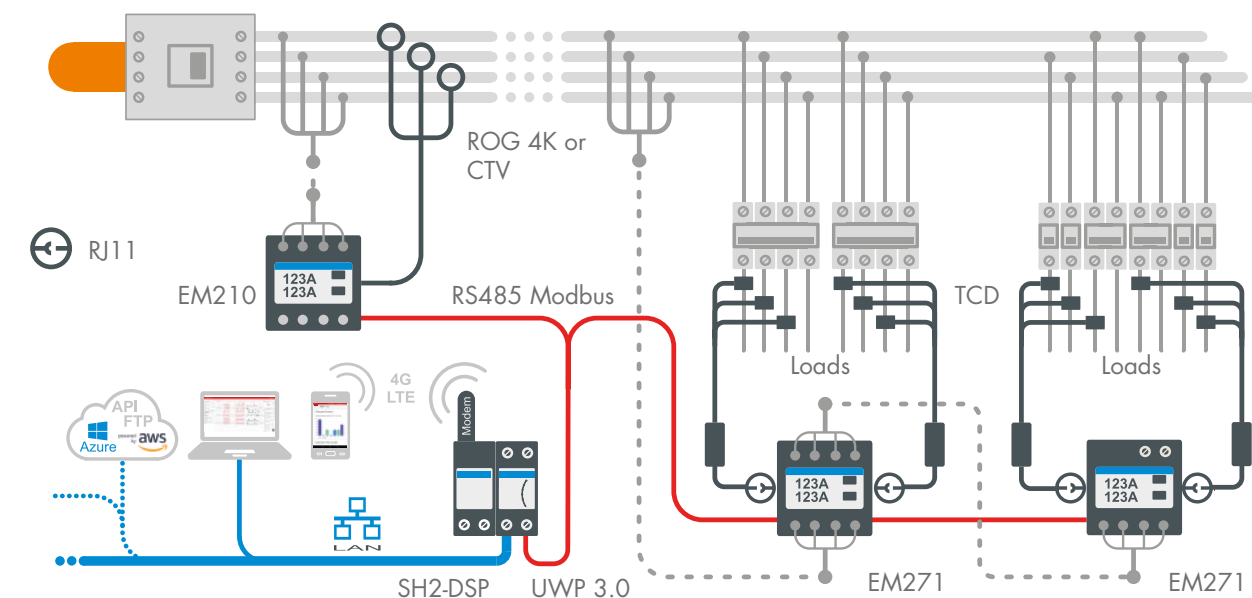
◀ **EM210, main metering solution**
• Patented meter, 4-DIN and 72x72 mm solution in the same housing for DIN-rail or panel mounting. Detachable 3*3-DGT/7-DGT display
• Up to 415 V L-L ac and CT/CTV/ROG-based current measuring inputs
• 5 A CT (AV version), 333 mV from CTV 1X-2X-3X-4X-8X sensors (MV version), 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): ±0.5 %RDG, kWh class 1 (IEC/EN 62053-21)
• Class B (EN50470-3), MID approved (AV version only)

◀ **CTV and ROG 4K 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 4K.** Rogowski coil current sensors. Primary: 20 to 4000 A, diameters: 115, 179, 275 mm

◀ **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 (kW):±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(*)	-

• Basic TCD xM unit (connected to three current sensors) for panel and DIN-rail mounting

TECHNOLOGY MONITORING

Monitoring
One platform, many solutions

Communication, analysis and reporting in one unit

UWP 3.0 is the core of this platform and also the unit with the task to analyse the plant variables being managed to achieve the energy efficiency goals.

UWP 3.0 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 3.0 is a Web-Server but also a gateway. UWP 3.0 is Microsoft® certified for IoT. One or many UWP 3.0 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 3.0 provides a solution to match the existing scenario.
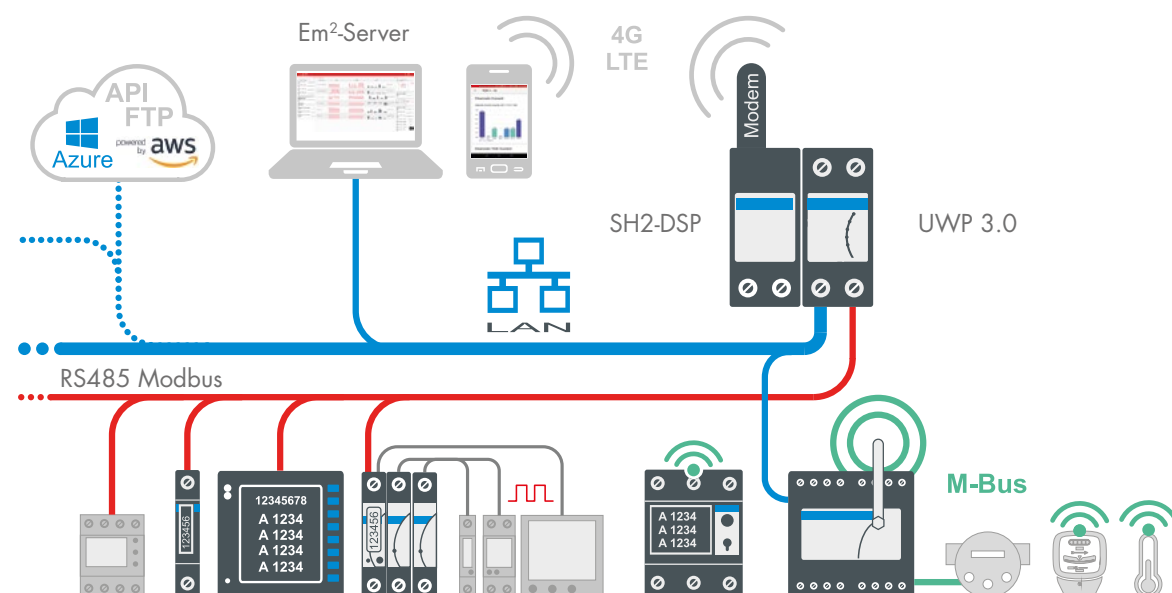
▶ UWP 3.0
- Micro PC with embedded Web Server, WEB services and data logger functions
- Ethernet Modbus TCP master/slave function
- 2 x RS485 ports, both of which support up to 64 Modbus devices
- Data display (charts and tables)
- Real time or scheduled data export to Excel, CSV and HTML formats
- 4GB 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

◀ SH2-DSP
- Modem extension unit for UWP 3.0
- 3G or 4G Mobile Internet connectivity with SMS alerts and SMS commands management
- 2-DIN module housing
- 20 – 28 V dc power supply

Tools to properly display the key variables

The UWP 3.0 unit allows you to automate the process of collecting data points from multiple meters.

The embedded Web-Server allows you to remotely display the key plant variables using analysis tools such as tables, trends, histograms, pies, comparison functions, and others. The system allows gathering, displaying, and logging variables from any meter or device connected to the available field-buses. Dashboards mixing both history and real time data allow users to take control of their data.
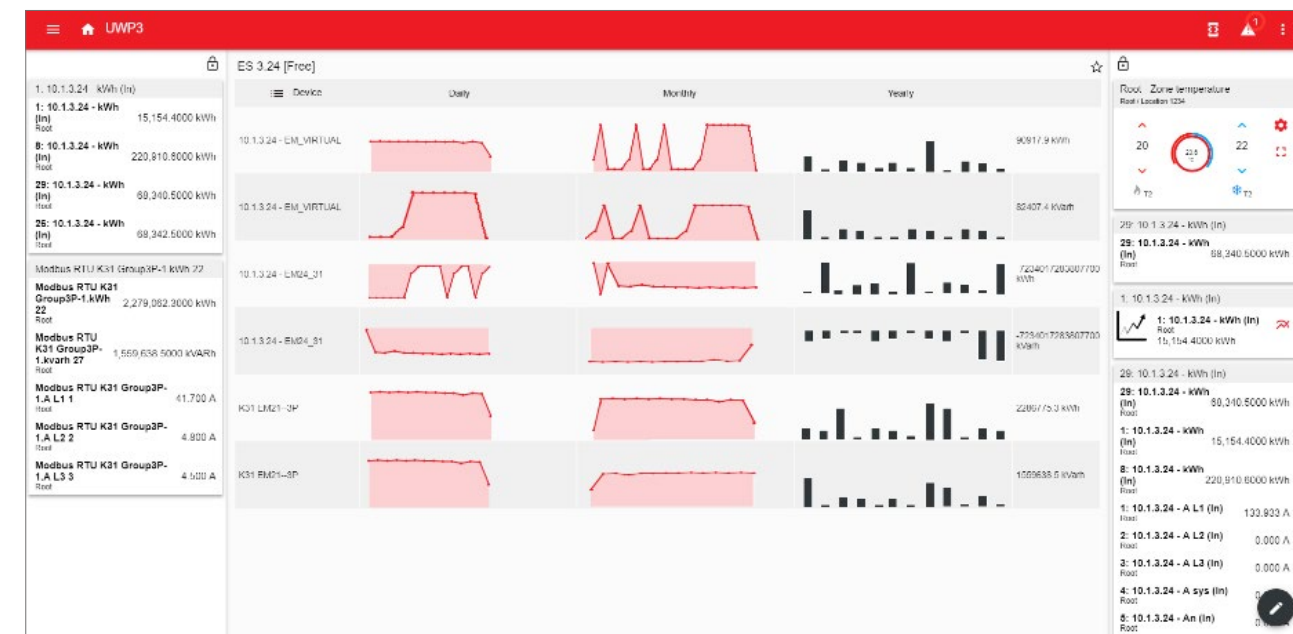
Monitoring

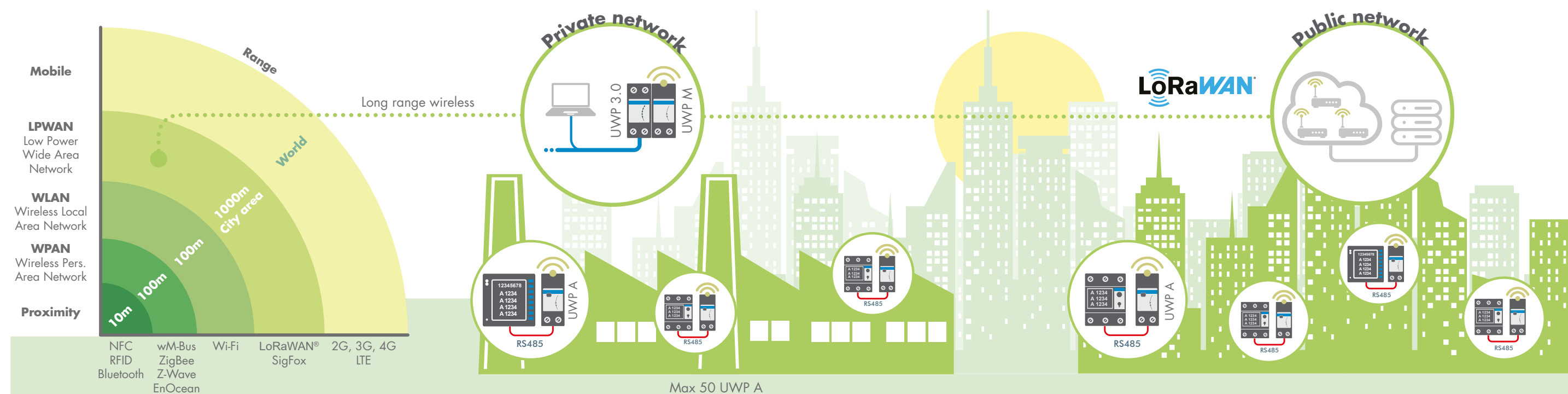## Long range wireless communication

The wireless technology

Choosing the right wireless technology is dependent on the application!

Gathering data in a secure, automatic and economic way is always difficult. There are a variety of different applications which may change according to the size of the meter network and of the area to be covered. Moreover, there are many available wireless communication technologies with some advantages, such as minimizing the wiring and installation costs also in case of retrofitting an existing installation, but also some limits, such as obstacles and interferences which may be fixed by skilled installers, and also cyber-security issues (if encryption is not carried out correctly). The "Range" graph below highlights, based on different technologies, the coverage distance, which can vary from just a few meters to global coverage using mobile communication.

However, the most popular wireless technologies are limited in terms of signal range or suffer from cost disadvantages, as they require a mobile phone contract for each measurement point. Moreover, in urban areas the situation is particularly complicated due to the restrictions of the rule concerning band occupation and interference with other devices. In all these cases the answer is LoRaWAN®, the long-range wireless communication technology.

Private and Public network solutions

LoRaWAN®, the long range, fast configuration, easy commissioning, secure, competitive, and reliable communication solution.

Energy efficiency monitoring and cost allocation, sub-metering in large buildings, industry, energy farms and cities are the best examples for long range wireless Carlo Gavazzi solutions. Thanks to LoRaWAN® long communication range, security and robustness, wireless networks can be easily set-up, without the high expense associated with the use of SIM cards or repeaters.

Whenever the user deals with a project focused on sub-metering, cost allocation, or the energy efficiency monitoring realm, the need for minimizing the TCO (total cost of ownership) is always a consideration. The long-range wireless solution of Carlo Gavazzi simplifies this scenario.

Range — Mobile / LPWAN Low Power Wide Area Network / WLAN Wireless Local Area Network / WPAN Wireless Pers. Area Network / Proximity

World / 1000m City area / 100m / 10m

NFC RFID Bluetooth / wM-Bus ZigBee Z-Wave EnOcean / Wi-Fi / LoRaWAN® SigFox / 2G, 3G, 4G LTE

Long range wireless

Private network — UWP 3.0 / UWP M / UWP A / RS485

Max 50 UWP A

Public network — LoRaWAN / UWP A / RS485

■ Long Range Communications or LoRaWAN® integration
Leveraging an existing standard LoRaWAN® network to send metering data to a remote system or creating from scratch a Long Range Wireless network in the license free band are both scenarios available to system integrators. In the former case UWP A converts meters into LoRaWAN® enabled IIoT units. In the latter, UWP A + UWP M + UWP 3.0 are the 3 tiers of a complete energy monitoring system capable to cover wirelessly both dense urban/indoor regions and rural areas (up to 10 km range in open air, 1 km in typical applications).

■ Easy commissioning and diagnostics
Standardized set-up for connecting any LoRaWAN® gateway, or plug and play tools to build-up and maintain a system based on Carlo Gavazzi's UWP 3.0 platform, are the key factors to preserve users from headaches.
Plug and play deployment of either small or large networks is possible for both private and public networks.

■ Security
UWP A and UWP M embed end-to-end AES128 encryption so to provide the necessary data security.

■ Low operating expenses
Wireless solution (EU 868MHz ISM band) with no SIM card or annual fees and a long communication range, allows users to deploy a wireless monitoring network from scratch by themselves.

■ Reliable communication
Long communication range, immunity to interferences and embedded security allow engineers and installers to build reliable wireless monitoring networks.

◖ UWP M
- Comprehensive energy monitoring solution
- Wireless solution with no SIM card (ISM band)
- Data concentrator for up to 50 UWP A endpoints for each UWP M
- Communication range: up to 10 km in open air
- Fast commissioning
- Robust and secure communication
- Integrated into UWP 3.0's ecosystem
- Power supply from the UWP 3.0 auxiliary bus

◖ UWP A
- LoRaWAN® adapter for Carlo Gavazzi meters
- Communication range: 10 km in open air, 1 km in typical applications
- USB port for easy set-up via UCS Software
- Universal power supply (19 – 29 V dc and 115 – 240 V ac)
- Configurable LoRaWAN® communication
- OTAA or ABP authentication
- Communication interval from 5 min to 24 h
- Plug and play integration into the UWP 3.0 ecosystem via UWP M

■ UCS freeware software
- Easy deployment of UWP A based wireless networks
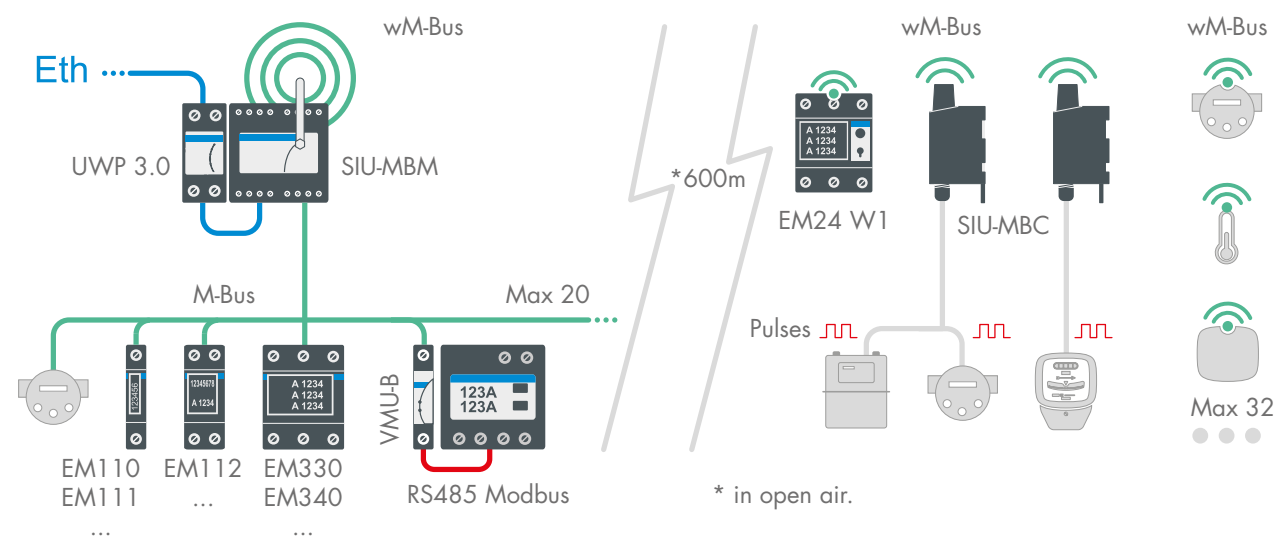- Configuration of any Carlo Gavazzi meter/analyzer
- Diagnostic functions

TECHNOLOGY MONITORING TECHNOLOGY MONITORING

Monitoring
Utility, main and sub meter integration

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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.

wM-Bus   wM-Bus   wM-Bus

Eth ....

UWP 3.0   SIU-MBM

EM24 W1   SIU-MBC

M-Bus   Max 20

*600m

Pulses

EM110 EM112 EM330   VMU-B
EM111 ... EM340
... ...   RS485 Modbus

Max 32

* in open air.

◀ 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-SOCl2 (≥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

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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.

RS485 Modbus

VMU-MC + 3 VMU-OC   UWP 3.0   Eth
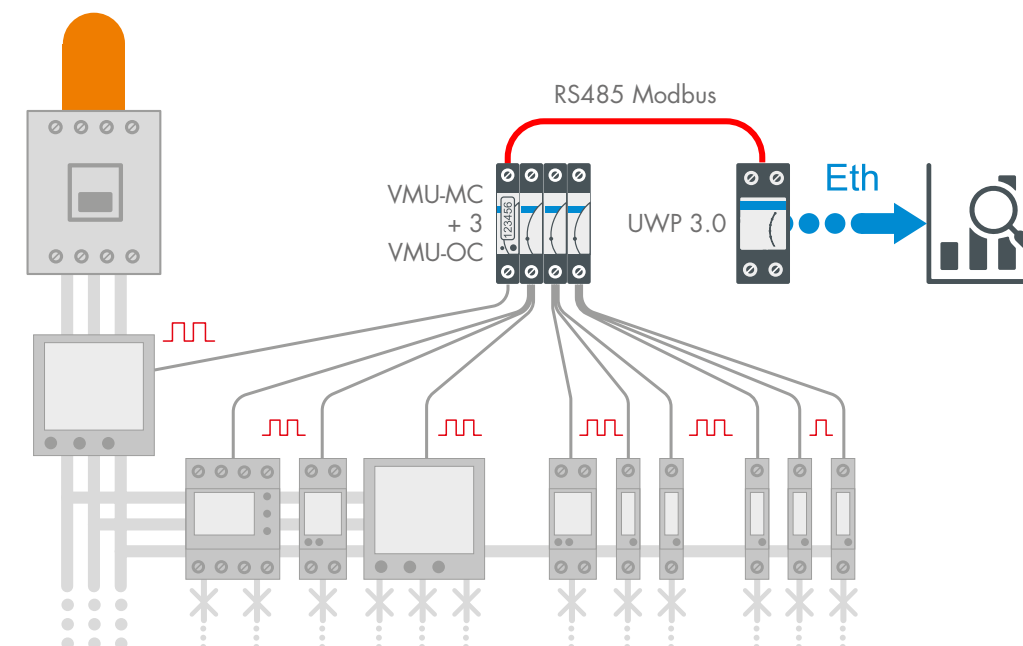
◀ VMU-MC, VMU-OC
- 1-DIN module housing
- Modular
- RS485 communication port
- 11 total inputs available
- Unit of measure: kWh, kvarh, kVAh, kJ, kcal, m³, Nm³, h, pcs, kg
VMU-MC:
- LCD display for: status, counter, any active tariff
- 2 inputs available (for pulses counting or for up to 4 tariffs selection)
- 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.


