Energy Management
Energy Meter
Type EM330

CARLO GAVAZZI

- **Digital input (for tariff management)**
- **Easy connection or wrong current direction detection**
- **Certified according to MID Directive (option PF only): see "how to order" below**
- **Other versions available (not certified, option X): see "how to order" on the next page**

- **Three phase energy meter**
- **Class 1 (kWh) according to EN62053-21**
- **Class B (kWh) according to EN50470-3**
- **Accuracy ±0.5% RDG (current/voltage)**
- **Current measurement via CT**
- **Backlit LCD display (3x 8-digit) with integrated touch key-pad**
- **Energy readout on display: 8 digit**
- **Variable readout on display: 4 digit**
- **Energy measurement: kWh and kvarh (imported/ exported); kWh+ by 2 tariffs; kWh per phase**
- **System variables: kW, kvar, kVA, VLL, VLN, PF, Hz, kWdmd, kWdmd peak**
- **Phase variables: kW, kvar, kVA, VLL, VLN, A, PF**
- **Auxiliary power supply**
- **Dimensions: 3-DIN module**
- **Protection degree (front): IP51**
- **Pulse output (optional, by open collector PNP)**
- **RS485 Modbus port (optional)**
- **M-bus port (optional)**
- **Run hour meter**
- **Neutral current calculation**

Product description

Three-phase energy meter with backlit LCD display with integrated touch keypad. Particularly indicated for active energy metering and for cost allocation (CT connection), with dual tariff management availability. It can measure imported and exported energy or be programmed to consider only the imported one. Housing for DIN-rail mounting, with IP51 front degree protection. The meter is optionally provided with pulse output proportional to the active energy being measured, RS485 Modbus port or M-bus port. Available for legal metrology (PF option, only for imported energy).

MID Certified according to MID Directive, Module B and Module D of Annex II, for legal metrology relevant to active electrical energy meters (see Annex V, MI003, of MID). Can be used for fiscal (legal) metrology.

How to order

EM330 DIN AV5 3 H O1 PF B

- **Model**
- **Range code**
- **System**
- **Power supply**
- **Output**
- **Option**
- **Measurement**

Type Selection

Range code

AV5:	400 VLL AC - 5(6)A (CT connection)

System

3:	3-phase, 3 or 4 wire

Power supply

H:	auxiliary power supply 90 to 260V ac/dc

Output

O1:	pulse output
S1:	RS485 Modbus port
M1:	M-bus port

Option

PF:	Certified according to MID Directive. Can be used for fiscal (legal) metrology.

Measurement

A:	The power is always integrated (both in case of positive imported and negative exported power) and the total energy meter is certified according to MID.
B:	Only the total positive energy meter is certified according to MID.

CARLO GAVAZZI

STANDARD

Not certified according to MID Directive. Cannot be used for fiscal (legal) metrology.

How to order

EM330 DIN AV5 3 H O1 X

- **Model**
- **Range code**
- **System**
- **Power supply**
- **Output**
- **Option**

Type Selection

Range code		System		Power supply		Output	
AV5:	400 VLL ac - 5(6)A (CT connection)	**3:**	3-phase, 3- or 4-wire; 2-phase 3-wire, 1-phase 2 wire	**H:**	auxiliary power supply 90 to 260V ac/dc	**O1:**	pulse output
						S1:	RS485 Modbus port
						M1:	M-bus port

