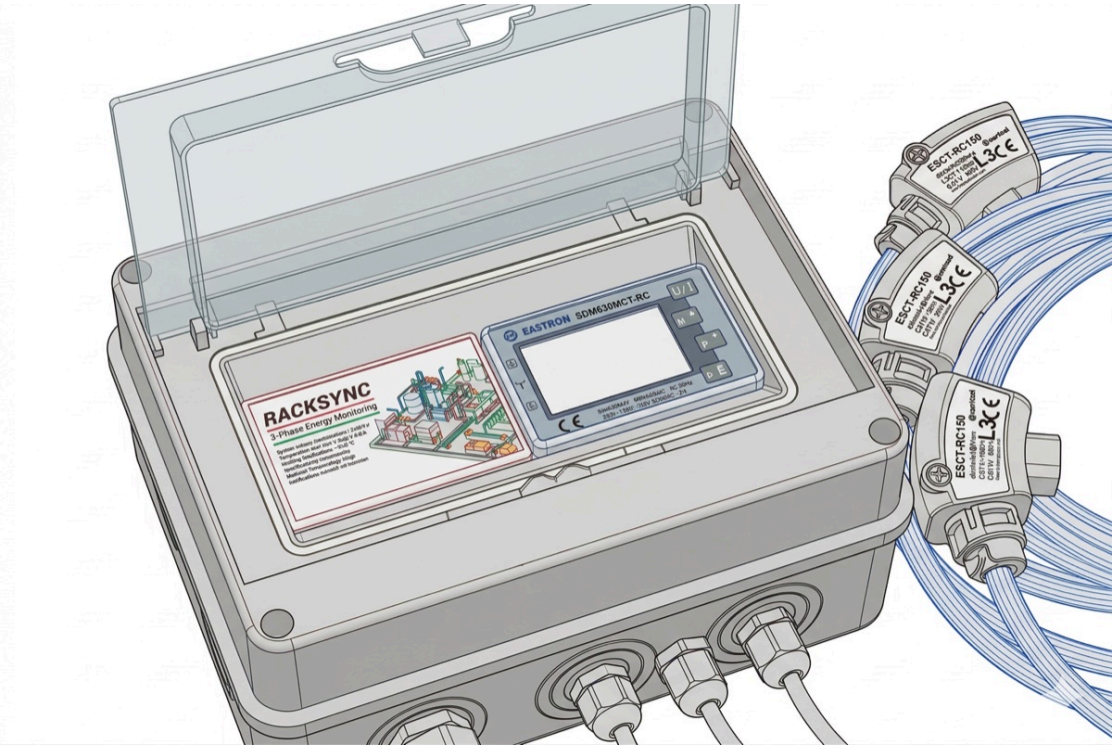
rect(width: 100%, height: 3cm, fill: brand-primary)[

]

RACKSYNC



3-Phase Industrial Energy Monitoring

SDM630MCT-RC

Installation & Operation Manual

Version 1.0.0

ALL ABOUT AUTOMATION

RACKSYNC CO., LTD.

Table of Contents

Introduction

What is 3P-EMON

The RACKSYNC 3-Phase Energy Monitoring System (3P-EMON) is a professional-grade 3-phase energy monitoring system designed for industrial and commercial installations. It combines the Eastron SDM630MCT-RC meter with Rogowski coil current transformers and a Tasmota ESP32-C3 IoT controller, all housed in a DIN-rail mounted HT-8WAY enclosure.

Target Audience

This manual is intended for the following audiences:

- **Qualified electricians** – responsible for physical installation and wiring of the system
- **System integrators** – responsible for configuration and commissioning of the monitoring system
- **Facility managers** – responsible for day-to-day operation and monitoring of energy data
- **IoT developers** – responsible for integrating the system with cloud platforms, home automation, and custom applications

What’s in the Box

Your 3P-EMON package includes the following items:

- HT-8WAY enclosure with SDM630MCT-RC meter pre-installed
- 3x ESCT-RC Rogowski coils (size per order)
- ESP32-C3 IoT controller with Tasmota firmware
- RS485 connection cables
- Product manual

Product Naming

Designation	Description
RS-EMON3P	System name for the complete 3-phase energy monitoring solution
ESCT-RC	Rogowski coil variant with flexible cable for use with the SDM630MCT-RC

System Overview

The 3P-EMON system measures voltage, current, power, energy, power factor, and frequency on 3-phase electrical systems. Measurement data is transmitted via Modbus RTU over RS485 for local communication, and published over MQTT via Wi-Fi with TLS encryption for cloud and home automation integration. This dual-interface design enables both on-site monitoring through Modbus master devices and remote monitoring through IoT platforms such as Home Assistant, MQTT brokers, and custom cloud dashboards.

Technical Specifications

This chapter provides the complete technical specification sheet for the SDM630MCT-RC, derived from the Eastron SDM630MCT datasheets.

Electrical Specifications

Parameter	Value
System types	1P2W, 3P3W, 3P4W (default)
Auxiliary power	85 [illegible]

Accuracy

Parameter	Accuracy
Voltage	1.0% of reading
Reactive energy	Class 2 (IEC 62053-23)

Physical

Parameter	Value
Dimensions	94.5 × 72 × 65 mm
Weight	[illegible]

Outputs

- 2× pulse outputs (active + reactive energy), opto-isolated
- 1× RS485 Modbus RTU port

Communication

Parameter	Value
Protocol	Modbus RTU
Data format	2400, 4[illegible], 38400

Compliance

- IEC 62053-21 (Class 1 active energy)
- IEC 62053-23 (Class 2 reactive energy)
- MID 2014/32/EU
- CE marked
- Measurement category: CAT III 300V

Operating Conditions

Parameter	Range
Operating temperature	–25°C to +55°C
Humidity	≤95% RH (non-condensing)
Storage temperature	–40°C to +70°C

Ordering Variants

Model	Input Type	Output
SDM630MCT-RC	85mV/kA (Rogowski)	Modbus + Pulse
SDM630MCT-5A	333mV (CT)	Modbus + Pulse

Current Transformer Selection Guide

ESCT-RC Rogowski Coil (Included)

The SDM630MCT-RC variant uses ESCT-RC flexible Rogowski coils with 85mV/kA output.

