

Energy Meter Manual

EM24 Ethernet

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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 energy meter can be configured for four different roles in a GX device (e.g. [Cerbo GX](#)):

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





The EM24 Ethernet offers one option for connection to a GX device:

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

2. Selection Guide

At Victron Energy, we stock several types of Energy Meters.

The Energy Meters are used in systems with a [GX device](#) to measure the output of a PV inverter, AC Genset, Inverter output or as a Grid Meter in an ESS installation (more information in the [ESS manual](#)).

Energy Meter	ET112	ET340	EM24 RS485	EM24 Ethernet
Appearance				
Display	No		LCD	
Part Number	REL300100000	REL300300000	REL200100000	REL200200100
Supported Phases	1-phase	3-phase		
Maximum Current Rating	100A	65A per phase		
Measurement Type	Shunt			
Data Connection	RS485			Ethernet

First decide if you need single- or three-phase meters

For a 3-phase utility connection, use a 3-phase meter. For a 3-phase PV Inverter, use a 3-phase meter as well. For a single-phase utility connection, use a single-phase meter. And in an installation with a single-phase utility connection, that also has a PV Inverter that needs measuring with a Victron meter, then you can use two ET112, one for the grid and one for the PV Inverter; or use the ET340.

Now, based on current, select the model:

Requirement	Measurement Type	Model / Solution
Single-phase up to 100A	Shunt	ET112
Three-phase up to 65A/phase	Shunt	ET340 / EM24
Single-phase more than 100A/phase	CT	Not available, use the three-phase CT solution
Three-phase more than 65A/phase	CTs	Carlo Gavazzi EM24DINAV53DISX (see FAQ Q7 [8])

The EM24 meter counts energy in a different way than the ET340. For Germany and most other countries; the EM24 is the advised model. See [FAQ Q4 and Q8 \[8\]](#) for further details regarding energy counting differences.

In case of EM24, select between RS485 and Ethernet connection:

The Ethernet model will have an advantage in installations where an Ethernet network is available. Rather than having to pull an RS485 wire between the main AC distribution board and the storage system, the existing Ethernet can be used.

The disadvantage is that this relies on that network functioning properly - in case of issues the storage system will switch to idle mode: passthrough.

Support for other Carlo Gavazzi meters

Besides above listed meters, there are many more meters available from Carlo Gavazzi. Use this list below to see which ones are compatible.

Type	GX firmware supported	Remarks
EM111	Yes	Compatible with ET112
ET111	Yes	Compatible with ET112
EM112	Yes	Compatible with ET112
EM340	No	Does not report exported energy per phase (unlike the ET340)
EM21 72D	No	Does not report exported energy / com protocol not compatible with supported grid meters
EM271	No	Does not report exported energy / com protocol not compatible with supported grid meters
EM530*	Yes	Only X and PFC models
EM540*	Yes	Only X and PFC models