Option	
X:	none

CARLO GAVAZZI

Input specifications

Rated Inputs	
Current type	3-phase loads, CT connection
Current range	5(6)A
Nominal voltage	AV5: 400 to 480 VLL ac
Accuracy (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)	
	AV5: Imin=0.25A; In: 5A, Imax: 6A; Un: 230 to 277 VLN (400 to 480 VLL)
Current	From 0.04In to 0.2In: ±(0.5%RDG+1DGT) From 0.2In to Imax: ±(0.5%RDG)
Phase-neutral voltage	In the range Un: ±(0.5% RDG)
Phase-phase voltage	In the range Un: ±(1% RDG)
Frequency	Range: 45 to 65Hz.
Active power	From 0.05 In to Imax, within Un range, PF=1: ±(1% RDG) From 0.1 In to Imax, within Un range, PF=0.5L or 0.8C: ±(1% RDG)
Power factor	±[0.001+1%(1.000 - "PF RDG")]
Reactive power	From 0.05 In to Imax, within Un range, sinphì=1: ±(2% RDG) From 0.1 In to Imax, within Un range, sinphì=0.5L or 0.8C: ±(2% RDG)
Energies	
Active energy	Class 1 according to EN62053-21 and MID Annex MI-003 Class B (Class B (kWh) according to EN50470-3)
Reactive energy	Class 2 according to EN62053-23
Start-up current:	10mA
Start-up voltage	90VLN
Resolution	Display/serial communication
Current	0.1/0.001 A
Voltage	0.1/0.1 V
Power	0.01 kW or kvar/ 0.1 W or var
Frequency	0.1 Hz/0.1Hz
PF	0.01/ 0.001
Energies (positive)	0.01 kWh or kvarh / 0.1 kWh or kvarh
Energies (negative)	0.01 kWh or kvarh / 0.1 kWh or kvarh
Energy additional errors	
Influence quantities	According to EN62053-21
Temperature drift	≤200ppm/°C
Sampling rate	4096 samples/s @ 50Hz 4096 samples/s @ 60Hz
Display and touch key-pad	
Type	Backlit LCD, 3 rows by 8-digit each, h 7 mm
Read-out	Energy: 8 digit. Variables: 4 digit
Touch key	3 (DOWN, Enter and UP).
Max. and Min. indication	
Energies	Max. 99 999 999 Min. 0.01
Variables	Max. 9999 Min. 0.01
Memory	
Energy	10^12 cycles. Energy value is saved every time the less significant digit increases.
Programming parameters	10^12 cycles. When a parameter is modified, only the relevant memory cell is overwritten
LEDs	
Flashing red light pulses	Proportional to the product of the CT and VT ratios
Weight (pulses/kWh) 1	> 700,1 (CT x VT)
Weight (pulses/kWh) 10	70.1–700 (CT x VT)
Weight (pulses/kWh) 100	7.1–70 (CT x VT)
Weight (pulses/kWh) 1000	< 7.1 (CT x VT)
Duration	90ms
Fix orange light	wrong current direction (only with PFB option or with "B" measurement selection in case of X option)
Current overloads	
Continuous	6A, @ 50Hz
For 500ms	5 In
Voltage Overloads	
Continuous	1.2 Un
For 500ms	2 Un
Input impedance	
230VL-N	1.2Mohm
5(6) A	< 1.25VA
Wrong connection detection	Installation guide to indicate if connections are correctly carried out. Can be disabled.
Phase sequence	Indicates if the phase sequence is not the correct one (L1-L2-L3)
Correct current direction	Indicates if the current direction is not the right one (only with PFB option or with type "B" measurement selection in case of X option).

CARLO GAVAZZI

Input specifications (cont.)

Load conditions	The wrong connection detection works in case of loads with: - PF>0.766 (<40°) if inductive or PF>0.996 (<5°) if capacitive - a current at least equal to 10% rated current

Digital input specifications

Digital inputs	Free of voltage contact
Function	Tariff management (switch between t1-t2)
Number of inputs	1
Contact measurement voltage	5 V
Input impedance	1kohm
Contact resistance	≤1kohm, close contact ≥100kohm, open contact
Overload	In case a voltage is erroneously applied to the digital input, the input is not damaged up to 30 V ac/dc.

