



Energy efficiency monitoring and active control solutions

Controls

Energy efficiency

From a cultural change to energy saving

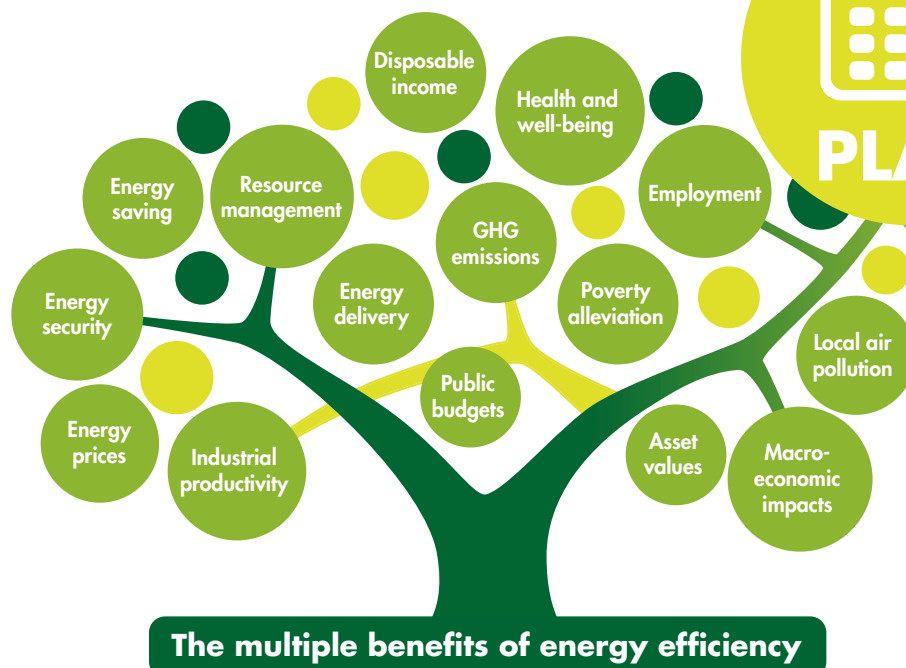
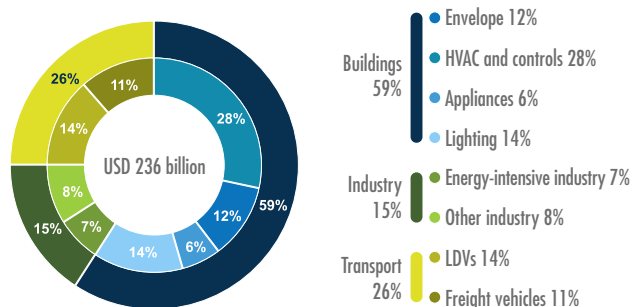
■ The new challenges for the energy sector

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

Energy efficiency is "the first fuel": it is key for cost effective energy transitions and the one energy resource that all countries possess 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).



The multiple benefits of energy efficiency

■ Why the plan do-check-act cycle

To be able to achieve Energy Efficiency mandatory regulations, goals and therefore 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 size to a large installation, has to go through an Energy audit which is the way to assess:

- **critical issues** within a site;
- **the 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, then 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 completed 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

Carlo Gavazzi provides with its meters, data analysis, communication technologies and control comprehensive solutions, all the information to carry out, by means of proper functions like KPIs (key performance indicators), benchmarking, reporting and the management of the base line, all the necessary automatic tools to measure the energy efficiency implementation plan.



Energy efficiency

UWP_{3.0} the paradigm shift

■ How can you implement an effective Energy Efficiency plan?

Meters are useless if relevant data cannot be collected remotely, remote collected data are 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 do not act properly on loads. Therefore the paradigm is to be able to generate useful information and to automatically convert them 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 regular 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 the 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 like: 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 the Cloud technologies. UWP 3.0 is Microsoft® Azure Certified for IoT.

More in details: 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 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 No-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.

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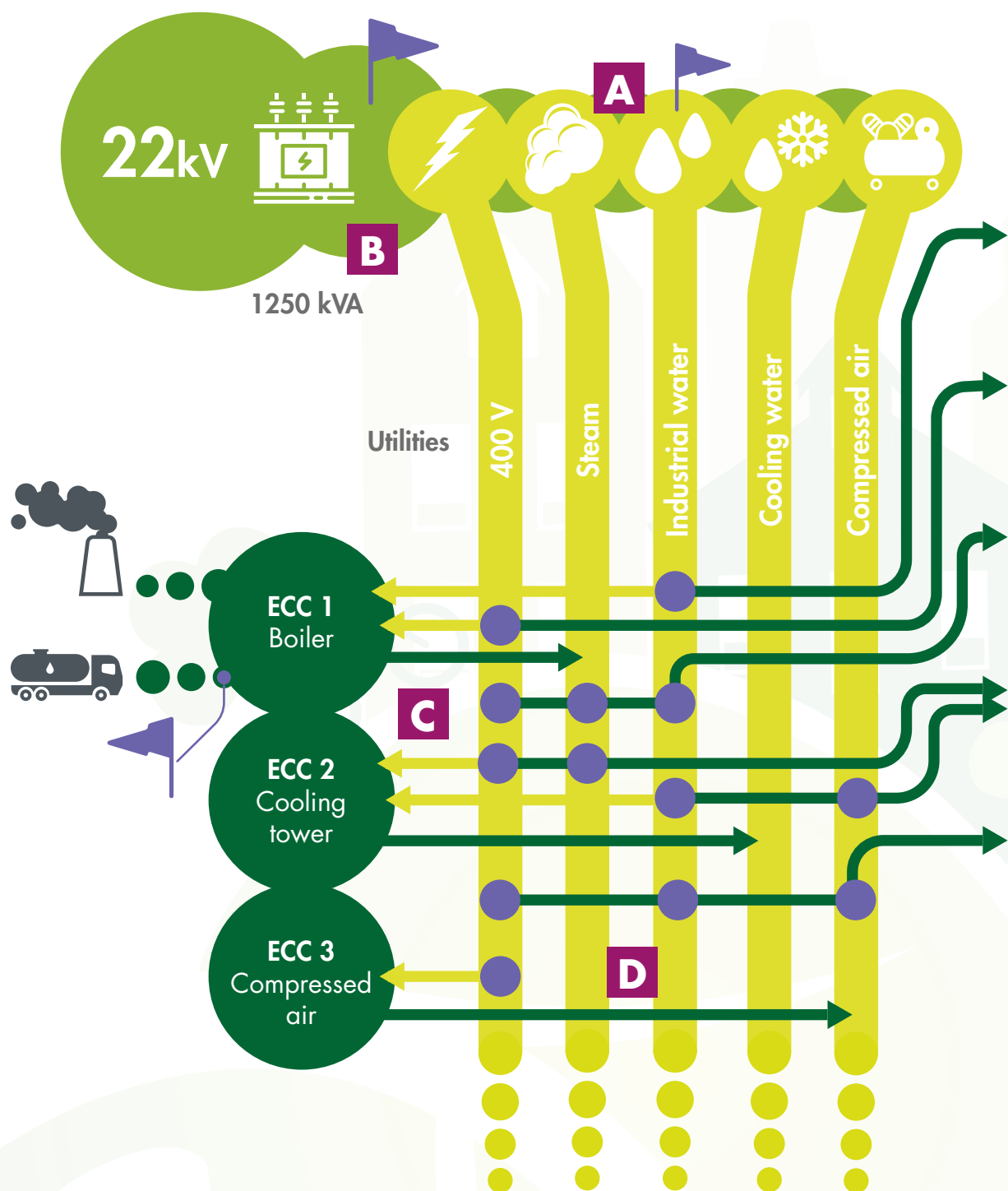


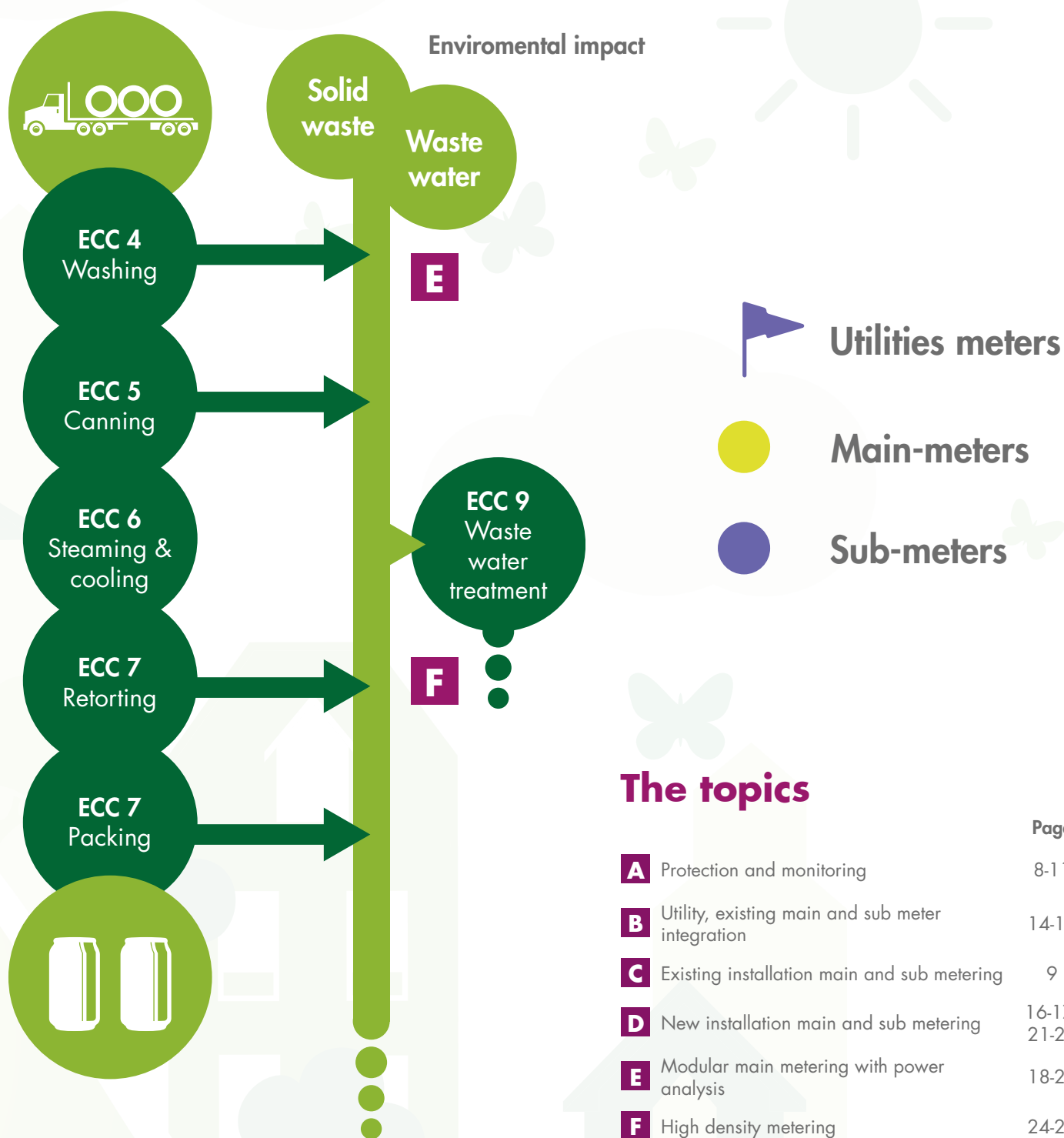


The map

■ The Carlo Gavazzi Energy Efficiency Monitoring competences

This map drives you, in this example, through the Carlo Gavazzi competences and product solutions. A travel through: protections, ESCo analysis tools, core unit, the utility meters data acquisition and integration, installed meters integration, main and sub-metering in existing and new installations!





Monitoring

Protection and monitoring

The electrical safety as part of the EEM solution

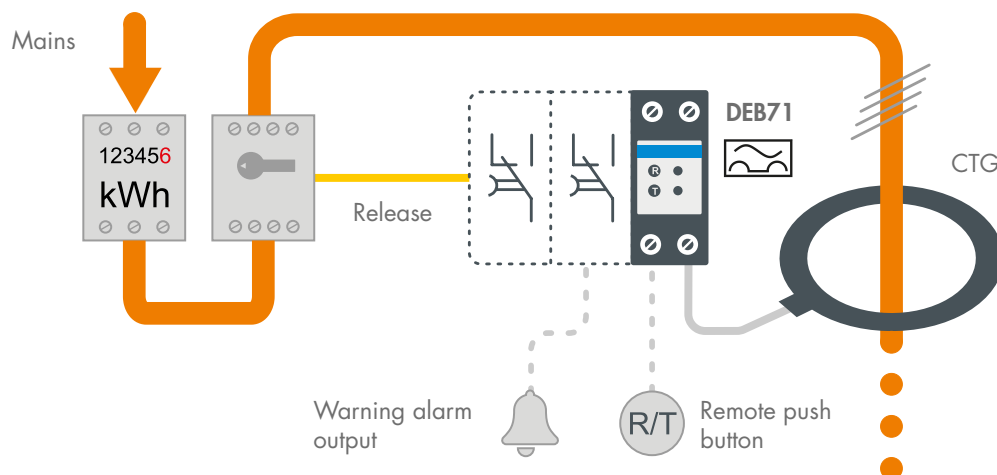
Why installation protection?

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 threat to life by protecting against the risks of electrocution and fire caused by earth faults.

How to detect dangerous earth leakage current? In industrial and commercial applications due to 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 like: high current lightning or if the installation's earth rod is 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 MRCD comply to the IEC60947-2 so to avoid nuisance trips and fulfils the "A" type operating characteristic so to work also in case of presence or absence of dc component residual currents.



■ DEA71

- Fixed current setting: 30mA or 300mA
- 2 relay outputs for warning and alarm
- Input for remote Reset / Test

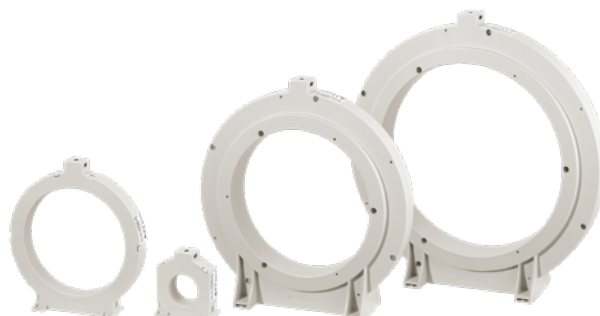
■ DEB71

- Adjustable setting from 30mA to 5A
- Adjustable delay up to 5s
- Leakage level LED bar
- 2 relay outputs for warning and alarm
- Input for remote Reset / Test

■ CTG, core balance transformer

- Easy installation
- High accuracy and sensitivity

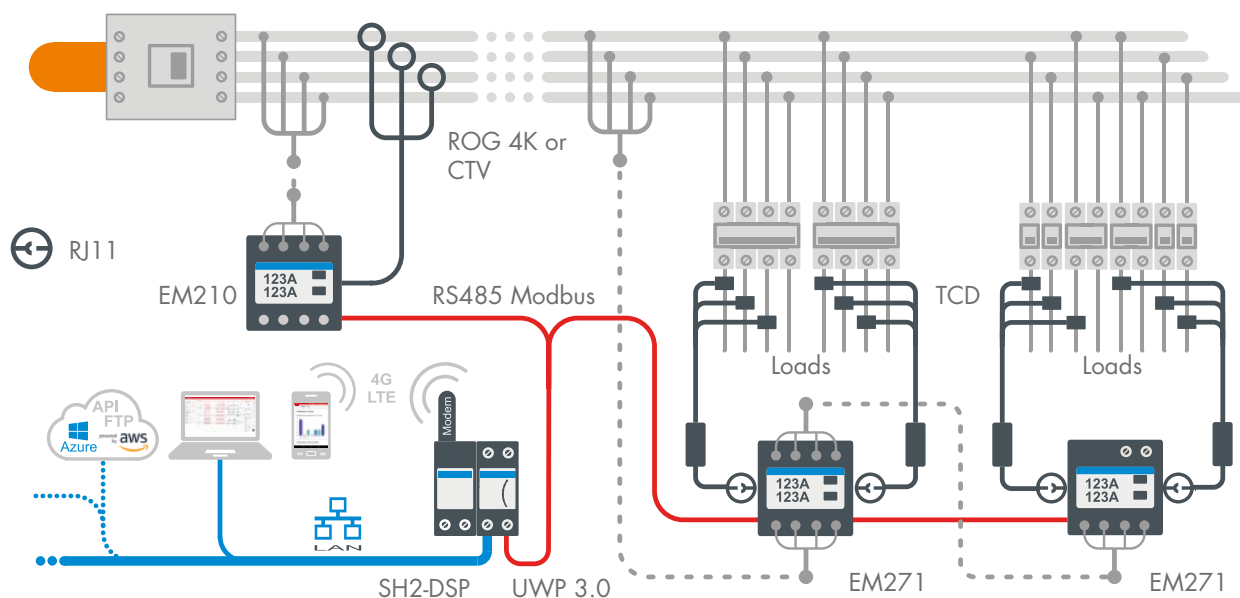
Model	Hole size (mm)
CTG35	35
CTG50	50
CTG70	70
CTG120	120
CTG160	160
CTG210	210



Retrofit main and sub-metering

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

To identify areas of energy wastage with a quick installation. This solution is suitable for ESCOs being able to easily remove equipment from a place where it has been installed, and re-install 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 72x72mm solution in the same housing for DIN-rail or panel mounting. Detachable 3*3-DGT/7-DGT display
- Up to 415 VLL ac and CT/CTV/ROG-based current measuring inputs
- 5A CT (AV version), 333mV 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
- Basic accuracy $\pm 0.5\%$ RDG (V/A), kWh class 1 (IEC62053-21), class B (EN50470-3), MID approved (AV version only)
- Pulse output and RS485 Modbus RTU (up to 115 kbps) port

■ CTV/ROG 4K series, sensing solutions

- **CTV 1X-2X-3X-4X-6X-8X.** Split-core current sensing unit, 333mV 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 4000A, diameters (mm): 115, 179, 275

■ EM271, sub metering solution

- Patented meter, 4-DIN and 72x72mm solution in the same housing for DIN-rail or panel mounting. Detachable 3*3-DGT/7-DGT display
- Up to 415 VLL ac and TCD-based current measuring inputs
- Current measurement by two basic TCD units with quick RJ11 plugs (see TCD M 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 kWh: 2.0% RDG (meter + TCD M unit). kWh: class 1 (IEC62053-21)
- RS485 Modbus RTU. 2 pulse outputs (loads 1 and 2)

■ TCD 0M-1M-2M-3M, 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	200	15.5
TCD 3M	400	20.5

