# EM530 and EM540
## Energy Analyzers

Launch Presentation

Winter 2022

# Contents

## EM530 and EM540 Energy Analyzers

- Fast and easy setup
- Error-proof installation
- Two- and three-phase up to 415V L-L
- CT 5A or Direct Connect (65A)
- DIN Rail Mount

## Why this launch?

- To upgrade and expand the Carlo Gavazzi portfolio of energy analysers to address the new needs emerging together with the most innovative green and energy efficiency applications, complementing the EM300 series
- To further help customers saving time and money, by decreasing the time needed to correctly install the analyser, to program its parameters and to the commissioning of the monitoring system
- To provide an analyzer that can warn the installer in case of a wiring error and suggest how to solve the issue. Or in case of installed analysers, to avoid wiring changes by making corrections via software, saving the time and cost of a further visit on site.
- To aid in predictive maintenance and reducing downtime by providing a set of run-hour meters, in addition to the electrical variables
- To provide additional safety by means of the new patented sealing and terminal blocks

## Expectations

- To aggressively expand our presence in emerging markets and in the most innovative applications, like no-feed PV energy storage systems, EV charging, or wherever better accuracy and resolution are needed
- To provide a compact DIN-rail energy analyser with accuracy class 0.5S (EM530 non-MID version) for all green-mark applications
- To add further meters suitable to be integrated, without the need of writing new drivers, into the CG Energy Management Monitoring solution
- To continue increasing our presence in the North American market as a provider of energy metering solutions, both for cost allocation and energy efficiency improvement applications

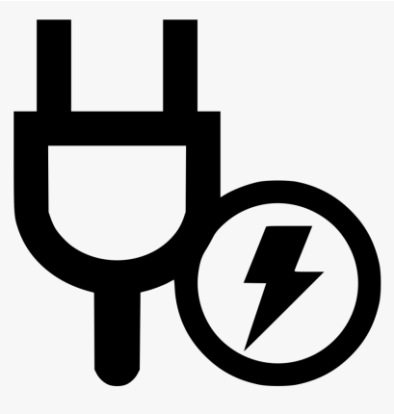
## Why EM50?

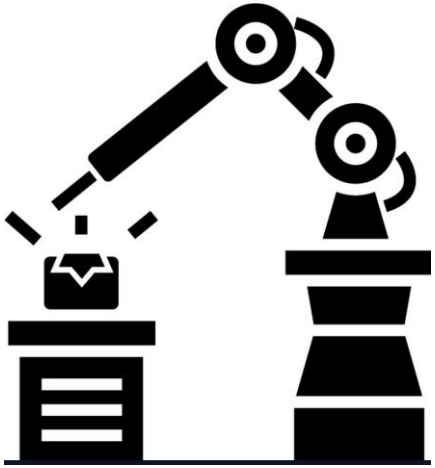
**EM530 and EM540 expand our offering of DIN-rail meters approved for the Americas:**

- EM530 and EM540 up to $415V_{LL}$
- EM330 up to $480V_{LL}$
- EM24 up to $480V_{LL}$ with Ethernet port
- EM24 up to $600V_{LL}$ with RS485
- EM50 up to $600V_{LL}$ with RS485

