EM530



Energy analyser for three- and two-phase 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.

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.

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.



Main functions

- · Measure active, reactive and apparent energy
- Measure the main electrical variables
- · Measure the load run hours and of the analyser
- · Measure the total harmonic distortion (THD) of current and voltages
- Transmit data to other systems through Modbus RTU or M-Bus
- Manage a digital output for pulses or alarm transmission
- · Visualize the measured variables on the display

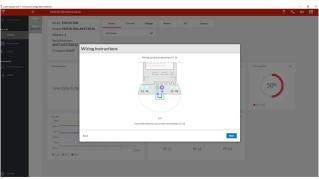
Main features

- System and phase variables (V L-L, V L-N, A, W/var, VA, PF, Hz)
- Displaying of the consumed active energy with a resolution of 0.001 kWh
- The frequency value is available via Modbus, with a resolution of 0.001 Hz
- Average value calculation (dmd) for current and power (kW / kVA)
- · Streamlined user interface featuring 3 mechanical buttons
- Modbus RTU RS485 (data refresh every 100 ms)
- · Continuous sampling of each voltage and current
- · Backlit LCD display
- · MID certified version
- MID-certified meter resolution 0.001 kWh
- cULus approved (UL 61010)
- · Compliance with the performance requirements set out by IEC/EN61557-12 (power and active energy)

UCS software

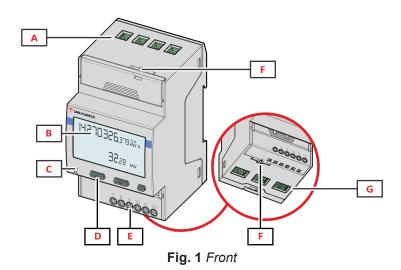
- · Free download from Carlo Gavazzi website
- · Configuration through RS485 from PC or trough UWP3.0 via LAN or the web (UWP Secure Bridge function)
- Setups can be saved offline for serial programming with a single command
- · Real time data view for testing and diagnostics
- Notification of possible wiring errors and display of the corrective steps, reassignment of the correct association of the phases or the direction of the currents via software control.



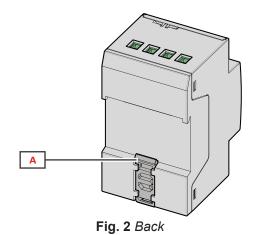




Structure



Area	Description
Α	Voltage inputs
В	Display
С	LED
D	Browsing and configuration buttons
E	Digital input, digital output and communication connections
F	MID seal housings
G	Current inputs



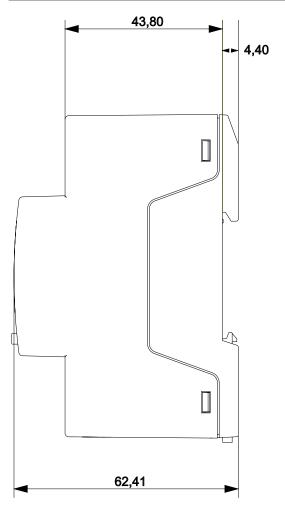
Area	Description
Α	DIN rail mounting bracket

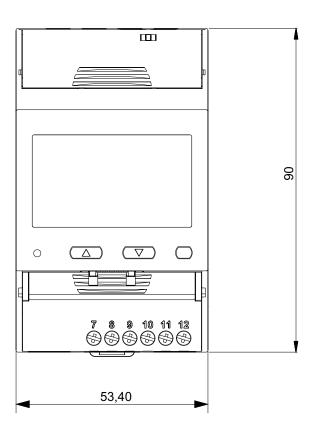


Features

General

Material	Housing: PBT Transparent cover: polycarbonate		
Protection degree	Front: IP40 Terminals: IP20		
Terminals	Voltage inputs: min: 0.2 mm2, max: 2.5 mm2, 0.45 Nm max Current inputs: min: 0.2 mm2, max: 2.5 mm2, 0.45 Nm max Inputs, outputs and communication: min: 0.2 mm2, max: 1.5 mm2, 0.4 Nm max		
Overvoltage category	Cat. III		
Pollution degree	2		
Mounting	DIN rail		
Weight	280 g (packaging included)		
Dimensions	3-DIN modules		





Environmental specifications

Operating temperature	From -25 to +55 °C/from -13 to +131 °F	
Storage temperature	From -25 to +70 °C/from -13 to 158 °F	
Electromechanical environ- mental condition	E2	
Mechanical environmental condition	M2	

NOTE: R.H. < 90 % non-condensing @ 40 °C / 104 °F.