* requires GX firmware 2.90 and higher

3. Installation and configuration

3.1. AC wiring

3.1.1. Configuration options

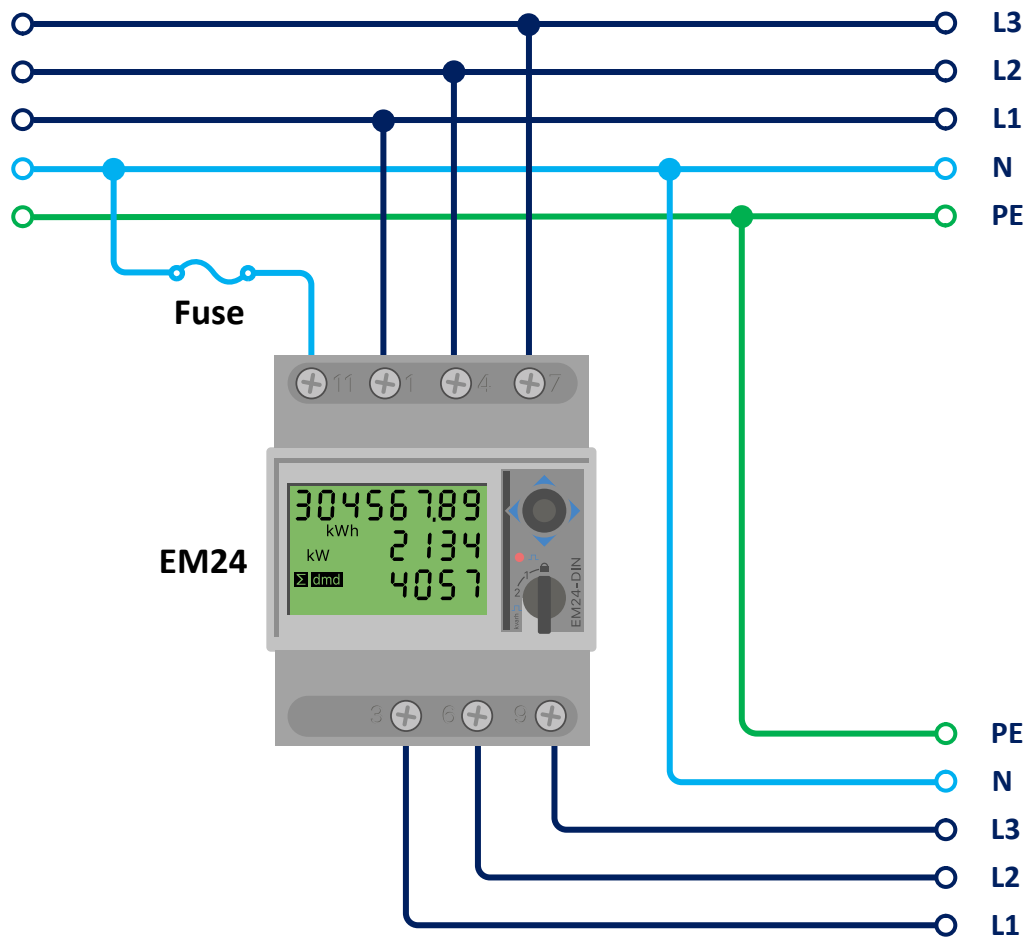
The configuration option of either Grid Meter, PV Inverter, Generator or AC Meter is set in the GX device. That selection will effect how the system should be wired, and how the information received from the meter is displayed on the screen.

See below diagrams for the different wiring options:

3.1.2. System examples

Example diagram

3-phase diagram

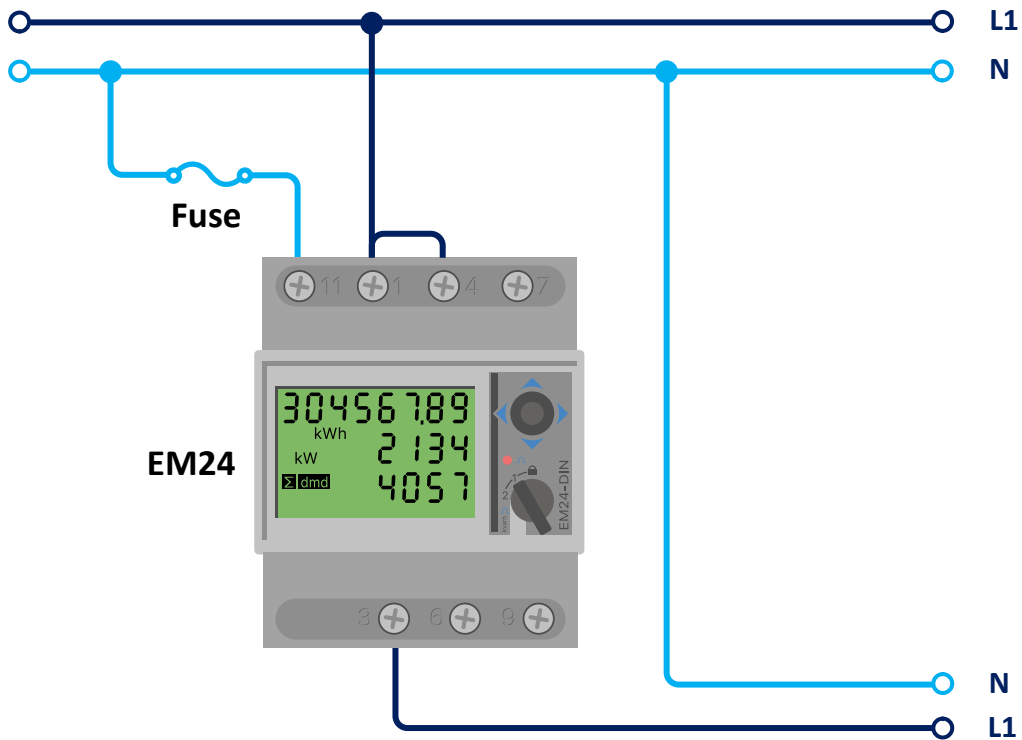


EM24 3-phase wiring



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 diagram shows 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 chose 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

