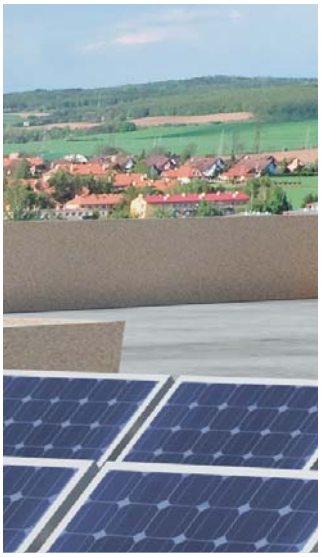
CARLO GAVAZZI
Automation Components

CARLO GAVAZZI

## Energy

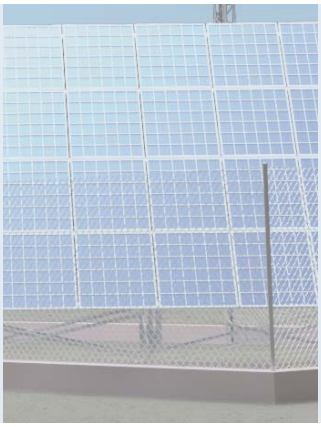
# Solutions for
# Renewable Energy

# Renewable Energy Solutions for







**Photovoltaic parks**

**Photovoltaic small business, commercial and tracking systems**

**Photovoltaic residential systems**

**Off-grid systems**

## ABOUT CARLO GAVAZZI

Carlo Gavazzi Automation is a multinational electronics group active in the design, manufacture and marketing of electronic equipment targeted at the global markets of industrial and building automation.

Our history is full of firsts and our products are installed in a huge number of applications all over the world.
With 80 years of successful operation, our experience is unparalleled. We have our headquarters in Europe and numerous offices around the world.

Our R&D competence centres and production sites are located in Denmark, Italy, Lithuania, Malta and the People's Republic of China.

We operate worldwide through 21 of our own sales companies and also selected representatives in more than 65 countries, from the United States in the West to the Pacific Rim in the East.

Our core competence in automation spans five product lines : Sense, Switch, Control, Fieldbus and EcoEnergy equipment.

Our wide array of products includes sensors, monitoring relays, timers, solid-state relays, electronic motor controllers, energy management equipment, fieldbus systems and components for renewable energy.

We focus our expertise on offering state-of-the-art product solutions in selected market segments.

Our customers include original equipment manufacturers of packaging machines, plastic-injection moulding machines, food and beverage production machines, conveying and materials handling equipment, door and entrance control systems, lifts and escalators, as well as heating, ventilation and air-conditioning devices.



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## DESIGNED TO MEET MARKET REQUIREMENTS

The increasing demand for energy, the availability and cost of oil and issues of pollution make alternative sources of renewable energy essential.

Sun and wind energy can be transformed into electricity that can be used directly or fed into the grid according to national regulations.

Renewable energy in combination with energy efficiency is the basis for sustainable development and respect for the environment in which we all live.

Carlo Gavazzi's wide expertise is focused on developing and offering an EcoEnergy package of products and devices for the Renewable Energy market, specifically photovoltaic power plants.

The growing development of cost-effective solar energy technology has great potential to benefit our world.

Solar technologies diversify the energy supply, reduce our dependence on fossil fuels, improve air quality and off-set greenhouse gas emissions.

Carlo Gavazzi offers complete and modular solutions to monitor and control the efficiency of photovoltaic plants.

Our product range for solar solutions includes inverters, solar battery chargers, energy meters and interface protections.

The increasing popularity of renewable energy systems is not only affecting grid-connected applications but is also widely considered as an alternative solution in off-grid systems.

In remote areas where most energy is supplied by diesel generators renewable energy systems are gaining popularity as their use, besides being "green", involves no air pollution nor noise and avoids periodic refuelling and consequent cash expenditure.