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



Up to
800A



Up to
400A

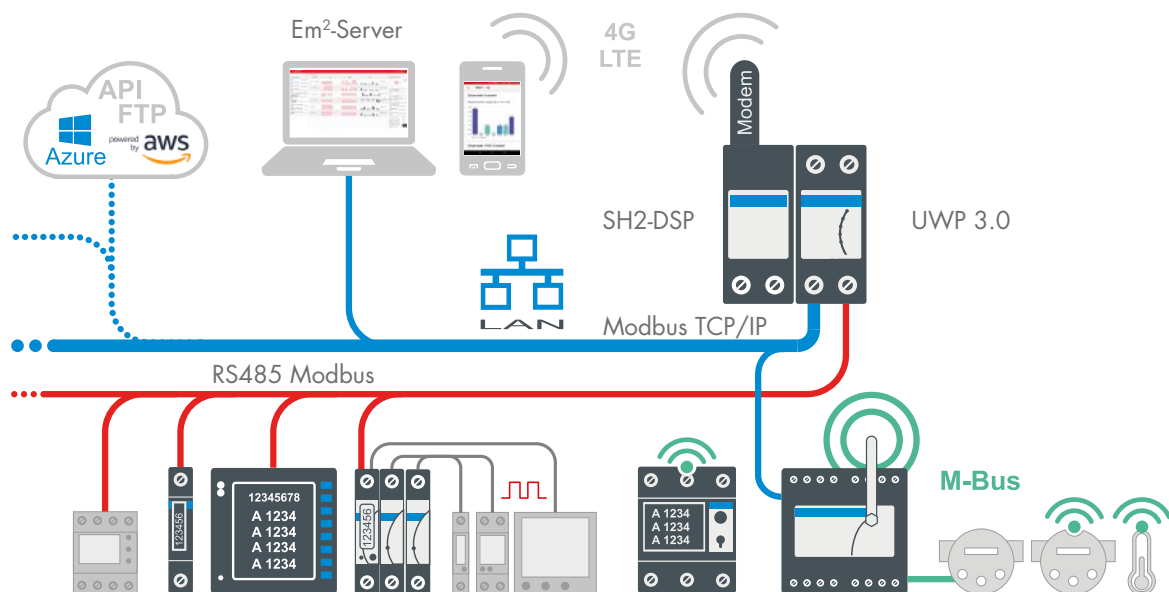
Monitoring

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 and 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 individual 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 to 28 Vdc power supply



■ SH2-DSP

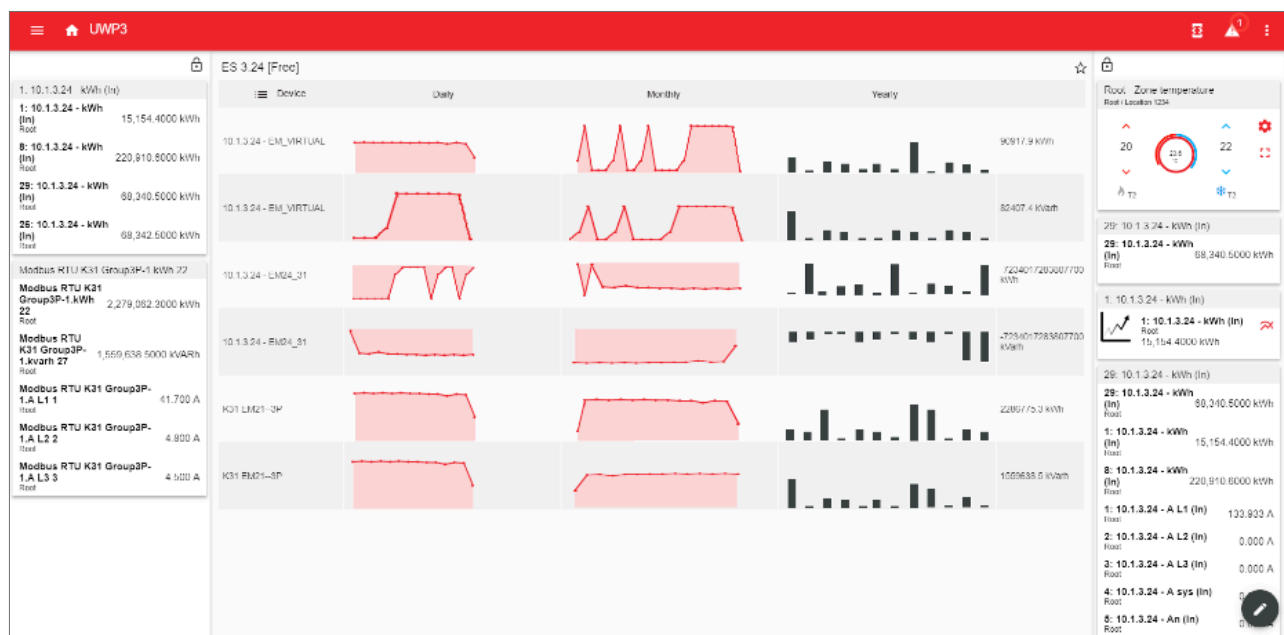
- Modem extension unit for UWP 3.0
- 3G or 4G Mobile Internet connectivity with SMS alerts and SMS commands management
- 2-DIN module housing
- 20 to 28 Vdc power supply



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 like: tables, trends, histograms, pies, comparison functions and others. The system allows for 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 onto their data.



Monitoring

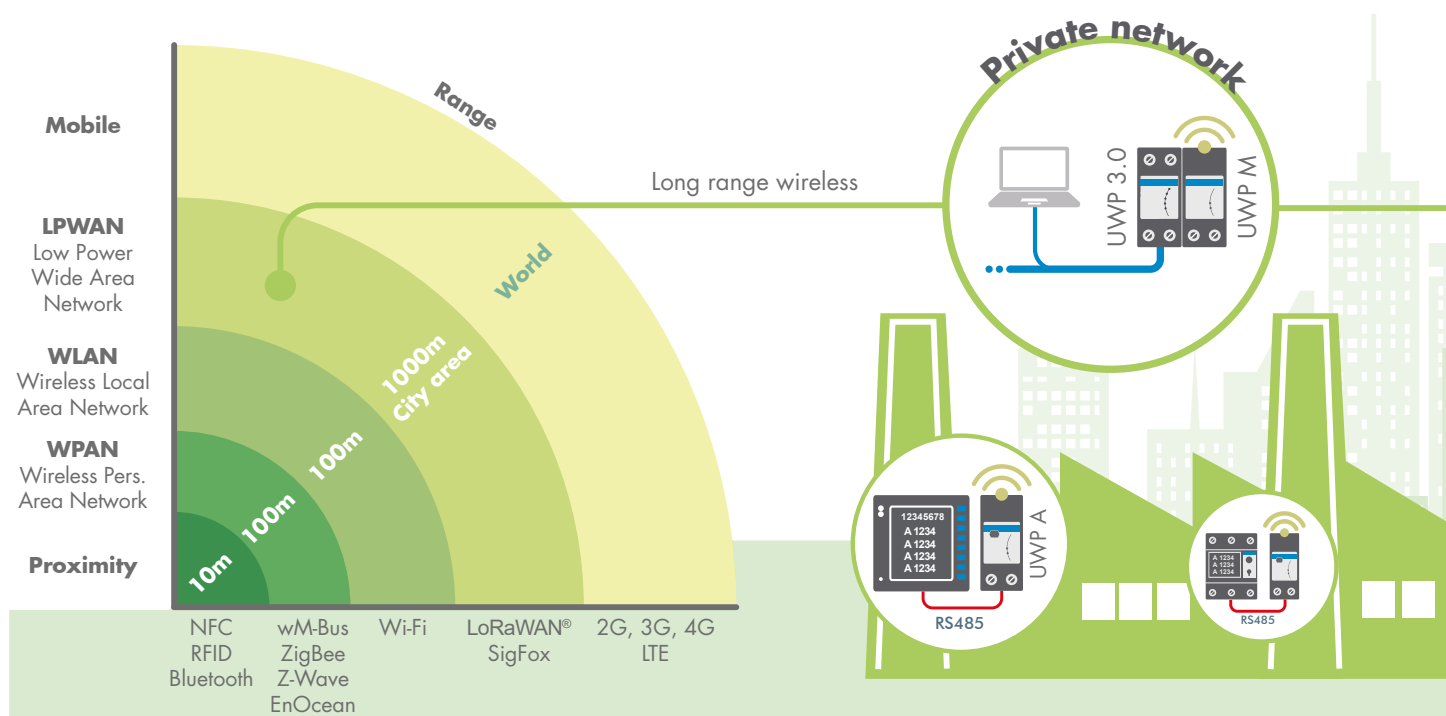
Long range wireless communication

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 from the size of the meter network to 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 like obstacles and interferences which maybe fixed by skilled installers and also cyber-security issues (if not correctly encrypted). 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 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.



■ 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.

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 systems. Thanks to LoRaWAN® long communication range, security and robustness, wireless networks can be easily set-up, without high expense due to the use of SIM cards or repeaters.

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



■ UWP M

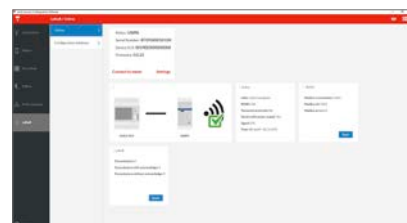
- Comprehensive energy monitoring solution
- Wireless solution with no SIM card (ISM band)
- Data concentrator for up to 50 UWP A endpoints each UWP M
- Communication range: up to 10 km in open air
- Fast commissioning
- Robust and secure communication
- Integrated into UWP 3.0's ecosystem

■ 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
- Configurable LoRaWAN® communication
- OTAA or ABP authentication
- Communication interval from 5 min to 24 h
- Plug'n 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 CG meter/analyzer
- Diagnostic functions



Monitoring

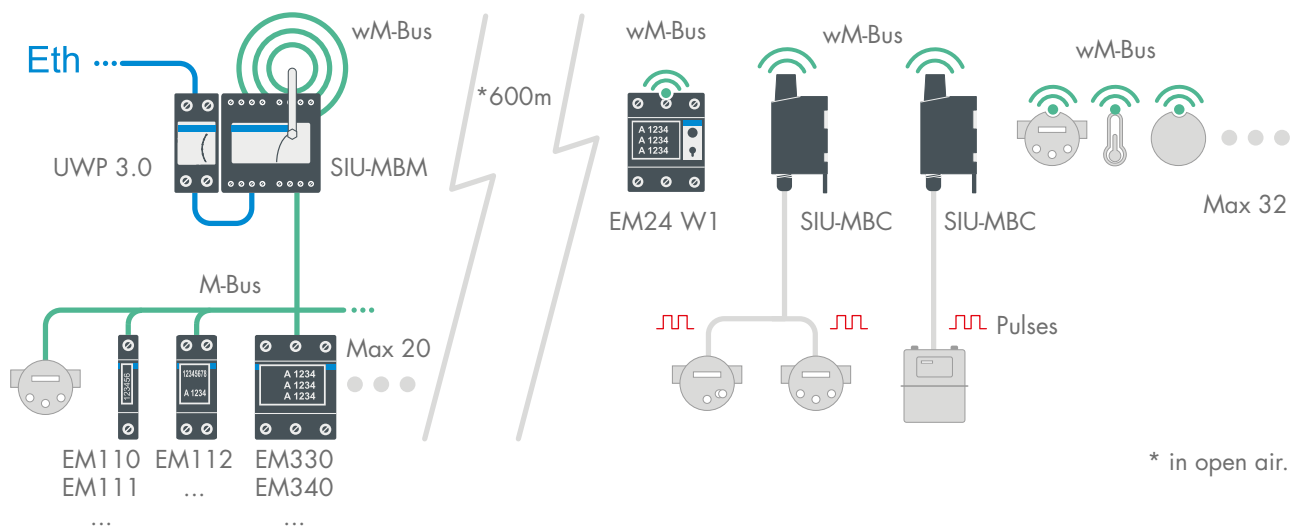
Utility, main and sub meter integration

Existing utility metering

The utility meters are valuable unexplored information sources that are frequently unavailable.

If utility meters are M-Bus (EN13757) wired or wireless based, then the SIU-MBC can be used as a dual pulse counter or directly via the 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 then 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, then the solution is SIU-MBM.



* in open air.

■ SIU-MBM 01, SIU-MBM 02

SIU-MBM 01 and 02:

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

SIU-MBM 02:

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

■ EM24 W1, EM series

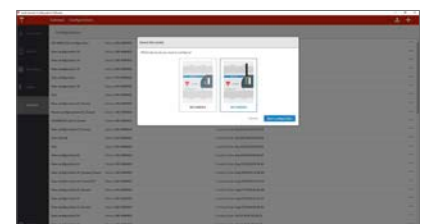
- DIN rail meters for main and sub-metering applications. See specs at page 22.

■ 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 block 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

■ Easy integration of Utility meters by means of SIU-MBM series into UWP 3.0 platform

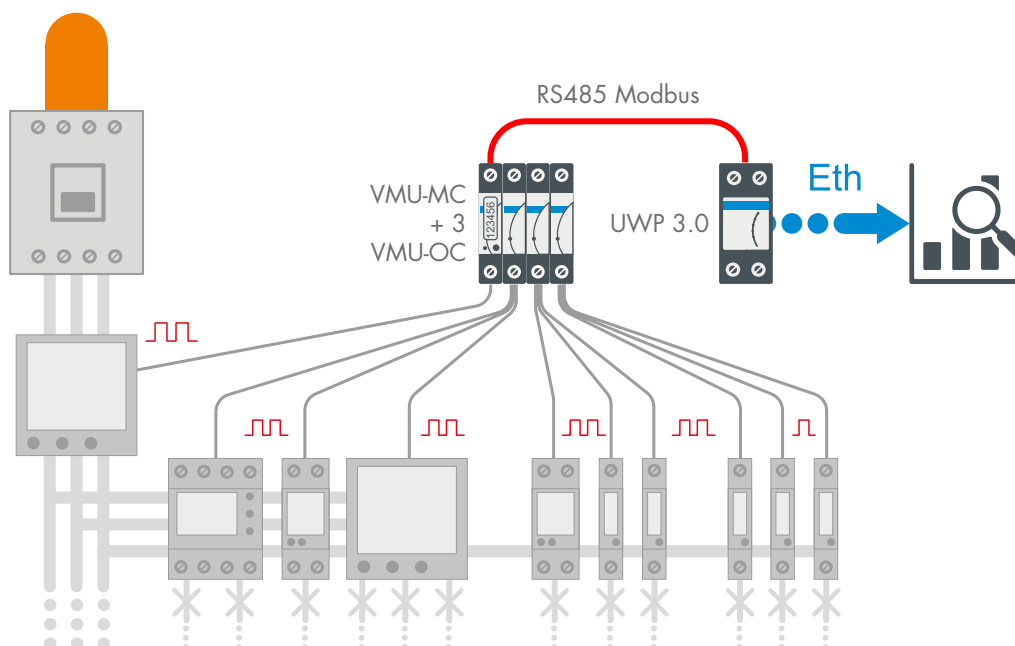
SIU-MBM can be properly configured by means of UCS desktop Universal Configuration Software so to gather data not only from utility meters but also from M-Bus main-meters, sub-meters and other M-Bus devices. By using UCS, it is possible to automatically scan the M-Bus and wireless M-Bus networks, select the necessary data points, configure the Modbus TCP allowing the communication through LAN with UWP 3.0 or another Modbus master or SCADA.



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 benefiting from quality data, data granularity and whole data management.



■ VMU-MC, VMU-OC

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

VMU-MC:

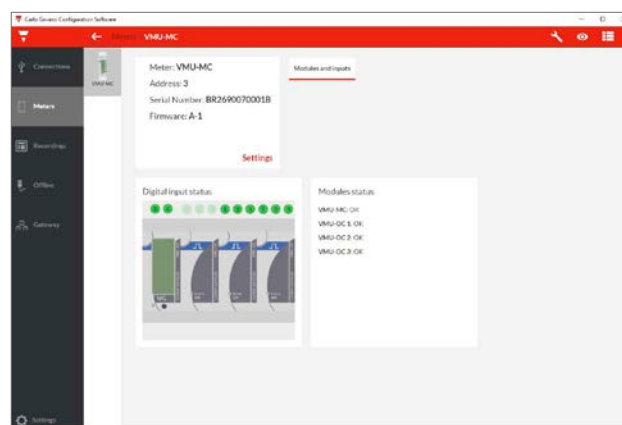
- LCD display for: status, counter, any active tariff
- Tariff management
- 2 input available (for pulses or for up to 4 tariffs selection)

VMU-OC:

- 3 inputs available (for pulses only)

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

UCS features for configuring devices, storing 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 as a digital input the tariff change, managing automatically the energy increase for both tariff 1 and tariff 2. Every counter input and function have an independent configurable pulse weight.



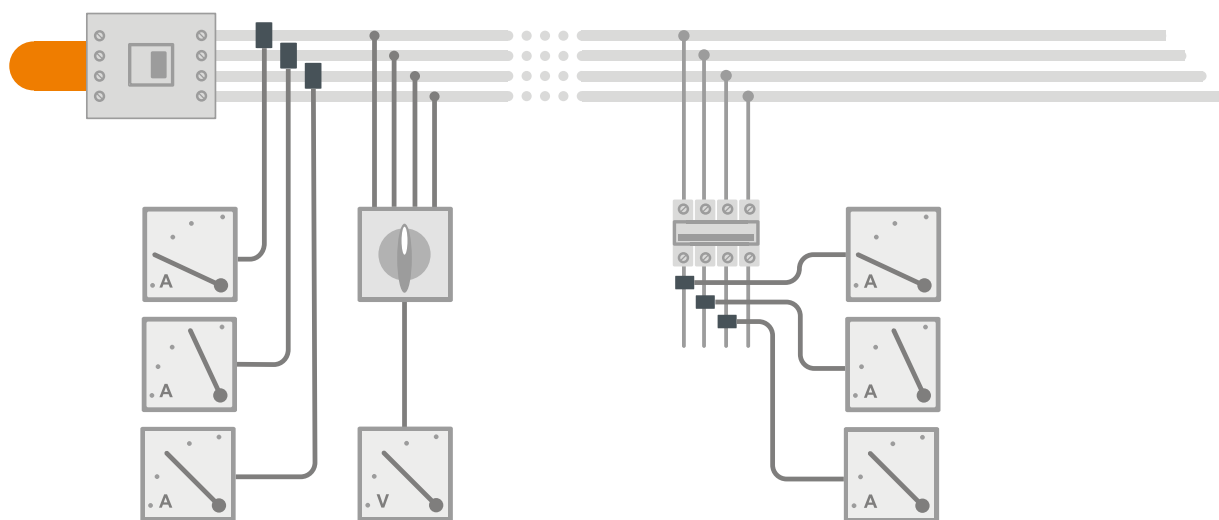
Monitoring

Panel mount meters

The user-needs evolution

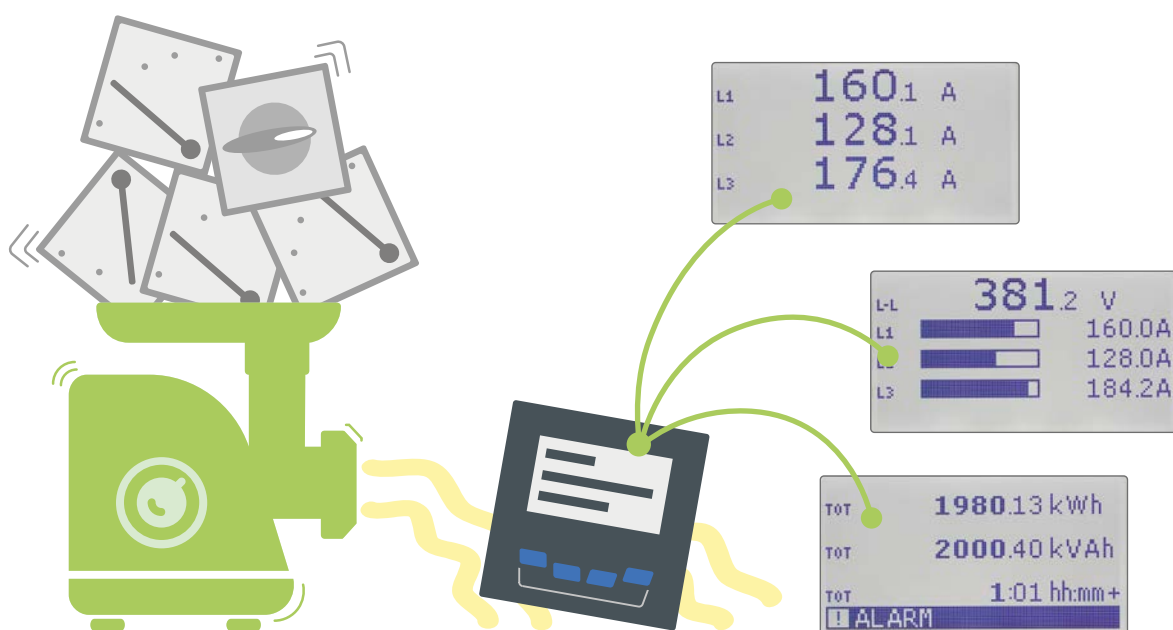
The use of analogue panel meters is not only linked to cost reasons

