

SDM630MCT-RC

Version 1.0.0

RACKSYNC CO., LTD.

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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 Meter family of flexible Rogowski transformers for 0.5 to 630 kVA

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	85-265VAC/50-60Hz (RC)

Accuracy

Parameter	Accuracy
Voltage	1.0% of reading
Reactive energy	Class 2 (IEC 62053-21) ±2% of reading

Physical

Parameter	Value
Dimensions	94.5 × 72 × 65 mm
Weight	12.5 g (0.44 oz)

Outputs

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

Communication

Parameter	Value
Protocol	Modbus RTU
Data format	2400, 8N1, 19200, 8N1, 38400, 4800, 9600, 19200, 38400, 76800, 153600, 307200, 614400, 1228800, 2457600, 4915200, 9830400, 19660800, 39321600, 78643200, 157286400, 314572800, 629145600, 1258291200, 2516582400, 5033164800, 10066329600, 20132659200, 40265318400, 80530636800, 161061273600, 322122547200, 644245094400, 1288490188800, 2576980377600, 5153960755200, 10307921510400, 20615843020800, 41231686041600, 82463372083200, 164926744166400, 329853488332800, 659706976665600, 1319413953331200, 2638827906662400, 5277655813324800, 10555311626649600, 21110623253299200, 42221246506598400, 84442493013196800, 168884986026393600, 337769972052787200, 675539944105574400, 1351079888211148800, 2702159776422297600, 5404319552844595200, 10808639105689190400, 21617278211378380800, 43234556422756761600, 86469112845513523200, 172938225691027046400, 345876451382054092800, 691752902764108185600, 1383505805528216371200, 2767011611056432742400, 5534023222112865484800, 11068046444225730969600, 22136092888451461939200, 44272185776902923878400, 88544371553805847756800, 177088743107611695513600, 354177486215223391027200, 708354972430446782054400, 1416709944860893564108800, 2833419889721787128217600, 5666839779443574256435200, 11333679558887148512870400, 22667359117774297025740800, 45334718235548594051481600, 90669436471097188102963200, 181338872942194376205926400, 362677745884388752411852800, 725355491768777504823705600, 1450710983537555009647411200, 2901421967075110019294822400, 5802843934150220038589644800, 11605687868300440077179289600, 23211375736600880154358579200, 46422751473201760308717158400, 92845502946403520617434316800, 185691005892807041234868633600, 371382011785614082469737267200, 742764023571228164939474534400, 1485528047142456329878949068800, 2971056094284912659757898137600, 5942112188569825319515796275200, 11884224377139650639031592550400, 23768448754279301278063185100800, 47536897508558602556126370201600, 95073795017117205112252740403200, 190147590034234410224505480806400, 380295180068468820449010961612800, 760590360136937640898021923225600, 1521180720273875281796043846451200, 3042361440547750563592087692902400, 6084722881095501127184175385804800, 12169445762191002254368350771609600, 24338891524382004508736701543219200, 48677783048764009017473403086438400, 97355566097528018034946806172876800, 194711132195056036069893612345753600, 389422264390112072139787224691507200, 778844528780224144279574449383014400, 1557689057560448288559148898766028800, 3115378115120896577118297797532057600, 6230756230241793154236595595064115200, 12461512460483586308473191190128230400, 24923024920967172616946382380256460800, 49846049841934345233892764760512921600, 99692099683868690467785529521025843200, 199384199367737380935571059042051686400, 398768398735474761871142118084103372800, 797536797470949523742284236168206745600, 1595073594941899047484568472336413491200, 3190147189883798094969136944672826982400, 6380294379767596189938273889345653964800, 12760588759535192379876547778691307929600, 25521177519070384759753095557382615859200, 51042355038140769519506191114765231718400, 102084710076281539039012382229530463436800, 204169420152563078078024764459060926873600, 408338840305126156156049528918121853747200, 816677680610252312312099057836243707494400, 1633355361220504624624198115672487414988800, 3266710722441009249248396231344974829977600, 6533421444882018498496792462689949659955200, 13066842889764036996993584925379899319910400, 26133685779528073993987169850759798639820800, 52267371559056147987974339701519597279641600, 104534743118112295975948679403039194559283200, 209069486236224591951897358806078389118566400, 418138972472449183903794717612156778237132800, 836277944944898367807589435224313556474265600, 1672555889889796735615178870448627112948531200, 3345111779779593471230357740897254225897062400, 6690223559559186942460715481794508451794124800, 13380447119118373884921430963589016903588249600, 26760894238236747769842861927178033807176499200, 53521788476473495539685723854356067614352998400, 107043576952946991079371447708