Carlo Gavazzi provides the right solution for both wind and sun systems by means of its battery chargers, converting energy into DC power to be delivered to the batteries.

# Renewable Energy

## Photovoltaic parks

| String boxes | Solar control solutions | Web server | Surge arresters | Current transformers |
|---|---|---|---|---|
| Eos SSB<br>Eos LSB | Eos Array<br>Eos Array Lite | Eos Box<br>Eos Web | DSB<br>DSC<br>DSF | TADK<br>CTD |

In terms of scale and accessibility, solar parks represent the most economical option as regards planning and construction. Carlo Gavazzi products ensure an important contribution to the maximum capacity utilization of the solar electricity produced in photovoltaic power plants - fixed plants or plants with tracking systems, 1 or 2 axis.

Alongside photovoltaic modules, Carlo Gavazzi is able to provide most automation components for a photovoltaic installation, both for power conversion and plant monitoring.

Systems and devices to monitor and control the efficiency of photovoltaic parks are essential to ensure that the solar investment is a solid one.

While Eos Box is designed to control ground installations up to 4MW, Eos Web provides a more integrated solution for roof-top installations up to 1MW.



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| Energy analyzers | Interface protections | Environmental sensors | Anemometer and wind vane | Digital energy production displays |
|---|---|---|---|---|
| EM24 DIN<br>EM26 96 | DPC02DM<br>DPC72DM | PVS-1<br>TEMPSOL<br>IKE2000 | DWS-V<br>DWS-D | DPY3 / DPY4<br>DPY5 / DPYEXL |

Both are web servers gathering data from string monitoring units such as Eos Array and Eos Array Lite, inverters and energy meters. All plant information are available simply using the PC web browser and an Internet connection from everywhere. The advanced string box Eos SSB, equipped with Eos Array solution, is suitable for managing a total string current of 150A and up to 15 strings (125A and up to 12 strings for the Eos SSB Extended version), while the string box Eos LSB, equipped with Eos Array Lite, can manage up to 150 A total string current (from 10 to 15 strings).

With the DPY displays it is possible to remotely show the yield of any power generation system.
The DPY 5 has 5 rows in order to display present power, energy produced since installation, $CO_2$ emissions saved, date/time and external temperature. On this device, besides the readings of the DPY 3, it is also possible to display the irradiation in $W/m^2$ and also the number of days since installation.
Carlo Gavazzi application engineers and product specialists with solid expertise provide complete support, starting from project planning up to the starting up.

# Renewable Energy

## Photovoltaic small business, commercial and tracking

| Solar inverters | Solar inverter | Surge arresters | Solar control solutions | String boxes | Web server |
|---|---|---|---|---|---|
| ISMG 1<br>ISMGT 1 | ISGA | DSB<br>DSF | Eos Array<br>Eos Array Lite | Eos SSB<br>Eos LSB | Eos Web<br>(VMU-C VMU-W) |

In photovoltaic plants the energy generated by the solar modules has to be converted into three phase 400 VAC power.
The Carlo Gavazzi PV inverters convert the energy into true sinewave balanced three phase power to be fed into the utility grid. They can be installed either Indoor or outdoor, on walls or on the ground.
The anti-islanding and the grid monitoring system ensure system safety and compliance with the relevant national recommendations.
Carlo Gavazzi provides everything for PV plant monitoring. Eos Array and Eos Array Lite are systems composed of individual modular elements interacting with one another, providing efficient local control to the solar plant and ensuring effective information management in medium or high power plants.
Furthermore, Carlo Gavazzi provides Eos Web where VMU-C unit is a local web-based data management system which gathers measurements and status information from one or more inverters to your PC or to a centralised cloud monitoring solution. As in some rented roofs, wired internet is not available, VMU-W solves the problem by using well spread mobile communication.
Carlo Gavazzi energy meters and