Output specifications

RS485 serial port	RS485 by screw connection.
Function	For communication of measured data, programming parameters
Protocol	ModBus RTU (slave function)
Baud rate	9.6, 19.2, 38.4, 57.6, 115.2 kbaud,
Data format	even or no parity,
Address	1 to 247 (default: 01)
Driver input capability	1/8 unit load. Maximum 247 devices on the same bus.
Data refresh time	1sec
Read command	50 words available in 1 read command
Rx/Tx indication	Rx segment on display is shown when a valid Modbus command is sent to that specific meter Tx segment on display is shown when a valid Modbus reply is sent back to the master
M-bus port	M-bus by screw connection.
Function	For communication of measured data
Protocol	M-bus according to EN13757-1
Baud rate	0.3, 2.4, 9.6 kbaud
Meters in the M-bus network	250
Primary address	Selectable
Secondary address	Univocally defined in each unit
Identification number range	from 9000 0000 to 9999 9999
Other	Available functions: wild card, header, initialisation SND_NKE, and req_udr management. Management of primary address modification via M-bus and reset of partial energy via M-bus available. VIF, VIFE, DIF and DIFE: see protocoll
Static output	
Purpose	For pulse output proportional to the active energy (kWh)
Pulse rate	Selectable in multiple of 100 Max 500 or 1500 kWh according to pulse ON duration

CARLO GAVAZZI

Output specifications (cont.)

Pulse ON duration	Selectable: 30ms or 100 ms according to EN62052-31	Load	V_{ON} 1 V dc max. 100mA V_{OFF} 80 V dc max.
Output type	Open collector PNP		

General specifications

Operating temperature	-25 to +65 °C (-13 to 149° F), indoor, (R.H. from 0 to 90% non-condensing @ 40°C)
Storage temperature	-30°C to +80°C (-22 to 176° F) (R.H. < 90% non condensing @ 40°C)
Overvoltage category	Cat. III
Insulation (for 1 minute)	4000 V ac RMS between measuring inputs and digital/serial output (see table) 4000 V ac RMS
Dielectric strength	4000 V ac RMS for 1 minute
EMC	According to EN62052-11
Electrostatic discharges	15kV air discharge;
Immunity to irradiated electromagnetic fields	Test with current: 10V/m from 80 to 2000MHz;
Electromagnetic fields	Test without any current: 30V/m from 80 to 2000MHz;
Burst	On current and voltage measuring inputs circuit: 4kV
Immunity to conducted disturbances	10V/m from 150KHz to 80MHz
Surge	On current and voltage measuring inputs circuit: 4kV;
Radio frequency	According to CISPR 22
Standard compliance	
Safety	EN62052-11
Metrology	EN62053-21, EN50470-3
Approvals	CE, MID (PF option only)
Connections	
Cable cross-section area	Voltage inputs: max. 4 mm^2, min. 1 mm^2 with/ without metallic cable ferrule; Max. screw tightening torque: 0.6 Nm
Other terminals	1.5 mm^2, Min./Max. screws tightening torque: 0.4 Nm
Housing	
Dimensions (WxHxD)	54 x 90 x 63 mm
Material	Noryl, self-extinguishing: UL 94 V-0
Sealing covers	Included
Mounting	DIN-rail
Protection degree	
Front	IP51
Screw terminals	IP20
Weight	Approx. 240 g (packing included)

Power supply specifications

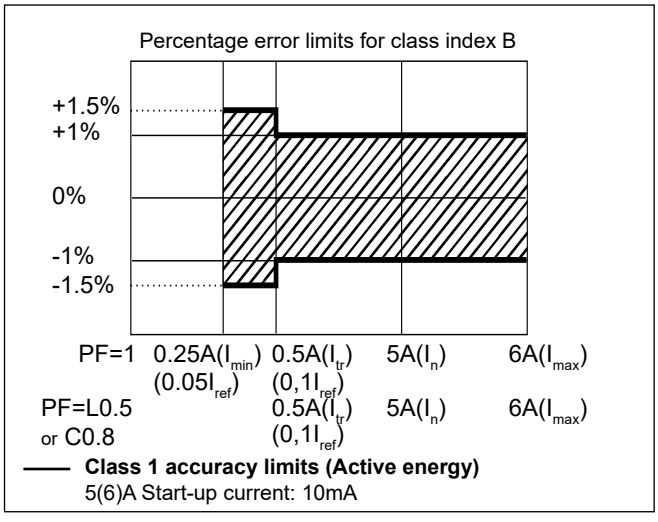
Auxiliary power supply	H: 90 to 260 V ac/dc	**Power consumption**	≤ 1W, ≤ 10VA