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 (6 to +70°C non-condensing)

Ordering Variants

Model	Input Type	Output
	85mV/kA (Rogowski)	Modbus + Pulse
SDM630MCT-RC		
SDM630MCT-5A	33mV (CT)	Modbus + Pulse
	5A (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	≤18mV (500mA)

Available Models

Model	Rated Current	Coil Type	Window Size
ESCT-RC16	200A	A	16mm
ESCT-RC240	200A	B	240mm

CT Family Comparison (All Eastron Families)

Family ESCT-RC	Type	Range	Output	Accuracy
	Rogowski Coil	200A–40kA	85mV/kA	≤1%
ECTB-xxx	Split Core (large)	600A–4000A	33mV/A	Class 0.5
	Split Core (small)	600A–4000A	33mV/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 ESCT-RC100	Rated Current	CT Ratio Setting
	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)
2	Phase L2 (Line 2)
3	Phase L3 (Line 3)
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
	RS485 D+ (Data+)
9	
12-14	RS485 D- (Data-)
	RS485 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	RS-485 Modbus (A/B/C/D, RTN) / Relay outputs (NO, NC, COM)

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 System type	Options	Default
	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 40063	Parameter	Range	Default
	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 ESCT-RC80	Rated Current	CT Ratio Value
	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 40065	Parameter	Range	Default
	PT ratio	1-4000	1

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

Communication Settings

Baud Rate

Register 40069	Options	Default
	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 40073	Options	Default
	EVEN, ODD, NONE	EVEN

Pulse Output Configuration

Register 40079	Parameter	Default
	Pulse output 1 mode	Import active energy
40083	Pulse output 1 mode	Import active energy
	Pulse width	60ms

Display Settings

Demand Integration Time (DIT)

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

Backlit Timeout

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

Password Change

Register 40091	Parameter	Default
	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	40009	9999	Change to user-defined

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:

[illegible]

3-Phase Energy Monitor

RS-EMON3P

MQTT parameters

Host ()

Port (8883)

☒ **MQTT TLS**

Client (RS-EMON3P_6A9B28)

User (test)

Password ■

Topic = %topic% (RS-EMON3P_6A9B28)

Full Topic (%prefix%/ %topic%/)

Save

Configuration

IIoT FW 15.3.0 (tasmota32) by RACKSYNC

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 HAutoDiscovery	Command	Value
	SetOption19 0	Use custom discovery
Devicename	SetOption17 1	Show device registry

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 Sleep	Command	Default
	Sleep 50	50 (dynamic)
Modbus polling interval	Automatic	20s
	20s	Automatic

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	Protected (Yes if fingerprint matches)	Full (yes, 120KB)

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	Only use RACKSYNC for RACKSYNC Configure MQTT train

Network Security Recommendations

Recommendation	Details
IoT VLAN	Place energy monitors on a separate VLAN
Wi-Fi security	Use WPA3 or WPA2-PSK for the Wi-Fi and RS485 only

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

Energy Screens

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

Power & Power Factor Screens

Display Total active power	Parameter	Unit
	Net power	kW
Frequency	Net power	kW
	Net power	kW

Demand Screens

Display Maximum demand	Parameter	Unit
	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-EMON3P_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 Total	Description	Unit
	Cumulative energy since last reset	kWh
Frequency	Frequency	Hz
	Frequency	Hz

Monitoring via Home Assistant

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

Sensor Entities

Entity sensor.rs_emon3p_energy_total	Description	Unit
	Total energy	kWh
Entity sensor.rs_emon3p_frequency	Frequency	Hz
	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:

[illegible]

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

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	Blow fuse for display	Check site utility for AC) terminals 5-6: min 85V

No Modbus Communication

Symptom	Possible Cause	Solution
No response from meter	Wrong baud rate	Verify baud rate matches (default: 9600)
Bus errors	RS485 termination not properly configured	Configure bus termination (default: 110 ohms)

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 polarity reversed	Check CT polarity (see manual)

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)
Slow telemetry	Wi-Fi congestion	Schedule sleep during peak hours Schedule sleep during low traffic times

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	MQTT client not initialized	Verify MQTT client is properly initialized
	MQTT client not connected	Verify MQTT client is connected to the broker