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| Current transformers | Energy analyzers | Interface protections | Environmental sensors | Anemometer | Digital energy production displays |
|---|---|---|---|---|---|
| TADK<br>TAD<br>CTD | EM24 DIN<br>EM26 96 | DPC02DM<br>DPC72DM | PVS-1<br>TEMPSOL<br>IKE2000 | DWS-V | DPY3<br>DPY4<br>DPY5 |

analysers measure the energy produced and provided to the grid or locally consumed.
These meters can be supplied with MID certification (Annex D). The energy produced at low voltage by a PV plant can be measured with a MID approved meter such as EM24-DIN or with the EM2172, the first 3-phase energy meter with detachable display.
When supplying energy to the grid, it is necessary to use a protection device installed between the generator and the power grid in order to grant the required voltage and/or frequency control.

Carlo Gavazzi's interface protections are the most compact solutions currently available on the market. DPC72 protection adds a control function to frequency derivative and event recording and is equipped with a large display for local information readout and a serial port for remote readout.
The surge arresters for indirect lightning L-Guard complete and supplement the Carlo Gavazzi portfolio for the photovoltaic market.
Furthermore, the new DPY displays, for indoor and outdoor environments, show instantaneous power, energy output and saved $CO_2$ emission.

# Renewable Energy

## Photovoltaic residential systems

| Solar inverters | Solar inverter | Solar control solutions | 1-phase energy meters | 3-phase energy analyzers | Touch screen / Data logger |
|---|---|---|---|---|---|
| ISMG 1<br>ISMGT 1 | ISGA | Eos Array Lite | EM10 DIN<br>EM11 DIN | EM23 DIN<br>EM24 DIN | SmartHUB |

Photovoltaic plants in residential areas are mostly grid connected installations.
Modules are set on roofs and the energy produced by the PV modules is delivered to the inverters and then fed into the public grid.
Carlo Gavazzi offers a wide range of devices and components for the configuration of the electrical solar system.
The transformerless inverters, ISMG series, convert direct current from the solar panels into alternate current. The range includes several models from 3 up to 5.1 kWp. Efficiency of the inverters is of the highest. The exclusive Smart MPPT technology ensures the increase of energy up to 20% thanks to the fully functional PV string control software.
The Carlo Gavazzi inverter range includes the single phase ISMGT1 with HF transformer. This enables the use of amorphous (thin film) panels that typically have one of the poles grounded. Dedicated software (ISMG Soft) enables the remote, instantaneous readout of the working parameters of one or more inverters.
For the energy metering you can use the one-phase energy meters (EM10) or EM23 for three-phase applications, both with LCD data display.



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# Off-grid systems

| Wind battery charger | Surge arrester | Anemometer | Digital modular indicator |
|---|---|---|---|
| WT3 BC48 | DSF | DWSV | UDM60 |

In remote areas renewable energy systems are gaining popularity by means of stand-alone, off-grid plants. Carlo Gavazzi, with its new range of battery chargers, provides a complete solution for both wind and sun energy conversion for industrial, commercial, agricultural, telecom and also rural electrification.
These battery chargers, all equipped with a new MPPT algorithm, convert most of the energy provided by the PV modules or wind turbines into DC power to be delivered to the batteries. All devices can optionally be equipped with a data logger for production data, parameters and alarms logging. Data can be recorded locally on memory cards or sent remotely via mobile communication.
In areas where sun is the prevailing source, Carlo Gavazzi provides the PV3BC48. This device can be connected to PV modules, either mono or polycrystalline as well as thin film with negative grounding types, up to 3 kWp of power.
If the prevailing source is the wind, Carlo Gavazzi offers the option of 2 different devices, each one with a different input power: the WT3BC48 and the WT6BC48. Both devices are already equipped with outputs for emergency braking management.