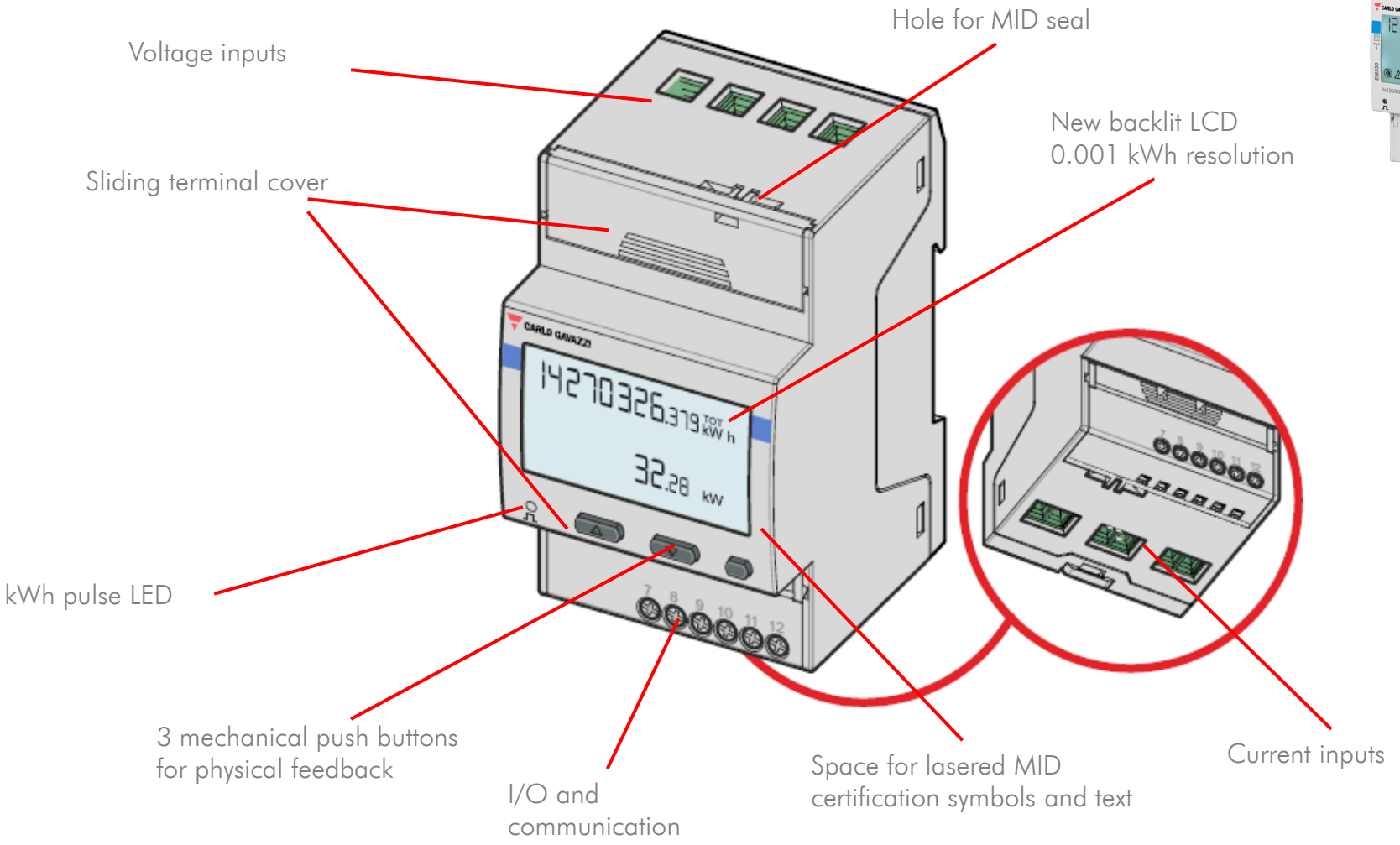
## Markets of interest

- **Conventional energy**: general purpose energy analyzer suitable for any panel builder and for any final application
- **Building automation**: energy analysis for energy efficiency applications; power metering for PV energy storage; indoor or temperature controlled EV charging applications
- **Industrial automation**: cost allocation; energy and time of use analysis for energy efficiency applications; on-board electrical parameter control