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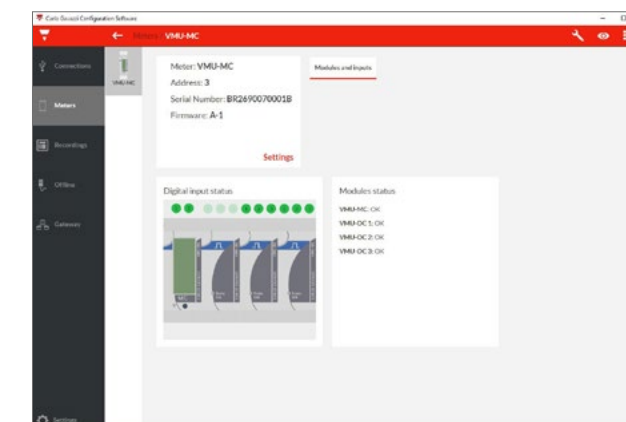
Monitoring

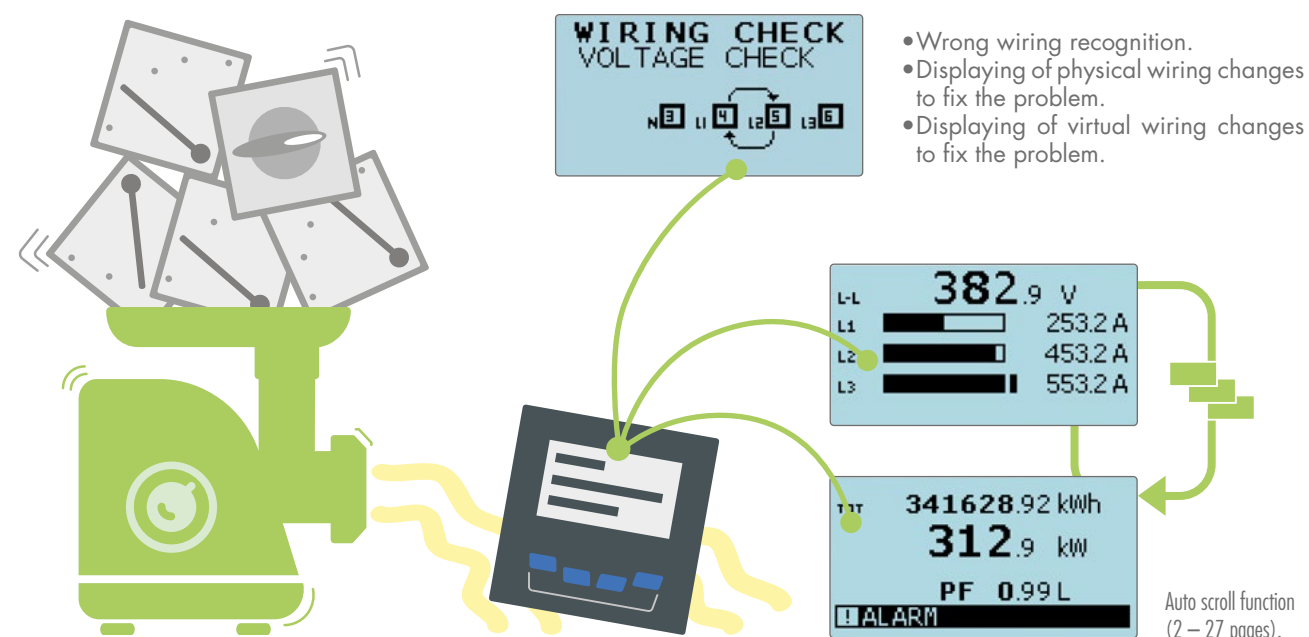## Panel mount meters
The evolution of user needs

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.
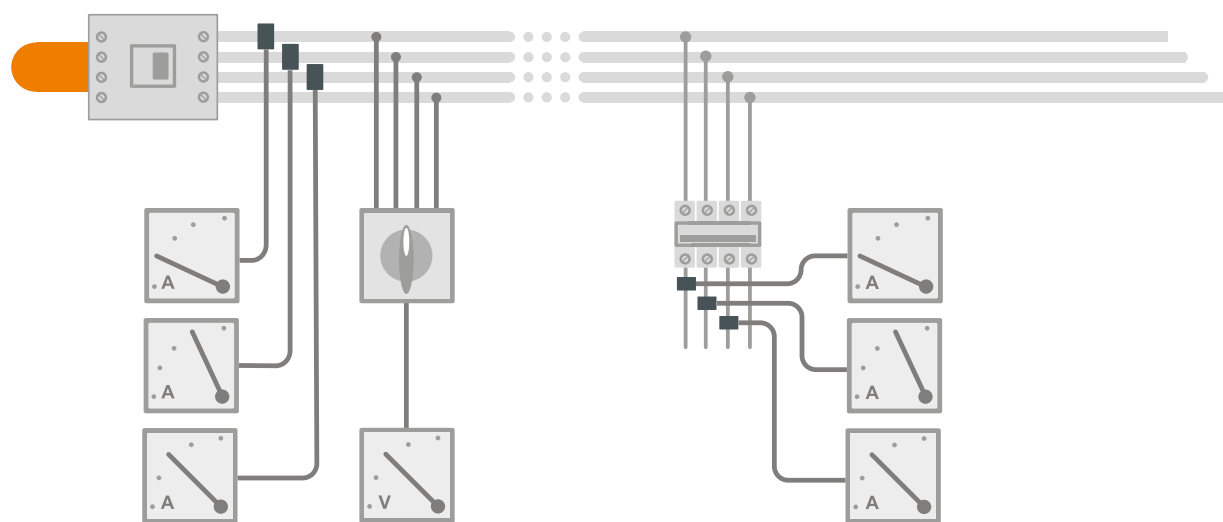
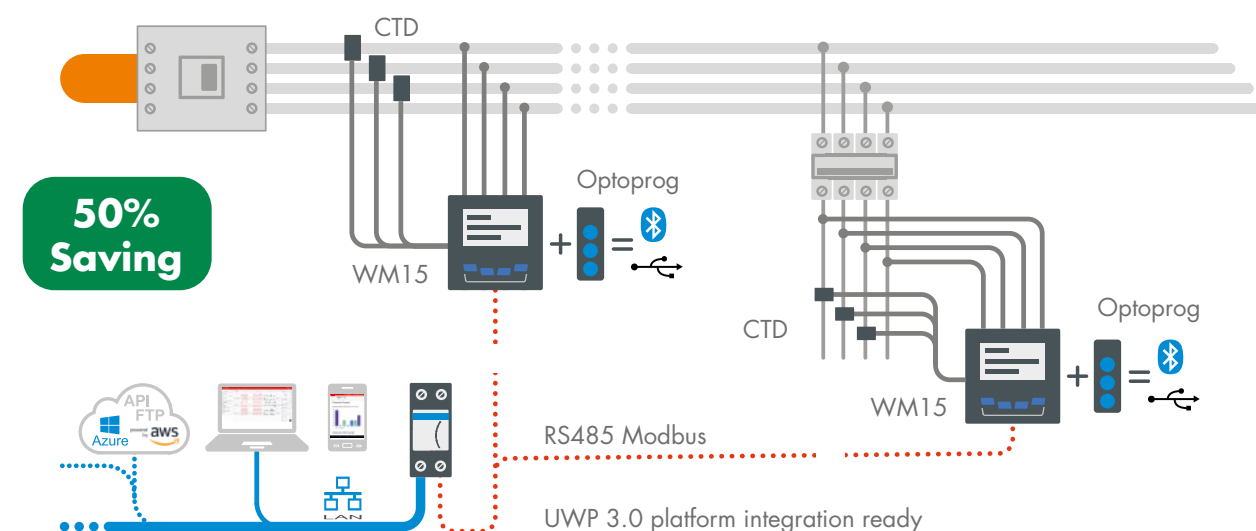■ **Users' needs change and with them the technical solutions proposed**
The position of the pointer in the analogue scale and the comparison among other analogue panel meters on the same distribution board is preferred for the reduced effort of the user in processing the information he is voluntarily 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.

WIRING CHECK
VOLTAGE CHECK

N3 L1 L2 5 L3 6

•Wrong wiring recognition.
•Displaying of physical wiring changes to fix the problem.
•Displaying of virtual wiring changes to fix the problem.

L-L   382.9 V
L1   253.2 A
L2   453.2 A
L3   553.2 A

T1T 341628.92 kWh
     312.9 kW
     PF 0.99 L
! ALARM

Auto scroll function (2 – 27 pages).

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 or on a machine, it can relate the energy consumption to the time the load is operating. Moreover, if an alarm is set, it can display it locally and transmit automatically and remotely all needed variables to validate the implemented energy efficiency policies or provide data to start a preventive maintenance plan instead.

CTD
Optoprog
WM15
50% Saving
CTD
Optoprog
WM15
RS485 Modbus
API FTP Azure aws
UWP 3.0 platform integration ready

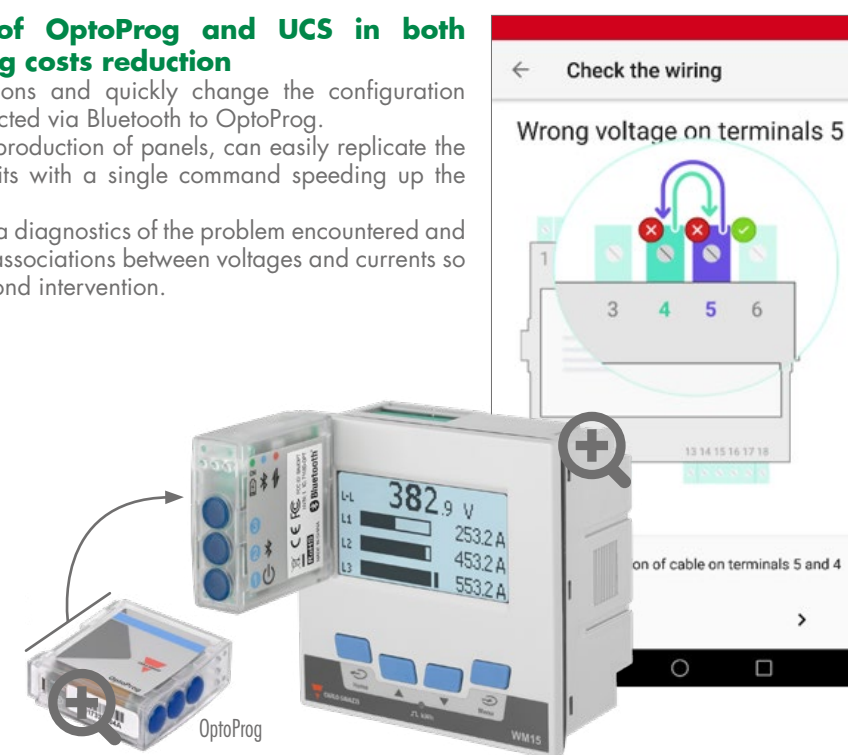■ **How to reduce installation and commissioning costs**
Installation and commissioning of advanced panel meters often have additional and hidden costs compared to standard analogue panel meters. WM15 reduces these costs by 50% compared to a standard 4 analogue meters installation and even more versus 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): ±0.5% RDG, kWh class 1 (IEC/EN 62053-21)
• MID approved (on request)

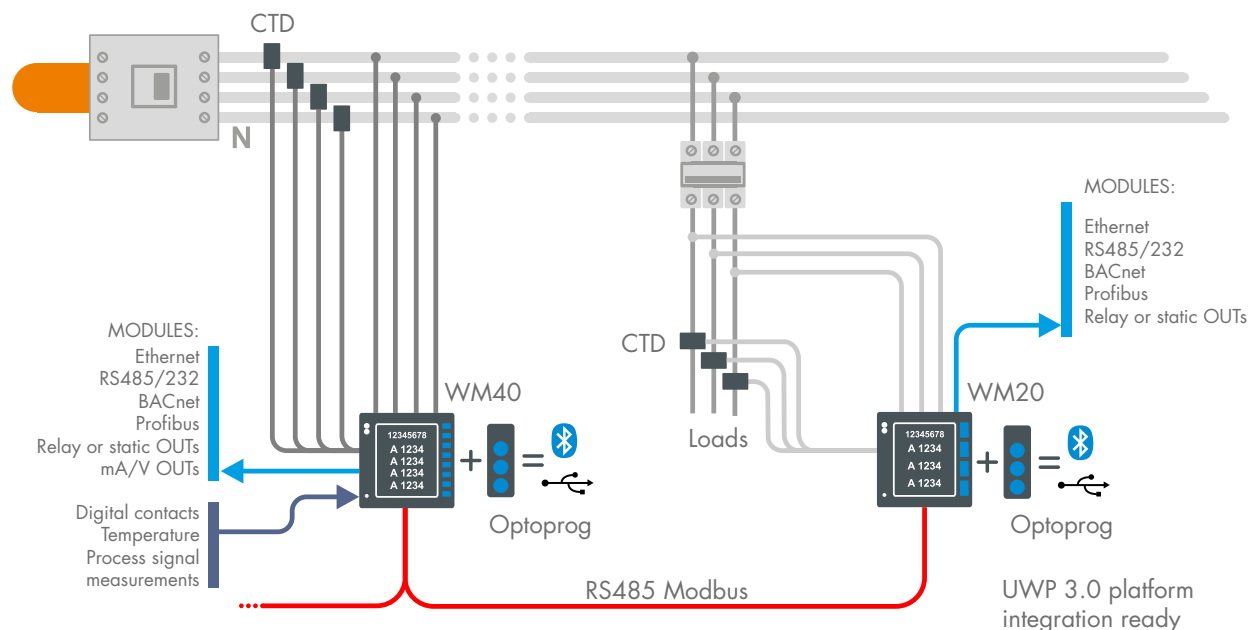← Check the wiring
Wrong voltage on terminals 5
3 4 5 6
13 14 15 16 17 18
on of cable on terminals 5 and 4

382.9 V
L1 253.2 A
L2 453.2 A
L3 553.2 A

OptoProg

Monitoring
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.

CTD

N

MODULES:
Ethernet
RS485/232
BACnet
Profibus
Relay or static OUTs

WM40

CTD

Loads

WM20

MODULES:
Ethernet
RS485/232
BACnet
Profibus
Relay or static OUTs
mA/V OUTs

Digital contacts
Temperature
Process signal
measurements

Optoprog

Optoprog

RS485 Modbus

UWP 3.0 platform
integration ready

◖ WM20

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

◖ WM30

- 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): ±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*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

- 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)
- Profibus DP-V0
- 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
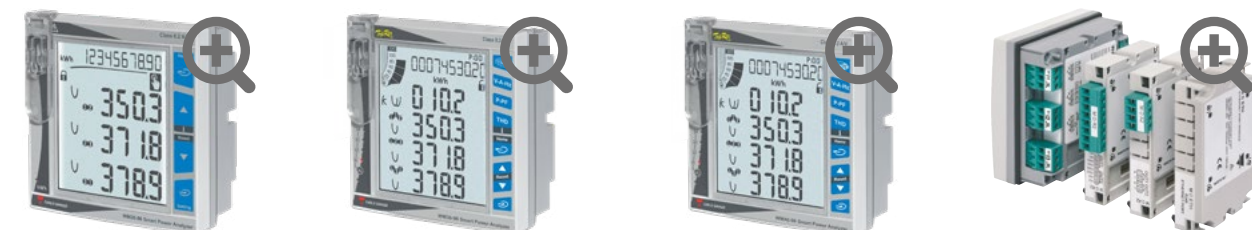
Advanced configuration and commissioning tools

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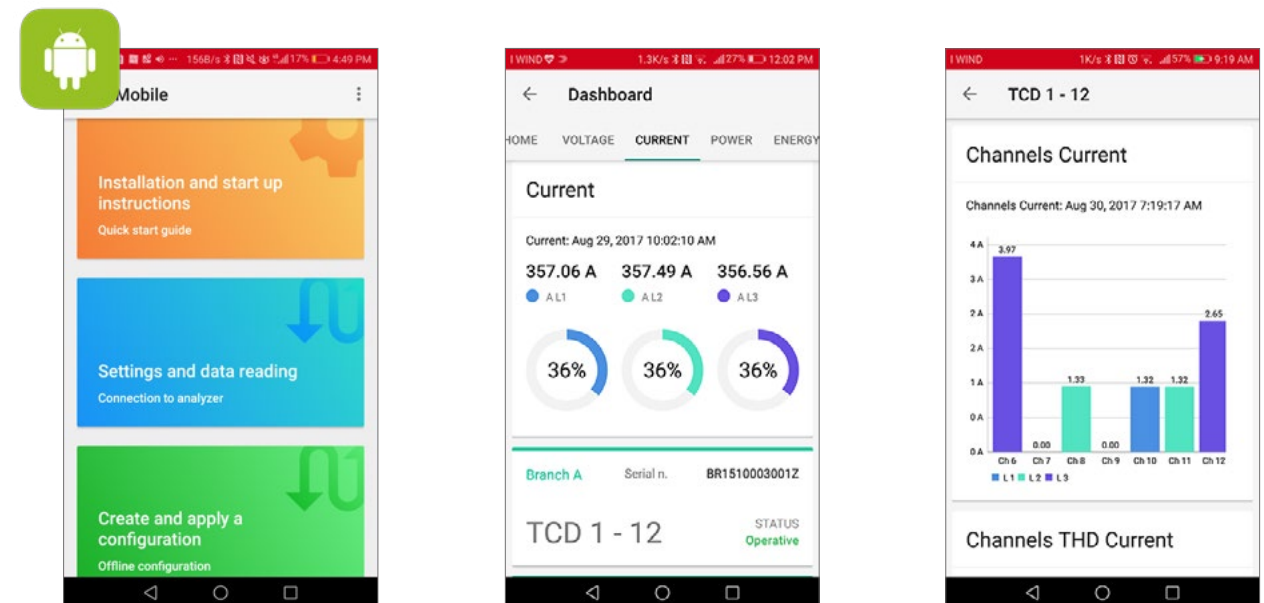
■ How do you do it? OptoProg + UCS is the solution!

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. ET112, ET330, ET340.

Monitoring

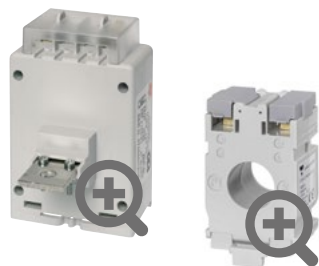## Current adapters and quick-fit solutions

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 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

[H]   [V]

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
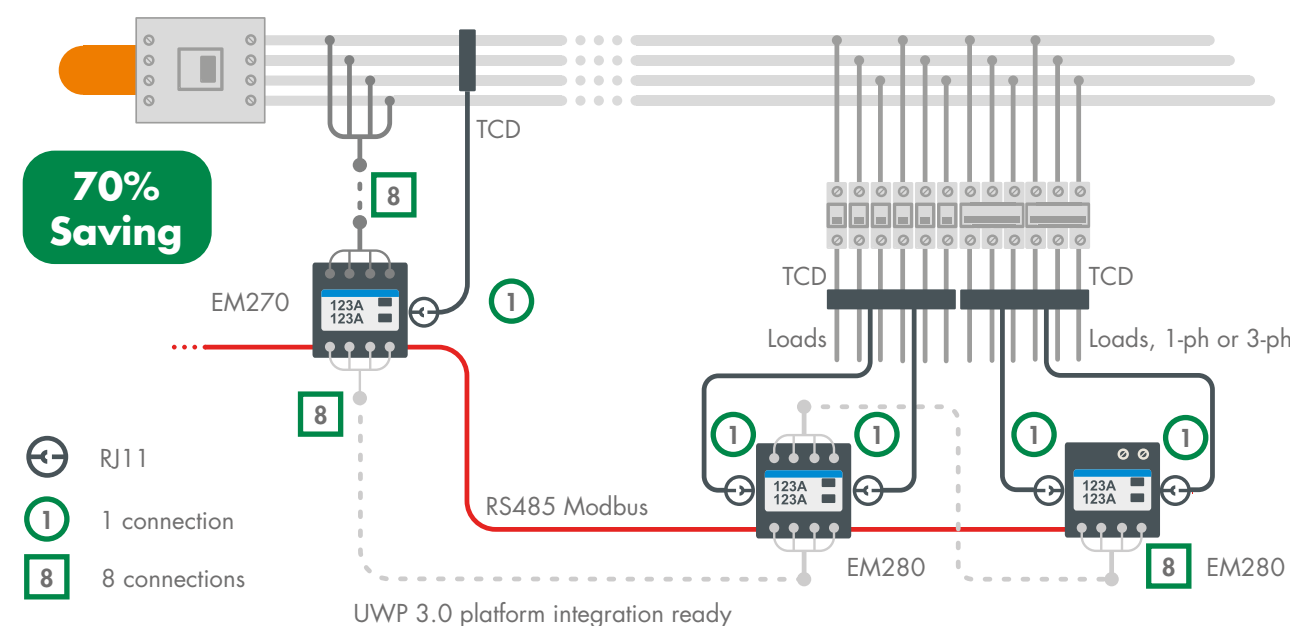- IEC/EN61869-2 compliant

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

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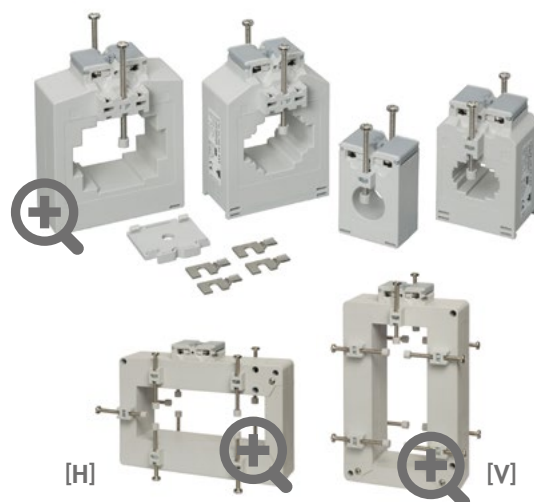
CTD 8/9/10/11/12-V-H

CTD	from (A)	to (A)
8 V/H	150	1600
		2500
9 V/H	400	2000
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 8/9/10-S

CTD	from (A)	to (A)
8 S	150	1600
		2500
9 S	400	2000
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

Main and sub-metering for new installations

Quick-fit solutions.

When installation time, meter configuration, and commissioning are a concern, Carlo Gavazzi Quick-fit is the solution. In a typical installation (lighting, HVAC, heating, refrigeration) using 1+4 regular meters you can achieve a time reduction of about 70% using 3 quick-fit meters instead.

70% Saving

TCD

EM270

TCD   TCD
Loads   Loads, 1-ph or 3-ph

RJ11

1 — 1 connection

8 — 8 connections

RS485 Modbus

EM280   EM280

UWP 3.0 platform integration ready

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): ±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

Up to 630A

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): ±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

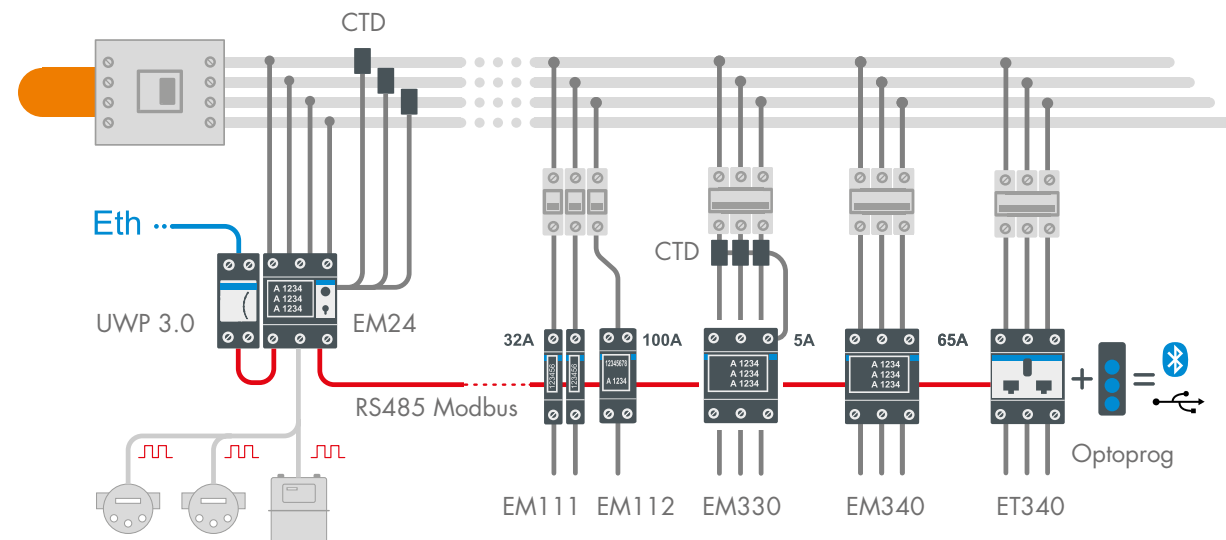- Primary: 6*32 A, hole size: 7 mm. Centre-to-centre distance: 17.5 mm. RJ11 cable length: 80, 150 or 200 cm

32A

CARLO GAVAZZI

Monitoring

A compact range of DIN rail mount meters
Main and sub-metering for new installations

CARLO GAVAZZI

Full energy analysis capability and MID approval.

