



Datasheet

ENM-223-R1 3-phase Energy Metering Module

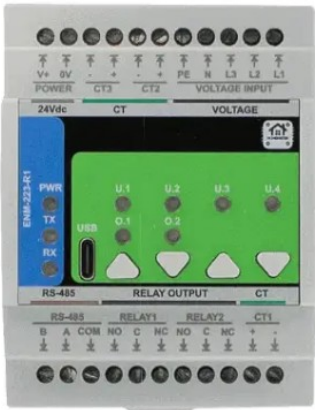
Part No.: ENM-223-R1

Manufacturer: ISYSTEMS AUTOMATION S.R.L.

Hardware Version: V1.0

Architecture: Modular (MCU Board +Relay board+ Field Board)

Controller: RP2350A



Functional Overview

The ENM-223-R1 is a modular 3-phase energy metering + I/O module for power monitoring and automation. It measures 3 voltage channels (L1/L2/L3-N) and 3 current channels (external CTs) using a dedicated ATM90E32AS metering IC, and provides 2 SPDT relay outputs, plus optional 4 buttons / 4 user LEDs for local control and indication.

The system is implemented using three hardware boards:

Board	Function
MCU Board	CPU, RS-485, USB-C, power conversion (24 V → 5 V → 3.3 V)
Field Board	3-phase metering front-end (voltage dividers + CT inputs), isolated analog domain, field connectors
Relay Extension	2 × SPDT relay output stage

The module connects to a PLC or SCADA as a Modbus RTU slave over RS-485 and is configured via USB-C Web Serial (WebConfig).

Technical Specifications

Specification	Details
Microcontroller	RP2350A dual-core microcontroller
Storage	External QSPI Flash (W25Q32JV)
Power Input	24 V DC nominal (V+ / 0V)
Metering IC	ATM90E32AS (3-phase energy metering / power quality)
Voltage Inputs	3 × L1/L2/L3-N+PE sensing, 85–265 V AC (mains measurement inputs)
Current Inputs	3 × CT channels (external current-output CTs); secondary ≤ 60 mA RMS into a 6 Ω on-board burden. Full scale 120 / 60 / 30 mA at PGA $\times 1$ / $\times 2$ / $\times 4$ (default $\times 2$). Do not use 1 A or 5 A secondary CTs.
Relay Outputs*	3 × SPDT dry-contact relays
Rated Load (System Limit)	3 A @ 250 VAC (resistive contact rating)
Max Load @ 250 VAC	750 VA (system limit)
Max Load @ 30 VDC	90 W (system limit)
Relay Component Rating (Informative Only)	Relay components are rated up to 12 A @ 250 VAC (resistive); however, this rating does not apply to the complete module
User Interface	4 buttons, 9xLEDs(Power, 4 user LEDs, RX, TX, 2xRelays)
RS-485	RS-485 Modbus RTU (MAX485, half-duplex) with TVS surge protection, PTC fuses, EMI choke, and fail-safe biasing
USB	USB-C (ESD protected, configuration and firmware upload)
File System	LittleFS persistent configuration storage

*Relay outputs are **not internally fused**. External overcurrent protection must be provided in accordance with applicable standards and installation requirements. Use appropriately rated fuses or circuit breakers and consider external contactors for loads exceeding 3 A or for inductive and high inrush loads.

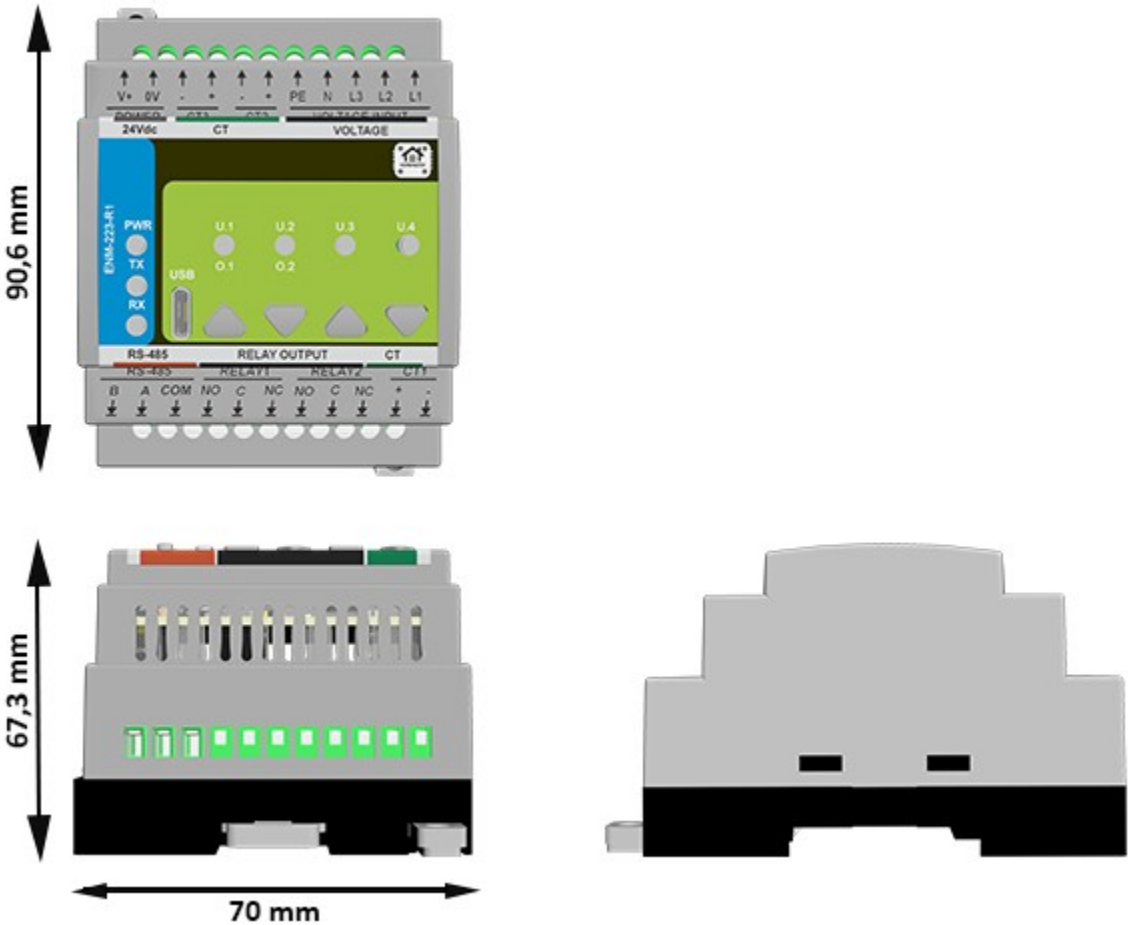
Installation, Environmental & Mechanical