Insulation (for 1 minute) between inputs and outputs

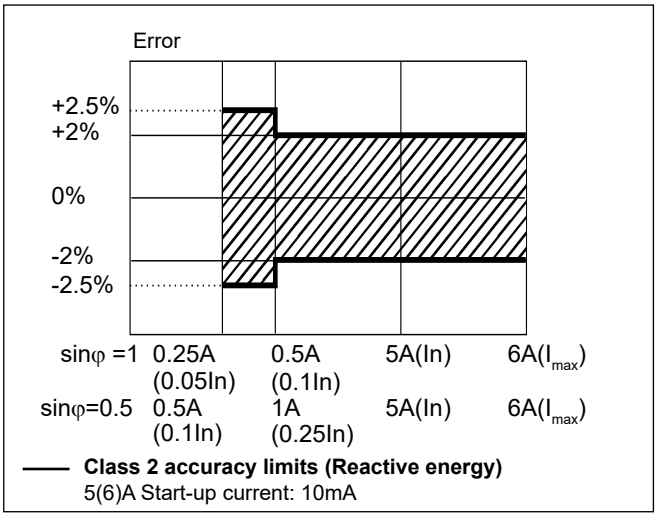
	Measuring input	Digital or serial output	Digital input
Measuring input	-	4 kV	4 kV
Digital or serial output	4 kV	-	0 kV
Digital input	4 kV	0 kV	-

Accuracy (according to EN50470-3 and EN62053-23)

kWh, accuracy (RDG) depending on the current



kvarh, accuracy (RDG) depending on the current



CARLO GAVAZZI

Display pages

1st row	2nd row	3rd row	"Full" mode	"Easy" mode	Note
kWh+ (imported)		kW system	X	X	In case of Measurement set to "A", total energy without considering the current direction.
kWh- (exported)		kW system	X	X	Only with Measurement set to "B"
kWh+ (imported)		V L-L system	X	X	
kWh+ (imported)		V L-N system	X	X	
kWh+ (imported)		PF system	X		
kWh+ (imported)		Hz	X		
kvarh+ (imported)		Kvar system	X	X	In case of Measurement set to "A": total positive reactive energy without considering the current direction.
kvarh- (exported)		Kvar system	X	X	Only with Measurement set to "B"
kWh+ (imported)		kVA system	X		
kWh+ (imported)	kWdmd peak	kWdmd	X		
kWh (t1)	"t1"	kW system	X	X	Only relevant to kWh+, with Tariff menu set to ON.
kWh (t2)	"t2"	kW system	X	X	Only relevant to kWh+, with Tariff menu set to ON.
kWh L1	kWh L2	kWh L3	X		In case of Measurement set to "A", total energy without considering the current direction. In case of Measurement set to "B", only imported energy.
kVA L1	kVA L2	kVA L3	X		
kvar L1	kvar L2	kvar L3	X		
PF L1	PF L2	PF L3	X		
V L1-N	V L2-N	V L3-N	X		
V L1-2	V L2-3	V L3-1	X		
run hour meter		An	X		
A L1	A L2	A L3	X	X	
kW L1	kW L2	kW L3	X		