This range offers you both CT connection inputs and direct connection capabilities. EM24, EM100 and EM300 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; display data completeness and touch keypad – most important variable information available at a glance and no keypad maintenance; full electric variables set availability also through the communication port – capability to know the single load behaviour so to perform a concise analysis.

CTD · Eth · UWP 3.0 · EM24 · RS485 Modbus · CTD · 32A · 100A · 5A · 65A · Optoprog · EM111 · EM112 · EM330 · EM340 · ET340

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): ±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

EM110-111-112
EM110 and EM111
- 32 A (max 45 A) - 1-DIN module housing - 7-digit (EM110 electromechanical) counter (cl. B EN50470-3 MID approved), pulse output.

EM112
- 100A, 2-DIN modules housing, display backup by supercapacitor.
- Backlit touch 8-digit LCD.

EM111 and EM112
- 115 – 230 V ac measuring inputs
- Basic accuracy (V/A): ±0.5% RDG
- Self powered (230 V ac)
- Measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, dual tariff
- Bi-directional kWh (cl. B EN50470-3 MID approved)
- Pulse output or RS485 Modbus RTU or M-Bus port

EM330, EM340
EM330
- CT 5 A, 90V to 260 V ac/dc auxiliary power supply

EM340
- 65 A, self powered (230 V ac)

EM330 and EM340
- 3-DIN modules housing
- Backlit touch 3*8-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, dual tariff, 3*1-phase kWh
- Basic accuracy (V/A): ±0.5% RDG
- Bi-directional kWh (cl. B EN50470-3 MID approved)
- Pulse output or RS485 Modbus RTU or M-Bus port

ET112, ET330/ET340
ET112
- 100 A, 115 – 230 V ac measuring inputs, 2-DIN modules housing

ET330
- CT 5 A, 230 – 400 V L-L ac measuring inputs, 90 V to 260 V ac/dc auxiliary power supply, 3-DIN modules housing

ET340
- 65 A, 230 – 400 V L-L ac measuring inputs, 3-DIN modules housing

ET112, ET330 and ET340
- Single and three-phase measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, dual tariff, 3*1-phase kWh, An
- Basic accuracy (V/A): ±0.5% RDG
- ET330 only: kWh class 0.5S (IEC62053-22)
- Self powered (230 V ac)
- RS485 Modbus RTU port (RJ45 daisy chain and screw terminal block connections)

5A 65A · 32A 100A · 5A 65A · 100A 5A 65A

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.
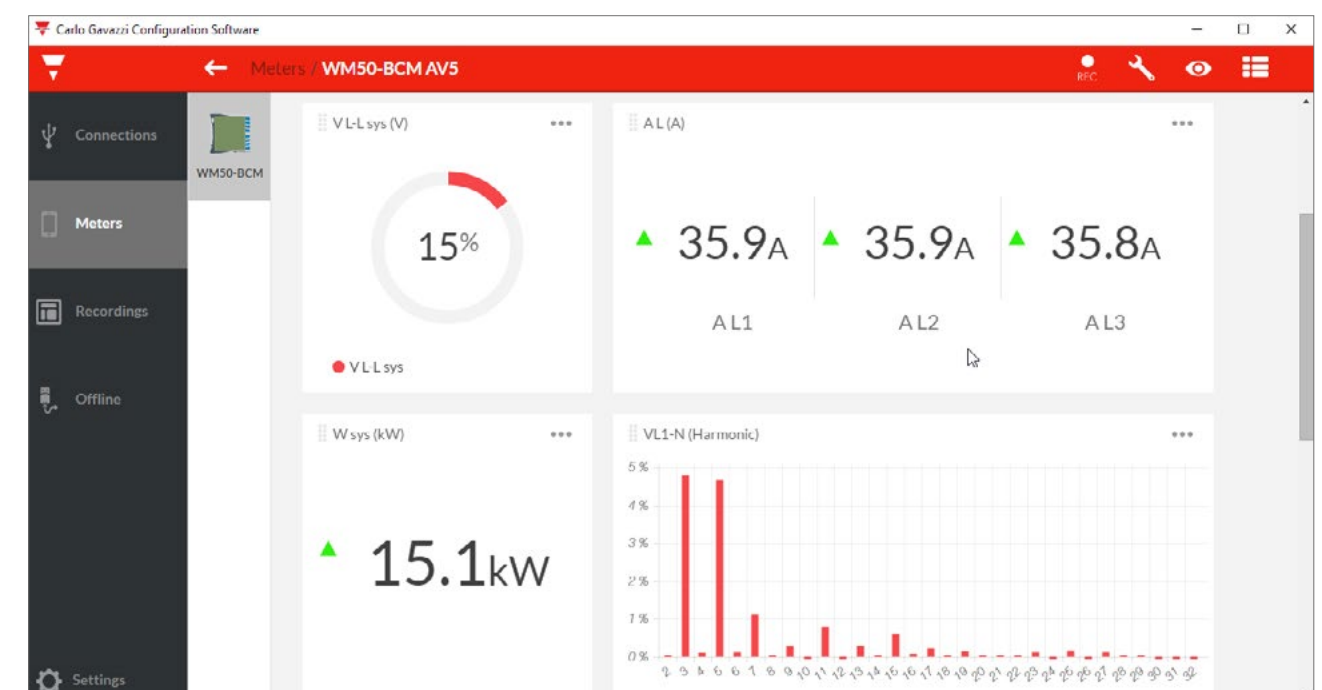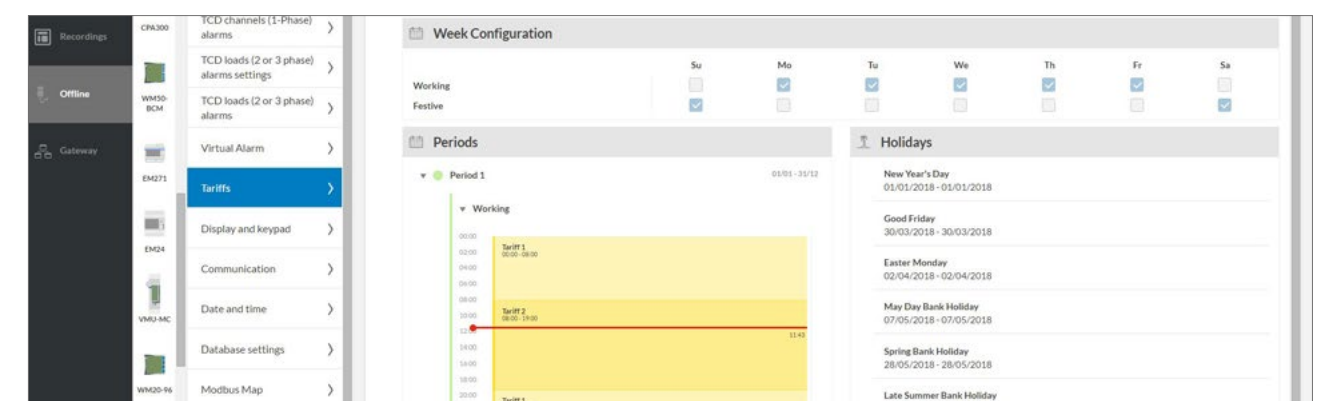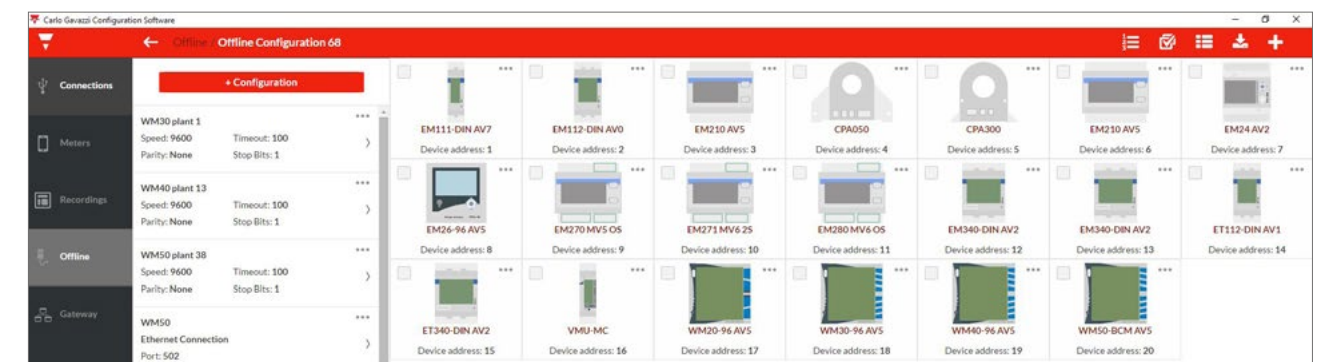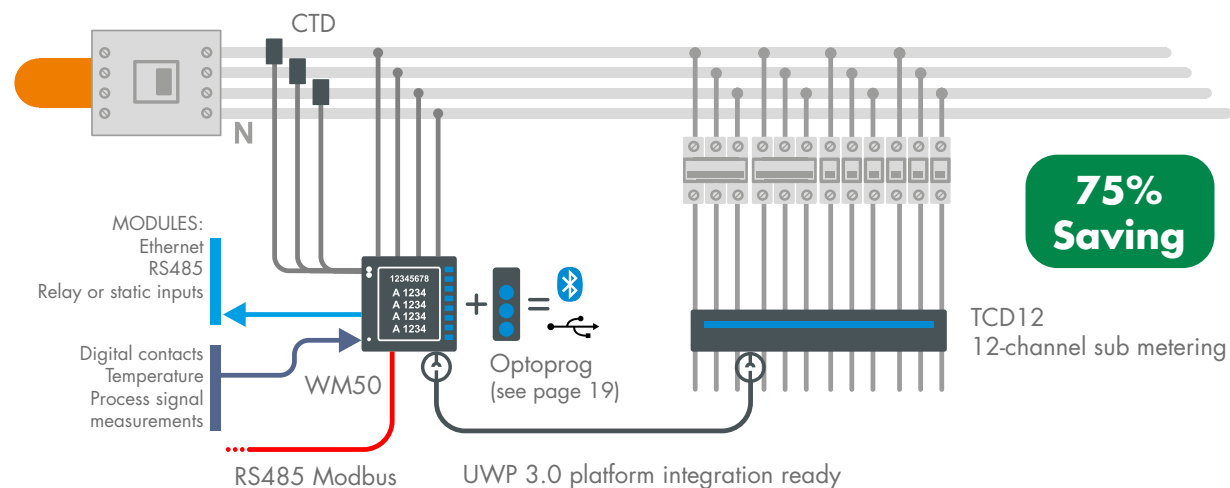
Quick-fit high-density metering solution

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 loads 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 loads. 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.

CTD
N
MODULES:
Ethernet
RS485
Relay or static inputs
Digital contacts
Temperature
Process signal
measurements
WM50
Optoprog (see page 19)
RS485 Modbus
UWP 3.0 platform integration ready
TCD12 12-channel sub metering

75% Saving

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): ±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
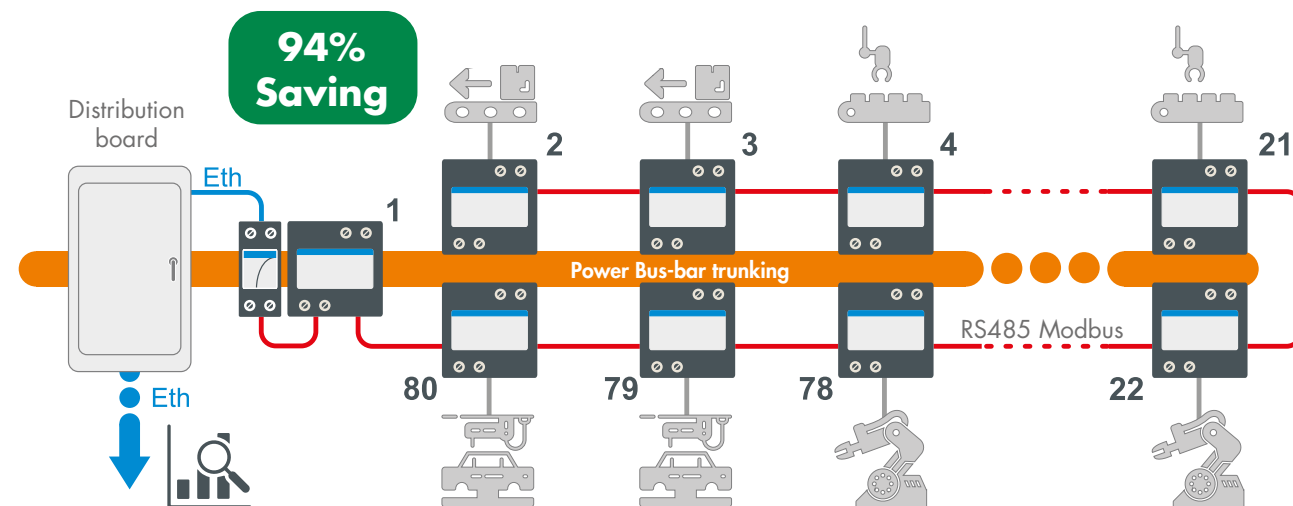
TCD12, sub metering
- Primary: 12*65 A
- Hole size: 8.5 mm
- Centre-to-centre distance: 17.5 mm
- RJ cable length: 30 – 500 cm
- 12-channel split-core current sensing unit
- Basic accuracy (V/A): ±0.5% RDG, class 2 (kWh) according to IEC/EN62053-21 (meter + TCD unit)
- Up to 96 channels: kWh, W, var, VA, PF, A, THD A
- Data available via communication module on board of WM50

65A
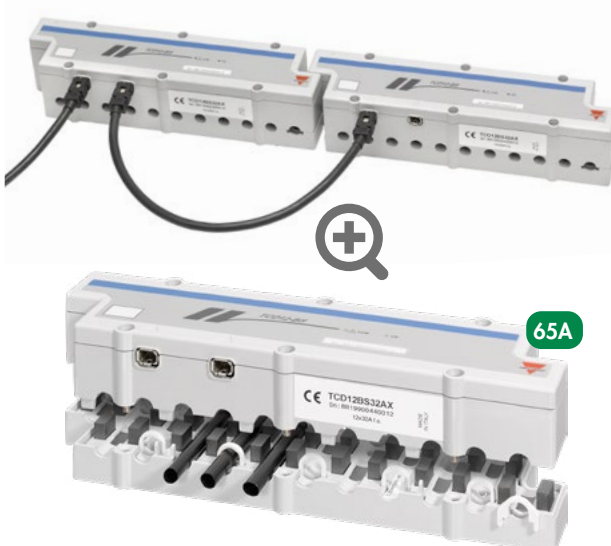
From main metering to submetering

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, and when the machines/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%).

94% Saving

Distribution board
Eth
Eth
Power Bus-bar trunking
RS485 Modbus
1   2   3   4   21
80   79   78   22

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 (kW): ±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)

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)

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

Monitoring
On premises and Cloud solutions

### A scalable architecture made of building blocks

It is a matter of fact that a small to medium Company or a large multinational have different needs in terms of organisation and management.

It is also obvious there is a connection between facility dimensions, management complexity and quantity of data being generated. At the end, the management of needs, becomes sooner or later the management of problems. In the specific case of data, it is therefore important to prevent the problems so to avoid fixing them afterwards, since problems are always costs.

■ The data sources

In our case, data are generated by the field devices – meters, sensors and I/Os – which are the sources to be used to implement an energy efficiency plan, a load monitoring solution or simply cost centers for cost allocations.

■ FDBB the Field Data Building Block
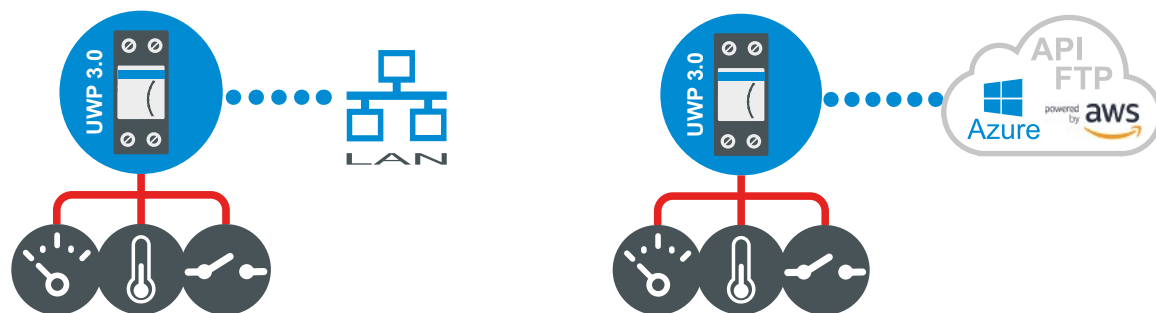
The fact that Carlo Gavazzi can provide field devices equipped with simple communication buses that can be connected to an UWP 3.0 is the core of the solution but also the prevention of problems.
If the field devices are aimed to generate the data, UWP. 3.0, through its field buses (wired Modbus and Dupline but also wireless) collects all data and manage them locally. Therefore, our ideal building block FDBB embeds the data generation and the edge computing as in the picture above.

#### ■ The solution is to decentralise the monitoring system

By using FDBBs (Field Data Building Blocks) the system becomes scalable and in case of missing communication to either the PC or the Cloud where the management software is running, the single FDBBs will continue to work and to manage data locally. As soon as the communication will be back, Em²-Server will synchronize the data again and update its database.

Em²-Server

> Gosh! Communication is gone!

> Don't worry! I don't stop collecting data, we synchronize later.
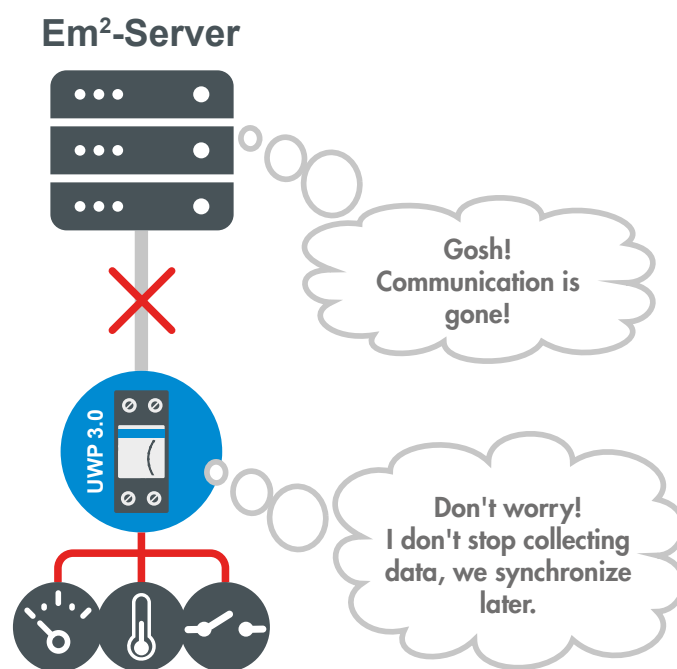
Data aggregation and standard web-browser access

Single-site or multi-site unique solution.

