Shelly Pro 3EM

Shelly Pro 3EM (The Device) is a DIN rail mountable three-phase energy meter. Enhanced with all the gen2 firmware flexibility and LAN connectivity, it provides professional integrators with additional options for end customer solutions. It can work standalone in a local LAN and/or Wi-Fi network, or it can also be operated through cloud home automation services through MQTT, HTTP, WebSocket. All of them support TLS.

The Device reports accumulated energy as well as as instantaneous voltage, current and pow factor per phase in real time. It stores data in non-volatile memory that can be retrieved for a

up to 60 days in 1 minute intervals.

The Device has real time clock to keep correct time if connection to an SNTP server is lost.

Shelly Pro 3EM can be accessed, set up and monitored remotely by the User, as well as the Device can access and communicate with automation system, as long as they are in the same network infrastructure.

The Device has an embedded Web Interface which can be used to monitor and control the device, as well as adjust its settings.

Device identification

- Device name: **Shelly Pro 3EM**
- Device model: **SPEM-003CEBEU120**
- Device SSID: **ShellyPro3EM-XXXXXX**

Short description

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⚠**NOTICE!** The Device does not have a built-in relay. Contactor control is provided using a Shelly Pro Addon attached to the Shelly Pro 3EM.

Features

- 4 Quadrant measurement

- DIN rail mounting
- Multiple connection types
- Current transformer connection
- Phase sequence error detection* (option)
- No load threshold**
- Optical pulse indication of energy usage
- Real-time clock
- Data logs
- Accuracy Class B (IEC 62053-21)
- Photovoltaic ready

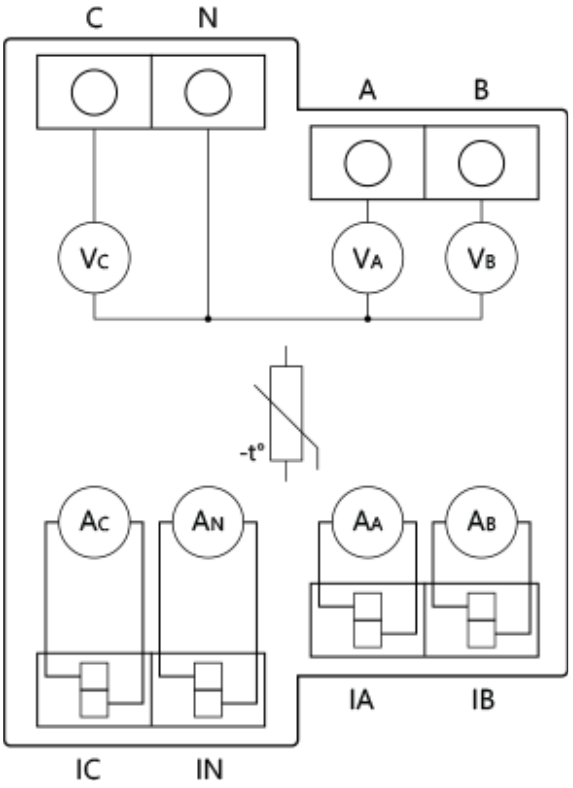
* The Device has phase sequence error detection circuits. This detection works on phase voltages and considers only the zero crossings. The regular succession of these zero-crossing events is Phase A followed by Phase B followed by Phase C. If the sequence of zero-crossing events is, instead, Phase A followed by Phase C followed by Phase B, then a `phase_sequence` error is reported, when the *Phase sequence error detection* option is enabled.

** In case the total load for the three channels drops below 30 W the measured power level will be displayed, but no consumed energy will be accumulated to the energy statistics and a `No load threshold` notification will be displayed in the Device web interface and in the mobile application.

Main applications

- Residential
- MDU (Multi Dwelling Units - apartments, condominiums, hotels, etc.)
- Light commercial (small office buildings, small retail/restaurant/gas station, etc.)
- Industrial (factories, power plants, water processing, refineries, etc.)
- Agricultural (farms, barns, silos, etc.)
- Government/municipal
- University/college

Simplified internal schematics



Device electrical interfaces

Inputs

- 4 line inputs on screw terminals: 3 **L** and 1 **N**
- 4 current transformer inputs: 3 for **L** current measurements and 1 for **N** current measurement

