Energy Management
Energy Meter
Type EM33 DIN

- **Easy connections management**
- **Certified according to MID Directive (option PF only): see “how to order” below**
- **Other version available (not certified, option X): see “how to order” on the next page**

- **Class 1 (kWh) according to EN62053-21**
- **Class B (kWh) according to EN50470-1-3**
- **Accuracy ±0.5% RDG (current/voltage)**
- **Three –phase energy meter**
- **Instantaneous variables readout: 3 DGT**
- **Energies readout: 7 DGT**
- **System variables: W, phase-sequence.**
- **Single phase variables: A, V**
- **Energy measurements: total kWh**
- **TRMS measurements of distorted sine waves (voltages/currents)**
- **Direct connection up to 32A**
- **RS485 serial communication port (MODBUS-RTU), iFIX SCADA compatibility**
- **Self power supply**
- **Dimensions: 4-DIN modules**
- **Protection degree (front): IP50**
- **Certified according to MID Directive, Annex "B"+ Annex “D” for legal metrology relevant to active electrical energy meters (see Annex MI-003), see option “PF” below.**

Product Description

Three-phase energy meter with built-in configuration joystick and LCD data displaying; particularly indicated for active energy metering and for cost allocation. Housing for DIN-rail mounting with IP50 (front) protection degree. Direct connection up to 32A, moreover the meter is provided with serial communication port.

MID Certified according to MID Directive, Annex "B" + Annex "D" for legal metrology relevant to active electrical energy meter (see Annex MI-003 of MID). Can be used for fiscal (legal) metrology.

How to order

EM33 DIN AV3 3 X XS PF

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

Type Selection

Range codes

AV3: 400VLL AC - 5(32)A (direct connection) VLN : 184V to 276VLN VLL : 318V to 480VLL

System

3: unbalanced load: 3-phase, 4-wire

Power supply

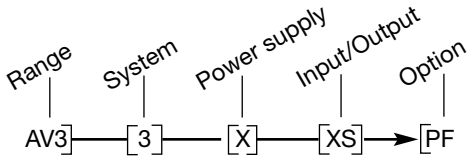
X: Self power supply -15% +20% of the rated measuring input voltage, 45 to 65 Hz

Output

XS: RS485 port

Options

PF: Certified according to MID Directive, Annex "B" + Annex "D" for legal metrology relevant to active electrical energy meter (see Annex MI-003 of MID). Can be used for fiscal (legal) metrology.



NOTE: please check the availability of the needed code on the verification path diagram on left before ordering.

CARLO GAVAZZI

STANDARD

Not certified according to MID directive. Cannot be used for fiscal (legal) metering.

How to order EM33 DIN AV3 3 X XS X

Model
Range code
System
Power supply
Output
Option

Type Selection

Range codes

AV3: 400VLL AC - 5(32)A (direct connection) VLN : 184V to 276VLN VLL : 318V to 480VLL

System

3: unbalanced load: 3-phase, 4-wire

Power supply

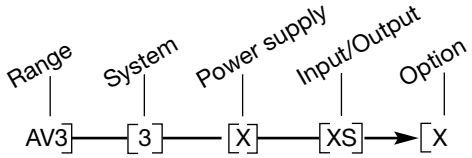
X: Self power supply -15% +20% of the rated measuring input voltage, 45 to 65 Hz

Output

XS: RS485 port

Options

X: None



NOTE: please check the availability of the needed code on the verification path diagram on left before order .