Em²-Server solution is scalable and therefore suitable to be used in small installations but also in large facilities or spread geographically in different locations in the same country or in different countries. It can scale up to 100 FDBBs which means up to 100 UWP 3.0s and up to 3,200 Modbus meters. Em²-Server allows to aggregate information replicated by UWP 3.0 within a single centralized database and the relevant information may be accessed by users from wherever by using a standard web-browser.
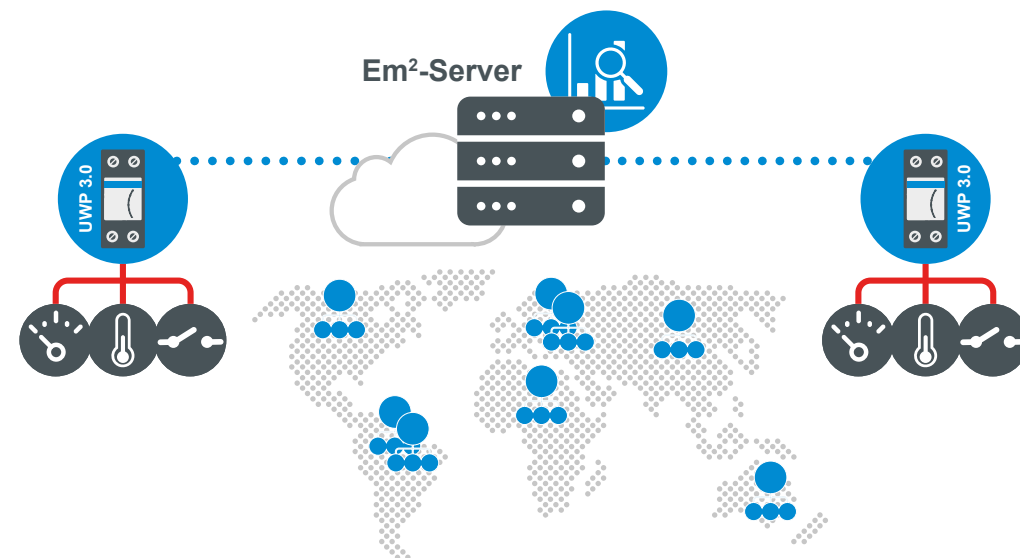
Em²-Server

Em²-Server has:
- a multilingual Web based user interface
- user rights management
- concurrent access from multiple locations
- integrated MAP view and interactive mapping feature
- movable and resizable dashboards fitting the needs of a control room
- hierarchical tree to navigate data with ease
- alarms view (only in case of combined use with VMU-C)
- Excel® reporting and PDF billing simulation
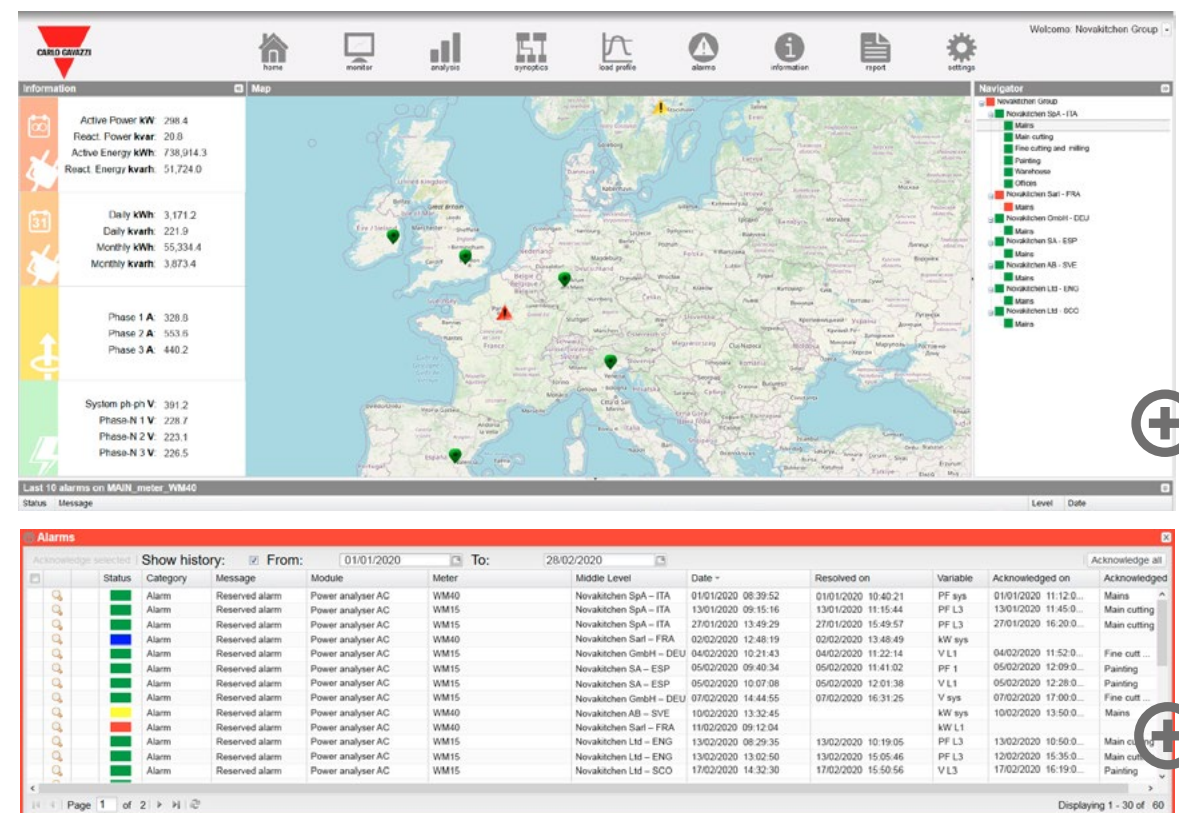
Monitoring

On premises and Cloud solutions

### Energy cost centers and other cost analysis tools

Em²-Server is a multi-function solution which manages field-sensor data of any type.

Energy efficiency and cost allocation are important goals to achieve, being part of an OPEX (Operating Expenses) reduction strategy of a company. To understand how energy is consumed and where it can be saved, it is important to have specific tools and dashboards which allow to perform an adequate analysis.

It does not matter if the need is to know on time, energy data to perform a cost analysis or to sell energy services, Em²-Server provides you the tools you need. This solution may generate billing documents but may also produce a simulation of a monthly or yearly energy bill based on existing consumption and utility supplier vs. same consumptions but based on another utility supplier to evaluate the real convenience to change over.
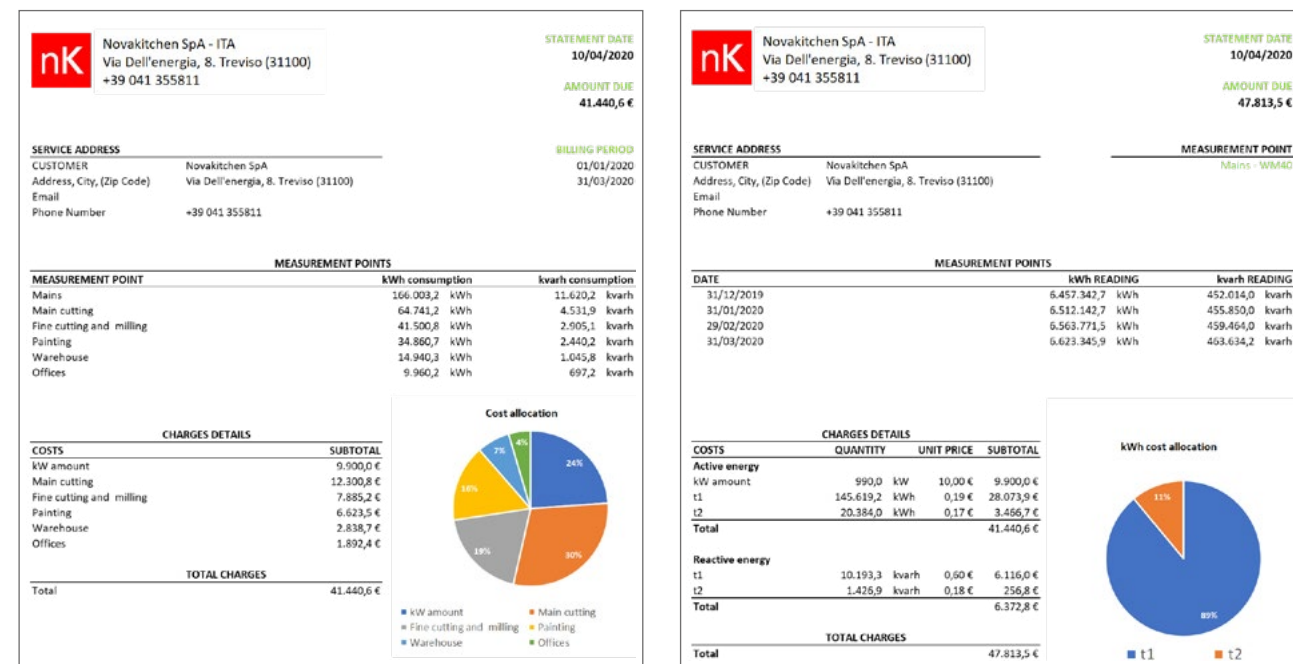

So, Em²-Server embedded essential tools are capable to perform a budget, comparative or summarized into a billing simulation PDF file and monthly balance analysis. Moreover, data can be exported using powerful Excel® export embedded analysis tool.
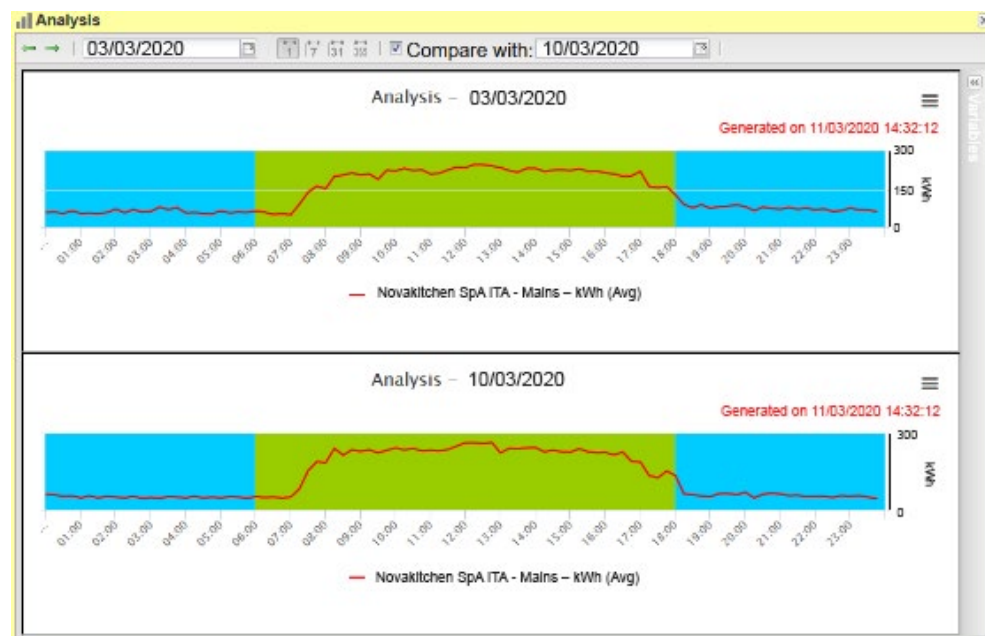
From cost analysis to advanced load profiling

Cost of energy in business activities is connected also to a tariff management.

Em²-Server manages multiple tariffs, multiple profiles, multiple calendars to make the entire analysis more accurate. This means, in a global business activity, to be able to manage automatically different energy costs in different geographical areas but also different working calendars at the same time producing, at the end, a common document.
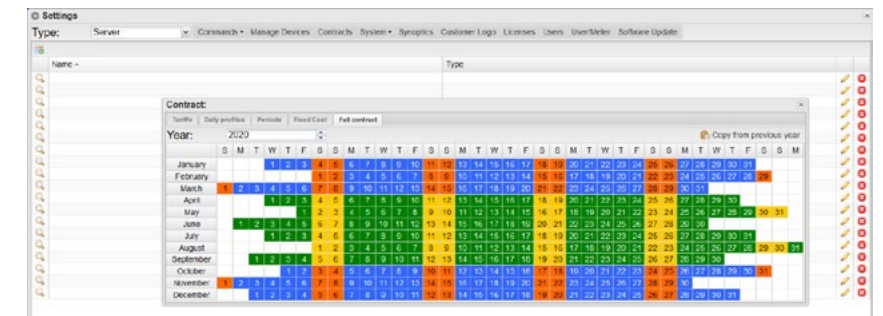
■ Advanced Load profile analysis
As important part of Em²-Server tools, there are also the specific load profile statistical (average, median, min, max, Sigma standard deviation) analysis which may based, on the set time, on hundreds of thousands of data and is aimed to discover at a glance, the load behaviour differences, thus discovering anomalies and suspicious consumptions.
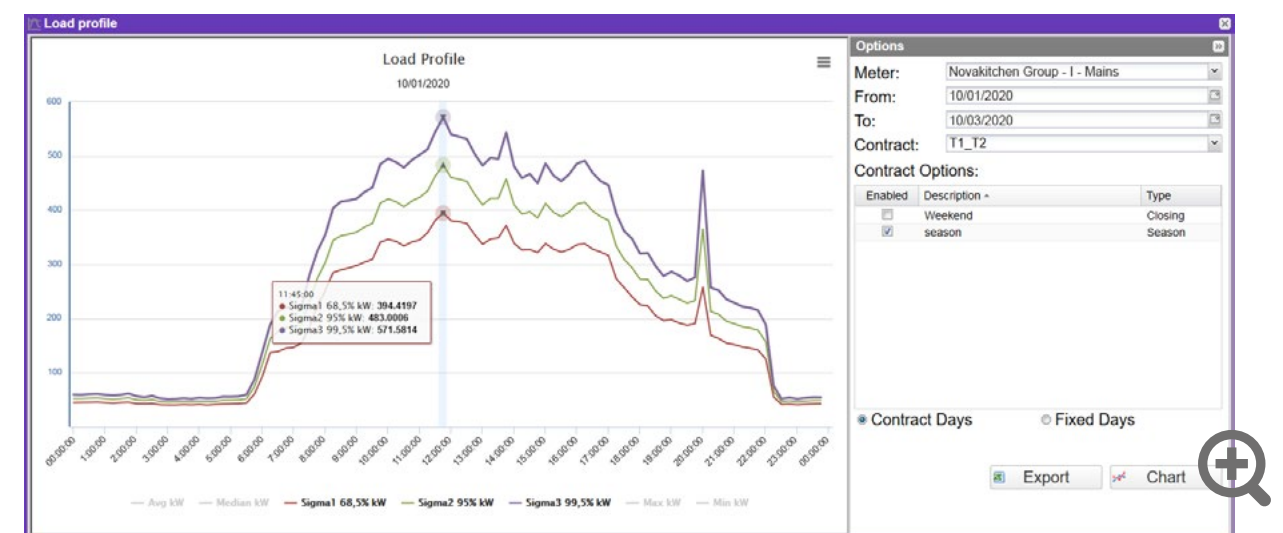
Active control
The map - multiple and different needs

■ Not only utilities and users but also buildings and occupants
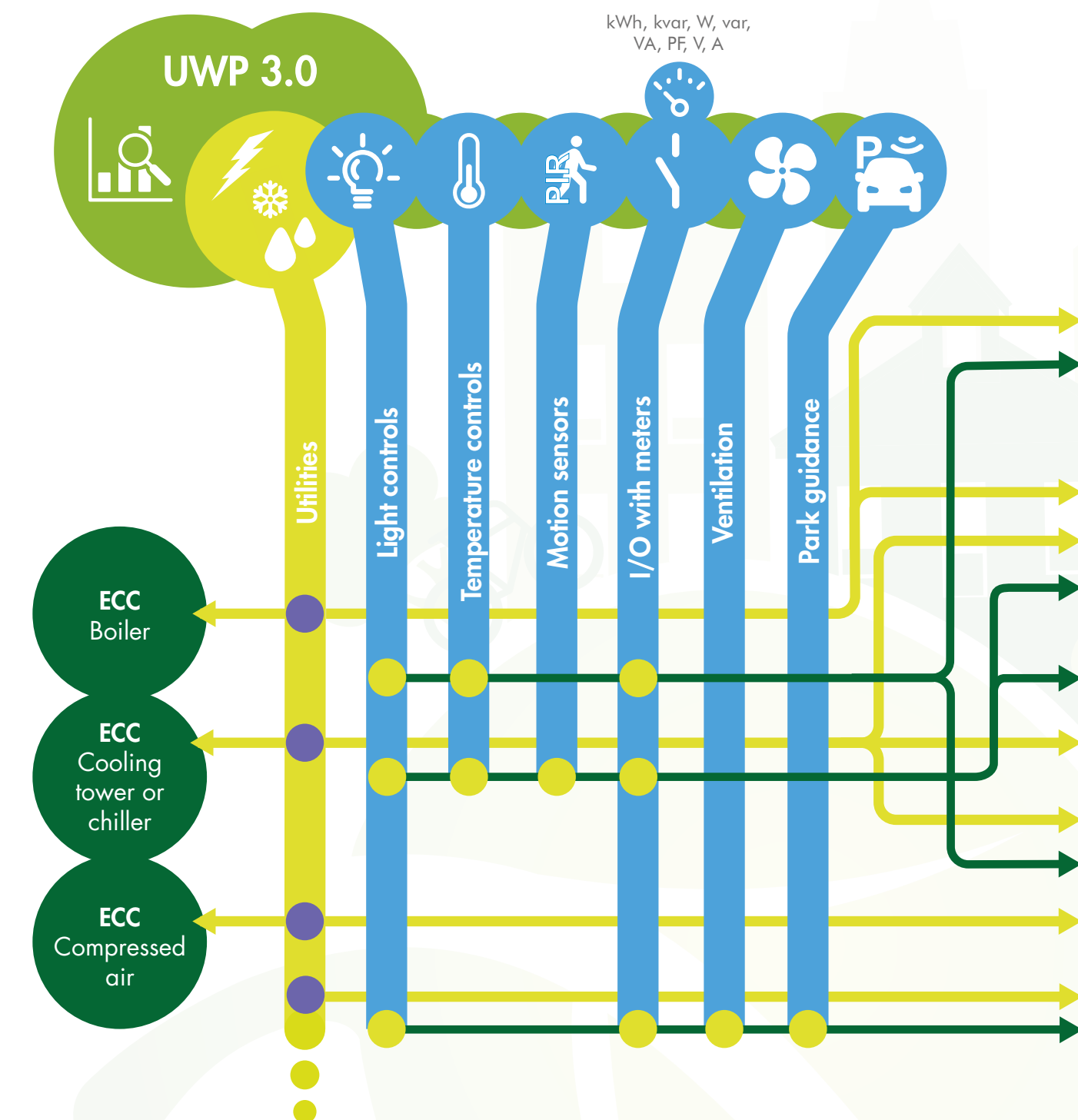
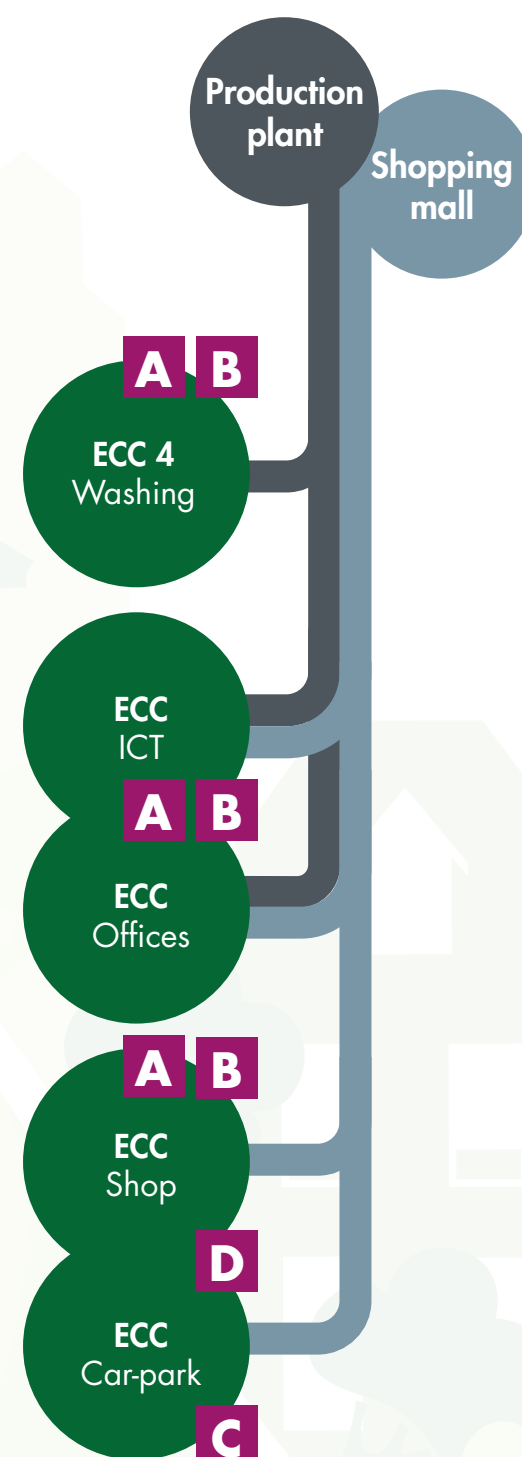The key objective of an energy efficiency plan is:
• minimizing consumptions (TOE, tons oil equivalent);
• minimizing costs;
• minimizing environmental impact (tons of CO_2);
• as a mandatory condition, ensuring the same productivity level!

● **Active controls**

● **Measurements**

ECC: Energy Cost Center

kWh, kvar, W, var, VA, PF, V, A

UWP 3.0

Utilities · Light controls · Temperature controls · Motion sensors · I/O with meters · Ventilation · Park guidance

ECC Boiler
ECC Cooling tower or chiller
ECC Compressed air

Production plant
Shopping mall

A **B**
ECC 4 Washing

ECC ICT
A **B**
ECC Offices

A **B**
ECC Shop
D

ECC Car-park
C

■ The energy performance of the building

Building Automation and Control Systems (BACS) can have a significant impact on the energy consumption of any kind of building and their occupants.

The EN 15232:2012 Standard: Energy Performance of Buildings in conjunction with the "Energy Performance of Buildings Directive" (EPBD) in Europe, as well as other standards (LEED, Energy star) in other regions, are the guides to achieve the planned energy efficiency goals.
Those standards are aimed to provide:

• a list of control, automation, and technical management functions that affect the energy performance of buildings;
• a method for defining the minimum requirements for the control, automation, and technical building management functions implemented in different types of buildings;
• detailed procedures for quantifying the impact these functions have on the energy performance of a building;
• a simplified method to obtain an initial estimate of the impact these functions have on the energy performance of buildings.
Carlo Gavazzi, with its global offer of products, solutions and competences, evolves its product portfolio from energy efficiency monitoring solutions to active control through building automation.

Being able, in an existing installation, to keep the same wiring or to simplify it, upgrading the technology, adding new functions, is beneficial to achieve the planned energy savings.

■ The performance of a car park

In a place, nearby a business activity, where there is a high concentration of parked cars, like in shopping malls, airports and in large railway stations, an indoor car-park or multi-storey garage is another point of attention. It is not only aimed to implement energy saving actions but also solutions to be more service effective.
The attention moves from the energy efficiency of the facility to the occupants of the car-park. This means the drivers, providing them automated information about where to drive and park the car, reducing their stress, thus increasing car flow efficiency and reducing fuel emissions.