Specifications

Parameter	Value
Current range	10A – 100kA
Compliance	≤1 (In)

Available Models

Model	Rated Current	Coil Type	Window Size
ESCT-RC16	200A	A	16mm
ESCT-RC240	[illegible]	[illegible]	[illegible]

CT Family Comparison (All Eastron Families)

Family	Type	Range	Output	Accuracy
ESCT-RC	Rogowski Coil	200A–40kA	85mV/kA	≤1%
ECTB-xxx	Split-Core (Clamp)	60A–3000A	333mV/A	Class 1

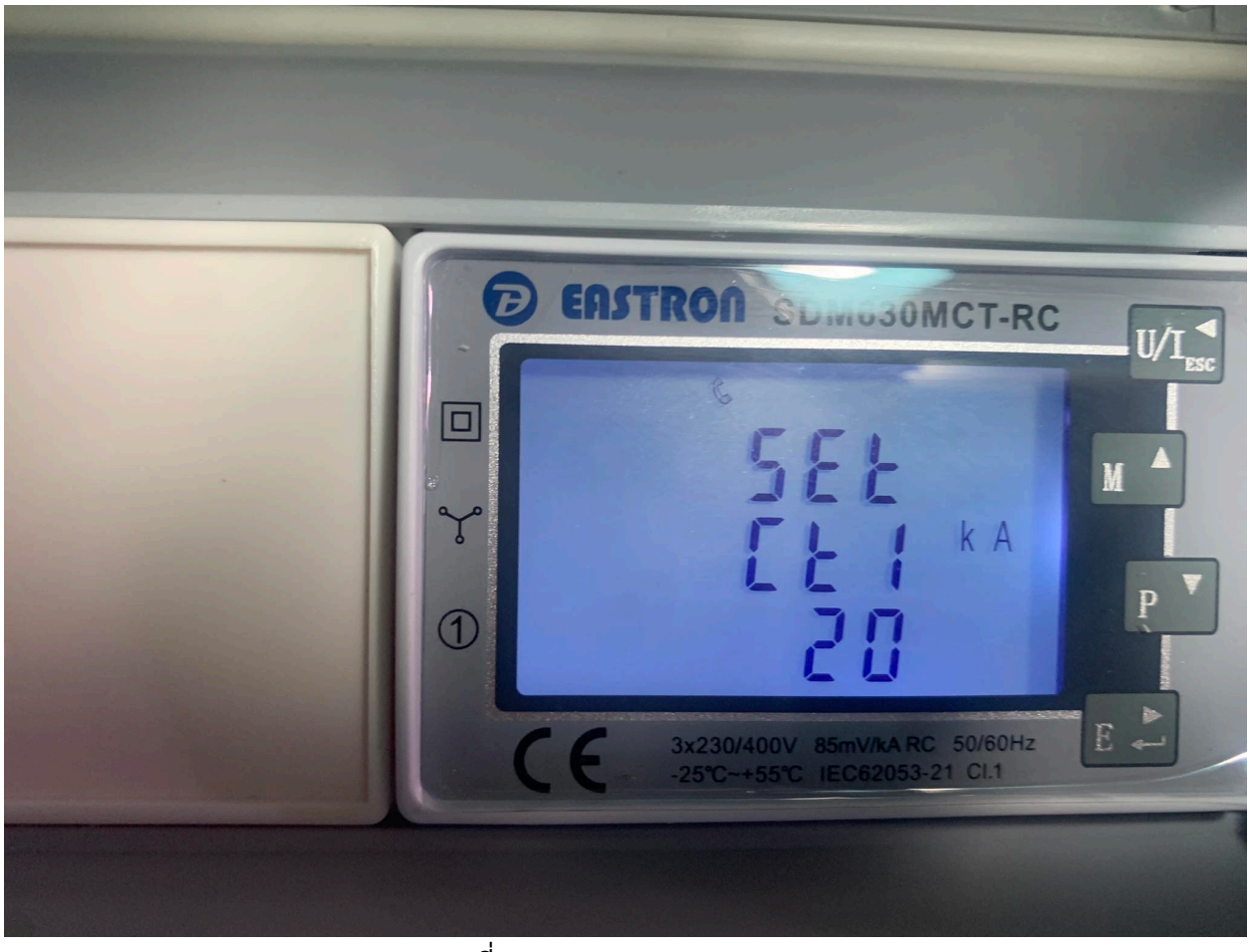
CT Ratio Configuration

The CT ratio must match the installed Rogowski coil model. Configure via:

- **LCD menu**: Hold E button 3s → password 1000 → Set Ct1/Ct2/Ct3
- **Modbus register 40063**: Write rated current value (e.g., 2000 for ESCT-RC100)
- **Range**: 1–2000 (default: 1)

Example Configuration

Coil Model	Rated Current	CT Ratio Setting
ESCT-RC100	2000A	Ct1/Ct2/Ct3 = 2000
ESCT-RC80	5000A	Ct1/Ct2/Ct3 = 5000



รูปที่ 1: LCD Display CT Setup

Installation

READ the safety warnings below before proceeding. Installation must be performed by a qualified electrician.