Input and output insulation

Туре	Measurement inputs	Digital input	Digital output	RS485 serial port	M-Bus serial port
Measurement inputs	-	Double/Rein- forced	Double/Rein- forced	Double/Rein- forced	Double/Rein- forced
Digital input	Double/Rein- forced	-	none	none	none
Digital output	Double/Rein- forced	none	-	-	-
RS485 serial port	Double/Rein- forced	none	-	-	-
M-Bus serial port	Double/Rein- forced	none	-	-	-

According to: EN 61010-1, EN 50470-1 (MID). Overvoltage category III. Pollution degree 2.



Compatibility and conformity

Directives	2014/32/EU (MID) 2014/35/EU (LVT - Low Voltage) 2014/30/EU (EMC - Electro Magnetic Compatibility)
Standards	2011/65/EU (Electric-electronic equipment hazardous substances) Electromagnetic compatibility (EMC) - emissions and immunity: EN 62052-11; EN 50470-1 (MID) Electrical safety: EN 61010-1, EN 50470-1 (MID) Metrology: EN62053-22, EN62053-23, IEC61557-12, EN 50470-3 (MID), IEC/EN61557-12 (active power and active energy, MID models only) Pulse output: IEC 62053-31
Approvals	C C C UL US USTED UK

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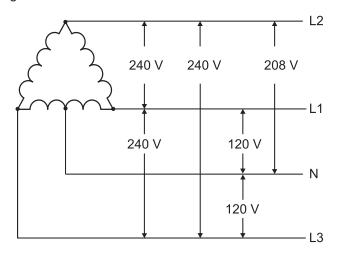


Electrical specifications

Electrical system		
Managed electrical system	Two-phase (3-wire) Three-phase with neutral (4-wire) Three-phase without neutral (3-wire) Wild leg system (three-phase, four-wire delta)	
MID managed electrical system	Three-phase with neutral (4-wire) Three-phase without neutral (3-wire) (ARON)	

Voltage inputs - MID				
Voltage connection	Direct			
Rated voltage L-N	230 V			
Rated voltage L-L	400 V			
Voltage tolerance	From 0.8 to 1.15 Un			
Overload	Continuous: 1.5 Un max			
Input impedance	Refer to "Power supply"			
Frequency	50 Hz			
Voltage inputs - Non MID models				
Voltage connection	Direct			
Rated voltage L-N (from Un min to Un max)	120 to 240 V			
Rated voltage L-L (from Un min to Un max)	208 to 415 V			
Voltage tolerance	From 0.8 to 1.15 Un			
Overload	Continuous: 1.5 Un max			
Input impedance	Refer to "Power supply"			
Frequency	From 45 to 65 Hz			

Note: for MID versions the voltage range is limited to 3x120 (208)...3x230 (400) V, frequency to 50Hz. **Note:** EM530 can also be installed in a wild leg system (three phases, four delta wires), where one of the phase-neutral voltages is higher than the other two.







Current inputs				
Current connection	Via CT			
CT transformation ratio	2000 max			
Rated current (In)	5 A			
Minimum current (Imin)	0.05 A			
Maximum current (Imax)	6 A			
Start-up current (Ist)	10 mA			
Overload	For 500 ms: 20 Imax (120 A)			
Input impedance	< 0.9 VA			
Crest factor	3			
Measurement type	by means of internal shunts			

Power supply

Туре	Self power supply
Consumption	< 1.3 W/2.6 VA
Frequency	50/60 Hz

Measurements

Method	TRMS measurements of distorted waveforms
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Available measurements

Active energy	Unit	System	Phase
Imported (+) Total	kWh+	•	•
Imported (+) partial	kWh+	•	-
Exported (-) Total	kWh-	•	-
Exported (-) partial	kWh-	•	-
by tariff	kWh+	•	-

Reactive energy	Unit	System	Phase
Imported (+) Total	kvarh+	•	-
Imported (+) partial	kvarh+	•	-
Exported (-) Total	kvarh-	•	-
Exported (-) partial	kvarh-	•	-

Apparent energy	Unit	System	Phase
Total	kVAh	•	-
Partial	kVAh	•	-

Run hour meter	Unit	System	Phase
Total (kWh+)	hh:mm	•	-
Partial (kWh+)	hh:mm	•	-
Total (kWh-)	hh:mm -	•	-
Partial (kWh-)	hh:mm -	•	-
Total ON time	hh:mm	•	-