Input specifications

Rated inputs	
System type	3 phase, unbalanced
Current type	By direct connection
Voltage	230 VLN/400 VLL AC
Current	5(32)AAC
Accuracy (Display + RS485) (@25°C ±5°C, R.H. ≤60%, 45 to 65 Hz)	Ib: see below, Un: see below
Ranges	Ib: 5A, Imax: 32A, 0.1 Ib: 0,5A 196 to 265VLN (340 to 460VLL)
Current	From 0.004Ib to 0.2Ib: ±(0.5% RDG +3DGT) From 0.2Ib to Imax: ±(0.5% RDG +1DGT).
Start up current	20mA
Phase-neutral voltage	In the range Un: ±(0,5% RDG +1DGT)
Active power	±(1%RDG +2DGT)
Active energy	Class 1 according to EN62053-21. Class B (kWh) according to EN50470-3
Energy additional errors	
Influence quantities	According to EN62053-21 and EN50470-1-2
Temperature drift	≤ 200ppm/°C
Sampling rate	1600 samples/s @ 50Hz; 1900 samples/s @ 60Hz

Input specifications (cont.)

Display refresh time	750 msec.
Display	2 lines (1 x 7 DGT; 2 x 3 DGT)
Type	LCD, h 9mm
Instantaneous variables read-out	3 DGT
Energy	Imported Total: 5+2, 6+1 or 7DGT
Overload status	EEE indication when the value being measured is exceeding the "Continuous inputs overload" (maximum measurement capacity)
Max. and Min. indication	Max. instantaneous variables: 999; energies: 9 999 999. Min. instantaneous variables: 0; energies 0.00
LEDs	Red LED (Energy consumption), 0.001 kWh by pulse Max frequency: 16Hz according to EN50470-1
Measurements	See "List of the variables that can be displayed and transmitted by means of RS485"
Method	TRMS measurements of distorted wave forms.
Coupling type	Direct
Crest factor	Ib 5A ≤4 (45A max. peak)

Current Overloads	
Continuous	32A, @ 50Hz
For 10ms	960A max, @ 50Hz
Voltage Overloads	
Continuous	265VLN
For 500ms	275VLN
Input impedance	
Voltage	Refer to "Power Consumption"
Current	< 4VA
Frequency	45 to 65 Hz
Joystick	For variable selection and serial communication address/speed programming

RS485 communication port

Type	Multidrop, bidirectional (static and dynamic variables)
Connections	2-wire max. distance 1000m
Addresses	247, selectable by means of the front joystick
Protocol	MODBUS/JBUS (RTU)
Data (bidirectional)	
Dynamic (reading only)	System and phase variables: see table "List of variables..."
Static (reading and writing)	Communication address and baud-rate parameters.
Static (reading only)	Serial number, year of production and firmware revision
Data format	1 start bit, 8 data bit, no parity,1 stop bit
Baud-rate	4800, 9600 bits/s
Driver input capability	1/5 unit load. Maximum 160 transceivers on the same bus.
Insulation	By means of optocouplers, 4000 VRMS output to measuring input

Software functions

System selection	
System 3-Phase unbalanced load	3-phase (4-wire);
Displaying	Up to 3 variables per page. See “Display pages”
Easy connection function	Automatic phase sequence detection with current and voltage synchronisation.

Both energy and power measurements are independent on the current direction. The total energy is displayed as “imported”.

General specifications

Operating temperature	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C) according to EN62053-21, EN62053-23 and EN50470-1
Storage temperature	-30°C to +70°C (-22°F to 158°F) (R.H. < 90% non-condensing @ 40°C) according to EN62053-21, EN62053-23 and EN50470-1
Installation category	Cat. III (IEC60664, EN60664)
Insulation (for 1 minute)	4000 VRMS between measuring inputs and RS485
Dielectric strength	4000 VRMS for 1 minute
Noise rejection CMRR	100 dB, 48 to 62 Hz
EMC	According to EN62052-11
Electrostatic discharges	15kV air discharge;
Immunity to irradiated electromagnetic fields	Test with current: 10V/m from 80 to 2000MHz; 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 suppression	According to CISPR 22