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

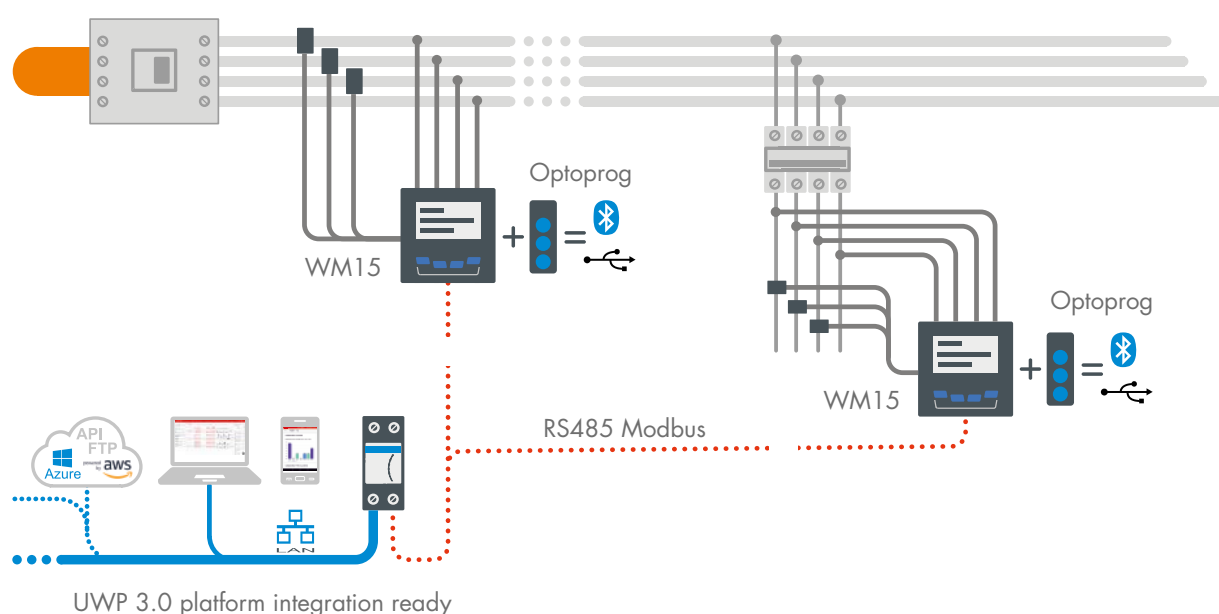
The position of the pointer in the analogue scale and the comparison among other analogue panel meters on the same distribution-board is preferred for the less effort the user makes to process the information he is voluntarily searching for (intrinsic cognitive load). But we know, the world evolves becoming 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 displaying, a proper accurate visualization of the same variable.



Immediacy of visualisation and integration

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

WM15 is also the answer to the growing need for additional electrical variables to make more in-depth analysis. This solution condenses the information of four analogue panel meters into a single meter, but also provides an accurate measurement of power and energy thanks to the continuous and simultaneous sampling of all phases. When it is installed on a distribution board 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.



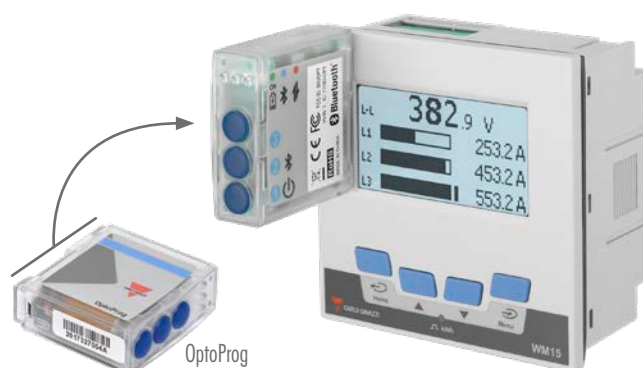
How to reduce installation and commissioning costs

Installation and commissioning of advanced panel meters often has additional and hidden costs compared to ordinary analogue panel meters. WM15 reduces these costs compared to ordinary digital panel meters thanks to an improved usability of the meter, the use of OptoProg and UCS.

Through the power and versatility of OptoProg - local configurator, and UCS desktop version or UCS mobile Android App, the installer can check the connections and quickly change the configuration parameters using a smartphone connected via Bluetooth to OptoProg. In addition, in the case of panel series production, the panel builder can easily replicate the same configuration on all WM15 units with a single command, thus eliminating errors and speeding up the production process. In the case of wiring errors, UCS not only provides a diagnostic of the problem encountered but can virtually correct the proper phase associations between voltages and currents to fix the error without requiring a second intervention.

WM15

- 5A Current inputs via CT
- 230 to 415 V L-L measuring inputs with self-power supply
- 230 to 600 V L-L measuring inputs with auxiliary power supply
- 96x96 panel mounting, 59 mm depth
- Bidirectional kWh and kvarh, run hour meter
- System and phase variables: V L-L, V L-N, A, W, var, VA, PF, Hz, THD (voltage and current)
- Current and power demand calculation
- Digital output for pulse transmission or alarm
- RS485 Modbus RTU port (100 ms data refresh)
- MID certified (on request)



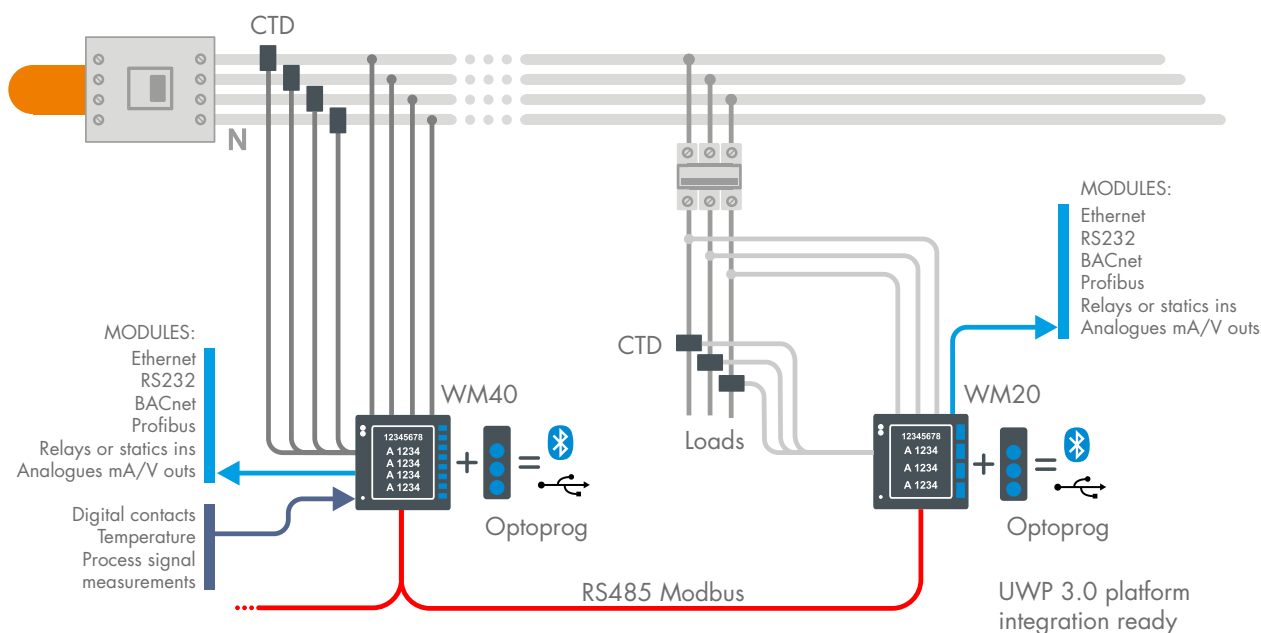
Monitoring

Beyond panel mount meters

Modular main metering with power analysis

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

By selecting, the most appropriate device to meet the different installation and application needs among the three available power analyser models for panel mount. Top accuracy, increasing metering capabilities and control functions by model, as well as a common modular system are the "on board" 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, and UCS mobile.



WM20

- 96x96mm panel mounting housing with front protection degree IP65, NEMA4X/12
- Basic accuracy 0.2% RDG (V/A)
- Single and three-phase measurements: V, A, An, Hz, PF, W, VA, var, run-hour, kvarh, bi-directional kWh (cl. 0.5s EN62053-22)
- 9+1-DGT counter variables LCD display
- Modular housing (see the modules list besides)
- Optical port for fast data reading and configuration
- Universal power supply (90 to 265Vac/dc, 19 to 60Vac, 21.6 to 60Vdc)
- THD analysis up to 31st harmonics with source detection, single harmonics via Modbus
- 3*4 DGT instantaneous variables LCD display
- Max values of all power variables
- Automatic scrolling pages
- 2 freely configurable virtual alarms

WM30

- 4*4 DGT instantaneous variables LCD display
- Avg and max values of all system and single phase variables
- 4 freely configurable virtual alarms
- Real time clock
- Other features like WM20
- 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 like WM30

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 like WM30

Modules

WM20/WM30/WM40

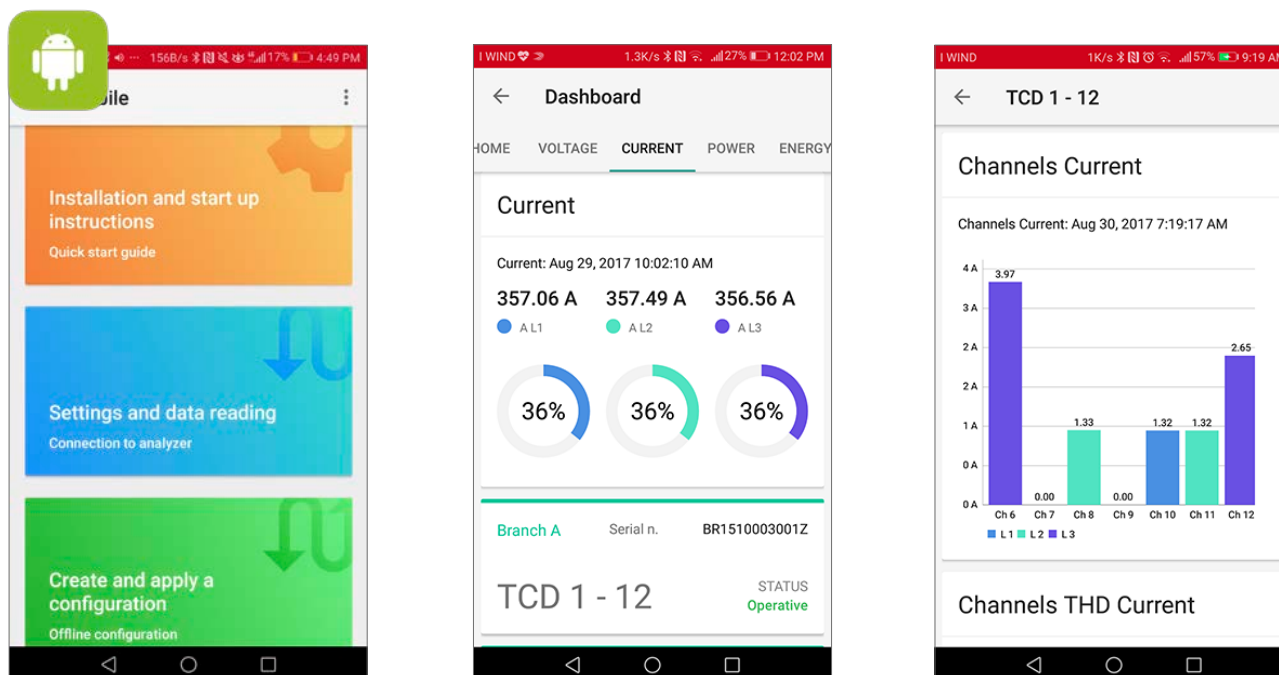
- RS232/RS485 Modbus RTU
- BACnet IP
- BACnet MS/TP
- Ethernet (Modbus TCP)
- EtherNet/IP (WM20 excluded)
- Profibus DP-V0
- 2-static and relay outputs
- 2*20mAdc or 2*10Vdc outputs
- 2*20mAdc or 10Vdc outputs
- Up to 4*20mAdc or 10Vdc outputs
- 6-channel digital inputs, Up to 6-relay/8-static outputs + 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 not only the product itself but is also the sequence of events which usually start 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 to answer to the different people skills and needs. OptoProg, with its App or simply a desktop software is the best answer to simplify the whole process.



How to do it!

OptoProg, the optical port-based coupling unit with build-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 advanced usability, allows to the Panel Builder to set all initial metering parameters without physically using the meter front keypad.

If the panel is produced in series with 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 upload the meter configuration parameters, change them, add alarms and download the new configuration to the power analyser again to complete the process. With the same UCS it's 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.



Optoprogram 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: 5A (standard), 1A (available upon request)
- Sealable terminal covers



■ CTD 1Z

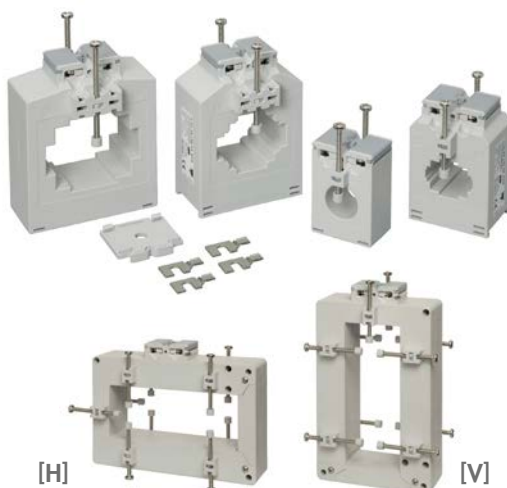
CTD	from (A)	to (A)
1z	50	200

- Solid core for cable or bus-bar
- Cable diameter: 22mm
- Secondary: 5A
- IEC61869-2

■ 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: Ø23mm to Ø51mm
- Bar: 20*5mm to 64*20mm or 51*43mm
- Secondary: 5A (standard), 1A (available upon request)
- Sealable terminal covers
- IEC61869-2



■ CTD 8/9/10/11/12-V-H

CTD	from (A)	to (A)
8 V/H	150	1600 (cURus) 2500 (CE)
9 V/H	400	2000 (cURus) 3200 (CE)
10 V/H		
11 V/H	1000	4000
12 V/H	1000	4000

- Solid core for cable or bus-bar
- Bar: 37*125mm to 53*125mm
- Secondary: 5A (standard), 1A (available upon request)
- Sealable terminal covers
- IEC61869-2

■ CTD 5/6-S

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

- Split-core for cable or bus-bar
- Bar: 26*32mm, 50*52mm
- Secondary: 5A (standard), 1A (available upon request)
- Sealable terminal covers
- IEC61869-2



■ CTD 8/9/10-S

CTD	from (A)	to (A)
8 S	150	1600 (cURus) 2500 (CE)
9 S	400	2000 (cURus) 3200 (CE)
10 S		

- Split-core for cable or bus-bar
- Bar: 31*81mm to 50*125mm
- Secondary: 5A (standard), 1A (available upon request)
- Sealable terminal covers
- IEC61869-2

■ CTA 5/6

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

- Split-core for cable
- Secondary: 5A
- Cable diameter: 24mm (5x), 36mm (6X)
- IEN61869-2



Quick-fit solutions.

[illegible]

- Triple solid-core current sensing unit

■ 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
<ul style="list-style-type: none"> Primary: 6*32A, hole size (mm): 7. Centre-to-centre distance (mm): 17.5mm. RJ11 cable length (cm): 80, 150 or 200 	

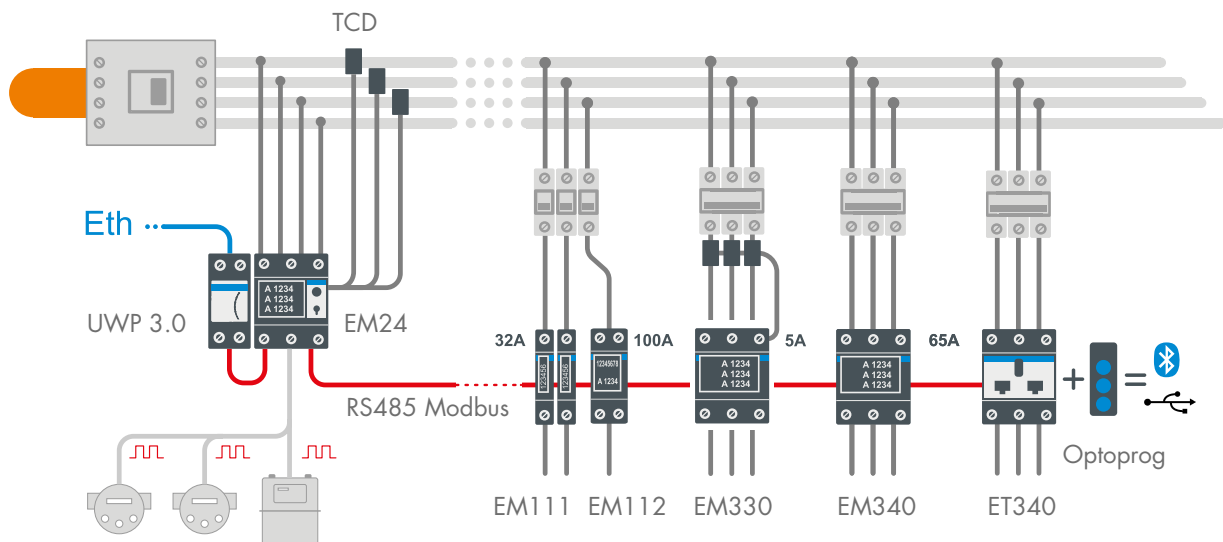


Monitoring

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

Full energy analysis capability and MID revenue approval.

This range offers you both CT connection inputs and direct connection capabilities with, for EM100-300 series also the MID approval (Measuring Instruments Directive, only for 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.