The topics
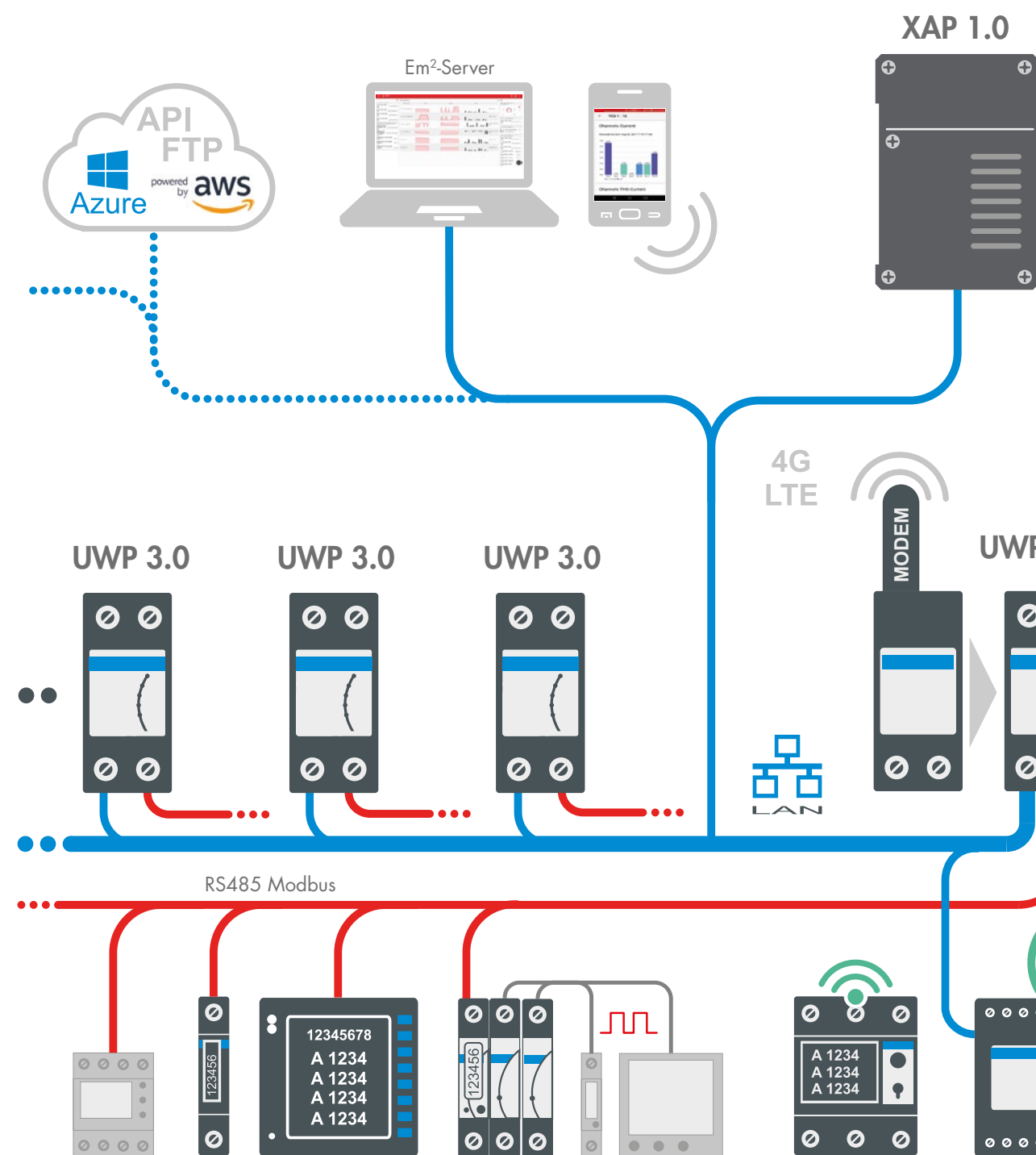
TECHNOLOGY · PLATFORM · MONITORING

Active control

One platform, many solutions

**The UWP 3.0 platform evolves from energy monitoring to active control, adding:
I/Os, functions and specific bus integration modules...**

■ **up to a full integration into a BMS**

API
FTP
Azure powered by aws

Em²-Server

XAP 1.0

4G
LTE

MODEM

UWP 3.0 UWP 3.0 UWP 3.0

UWP 3.0

LAN

RS485 Modbus

12345678
A 1234
A 1234
A 1234
A 1234

123456

A 1234
A 1234
A 1234

M-Bus

2.4GHz

In   Out   kWh

DALI

Dupline®

P P P P

In   PIR

■ **The architecture completion**
Simplicity, short commissioning time, cost reductions, error proof configuration, expandability and scalability are the key characteristics of UWP 3.0, which make this platform a powerful solution to achieve the Energy Efficiency goals. This means that the platform evolves from the pure monitoring introduced in the first part of the presentation of this solution, to the active control. Although collecting automatically all the meters data is extremely important, this is not enough to achieve the maximum results in terms of energy savings. Therefore, energy efficiency aimed to minimize the energy costs is the synergy of two major actions: monitoring and active load control.

■ **The active control**
The active control performed by UWP 3.0 is the capability of this platform to act, at a first level, directly and automatically on the loads but also at a second level to integrate into other management systems.
As a first example, in an industrial plant we can have several buildings like a production facility with services, offices, and a warehouse, with different needs in terms of load control and integration. In the production facility, there are energy intensive loads like large machines, electric heaters, chillers and air-compressors. All of them have to be monitored and optimised. There is also the need to allocate the energy costs by produced item (see our extensive meter offer).
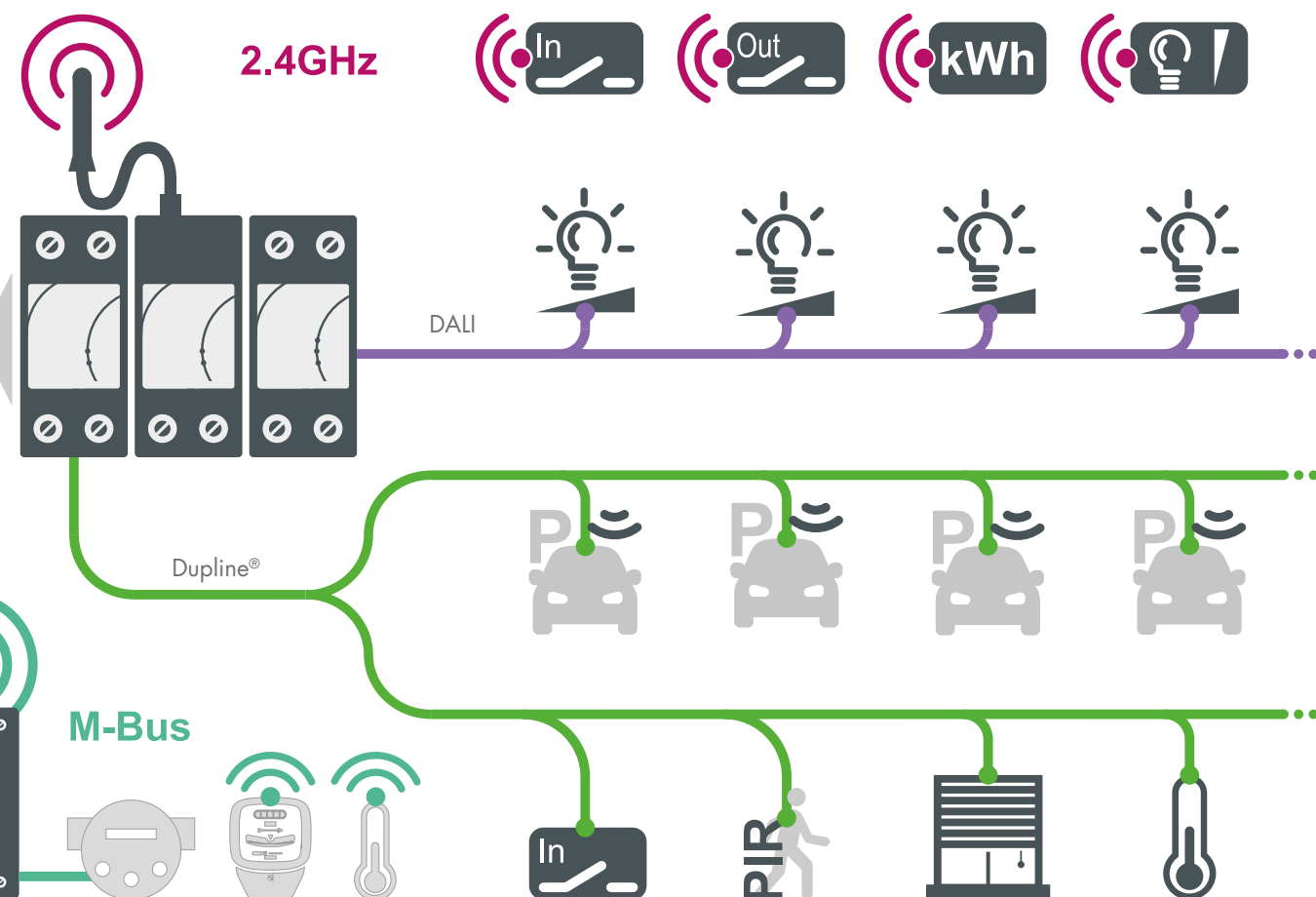
Active control

The architecture technologies

One solution from Field devices up to Management

Efficiency is not only electric or on the transformation process, it is also human.

CARLO GAVAZZI

The BACnet communication integration and more

BACnet means a specific data communication architecture and protocol designed to ...

■ **Energy savings and human efficiency**

In the offices there is the need to maximize energy efficiency in relation to the external environmental conditions and people occupancy, while providing the highest levels of comfort, safety and quality. Lighting is one of the major areas to focus on, so to reduce electricity costs. A proper controller module based on DALI bus provides a wide range of control strategies to achieve both energy savings and comfort level. Efficiency is important not only for energy resources, but also for human resources. A modern company knows that people engagement, mood, and commitment can be easily enhanced taking care of the work space in terms of CO_2 level (ventilation), temperature (heating and cooling), and illumination (DALI).

■ **Control and integration**

Last but not least, in the warehouse the main energy users are lighting, heating, and ventilation. A proper management of those loads and the communication by means of BACnet, will integrate the UWP 3.0 platform into a BMS so to complete the offer to achieve the energy efficiency goals.

■ **From energy efficiency to flow efficiency**

As an additional example, moving from an industrial installation to a shopping mall or an airport, there is the need to different extents, in addition to what already explained beside, to implement energy efficiency strategies also in an indoor car-park or multi-storey garage. In this case, as for the people using the offices, efficiency is important not only to control lighting and ventilation (making sure they are disabled in unoccupied zones), but also for drivers, providing them automated information about where to drive and park the car, reducing their stress, thus increasing car flow efficiency and reducing fuel emissions.

Beyond communication networks, the BACnet communication integration

Learn more

... provide mechanisms for computerized building automation devices to exchange information, regardless of the particular building service they perform.

■ This means a data exchange and management of heating, ventilation, and air-conditioning control. But also lighting control, access control, and fire detection systems and their associated equipment to achieve the energy efficiency and saving goals. While communication networks are used extensively in Building Automation systems at the automation and management levels, they are less used at the device level, especially within HVAC control systems. In most cases, each data point needs its own wire(s) back to the DDC (Direct Digital Control), which complicates the installation in case of widely distributed data points, meaning, cost issues and device level complexity.

■ While on one hand UWP 3.0 significantly simplifies the field level of HVAC and lighting wiring without increasing material costs, on the other hand it reduces both commissioning and BACnet integration time.

■ UWP 3.0 is a multi protocol unit which means, in a BACnet world, the central unit of the system. It interfaces to XAP 1.0 the DDC's (Direct Digital Controls) and the BMS (Building Management System) through BACnet/IP, managing up to 7 Dupline® bus generators. The Dupline® fieldbus links together all the sensors, actuators and indicators needed for the HVAC and lighting systems in a free topology network.
Carlo Gavazzi is part of the BACnet Manufacturers Association (BMA), is listed as an official vendor, and provides BTL certified products.

Management

Automation

Field

XAP 1.0 · API FTP · Azure · powered by aws

BACnet ASHRAE

4G LTE · Modem · LAN · 2.4GHz · M-Bus

SH2-MCG · SB2-DALI

SH2-DSP · UWP 3.0 · SH2-WBU · SIU-MBM

LoRaWAN

2.4GHz · In · Out · kWh · PIR · Dupline®

12345678 A 1234 A 1234 A 1234 A 1234

A 1234 A 1234 A 1234

Modbus · **M-Bus** · Dupline® · **DALI**

PLATFORM · MONITORING · CONTROL

BACnet ASHRAE · Modbus · KNX

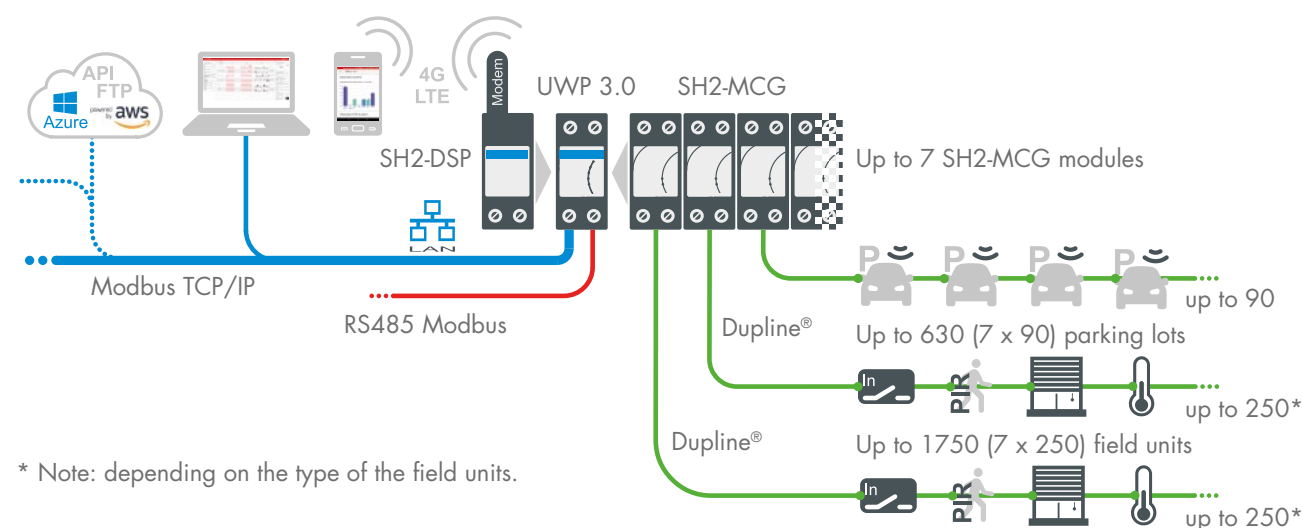powered by aws · Azure · CoDeSys · MQTT

DALI · OPC UA · Node-RED · M-Bus
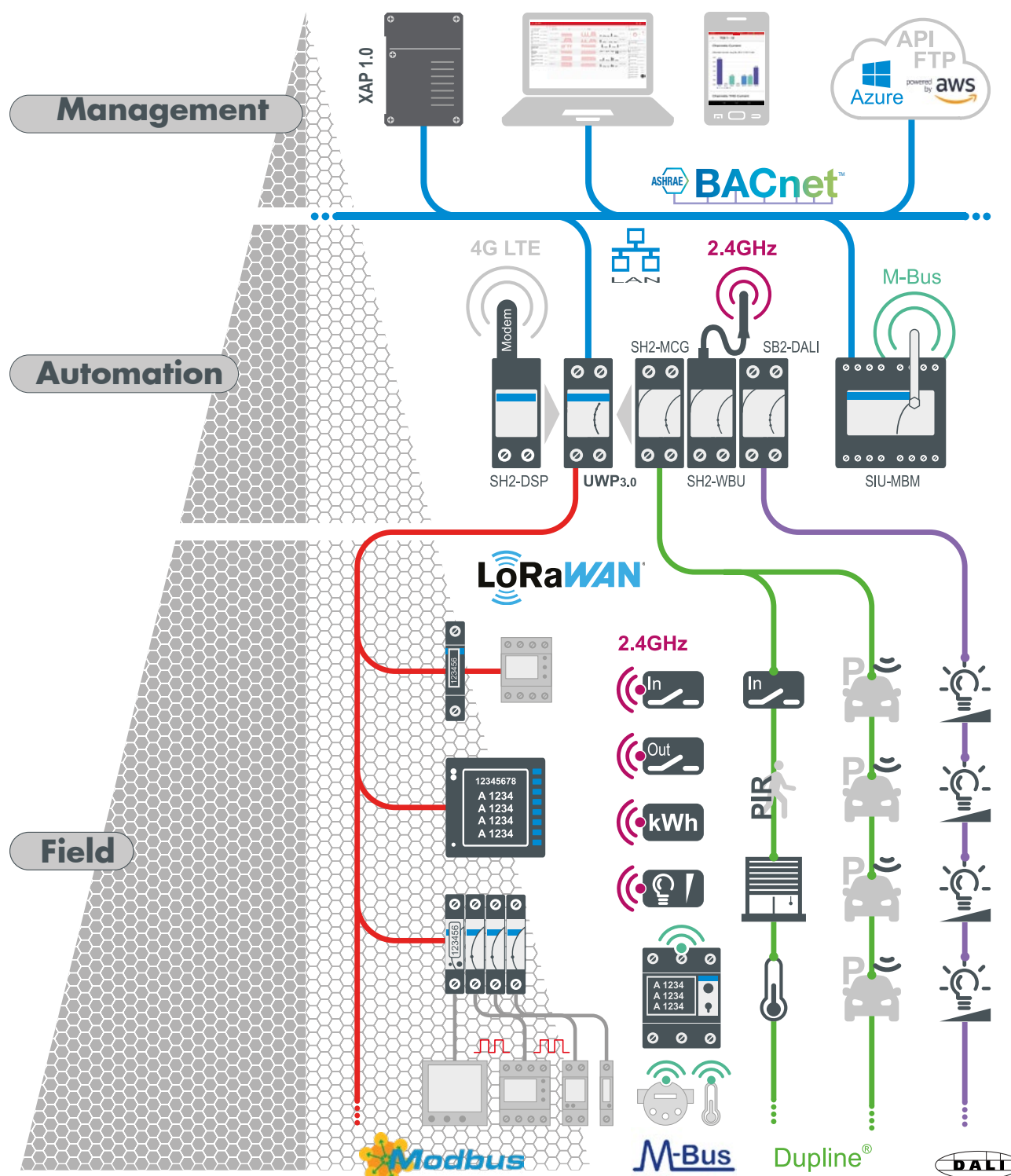
The smart field bus wiring

The Dupline® bus

Dupline® is the smart fieldbus to exchange information between smart field sensors and the UWP 3.0 core unit and platform.

Modbus TCP/IP
RS485 Modbus

UWP 3.0   SH2-MCG
SH2-DSP
Up to 7 SH2-MCG modules

Dupline®   up to 90
Up to 630 (7 x 90) parking lots

Dupline®   up to 250*
Up to 1750 (7 x 250) field units
up to 250*

* Note: depending on the type of the field units.

■ Why the Dupline® proprietary smart bus?
Because among all the platform compatible standard field buses, Dupline® is the best solution in its application context, since it brings numerous benefits, such as:
- eliminating expensive shielded cable, saving money just because it uses a twisted pair (2 wires);
- being extremely noise immune, can run next to power cables;
- carrying the power supply to power the connected sensors;
- simplifying the field level wiring (based on free topology) without increasing the material costs (e.g. using existing cables);
- running the bus signal up to 1.24 mi (2 km) without any repeater;
- being robust with a proven technology with over 150,000 installations worldwide including not only energy efficiency solutions but also mining, oil drilling, railroads and many others;
- being modular and scalable, the system can be progressively extended with new modules (up to 7) according to the application needs.
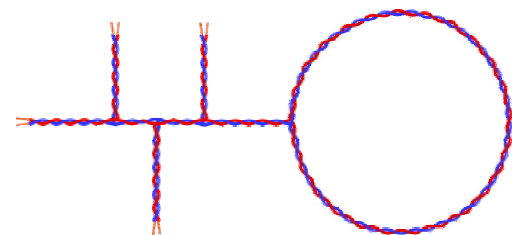
◀ SH2-MCG
- Connection to UWP 3.0 via internal bus or terminals via the high speed bus
- Up to 7 SH2-MCGs can be connected on the same network, considering the sum of SH2-MCGs and SH2-WBUs
- 2-DIN modules housing
- 24 V dc power supply

■ The noise and crosstalk immunity of Dupline®
1) Inductive coupling effect in parallel wires.
2) Minimizing the inductive coupling effect in Dupline® twisted Cables.

❶   ❷
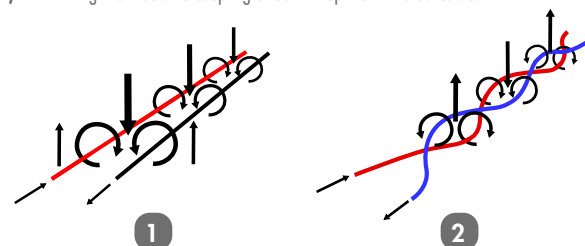
■ The free topology of the Dupline® network
Ease of installation and wiring.

■ Only 2 wires to perform a reliable communication
Many wires vs. two wires, this is the Dupline® smart field bus!

Specialised sensors for a changing world

Being able, in an existing installation, to keep the same wiring or to simplify it, upgrading the technology, adding new functions, is beneficial to achieve the planned energy efficiency savings.

UWP 3.0   2.4GHz
SH2-DSP
SH2-WBU
Modbus TCP/IP
RS485 Modbus
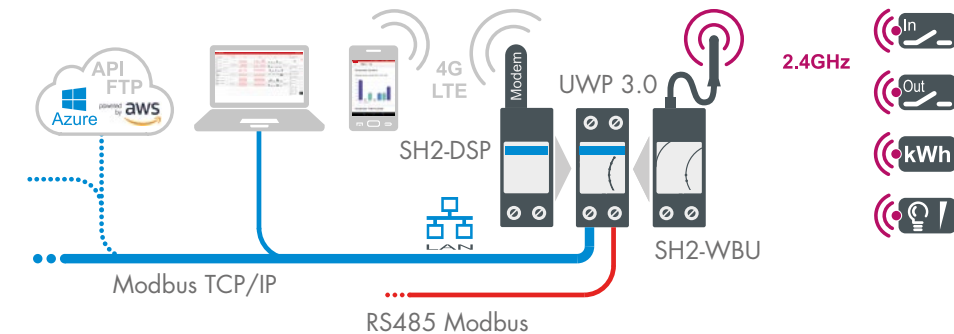
This means, within the UWP 3.0 platform, the availability of Dupline® smart field components suitable to:
- measure environmental parameters, such as temperature, humidity and CO_2;
- measure luminous flux per unit area (LUX);
- measure standard signals, such as volts and milliamps from various transmitters;
- measure the energy consumption of single-phase loads;
- detect movement and presence within a room;
- sense status signals, such as light and load switches and alarms;
- activate outputs by means of relays;
- generate 10 V dc analogue signal outputs;
- display and locally adjust temperatures.

Moreover, also different combined and streamlined sensing and actuating components, specifically designed to meet space constraints and cost savings.

A complete set of units capable to measure ambient parameters and to manage input and output signals aimed to provide all the necessary information to the platform through the UWP 3.0 core unit. This becomes the ecosystem which with proper algorithm boosts the energy savings.