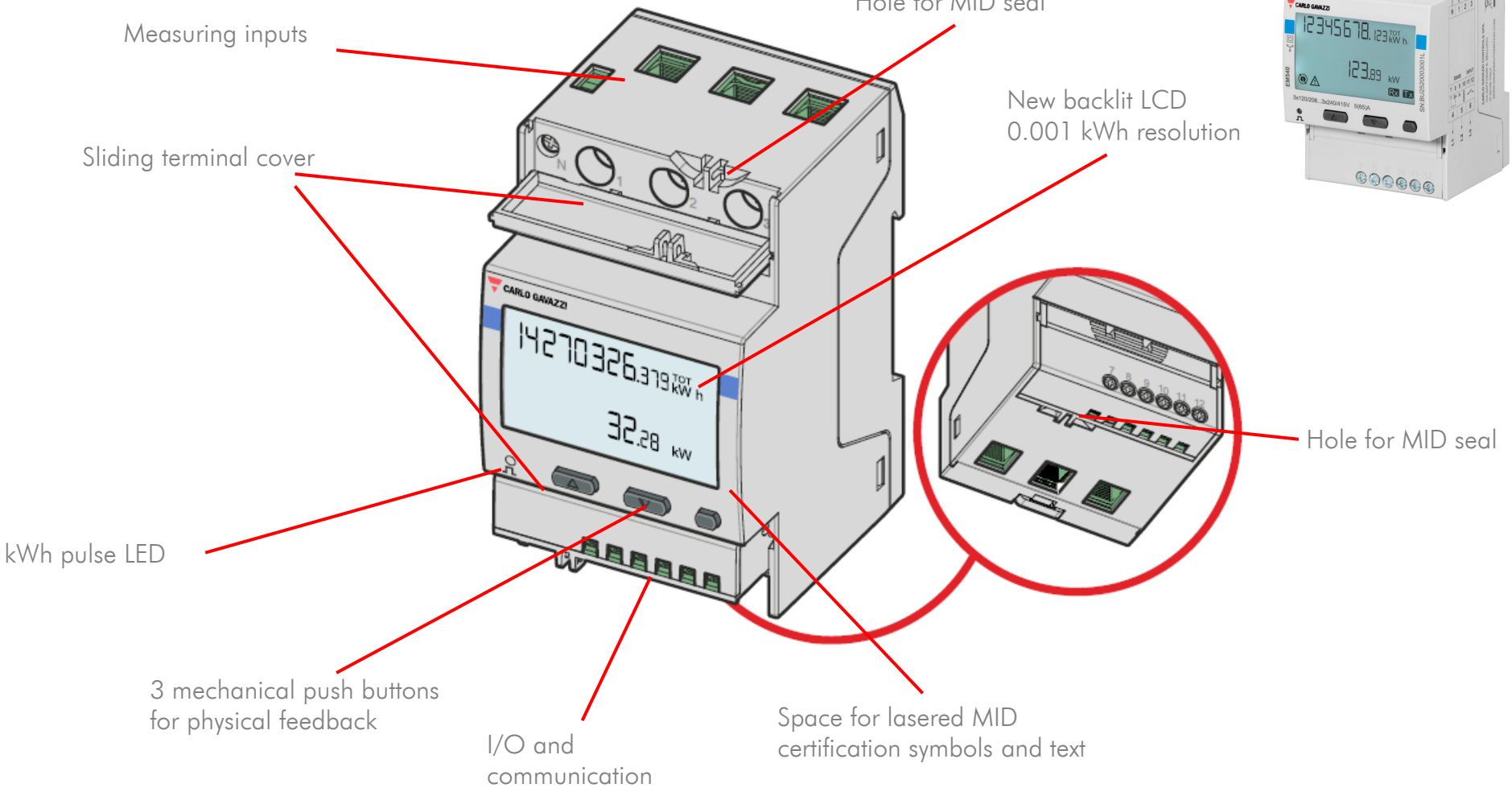


# EM530– CT 5 A energy analyzer



# EM540– 65 A energy analyzer



# Sliding terminal covers



PATENT PENDING

# Measurements and performances

| | | |
|---|---|---|
| Run hour meter | ✓ | Positive and negative<br>Total ON time |
| Total imported energy per phase | ✓ | kWh L1, L2, L3 |
| Partial/total meters | ✓ | TOT/PAR kWh +/-<br>TOT/PAR kvarh +/-<br>TOT/PAR kVAh<br>TOT/PAR run hour |
| THD calculation | ✓ | Currents / voltages |
| Neutral current | ✓ | |

# Measurements and performances

| | | |
|---|---|---|
| High speed serial communication refresh | ✓ | <100 ms |
| High resolution energy meters and frequency (via serial communication) | ✓ | 0.001 kWh<br>0.001 Hz |
| Simultaneous sampling of each voltage and current | ✓ | |

## Relevant Technical Data

### EM530 – Energy Analyzer

- Class 0.5S (kWh) according to EN62053-22, class 2 (kvarh) according to EN62053-23
- Accuracy: ±0.3% RDG (current), ±0.2% RDG (voltage)
- Instantaneous variables readout: 3x7 (5+2) DGT
- Energy readout: 11 (8+3) DGT
- Voltage inputs: up to 415 V L-L
- Self power supply
- Current inputs: via 5 A current transformers (max primary current 10 000 A)
- System variables: V L-L, V L-N, VA, W, var, Hz, PF, An
- Single phase variables: VLL, VLN, A, VA, W, var, PF, THD V L-L, THD V L-N, THD A
- Average calculation of active and apparent power (system) and currents (single phase)
- Current and voltage THD (up to 15th harmonic)
- Energy measurements (imported/exported): total kWh, kvarh, kVAh; partial kWh, kvarh, kVAh. Total kWh by phase.
- Run hour meters (relevant to both imported/exported energy: 8+2 DGT). Total operating time.
- Digital output (O1 version), or RS485 Modbus (S1 version) or M-Bus (M1 version, for Europe)
- Programmable display and slide show function
- cULus approval; MID certification (PF version, for Europe)