Safety Warnings

- **CAT III** — Distribution level measurement. Lethal voltages present.
- Disconnect all power before installation. Follow lock-out/tag-out (LOTO) procedures.
- Verify absence of voltage before touching terminals.

Package Contents

1. HT-8WAY DIN-rail enclosure with SDM630MCT-RC meter pre-installed
2. 3x ESCT-RC Rogowski coils (size per order)
3. ESP32-C3 IoT controller (pre-wired to meter RS485)
4. RS485 communication cables
5. Cable glands for enclosure entry
6. This manual

Step 1: Mount the Enclosure

Mount the HT-8WAY enclosure on a 35mm DIN rail in the distribution panel:

1. Select a location accessible for maintenance, with adequate ventilation
2. Ensure minimum clearance: 50mm above/below for wiring
3. Snap enclosure onto DIN rail
4. Secure with DIN rail clips

Step 2: Wire Voltage Connections

Connect voltage inputs to terminals 1–4:

Terminal	Connection
1	Phase L1 (Line 1)
4	Neutral (N)

For 3P4W (default): Connect all 4 terminals.

For 3P3W: Connect terminals 1, 2, 3 only (no neutral).

For 1P2W: Connect terminal 1 (L) and terminal 4 (N) only.

Step 3: Wire Auxiliary Power

Connect auxiliary power to terminals 5–6:

- Terminal 5: Live (85–277V AC)
- Terminal 6: Neutral

The meter powers on when auxiliary power is applied. Display should light up within 3 seconds.

Step 4: Install Rogowski Coils

Install the 3 Rogowski coils on the phase conductors:

1. **Open** the Rogowski coil by releasing the latch
2. **Place** the coil around the conductor (L1 for CT1, L2 for CT2, L3 for CT3)
3. **Close** the coil completely — ensure the latch clicks shut with no gap
4. **Verify orientation**: The arrow on the coil must point in the direction of current flow (source to load)

Connect Rogowski coil cables:

- CT1 (L1) -> Terminals 15, 16
- CT2 (L2) -> Terminals 17, 18
- CT3 (L3) -> Terminals 19, 20

Step 5: Wire RS485 (Optional)

If using external Modbus master or daisy-chaining multiple meters:

Terminal	Connection
9	RS485 D+ (Data+)
12–14	RS485 D− (Data−) / GND

Use twisted-pair cable. Install 120-ohm termination resistor at each end of the bus for runs >10m.

Step 6: Wire Pulse Outputs (Optional)

Terminal	Connection
7	Pulse output 1 (Active energy)
8	Pulse output 2 (Reactive energy)

Pulse outputs are opto-isolated open-collector. Maximum: 27V DC, 27mA.

Terminal Block Reference

Terminals	Function
1–4	Voltage inputs (L1, L2, L3, N)
15–20	RS485 Modbus (A/B, GND, Shield)

Post-Installation Checklist

- ☐ All voltage connections secure and torqued
- ☐ Auxiliary power connected and meter display active
- ☐ Rogowski coils properly installed (correct orientation, fully closed)
- ☐ CT cables connected to correct terminals (CT1->15/16, CT2->17/18, CT3->19/20)
- ☐ Cable glands tightened
- ☐ Enclosure cover secured
- ☐ No exposed conductors

Product Photos

รูปที่ 2: Product Front View (Open)

รูปที่ 3: Product Front View (Closed)

Meter Configuration

This chapter covers configuring the SDM630MCT-RC meter via the front LCD panel.

Entering Setup Mode

1. Press and hold the **E (Enter)** button for **3 seconds**
2. The display shows the password prompt: `CodE 0000`
3. Use the ↑/↓ buttons to enter password: **1000** (default)
4. Press **E** to confirm
5. The first setup menu item appears

System Type Selection

Setting	Options	Default
System type	1P2W, 3P3W, 3P4W	3P4W

Navigate to Sys and select the wiring type matching your installation. Most 3-phase installations use **3P4W** (3-phase 4-wire with neutral).

CT Ratio Configuration

Critical: The CT ratio MUST match the installed Rogowski coil rated current.

Register	Parameter	Range	Default
40063	CT1 ratio	1–2000	1
40063	CT2 ratio	1–2000	1

Setting CT Ratio via LCD

1. In setup mode, navigate to `SEt` → `Ct1`
2. Use ↑/↓ to set the rated current of your ESCT-RC coil
3. Press E to confirm
4. Repeat for `Ct2` and `Ct3`

รูปที่ 4: LCD Display CT Setup

Common CT Ratio Settings

Coil Model	Rated Current	CT Ratio Value
ESCT-RC80	1000A	1000
ESCT-RC150	3000A	2000*

*Note: Maximum CT ratio setting is 2000. For coils rated above 2000A, set the ratio to the maximum and apply scaling in software/MQTT.

PT Ratio (Voltage Transformer)

Register	Parameter	Range	Default
40065	PT ratio	1–4000	1

Set to 1 for direct connection (no voltage transformer).

Communication Settings

Baud Rate

Register	Options	Default
40069	2400, 4800, 9600, 19200, 38400	9600

Modbus Address

Register	Range	Default
40071	1–247	1

Set a unique address for each meter on the same RS485 bus.

Parity

Register	Options	Default
40073	EVEN, ODD, NONE	EVEN

Pulse Output Configuration

Register	Parameter	Default
40079	Pulse output 1 mode	Import active energy
40083	Pulse output 2 mode	Import reactive energy

Display Settings

Demand Integration Time (DIT)

Register	Options	Default
40085	1, 5, 8, 10, 15, 20, 30, 60 (minutes)	15

Backlit Timeout

Register	Range	Default
40089	0–255 (minutes, 0=always on)	5

Password Change

Register	Parameter	Default
40091	Setup password	1000

Security recommendation: Change the default password (1000) to prevent unauthorized configuration changes.