Category	Specification	Details
Terminal Specifications	Terminal type	Pluggable screw terminal blocks, 5.08 mm pitch
	Terminal pitch	5.08 mm
	Wire cross-section	0.2–2.5 mm ² (AWG 24–12)
	Conductor type	Solid or stranded copper
	Stranded wire	Ferrules recommended
	Tightening torque	0.4 Nm (max)
Environmental Ratings	Operating temperature	0 °C to +40 °C
	Storage temperature	-10 °C to 55 °C
	Relative humidity	0–90 % RH, non-condensing
	Ingress protection	IP20 (inside cabinet)
	Installation	Indoor control cabinet only; not for outdoor or exposed installation
	Terminal protection	All wiring terminals must be protected

		against accidental contact
Mechanical & Packaging	Product dimensions	71.5 x 90 x 59 mm (LxWxH)
	DIN units	4 division units (≈ 72 mm DIN rail mounting width)
	Mounting	35 mm DIN rail
	Net weight	Xxx g
	Gross weight	Xxx+98 g
	Pack size	140× 125 × 94 mm (L × W × H)
	Mechanical drawing	Front + side views with DIN-clip depth (see below)
	Notes	All dimensions shown in millimeters unless stated otherwise

Install only inside a control cabinet with ventilation; the cabinet must include a protective front plate covering all module connection terminals and a closing protective door; not for outdoor or exposed installation.

All wiring terminals must be protected against accidental contact by an insulating front plate, wiring duct, or terminal cover. Exposed live terminals are not permitted.



Cable Recommendations & Shield Grounding

Use shielded, twisted constructions and bond shields correctly to reduce EMI and ground-loop issues.

General Routing Rules

- Route low-level signal cables separately from mains, relay outputs, contactors, VFD motor cables, and power wiring.
- If crossing power cables is unavoidable, cross at **90°**.
- Keep cable runs as short as practical and avoid parallel runs with high-current conductors.

RS-485 Cable

- **Construction:** twisted pair for **A/B**
- **Characteristic impedance:** **120 Ω** (recommended)
- **Shielding:** overall shield is recommended in cabinets; use individually shielded pairs + overall shield in high-EMI
- **Examples:** **J-Y(ST)Y 2×2×0.5 mm²** or **LI2YCY PiMF 2×2×0.50**
- Use one twisted pair for **A/B**. Use the second pair for **COM (0V reference)** or spare.

Shield Grounding

- **Default recommendation:** bond cable shield(s) to cabinet **PE/EMC ground at the PLC end only**.
- **Do not** connect shields to signal terminals (RS-485 A/B/COM).
- If both ends are in equipotential bonded cabinets, shields may be bonded at both ends using proper 360° clamps.

Compliance & Certifications

The ENM-233-R1 is CE marked and designed to comply with the applicable European Union directives. The manufacturer, ISYSTEMS AUTOMATION (HomeMaster brand), maintains the technical documentation and a signed EU Declaration of Conformity (DoC).

EU Directives

EMC 2014/30/EU · LVD 2014/35/EU · RoHS 2011/65/EU

Harmonised Standards

Area	Standards
EMC	EN 61000-6-1 (Immunity) · EN 61000-6-3 (Emissions)
Electrical Safety	EN 62368-1
RoHS	EN IEC 63000

Safety notice

L / N: hazardous voltage · 24 V DC: SELV · Qualified personnel only

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