■ EM24, EM24 W1

EM24 and EM24 W1

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

EM24 W1

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

■ EM110-111-112

EM110 and 111

- 32A (max 45A), 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 Vac measuring inputs
- Self-power supply
- Measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, bi-directional kWh (cl. B EN50470-3, MID approved), dual tariff
- Pulse output or RS485 Modbus RTU or M-Bus port

■ EM330, EM340

EM330

- CT 5A, An, 90V to 260Vac/dc auxiliary power supply

EM340

- 65A, Self-power supply
- 3-DIN modules housing
- 230 to 400 VLLac measuring inputs
- Single and three-phase measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, bi-directional kWh (cl. B EN50470-3, MID approved), dual tariff, 3*1-phase kWh
- Backlit touch 3*8-digit LCD
- Pulse output or RS485 Modbus RTU or M-Bus port

■ ET112, ET340/ET330

ET112

- 100A, 115/230 Vac measuring inputs, 2-DIN modules housing

ET330

- CT 5A, An, 90V to 260Vac/dc auxiliary power supply

ET340

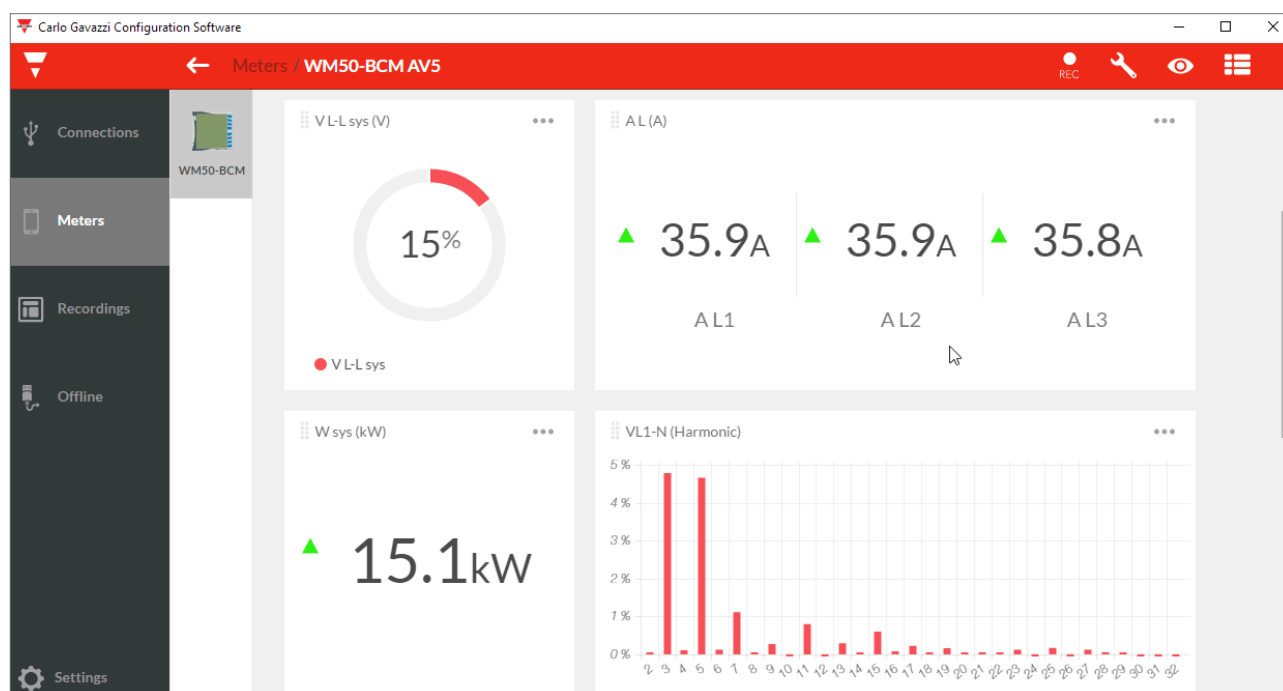
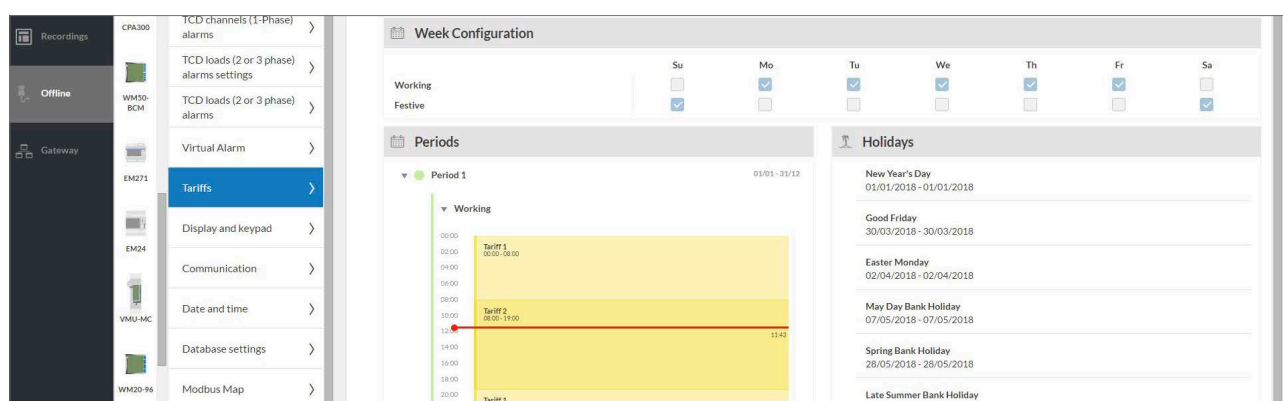
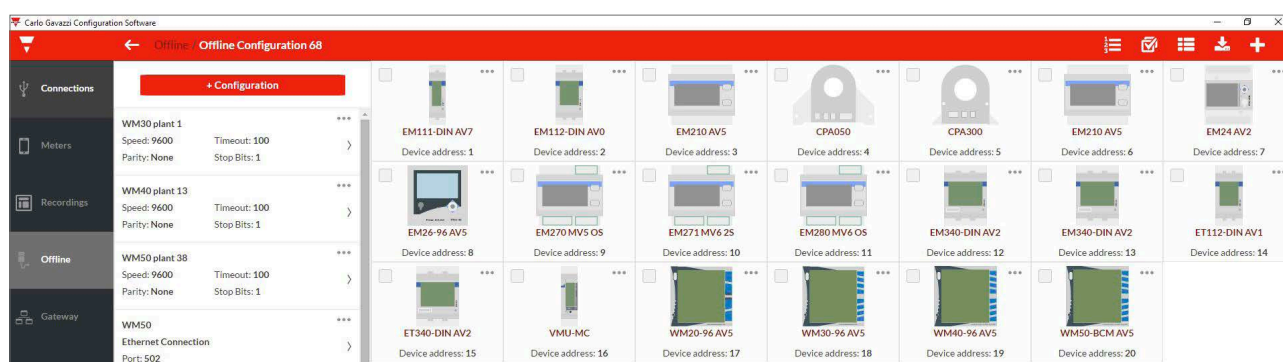
- 65A, 230 to 400 VLLac, 3-DIN modules housing
- ET112 and ET340
- Single and three-phase measurements: V, A, Hz, PF, W, VA, var, run-hour, kvarh, bi-directional kWh (cl. B EN50470-3), dual tariff, 3*1-phase kWh, An
- Self-power supply
- RS485 Modbus RTU port (RJ45 daisy chain and screw terminal block connections)



The universal configuration software

UCS, the universal configuration tool continuously upgraded and compatible to all CG meters.

Beyond the regular display variables, functionality and configuration parameters, the need to be more effective and efficient during first meter configuration (by the Panel Builder) and the site commissioning (by the System Integrator) is common place. 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, like: Panel Builder, Installer, System Integrator and End-user to limit and fix any installation, configuration and commissioning error.



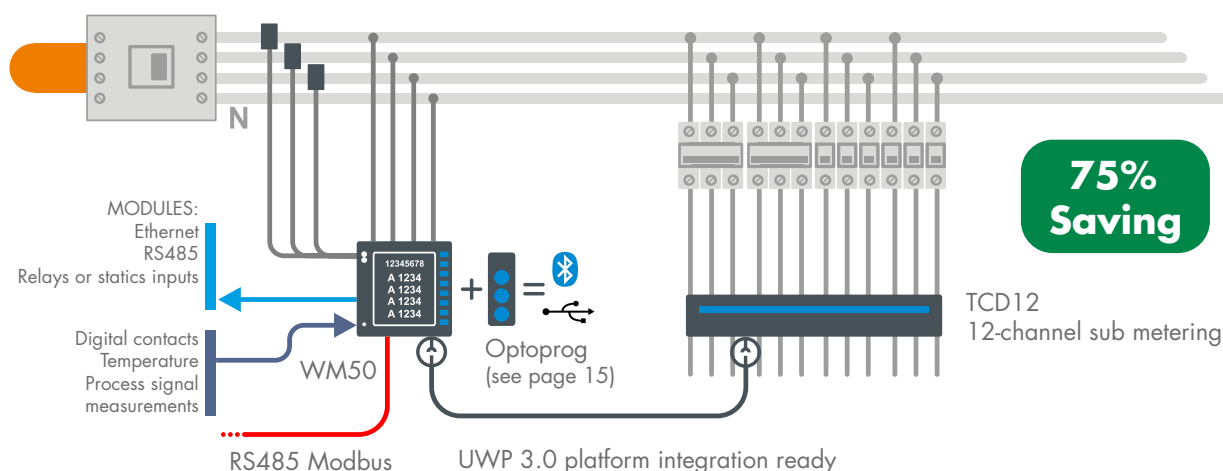
Monitoring

Quick-fit high-density metering solution

Distribution board-based solution

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

When the electrical system is different from a bus-bar trunking or bus-duct system and feeding of numerous loads is in a common distribution board, than the 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 is not only given by the components cost but even more by installation and commissioning costs, this innovative solution allows you to achieve more than 75% installation and commissioning savings vs. a regular solution.



■ WM50, main metering solution for distribution boards

- 96x96mm panel mounting meter with IP65, NEMA4X/12 front protection degree and modular housing
- Up to 480 VLL ac and 5A 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 EN62053-22), THD analysis up to 31st harmonics, single harmonics via Modbus
- Basic accuracy 0.2% RDG (V/A)
- 9+1-DGT totalized variables LCD display
- Optical port for fast data reading and configuration
- Universal power supply (90 to 260Vac/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

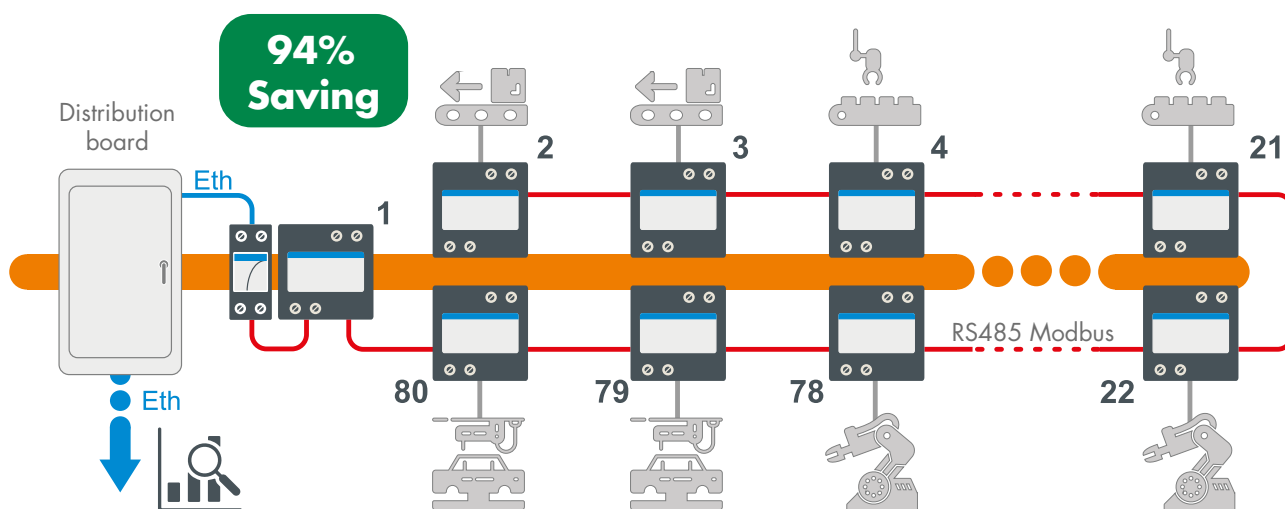
- Primary: 12*65A
- Hole size (mm): 8.5
- Centre-to-centre distance (mm): 17.5mm
- RJ cable length (cm): 30 to 500
- 12-channel split-core current sensing unit
- Accuracy Class 2 (kWh) according to EN62053-21 (meter + TCD unit)
- Up to 96 channels: kWh, W, var, VA, PF, A, THD A
- Data available via communication module



Bus-bar trunking and bus-duct system-based solution

Why a high-density metering solution?

When either in an industrial or commercial installation, in the same facility, metering is not only for load monitoring but is more to build up energy cost centres for cost allocation and the machines/loads to be monitored are numerous, a regular metering solution is not the best answer. The point is not the 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 design, 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 connected to a VMU-C which automates the meter addressing and in general the whole commissioning process by 94%.



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

- Patented meter, 4-DIN modules for DIN-rail mounting
- Up to 415 VLL ac (rated) and TCD-based current measuring inputs
- Current measurement by two basic TCD units with quick RJ11 plugs (see TCD M series)
- Quick configuration by automatic recognition of TCD units
- Self addressing in a Modbus system (in combination with VMU-C)
- 2*3-phase energy analysers with sum function in the same unit
- Measurements: V, A, Hz, PF, W, VA, var, bi-directional kWh
- Basic accuracy kWh: 2.0% RDG (meter + TCD M unit). kWh: class 1 (IEC62053-21)
- Data format: 3-DGT (instantaneous variables)/7-DGT (totalizers)
- RS485 Modbus RTU. 2 pulse outputs (loads 1 and 2)

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 sensing units.



VMU-C gateway and web-server solution

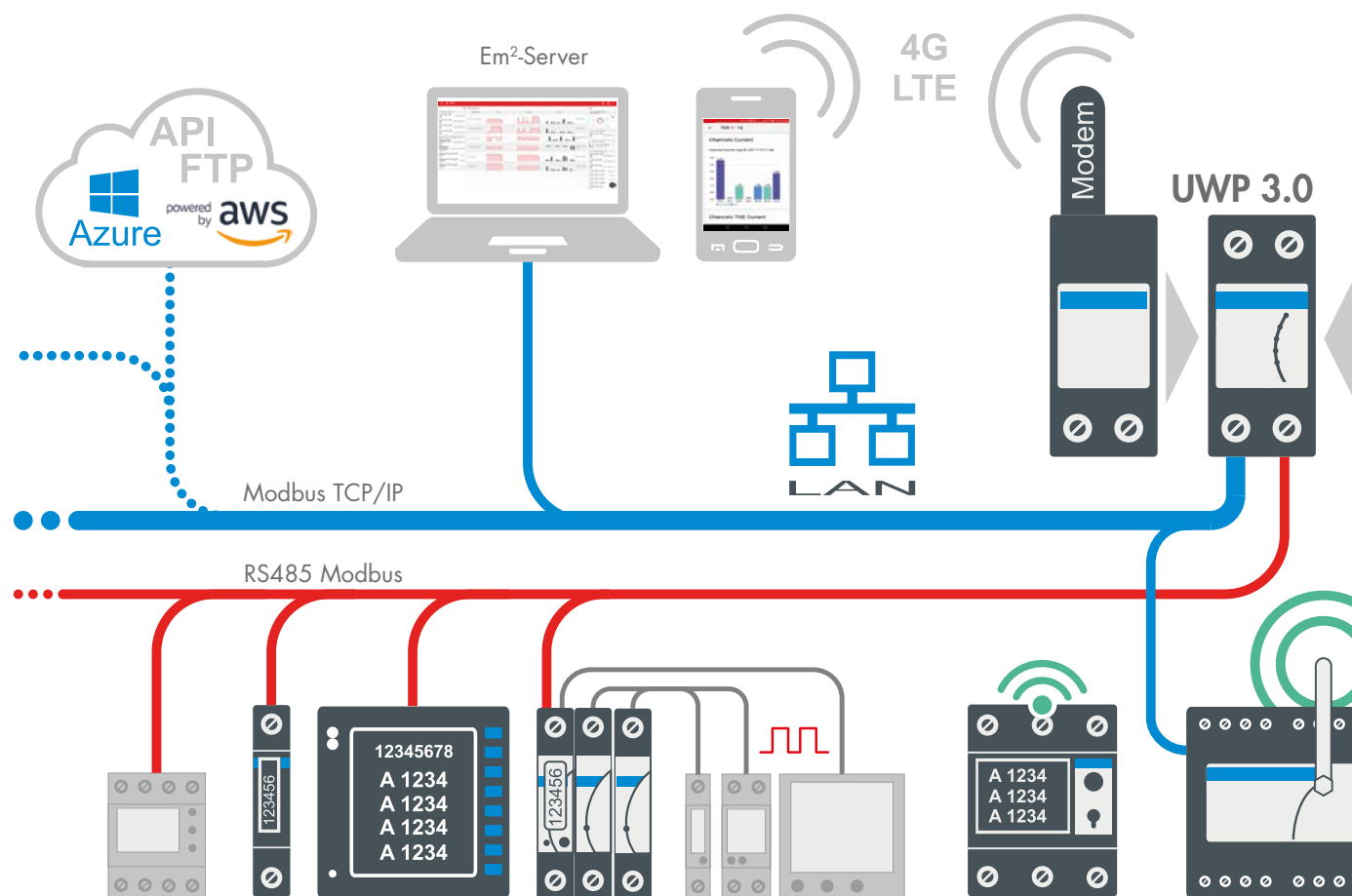
- VMU-C EM and ET272 are mandatory parts of the bus-duct solution
- 2-DIN module housing. 12 to 28 V dc power supply
- Micro PC with embedded Web Server, WEB services and data logger functions
- Ethernet Modbus TCP master/slave function
- One RS485-Modbus port for the management of up to 80 ET272.
- 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 individual load. Costs analysis
- Virtual meter with sum function
- Alarm management (e-mail or SMS by means of SH2-DSP)



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.



■ 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 the platform evolves from the pure monitoring introduced in the first part of this solution presentation, to the active control. Although gathering 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 reduce at maximum the energy costs is the merge of two major actions: monitoring and active load control.

■ The active control

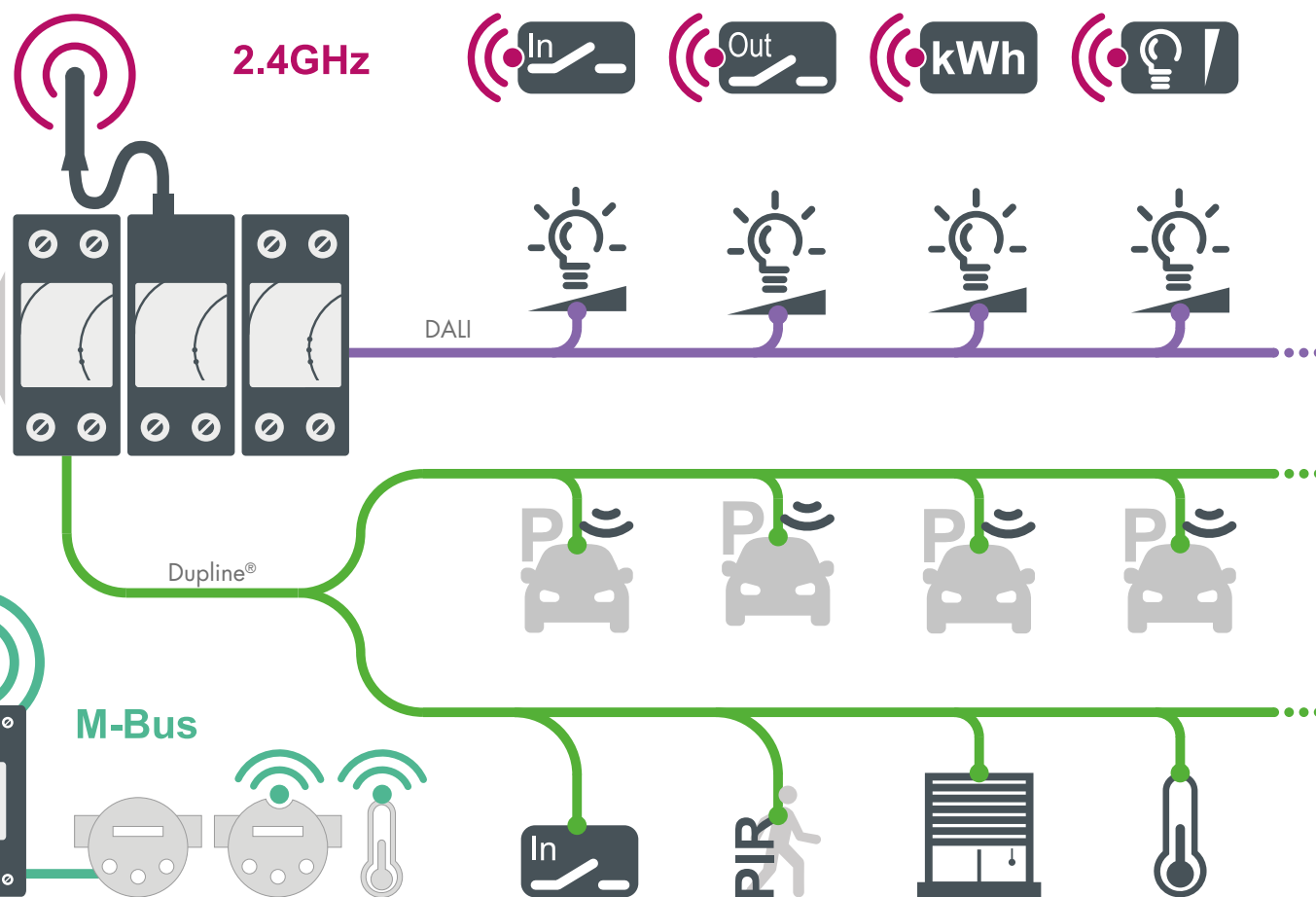
The active control performed by UWP 3.0 is the capability of this platform to act, at a first level, directly and

automatically on the loads but also as 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. As 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).