X= available

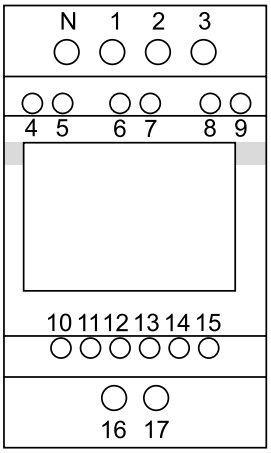
CARLO GAVAZZI

Additional available information on the display

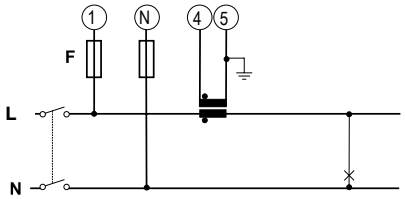
Page	Display	Description
Info 1	YEAr (2015)	Year of production
Info 2	SErIAL n (dddnnnA)	Serial number (ddd= day of the year; nnn=progressive number; A= production line, internal use only)
Info 3	rEVISIon (A.01)	Firmware revision
Info 4	PuLS LEd	Pulse rate of front LED (pulse/kWh)
P3	SYStEM	System type
P4	CT ratio	current transformer ratio
P5	VT ratio	voltage transformer ratio
P6	MEASurE (only X option)	Measurement type
P7	InStALL	Wrong connection detection function
P8	P Int	Integration time for Wdmd calculation
P9	ModE	Set of variables on display
P10	tArIFF	Tariff enabling (and current tariff if enabled)
P11	HoME (only X option)	Selected home page
P12-1	PuLSE (O1 option)	Selection of pulse ON duration of output
P12-2	PuLrAtE (O1 option)	Selection of the pulse rate of output
P13	Prl Add (M1 option)	M-bus primary address
P14	AddrESS (S1 option)	Modbus serial address
P15	bAud (M1 or S1)	M-bus or Modbus baud rate
P16-1	PArItY (S1)	Modbus parity
P16-2	StoP bIt (S1)	Stop bit (in case of No parity only)
Info 5	Secondary address (M1)	M-bus secondary address