Saving and Exiting

After all changes:

1. Press and hold **E** for 3 seconds, or navigate through all menu items
2. Changes are saved automatically
3. The meter restarts with new settings

Configuration Quick Reference

Parameter	Register	Default	Recommended for RS-EMON3P
System type	—	3P4W	Match installation
Password	40075	1	Match installation

Tasmota IoT Setup

The RS-EMON3P includes an ESP32-C3 microcontroller running Tasmota firmware (custom RACKSYNC IIoT build) that bridges the SDM630MCT-RC meter's Modbus RTU interface to Wi-Fi/MQTT for cloud and smart home integration.

Hardware

- **MCU**: ESP32-C3 (RISC-V single-core, 160MHz, 400KB SRAM)
- **GPIO6**: Modbus RX (connected to meter RS485 D+)
- **GPIO7**: Modbus TX (connected to meter RS485 D-)
- **Firmware**: IIoT FW 15.3.0 (tasmota32) by RACKSYNC

First Boot — AP Mode

On first boot (or after factory reset), the ESP32-C3 creates a Wi-Fi access point:

1. The device broadcasts SSID: **RS-EMON3P** (or RS-EMON3P_XXXXXX based on MAC)
2. Connect to this Wi-Fi network from your phone or laptop
3. A captive portal appears (or navigate to **192.168.4.1**)
4. Select your Wi-Fi network and enter credentials
5. The device connects to your network and exits AP mode
6. The device's IP address is displayed on the captive portal page

Wi-Fi Configuration

After initial setup, access the Tasmota web UI:

- **mDNS**: `http://<hostname>.local/` (e.g., `http://rs-emon3p.local/`)
- **IP address**: Check your router's DHCP client list

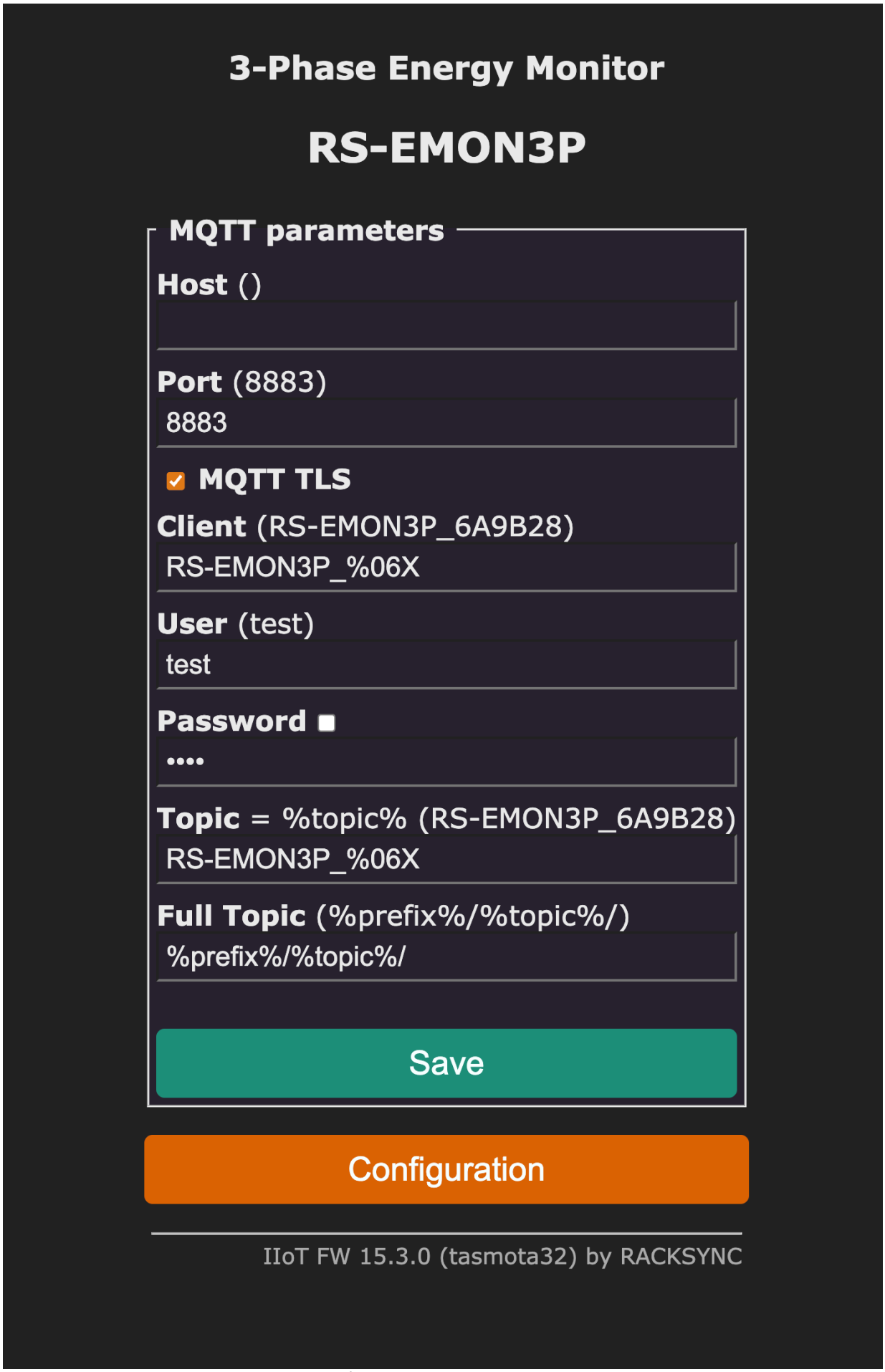
MQTT Configuration

MQTT is the primary data transport for telemetry and control.