Even if the smart wired Dupline® brings many installation and working benefits, it may happen that a totally wired architecture is technically not possible. In that case, the solution is to add the IEEE802.15.4 2.4 GHz wireless expansion module "SH2-WBU" to build up a wireless network, where other Carlo Gavazzi field smart units can be added to expand the platform capabilities. This means:
- 4 programmable push buttons to turn ON/OFF lights;
- 4 digital inputs with embedded counter function;
- a light dimmer with embedded single-phase energy analyzer;
- a relay output with embedded single-phase energy analyzer;
- doors/windows magnetic sensors.
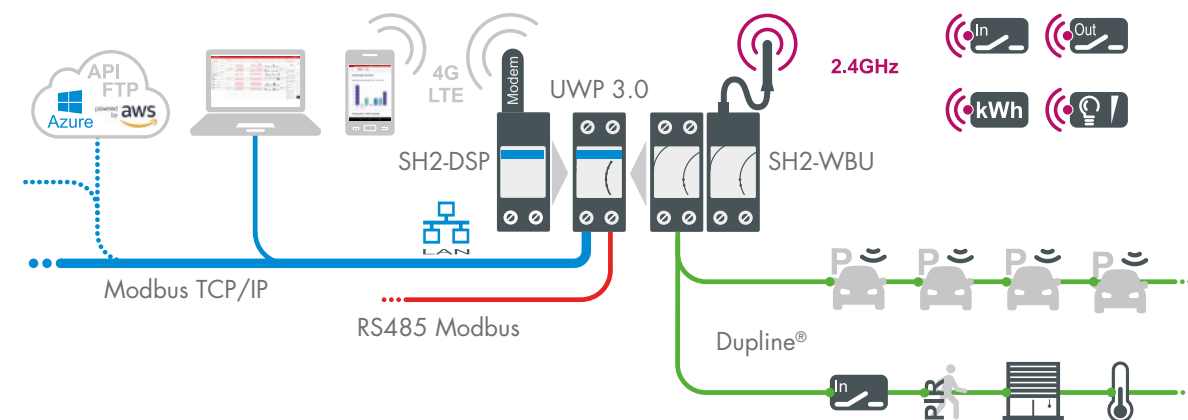
UWP 3.0   2.4GHz
SH2-DSP   SH2-WBU
Modbus TCP/IP
RS485 Modbus
Dupline®

XAP 1.0 the eXtended Automation Platform

■ Flexibility, scalability and integration capability!

In a medium to big industrial site or building, the need is to collect a massive amount of data generated by field devices like meters and sensors. These data have to be brought where they need to be processed and managed to implement an effective Energy Efficiency plan, thus saving natural resources and consequently also preserving the environment. In this respect, it is important to have a flexible system suitable to the different local needs. Being a production facility something that changes very often due to process reviews, scalability is a must. Moreover, to be able to meet an Energy Efficiency plan, there is the need to interact with users, to exchange data with new or already existing systems using different communication protocols, but also with Cloud-based systems. In a system, this means being able to manage an efficient and effective integration.

## ■ Why is it fundamental to manage data in an efficient and effective way?

Nowadays, data management is fundamental to achieve the saving goals, but this is very often a hassle for the system integrator. There are two orders of problems:
• the first one is related to the way data is exchanged, therefore the protocols used, and as a consequence the potential lack of know-how;
• the second one is the data interaction and the logic to be implemented to achieve the energy saving goals.
Both problems are costs which will be paid by the end users, but will also limit the competitiveness of the companies providing the solution and services. How to solve those problems? From the point of view of the system integrator, by making the architecture lean by using as few devices as possible in the data exchange, and from the point of view of the Energy service Companies, by easily implementing proper control logics.

■ One step further!

When architecture complexity increases, to be able to meet additional integration needs and to automate the management system, UWP 3.0 is only a part of the solution. To complete the architecture there is the need to add a further powerful device which goes beyond the UWP 3.0 features. It is XAP 1.0, the ultimate compact controller and gateway with embedded IIoT (Industrial Internet of Things) for seamless connection of multiple and various devices and sub-systems. Using the standard IEC61131 CODESYS, XAP 1.0, it supports network stacks and local I/O expandability. It provides easy programming, while the configurable web interface makes it an outstanding web HMI, with easily programmable graphic pages, functions, and protocols. The two Ethernet ports offer network segregation for WAN/LAN. XAP 1.0 is simple to connect to other devices as it offers multiple embedded standards, such as CODESYS, OPC UA, KNX IP, and BACnet, as well as data distribution via MQTT. The Linux-based operating system is designed to be interference resistant, while HTTPS provides secure web server access. By providing internet and web-server capability, XAP 1.0 together with UWP 3.0, are the supervision and control solution to ensure optimisation of lighting, HVAC and in general building automation functions which can dramatically decrease energy usage and in turn the energy bill!

FTP

powered by aws

Azure

XAP 1.0

UWP 3.0   UWP 3.0

Automation functions

Edge units

Field devices
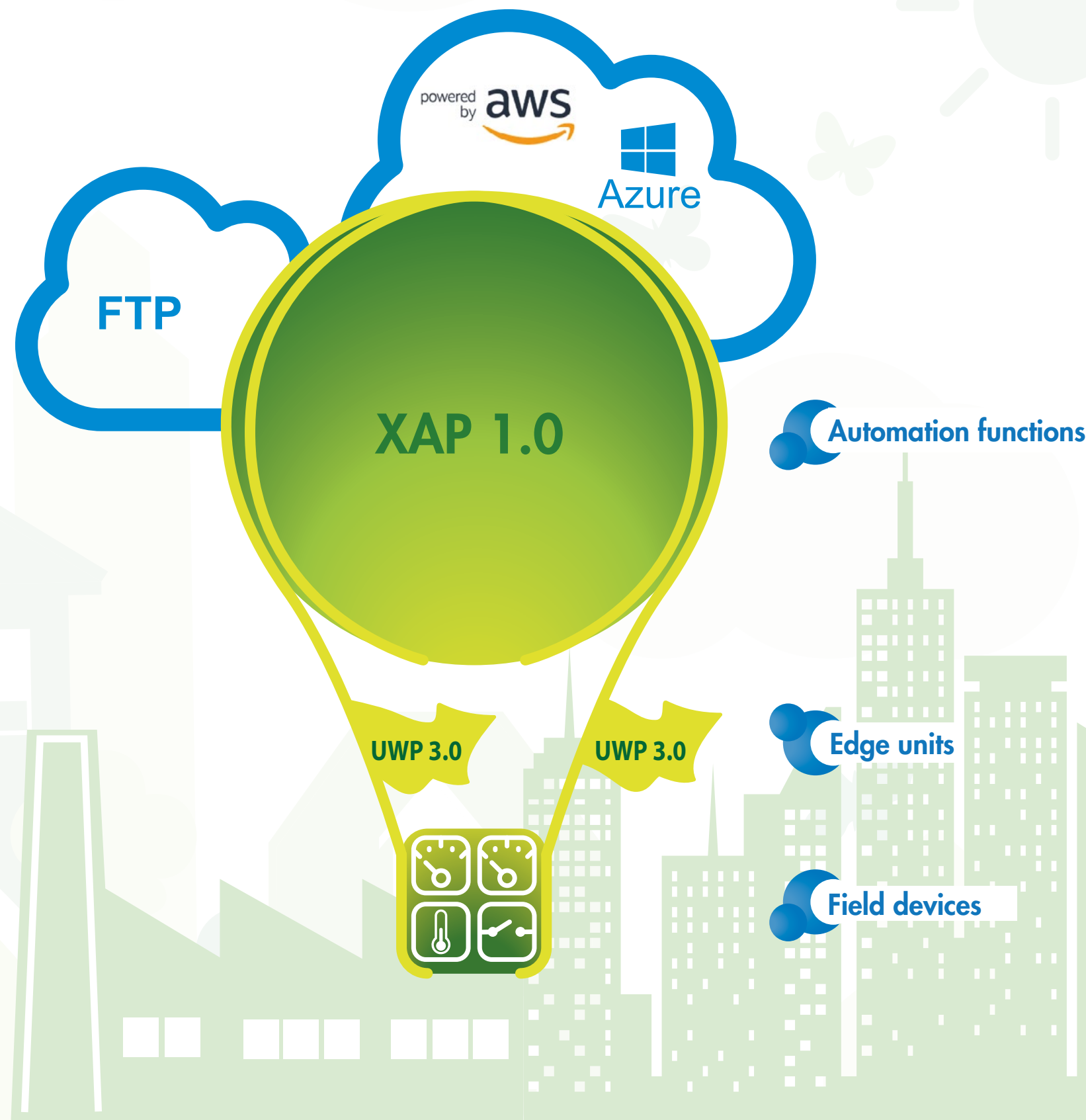
Active control

XAP 1.0 the eXtended Automation Platform

Flexibility, scalability and integration capability!

XAP 1.0, a compact, IIoT-ready controller and gateway for seamless connection of multiple and diverse devices and sub-systems.

XAP 1.0 is aimed to deliver a complete solution for both industrial and building automation, from BMS down to field devices being XAP 1.0 the management level, UWP 3.0 the edge automation level, and the Dupline® and Modbus devices the field level.
XAP 1.0 integrates the Codesys V3 development environment based on a solid Soft-PLC engine for programming controller applications according to the international industrial standard IEC61131-3. In order to be able to interact with industrial processes, XAP 1.0 integrates OPC UA client and server capabilities thus connecting databases, analytic tools, ERP, and other systems with real-world data from low-end devices. As modern processes involve cloud technology and services, the Node-RED connector has been embedded to connect hardware devices and online services (MQTT, FTP, SMTP) as part of the IoT world. XAP 1.0 among many available tools and functionalities is powered by a configurable web interface which makes it an outstanding web HMI, which can be easily programmed with graphic pages, functions and protocols, thus contributing significantly to system optimisation, ensuring total and integrated control.
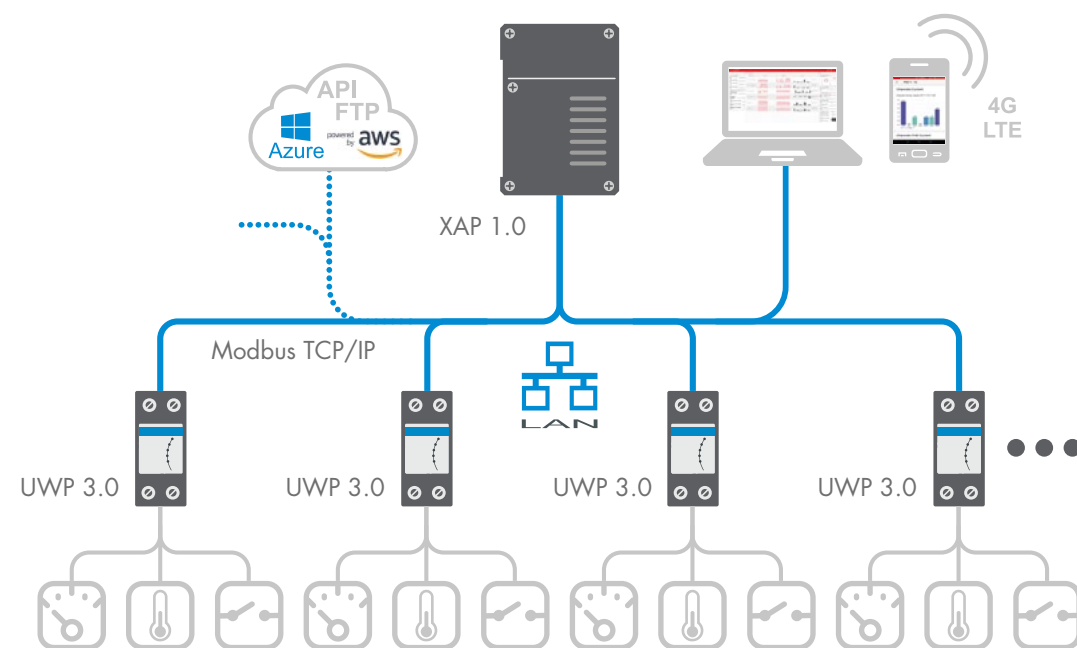
XAP 1.0
- Controller and gateway, web HMI, PLC for building automation functions
- Data communication: OPC UA
- Cloud connectivity: Node-RED (Optional)
- Operating system: Linux
- Secure web server access: HTTPS
- Protocols: Modbus RTU/TCP-IP master and slave, BACnet client, KNX IP, KNX TP using an expansion module
- Compatible with CODESYS V3: it supports network stacks and local I/O expandability

- 2 Ethernet ports for network segregation from WAN/LAN
- Customisable web interface, with different access types according to the type of user
- Connectible to UWP 3.0 via BACnet or Modbus/TCP
- 24 V dc power supply

Learn more

A combination of tools in one solution

In a medium to large industrial site or building, the need is to collect a massive amount of data generated by field devices like meters and sensors to implement an Energy Efficiency plan.

In such applications, architecture complexity is a rising problem, together with additional integration needs and a high level of data exchange. In addition, to be able to achieve the saving goals, also data interaction and logic complexity have to be managed properly. XAP 1.0 is the solution to those problems, being one core device with easy protocols management, able to manage a high level of data exchange and interactions with proper logic tools. In an ordinary architecture, the configuration of the whole system may impact the TCO (Total Cost of Ownership), that's why XAP 1.0, as an advanced system, uses an advanced user interface so to be more effective, and SCADA functions or web pages can be created for any type of application.
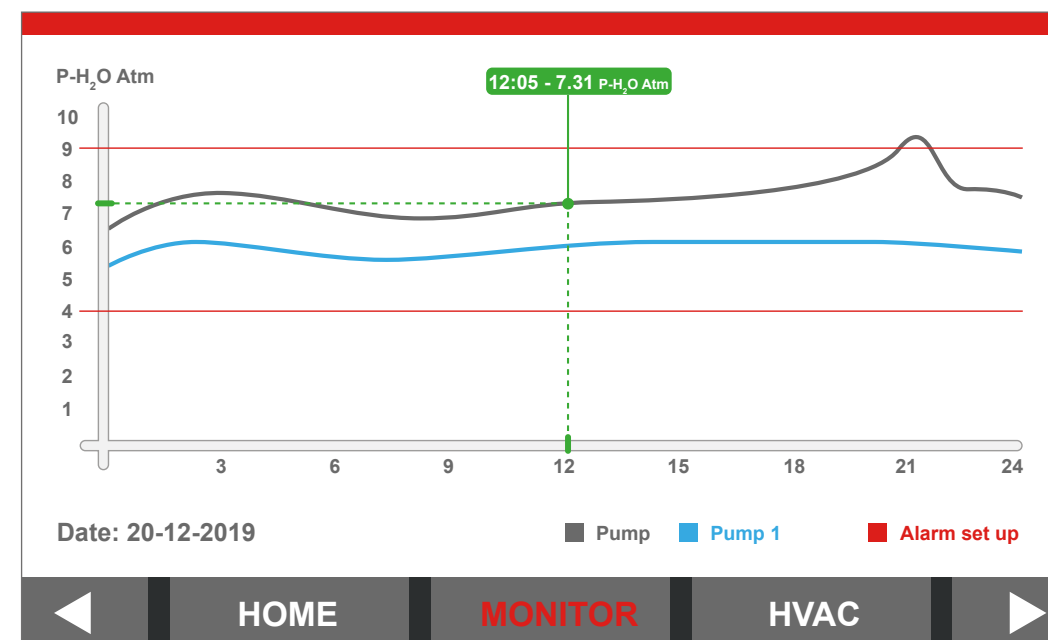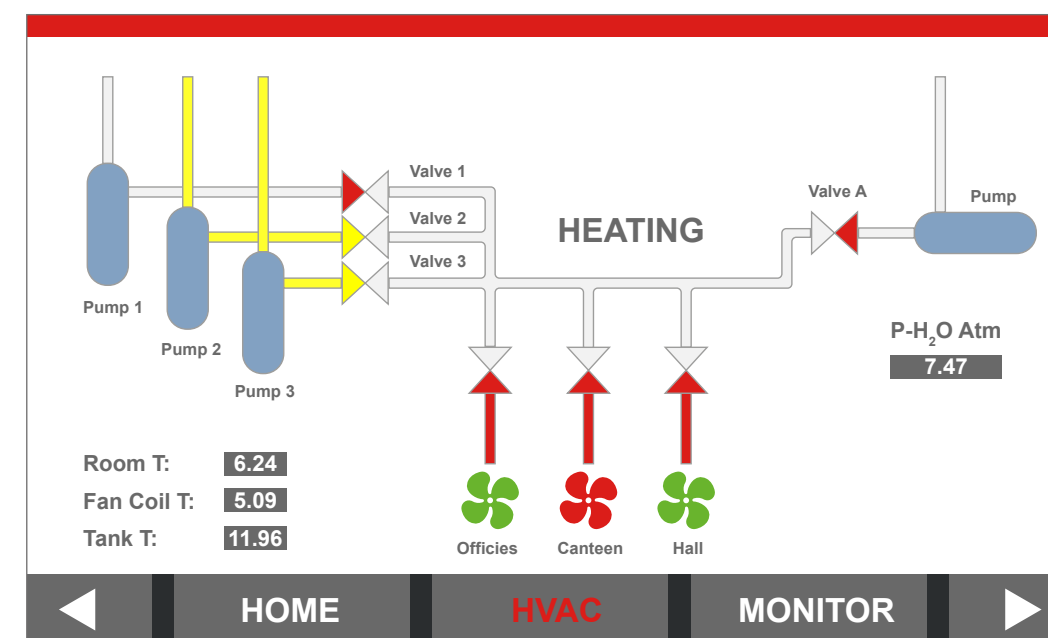
Active control

Beyond communication networks

From DALI control to tunable white

The UWP 3.0 platform can be enhanced, if needed, adding to the BACnet/IP communication bus also the DALI worldwide standard bus.

Helping the application to maximize energy efficiency in relation to the external environmental conditions and occupancy of the building, while providing the highest levels of comfort, safety and quality. Lighting in buildings, is one of the major areas to focus on in order to reduce electricity costs, so the ability to control and monitor is a key feature that can easily be achieved by means of both flexibility and scalability of the UWP 3.0 platform. The provided main control strategies are:
• daylight harvesting, which provides automatic dimming to compensate for the amount of natural light;
• automatic sunrise and sunset calculation;
• real-time clock and schedulers to switch ON/OFF, dim or change scenario;
• light level control according to people presence and timers;
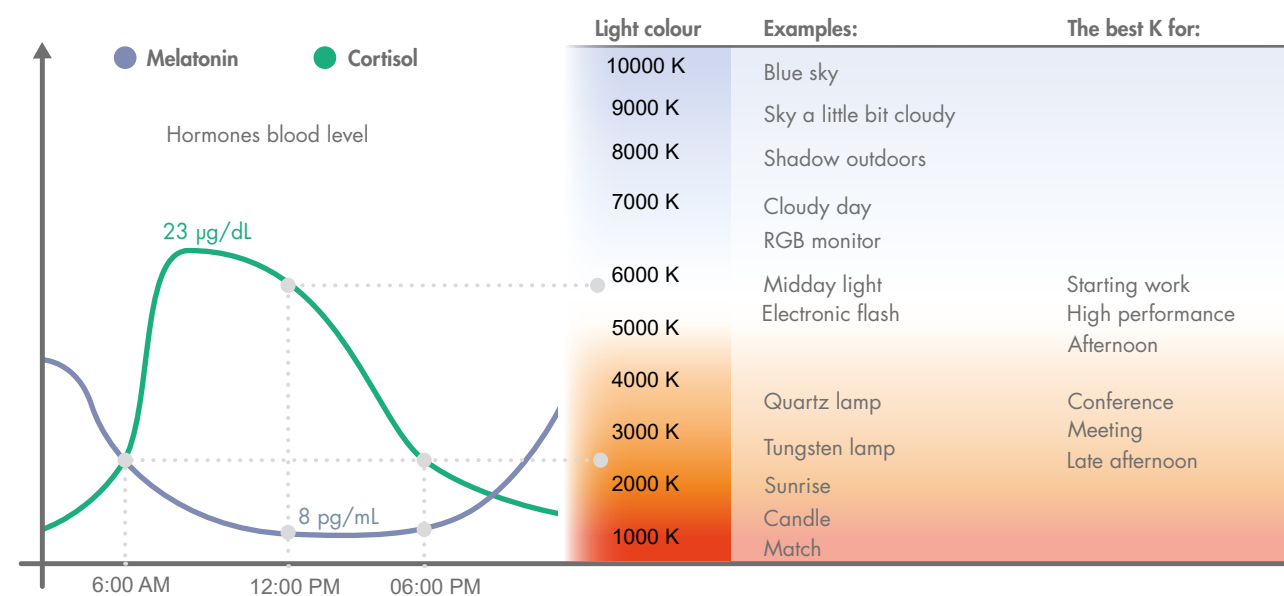• zone control.

■ Lighting strategies are connected to building occupants

These advanced functions are not enough to meet the more demanding lighting needs, which nowadays are not limited to the energy savings only. The Carlo Gavazzi platform implements, through specific DALI master units also the DALI (Digital Addressable Lighting Interface) bus. This means a unique and wide range of control strategies which can be adapted at any time according to the changing needs of the building occupants. The remarkable success of DALI is also due to its very easy installation (just two non-polarized wires with free topology), its low commissioning costs (no certified wires or fees are required) and last but not least, its scalability and flexibility.

Nowadays people are the most important resource a Company must take care of: people engagement, mood, and commitment can easily be enhanced taking care of the work space in terms of CO_2 level, temperature and illumination, which means people performance and efficiency. This means, in different words, that people's biological clock is regulated by light and darkness as shown in the graph below.

#### ■ The temperature of white light influences people's performances

The graph shows how our hormones change during the day according to the colour temperature: cortisol is our waking hormone, whilst melatonin controls our sleeping rhythm. A warmer temperature is more relaxing, while a cooler temperature creates a motivating environment. As a consequence, the white colour of lamps influences people's performance and efficiency. Thanks to an ever-improving LED technology, all the mainstream LED lighting companies are moving to offer products which can change the white of the light from warm (2500K) to cold (6000K) to follow the behaviour of natural white. This feature is called "Tunable white" or Kelvin colour temperature change or CCT (Correlated Colour Temperature) and is the capability of changing the temperature (K) of the colour of the light.


Light colour	Examples:	The best K for:
10000 K	Blue sky	
9000 K	Sky a little bit cloudy	
8000 K	Shadow outdoors	
7000 K	Cloudy day RGB monitor	
6000 K	Midday light Electronic flash	Starting work High performance
5000 K		Afternoon
4000 K		
3000 K	Quartz lamp	Conference Meeting
2000 K	Tungsten lamp Sunrise	Late afternoon
1000 K	Candle Match	

Lighting exposure has an impact on the mood

In offices where people have little access to the beneficial properties of daylight, static lighting conditions might disrupt the biological rhythm.