CARLO GAVAZZI

Wiring diagrams

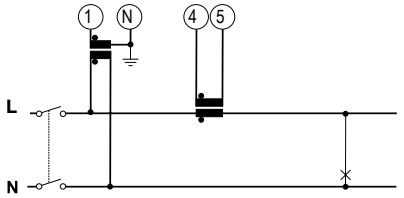


1-ph, 2-wire **Fig.1**



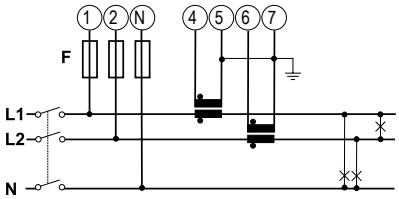
1-CT connection

1-ph, 2-wire **Fig.2**



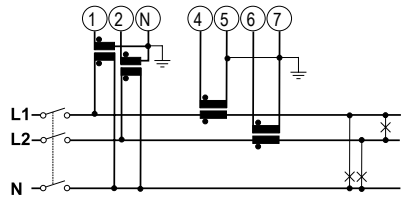
1-CT and 1-VT connections

2-ph, 3-wire **Fig.3**



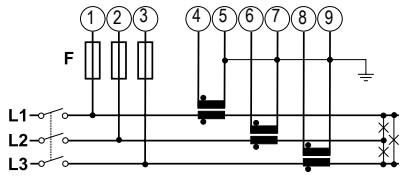
2-CT connection

2-ph, 3-wire **Fig.4**



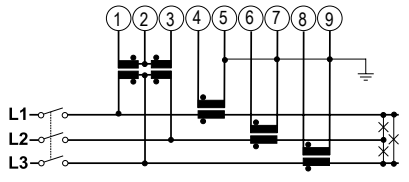
2-CT and 2-VT/PT connections

3-ph, 3-wire, unbalanced load **Fig.5**



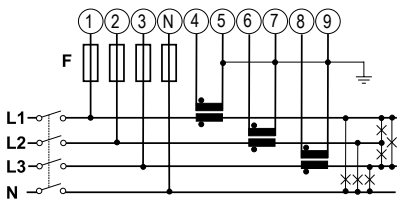
3-CT connection

3-ph, 3-wire, unbalanced load **Fig.6**



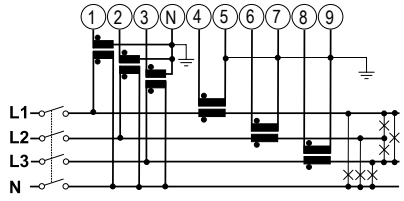
3-CT and 2-VT/PT connections

3-ph, 4-wire, unbalanced load **Fig.7**



3-CT connection

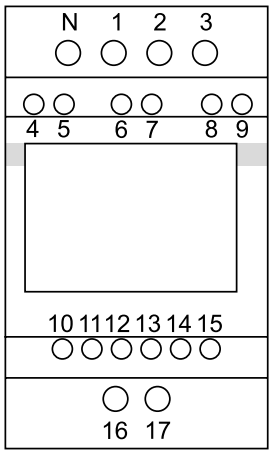
3-ph, 4-wire, unbalanced load **Fig.8**



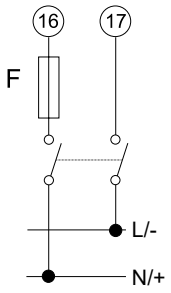
3-CT and 3-VT/PT connections

CARLO GAVAZZI

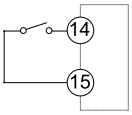
Wiring diagrams (cont.)



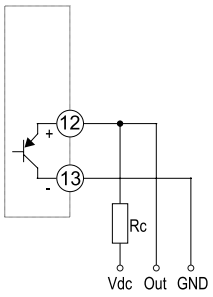
Power supply **Fig.9**



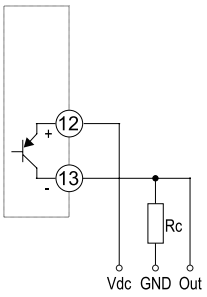
Digital Input **Fig.10**



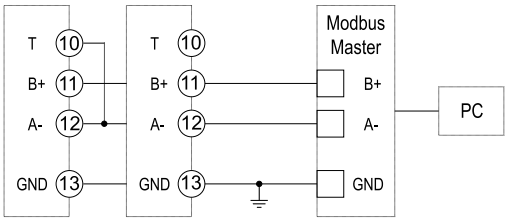
Pulse output **Fig.11**



Pulse output **Fig.12**

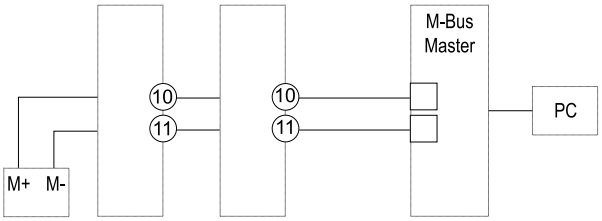


RS485 Modbus communication port **Fig.13**

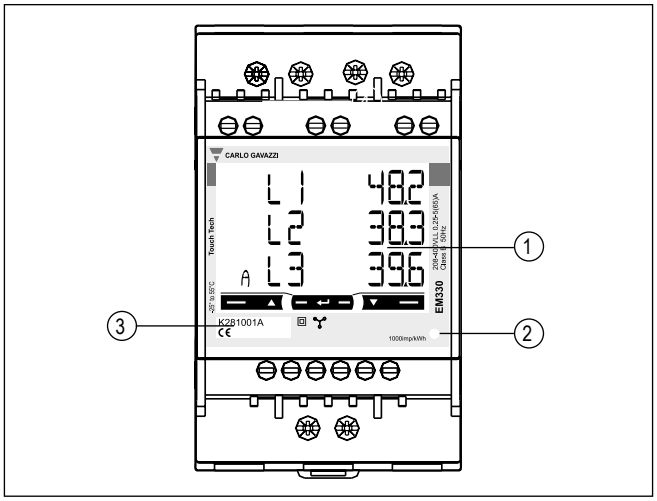


Additional instruments with RS485 are connected in parallel. The serial output must only be terminated on the last network device connecting terminals A- and T. For connections longer than 1000 m use a signal repeater. Maximum 247 transceivers on the same bus.

M-Bus communication port **Fig.14**



Front panel description



1. **Display**
   Backlit LCD display with touch key-pad.

2. **LED**
   LED proportional to kWh reading

3. **Serial number**
   Area reserved to serial number and MID-relevant data in PF versions

Dimensions