Basic MQTT Settings

Configure via Tasmota web UI → Configuration → Configure MQTT:

Setting	Value
Host	Your MQTT broker address
Full Topic	RS-EMON3P[illegible] (from MAC)



รูปที่ 5: MQTT Configuration

TLS Configuration (Recommended)

For production deployments, use MQTT over TLS:

1. Set port to **8883**
2. Enable TLS via console: `MqttFingerprint1 <SHA256-fingerprint>`
3. Or use CA certificate validation (enterprise deployments)

See TLS Security for detailed TLS setup instructions.

Telemetry

Telemetry Period

Default telemetry period is **20 seconds**. Configure via:

```
TelePeriod 20
```

Range: 10–3600 seconds.

MQTT Topic Structure

Telemetry data is published to:

```
tele/RS-EMON3P_XXXXXX/SENSOR {"ENERGY":
{"TotalStartTime":"2026-01-01T00:00:00","Total":12345.67,"Yesterday":100.23,"Today":50.12,"Period":12,"Power":4500,
```

Status data:

```
tele/RS-EMON3P_XXXXXX/STATE
{"Time":"2026-03-31T12:00:00","Uptime":"0T12:30:00","UptimeSec":45000,"Heap":98,"SleepMode":"Dynamic","Sleep":50,"L
{"AP":1,"SSId":"YourNetwork","BSSId":"AA:BB:CC:DD:EE:FF","Channel":6,"Mode":"11n","RSSI":62,"Signal":-68,"LinkCount
```

Home Assistant Integration

The firmware includes automatic Home Assistant discovery.

Auto-Discovery Configuration

Setting	Command	Value
HAutoDiscovery	SetOption19 0	Use custom discovery
Devicename	SetOption19 1	Show device register

Discovery prefix: `homeassistant`

Discovered Entities

Home Assistant will automatically discover:

- **Sensor**: Total energy (kWh)
- **Sensor**: Today's energy (kWh)
- **Sensor**: Yesterday's energy (kWh)
- **Sensor**: Power (W)
- **Sensor**: Apparent power (VA)
- **Sensor**: Reactive power (VAr)
- **Sensor**: Voltage (V)
- **Sensor**: Current (A)
- **Sensor**: Power factor
- **Sensor**: Frequency (Hz)

OTA Firmware Updates

Update firmware over-the-air:

1. Go to Firmware Upgrade in Tasmota web UI
2. Enter OTA URL or upload firmware file
3. Device reboots with new firmware

Security: Use HTTPS OTA URLs only in production.

Power Management

Setting	Command	Default
Sleep	`Sleep 50`	50 (dynamic)
Modbus polling interval	`TelePeriod`	Automatic ~~20~~s

TLS Security

Why TLS Matters for Industrial IoT

Energy monitoring data is sensitive — it reveals facility operational patterns, occupancy, and equipment usage. Transmitting this data unencrypted over MQTT (port 1883) exposes it to:

- Network sniffing on local Wi-Fi
- Man-in-the-middle attacks on internet paths
- Credential interception (MQTT username/password)

TLS encryption (MQTT over port 8883) protects data in transit and authenticates the broker.

TLS Modes

Mode	Security Level	Use Case
Fingerprint validation	Medium	Home/Small office — validates broker certificate fingerprint
CA certificate validation	High	Enterprise/AWS IoT/Azure IoT Hub — validates full certificate chain

Trade-offs

Aspect	Fingerprint	CA Certificate
Setup complexity	Simple	Moderate
ESP32-C3 compatible	Most tested (fingerprint matches)	Fully tested

Obtaining TLS Certificates

Option 1: Extract Fingerprint from Broker

```
openssl s_client -connect broker.example.com:8883 < /dev/null 2>/dev/null | openssl x509 -
fingerprint -sha256 -noout
```

Output: `sha256 Fingerprint=AA:BB:CC:DD:...`

Option 2: Extract from Browser

1. Open `https://broker.example.com:8883` in browser
2. Click the lock icon → Certificate → Details
3. Copy the SHA-256 fingerprint

Option 3: Let's Encrypt (Recommended)

Use a broker with a Let's Encrypt certificate for automatic renewal.

Configuring TLS Fingerprint

Step 1: Set MQTT Port to 8883

Via web UI → Configuration → Configure MQTT → Port: **8883**

Step 2: Set TLS Fingerprint

Via Tasmota console:

```
MqttFingerprint1
AA:BB:CC:DD:EE:FF:00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF:00:11:22:33:44:55:66:77:88:99
```

Step 3: Auto-Learn Mode (Alternative)

If you don't have the fingerprint handy, enable auto-learn:

```
SetOption132 1
```

The device will learn the broker's fingerprint on first successful TLS connection. **Verify** the learned fingerprint matches your broker before trusting it.

Step 4: Verify TLS Connection

Check console logs for:

```
MQTT: Connected to broker.example.com:8883 (TLS)
```

Test port connectivity:

```
openssl s_client -connect broker.example.com:8883
```

Configuring CA Certificate Validation

For enterprise deployments using AWS IoT, Azure IoT Hub, or private CA:

Compile flag: `#define USE_MQTT_TLS_CA_CERT`

This stores the full CA certificate chain in firmware. Contact RACKSYNC for custom firmware builds with your CA certificate.

Troubleshooting TLS

Fingerprint Mismatch After Certificate Renewal

If the broker's certificate was renewed (e.g., Let's Encrypt every 90 days):

1. Extract the new fingerprint
2. Update via console: `MqttFingerprint1 <new-fingerprint>`
3. Restart MQTT: `Restart 1`

Prevention: Use CA certificate validation instead of fingerprint.