Thanks to the SB2-DALI specific module and the embedded "Tunable White" features, independently from the external environmental conditions, it can provide the perfect atmosphere for each activity during a working day. Cooler temperatures to support concentration and focus or to compensate for an afternoon dip in energy levels, warmer temperatures during activities which require creativity and cooperation.
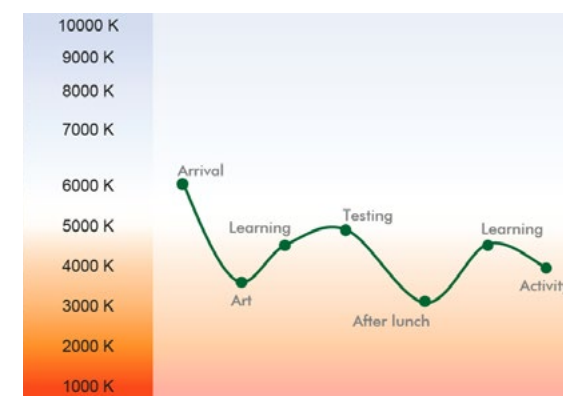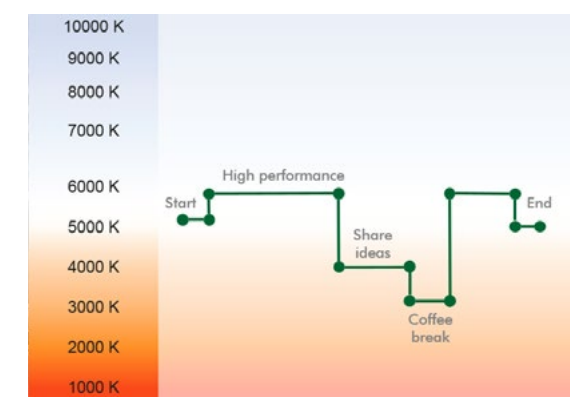

Light temperature vs. daily activity in a school.
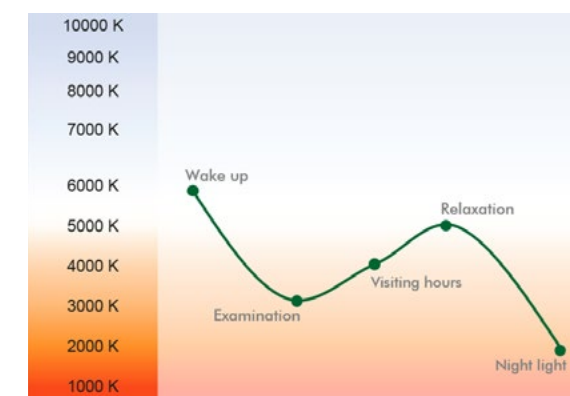
Light temperature vs. daily activity in a hospital.
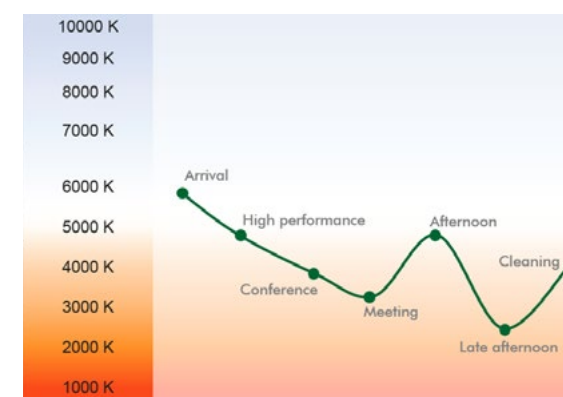
Light temperature vs. daily activity in an office.

Light temperature steps vs. daily activity in an office.

■ Lighting system and human's health

Additionally, studies have shown that light exposure has an impact on the mood and reduces symptoms of depression in individuals. Exposure to light has also been directly linked with health and can affect how we recover and heal. Rooms with large, sun-facing windows reduce recovery time for patients suffering from severe depression and those recuperating after heart attacks, compared to similarly afflicted patients in rooms with windows facing buildings or other obstructions. Reduced exposure to daylight has been linked to the onset of depression and impairment of cognitive function in individuals. Studies show strong links between better views, brighter light and better performance in office environments.

The lighting environments where humans spend their time impact their visual, circadian and mental health. Currently, lighting conditions in most spaces are designed to meet the visual needs of individuals but do not take into account circadian and mental health. This presents an opportunity for projects to provide lighting conditions required by humans for optimal health and well-being.

WELL aims to provide a lighting environment that reduces circadian phase disruption, improves sleep quality and positively impacts mood and productivity.
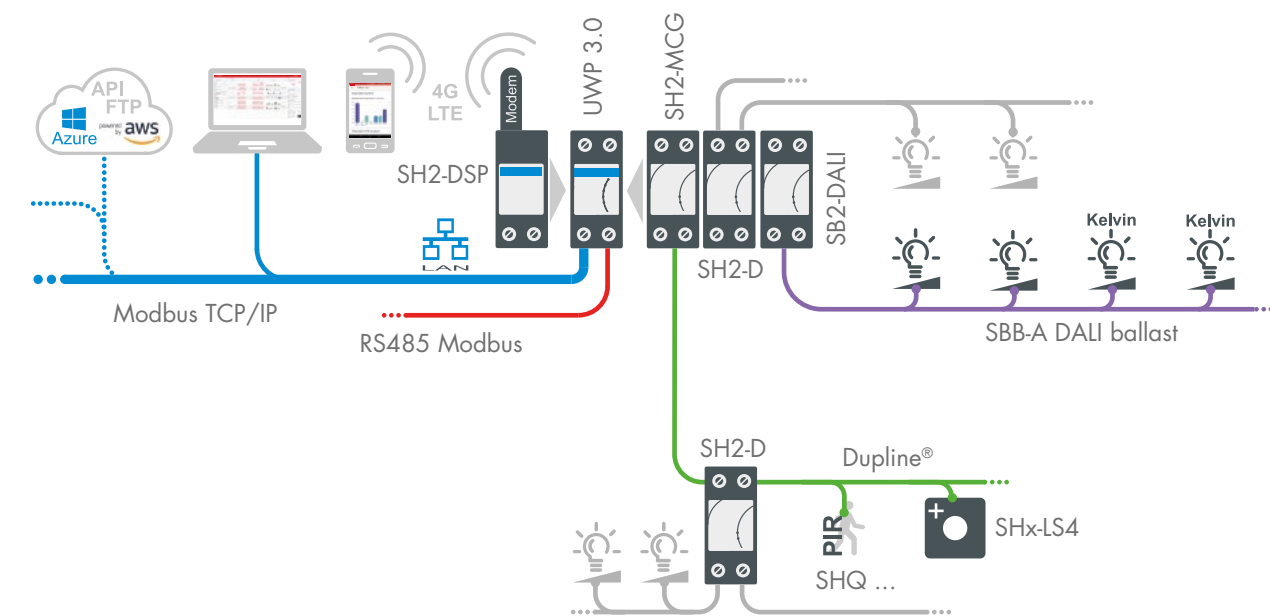
INTERNATIONAL WELL BUILDING INSTITUTE ™

TECHNOLOGY

CONTROL

Active control
Precise control for a green building

The evolution of the lighting

If most energy waste is due to inefficient room temperature management, misuse of lighting is largely underestimated.

It doesn't matter if the building is for industrial, commercial or public use, the common problem is how to make lighting part of the energy efficiency plan, but also, how to make people more efficient. As proper ON/OFF light switches are an obvious part of this offer, passive infrared (PIR) movement detectors with programmable sensitivity and embedded lighting measurement together with light dimmers are the offer completion to carry out an effective control by automatically switching off the lights when either people are not occupying the room or there is enough day light in the room.

Modbus TCP/IP
RS485 Modbus
SH2-DSP · UWP 3.0 · SH2-MCG
SB2-DALI
SH2-D
SBB-A DALI ballast
Kelvin · Kelvin
SH2-D · Dupline®
PIR
SHx-LS4
SHQ ...

◀ SB2-DALI and SBB-A
SB2-DALI
- Dupline® bus interface to DALI controller with embedded power supply unit capable to manage up to 64 DALI ballasts
- Up to 7 SB2-DALI can be connected to one Dupline® bus, depending on the configuration of the DALI groups
- 2-DIN module housing
- 230 V ac power supply
SBB-A
- 2 constant current output channels, total output power up to 50 W
- Output current level selectable from 250 mA - 1500 mA
- Built-in DALI interface, DALI DT6 and DT8 ballast. DALI approval
- Colour temperature adjustment: device Type 8, colour Type Tc

◀ SHQ, SBQ, SHx-P90
SHQ
- Passive infrared detector (PIR)
- Detects movement and presence
- Indoor and outdoor applications
- Dupline® bus powered
- Lighting measuring range: 0 – 20 K lux
- Walk test: LED indication
- Programmable sensitivity
SHQ/SBQ
- Operating angle: 360°
SHx-P90
- Operating angle: 90°
- 4 individually programmable push buttons

◀ SHx-LS4
- 4 individually programmable push buttons
- Integrated temperature and humidity sensor
- Temperature range: -40 – 60 °C
- Humidity range: 5 – 95 %
- Dupline® bus powered
- SHA4: designed to fit into wall sockets and frames from Fuga, NIKO, and BTicino
- SHE5: designed to fit into wall sockets and frames from Elko, Gira, and Jung

◀ SH2-D
- Universal dimmer switch for R, L, C loads up to 500 W and LEDs loads
- Two models available: with and without embedded energy analyzer
- Automatic load type detection: R, L, C
- LED-indications for power supply, bus and output status
- Push button for local ON/OFF switching
- 2-DIN module housing
- 115/230 V ac power supply

kWh, kvar, W, var, VA, PF, V, A

A software to configure quickly and easily your system

Programming is half of the cost of an installation, but thanks to the UWP Tool configuration software, this activity is extremely shortened.

The master unit UWP 3.0 is programmed by means of the configuration software UWP Tool, freely downloadable from the Carlo Gavazzi website. UWP Tool has been developed to make commissioning fast, easy and error free. It guides the user step by step in the creation of the map of the installation and of the automation functions. Furthermore, it is an essential tool for the diagnostics of the installation: the bus and any connected device can be easily monitored.
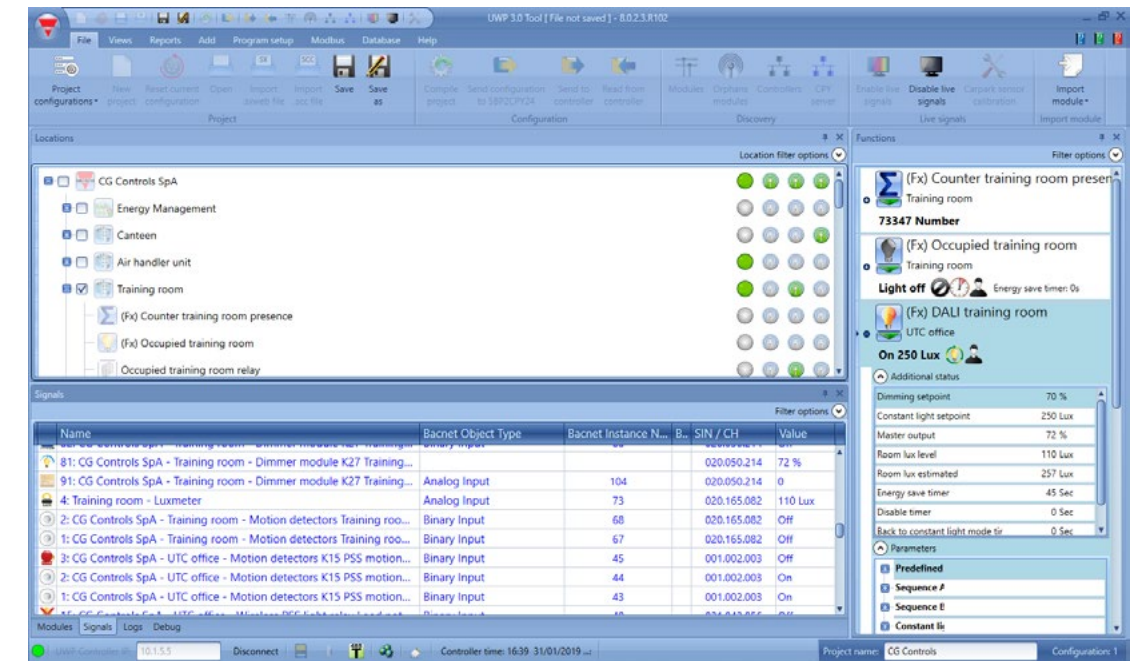
■ Fast commissioning
As soon as the software is connected to a master unit UWP 3.0, it scans the network and finds all the connected modules. Thanks to this feature, the installer doesn't have to worry about any addressing of the modules, since it is done automatically.

■ Report
Anything which is happening in the system is monitored in order to issue a warning if something goes wrong. All this information is logged in a file so that the installer can check it any time.

■ Diagnostics
Should any trouble occur, the system provides powerful diagnostic functions in order to make fault finding much easier. The bus is always monitored, providing information about short-circuits, bus voltage and bus load, noise level, and quality of the bus signals.

■ Clear view
When commissioning a project, it is very important to have a clear overview of the installation to place modules and quickly create logics. Afterwards, a well-structured location tree will help in reminding what has been done or troubleshot.

■ Save time
The icon and picture based wizard guides the installer/integrator in a straightforward and error free programming, since everything is very immediate and no memory efforts are required.

■ Easy testing
Thanks to the live signals function, it is very easy and straightforward to test the logics. Everything can be done in front of the PC: enabling and disabling the functions, changing the parameters to reach the perfect settings, or trouble shooting.
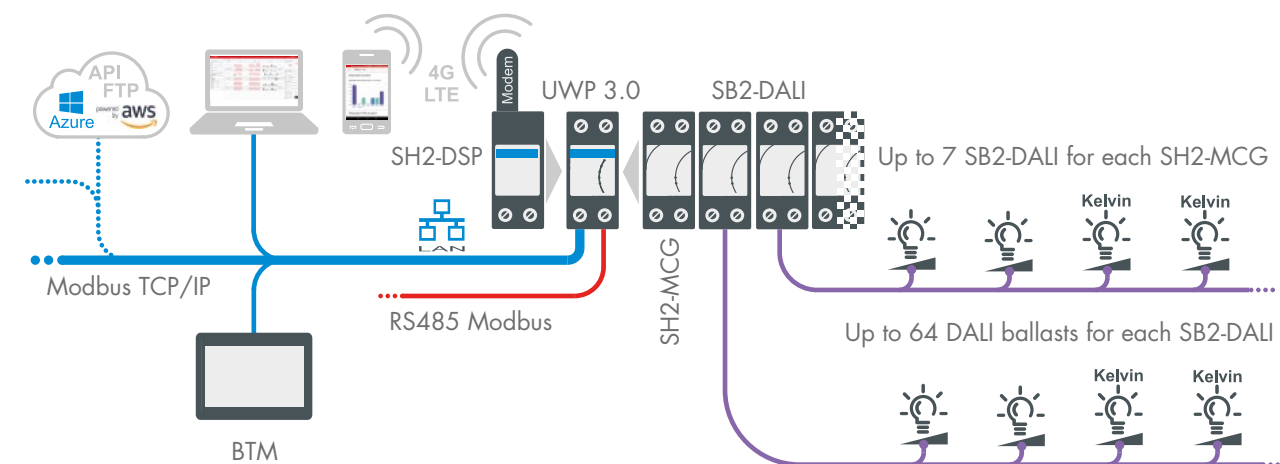
Active control

Not only lighting efficiency

Energy efficiency and people efficiency

DALI technology makes a working ambient more energy efficient but also more people efficient.

The DALI technology which Carlo Gavazzi has embedded into the SB2-DALI unit is a step beyond an energy efficiency program, since it provides, through the available LED-based lighting systems, functions like "Tunable white" and "lighting scenarios" to influence people's working performance.

API FTP
Azure powered by aws

4G LTE
Modem

UWP 3.0

SB2-DALI

SH2-DSP

Up to 7 SB2-DALI for each SH2-MCG

Kelvin   Kelvin

Modbus TCP/IP

SH2-MCG

RS485 Modbus

Up to 64 DALI ballasts for each SB2-DALI

Kelvin   Kelvin

BTM

■ People efficiency can make a company more competitive

Understanding business energy costs, energy management, and people efficiency can make a company more competitive. This depends not only on energy efficiency and energy management, but also on the working environment for the workers. The latter can be addressed and improved by the control of CO_2 level, temperature and illumination which means people performance and efficiency.

Being able to change the working environment according to specific needs is the key to the success of the solution. That's why Carlo Gavazzi provides a dedicated end-user app to turn a smartphone into a powerful remote controller. It also provides a SmartHub wall-box with 4" or 7" display and a configuration software for the installer, the most effective tool to implement and set all the energy saving strategies.

◖BTM-T4 smartHUB
- 4.3", 480*272 pixel, TFT display
- Touch display
- 64 k colours
- 2 Ethernet ports, USB host port, SD card slot, multistandard serial port
- Windows CE operating system
- Completely configurable functions
- Dimension 147*107*56 mm
- 24 V dc power supply

◖BTM-T7 smartHUB
- 7", 800*480 pixel, TFT display
- Touch display
- 64 k colours
- 2 Ethernet ports, USB host port, SD card slot, multistandard serial port
- Windows CE operating system
- Completely configurable functions
- Dimension 187*147*47 mm
- 24 V dc power supply

Right at your fingertips

In today's world, apps are essential tools for our everyday life: so why don't you control your building via an Android or iOS device?

Any mobile device can be turned into a remote controller thanks to the integrated web app and the ownControl app, available both for Android and iOS phones/tablets. The pages of the App can easily be customised with graphs to monitor the consumptions, the temperature of a room or the level of a light. Many widgets are available to switch and dim lights, to change temperatures, to set the curtains position and in general to remotely control any function of the system. Furthermore, webcams can be easily integrated into the App to have a 360° supervision of the building.

Active control
From environment to actions

From wired environmental probes to I/Os

Wired sensors are essential components of every metering and control system.
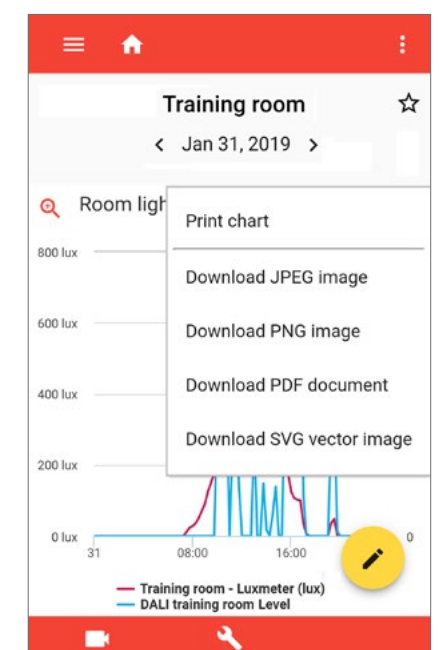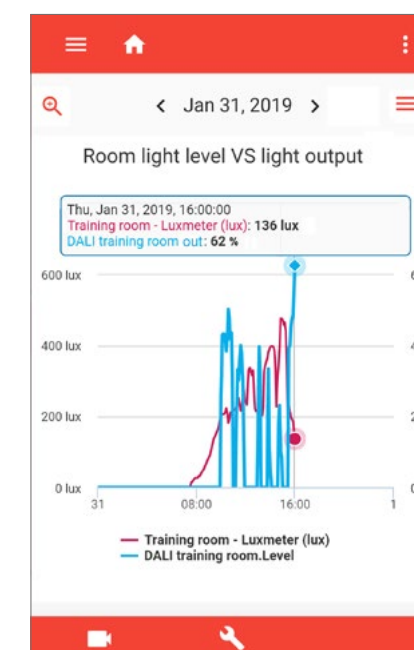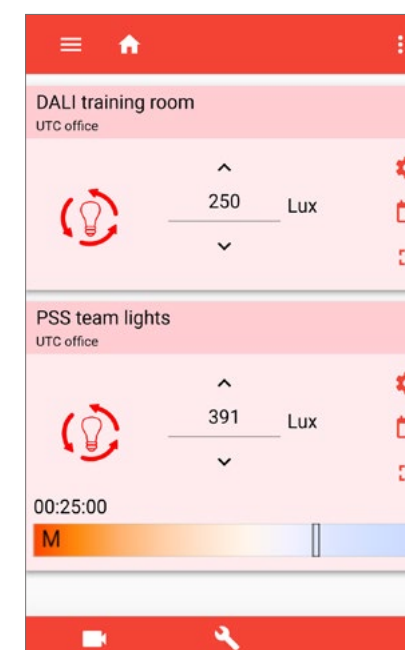
In Industrial, commercial, and public buildings, the combination of temperature, humidity, CO_2, and other non-electric and electric variables is essential to the management of the proper energy vectors. This means that air heating, cooling and ventilation, but also air quality information must be collected and managed to implement a proper energy efficiency plan. The UWP 3.0 platform, equipped with bus powered smart field devices, is the most effective answer, featuring specific field units, such as analogue inputs to measure signals from various temperature sensors, but also standard process signals (10V/20mA); single and combined wall mount sensor units with onboard display, digital inputs to detect alarms and ON/OFF switches, smart relay outputs to activate valves/actuators with signal feedback (by means of embedded energy analyzers) for real-time diagnostics, and last but not least, remote controllers with embedded display. To be able to meet the different installation needs, most of the devices have specific configurable functions.
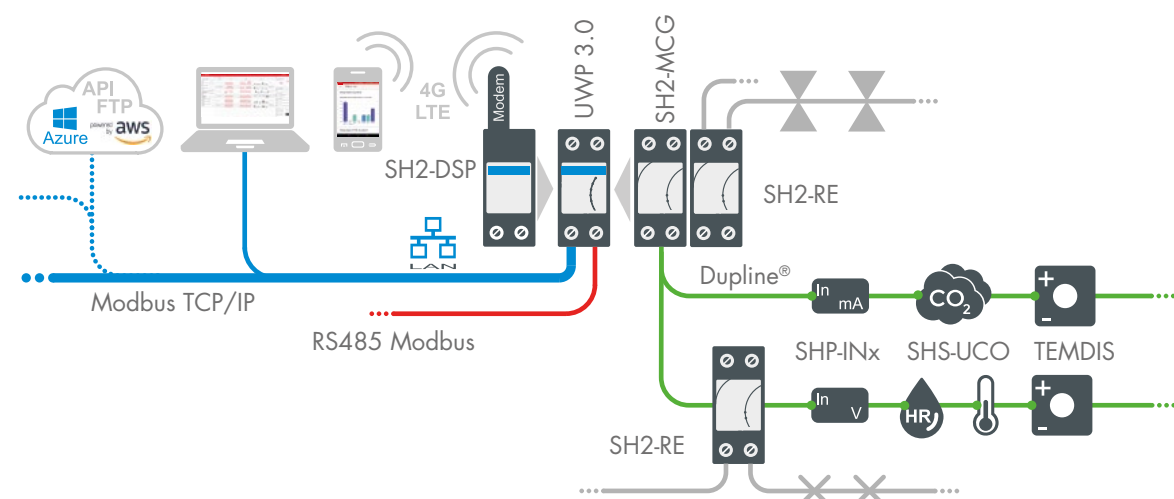
◖ SHS-UCO
- Room sensors for CO_2, temperature and humidity measurement
- Available with/ without display, or RGB LED
- Temperature range: -20 — +50 °C
- Humidity range: 0 — 100 %RH
- CO_2 range: 0 — 2000 ppm
- Easily mountable
- Dupline® bus powered
- Low energy consumption
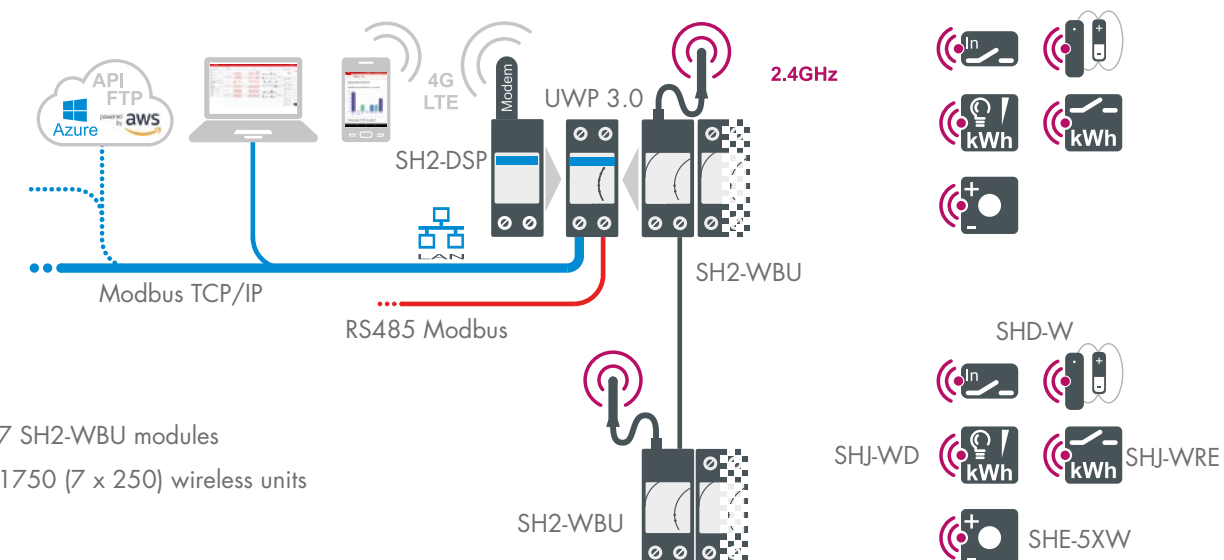
◖ SHP-INx
- SHP-INV3: 3*0 — 10 V adjustable inputs
- SHP-INA2: 2*0/4-20 mA adjustable inputs
- SHP-INV2T1P1: 2*0-10 V dc + 10K3 thermistor + 1-11 kΩ inputs, 24 V dc powered
- SHP INT: Pt1000, Ni1000, 10K3 thermistor, 1-11 kΩ potentiometer inputs, Bus-powered
- SHP IN: 4 contact ON/OFF/counter inputs. Count reset via Dupline® (optional)