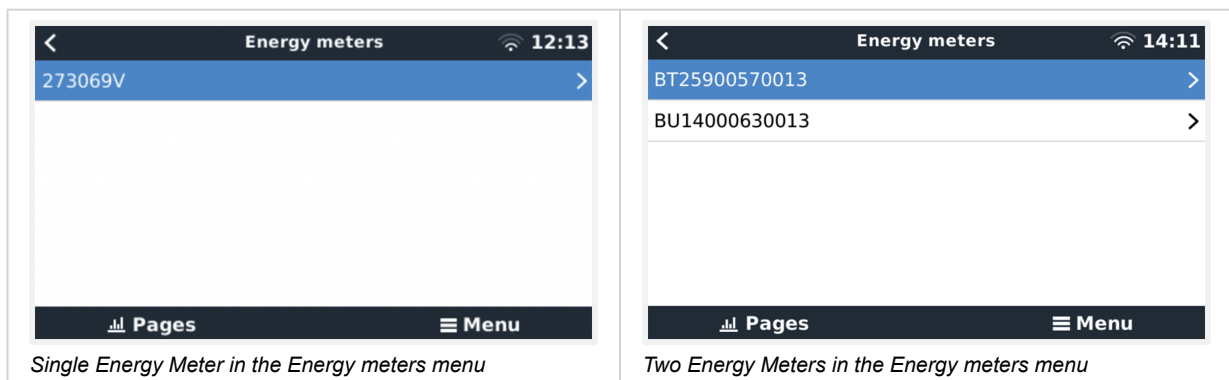
If you are considering using a 3-phase meter in a single-phase installation to measure the grid on one input of the meter and the PV inverter output on another input of the energy meter, use the ET340 instead.

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.

3.2. GX device configuration

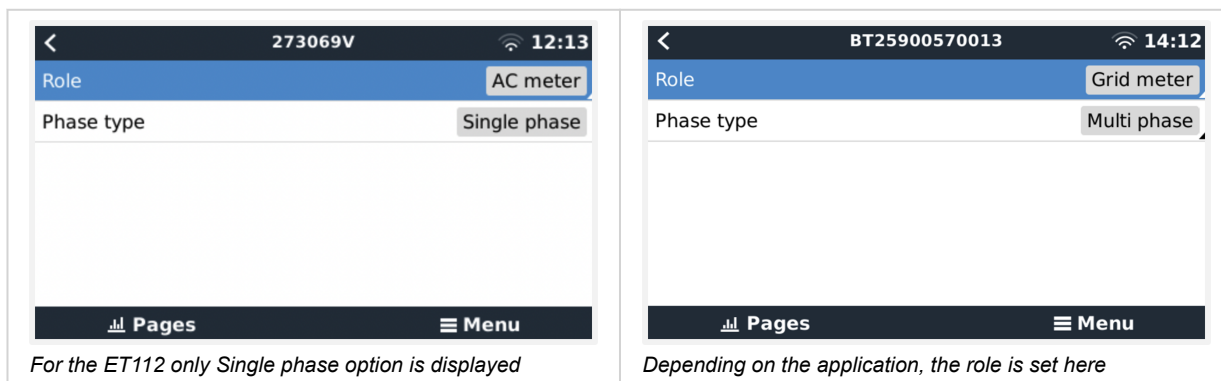
After proper connection and powering up, the meter(s) will be visible on the GX device in the Settings → Energy meters menu:



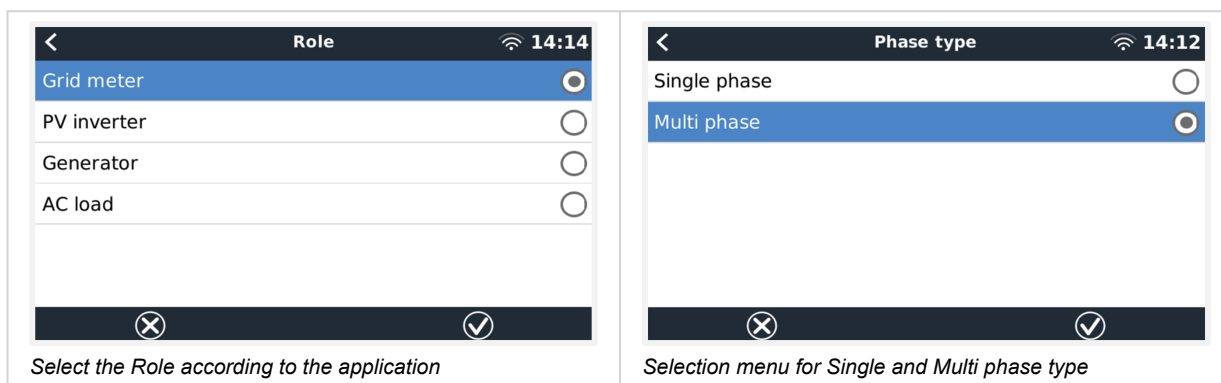
Single Energy Meter in the Energy meters menu

Two Energy Meters in the Energy meters menu

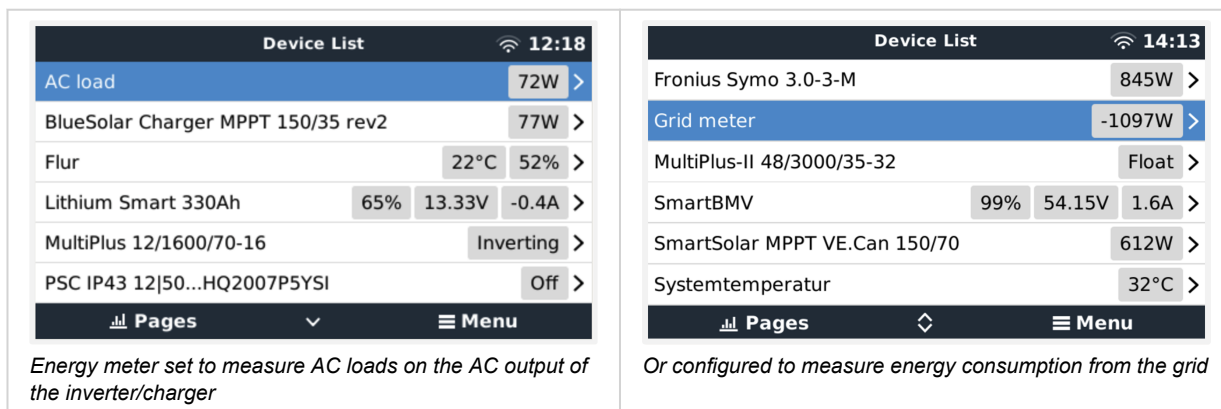
After selecting an Energy Meter, you have to set the Role and Phase type. Press the space bar or right click to get to the Phase type and Role menu:



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



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



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:

Grid meter			
Error Code	No error (0)		
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	

Detailed overview page of a 3-phase Grid meter

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

Always be informed about all details, to the second

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

Custom name configuration

Setup	
Role	Grid meter

Quickly change roles

4. 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?

- EM24 - REL200100000 - Carlo Gavazzi EM24DINAV93XISX
- ET112 - REL300100000 - Carlo Gavazzi ET112-DIN.AV01.X.S1.X
- ET340 - REL300300000 - Carlo Gavazzi ET340-DIN.AV23.X.S1.X

Differences:

- The ET meters don't have a front selector that the installer needs to put in a different setting than it comes out of the box: easier, less mistakes to be made.
- The ET meters have no display. The only thing they have is an LED, which blinks in case of active communication.
- The new meters have two RJ45 sockets for the Modbus RS485 connection. But they are not used. 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 new meter only (ET340):

- Measuring energy from single-phase PV Inverter on the second phase of the new meter, ET340, actually works. Whereas with the old meter, the EM24, only the Power Metering (Watts) works. The Energy Metering (kWh) for a single phase PV Inverter on the second phase of the EM24 does not work. See Q9 for the details.

Q5: Will you keep shipping both 3-phase meters? (ET340 & EM24)

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 the CG EM24DINAV53DISX 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 EM24 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 EM24, 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 Australia and Germany for example to only be billed for the total in a 3-phase system. So it is more accurate to use an EM24 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.