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Electrical variable	Unit	System	Phase
Voltage L-N	V	•	•
Voltage L-L	V	•	•
Current	A	•	•
DMD	A	-	•
DMD MAX	A	-	•
Neutral current	A	•	-
Active power	W	•	•
DMD	W	•	-
DMD MAX	W	•	-
Apparent power	VA	•	•
DMD	VA	•	-
DMD MAX	VA	•	-
Reactive power	Var	•	•
Power factor	PF	•	•
Frequency	Hz	•	-
THD Current*	THD A %	-	•
THD Voltage L-N*	THD L-N %	-	•
THD Voltage L-L*	THD L-L %	-	•

^{*} Up to 15th harmonic

NOTE: the available variables depend on the type of system set.

Total imported active energy (kWh TOT) is the only MID certified meter. Apparent energy, reactive energy and exported active energy are not MID certified. Partial meters are not MID certified.

All the variables calculated by the meter are referred to the primary current of the current transformer.



Energy metering

Energy metering depends on the measurement type you chose (selectable in non-MID models, according to the model in MID-certified models).

A measurement (MID PFA models)

Easy connection function: irrespective of the current direction, the power always has a plus sign and contributes to increase the positive energy meter. The negative energy meter is not available.

B measurement (MID PFB models)

For each measuring time interval, the individual phase energies with a plus sign are summed to increase the positive energy meter (kWh+), while the others increase the negative one (kWh-).

Example:

P L1= +2 kW, P L2= +2 kW, P L3= -3 kW Integration time = 1 hour $kWh+ = (2+2) \times 1h = 4 kWh$ $kWh- = 3 \times 1h = 3kWh$

C measurement (MID PFC models)

For every measuring interval time, the energies of the single phases are summed; according to the sign of the result, the positive (kWh+) or negative totalizer (kWh-) is increased. Example:

P L1= +2 kW, P L2= +2 kW, P L3= -3 kW



Integration time = 1 hour +kWh=(+2+2-3)x1h=(+1)x1h=1 kWh -kWh=0 kWh



Measurement accuracy

Current	
From 0.05 In to Imax	± 0.3% rdg
From 0.01 In to 0.05 In	± 0.6% rdg

Phase-phase voltage	
From Un min -20% to Un max +15%	± 0.2% rdg

Phase-neutral voltage	
From Un min -20% to Un max +15%	± 0.2% rdg

Active and apparent power		
From 0.05 In to Imax (PF=1)	± 0.5% rdg	
From 0.01 In to 0.05 In (PF=1)	± 1% rdg	
From 0.1 In to Imax (PF=0.5L - 0.8C)	± 0.6% rdg	
From 0.02 In to 0.1 In (PF=0.5L - 0.8C)	± 1% rdg	
Active energy	Class 0.5 S EN 62053-22, Class B EN50470-3 (MID)	
Reactive energy	Class 2 (EN62053-23)	

Reactive power	
From 0.1 In to Imax (sinφ=0.5L	
- 0.5C)	± 2% rdg
From 0.05 In to Imax (sinφ=1)	
From 0.05 In to 0.1 In	
(sinφ=0.5L - 0.5C)	± 2.5% rdg
From 0.02 In to 0.05 In (PF=1)	
Active energy	Class 0.5 S EN 62053-22, Class B EN50470-3 (MID)
Reactive energy	Class 2 (EN62053-23)

Frequency	
From 45 to 65 Hz	± 0.1% rdg

Measurement accuracy according to IEC/EN61557-12 (MID models)		
Active power	Performance class 1	
Active energy	Performance class 2	



Measurement resolution

Variable	Display resolution	Resolution by serial communication
Energy	0.001 kWh/kvarh/kVAh	
Single phase and tariff energy	0.01 kWh	0.001 kWh
Power	0.01 kW/kvar/kVA	0.1 W/var/VA
Current*	0.01 A	0.001 A
Voltage	0.1 V	
Frequency	0.01 Hz	0.001 Hz
THD	0.01 %	
Power factor	0.01	0.001

*Note: value referred to CT ratio =1



Display

Туре	Segments
Refresh time	500 ms
Description	Backlit LCD
	Instantaneous: 5+1 dgt or 5+2 dgt
Variable readout	Power factor: 1+2 dgt
	Energy: 8+3 dgt



LED

	Red. Pulse weight: proportional to energy consumption and depending on the CT ratio (16 Hz maximum frequency):	
	Weight (kWh per pulse)	CT ratio
Front	0.001	≤ 7
	0.01	From 7.1 to 70
	0.1	From 70.1 to 700
	1	From 700.1 to 2000