# Our product range

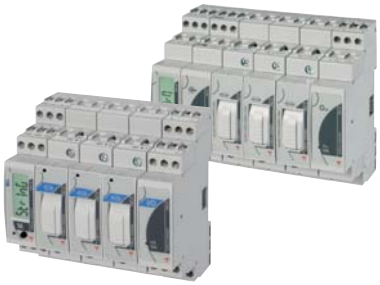
## Solar control solutions

### Eos Array / Eos Array Lite

- Modular local control system for PV plant
- Up to 16 DIN module configuration
- Eos-ArraySoft, freeware configuration software
- Eos-Array can manage in addition to VMU-M unit up to: 1 VMU-P, up to 15 VMU-S and up to 7 VMU-O for a total of maximum 15 units

MAIN FEATURES

- The Eos Array solution can be composed of: VMU-M, the master unit and data logger; VMU-S, the string controller; VMU-P, the environment variable unit and VMU-O, the I/O unit
- Eos Array Lite is the answer to those photovoltaic applications where a less sophisticated monitoring solution is needed



## Web server

### VMU-C (Eos Web)

- Micro PC with Web-server and Web service capability
- Data and event logging capability
- Internal 4GB memory and 16GB SDHC card back-up memory
- Variables shown as graphs and numbers in formatted tables
- All data exports on HTML format compatible with Excel or other spread sheets
- Management up to 11 Eos Array, 11 inverters and 11 Energy meters

MAIN FEATURES

- Efficiency calculation and control on different levels: string, BOS and Performance ratio and Yield indices
- Alarms control with automatic e-mailing and SMS management

## Compact mobile modem

### VMU-W (Eos Web)

- Internet access point when regular wired network is not available
- Mobile modem: GSM, GPRS, EDGE, UMTS, HSPA
- Dimensions: 2 DIN modules

MAIN FEATURES

- Suitable for use in combination with VMU-C
- Automatic dual or quad band setting (850-900Mhz, 1800-1900/2100Mhz)

## String Boxes

### Eos SSB / Eos LSB

- String rated input: current up to 12 A @ 60 °C, Voltage 1000 VDC
- Communication port: RS485 or fibre optic according to the model
- Power supply: 90 to 260 VAC
- PV panel antitheft control (only Eos SSB)
- Remote parallel string switch-off (only Eos SSB)

MAIN FEATURES

- Strings box, based on combinations of Eos Array modules, to manage up to 150A in case of EoS SSB Standard and Eos LSB and up to 125A in case of Eos SSB Extended
- Component control functions such as monitoring of switch disconnector status and correct working of surge arresters (only Eos SSB)

## Web server

### Eos Box

- Remote management of Eos-Array systems
- WEB-Server capability
- Graphical and analytical trends
- Alarm and events logging
- Automatic e-mailing
- Statistical analysis with efficiency calculation

MAIN FEATURES

- Embedded PC for remote Eos Array, inverters and energy meter management, designed to monitor the status of PV plants and ensure solar investment safety

## Touch screen / Data logger

### SmartHUB

- Energy data logging from meters and PV inverters
- Colour touch screen 7" (BTM-T7) and 4.3" (BTM-T4)
- Remote access through Web browsers
- Alarms management

MAIN FEATURES

- Wide screen display, 64K colours
- 2 Ethernet port with integrated switch
- SD memory card slot
- USB host port
- Multistandard Modbus RTU serial communication port (selectable: RS485, RS422 or RS232)



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# Our product range

## Energy analyzer

### EM26 96

- 3-phase energy meters with CT/VT connection
- Primary current input: 5 A
- 96 x 96 mm housing dimensions, only 45 mm behind the panel
- Class 1 (kWh) acc. to EN62053-1
- Modbus communication port

MAIN FEATURES
- Energy analyser in a very compact housing to save space
- Suitable for measuring generated and consumed energy
- MID Annex D certification available

## Energy analyzers

### EM23 DIN / EM24 DIN

- 3-phase energy meters with direct connection
- Current input up to 65 A
- 4 DIN modules dimension
- Class 1 (kWh) acc. to EN62053-1
- Pulse open collector output
- Modbus communication port (EM24)