## Relevant Technical Data

### EM540 – Energy Analyzer

- Class 1 (kWh) according to EN62053-21, class 2 (kvarh) according to EN62053-23
- Accuracy: ±0.5% RDG (current/voltage)
- Instantaneous variables readout: 3x7 (5+2) DGT
- Energy readout: 11 (8+3) DGT
- Voltage inputs: up to 415 V L-L
- Self power supply
- Current inputs: direct connection up to 65 A
- System variables: V L-L, V L-N, VA, W, var, Hz, PF, An
- Single phase variables: VLL, VLN, A, VA, W, var, PF, THD V L-L, THD V L-N, THD A
- Average calculation of active and apparent power (system) and currents (single phase)
- Current and voltage THD (up to 15th harmonic)
- Energy measurements (imported/exported): total kWh, kvarh, kVAh; partial kWh, kvarh, kVAh. Total kWh by phase.
- Run hour meters (relevant to both imported/exported energy: 8+2 DGT). Total operating time.
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- Programmable display and slide show function
- cULus approval; MID certification (PF version, for Europe)

## Features and Benefits (installation)

| CUSTOMER ISSUE: | OUR SOLUTION: | ACHIEVED BENEFITS: |
|---|---|---|
| • A wiring error, common for unskilled but possible also for expert installers, is difficult to be detected and leads to wrong measurements | • In case of wrong connection detected by EM530 or EM540, a proper icon is clearly visible on display | • Immediate wiring error detection and correction suggestion |
| **CUSTOMER ISSUE:**<br>• In case of wiring error detected, the solution is obtained through several attempts and is extremely time-consuming | **OUR SOLUTION:**<br>• In case of error detected, an error code is available in a proper info page. In the manual, step by step instruction are available to correct the error<br>• As alternative, connecting to the meter via UCS software, correction steps are shown visually | **ACHIEVED BENEFITS:**<br>• Easy navigation<br>• No need of manual reading to understand basic commands<br>• Avoid errors and user frustration |
| **CUSTOMER ISSUE:**<br>• When a wiring error is not detected immediately, the installer has to go to the installation site again and solve it, spending time and money | **OUR SOLUTION:**<br>• Connecting via UCS software, also remotely if EM540 or EM530 is connected to UWP3.0 exploiting the UWP bridge function, the error can be solved re-assigning the phase-terminal association | **ACHIEVED BENEFITS:**<br>• Remote virtual wiring correction without extra costs |

## Features and Benefits (configuration)

| CUSTOMER ISSUE: | OUR SOLUTION: | ACHIEVED BENEFITS: |
|---|---|---|
| • After the installation, the configuration of the basic metering parameters is often complex and not user friendly, thus requiring properly trained people. The procedure is extremely time expensive. | • EM540 and EM530 show, at the first power on, a quick configuration wizard that guides the user through the setting of the main measurement and communication parameters. | • Easy configuration also by non-skilled people, requiring less than 30 seconds, without reading the manual |
| **CUSTOMER ISSUE:** | **OUR SOLUTION:** | **ACHIEVED BENEFITS:** |
| • Configuration of advanced parameters is often a complex task because menu navigation is complex and not intuitive. Navigation based on short / long pressing and double pressing on the keypad is not a familiar approach and requires training and manual reading. | • In EM530 and EM540 we implemented an intuitive navigation based on 3 push buttons (single press).<br>• Feedbacks about results of their action, like «SAVING..» or «RESETTING..», help users to understand what is happening on the user interface, without reading the manual.<br>• Advanced parameters are grouped in proper wizards | • Easy navigation<br>• No need of manual reading to understand basic commands<br>• Avoid errors and user frustration |