Digital outputs/inputs

Digital inputs

Connection type	Screw terminals	
Number of inputs	1	
Туре	Free contact	
Function	Remote status Tariff management Partial meter start/pause Partial meter reset	
Features	Open contact voltage: 5 Vdc +/- 5% Closed contact voltage: 5 mA max Input impedance: 11.6 k Ω Open contact resistance: \geq 25 k Ω Closed contact resistance: \leq 840 Ω Maximum voltage applicable with no damages: 30 V ac	
Configuration parameters Input function		
Configuration mode	Via keypad or UCS software	

Note: type S0, class B in accordance with EN62053-31



Digital outputs



Digital output

Connection type	Screw terminals	
Maximum number of outputs	1	
Туре	Opto-mosfet	
Function	Pulse output or alarm output	
Features	V _{ON} 2.5 V ac/dc, max 100 mA V _{OFF} 42 V ac/dc	
Configuration parameters	Output function (pulse/alarm) Pulse weight (from 0.001 to 10 kWh per pulse) Pulse duration (30 or 100 ms) Output normal status (NO or NC)	
Configuration mode	Via keypad	

Communication ports



Modbus RTU

Protocol	Modbus RTU	
Devices on the same bus Max 247 (1/8 unit load)		
Communication type	Multidrop, bidirectional	
Connection type 2 wires		
0.5	Modbus address (from 1 to 247)	
Configuration parameters	Baud rate (9.6 / 19.2 / 38.4 / 115.2 kbps)	
	Parity (None/ Odd/ Even)	
Refresh time ≤ 100 ms		
Configuration mode	guration mode Via keypad or UCS software	

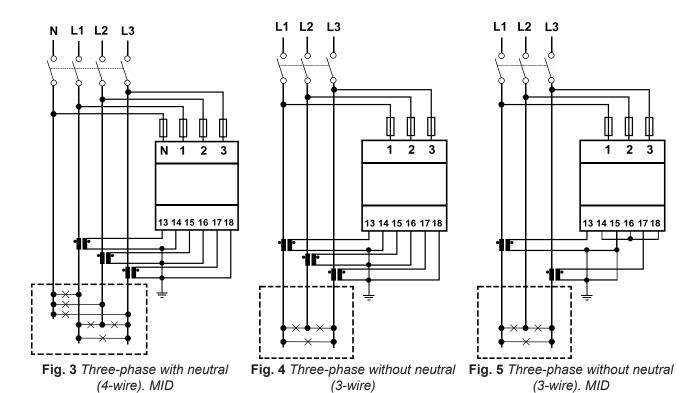


M-Bus

Protocol M-Bus according to EN13757-3:2013	
Devices on the same bus Max 250 (1 unit load)	
Connection type 2 wires	
Configuration parameters	Primary address (1 to 250) Baud rate (0.3/ 2.4 / 9.6 kbps)
Refresh time ≤ 100 ms	
Configuration mode Via keypad	



Connection Diagrams



N L1 L2

N 1 2 3

N 1 2 3

Fig. 6 Two-phase system with neutral (3-wire)



Digital outputs/inputs

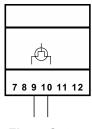


Fig. 7 Output

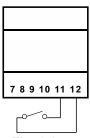


Fig. 8 Input

Communication

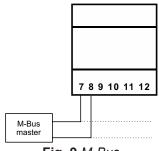


Fig. 9 M-Bus

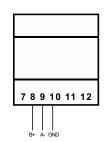


Fig. 10 RS485 port

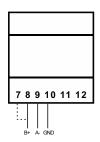


Fig. 11 Last device on RS485



References



EM530 DIN AV5 3X	
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Enter the code option instead of \Box

Code	Options	Description
EM530 DIN AV5 3X		-
	01	Digital output
	S 1	RS485 Modbus RTU
	M1	M-Bus
	Х	Non MID models
	PFA	MID models (3P, 3P.n)
	PFB	MID models (3P, 3P.n)
	PFC	MID models (3P, 3P.n)

- PFA: Easy connection, the total energy totalizer (kWh+) is certified according to MID;
- PFB: only the total positive totalizer (kWh+) is certified according to MID. The negative energy totalizer is available but not certified according to MID.

Note: for each measuring time interval, the individual phase energies with a plus sign are summed up to increase the positive energy meter (kWh+), while the others increase the negative one (kWh-).