■ 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 not only on energy resources but also on human resources, this means, a modern Company knows that: people engagement, mood and commitment can be easily be boosted up taking care of the work space in terms of CO₂ level (ventilation), temperature (heating and cooling) and illumination (DALI).

■ Control and integration

Last but not least, in the warehouse, the energy focus is on lighting as well, but also on both heating and ventilation. A proper management of those loads and the communication by means of BACnet, will integrate UWP 3.0 platform into a BMS so to complete the offer to achieve the energy efficiency goals.

■ From energy efficiency to flow efficiency

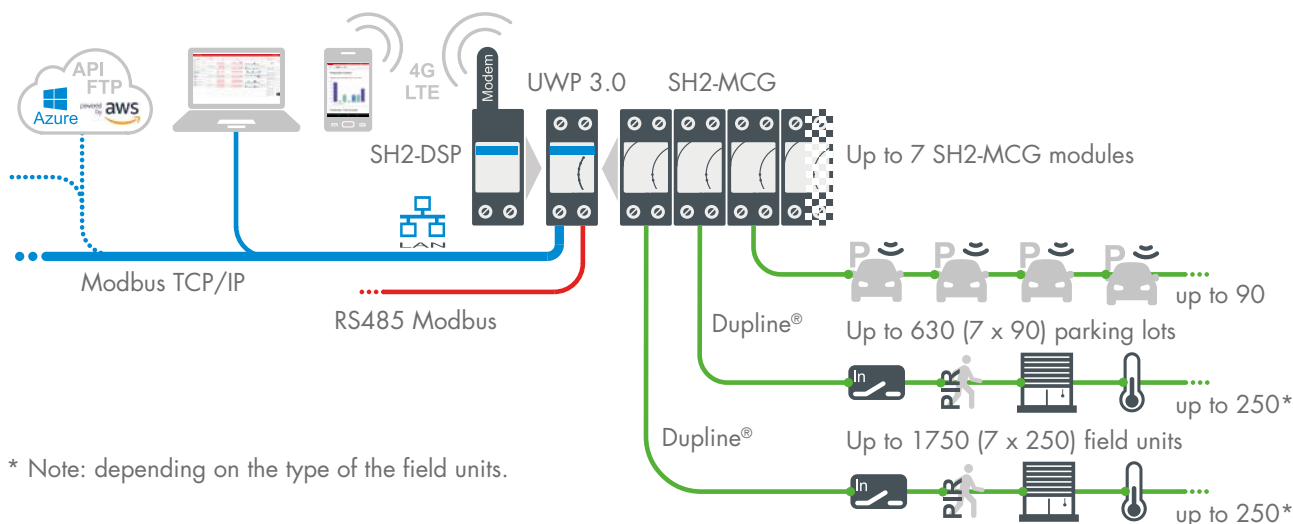
As an additional example, moving from an industrial installation to a shopping mall or an airport, there is the need to different extents, in addition to what already explained above, to implement energy efficiency strategies also in an indoor car-park or multi-storey garage. In this case, as for the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

Active control

The smart field bus wiring

The Dupline® bus

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



■ Why Dupline® proprietary smart bus?

Because among all the platform compatible standard field buses, Dupline® in its application context, is the best solution, since it brings numerous benefits like:

- 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 2km 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.

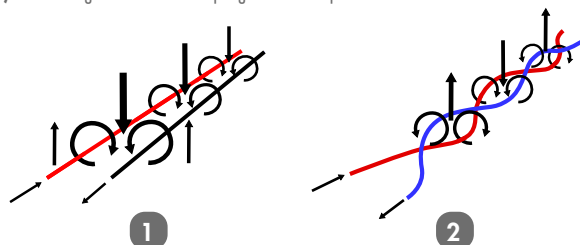
■ SH2-MCG

- Connection to SH2-WEB via internal bus or terminals via the high speed bus
- Up to 7 SH2-MCG can be connected on the same network, considering the sum of SH2-MCG and SH2-WBU
- 2-DIN modules housing
- 24 Vdc power supply



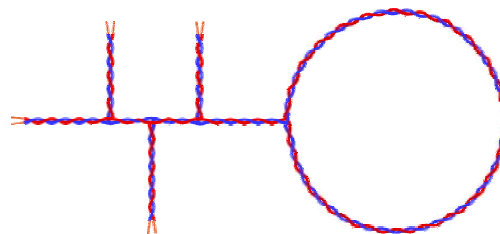
■ The noise and crosstalk immunity of Dupline®

- 1) Inductive coupling effect in parallel wires.
- 2) Minimizing the inductive coupling effect in Dupline® twisted Cables.



■ The free topology of the Dupline® network

Ease of installation and wiring.



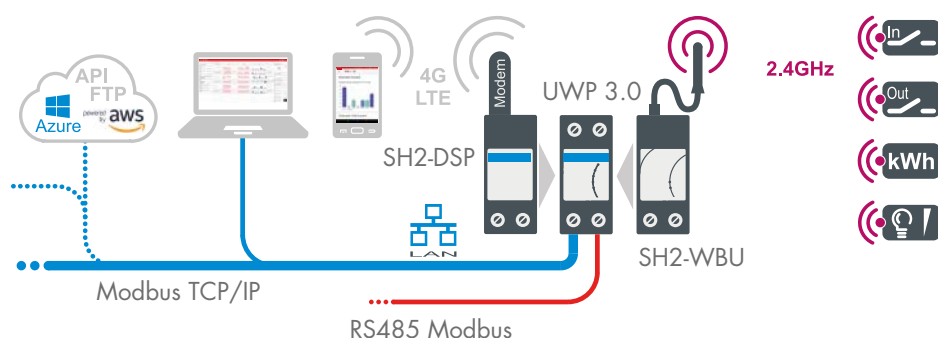
■ Only 2 wires to perform a reliable communication

Many wires vs. two wires, this is the Carlo Gavazzi 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.



This means, within the UWP 3.0 platform, the availability of Dupline® smart field components suitable to:

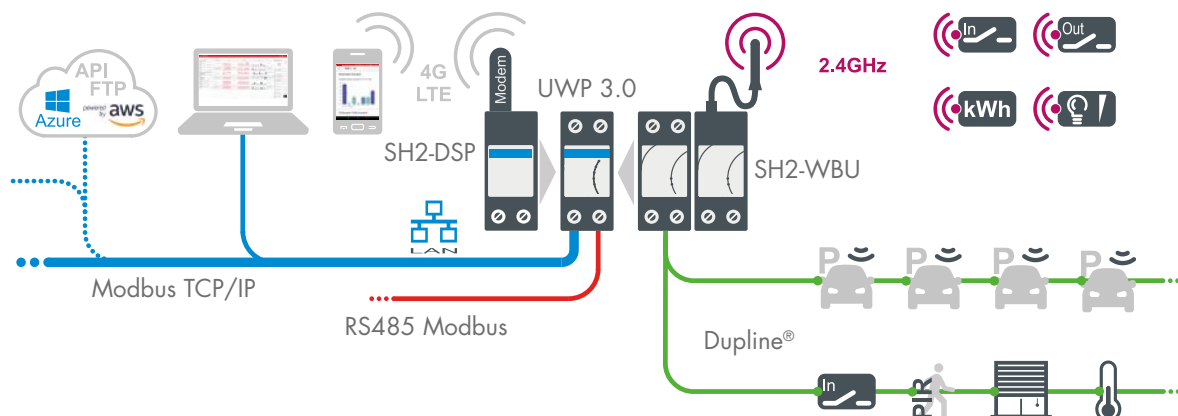
- measure environmental parameters like temperature, humidity and CO₂;
- measure luminous flux per unit area (LUX);
- measure standard signals like volts and milliamps from various transmitters;
- measure the energy consumption of one-phase loads;
- detect movement and presence within a room;
- sense status signals like light and load switches and alarms;
- activate outputs by means of relays;
- generate 10Vdc 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 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 IEE802.15.4 2.4GHz wireless expansion module "SH2-WBU" to build up a wireless network, where other Carlo Gavazzi field smart components can be added to expand the platform capabilities. This means:

- 4 programmable push buttons to turn ON/OFF lights;
- 4 digital inputs with embedded one-phase energy meter;
- a light dimmer with embedded one-phase energy meter;
- a relay output with embedded one-phase energy meter;
- doors/windows magnetic sensors.



Active control

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 gather massive number of data generated by field devices like meters and sensors. This is needed to be able to route data 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. This means in a system, being able to manage an efficient and effective integration

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

Nowadays, data management are key to achieve the saving goals, but this is very often a hassle for the system integrator. There are two order of problems:

- the first one is related to the way data are exchanged, therefore the used protocols and as a consequence the potential lack of knowledge;
- the second one is the data interaction and the logic to be implemented to achieve the energy saving goals.

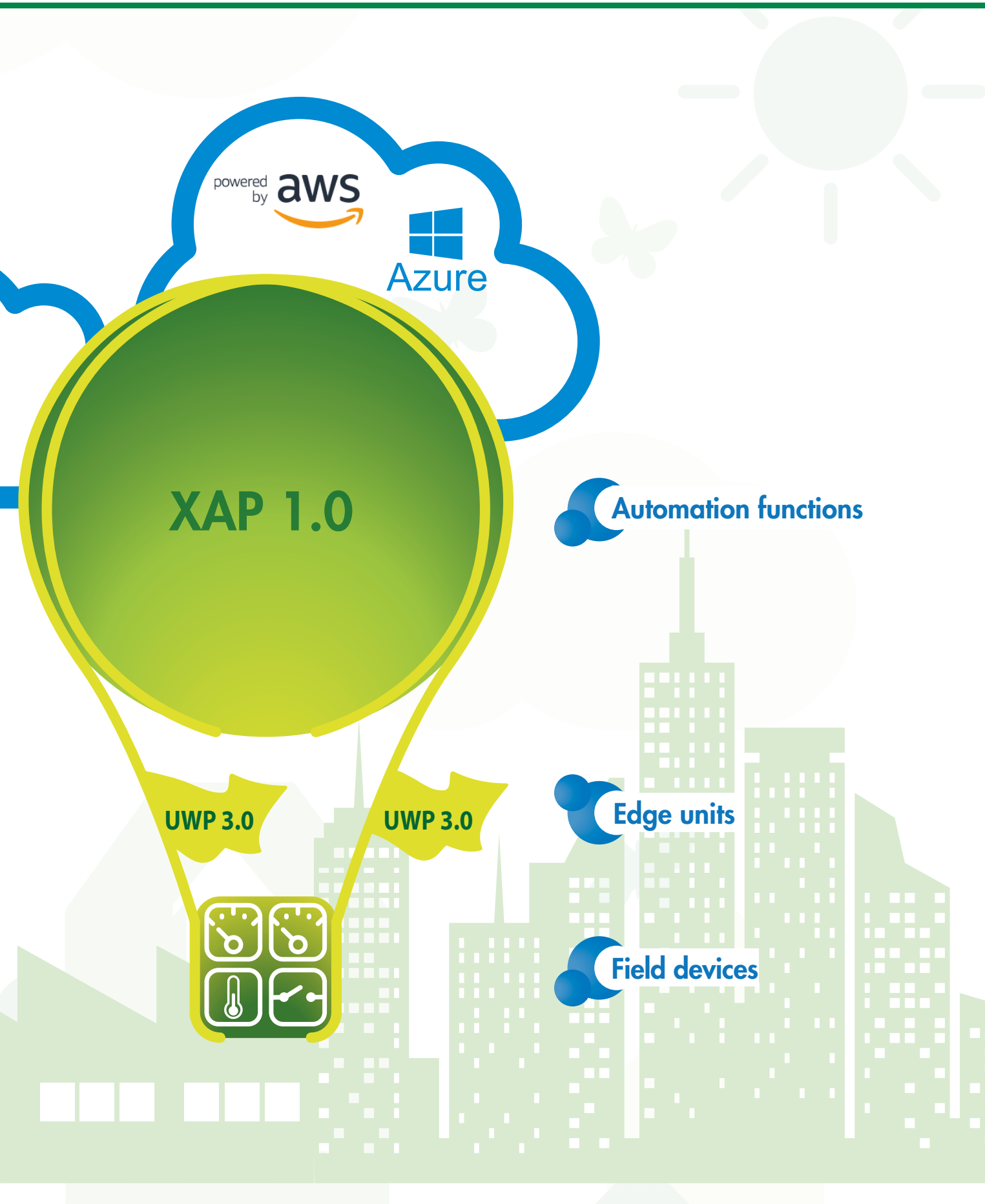
Both problems are costs which, at the end will be paid by the end users but will also limit the competitiveness of the Companies providing the solution and services. How to solve those problems? For the system integrator, to make the architecture lean by using as less devices as possible in the data exchange and for the Energy service Companies by easily implementing proper controls logics.

■ One more step further!

When architecture complexity rises, to be able to meet more integration needs and to automate the management system, than 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 the 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 IEC 61131 CODESYS, XAP 1.0 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 programable 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 resistant to surveillance and interference, whilst the 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



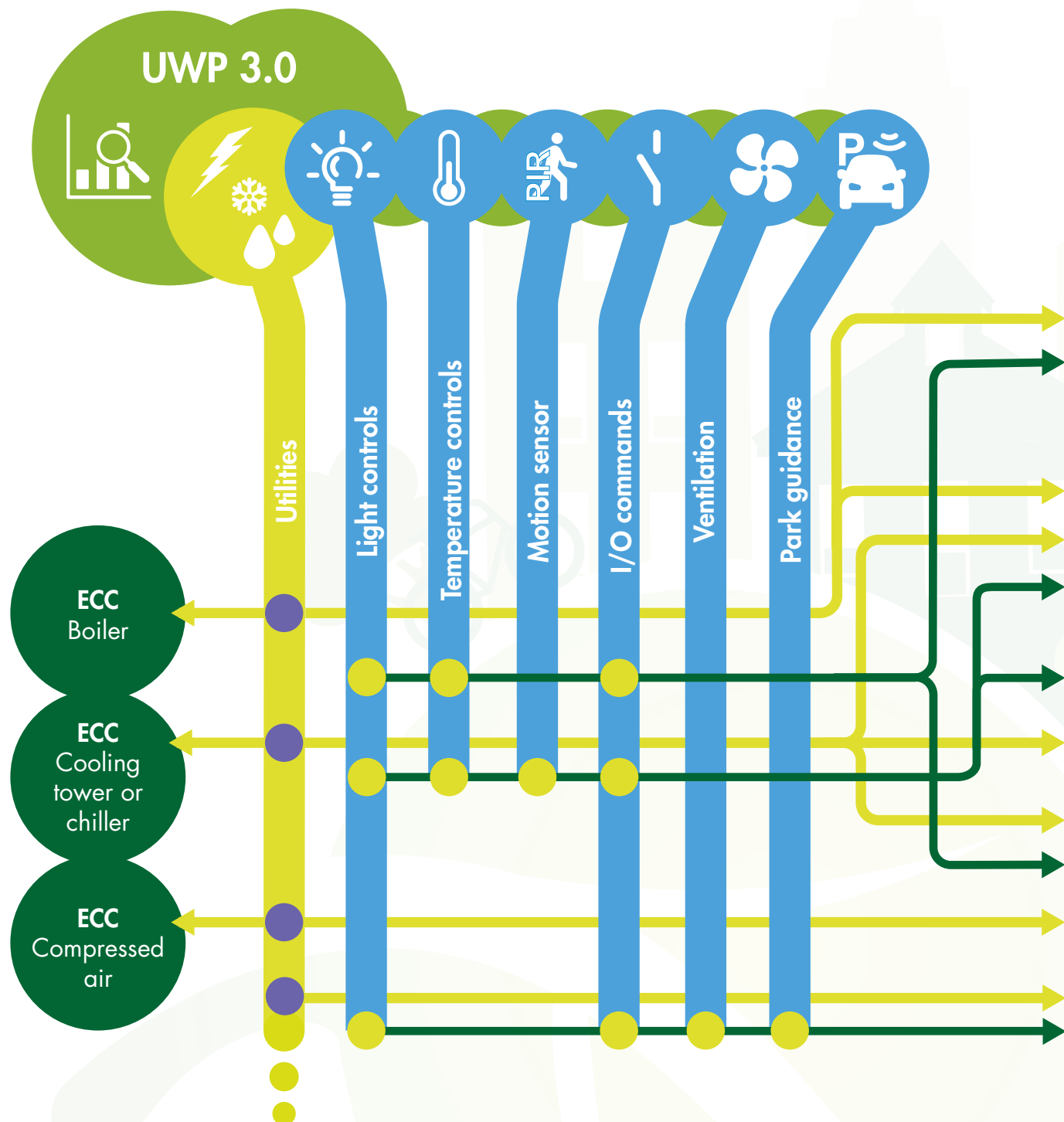
Active control

The map - two solution examples

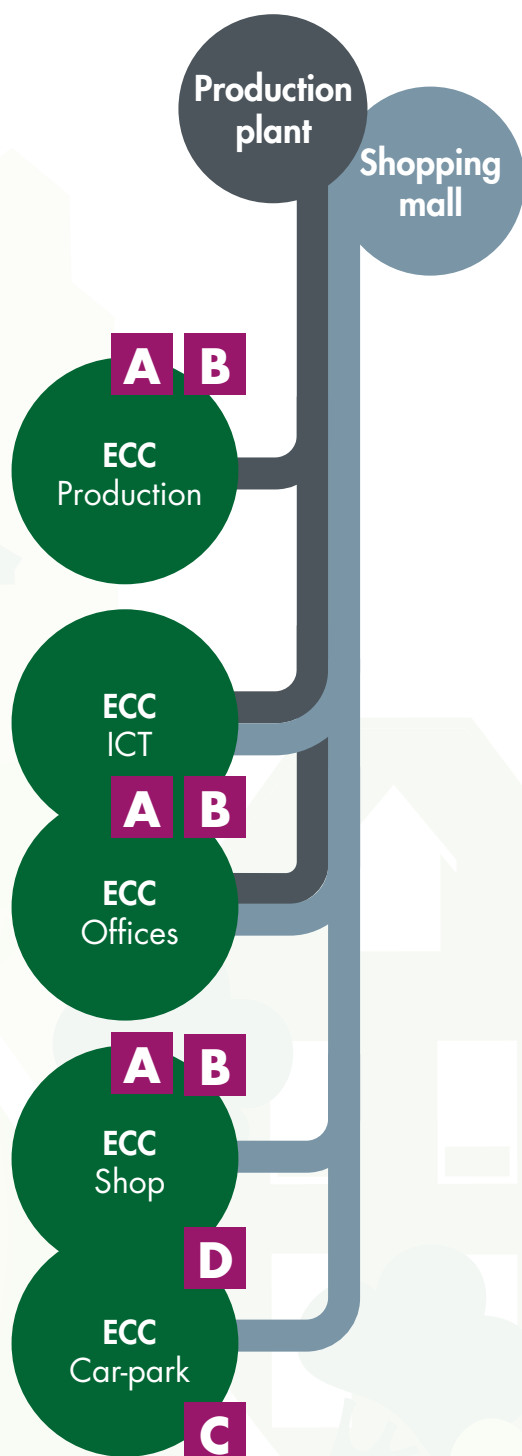
■ Not only utilities and users but also buildings and occupants

The key objective of an energy efficiency plan is the combination of:

- minimizing the consumptions (TOE, tons oil equivalent);
- minimizing costs;
- minimizing environmental impact (tons of CO₂);
- but, as a mandatory condition, keeping same productivity level!