Standard compliance	
Safety	IEC60664, IEC61010-1 EN60664, EN61010-1 EN62052-11, EN50470-1
Metrology	EN62053-21, EN50470-3, MID “annex MI-003”
Approvals	CE, MID (PF option only)
Connections	Screw-type
Cable cross-section area	Measuring inputs: max. 16 mm^2, min. 2.5 mm^2 (by cable lug); Min./Max. screws tightening torque: 1.7 Nm / 3 Nm Output terminals: 1.5 mm^2 Min./Max. screws tightening torque: 0.4 Nm / 0.8 Nm
Housing DIN	
Dimensions (WxHxD)	71 x 90 x 64.5 mm
Material	Nylon PA66, self-extinguishing: UL 94 V-0
Mounting	DIN-rail
Protection degree	
Front	IP50
Screw terminals	IP20
Weight	Approx. 400 g (packing included)

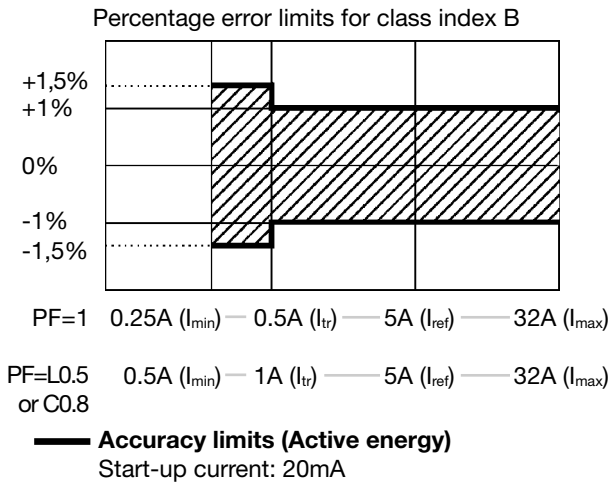
Power supply specifications

Self supplied version	
Range	230VLN -15% +15%, 45-65Hz.
Note	The instrument works only if all the voltage inputs are connected (3-phase and neutral).

Power consumption	≤12VA/2W

Accuracy (according to EN50470-3)

kWh, accuracy (RDG) depending on the current



MID "Annex MI-003" compliance (PF option only)

Accuracy	0.9 Un ≤ U ≤ 1.1 Un; 0.98 fn ≤ f ≤ 1.02 fn; fn: 50 or 60Hz; cosφ: 0.5 inductive to 0.8 capacitive. Class B I st: 0.02A; I min: 0.25A; I tr: 0.5A; I max: 32A.
Operating temperature	-25°C to +55°C (-13°F to 131°F) (R.H. from 0 to 90% non-condensing @ 40°C)

EMC compliance	E2
Mechanical compliance	M2
Protection degree	in order to achieve the protection against dust and water required by the norms harmonized to MID, the meter must be used only installed in IP51 (or better) cabinets.

Used calculation formulas

Phase variables

Instantaneous effective voltage

$$V_{1N} = \sqrt{\frac{1}{n} \cdot \sum_{1}^{n} (V_{1N})_i^2}$$

Instantaneous active power

$$W_1 = \frac{1}{n} \cdot \sum_{1}^{n} (V_{1N})_i \cdot (A_1)_i$$

Instantaneous effective current

$$A_1 = \sqrt{\frac{1}{n} \cdot \sum_{1}^{n} (A_1)_i^2}$$

System variables

Three-phase active power

$$W_\Sigma = W_1 + W_2 + W_3$$

Energy metering

$$kWhi = \int_{i1}^{t2} Pi(t)dt \cong \Delta t \sum_{n1}^{n2} Pnj$$

Where:

i= considered phase (L1, L2 or L3)
P= active power; **Q**= reactive power;
$\mathbf{t_1}$, $\mathbf{t_2}$ =starting and ending time points of consumption recording; **n**= time unit;Δ**t**= time interval between two successive power consumptions;
$\mathbf{n_1}$, $\mathbf{n_2}$ = starting and ending discrete time points of consumption recording