Memory Errors on ESP32-C3

TLS requires additional RAM. If memory errors appear:

- Reduce `TelePeriod` (less frequent = less memory pressure)
- Disable unused Tasmota features
- Consider fingerprint mode instead of CA validation

Port Blocked

Verify port 8883 is open:

```
telnet broker.example.com 8883
nc -zv broker.example.com 8883
```

Certificate Expiry

Check certificate expiry:

```
openssl s_client -connect broker.example.com:8883 < /dev/null 2>/dev/null | openssl x509 -noout -
dates
```

Device Security Best Practices

Practice	How
Change default MQTT credentials	Configure unique username/ password
Keep firmware updated	Configure Modbus Admin

Network Security Recommendations

Recommendation	Details
IoT VLAN	Place energy monitors on a separate VLAN
Wi-Fi security	Use WPA2 or WPA3 and disable WPS

Operation

Reading the LCD Display

The SDM630MCT-RC features a backlit LCD that cycles through measurement screens. Press the ↑/↓ buttons to navigate manually.

Voltage & Current Screens

Display	Parameter	Unit
L1-N voltage	Phase 1 voltage	V
L3 current	Phase 3 current	A

Energy Screens

Display	Parameter	Unit
Import active energy	Total kWh consumed	kWh
Export reactive energy	Total kVArh generated	kVArh

Power & Power Factor Screens

Display	Parameter	Unit
Total active power	Net power	kW
Frequency	[illegible]	[illegible]

Demand Screens

Display	Parameter	Unit
Maximum demand	Peak power demand	kW
Current demand	Running demand	kW

Interpreting MQTT Telemetry

The Tasmota firmware publishes measurement data via MQTT every `TelePeriod` seconds (default: 20s).

SENSOR Message

Topic: `tele/RS-EM0N3P_XXXXXX/SENSOR`

```
{
  "Time": "2026-03-31T14:30:00",
  "ENERGY": {
    "TotalStartTime": "2026-01-01T00:00:00",
    "Total": 15432.56,
    "Yesterday": 123.45,
    "Today": 67.89,
    "Period": 15,
    "Power": 4523,
    "ApparentPower": 4810,
    "ReactivePower": 1187,
    "Factor": 0.94,
    "Voltage": 230.8,
    "Current": 19.6,
    "Frequency": 50.0
  }
}
```

Key Fields

Field	Description	Unit
Total	Cumulative energy since last reset	kWh
Frequency	[illegible]	[illegible]

Monitoring via Home Assistant

When Home Assistant auto-discovery is enabled, the following entities appear:

Sensor Entities

Entity	Description	Unit
sensor.rs_emon3p_energy_total	Total energy	kWh
sensor.rs_emon3p_frequency	Yesterday energy	kWh

Creating Dashboards

In Home Assistant:

1. Go to Settings → Dashboards → Edit
2. Add cards for energy monitoring entities
3. Recommended: Energy card, Gauge card for power, History graph for trends

Reading Energy Counters

The SDM630MCT-RC maintains separate counters:

Counter	Modbus Register	Description
Import active energy	30053–30054	Total kWh purchased from grid
Total active energy	30059–30060	Total kWh Exported grid

These counters persist through power outages and are stored in non-volatile memory.

Resetting Demand Values

Demand values can be reset via:

- **LCD menu**: Navigate to demand screen → hold E button
- **Modbus**: Write to register 40001 (value 1 = reset demand)

Power Factor Sign Convention

Power Factor	Meaning
+0.0 to +1.0	Inductive load (current lags voltage)
1.0	Resistive load (unity power factor)
	Capacitive load (current leads voltage)

Most industrial loads are inductive (motors, transformers), resulting in positive PF values typically 0.7–0.95.

Troubleshooting

No Display / Meter Not Powering On

Symptom	Possible Cause	Solution
Blank LCD	No auxiliary power	Check terminals 5-6: verify 85-277V AC present
Display flickering	Blown fuse/breaker; Low voltage	Check upstream protection; Measure voltage at terminals 5-6 (min 85V AC)

No Modbus Communication

Symptom	Possible Cause	Solution
No response from meter	Wrong baud rate	Verify baud rate matches (default: 9600)
Bus errors	RS4 ped	A s en ns

Modbus Debugging via Tasmota Console

```
SerialLog 3
```

This enables verbose serial logging to see Modbus traffic in the Tasmota console.

Incorrect Readings

Symptom	Possible Cause	Solution
Zero current reading	CT not connected	Check Rogowski coil cables on terminals 15-20
Inaccurate readings	CT [illegible]	[illegible]

Reset Energy Counters via Tasmota Web Interface

If accumulated energy totals (kWh) are wrong — for example after changing the CT ratio, re-wiring the coils, or moving the meter — clear the stored counters so new readings start from zero:

1. Open the Tasmota web UI in a browser: `http://<device-ip>` (find the IP from your router or the AP-mode portal).
2. Click **Console**.
3. Enter the reset command and press Enter:

   ```
   EnergyReset 3
   ```

   `EnergyReset 3` clears the total energy counter. Use `EnergyReset 1` for the *Today* total or `EnergyReset 2` for the *Yesterday* total. See Appendix C: Tasmota Commands for the full `EnergyReset 1-7` range.
4. Confirm the console reply shows the counter reset to `0.000`, then verify the live values on the **Main** page.

Note: This clears only the accumulated energy history. It does not change live voltage, current, or power readings — if those are wrong, correct the CT ratio or wiring using the table above first, then reset the counters.

