

Energy Meter Manual

EM24 Ethernet

rev 05 - 08/2023

This manual is also available in [HTML5](#)

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1. Introduction

The Victron EM24 Ethernet is a standard device to measure the power and energy of a 3-phase application, for example at the distribution box or to measure the output of a PV Inverter, AC Genset or the output of an inverter and inverter/charger.

Its data will be displayed on a GX device and our VRM portal.

1.1. Features

The EM24 Ethernet can be configured for four different roles in a GX device such as the [Cerbo GX](#):

1. As a Grid meter and used as control input for an ESS System.
2. To measure the output of a PV Inverter.
3. To measure the output of a AC Genset.
4. As a AC meter to measure the output of an inverter or inverter/charger.

It offers one option for connection to a GX device:

1. A wired ethernet connection to the local network in such a way that the GX device can reach it.

2. Installation and configuration

2.1. AC wiring

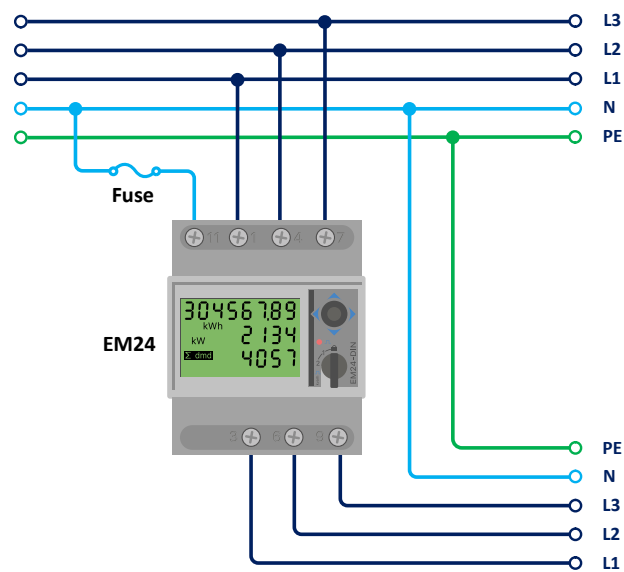
2.1.1. Configuration options

The configuration option of either Grid Meter, PV Inverter, Generator or AC Meter is set in the GX device. For details on GX device configuration see the [GX device configuration \[4\]](#) chapter. This selection will effect how the system should be wired and how the information received from the meter is displayed on the screen.

See below diagrams for the different wiring options:

2.1.2. System examples

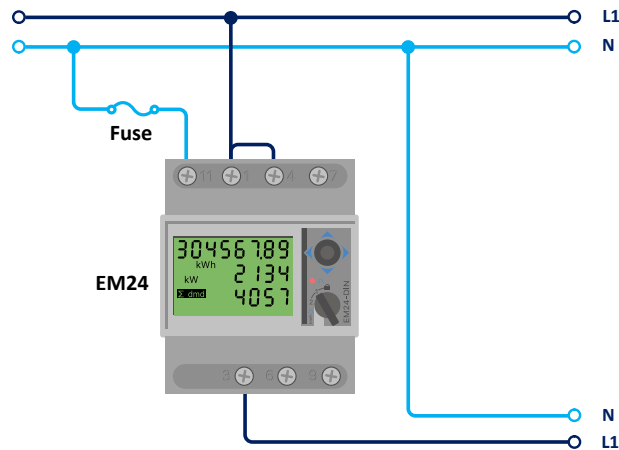
Example diagrams



EM24 3-phase wiring



When used to measure a PV Inverter, terminals 1, 4 and 7 should face the PV inverter to ensure correct direction of current and power.

Single-phase, single function

EM24 connected as a single-phase, single function grid meter

Note the jumper between terminals 1 and 4. You do not need this connection if you have the version AV2 of the sensor.

The diagrams show the wiring when used as a grid meter.