List of the available variables

List of variables that can be displayed and transmitted by means of RS485

No	Variable	3-ph. 4-wire unbalanced system	Notes
1	A L1	x	
2	A L2	x	
3	A L3	x	
4	V L1N	x	
5	V L2N	x	
6	V L3N	x	
7	W sys	x	sys=system
8	kWh	x	Total
9	Phase seq.	x	

(x) = available

Display pages

Display variables in 3-phase systems with neutral

No	1st line	2nd line	Phase Sequence	Notes
1	Total kWh	kW sys	Warning triangle if reverse sequence	Joystick position: Up
2	A L1 - A L2	A L3	Warning triangle if reverse sequence	Joystick position: Down
3	V L1N - V L2N	V L3N	Warning triangle if reverse sequence	Joystick position: Left
4	Information	Information		Joystick position: Right

Note: whatever page the user has selected, after 60s it goes back to page 1.

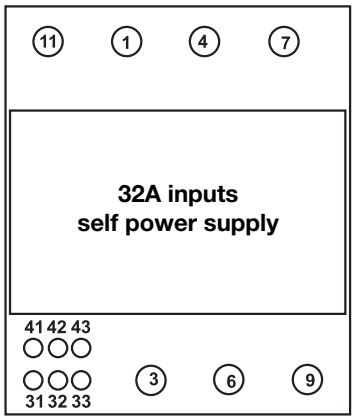
Additional available information on the display

Type	1st line	2nd line	Note
Meter information 1	Serial number (1234567)	Sn (text)	Available also on the RS485
Meter information 2	Year of production (Yr 2009)	Firmware revision (A.00)	Available also on the RS485
Meter information 3	Serial communication Address (Adr 1)	Communication speed (4.8 or 9.6)	Available also on the RS485

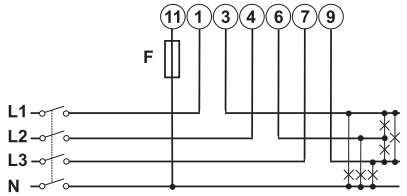
Insulation between inputs and outputs

	Measuring Inputs	Communication port	Self power supply
Measuring Inputs	-	4kV	0kV
Communication port	4kV	-	4kV
Self power supply	0kV	4kV	-

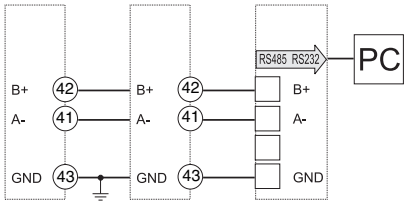
Wiring diagrams



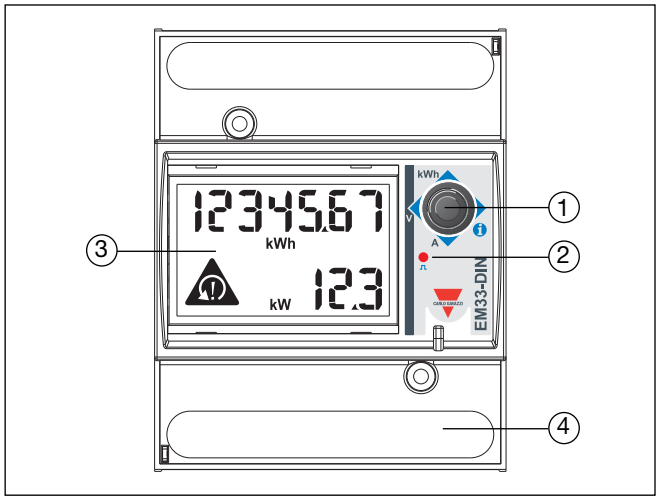
3-ph, 4-wire, unbalanced load **Fig.1**



RS485 port **Fig. 2**



Front panel description



1. **Joystick**
   To scroll the variables on the display, to access to the information pages and to program the needed parameters.

2. **LED**
   Red LED blinking proportional to the energy being measured.

3. **Display**
   LCD-type with alphanumeric indications to display all the measured variables.

4. **Connections**
   Screw terminal blocks for instrument wiring.

Dimensions