- Active controls
- Measures



■ The energy performance of the building

Building Automation and Control Systems (BACS) can have significant impact on the energy consumption of any kind of buildings 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 other standards (LEED, Energy star) in other regions, are the guides to achieve the planned energy efficiency goals. Those standards are aimed to build up:

- 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.

The Carlo Gavazzi as a global offer of products, solutions and competences, evolves its product portfolio from energy efficiency monitoring solutions to the active control through the 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 efficiency 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 where to drive and park the car reducing their stress, thus increasing car flow efficiency and reducing the fuel emissions.

The topics

	Page
■ Automation platform	34-37
A Energy and people efficiency	38-41
B Wired and wireless environmental probes and I/Os	42-43
C Car parking outdoor guidance system	44-47
D Fire damper control solution	48

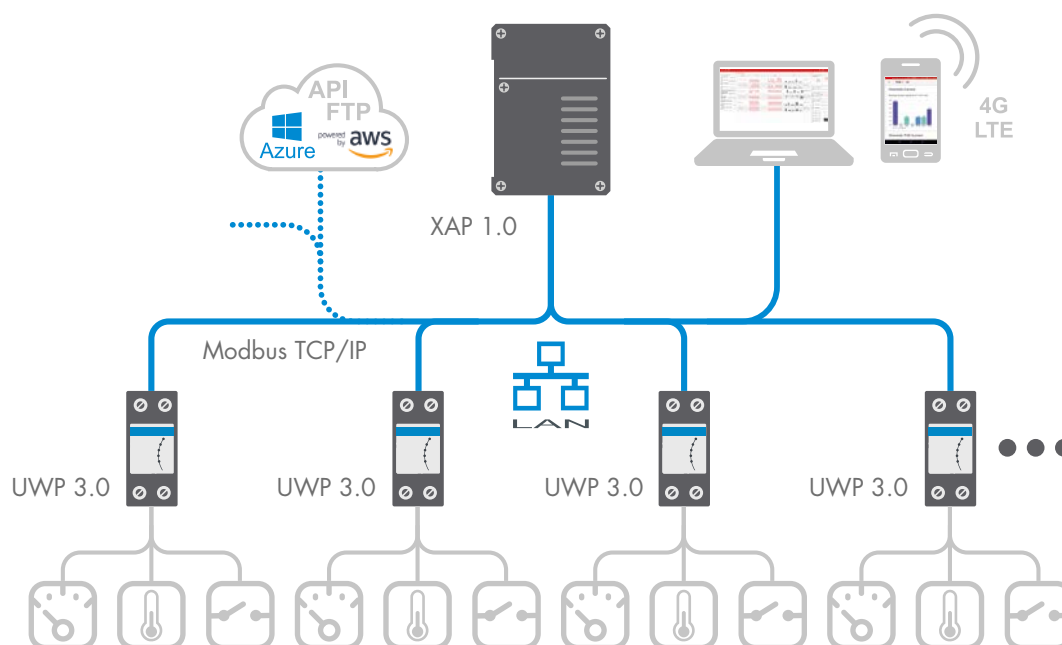
Active control

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 IEC 61131-3. 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 process' are involving cloud technology and services, Node-RED connector has been embedded to wire hardware devices and online services (MQTT, FTP, SMTP) as part of the Internet of Things. XAP 1.0 among many available tools and functionalities is empowered 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 a system optimisation, ensuring total and integrated control.



■ XAP 1.0

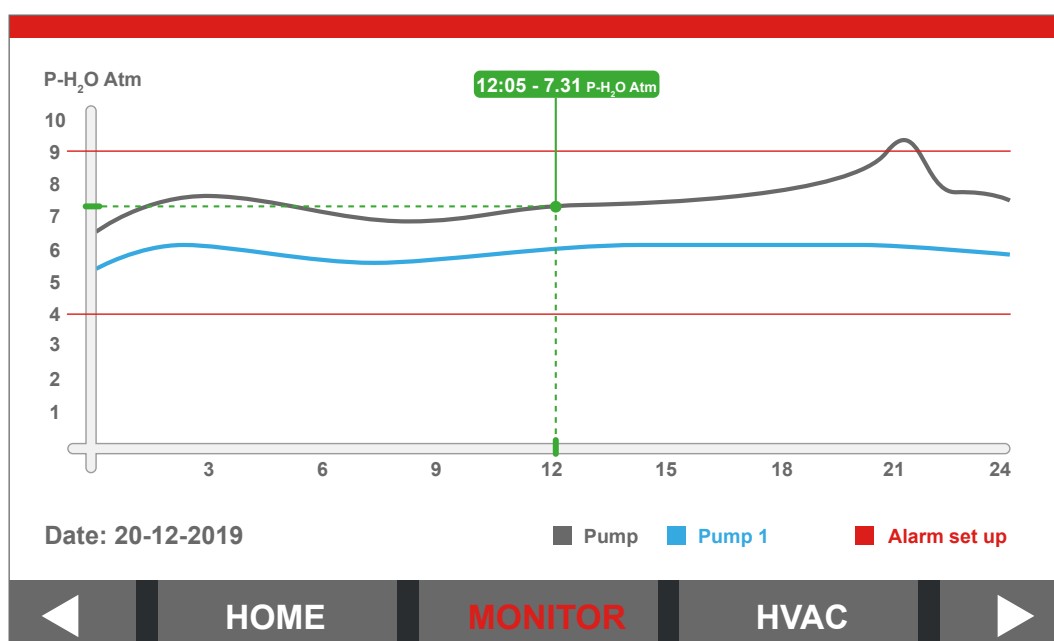
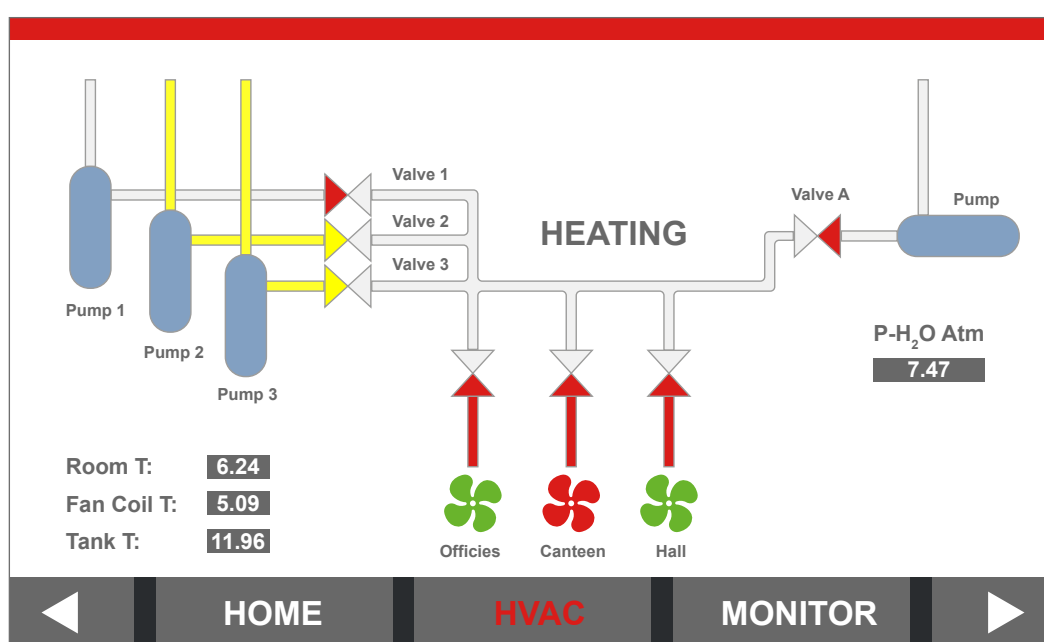
- Controller and gateway, web HMI, PLC for building automation functions
- Data communication OPC UA
- Cloud connectivity Node-RED (Optional)
- Operating system Linux
- Secure web server access: HTTPS
- Protocols: Modbus RTU/TCP-IP master and slave, BACnet client, KNX IP, KNX TP using an expansion module
- Compatible with CODESYS V3: it supports network stacks and local I/O expandability
- 2 Ethernet ports for network separation 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



A combination of tools in one solution

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

In such applications, the architecture complexity is a rising problem together with more 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, capable 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 into the TCO (Total Cost of ownership), that's why XAP 1.0, as an advanced system, uses an evolved user interface so to be more effective, and SCADA functions or web pages can be created for any type of application.



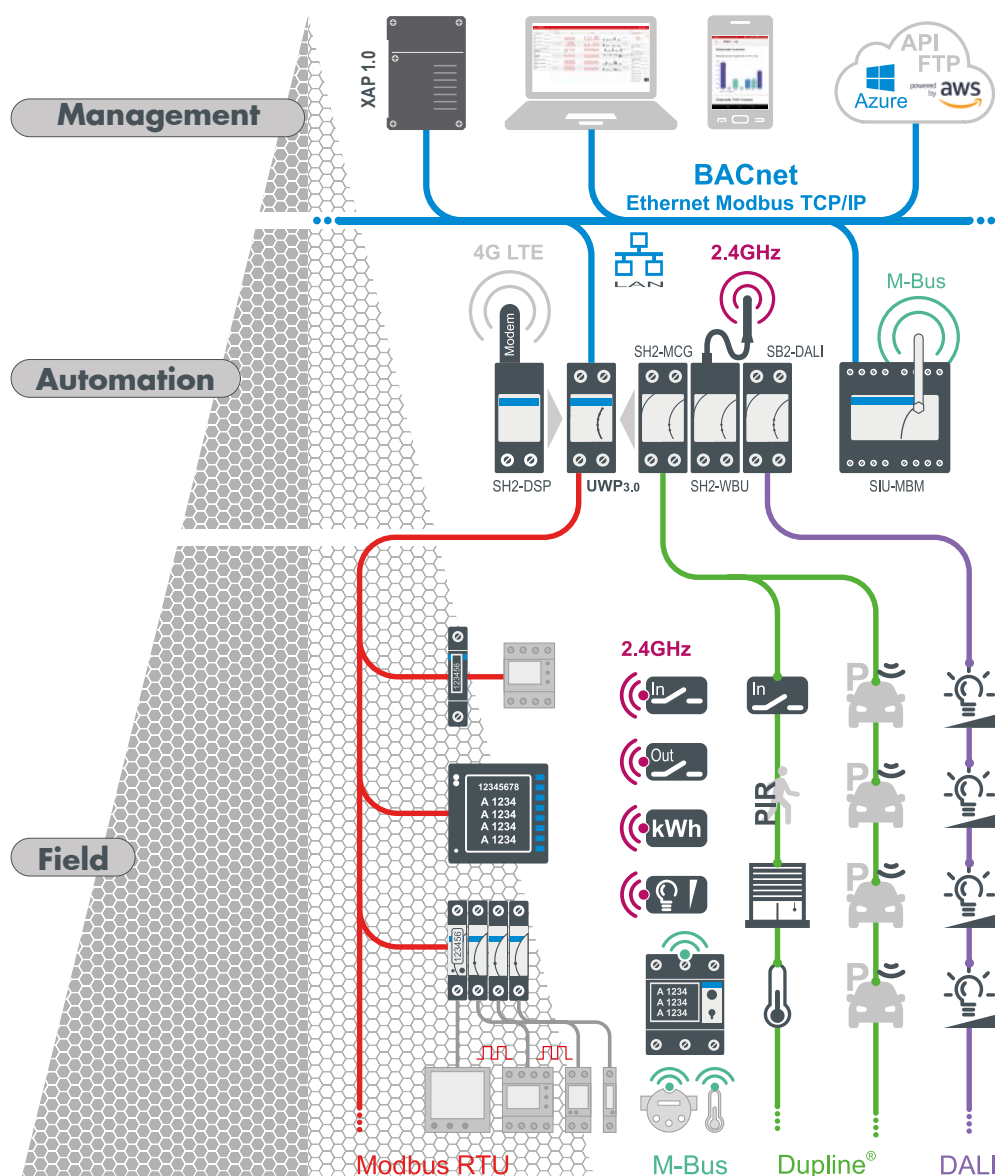
Active control

Beyond communication networks

The BACnet communication integration

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

From DALI control to tunable white

The UWP 3.0 platform can be empowered, 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 UWP 3.0 platform. The provided main control strategies are:

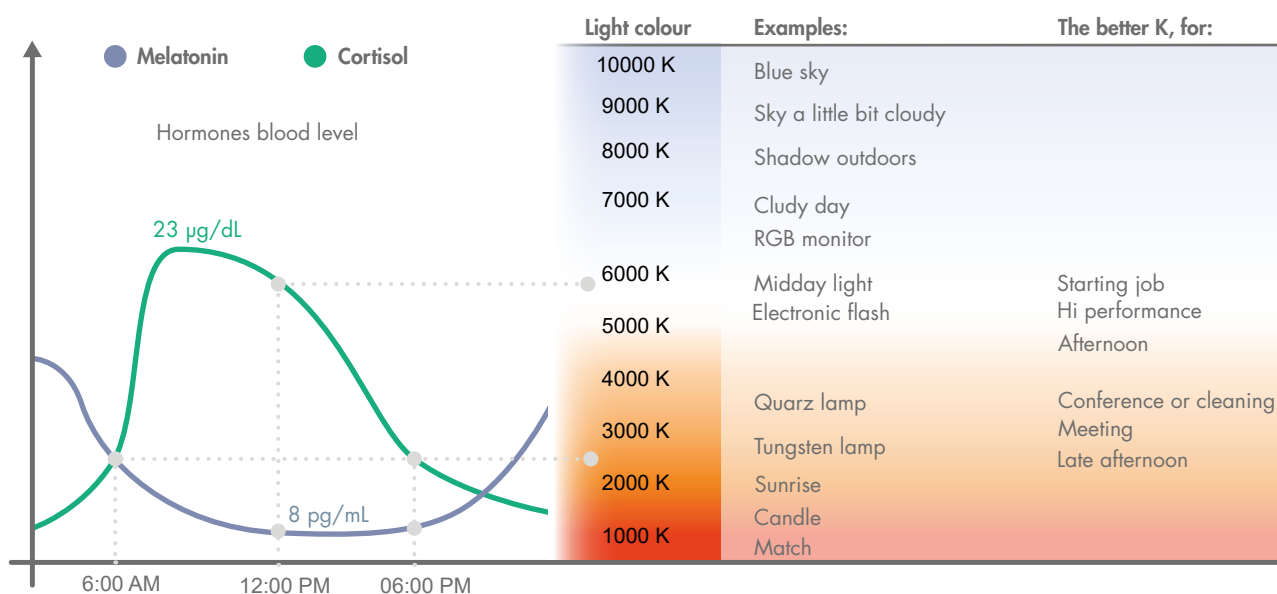
- daylight harvesting, which provides automatic dimming to compensate for the amount of natural light;
- automatic sunrise and sunset calculation;
- real-time clock and schedulers to switch on/off, dim or change scenario;
- light level control according to people presence and timers;
- zone control.

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 bus (Digital Addressable Lighting Interface). This means, 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 empowered taking care of the work space in terms of CO₂ 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 picture below.

■ The colour of the light influences people's performances

The graph above shows how our hormones change during the day according to the colour temperature: cortisol is our waking hormone, whilst melatonin controls our sleeping rhythm. Warmer temperature is more relaxing, while cooler temperature creates a motivating environment. As a consequence, the white colour of lamps influences people's performance and efficiency. Thanks to 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.



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

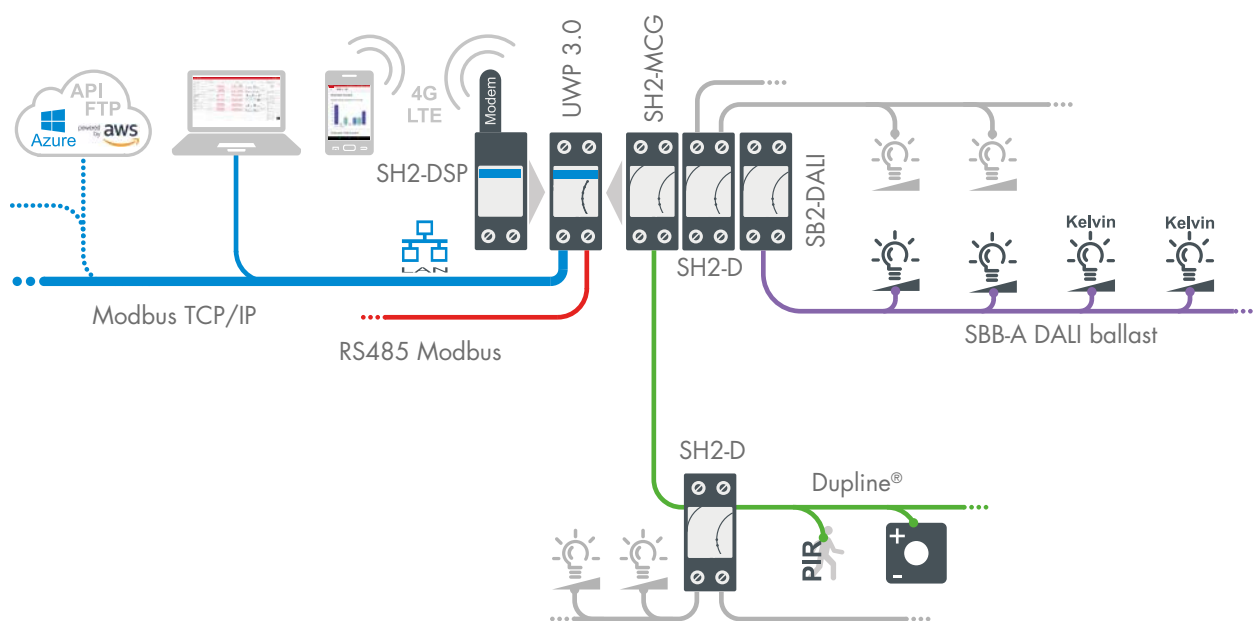
Active control

Precise control for a green building

The evolution of the lighting

If the most wasted energy is due to inefficient room temperature management, misuse of lighting is largely under estimated.

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 movement detectors (PIR) 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.