• PFC: only the positive totalizer (kWh+) is MID-certified. The negative energy totalizer is available but is not MID-certified. Note: for each measuring time interval, the energies of the individual phases are summed up; according to the sign of the result, the system increases the positive totalizer (kWh+) or the negative one (kWh-).

CARLO GAVAZZI compatible components

Purpose	Component name/part number	NOTES
Configure analyzer via desktop application	UCS software	Available for free download at: www.productselection.net
Aggregate, store and transmit data to other systems	UWP 3.0	See relevant datasheet

EM540



Energy analyser for three- and two-phase systems



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.

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 (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.
- 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.

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.



Main functions

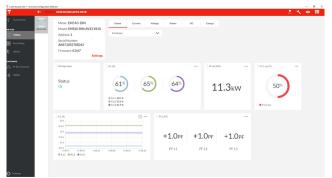
- · Measure active, reactive and apparent energy
- · Measure the main electrical variables
- · Measure the load run hours and of the analyser
- · Measure the total harmonic distortion (THD) of current and voltages
- · Transmit data to other systems through Modbus RTU or M-Bus
- Manage a digital output for pulses or alarm transmission
- · Visualize the measured variables on the display

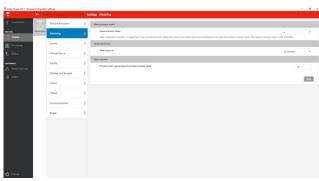
Main features

- System and phase variables (V L-L, V L-N, A, W/var, VA, PF, Hz)
- Displaying of the consumed active energy with a resolution of 0.001 kWh
- The frequency value is available via Modbus, with a resolution of 0.001 Hz
- Average value calculation (dmd) for current and power (kW / kVA)
- · Streamlined user interface featuring 3 mechanical buttons
- Modbus RTU RS485 (data refresh every 100 ms)
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- MID-certified meter resolution 0.001 kWh
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UCS software

- · Free download from Carlo Gavazzi website
- · Configuration through RS485 from PC or trough UWP3.0 via LAN or the web (UWP Secure Bridge function)
- · Setups can be saved offline for serial programming with a single command
- · Real time data view for testing and diagnostics
- Notification of possible wiring errors and display of the corrective steps, reassignment of the correct association of the phases or the direction of the currents via software control.







Structure

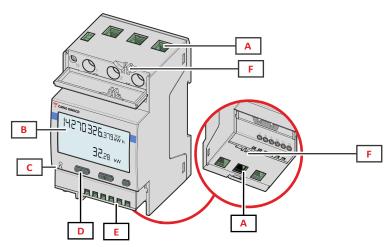


Fig. 1 Front

Area	Description
Α	Voltage inputs/Current inputs
В	Display
С	LED
D	Browsing and configuration buttons
E	Digital input, digital output and communication connections
F	MID seal housings

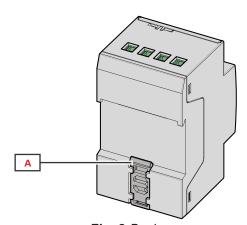


Fig. 2 Back

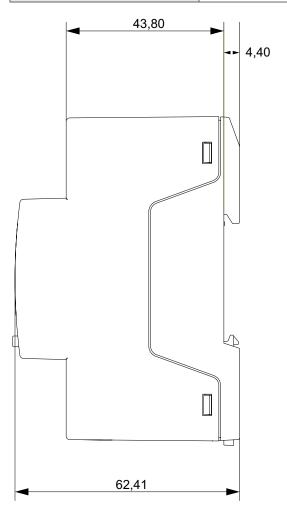
Area	Description
Α	DIN rail mounting bracket

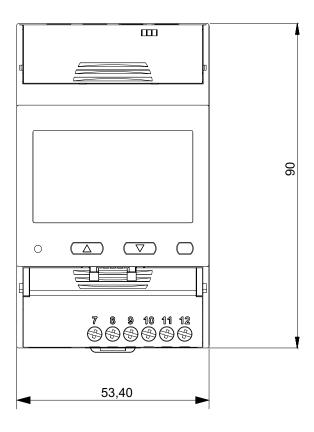


Features

General

Material	Housing: PBT Transparent cover: polycarbonate	
Protection degree	Front: IP40 Terminals: IP20	
Terminals	Measurement inputs (Phase 1,2, 3): min: 2.5 mm², max: 16 mm², 2.5 Nm max Neutral: min: 0.06 mm², max: 2.5 mm², 0.5 Nm max Inputs, outputs and communication: min: 0.2 mm2, max: 1.5 mm2, 0.4 Nm max	
Overvoltage category Cat. III		
Pollution degree 2		
Mounting DIN rail		
Weight	370 g (packaging included)	
Dimensions	3-DIN modules	







Environmental specifications

Operating temperature	From -25 to +55 °C/from -13 to +131 °F
Storage temperature	From -25 to +70 °C/from -13 to 158 °F
Electromechanical environ- mental condition	E2
Mechanical environmental condition	M2

NOTE: R.H. < 90 % non-condensing @ 40 °C / 104 °F.