## Features and Benefits (housing and display)

| CUSTOMER ISSUE: | OUR SOLUTION: | ACHIEVED BENEFITS: |
|---|---|---|
| • When big numbers, like kWh meters, are shown on an LCD display, the value is not easy to read. If the position of the decimal separator is not fixed, an additional effort is required to read the value.<br>• Engineering units are not easy to be read | • Digits after the decimal separator are smaller, allowing bigger digits in the integer part of the number and enhancing readability<br>• The decimal separator is always in the same position<br>• “Plain-text” engineering units are used | • High resolution energy meters<br>• enhanced readability of energy meters, real time variables and engineering units |
| **CUSTOMER ISSUE:**<br>• Sealable terminal cover, for MID installations, can be lost<br>• Putting the seal is not an easy task | **OUR SOLUTION:**<br>• Carlo Gavazzi patented sliding cover | **ACHIEVED BENEFITS:**<br>• Covers cannot be lost<br>• Hands free installation<br>• Insulation plate not required |
| **CUSTOMER ISSUE:**<br>• The energy analyser is protected by a glass door. To access data not available in the default page, it is needed opening the door and operating on the push button. | **OUR SOLUTION:**<br>• Enabling the SLIDE-SHOW function (available in non-MID version), two or more selectable pages are shown in sequence. | **ACHIEVED BENEFITS:**<br>• Without operating on the push buttons, any desired variable is available on the display.<br>• The user can select only the pages he needs for |
| **CUSTOMER ISSUE:**<br>• In MID application, the kWh resolution valid for fiscal metering is limited to 1 kWh in case of auto-ranging value on display | **OUR SOLUTION:**<br>• In EM540 and EM530 the resolution of total kWh is always 0.001 kWh (without auto-ranging) | **ACHIEVED BENEFITS:**<br>• 0.001 kWh resolution valid for fiscal applications |

## Main competitors: EM540 / EM530

| Product name | Our Strength | Our Weakness | Prod. picture |
|---|---|---|---|
| ***IME: Conto D4*** | • *Dimensions (3-DIN Vs. 4-DIN)*<br>• *0.001 kWh resolution*<br>• *THD calculation*<br>• *Reset or start/stop partial meters via dig. input* | • *Matrix display*<br>• *2 static outputs available* |  |
| ***Socomec: Countis E2x / E4x (by Algodue)*** | • *Dimensions (3-DIN Vs. 4-DIN)*<br>• *0.001 kWh resolution*<br>• *3 variables on display (Vs. 1)*<br>• *Quick setup and check wiring* | • *Version with Modbus TCP/IP on Ethernet* |  |
| ***Lovato: D300 / D310*** | • *Dimensions (3-DIN Vs. 4-DIN)*<br>• *0.001 kWh resolution*<br>• *3 variables on display (Vs. 1)*<br>• *Modbus and M-bus integrated*<br>• *Quick setup and check wiring* | • *4 tariffs Vs. 2*<br>• *2 static outputs available*<br>• *Programmable mathematical calculations* |  |
| ***Inepro: Pro380*** | • *Dimensions (3-DIN Vs. 4-DIN)*<br>• *0.001 kWh resolution*<br>• *3 variables on display (Vs. 1)*<br>• *Quick setup and check wiring* | • *100A direct current*<br>• *2 static outputs available*<br>• *Extended temperature range (-40 +70°C)* |  |

See other competitors in the Cross-reference file

## Main competitors: EM540 / EM530

| Product name | Our Strength | Our Weakness | Prod. picture |
|---|---|---|---|
| **Circutor: C21 / C31** | • Dimensions (3-DIN Vs. 5-DIN)<br>• 0.001 kWh resolution<br>• 3 variables on display (Vs. 1)<br>• Modbus and M-bus integrated ports available | • 2 static outputs available |  |
| **Schneider: IEM 31xx / 32xx** | • Dimensions (3-DIN Vs. 5-DIN)<br>• 0.001 kWh resolution<br>• 3 variables on display (Vs. 1)<br>• M-bus integrated port available<br>• THD calculation | • Class C kWh (MID)<br>• 4 tariffs Vs. 2<br>• BACnet and LON ports available |  |
| **ABB: B23 / B24** | • Dimensions (3-DIN Vs. 4-DIN)<br>• 0.001 kWh resolution<br>• 3 variables on display (Vs. 1)<br>• Dual tariff management<br>• THD calculation | |  |
| **Algodue: UEM63** | • Dimensions (3-DIN Vs. 4-DIN)<br>• 0.001 kWh resolution<br>• 3 variables on display (Vs. 1)<br>• More electrical systems available<br>• Dual tariff management | • MID up to 70 °C |  |

See other competitors in the Cross-reference file

# Zero Feed-in Management

**Customer issue:**
in residential application, photovoltaic panels are often installed in combination with battery storage systems. A supervisor unit is required to manage the power flows among network, load, photovoltaic plant and battery. To operate correctly the system needs real time data, but energy meters commonly available in the market are too slow, with a typical response time around 1 second. The frequency value, useful to detect anomalies, is available with low resolution.