To measure a single-phase PV inverter in a 3-phase system, connect all 3 phases to the grid phasing terminals (3, 6 and 9). Now you can choose on which phase you want the PV inverter by connecting the L1 line of the PV inverter to terminal 1, 4 or 7.

Single-phase, dual function

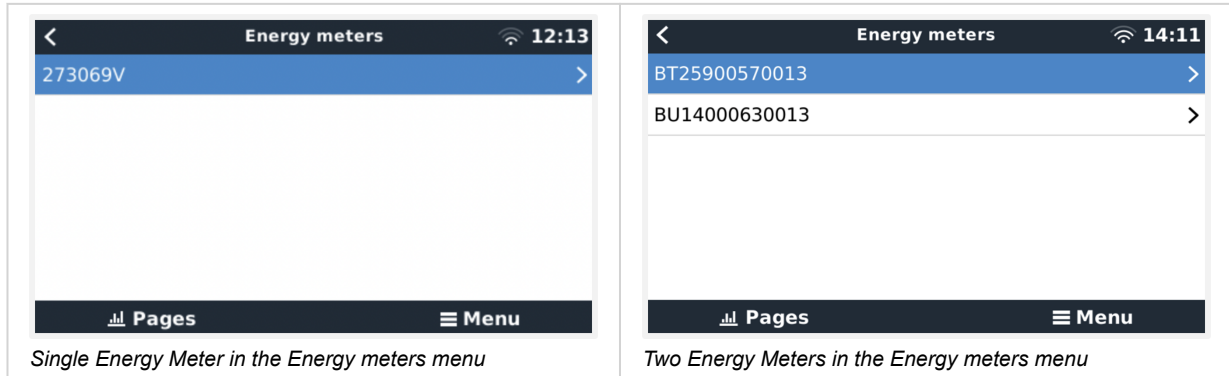
If you want to use a three-phase meter in a single-phase installation to measure the grid on one input of the meter and the output of the PV inverter on another input of the energy meter, make sure that the energy meter uses L1 and the PV inverter uses L2.

Front selector

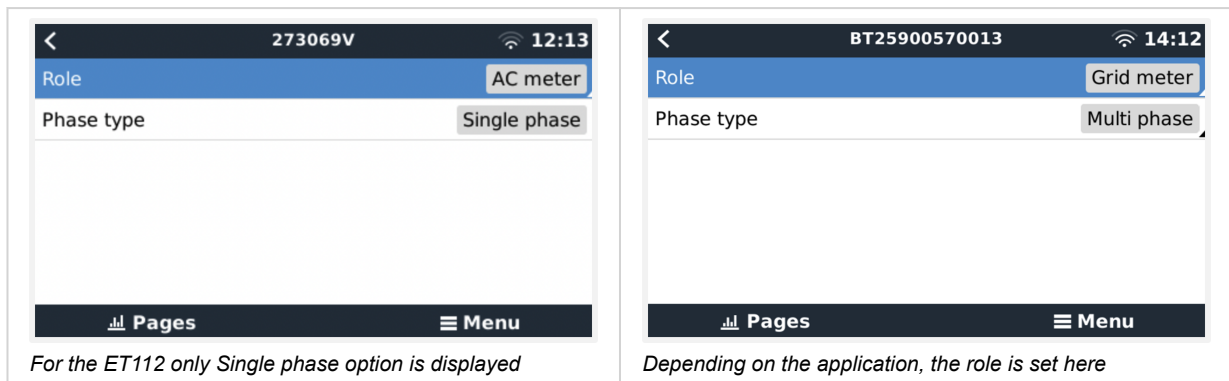
Change the front selector so it is not in the locked state. This allows it to be automatically configured by the GX Device. The front selector is located next to the display as indicated in the image above.