◖ SHx-TEMDIS
- Temperature controller with display
- Shows current room, outdoor, and auxiliary temperature
- Turns ON/OFF heating and cooling
- Energy Save through 3 different setpoints: comfort, activity, economy
- Dupline® bus powered
- SHA4: designed to fit into wall socket from Fuga, Niko, and BTicino
- SHE5: designed to fit into wall socket from Elko, Gira, Schneider, Siemens, and Jung

◖ SH2-RE
- 2 or 4 relay outputs with embedded energy analyzer
- LED-indications for power supply, bus and outputs status
- Push button for local ON/OFF switching
- 2-DIN module housing
- 230 V ac power supply, Dupline® bus powered, 24 V dc
- Connection to other cabinet modules via local bus

kWh, kvar, W, var, VA, PF, V, A

From wireless I/Os to sensing and dimming

In a new building, a standard way to connect sensors to the core unit is wiring them, but if the building is already existing, then a retro-fit solution is needed.

All the available Carlo Gavazzi field bus devices for retro-fit applications are based on a 2.4GHz (IEEE802.15.4) communication frequency. According to their installation needs, some of them, like the contact outputs and light dimmers, both of them with embedded energy and power analysis for signal feedback, are designed so to be accommodated in existing junction boxes where there is always a space constraint. In order to reduce energy waste, it is possible to control automatic room heating, cooling and ventilation systems by means of door and window magnetic sensors and use programmable push-buttons to switch the light ON and OFF.

Up to 7 SH2-WBU modules

Up to 1750 (7 x 250) wireless units

◖ SH2-WBU
- Wireless access point and router based on WiDup wireless communication protocol for UWP 3.0. 2.4 GHz (IEEE 802.15.4).
- Manage up to 250 slave units per SH2-WBU
- LED-indications for power supply and bus status
- Connection to other cabinet modules via local bus
- 2-DIN module housing, 230 V ac power supply, Dupline® bus powered, 24 V dc

◖ SHE-5XW
- 4 wireless programmable push-buttons
- Flat design: 10 mm depth
- IEEE802.15.4@ 2.4 GHz compliant
- For mounting on any surface
- LED indication for low battery and bus activity
- Embedded temperature sensor

◖ SHD-W
- Wireless magnetic sensor for doors/ windows
- Additional voltage free input
- 1 red LED/1 blue LED for battery level indication
- IEEE802.15.4@ 2.4 GHz compliant
- Range up to 100 m in open air
- Wall mounting, screw or double sided tape

◖ SHJ-WRE, SHJ-WD
- IEEE802.15.4@ 2.4 GHz compliant
- Range up to 700m in open air
- Embedded energy analyser
- Programmable routing function
- 230 V ac power supply
- Dimensions: 40.8*45.5*21.5 mm
- SHJ-WRE
- Wireless contact output (10 A /250 V ac)
- SHJ-WD
- Wireless dimmer (R,L,C load up to 200 W and LEDs)

kWh, kvar, W, var, VA, PF, V, A

Active control

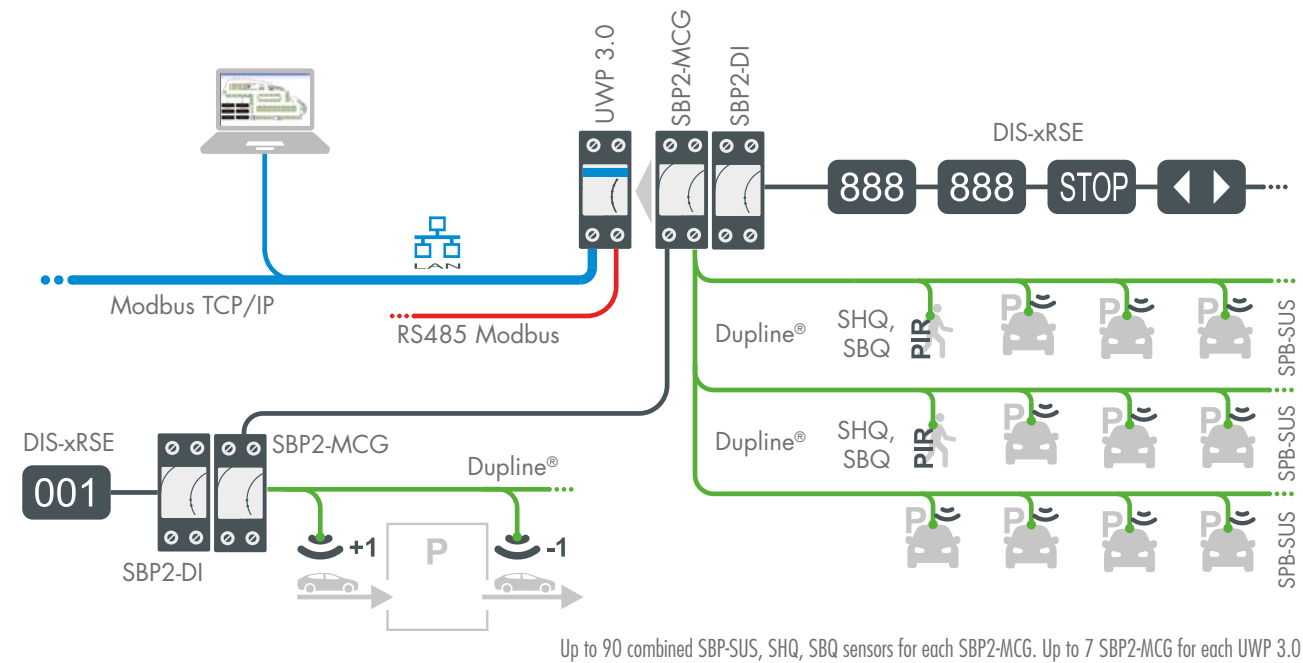## Indoor car parking guidance system

A profitable and fully integrated solution

A modern indoor car-park or multi-storey garage needs to be both energy and service efficient.

In a car park or a multi-storey garage, lighting and ventilation are the big energy consumers, and in many cases they are ON all the time. In this case, being energy efficient, means intelligent demand-based control where lighting levels are based on the presence of people and cars, and the speed of ventilation fans is based on actual measured CO_2 levels. Being fire protected means to manage a proper fire protection system based on fire dampers. Car parks or multi-storey garages sell services based on car occupancy and, being part of a wider system (like an airport or a shopping mall) they are integrated in a global service system. Providing a quality service and having an adequate profitability is a mandatory condition! Carpark 3 with its web-server-based management software is the answer to manage the car park efficiently. The car park operator will be able to monitor the real-time status of the entire car park through a graphical user interface taking actions in case of alarms or high occupancy rates. Spaces for specific purposes can be reserved manually by selecting a specific colour for the LED indicators, or using a calendar-based scheduler. All parking events are logged into the database, so as to build up a powerful analysis tool aimed to improve the car park service performance.

Up to 90 combined SBP-SUS, SHQ, SBQ sensors for each SBP2-MCG. Up to 7 SBP2-MCG for each UWP 3.0

Carpark server SBP2-CPY
- Carpark server which **links together up to 10 UWP 3.0** controllers
- Manages the parking guidance system
- Built-in web server with parking management software
- Data export to Excel® format
- One Ethernet port
- 12 – 28 V dc power supply
- DIN-rail mounting

DIS-xRSE
- Bright RGB LED matrix
- Selectable symbols
- Visible at a distance of more than 50 m
- Brightness control
- Settings are configurable from the embedded webserver
- Indoor and outdoor use - IP55
- Extended temperature range, up to -30°C
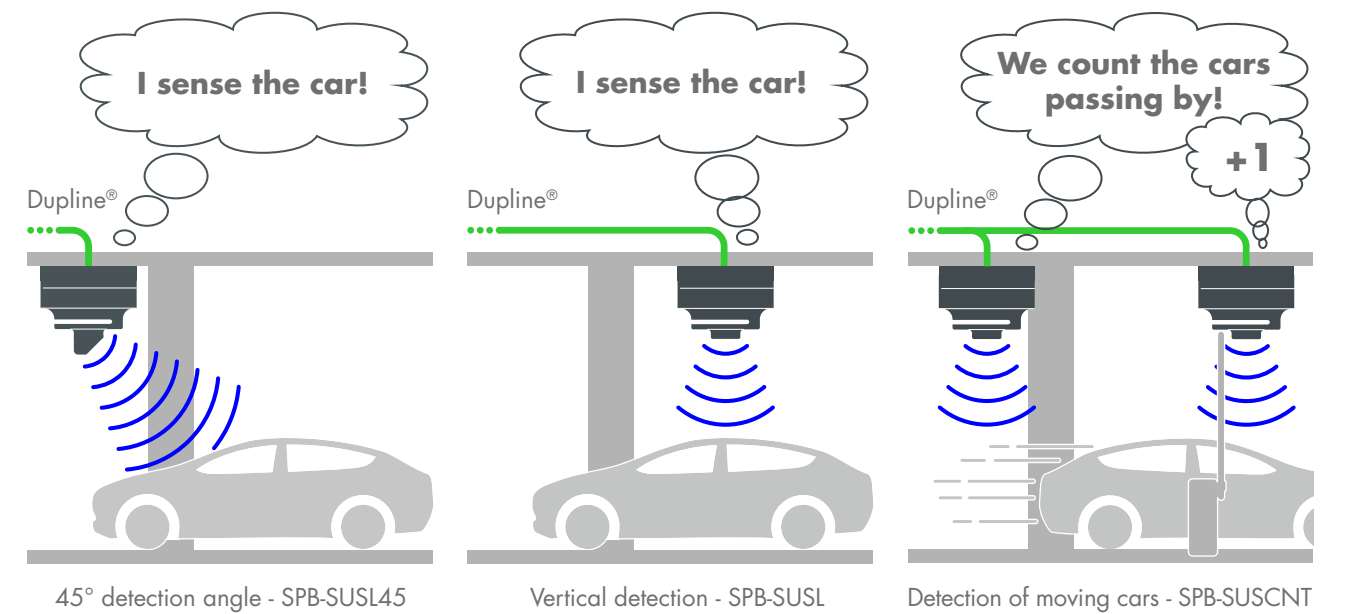- Up to 4 digits, 2 symbols and running text
- 24 V dc power supply

SBP2-DI
- Gateway to connect the displays DIS-xRSE to the Dupline® network
- 2-DIN module housing
- Can be mounted up to 300 m away from the display
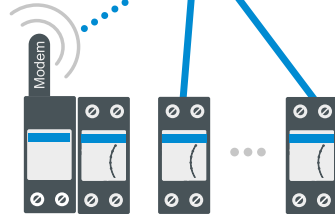
Better utilisation - higher revenue

Reduce stress and frustration of users, enhancing your car park with a guidance system.

The first thing users will notice when entering the carpark is how great it looks. Bright indicator lights in different colours, beautiful direction displays, and aesthetically designed sensors all together create an impressive scenario that will attract attention. The next thing users will enjoy is the easily comprehensible guidance function. By following the direction displays with dynamic green arrows, they will be led to the nearest driveway with vacant spaces. Once there, the drivers just have to look for the bright green LED lights indicating vacant spaces. In this manner the service will be improved, but there is more to it than that. You will achieve a better utilisation of the carpark, an improved efficiency through powerful supervision and analytics software tools, and a significant potential for energy savings.

45° detection angle - SPB-SUSL45   Vertical detection - SPB-SUSL   Detection of moving cars - SPB-SUSCNT

SBP-SUSL45
- Ultrasonic sensor with a 45° detection angle for mounting outside the parking bay
- Power and communication via the Dupline® 3-wire bus
- Clearly visible LED indication in a 360° visual angle
- 8 selectable LED colours to use for status indication
- Protected against dust and moisture

SBP-SUSL
- Ultrasonic sensor with a vertical detection angle for mounting directly above the car
- Power and communication via the Dupline® 3-wire bus
- Clearly visible LED indication in a 360° visual angle
- 8 selectable LED colours to use for status indication
- Protected against dust and moisture

SBP-ILED
- Additional LED indicator to be used in conjunction with the sensor SBP-SUSL
- Power and communication via the Dupline® 3-wire bus
- Clearly visible LED indication in a 360° visual angle
- 8 selectable LED colours to use for status indication
- Protected against dust and moisture

SBP-SUSCNT
- Vertical sensor to be mounted directly above the driving lane
- Designed for detection of moving cars in a count system
- Detection of cars running at speeds up to 20 Km/h
- Power and communication via the Dupline® 3-wire bus
- 8 selectable LED colours to use for status indication
- Protected against dust and moisture

Active control

Outdoor car parking guidance system

Wireless sensors and WEB cam solutions

To be energy and service efficient is not only an indoor car park need, but also an outdoor car park need, even if different technologies are used.

Ten minutes searching for a parking bay several times daily means more than 240 hours per year, and an average of 700 complete days in a life. Driving around looking for an available parking bay wastes fuel, produces anxiety and increases pollution in city centers. To make traffic more fluid and increase rotation at outdoor parking spaces, single bay monitoring by LoRaWAN or NB-IoT wireless sensors is the perfect and invisible solution, since sensors are installed underground. Where drilling is not possible, webcameras can be used: standard IP cameras are connected to the videobox SBP-VBE which processes the images and sends to UWP 3.0 only the occupancy status in full respect of the GDPR.
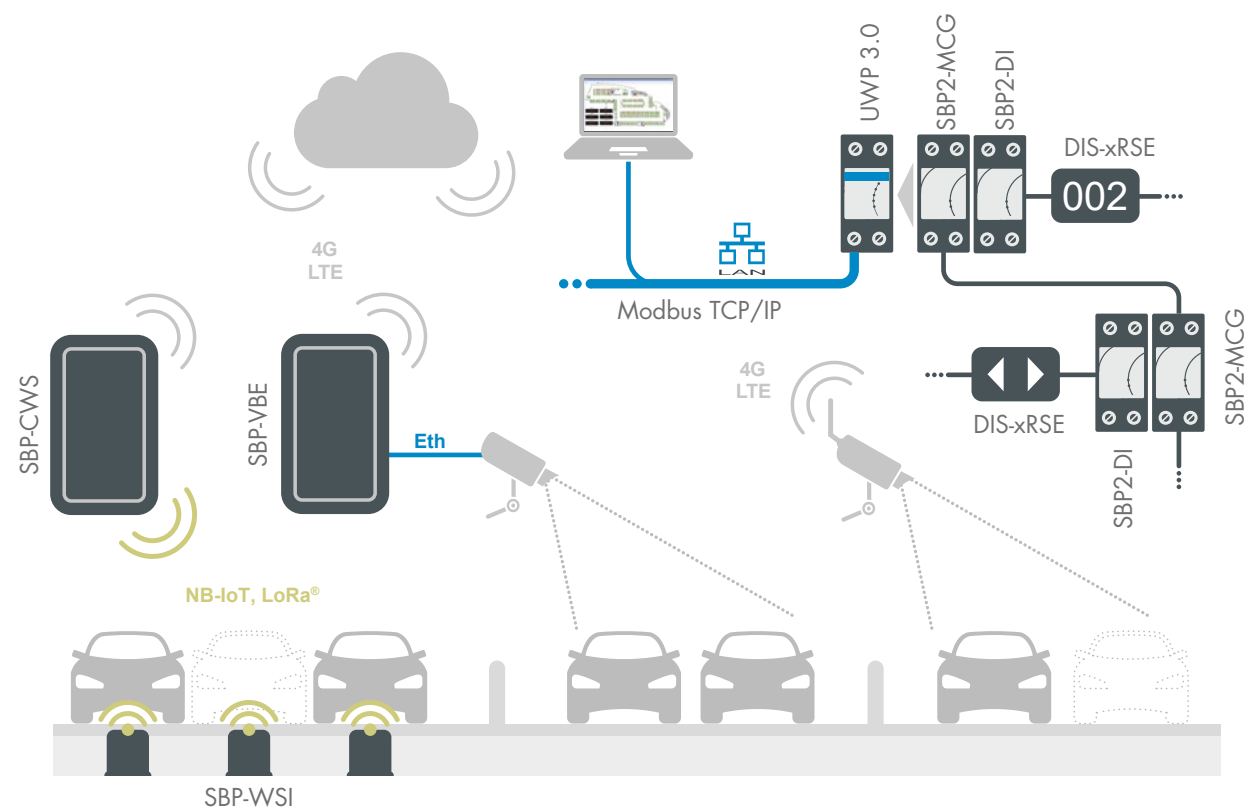
◖ SBP-WSI
- Long life lithium battery, up to 10 years
- Wide temperature range. -40 − +85 °C
- Long range communication. Up to 2 Km in urban environment, 500 m in typical applications
- Available in different versions. Long Range wireless, LoRaWAN® or NB-IoT
- Easy and invisible installation. Flush mount under the road surface

◖ SBP-CWS
- Long Range wireless communication. 500 m in typical conditions
- Wide range power supply. It works with 24-48 V dc and 100-230 V ac
- Flexible installation. It is suitable for wall or pole mounting
- IP66 rated housing. For indoor and outdoor use

◖ SBP-VBE
- Up to 8 IP cameras management. One camera covers an average of 40 parking bays: it depends on the mounting height, positioning, and IP camera specifications
- Utmost respect for privacy. In accordance with the GDPR: after analysing the images, they are automatically destroyed so that there is no trace of sensitive content
- Quick installation. No effect on normal parking activities

Effective management through the built-in webserver

Immediate overview about the parking bays status helps you manage in an efficient and cost-effective way your parking installation.

UWP 3.0 provides a graphical user interface and management tool via the built-in web server, which can be accessed from any PC. This software provides a complete overview of the status of the carpark in real-time: each bay and its display can be monitored, occupancy rates and statistics for the different types of spaces and areas of the carpark can be viewed as bar graphs. Alarms about occupancy time or rate pop up on the screen and are recorded in the alarm log, allowing the operator to take immediate action if needed.

Fire Damper control solution

Cost effective wiring and fast BMS integration

How to prevent the spread of fire inside the ductwork in buildings with fire-resistance rated walls and floors?

Fire dampers are passive fire protection products largely used in industry, public buildings, shopping malls, airports, and indoor car-parks or multi-storey garages. In those places, fire dampers are used to prevent the spread of fire inside heating, ventilation, and air conditioning (HVAC) ducts. When a rise in temperature occurs in standard installations, the fire damper closes, activated by a thermal element which melts at temperatures higher than room temperature but low enough to indicate the presence of a fire, allowing springs to close the damper blades. In more advanced solutions, fire dampers closure is initiated by an electrical signal from a fire alarm system, utilising remote detectors, indicating the sensing of heat in the building occupied spaces or in the HVAC duct system. Carlo Gavazzi, among the different product solutions for energy efficiency and building automation, provides a ready-to-use junction box for fast and easy decentralized installation, capable to monitor and control up to two fire damper actuators. This junction-box, being based on the Dupline® bus technology, is part of the UWP 3.0 platform and XAP 1.0 BMS system. UWP 3.0 can manage, for every Dupline® generator (SH2-MCG), up to 60 fire dampers.

BDA-RE
- Small sized single relay output
- Load: 16 A/ 250 V ac
- Withstands 130 A inrush current
- Dupline® bus powered

SH2-RE
- 2 or 4 relay outputs with embedded energy analyzer
- LED-indications for power supply, bus and outputs status
- Push button for local ON/OFF switching
- 2-DIN module housing
- 230 V ac power supply, Dupline® bus powered, 24 V dc
- Connection to other SBB units via Dupline® bus

kWh, kvar, W, var, VA, PF, V, A

SBB-4I
- Robust module for decentralized installation near or directly on fire dampers
- Designed to monitor two fire dampers
- 4 contact inputs (voltage-free)
- Easy wiring of the system
- Cost-effective design
- Dupline® bus-powered

SBB-4I2O
- Robust I/O-module for decentralized installation near or directly on fire dampers
- Designed to control two fire dampers
- 4 contact inputs (voltage-free)
- 2 relay outputs (230 V ac/ 3 A)
- Easy wiring of the system
- Cost-effective design
- 230 V ac, 24 V ac/dc power supply

Note

TECHNOLOGY

CONTROL

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