**Our Solution:**
EM540 is able to analyze continuously any phase, providing accurate data of voltage, current, power and many other single-phase and system variables, every 100 ms. Frequency resolution is 0.001 Hz while energy resolution is 0.001 kWh. It is therefore able to provide top quality measurement capabilities, that are usually available only in much more expensive devices.

# Machine Predictive Maintenance

**Customer issue:**
maintenance of critical loads and industrial machines is typically based on working hours. Without a dedicated monitoring system, working hours are only estimated, with risk of outage, if the working hours are underestimated.

**Our Solution:**
EM530 provides a run hour meter with selectable current threshold, that can be adjusted above the stand-by consumption, to monitor the effective working hours. Collecting this information remotely via Modbus RTU, proper maintenance activities can be implemented. In addition, comparing this value with the total operating time it is possible to evaluate the consumption of stand-by mode, and put in place actions to reduce it.

# Energy Efficiency Monitoring

**Customer issue:** implementing an energy efficiency program requires the installation of several energy meters to monitor the most critical loads and identify possible actions. The correct configuration and addressing of any meter and the implementation of the Modbus map to read data is an extremely time-consuming activity.

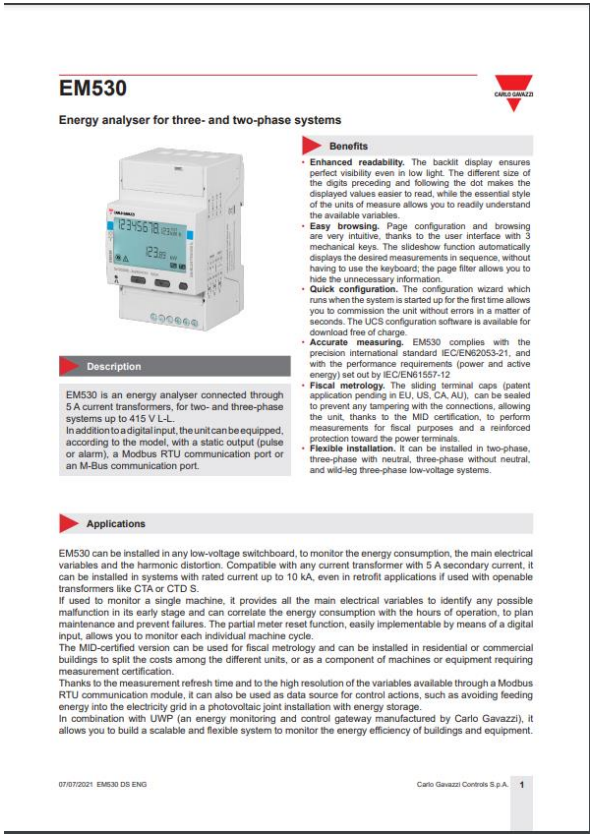
**Our Solution:** EM530 and EM540 are only 3-DIN modules wide, guaranteeing the minimum space occupancy also in existing switchboards. Completing the quick set up procedure, the meter is ready to communicate data with any Modbus master, in just a few seconds. In combination with UWP 3.0, Carlo Gavazzi monitoring gateway, the integration is even faster, being the Modbus map already implemented.

# Submetering

- **Fast addressing** with quick set up wizard at power on
- **Error proof installation** thanks to the wiring check wizard
- **Easy integration** in existing systems via M-Bus or Modbus
- **Accurate fiscal metering**, with 0.001 kWh resolution MID certified