2.2. GX device configuration

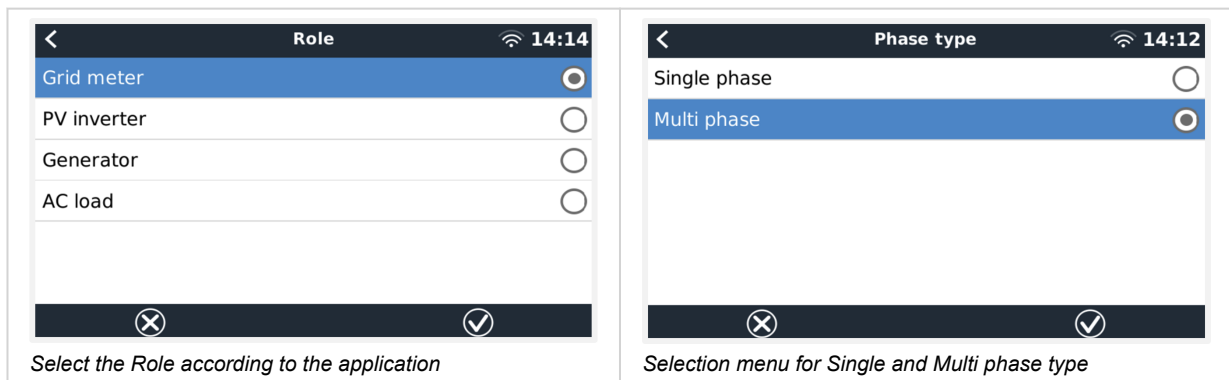
After proper connection and powering up, the meter(s) will be visible on the GX device in the Settings → Energy meters menu:



After selecting an Energy Meter, you have to set the Role and Phase type. Press the space bar or right click to get to the Phase type and Role menu:



Select either Role or Phase type and press the space bar to make changes:



Single-phase, single function and single-phase, dual function mode setup:

Role: PV inverter
Position: AC Input 1
Phase type: Single phase

Pages Menu

Single-phase, single function

Role: Grid meter
Phase type: Single phase
PV inverter on phase 2:
PV inverter on phase 2 Position: AC Input 1

Pages Menu

Single-phase, dual function to measure grid on L1 and a PV Inverter on L2

After all settings have been made, the Energy Meter now appears with the relevant data in the device list of the GX device:

AC load	72W
BlueSolar Charger MPPT 150/35 rev2	77W
Flur	22°C 52%
Lithium Smart 330Ah	65% 13.33V -0.4A
MultiPlus 12/1600/70-16	Inverting
PSC IP43 12 50...HQ2007P5YSI	Off

Pages Menu

Energy meter set to measure AC loads on the AC output of the inverter/charger

Fronius Symo 3.0-3-M	845W
Grid meter	-1097W
MultiPlus-II 48/3000/35-32	Float
SmartBMV	99% 54.15V 1.6A
SmartSolar MPPT VE.Can 150/70	612W
Systemtemperatur	32°C

Pages Menu

Or configured to measure energy consumption from the grid

Right-click or press the spacebar to get to the Energy Meter overview with all relevant data on energy consumption and its generation in all phases. At the bottom of the menu, the role of the Energy Meter can be set via the Setup menu. The data used for communication can be read out via the Device menu. You can also set up a custom name for the Energy Meter there:

AC Phase L1	237V	-1.8A	-388W
AC Phase L2	237V	-1.9A	-427W
AC Phase L3	238V	-1.6A	-338W
AC Totals		-5.4A	-1153W
			5606.4kWh

Pages Menu

Detailed overview page of a 3-phase Grid meter

Energy L1	1843.8kWh
Energy L2	2428.1kWh
Energy L3	2251.0kWh
Phase Sequence	L1-L2-L3
Setup	>
Device	>

Pages Menu

Always be informed about all details, to the second

Connected: Yes
Connection: /dev/ttyUSB0
Product: Grid meter
Name:
Product ID: b002
Firmware version: 3

Pages Menu

Custom name configuration

Role: Grid meter

Pages Menu

Quickly change roles

3. FAQ

Q1: Can I combine three ET112s for a 3-phase system?

No. Use a real 3-phase meter.

Q2: Can I use other meters, for example from other brands?

No.