MAIN FEATURES
- Direct measurement in a very compact housing to save space
- Suitable for measuring generated and consumed energy (EM24)
- MID Annex D certification available

## Energy meters

### EM10 DIN / EM11 DIN

- Single-phase energy meters with direct connection
- Current input up to 32 A
- 1 DIN module dimension
- Class 1 (kWh) acc. to EN62053-1
- Pulse open collector output

MAIN FEATURES
- Direct measurement in a very compact housing to save space
- Suitable for measuring generated energy
- MID Annex D certification available

## Energy meters

### EM2172D

- 3-phase energy meters with CT/VT connection
- Primary current input: 5 A
- 4 DIN modules for DIN -rail mounting and panel mounting (72x72mm)
- Class 1 (kWh) acc. to EN62053-1
- Pulse open collector output
- Modbus communication port

MAIN FEATURES
- Very compact housing to save space
- MID Annex D certification available

## Digital modular indicators

### UDM60 / UDM40 / USC

- Modular Controller for pulse signals (UDM60)
- Dual 6-DGT
- 0.001% RDG basic accuracy
- NPN, PNP, NAMUR, TTL, Pick-up, free of voltage contacts and AC signal inputs
  Multi-input modular instrument (UDM40, USC)
- 4-DGT three colour LED
- 0.1% RDG basic accuracy
- Dual rate, speed, frequency and period measurement (0.001Hz to 50kHz)

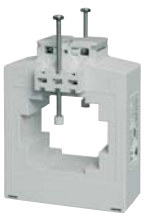
MAIN FEATURES
- Digital panelmeter for current, voltage, temperature, resistance, rate, frequency, speed and period measurements

## Current transformers

### CTD / TADK

- CTD: currents from 40 to 4000 A
  TADK2: 1-250 A
- Removable panel fixing clips
- DIN-rail and panel mounting facility (TAD...)
- Double screw terminals (CTD)
- Sealable covers
- Case: ABS, self-extinguishing level UL 94 V-0
- Precision class: 0.5

MAIN FEATURES
- Wound primary / solid core or split-core
- Compliance with IEC 60185, VDE 0414-1 regulations
- Removable DIN-rail mounting holder



# Our product range

## Interface protections

### DPC02DM...B003 / B005

- Dimensions: 45 x 80 x 99.5 mm
- DIN rail mounting
- Power: 208 to 240 VAC or 380 to 415 VAC
- Protection degree: IP20
- Output: programmable relays 2 SPDT N.E. or 1 DPDT N.E.

MAIN FEATURES
- DK5940 Ed. 2.2 Interface Protection
- One-phase and three-phase relays for monitoring maximum and minimum voltage and frequency, phase sequence and phase failure. It checks that frequency and voltage are within the limits set by the utility

## Interface protections

### DPC72DM...B003

- Dimensions: 90 x 71 x 65 mm, 4-DIN mod.
- DIN rail mounting – sealable housing
- Values and intervention time programming
- Serial port RS485 Modbus RTU
- Protection degree: IP50
- Output: 1 DPDT N.E.

MAIN FEATURES
- DK5940 Ed. 2.2 and AEEG 84/2012/EEL resolution interface protection
- One-phase and three-phase relays for monitoring maximum and minimum voltage and frequency, phase sequence and phase failure. It checks that frequency and voltage are within the limits set by the utility
- Record of the last 10 events (date, time and reason for the event)

## Surge arresters

### DSB / DSC / DSF

- Class II or Class I and II
- Available for PV and AC installations
- Models for communication lines
- Optional remote monitoring
- For DIN rail mounting

MAIN FEATURES
- NO backup fuse required
- Appr. Acc. to IEC61643-11 and UTE C61-740-51
- Complies with prEN50539-11

## 1-phase solar inverters

### ISMG 1

- Single Phase Transformerless
- 4 powers 3.0, 3.3, 3.8 and 5.1kW AC
- Operating Temperature Range from -10°C to +60°C
- IP54
- CE, DK5940 (CEI0-21 in progress), RD661 / RD1663, VDE ARN4105