Input and output insulation

Туре	Measurement inputs	Digital input	Digital output	RS485 serial port	M-Bus serial port
Measurement inputs	-	Double/Rein- forced	Double/Rein- forced	Double/Rein- forced	Double/Rein- forced
Digital input	Double/Rein- forced	-	none	none	none
Digital output	Double/Rein- forced	none	-	-	-
RS485 serial port	Double/Rein- forced	none	-	-	-
M-Bus serial port	Double/Rein- forced	none	-	-	-

According to: EN 61010-1, EN 50470-1 (MID). Overvoltage category III. Pollution degree 2.



Compatibility and conformity

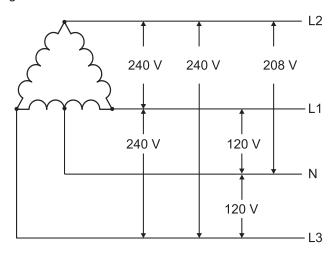
Directives	2014/32/EU (MID) 2014/35/EU (LVT - Low Voltage) 2014/30/EU (EMC - Electro Magnetic Compatibility) 2011/65/EU (Electric-electronic equipment hazardous substances)
Standards	Electromagnetic compatibility (EMC) - emissions and immunity: EN 62052-11; EN 50470-1 (MID) Electrical safety: EN 61010-1, EN 50470-1 (MID) Metrology: EN62053-21, EN62053-23, IEC61557-12, EN 50470-3 (MID), IEC/EN61557-12 (active power and active energy, MID models only) Pulse output: IEC 62053-31
Approvals	C C C UL US USTED UK CA

Electrical specifications

Electrical system		
Managed electrical system	Two-phase (3-wire) Three-phase with neutral (4-wire) Three-phase without neutral (3-wire) Wild leg system (three-phase, four-wire delta)	
MID managed electrical system	Three-phase with neutral (4-wire)	

Voltage inputs - MID			
Voltage connection	Direct		
Rated voltage L-N	120 to 230		
Rated voltage L-L	208 to 400 V		
Voltage tolerance	From 0.8 to 1.15 Un		
Overload	Continuous: 1.5 Un max		
Input impedance	Refer to "Power supply"		
Frequency	50 Hz		
Voltage inputs - Non MID models			
Voltage connection	Direct		
Rated voltage L-N (from Un min to Un max)	120 to 240 V		
Rated voltage L-L (from Un min to Un max)	208 to 415 V		
Voltage tolerance	From 0.8 to 1.15 Un		
Overload	Continuous: 1.5 Un max		
Input impedance	Refer to "Power supply"		
Frequency	From 45 to 65 Hz		

Note: for MID versions the voltage range is limited to 3x120 (208)...3x230 (400) V, frequency to 50Hz. **Note:** EM540 can also be installed in a wild leg system (three phases, four delta wires), where one of the phase-neutral voltages is higher than the other two.





Current inputs			
Current connection	Direct		
Base current (lb)	5 A		
Minimum current (Imin)	0.25 A		
Maximum current (Imax)	65 A		
Start-up current (Ist)	20 mA		
Overload	For 10 ms: 30 Imax (1950 A)		
Input impedance	< 3.4 VA		
Crest factor	Crest factor: 4 (Imax peak 92A)		

Power supply

Туре	Self power supply
Consumption	< 1.3 W/2.6 VA
Frequency	50/60 Hz

Measurements

Method	TRMS measurements of distorted waveforms
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>

Available measurements

Active energy	Unit	System	Phase
Imported (+) Total	kWh+	•	•
Imported (+) partial	kWh+	•	-
Exported (-) Total	kWh-	•	-
Exported (-) partial	kWh-	•	-
by tariff	kWh+	•	-

Reactive energy	Unit	System	Phase
Imported (+) Total	kvarh+	•	-
Imported (+) partial	kvarh+	•	-
Exported (-) Total	kvarh-	•	-
Exported (-) partial	kvarh-	•	-