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 discovery messages	Verify MqttTopicPrefix device

OTA Update Failures

Symptom	Possible Cause	Solution
Update fails to start	Wrong OTA URL	Verify URL is accessible and HTTPS
Device unresponsive after update	Corrupted firmware	Flash a stable one before updating
	Unstable Wi-Fi	Flash a stable one before updating

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	Coil not fully closed Center of coil not aligned with center of tail opening	Reinstall coil to match, center of tail opening

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 Protocol	Default
	Modbus RTU
Float format	Big-Endian (IEEE 754)
	Big-Endian (IEEE 754)

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
	0x753D	Phase 1 current	A	✓	✓	✓
30019	0x753E	Phase 2 current	A	✓	✓	—

Power Registers

Address	Hex	Parameter	Unit	3P4W	3P3W	1P2W
30021	0x7545	Phase 1 active power	W	✓	✓	✓
30022	0x7546	Phase 2 active power	W	✓	✓	✓
30023	0x7547	Phase 3 active power	W	✓	✓	✓
30024	0x7548	Phase 1 reactive power	Var	✓	✓	✓
30025	0x7549	Phase 2 reactive power	Var	✓	✓	✓
30026	0x754A	Phase 3 reactive power	Var	✓	✓	✓
30027	0x754B	Phase 1 complex power	VA	✓	✓	✓
30028	0x754C	Phase 2 complex power	VA	✓	✓	✓
30029	0x754D	Phase 3 complex power	VA	✓	✓	✓
30030	0x754E	Phase 1 power factor		✓	✓	✓
30031	0x754F	Phase 2 power factor		✓	✓	✓
30032	0x7550	Phase 3 power factor		✓	✓	✓
30033	0x7551	Phase 1 THD	%	✓	✓	✓
30034	0x7552	Phase 2 THD	%	✓	✓	✓
30035	0x7553	Phase 3 THD	%	✓	✓	✓
30036	0x7554	Phase 1 voltage	V	✓	✓	✓
30037	0x7555	Phase 2 voltage	V	✓	✓	✓
30038	0x7556	Phase 3 voltage	V	✓	✓	✓
30039	0x7557	Phase 1 current	A	✓	✓	✓
30040	0x7558	Phase 2 current	A	✓	✓	✓
30041	0x7559	Phase 3 current	A	✓	✓	✓
30042	0x755A	Phase 1 frequency	Hz	✓	✓	✓
30043	0x755B	Phase 2 frequency	Hz	✓	✓	✓
30044	0x755C	Phase 3 frequency	Hz	✓	✓	✓
30045	0x755D	Phase 1 active power	W	✓	✓	✓
30046	0x755E	Phase 2 active power	W	✓	✓	✓
30047	0x755F	Phase 3 active power	W	✓	✓	✓
30048	0x7560	Phase 1 reactive power	Var	✓	✓	✓
30049	0x7561	Phase 2 reactive power	Var	✓	✓	✓
30050	0x7562	Phase 3 reactive power	Var	✓	✓	✓
30051	0x7563	Phase 1 complex power	VA	✓	✓	✓
30052	0x7564	Phase 2 complex power	VA	✓	✓	✓
30053	0x7565	Phase 3 complex power	VA	✓	✓	✓
30054	0x7566	Phase 1 power factor		✓	✓	✓
30055	0x7567	Phase 2 power factor		✓	✓	✓
30056	0x7568	Phase 3 power factor		✓	✓	✓
30057	0x7569	Phase 1 THD	%	✓	✓	✓
30058	0x756A	Phase 2 THD	%	✓	✓	✓
30059	0x756B	Phase 3 THD	%	✓	✓	✓
30060	0x756C	Phase 1 voltage	V	✓	✓	✓
30061	0x756D	Phase 2 voltage	V	✓	✓	✓
30062	0x756E	Phase 3 voltage	V	✓	✓	✓
30063	0x756F	Phase 1 current	A	✓	✓	✓
30064	0x7570	Phase 2 current	A	✓	✓	✓
30065	0x7571	Phase 3 current	A	✓	✓	✓
30066	0x7572	Phase 1 frequency	Hz	✓	✓	✓
30067	0x7573	Phase 2 frequency	Hz	✓	✓	✓
30068	0x7574	Phase 3 frequency	Hz	✓	✓	✓
30069	0x7575	Phase 1 active power	W	✓	✓	✓
30070	0x7576	Phase 2 active power	W	✓	✓	✓
30071	0x7577	Phase 3 active power	W	✓	✓	✓
30072	0x7578	Phase 1 reactive power	Var	✓	✓	✓
30073	0x7579	Phase 2 reactive power	Var	✓	✓	✓
30074	0x757A	Phase 3 reactive power	Var	✓	✓	✓
30075	0x757B	Phase 1 complex power	VA	✓	✓	✓