■ SB2-DALI

- Interfaces the Dupline® bus to standard DALI lighting actuators
- Operates as DALI controller and power supply with possibility to connect up to 64 ballasts to the DALI bus output
- Can be linked to Dupline® at any point in the installation
- Multiple SB2-DALI units can be connected to the same Dupline® bus
- Allows the powerful combination of Dupline® and DALI
- 2-DIN module housing
- 230 Vac power supply

■ SHS-Q, SHx-xXLS4P

- Passive infrared detector (PIR)
 - Detects movement and presence
 - Indoor and outdoor applications
 - Bus powered
 - Lighting measuring range: 0 to 20 K lux
 - Walk test: LED indication
 - Programmable sensitivity
- SHS-Q:
- Operating angle: 360°
- SHxXLS4P:
- Operating angle: 90°
 - 4 individually programmable push button

■ SHx-xXLS4

- 4 individually programmable push button
- Integrated temperature and humidity sensor
- Temperature range: -40° to 60°C
- Humidity range: 5 to 95 %
- SHA4: Developed to fit into wall socket and frames from Fuga, NIKO and BTicino
- SHE5: Developed to fit into wall socket and frames from Elko, Gira and Jung

■ SBB-A and SH2-D

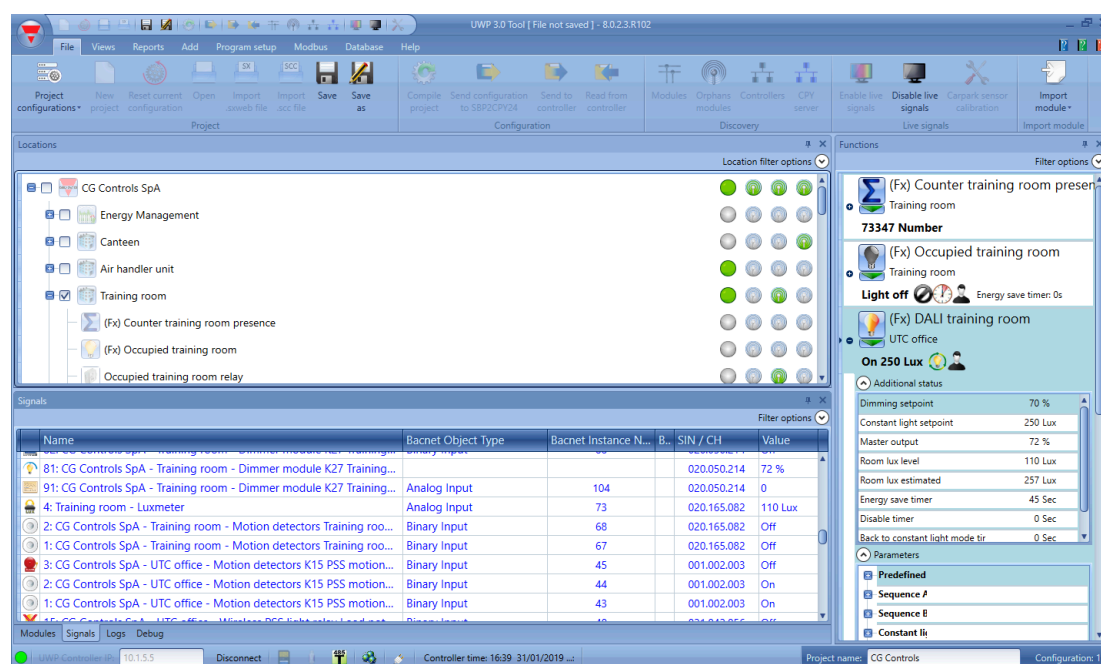
- 2 constant current output channels, total output power up to 50W
 - Output current level selectable from 250mA to 1500mA
 - Built-in DALI interface, DALI DT6 and DT8 ballast
 - DALI approval
 - Colour temperature adjustment according to DALI specifications of Device Type 8, Colour Type Tc
- SH2-D:
- Universal dimmer switch for R, L, C up to 500 W and LEDs loads
 - Automatic load detection for R, L, C load
 - Push button for local on/off switching



A software to fast and easily configure your system

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

The master unit is programmed by means of the configuration software UWP tool, downloadable free from the Carlo Gavazzi website. The UWP software 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 diagnostic 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, 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 give an immediate message if something goes wrong. All this information is logged in a file so that the installer can check it any time.

■ Diagnostic

If any trouble should occur, the system provides powerful diagnostic functions in order to make the fault finding much easier: the bus is always monitored, giving 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 troubleshooted.

■ Save time

The icon and picture based wizard drives 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 activating and deactivating the functions, changing the parameters to reach the perfect settings, or trouble shooting.

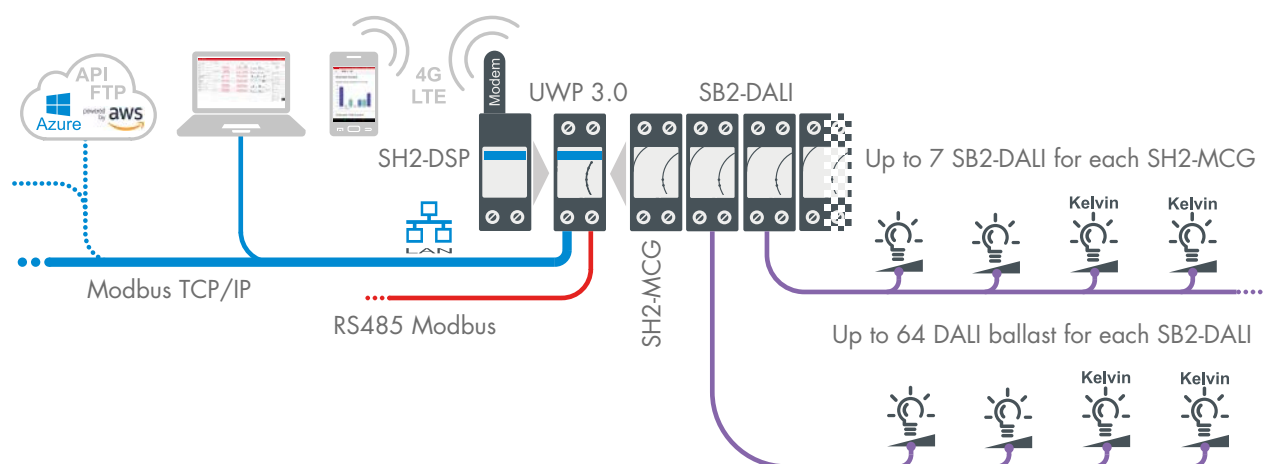
Active control

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 a specific module, is a step beyond an energy efficiency program, since it provides, through the available LED-based lighting systems, proper functions like the "Tunable white" and the "lighting scenarios" to influence people's working performance.



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, energy management but also on the working environment for the workers. The latter can be addressed and improved by the control of CO₂ level, temperature and illumination which means people performance and efficiency.

Being able to change the working ambient according to specific needs is the key to the success of the solution. That's why Carlo Gavazzi provides a proper end-user App to turn a Smartphone into a powerful remote controller, but also a SmartHub as a 4" or 7" wall-box display in to an intuitive interface and an Installer configuration software the most effective tool to implement and set all the energy saving strategies.

BTM-T4-24 smartHUB

- 4.3", 480 x 272 pixel, TFT display
- Touch display
- 64k colours
- 2 ethernet port, USB host port, SD card slot, multistandard serial port
- Windows CE, completely configurable
- Dimension 147x107x56
- 24 Vdc power supply

BTM-T7-24 smartHUB

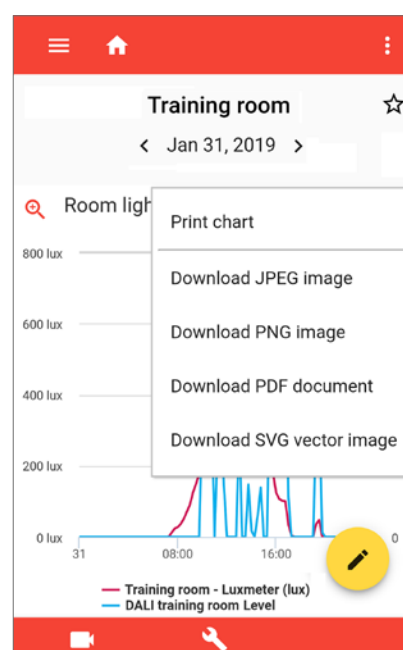
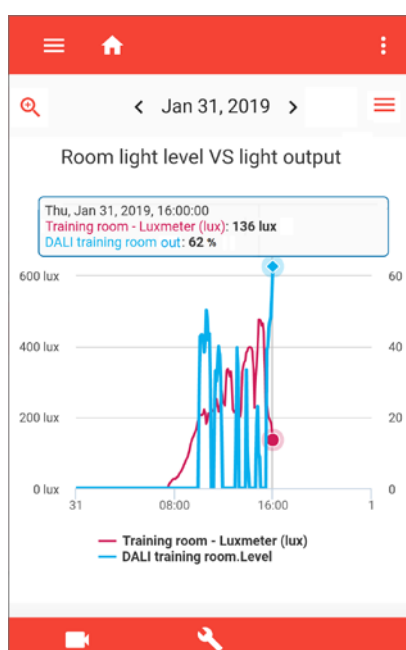
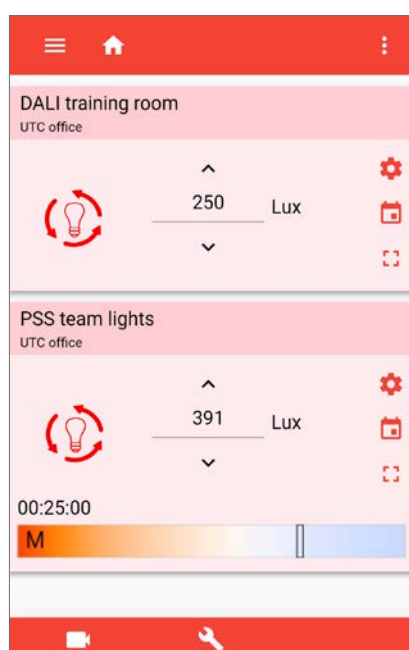
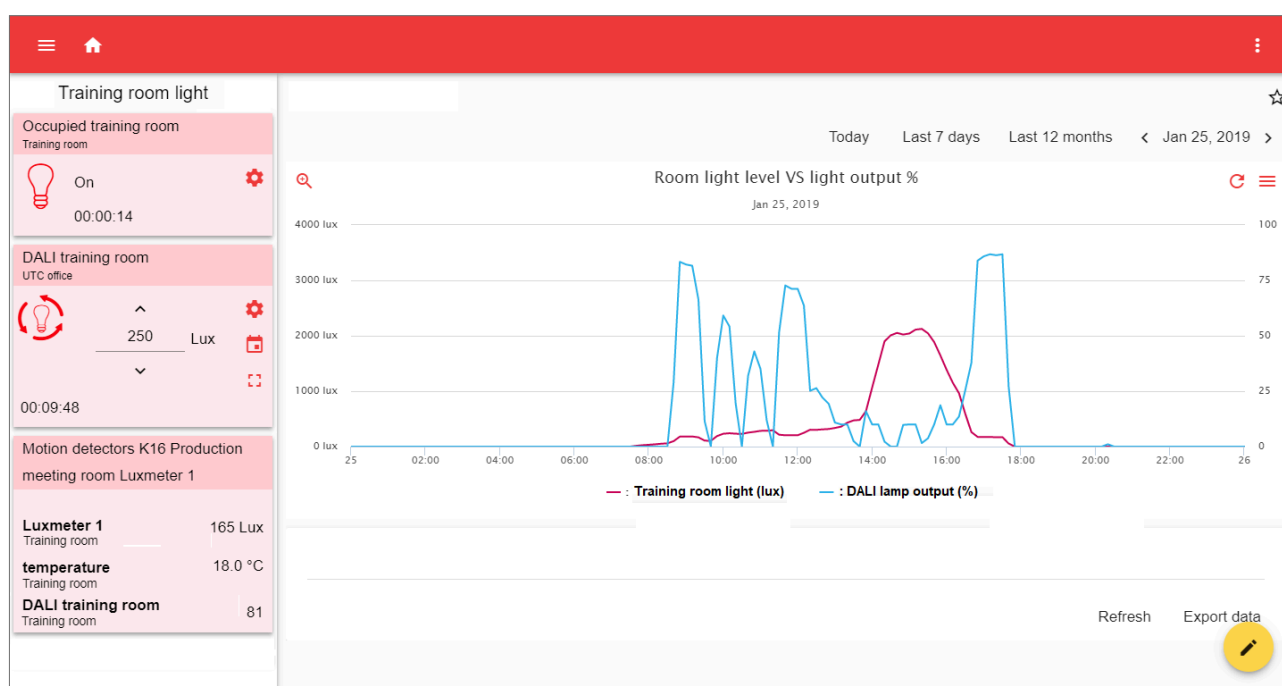
- 7", 800 x 480 pixel, TFT display
- Touch display
- 64K colours
- 2 ethernet port, USB host port, SD card slot, , multistandard serial port
- Windows CE, completely configurable
- Dimension 187x147x47
- 24 Vdc power supply



Right at your finger tips

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

Any smart 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 let have a 360° supervision of the building.



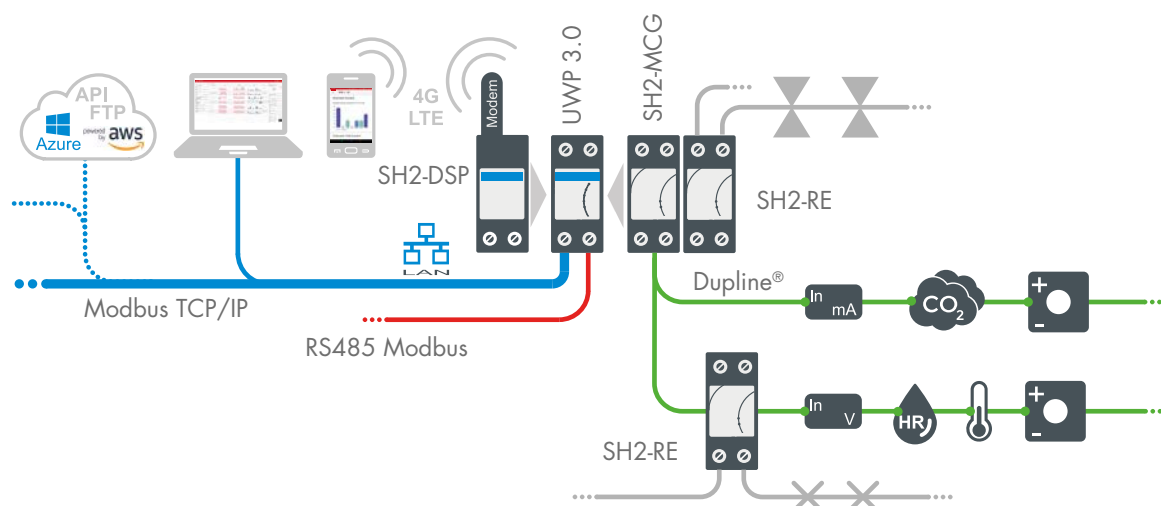
Active control

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, CO₂ and other non-electric and electric variables is essential to the management of the proper energy vectors. This means the air heating, cooling and ventilation but also the air quality are the information which must be gathered and managed to implement a proper energy efficiency plan. The UWP 3.0 platform equipped with proper bus powered smart field devices, is the most effective answer. Meaning 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 meters) 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 CO₂, temperature and humidity measurement
- Available with display, RGB LED or neutral
- Temperature range: -20°C to +50°C
- Humidity range: 0 to 100 %RH
- CO₂ range: 0 to 2000 ppm
- Easily mountable
- Bus powered
- Low current consumption

■ SHP-IN, SHP-INT

- Ranges: 0-10 V, 0-20 mA, 4-20 mA
 - 24 Vdc powered
 - SHPINV324: 3 x 0-10 V analog
 - SHPINA224: 2 x 0-20 mA / 4-20 mA inputs (configurable)
 - SHPINV2T1P124: 2 x 0-10 Vdc + 1 x 10K3 + 1 x 1-11K inputs
- SHPIINT:
- Ranges: Pt1000, Ni1000, 10K3 thermistor, 1-11 KΩ potentiometer
 - Bus-powered
 - Option for count reset via Smart Dupline®

■ SHx-xXTENDIS

- 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
- Bus powered
- SHA4: Developed to fit into wall socket from Fuga, Niko an BTicino
- SHE5: Developed to fit into wall socket from Elko, Gira, Schneider, Siemens and Jung

■ SH2-RE

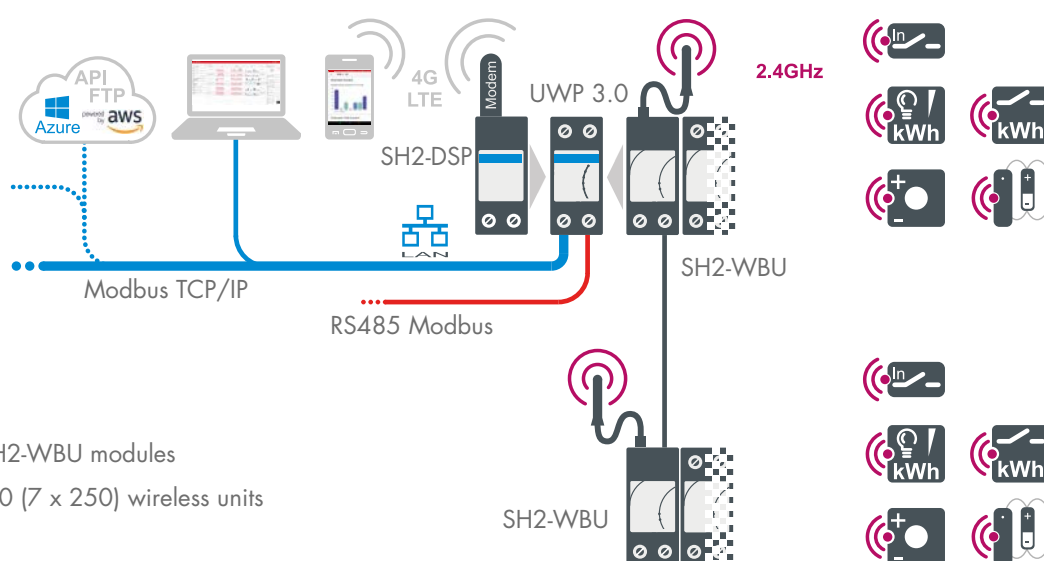
- 2 and 4 outputs relay
- Energy reading
- LED-indications for power supply, bus and outputs status
- Connection to other cabinet modules via local bus
- Push button for local on/off switching
- 2-DIN module housing
- 230 Vac power supply, Bus-powered, 24 Vdc



From wireless I/Os to sensing and dimming

In a new building, a regular way to connect sensors to the core unit is to wire them, but if the building is already existing, than 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. As per their installation needs, some of them, like the contact outputs and light dimmers, both of them with embedded energy meter for signal feedback, are made so to be accommodated in existing junction boxes where there is always a space constraint. Programmable push-buttons to switch the light On/Off, as well as door and window magnetic sensors may be used only when really needed, the automatic room heating, cooling and ventilation so to reduce energy wastage.