Apparent energy	Unit	System	Phase
Total	kVAh	•	-
Partial	kVAh	•	-

Run hour meter	Unit	System	Phase
Total (kWh+)	hh:mm	•	-
Partial (kWh+)	hh:mm	•	-
Total (kWh-)	hh:mm -	•	-
Partial (kWh-)	hh:mm -	•	-
Total ON time	hh:mm	•	-



Electrical variable	Unit	System	Phase
Voltage L-N	V	•	•
Voltage L-L	V	•	•
Current	Α	•	•
DMD	Α	-	•
DMD MAX	Α	-	•
Neutral current	Α	•	-
Active power	W	•	•
DMD	W	•	-
DMD MAX	W	•	-
Apparent power	VA	•	•
DMD	VA	•	-
DMD MAX	VA	•	-
Reactive power	Var	•	•
Power factor	PF	•	•
Frequency	Hz	•	-
THD Current*	THD A %	-	•
THD Voltage L-N*	THD L-N %	-	•
THD Voltage L-L*	THD L-L %	-	•

^{*} Up to 15th harmonic

NOTE: the available variables depend on the type of system set.

Total imported active energy (kWh TOT) is the only MID certified meter. Apparent energy, reactive energy and exported active energy are not MID certified. Partial meters are not MID certified.

All the variables calculated by the meter are referred to the primary current of the current transformer.



Energy metering

Energy metering depends on the measurement type you chose (selectable in non-MID models, according to the model in MID-certified models).

A measurement (MID PFA models)

Easy connection function: irrespective of the current direction, the power always has a plus sign and contributes to increase the positive energy meter. The negative energy meter is not available.

B measurement (MID PFB models)

For each measuring time interval, the individual phase energies with a plus sign are summed to increase the positive energy meter (kWh+), while the others increase the negative one (kWh-).

Example:

P L1= +2 kW, P L2= +2 kW, P L3= -3 kW Integration time = 1 hour kWh+ = (2+2) x1h = 4 kWhkWh- = 3 x 1h= 3kWh

C measurement (MID PFC models)

For every measuring interval time, the energies of the single phases are summed; according to the sign of the result, the positive (kWh+) or negative totalizer (kWh-) is increased. Example:

P L1= +2 kW, P L2= +2 kW, P L3= -3 kW



Integration time = 1 hour +kWh=(+2+2-3)x1h=(+1)x1h=1 kWh -kWh=0 kWh



Measurement accuracy

Current	
From 2 A to 65 A	± 0.5% rdg
From 0.5 A to 2 A	± 1% rdg

Phase-phase voltage	
From Un min -20% to Un max +15%	± 0.5% rdg

Phase-neutral voltage	
From Un min -20% to Un max +15%	± 0.5% rdg

Active and apparent power	
From 1.0 A to 65.0 A (PF=0.5L - 1 - 0.8C)	± 1% rdg
From 0.5 A to 1.0 A (PF=1)	± 1.5% rdg

Reactive power	
From 1.0 A to 2.0 A (sinφ=0.5L	
- 0.5C)	± 2% rdg
From 0.5 A to 1.0 A (sinφ=1)	
From 2.0 A to 65.0 A (sinφ=0.5L	
- 0.5C)	± 2.5% rdg
From 1.0 A to 65.0 A (PF=1)	
Active energy	Class 1 EN62053-21, Class B EN50470-3 (MID)
Reactive energy	Class 2 (EN62053-23)

Frequency	
From 45 to 65 Hz	± 0.1% rdg



Measurement resolution

Variable	Display resolution	Resolution by serial communication	
Energy	0.001 kWh/	0.001 kWh/kvarh/kVAh	
Single phase energy	0.01 kWh	0.001 kWh	
Power	0.01 kW/kvar/kVA	0.1 W/var/VA	
Current	0.01 A	0.001 A	
Voltage	0.1	1 V	
Frequency	0.01 Hz	0.001 Hz	
THD	0.01	1 %	
Power factor	0.01	0.001	



Display

Туре	Segments
Refresh time	500 ms
Description	Backlit LCD
	Instantaneous: 5+1 dgt or 5+2 dgt
Variable readout	Power factor: 1+2 dgt
	Energy: 8+3 dgt



Fuend	Dad Dulas variable preparticul to an army consumption, 0.004 I/Mb nor pulas
Front	Red. Pulse weight, proportional to energy consumption, 0.001 kyyn per bulse
FIOIIL	Red. Pulse weight: proportional to energy consumption: 0.001 kWh per pulse