30076	0x757C	Phase 2 complex power	VA	✓	✓	✓
30077	0x757D	Phase 3 complex power	VA	✓	✓	✓
30078	0x757E	Phase 1 power factor		✓	✓	✓
30079	0x757F	Phase 2 power factor		✓	✓	✓
30080	0x7580	Phase 3 power factor		✓	✓	✓
30081	0x7581	Phase 1 THD	%	✓	✓	✓
30082	0x7582	Phase 2 THD	%	✓	✓	✓
30083	0x7583	Phase 3 THD	%	✓	✓	✓
30084	0x7584	Phase 1 voltage	V	✓	✓	✓
30085	0x7585	Phase 2 voltage	V	✓	✓	✓
30086	0x7586	Phase 3 voltage	V	✓	✓	✓
30087	0x7587	Phase 1 current	A	✓	✓	✓
30088	0x7588	Phase 2 current	A	✓	✓	✓
30089	0x7589	Phase 3 current	A	✓	✓	✓
30090	0x758A	Phase 1 frequency	Hz	✓	✓	✓
30091	0x758B	Phase 2 frequency	Hz	✓	✓	✓
30092	0x758C	Phase 3 frequency	Hz	✓	✓	✓
30093	0x758D	Phase 1 active power	W	✓	✓	✓
30094	0x758E	Phase 2 active power	W	✓	✓	✓
30095	0x758F	Phase 3 active power	W	✓	✓	✓
30096	0x7590	Phase 1 reactive power	Var	✓	✓	✓
30097	0x7591	Phase 2 reactive power	Var	✓	✓	✓
30098	0x7592	Phase 3 reactive power	Var	✓	✓	✓
30099	0x7593	Phase 1 complex power	VA	✓	✓	✓
30100	0x7594	Phase 2 complex power	VA	✓	✓	✓
30101	0x7595	Phase 3 complex power	VA	✓	✓	✓
30102	0x7596	Phase 1 power factor		✓	✓	✓
30103	0x7597	Phase 2 power factor		✓	✓	✓
30104	0x7598	Phase 3 power factor		✓	✓	✓
30105	0x7599	Phase 1 THD	%	✓	✓	✓
30106	0x759A	Phase 2 THD	%	✓	✓	✓
30107	0x759B	Phase 3 THD	%	✓	✓	✓
30108	0x759C	Phase 1 voltage	V	✓	✓	✓
30109	0x759D	Phase 2 voltage	V	✓	✓	✓
30110	0x759E	Phase 3 voltage	V	✓	✓	✓
30111	0x759F	Phase 1 current	A	✓	✓	✓
30112	0x75A0	Phase 2 current	A	✓	✓	✓
30113	0x75A1	Phase 3 current	A	✓	✓	✓
30114	0x75A2	Phase 1 frequency	Hz	✓	✓	✓
30115	0x75A3	Phase 2 frequency	Hz	✓	✓	✓
30116	0x75A4	Phase 3 frequency	Hz	✓	✓	✓
30117	0x75A5	Phase 1 active power	W	✓	✓	✓
30118	0x75A6	Phase 2 active power	W	✓	✓	✓
30119	0x75A7	Phase 3 active power	W	✓	✓	✓
30120	0x75A8	Phase 1 reactive power	Var	✓	✓	✓
30121	0x75A9	Phase 2 reactive power	Var	✓	✓	✓
30122	0x75AA	Phase 3 reactive power	Var	✓	✓	✓
30123	0x75AB	Phase 1 complex power	VA	✓	✓	✓
30124	0x75AC	Phase 2 complex power	VA	✓	✓	✓
30125	0x75AD	Phase 3 complex power	VA	✓	✓	✓
30126	0x75AE	Phase 1 power factor		✓	✓	✓
30127	0x75AF	Phase 2 power factor		✓	✓	✓
30128	0x75B0	Phase 3 power factor		✓	✓	✓
30129	0x75B1	Phase 1 THD	%	✓	✓	✓
30130	0x75B2	Phase 2 THD	%	✓	✓	✓
30131	0x75B3	Phase 3 THD	%	✓	✓	✓
30132	0x75B4	Phase 1 voltage	V	✓	✓	✓
30133	0x75B5	Phase 2 voltage	V	✓	✓	✓
30134	0x75B6	Phase 3 voltage	V	✓	✓	✓
30135	0x75B7	Phase 1 current	A	✓	✓	✓
30136	0x75B8	Phase 2 current	A	✓	✓	✓
30137	0x75B9	Phase 3 current	A	✓	✓	✓
30138	0x75BA	Phase 1 frequency	Hz	✓	✓	✓
30139	0x75BB	Phase 2 frequency	Hz	✓	✓	✓
30140	0x75BC	Phase 3 frequency	Hz	✓	✓	✓
30141	0x75BD	Phase 1 active power	W	✓	✓	✓
30142	0x75BE	Phase 2 active power	W	✓	✓	✓
30143	0x75BF	Phase 3 active power	W	✓	✓	✓
30144	0x75C0	Phase 1 reactive power	Var	✓	✓	✓
30145	0x75C1	Phase 2 reactive power	Var	✓	✓	✓
30146	0x75C2	Phase 3 reactive power	Var	✓	✓	✓
30147	0x75C3	Phase 1 complex power	VA	✓	✓	✓
30148	0x75C4	Phase 2 complex power	VA	✓	✓	✓
30149	0x75C5	Phase 3 complex power	VA	✓	✓	✓
30150	0x75C6	Phase 1 power factor		✓	✓	✓
30151	0x75C7	Phase 2 power factor		✓	✓	✓
30152	0x75C8	Phase 3 power factor		✓	✓	✓
30153	0x75C9	Phase 1 THD	%	✓	✓	✓