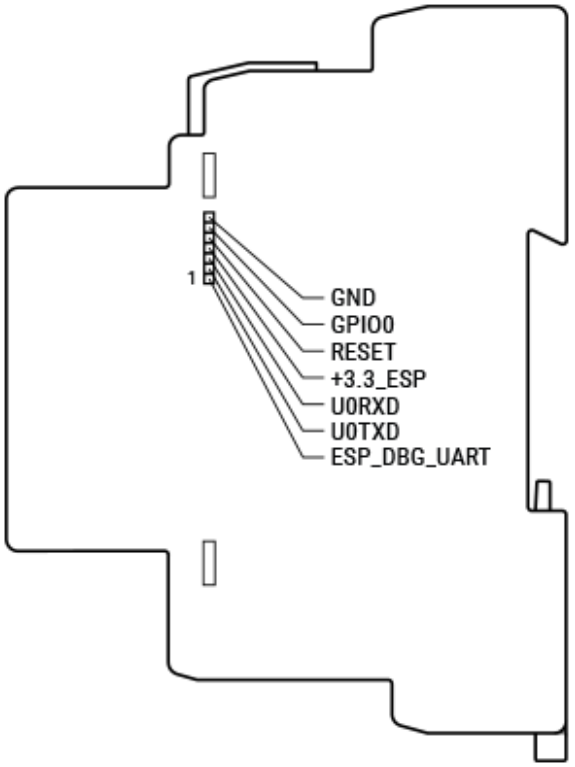
Ethernet port

- 1 RJ45 connector

⚠**CAUTION!** Plug in or unplug the LAN cable only when the Device is powered off! The LAN cable connector must not be metallic in the parts touched by the user to plug in or unplug the cable.

Addon interface

- Shelly proprietary serial interface



⚠**CAUTION!** High voltage on the add-on interface when the Device is powered!

Connectivity

- Wi-Fi
- Ethernet
- Bluetooth (for inclusion purposes)

Each connectivity option can be enabled or disabled by the user.

Safety features

- Internal temperature sensing and reporting

Supported load types

- Resistive (incandescent bulbs, heating devices)
- Capacitive (LED light drivers, capacitor banks, electronic equipment, motor start capacitors)
- Inductive (transformers, fans, refrigerators, air-conditioners)

User interface

Inputs

- One tactile dome button
    - Press and hold for 5 sec to activate Device AP.
    - Press and hold for 10 sec to factory reset.

Outputs

- LED indication
    - Power: Red light if power supply is connected.
    - Wi-Fi (varies):
        - Blue light if in AP mode.
        - Red light if in STA mode, and not connected to a Wi-Fi network.
        - Yellow light if in STA mode, and connected to a Wi-Fi network. Not connected to Shelly Cloud or Shelly Cloud disabled.
        - Green light if in STA mode, and connected to a Wi-Fi network and the Shelly Cloud.
        - The LED will be flashing Red/Blue if OTA update is in progress.
    - LAN: Green light if LAN is connected.
    - Count: Red light will be flashing when the Device is measuring energy according to settings with frequency dependent to the energy flowing through the measured circuit.

Specifications

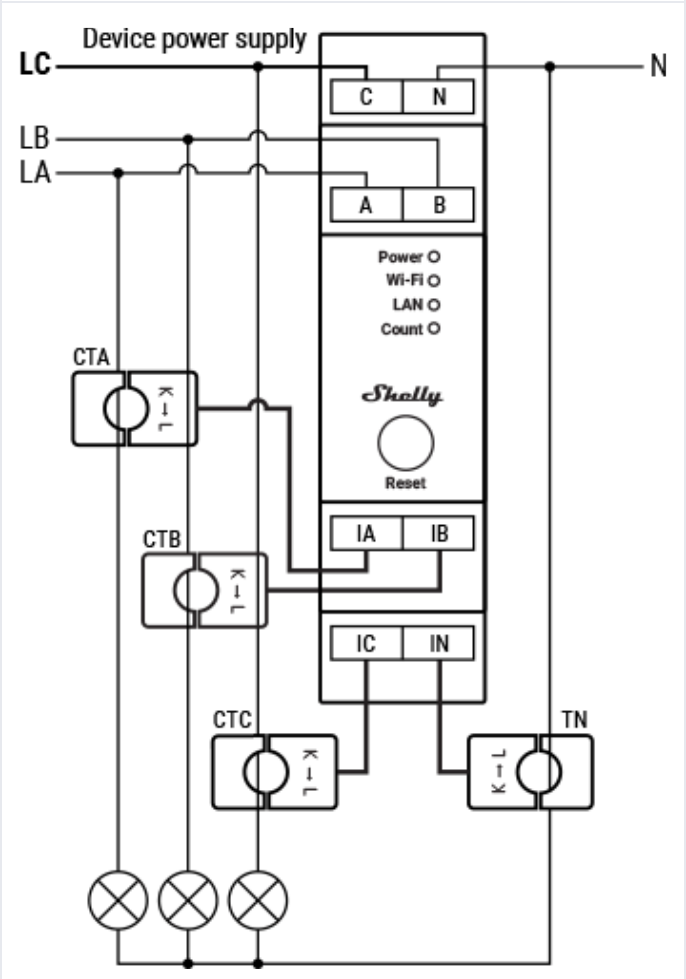
Type	Value
Physical	
Size (HxWxD):	94x19x69 ±0.5 mm / 3.70x0.75x2.71 ±0.02 in
Weight:	62 ±1 g / 2.19 ±0.05 oz
Mounting:	DIN rail