# Marketing Tools

- Datasheets
- EV Charging Brochure
- Application Notes



EM530

Energy analyser for three- and two-phase systems

Benefits

- **Enhanced readability.** The backlit display ensures perfect visibility even in low light. The different size of the digits preceding and following the dot makes the displayed values easier to read, while the essential style of the units of measure allows you to readily understand the available variables.
- **Easy browsing.** Page configuration and browsing are very intuitive, thanks to the user interface with 3 mechanical keys. The slideshow function automatically displays the desired measurements in sequence, without having to use the keyboard; the page filter allows you to hide the unnecessary information.
- **Quick configuration.** The configuration wizard which runs when the system is started up for the first time allows you to commission the unit without errors in a matter of seconds. The UCS configuration software is available for download free of charge.
- **Accurate measuring.** EM530 complies with the precision international standard IEC/EN62053-21, and with the performance requirements (power and active energy) set out by IEC/EN61557-12.
- **Fiscal metrology.** The sliding terminal caps (patent application pending in EU, US, CA, AU), can be sealed to prevent any tampering with the connections, allowing the unit, thanks to the MID certification, to perform measurements for fiscal purposes and a reinforced protection toward the power terminals.
- **Flexible installation.** It can be installed in two-phase, three-phase with neutral, three-phase without neutral, and wild-leg three-phase low-voltage systems.

Description

EM530 is an energy analyser connected through 5 A current transformers, for two- and three-phase systems up to 415 V L-L.
In addition to a digital input, the unit can be equipped, according to the model, with a static output (pulse or alarm), a Modbus RTU communication port or an M-Bus communication port.

Applications

EM530 can be installed in any low-voltage switchboard, to monitor the energy consumption, the main electrical variables and the harmonic distortion. Compatible with any current transformer with 5 A secondary current, it can be installed in systems with rated current up to 10 kA, even in retrofit applications if used with openable transformers like CTA or CTD S.
If used to monitor a single machine, it provides all the main electrical variables to identify any possible malfunction in its early stage and can correlate the energy consumption with the hours of operation, to plan maintenance and prevent failures. The partial meter reset function, easily implementable by means of a digital input, allows you to monitor each individual machine cycle.
The MID-certified version can be used for fiscal metrology and can be installed in residential or commercial buildings to split the costs among the different units, or as a component of machines or equipment requiring measurement certification.
Thanks to the measurement refresh time and to the high resolution of the variables available through a Modbus RTU communication module, it can also be used as data source for control actions, such as avoiding feeding energy into the electricity grid in a photovoltaic joint installation with energy storage.
In combination with UWP (an energy monitoring and control gateway manufactured by Carlo Gavazzi), it allows you to build a scalable and flexible system to monitor the energy efficiency of buildings and equipment.

07/07/2021 EM530 DS ENG — Carlo Gavazzi Controls S.p.A. 1

EM540

Energy analyser for three- and two-phase systems

Benefits

- **Enhanced readability.** The backlit display ensures perfect visibility even in low light. The different size of the digits preceding and following the dot makes the displayed values easier to read, while the essential style of the units of measure allows you to readily understand the available variables.
- **Easy browsing.** Page configuration and browsing are very intuitive, thanks to the user interface with 3 mechanical keys. The slideshow function automatically displays the desired measurements in sequence, without having to use the keyboard; the page filter allows you to hide the unnecessary information.
- **Quick configuration.** The configuration wizard which runs when the system is started up for the first time allows you to commission the unit without errors in a matter of seconds. The UCS configuration software is available for download free of charge.
- **Accurate measuring.** EM540 complies with the precision international standard IEC/EN62053-21, and with the performance requirements (power and active energy) set out by IEC/EN61557-12.
- **Fiscal metrology.** The sliding terminal caps (international patent of Carlo Gavazzi), can be sealed to prevent any tampering with the connections, allowing the unit, thanks to the MID certification, to perform measurements for fiscal purposes and a reinforced protection toward the power terminals.
- **Flexible installation.** It can be installed in two-phase, three-phase with neutral, three-phase without neutral, and wild-leg three-phase low-voltage systems.
- In combination with UWP (an energy monitoring and control gateway manufactured by Carlo Gavazzi), it allows you to build a scalable and flexible system to monitor the energy efficiency of buildings and equipment.

Description

EM540 is a direct connection energy analyser, for two- and three-phase systems up to 415 V L-L and current up to 65 A.
In addition to a digital input, the unit can be equipped, according to the model, with a static output (pulse or alarm), a Modbus RTU communication port or an M-Bus communication port.

Applications

EM540 can be installed in any low-voltage switchboard with rated current up to 65 A, to monitor the energy consumption, the main electrical variables and the harmonic distortion.
If used to monitor a single machine, it provides all the main electrical variables to identify any possible malfunction in its early stage and can correlate the energy consumption with the hours of operation, to plan maintenance and prevent failures. The partial meter reset function, easily implementable by means of a digital input, allows you to monitor each individual machine cycle.
The MID-certified version can be used for fiscal metrology and can be installed in residential or commercial buildings to split the costs among the different units, or as a component of machines or equipment requiring measurement certification.
Thanks to the measurement refresh time and to the high resolution of the variables available through a Modbus RTU communication module, it can also be used as data source for control actions, such as avoiding feeding energy into the electricity grid in a photovoltaic joint installation with energy storage.