Wi-Fi Connection Issues

Symptom	Possible Cause	Solution
Cannot connect to Wi-Fi	Wrong credentials	Reset to AP mode (see below)
	Wi-Fi signal too weak	Move device closer to router
Slow telemetry	Wi-Fi power save enabled	Set `Sleep Mode` to `None`

Reset to AP Mode

Method 1 — Via console:

```
WifiManager 1
Restart 1
```

Method 2 — Hardware reset:

- Press and hold the reset button on ESP32-C3 for 10+ seconds
- Device restarts in AP mode with SSID “RS-EMON3P”

MQTT Connection Errors

Symptom	Possible Cause	Solution
MQTT not connecting	Wrong host/port	Verify broker address and port (1883/8883)
Connection drops		

Check MQTT Status

```
Status 6
```

Shows current MQTT connection state, broker, and topic.

Home Assistant Not Discovering Device

Symptom	Possible Cause	Solution
No entities in HA	Wrong discovery prefix	Verify `SetOption19 0` and `Prefix homeassistant`
Duplicate entities	Multiple devices same topic	Retain TOPIC per device

OTA Update Failures

Symptom	Possible Cause	Solution
Update fails to start	Wrong OTA URL	Verify URL is accessible and HTTPS
	Unstable Wi-Fi	Ensure stable connection before updating
Device unresponsive after update	Corrupted firmware	Flash via serial (recovery mode)

Rogowski Coil Positioning Issues

Symptom	Possible Cause	Solution
Intermittent zero readings	Coil not fully closed	Verify latch is clicked shut with no gap
Low accuracy	[illegible]	[illegible]

RS485 Bus Termination

When to Install 120Ω Termination

- **Required**: Bus length > 10 meters
- **Required**: Baud rate > 9600
- **Install**: At each physical end of the bus (only 2 resistors total)
- **Remove**: If present on every node (causes signal attenuation)

Verification

Measure resistance across D+ and D- at one end of the bus (power off):

- With termination: ~60Ω (two 120Ω resistors in parallel)
- Without termination: >10kΩ (high impedance)

Getting Support

If you cannot resolve an issue, see Support & Contact for support channels.

Appendices

This section contains detailed technical reference materials for the RACKSYNC 3P-EMON SDM630MCT-RC system.

- **Appendix A: Modbus Register Map** — Complete register listing with addresses, data formats, and wiring support matrices
- **Appendix B: Wiring Diagrams** — Detailed wiring diagrams for 3P4W, 3P3W, and 1P2W system configurations
- **Appendix C: Tasmota Command Reference** — Complete command reference for the RACKSYNC IIoT firmware

Appendix A: Modbus Register Map

Source: Eastron SDM630MCT Modbus Protocol V1.7

Communication Parameters

Parameter	Default
Protocol	Modbus RTU
Float format	Big-Endian (ABCD)

Input Registers (Function Code 04)

All values are 32-bit IEEE 754 floats occupying 2 consecutive registers.

Voltage Registers

Address	Hex	Parameter	Unit	3P4W	3P3W	1P2W
30001	0x7531	Phase 1 line to neutral volts	V	✓	✓	✓
30011	0x753B	Phase 2 line to neutral volts	V	✓	✓	—

Current Registers

Address	Hex	Parameter	Unit	3P4W	3P3W	1P2W
30013	0x753D	Phase 1 current	A	✓	✓	✓
30019	0x7543	Phase 2 current	A	✓	✓	—

Power Registers

Address	Hex	Parameter	Unit	3P4W	3P3W	1P2W
30021	0x7545	Phase 1 active power	W	✓	✓	✓
30043	0x754B	[illegible]	W	✓	✓	✓

Power Factor & Frequency

Address	Hex	Parameter	Unit	3P4W	3P3W	1P2W
30045	0x755D	Phase 1 power factor	—	✓	✓	✓
30061	0x756D	Phase 1 phase angle	Degrees	✓	✓	✓

Energy Registers

Address	Hex	Parameter	Unit	3P4W	3P3W	1P2W
30063	0x756F	Import active energy	kWh	✓	✓	✓
30073	0x7579	Export active energy	kWh	✓	✓	✓

Demand Registers

Address	Hex	Parameter	Unit
30075	0x757B	Total system power demand	W
30089	0x7589	Maximum total system power demand	W

Total Harmonic Distortion

Address	Hex	Parameter	Unit
30091	0x758B	Phase 1 voltage THD	%
30101	0x7595	Phase 2 voltage THD	%

Holding Registers (Function Code 03/16)

Configuration Registers

Address	Hex	Parameter	Range	Mode	Default
40001	0x9C41	Reset demand / energy	1=reset	wo	—
40095	0x9C	integration time)	1= 2= 3=19200,	r/w	1

Pulse Output Mode Values

Value	Pulse 1 Meaning	Pulse 2 Meaning
0	Import active energy	Import reactive energy
2	Export active energy	Export reactive energy

Modbus RTU Frame Format

Request Frame (Read Input Registers)

```
[Address][Function][Register Hi][Register Lo][Count Hi][Count Lo][CRC Lo][CRC Hi]
  01       04        00          00          00        02        xx      xx
```

Response Frame

```
[Address][Function][Byte Count][Data Hi][Data Lo][Data Hi][Data Lo][CRC Lo][CRC Hi]
  01       04        04          xx      xx      xx      xx      xx      xx
```

CRC-16 Calculation

Modbus RTU uses CRC-16 (Modbus variant). Most Modbus libraries handle this automatically.

RS485 Wiring Specifications

Parameter	Value
Cable type	Twisted pair (shielded recommended)
Connectors	Screw terminal (removable, 10 mm)

Appendix B: Wiring Diagrams

3-Phase 4-Wire (3P4W) — Primary Configuration

This is the default and most common configuration for commercial/industrial installations with a neutral conductor.