Up to 7 SH2-WBU modules

Up to 1750 (7 x 250) wireless units

■ SHE-5XW

- 4 programmable push-button
- Flat design: 10 mm of depth
- Wireless communication (IEEE 802.15.4), at 2.4 GHz
- For mounting on any surface
- LED indication for low battery and bus activity
- Embedded temperature sensor

■ SHJ-WRE

- Wireless contact output with integrated energy meter
- Wireless transmission based on IEEE802.15.4 @2.4 GHz
- Range up to 700m open air
- Load: 10 A /250 Vac
- Energy reading
- Programmable routing function
- Mounting into eurobox

■ SHD-W

- Wireless magnetic sensor for doors/windows
- Additional voltage free input
- 1 red LED/ 1 blue LED for battery level indication
- Range up to 100 m in open air
- Wall mounting, screw or double sided tape

■ SHJ-WD

- Wireless dimmer with integrated energy meter
- Wireless transmission based on IEEE802.15.4@ 2.4 GHz
- Range up to 700m open air
- Universal dimmer switch for R,L,C load up to 200W and LEDs
- Energy reading
- Programmable routing function
- Mounting into eurobox



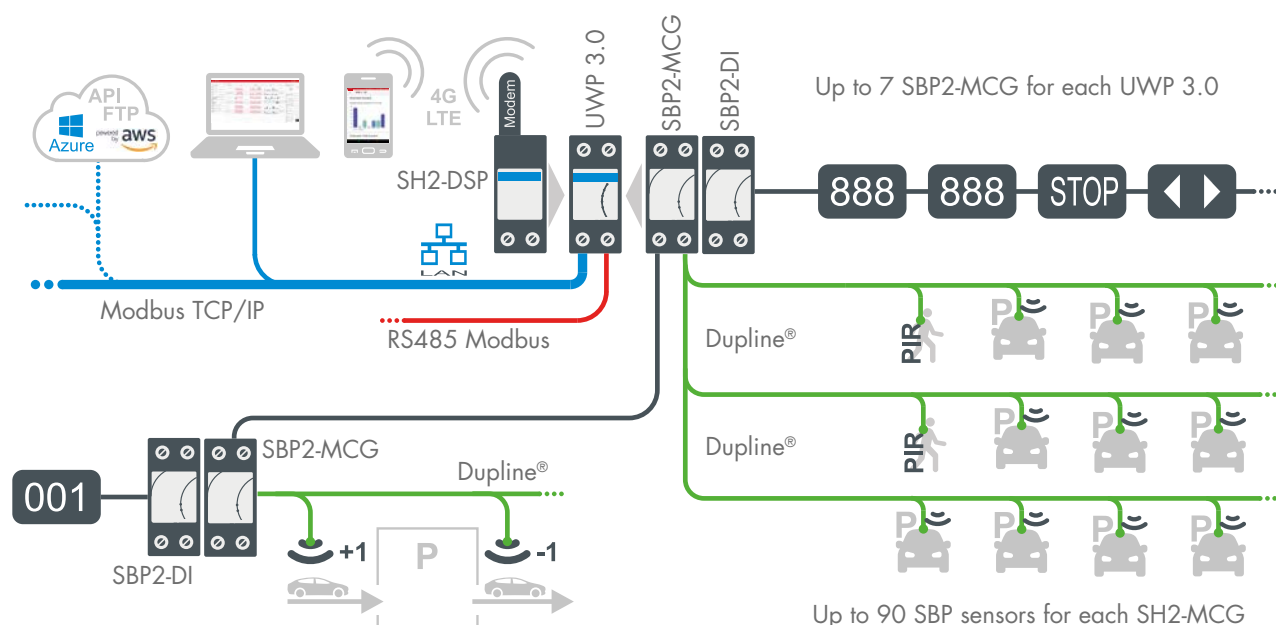
Active control

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 two 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 CO₂ levels. Being fire protected means, to manage a proper fire protection system based on fire dampers. But a car park or a multi-storey garage is also a building which sells services based on car occupancy and where, being part of another place, like an airport or a shopping mall, it is part of 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 run 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 proper colour for the LED indicators, or using a calendar-based scheduler. All parking events are logged into the database, so to build up a powerful analysis tool aimed to improve the car park service performance.



■ DISxRSE

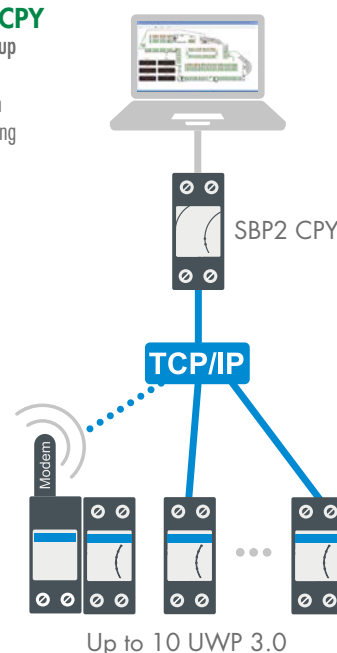
- Bright RGB LED matrix
- Selectable symbols
- Visible at a distance of more than 50 m
- Brightness control
- Settings are configurable from the embedded webserver
- Indoor and outdoor use - IP55
- Extended temperature range below -30°C
- Up to 4 digits and 2 symbols and running text

■ SBP2-DI

- Gateway to connect the displays (SBP-DIS) to the Dupline® network.
- 2-DIN housing display interface.
- Can be mounted up to 300 m away from the display.

■ Carpark server SBP2-CPY

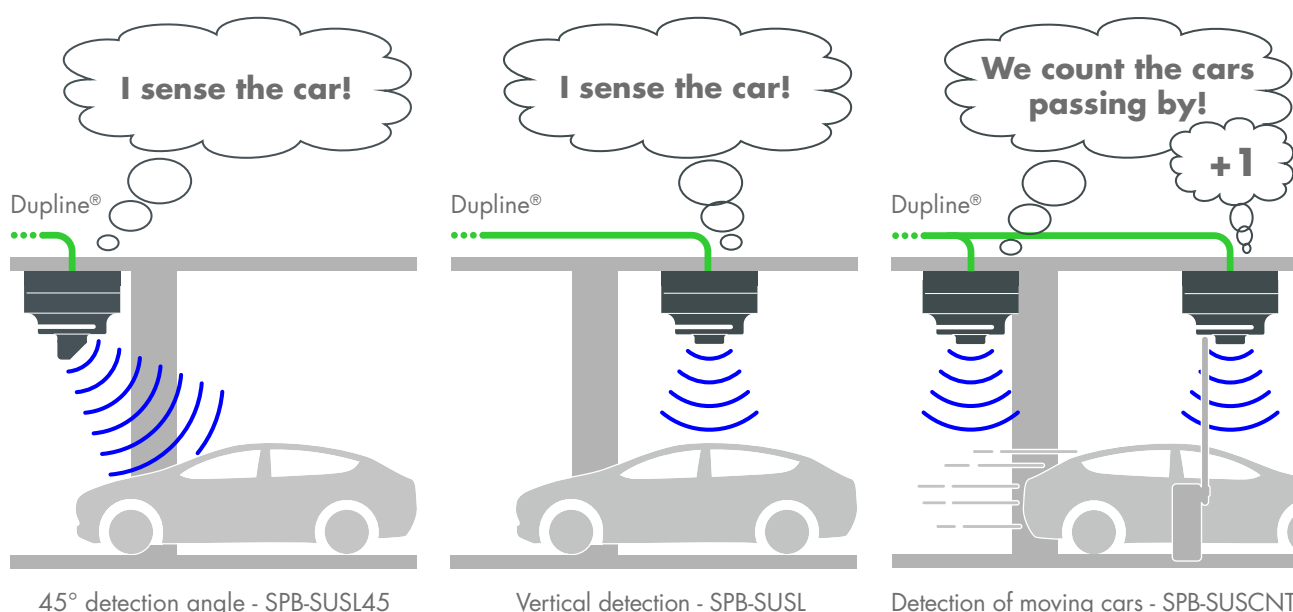
- Carpark server which links together up to 10 UWP 3.0 controllers
- Manages the parking guidance system
- Built-in web server with parking management software
- Data export in Excel® format
- One Ethernet port
- 12 to 28 Vdc power supply
- DIN-rail mounting



Better utilisation - higher revenue

Reduce stress and frustration of your customers empowering your car park with Carlo Gavazzi's CP3 guidance system.

The first thing your customers will notice when entering the carpark is how great it looks. The 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 your customers 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. The improved appearance and service of the carpark will attract additional customers, 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.



■ SBP-SUSL45

- Ultrasonic sensor with a 45° detection angle for mounting outside the parking space
- Power and communication via the Dupline® 3-wire bus
- Clearly visible LED indication in a 360° visual angle
- Select between 8 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
- Select between 8 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 20Km/h
- Easy and fast installation
- No maintenance of the sensor

■ SBP-ILED

- UAdditional only LED indicator to be used in conjunction with the sensor SBPSUSL
- Power and communication via the Dupline® 3-wire bus
- Clearly visible LED indication in a 360° visual angle
- Select between 8 LED colours to use for status indication
- Protected against dust and moisture



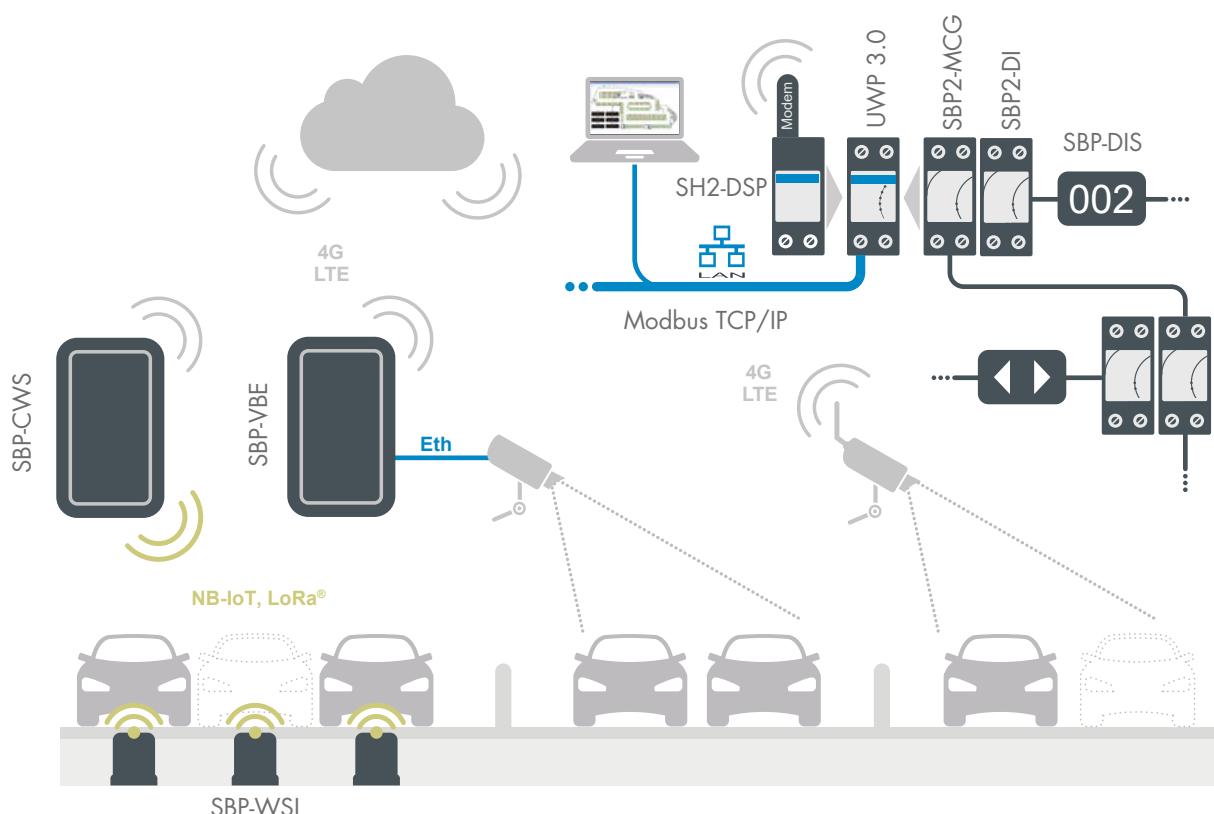
Active control

Outdoor car parking guidance system

Wireless sensors and WEB cam solutions

A modern outdoor car-park needs to be energy and service efficient.

Ten minutes searching for car parking 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 car slot 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 inground. Where drilling is not possible, webcams can be used: standard IP cameras are connected to the videobox SBP-VBE which processes the images and send to UWP only the occupancy status in full respect of the GDPR.



■ SBP-WSI

- Long life lithium battery. Up to 10 years.
- Wide temperature range. -40°C to +85°C.
- Long range communication. Up to 2 Km in urban environment, 500 m in typical applications.
- Available in different version. 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 VDC and 100-230 VAC.
- Flexible installation. It is suitable for wall or pole mounting.
- IP66 rated housing. For indoor and outdoor use.

■ SBP-VBE

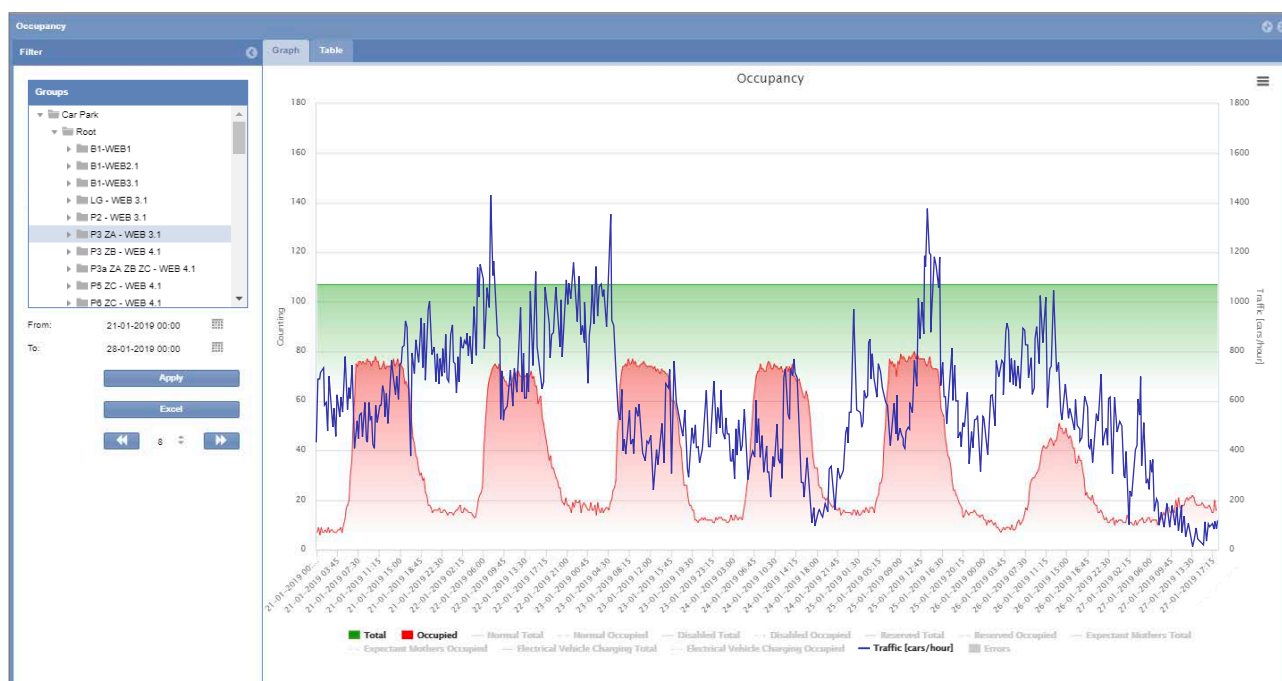
- Cameras management. Up to 8 IP cameras. One camera covers an average of 40 parking bays: it depends on the mounting height, positioning and IP cameras specifications.
- Utmost respect for privacy. In accordance with the GDPR: after analysing the images, they are automatically destroyed so that there 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 status helps you manage in an efficient and cost-effective way your parking installation

UWP 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 single bay and the displays can be monitored, occupancy rates and statistics for the different types of spaces and areas of the carpark can be seen as bar graphs. Alarms about occupancy time or rate pop up on the screen and go into the alarm log, allowing the operator to take immediate action if needed.



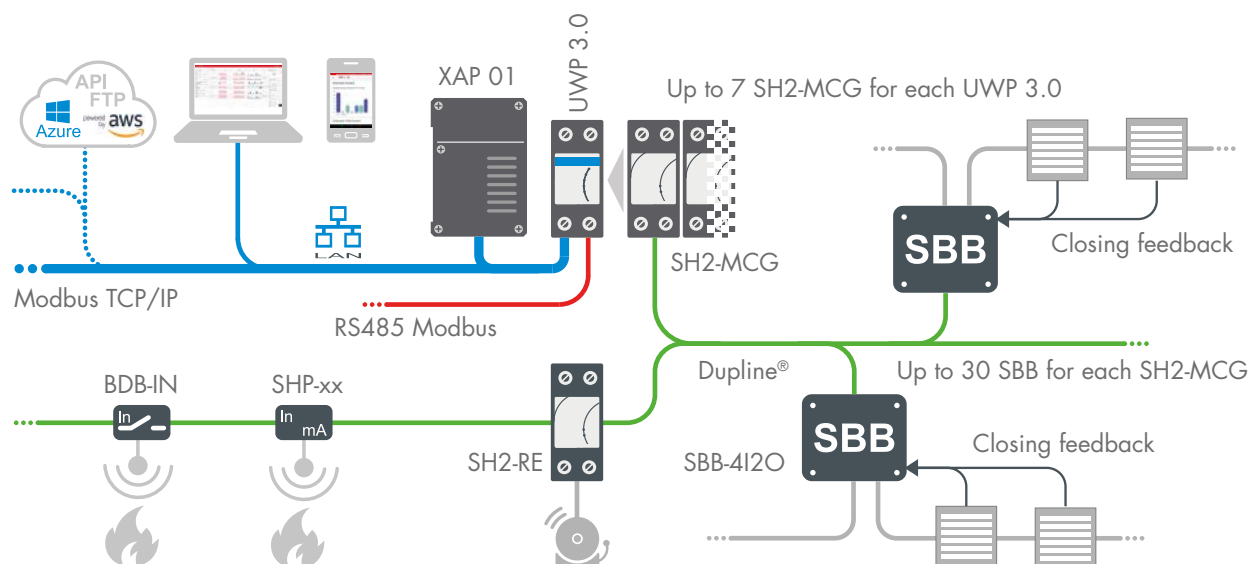
Active control

Fire Damper control solution

Cost effecting wiring and fast BMS integration

How to prevent the spread of fire inside the ductwork through 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-park or multi-storey garage. In those places, heating, ventilation, and air conditioning (HVAC) ducts, fire dampers are used to prevent the spread of fire inside the ductwork through fire-resistance rated walls and floors. When a rise in temperature occurs, the fire damper closes, in the regular installations, activated by a thermal element which melts at temperatures higher than ambient but low enough to indicate the presence of a fire, allowing springs to close the damper blades. In the more evolved solutions, fire dampers close following receipt of an electrical signal from a fire alarm system, utilising detectors remote from the damper, 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 decentral 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-MCG24), up to 60 fire dampers.



■ SBB-4I

- Robust module for decentralized installation near fire dampers
- Designed to monitor two fire dampers
- 4 contact inputs (voltage-free)
- Box for decentralised mounting near or directly on fire dampers
- Easy wiring of the system
- Cost-effective design
- Bus-powered

■ SBB-4I2O

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

■ BDA-RE

- Small sized single relay output
- Load: 16 A/ 250 Vac
- Withstands 130 A inrush current
- Bus-powered

■ SH2-RE

- 2 and 4 outputs relay
- Energy reading
- LED-indications for power supply, bus and outputs status
- Connection to other cabinet modules via local bus
- Push button for local on/off switching
- 2-DIN module housing
- 230 Vac power supply, Bus-powered, 24 Vdc



Note

[illegible]

Note

This image shows a full page of blank, lined paper. It features approximately 28 horizontal green lines spaced evenly across the page, typical of standard notebook paper. The lines are thin and light green, set against a plain white background. There are no margins, text, or other markings on the page.

Note

[illegible]

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