Screw terminals max torque:	0.4 Nm / 4.43 lbin
Conductor cross section:	0.5 to 2.5 mm² / 20 to 14 AWG (solid, stranded and bootlace lugs)
Conductor stripped length:	6 to 7 mm / 0.24 to 0.28 in
Shell material:	Plastic
Color:	White
Environmental	
Ambient temperature:	-20 °C to 40 °C / -5 °F to 105 °F
Humidity:	30 % to 70 % RH
Max. altitude:	2000 m / 6562 ft
Electrical	
Power supply voltage AC:	110 - 240 V, 50/60 Hz
Power supply voltage DC:	N/A
Power consumption:	< 3 W
Sensors, meters	
Temperature sensor:	Yes
Voltmeters (RMS for each phase):	100 - 260 V
Voltmeters accuracy:	±1 %

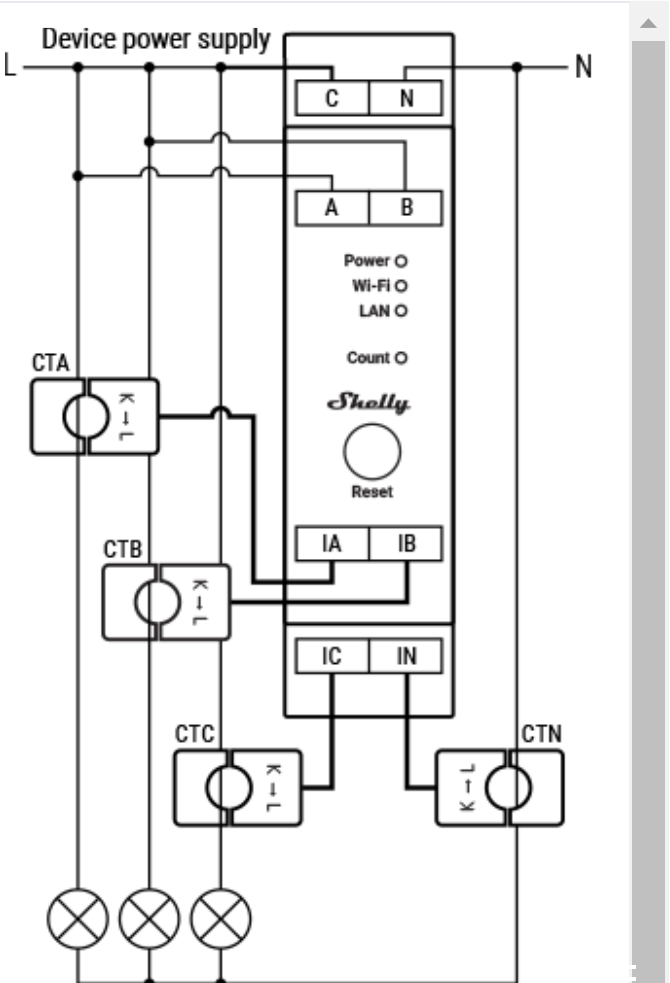
Ammeters (RMS via CT for each phase and the Neutral):	0 - 120 A
Ammeters accuracy:	±1 % (2 - 120 A), ±2 % (1 - 2 A), ±5 % (0 - 1 A)
Power and energy meters:	• Active and apparent power • Active and apparent energy • Power factor • Fundamental active and fundamental reactive energy
No load threshold:	30 W (total for the three channels)
Measurement data storage:	At least 60 days of 1 min data resolution
Data export:	• CSV for PQ recorded values • JSON format export trough RPC
Radio	
RF band:	2400 - 2495 MHz
Max. RF power:	<20 dBm
Wi-Fi protocol:	802.11 b/g/n
Wi-Fi Range:	Up to 30 m / 100 ft indoors and 50 m / 160 ft outdoors (Depends on local conditions)
Bluetooth Protocol:	4.2
Bluetooth Range:	Up to 10 m / 33 ft indoors and 30 m / 100 ft outdoors (Depends on local conditions)
MCU	

CPU:	ESP32-D0WDQ6
Flash:	16 MB
Firmware capabilities	
Webhooks (URL actions):	20 with 5 URLs per hook
Scripting:	mJS
MQTT:	Yes
CoAP:	No

Basic wiring diagrams



Shelly Pro 3EM 3-phase wiring diagram



Shelly Pro 3EM mono-phase wiring diagram

Legend

Terminals		**Cables**	
A	Phase A input	**LA**	Phase A live (100-260 V) cable
B	Phase B input	**LB**	Phase B live (100-260 V) cable
C	Phase C and power supply input	**LC**	Phase C live (100-260 V) cable
N	Neutral terminal	**L**	Mono-phase live (100-260 V) cable
IA	Phase A current transformer input	**N**	Neutral cable
IB	Phase B current transformer input	**Current transformers**	
IC	Phase C current transformer input	**CTA**	Phase A current transformer
IN	Neutral current transformer input	**CTB**	Phase B current transformer
		CTC	Phase C current transformer
		CTN	Neutral current transformer

Troubleshooting