30154	0x75CA	Phase 2 THD	%	✓	✓	✓
30155	0x75CB	Phase 3 THD	%	✓	✓	✓
30156	0x75CC	Phase 1 voltage	V	✓	✓	✓
30157	0x75CD	Phase 2 voltage	V	✓	✓	✓
30158	0x75CE	Phase 3 voltage	V	✓	✓	✓
30159	0x75CF	Phase 1 current	A	✓	✓	✓
30160	0x75D0	Phase 2 current	A	✓	✓	✓
30161	0x75D1	Phase 3 current	A	✓	✓	✓
30162	0x75D2	Phase 1 frequency	Hz	✓	✓	✓
30163	0x75D3	Phase 2 frequency	Hz	✓	✓	✓
30164	0x75D4	Phase 3 frequency	Hz	✓	✓	✓
30165	0x75D5	Phase 1 active power	W	✓	✓	✓
30166	0x75D6	Phase 2 active power	W	✓	✓	✓
30167	0x75D7	Phase 3 active power	W	✓	✓	✓
30168	0x75D8	Phase 1 reactive power	Var	✓	✓	✓
30169	0x75D9	Phase 2 reactive power	Var	✓	✓	✓
30170	0x75DA	Phase 3 reactive power	Var	✓	✓	✓
30171	0x75DB	Phase 1 complex power	VA	✓	✓	✓
30172	0x75DC	Phase 2 complex power	VA	✓	✓	✓
30173	0x75DD	Phase 3 complex power	VA	✓	✓	✓
30174	0x75DE	Phase 1 power factor		✓	✓	✓
30175	0x75DF	Phase 2 power factor		✓	✓	✓
30176	0x75E0	Phase 3 power factor		✓	✓	✓
30177	0x75E1	Phase 1 THD	%	✓	✓	✓
30178	0x75E2	Phase 2 THD	%	✓	✓	✓
30179	0x75E3	Phase 3 THD	%	✓	✓	✓
30180	0x75E4	Phase 1 voltage	V	✓	✓	✓
30181	0x75E5	Phase 2 voltage	V	✓	✓	✓
30182	0x75E6	Phase 3 voltage	V	✓	✓	✓
30183	0x75E7	Phase 1 current	A	✓	✓	✓
30184	0x75E8	Phase 2 current	A	✓	✓	✓
30185	0x75E9	Phase 3 current	A	✓	✓	✓
30186	0x75EA	Phase 1 frequency	Hz	✓	✓	✓
30187	0x75EB	Phase 2 frequency	Hz	✓	✓	✓
30188	0x75EC	Phase 3 frequency	Hz	✓	✓	✓
30189	0x75ED	Phase 1 active power	W	✓	✓	✓
30190	0x75EE	Phase 2 active power	W	✓	✓	✓
30191	0x75EF	Phase 3 active power	W	✓	✓	✓
30192	0x75F0	Phase 1 reactive power	Var	✓	✓	✓
30193	0x75F1	Phase 2 reactive power	Var	✓	✓	✓
30194	0x75F2	Phase 3 reactive power	Var	✓	✓	✓
30195	0x75F3	Phase 1 complex power	VA	✓	✓	✓
30196	0x75F4	Phase 2 complex power	VA	✓	✓	✓
30197	0x75F5	Phase 3 complex power	VA	✓	✓	✓
30198	0x75F6	Phase 1 power factor		✓	✓	✓
30199	0x75F7	Phase 2 power factor		✓	✓	✓
30200	0x75F8	Phase 3 power factor		✓	✓	✓
30201	0x75F9	Phase 1 THD	%	✓	✓	✓
30202	0x75FA	Phase 2 THD	%	✓	✓	✓
30203	0x75FB	Phase 3 THD	%	✓	✓	✓
30204	0x75FC	Phase 1 voltage	V	✓	✓	✓
30205	0x75FD	Phase 2 voltage	V	✓	✓	✓
30206	0x75FE	Phase 3 voltage	V	✓	✓	✓
30207	0x75FF	Phase 1 current	A	✓	✓	✓
30208	0x7600	Phase 2 current	A	✓	✓	✓
30209	0x7601	Phase 3 current	A	✓	✓	✓
30210	0x7602	Phase 1 frequency	Hz	✓	✓	✓
30211	0x7603	Phase 2 frequency	Hz	✓	✓	✓
30212	0x7604	Phase 3 frequency	Hz	✓	✓	✓
30213	0x7605	Phase 1 active power	W	✓	✓	✓
30214	0x7606	Phase 2 active power	W	✓	✓	✓
30215	0x7607	Phase 3 active power	W	✓	✓	✓
30216	0x7608	Phase 1 reactive power	Var	✓	✓	✓
30217	0x7609	Phase 2 reactive power	Var	✓	✓	✓
30218	0x760A	Phase 3 reactive power	Var	✓	✓	✓
30219	0x760B	Phase 1 complex power	VA	✓	✓	✓
30220	0x760C	Phase 2 complex power	VA	✓	✓	✓
30221	0x760D	Phase 3 complex power	VA	✓	✓	✓
30222	0x760E	Phase 1 power factor		✓	✓	✓
30223	0x760F	Phase 2 power factor		✓	✓	✓
30224	0x7610	Phase 3 power factor		✓	✓	✓
30225	0x7611	Phase 1 THD	%	✓	✓	✓
30226	0x7612	Phase 2 THD	%	✓	✓	✓
30227	0x7613	Phase 3 THD	%	✓	✓	✓
30228	0x7614	Phase 1 voltage	V	✓	✓	✓
30229	0x7615	Phase 2 voltage	V	✓	✓	✓
30230	0x7616	Phase 3 voltage	V	✓	✓	✓
30231	0x7617	Phase 1 current	A	✓	✓	✓
30232	0x7618	Phase 2 current				