04/11/2020 EM540 DS ENG — Carlo Gavazzi Controls S.p.A. 1

CARLO GAVAZZI
Automation Components

CARLO GAVAZZI

Solutions

Electric Vehicle (EV) Charging

# Marketing Tools

- Digital Platform
- EV Charging Video

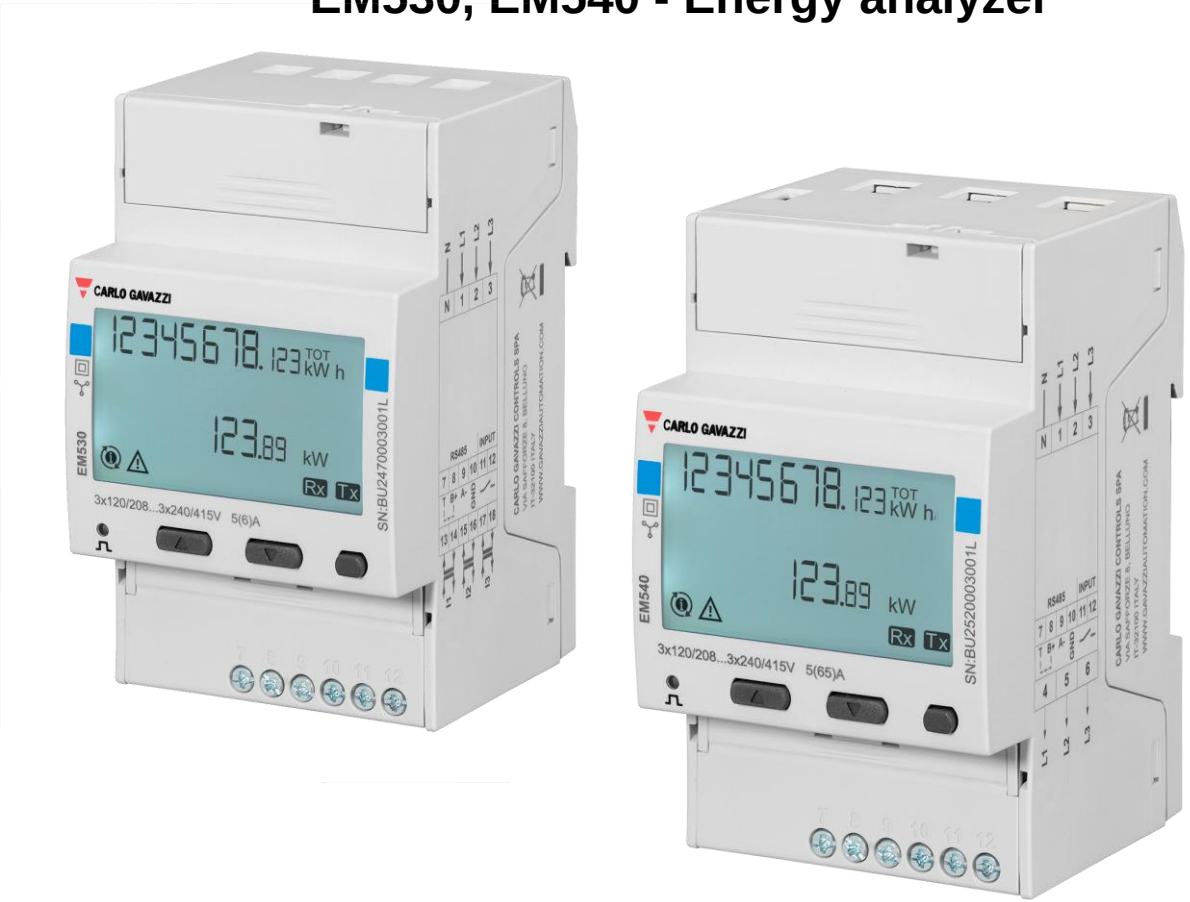

## Certifications

MID certification (Module B + D)


**Factory: ISO 9001:2015 certified**
**ISO 14001:2015 certified**

# Conclusions

## EM530, EM540 - Energy analyzer




**EM530 and EM540.  Raising the bar!**