Connections

Terminal	Connection	Description
1	Phase L1	Voltage measurement
19–20	Auxiliary Supply	Voltage measurement Supply

Notes

- All 4 voltage terminals connected (L1, L2, L3, N)
- 3 Rogowski coils required (one per phase)
- Measures: V, A, W, VA, VAr, PF, kWh per phase + totals

3-Phase 3-Wire (3P3W)

Used in systems without a neutral conductor (delta configuration).

Connections

Terminal	Connection	Description
1	Phase L1	Voltage measurement
19–20	[illegible]	[illegible]

Notes

- Only 3 voltage terminals connected (L1, L2, L3)
- 2 Rogowski coils required (CT1 + CT2)
- CT3 not used
- Set system type to 3P3W in meter configuration

1-Phase 2-Wire (1P2W)

For single-phase installations.

Connections

Terminal	Connection	Description
1	Phase L	Voltage measurement
19–20	[illegible]	[illegible]

Notes

- Only terminal 1 (L) and terminal 4 (N) connected
- 1 Rogowski coil required (CT1 only)
- Set system type to 1P2W in meter configuration

Auxiliary Power Wiring

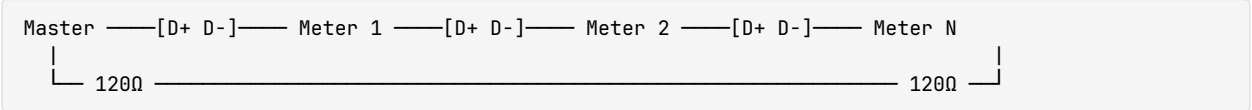
The meter requires auxiliary power independent of voltage measurement inputs.

Terminal	Connection
5	Live (85–277V AC, 50/60Hz)
6	Neutral

Note: Auxiliary power can be sourced from any phase or a dedicated supply. The meter starts up within 3 seconds of power application.

RS485 Daisy-Chain Wiring

For installations with multiple meters on the same Modbus bus:



Requirements

- **Cable**: Twisted pair (minimum 22 AWG), shielded for industrial environments
- **Topology**: Linear daisy-chain (no star or T-taps)
- **Termination**: 120Ω resistor at each physical end of the bus
- **Max length**: 1200 meters total bus length
- **Max devices**: 32 meters per bus segment
- **Addresses**: Each meter must have a unique Modbus address (register 40071)

General Wiring Notes

1. **Wire gauge**: Use appropriately rated wire for the current being measured. For voltage inputs and auxiliary power, minimum 1.5mm² (14 AWG) is recommended.
2. **Cable glands**: Use appropriately sized cable glands on the HT-8WAY enclosure to maintain IP rating.
3. **CT polarity**: Rogowski coil arrow must point in the direction of current flow (source → load).
4. **Isolation**: RS485 is galvanically isolated from voltage/current inputs.
5. **Grounding**: Connect RS485 shield (terminal 11) to ground at one point only to avoid ground loops.

Appendix C: Tasmota Command Reference

Complete command reference for the RACKSYNC IIoT firmware (Tasmota 15.3.0) running on the ESP32-C3 controller. Access via web UI console or MQTT.

Energy Monitoring Commands

Command	Syntax	Description	Example
EnergyRes	`EnergyRes <0-5>`	Energy resolution decimal places	`EnergyRes 3`
PowerDelta	[illegible] <kW>	[illegible] counter	[illegible] 123400.67

MQTT Commands

Command	Syntax	Description	Example
MqttHost	`MqttHost <addr>`	Set MQTT broker address	`MqttHost broker.example.com`
Prefix3	[illegible]	[illegible]	[illegible]

Wi-Fi Commands

Command	Syntax	Description	Example
SSId	`SSId1 <name>`	Set Wi-Fi SSID	`SSId1 MyNetwork`
WifiManager	[illegible]	[illegible]	[illegible]

System Commands

Command	Syntax	Description	Example
Status	`Status <0-11>`	Show device status	`Status 0`
SerialLog	`<cmd1;cmd2;...>`	Execute commands	`MyNet; Password1 MyPass; Restart 1`

Telemetry Commands

Command	Syntax	Description	Example
TelePeriod	`TelePeriod <sec>`	Set telemetry interval (10-3600)	`TelePeriod 20`
SetOption59	`SetOption59 <0/1>`	Send tele on state change	`SetOption59 1`

Modbus/Serial Commands

Command	Syntax	Description	Example
Baudrate	`Baudrate <rate>`	Set serial baud rate	`Baudrate 9600`
SerialConfig	`SerialConfig <8N1>`	Set serial format	`SerialConfig 8E1`

Home Assistant Integration

Command	Syntax	Description	Example
SetOption19	`SetOption19 <0/1>`	HAutoDiscovery control	`SetOption19 0`
DeviceName	`SetOption19 <0/1>`	Device display name	`SetOption19 1` `EMON3P`

Time & Location

Command	Syntax	Description	Example
Timezone	`Timezone <offset>`	Set timezone (Thailand: 7)	`Timezone 7`
Longitude	Longitude <deg>	Set longitude	Longitude 100.75038

Complete Initial Setup Example

This Backlog command configures the device for a typical Thai installation:

```
Backlog SSId1 MyNetwork; Password1 MyWiFipass; MqttHost broker.example.com; MqttPort 8883; MqttUser emon_user; MqttPassword mqtt_secret; TelePeriod 20; Timezone 7; Hostname rs-emon3p; DeviceName RS-EMON3P; Restart 1
```

Index

This is the alphabetical index for the RACKSYNC 3P-EMON SDM630MCT-RC manual. Key terms and cross-references:

A

B

C

D

E

F

G

H

I

K

L

M

O

P

R

S

T

W