MAIN FEATURES
- 2 or 3 independent MPPT inputs
- 2 ports RS485 and RS232

## 1-phase solar inverters

### ISMGT 1

- Single Phase with High Frequency Transformer
- 4 powers 2.8, 3.8, 4,0 and 5.1kW AC
- Operating Temperature Range from -25°C to +58°C
- Replaceable Ground fault fuse
- CE, VDE0126, DK5940, RD661 / RD1663, G83

MAIN FEATURES
- 4 string inputs
- Incorporated disconnector for both DC and AC
- Designed for poly and monocrystalline as well as thin Film modules

## 1-phase solar inverters

### ISGA

- Split phase 240Vac 60Hz (for North America)
- 5 powers 2.2, 3.3, 4.4 and 5.5kW
- Temperature range @Pnom -20° to +45°C
- IP65 / NEMA3R
- UL1741, CSA/CAN22.2, IEEE1547/1547.2

MAIN FEATURES
- 1 or 2 independent MPP Inputs
- Built in DC disconnector
- RS232 std; RS485, Ethernet communication ports



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# Our product range

## Irradiation sensors

### PVS-1

- Sensor type: crystalline silicon cell
- No need for external power supply (self-powered)
- Long lasting 3% accuracy, thanks to a special anti-ageing treatment.
- Calibration process according to IEC 60904-2 and 60904-4

MAIN FEATURES
- Long life rugged aluminium case
- UV resistant resin encapsulation
- Fast installation, thanks to the clamping system designed to easily fit the photovoltaic module's frame.

## Temperature sensors

### IKE20001K / TEMPSOL

- Temperature Pt100 or Pt1000 (TEMPSOL)
- Temperature Pt1000 (IKE20001K)
- ±0.3°C connection type
- 2 wire connection type

MAIN FEATURES
- Specifically design to measure the temperature of PV panels (TEMPSOL)
- For air temperature measurement in PV plants (IKE20001k)

## Wind vane / Anemometer

### DWS-V / DWS-D

- Rotor size: 145 mm
- PNP & NPN open collector output in one unit
- Rotor: Black painted stainless steel
- Wind vane for relative wind direction (0 and 90 degree internals -DWS-D-DAC13) (+/- 7 degree of wind direction, left/right wind indication DWS-D-DDC13)
- Anemometer with opto-electronic detection (DWS-V...) Measuring range 2 to 30 m/s
- Current source output 10 to 28 VDC supply

MAIN FEATURES
- Opto-electronic detection
- All inputs and outputs are protected against reverse polarity and transients
- Dust sealed stainless steel ball bearing

## Wind battery charger

### WT3 BC48

- For 3 kW Wind turbine
- 48V lead acid batteries
- Capacity from 500Ah to 1200Ah
- Programmable Turbine curve
- Main operating parameters readings
- IP54

MAIN FEATURES
- MPPT Algorithm
- RS485 communication
- Turbine braking management
- Interrupted Charge management

## Indoor/outdoor digital energy production displays

### DPY30 / DPY40 / DPY50

- Indoor and Outdoor construction
- 3, 4 or 5 lines or fully customizable
- Power supply 230V 50Hz
- Can be connected with CG EM24 or EM26
- DPY40 programmable messages

MAIN FEATURES
- Flexibility of readings and general appearance
- Easy installation with no programming (plug and play)
- High visibility also in direct sunlight or from high distance (DPY30 and DPY50)


## Outdoor digital energy production displays

### DPYEXL

- Outdoor construction
- LED Backlit header and titles
- Power supply 230Vac
- Self Adjusting decimal point
- Can be connected to CG EM21, EM24 and EM26

MAIN FEATURES
- Fully customizable titles
- High brightness LED's up to 75m reading
- Crepuscular brightness adjustment

## Notes



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