Q3: I already have a Fronius SmartGrid meter, can I use that?

No.

Q4: What are the differences between the various 3-phase meters?

- EM540 - REL200100100 - Carlo Gavazzi EM540DINAV23XS1X
- ET112 - REL300100000 - Carlo Gavazzi ET112-DIN.AV01.X.S1.X
- ET340 - REL300300000 - Carlo Gavazzi ET340-DIN.AV23.X.S1.X

Differences:

- The ET meters have no display. The only thing they have is an LED, which blinks in case of active communication.
- The ET meters have two RJ45 sockets, but they are not used with the Victron RS485 to USB interface. Note the possible confusion because of yet another RJ45 socket in the Victron world though. Don't mix that with VE.Bus, VE.Can or VE.net. Besides the RJ45 sockets, the meters still also have screw terminals access below the sockets for the RS485 wiring, which is how we advise to connect a meter to the [RS485 to USB interface](#) and then a GX device.
- Since there is no display, the modbus address can no longer be changed on the meter. Combining multiple of those meters on one RS485 network is therefore not supported by Victron. You are advised to use multiple RS485 to USB interfaces.

3-phase meter only:

- Measuring energy from single-phase PV Inverter on the second phase of a 3-phase meter actually works.

Q5: Will you keep shipping both 3-phase meters? (ET340 & EM540)

Yes. There are still situations suitable for each. See Q8.

Q6: Can I buy those meters directly from Carlo Gavazzi instead of from you?

Yes. That is also why we make no secret of the CG part numbers.

Q7: I want to use Current Transformers (CTs), is that possible?

Yes. You can buy a CG EM24DINAV53DISX or a CG EM530DINAV53XS1X directly from Carlo Gavazzi or one of their distributors. Even though Victron does not stock that type of meter, we do support it in our software.

Q8: What's the difference between ET340 and EM540 in 3-phase systems?

These meters have a different way of calculating the total of energy imported and exported.

In the ET340, the energy imported and exported is counted at each individual phase and then the Total is provided from the sum of those values.

In the EM540, the energy imported and exported is counted as a total power, with net differential readings from each phase cancelling each other out.

Which Energy Meter is most suitable depends on the measuring configuration in your country. It is most common in Austria and Germany for example to only be billed for the total in a 3-phase system. So it is more accurate to use an EM540 to match the billing.

So if you are exporting from one phase and importing from another phase after the energy meter, but before the billing meter, then you will not be charged for this, and the meter should not count it as an import and an export.

This is also how Victron's phase compensation feature works, to make the most of the cost savings for an ESS system when there is a differential in generation and load across different phases.

Q9: Can I use an isolated USB-RS485 interface?

Yes. The interfaces we sell are non isolated; suitable for most use cases.

In case an isolated one is needed; purchase it directly from [Hjelmslund Electronics](#).

- USB485-STIXL : Isolated USB to RS485 converter

Q10: Can I use Victron Energy Meters instead of a Victron Inverter/Charger to make use of a GX device (e.g. Cerbo GX), VRM and other features?

Energy Meters are intended to supplement a Victron Inverter/Charger in the system. Energy Meters are currently limited in their potential applications. Each Energy Meter is only intended to provide a specific piece of additional information - total loads on AC input and grid import/export, or AC PV inverter and AC generator production without network communications.

However, it is perfectly possible to initially use just a GX device together with an Energy Meter to determine and record the consumption, for example of houses/buildings, heating systems with heat pumps, ventilating and air conditioning or production facilities. Afterwards, the collected data can be evaluated and a decision can be made about the dimensioning of the required Victron inverter/charger(s), the solar system and the type, size and number of batteries.

With GX device firmware version 2.80 and later, they can also be used for other purposes e.g. to measure specific, arbitrary AC loads or circuits for example. But this should not be considered a replacement to having a Victron Inverter/Charger. Attempting to use other brand battery inverters and trying to substitute their lack of data connectivity to the GX device by using Energy Meters will not work as expected.