Digital outputs/inputs

Digital inputs

Connection type	Screw terminals
Number of inputs	1
Туре	Free contact
Function	Remote status Tariff management Partial meter start/pause Partial meter reset
Features	Open contact voltage: 5 Vdc +/- 5% Closed contact voltage: 5 mA max Input impedance: 11.6 k Ω Open contact resistance: \geq 25 k Ω Closed contact resistance: \leq 840 Ω Maximum voltage applicable with no damages: 30 V ac
Configuration parameters	Input function
Configuration mode	Via keypad or UCS software

Note: type S0, class B in accordance with EN62053-31



Digital outputs



Digital output

Connection type	Screw terminals
Maximum number of outputs	1
Туре	Opto-mosfet
Function	Pulse output or alarm output
Features	V _{ON} 2.5 V ac/dc, max 100 mA V _{OFF} 42 V ac/dc
Configuration parameters	Output function (pulse/alarm) Pulse weight (from 0.001 to 10 kWh per pulse) Pulse duration (30 or 100 ms) Output normal status (NO or NC)
Configuration mode	Via keypad

Communication ports



Modbus RTU

Protocol	Modbus RTU	
Devices on the same bus	vices on the same bus Max 247 (1/8 unit load)	
Communication type	Multidrop, bidirectional	
Connection type	2 wires	
	Modbus address (from 1 to 247)	
Configuration parameters	Baud rate (9.6 / 19.2 / 38.4 / 115.2 kbps)	
	Parity (None/ Odd/ Even)	
Refresh time	≤ 100 ms	
Configuration mode	Via keypad or UCS software	

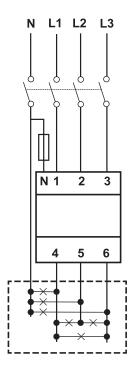


M-Bus

Protocol	M-Bus according to EN13757-3:2013	
Devices on the same bus	Max 250 (1 unit load)	
Connection type	2 wires	
Configuration parameters Primary address (1 to 250) Baud rate (0.3/ 2.4 / 9.6 kbps)		
Refresh time	≤ 100 ms	
Configuration mode	Via keypad	



Connection Diagrams



1 2 3 4 5 6

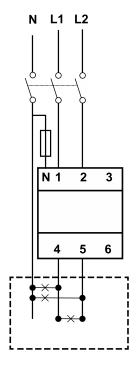
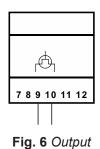


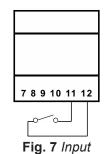
Fig. 3 Three-phase with neutral (4-wire). MID

Fig. 4 Three-phase without neutral (3-wire). MID

Fig. 5 Two-phase system with neutral (3-wire)

Digital outputs/inputs

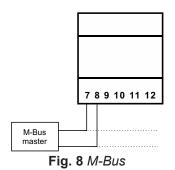


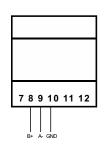


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Communication





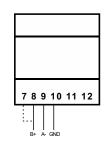


Fig. 9 RS485 port

Fig. 10 Last device on RS485



References



◯ EM540 DIN AV2 3X □	
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Enter the code option instead of \Box

Code	Options	Description	
EM540 DIN AV2 3X		-	
	01	Digital output	
	S 1	RS485 Modbus RTU	
	M1	M-Bus	
	Х	Non MID models	
	PFA	MID models (3P, 3P.n)	
	PFB	MID models (3P, 3P.n)	
	PFC	MID models (3P, 3P.n)	

- PFA: Easy connection, the total energy totalizer (kWh+) is certified according to MID;
- PFB: only the total positive totalizer (kWh+) is certified according to MID. The negative energy totalizer is available but not certified according to MID.

Note: for each measuring time interval, the individual phase energies with a plus sign are summed up to increase the positive energy meter (kWh+), while the others increase the negative one (kWh-).

• PFC: only the positive totalizer (kWh+) is MID-certified. The negative energy totalizer is available but is not MID-certified. Note: for each measuring time interval, the energies of the individual phases are summed up; according to the sign of the result, the system increases the positive totalizer (kWh+) or the negative one (kWh-).

CARLO GAVAZZI compatible components

Purpose	Component name/part number	NOTES
Configure analyzer via desktop application	UCS software	Available for free download at: www.productselection.net
Aggregate, store and transmit data to other systems	UWP 3.0	See relevant datasheet