Power Factor & Frequency

Address	Hex	Parameter	Unit	3P4W	3P3W	1P2W
	30045	0x755D	Phase 1 power factor	—	✓	✓
30061	0x755E	Phase 2 power factor	—	✓	✓	✓
	0x755F	Phase 3 power factor	—	✓	✓	✓

Energy Registers

Address	Hex	Parameter	Unit	3P4W	3P3W	1P2W
	30063	0x756F	Import active energy	kWh	✓	✓
30073	0x7573	Export active energy	kWh	✓	✓	✓

Demand Registers

Address	Hex	Parameter	Unit
30075	0x757B	Total system power demand	W
30089	0x7585	Minimum 3-phase system power demand	W
	0x7586	Maximum 3-phase system power demand	W

Total Harmonic Distortion

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

Holding Registers (Function Code 03/16)

Configuration Registers

RACKSYNC CO., LTD.	132	2=1960E, 3=19200.	https://github.com/racksync
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Pulse Output Mode Values

Value 0	Pulse 1 Meaning	Pulse 2 Meaning
	Import active energy	Import reactive energy
2	Export active energy	Export reactive energy
	Import active energy	Import 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	120G1700B9-B of 10s D-) Screw terminal block, 10s D-)

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
	Phase L1	Voltage measurement
19–20	ANALOG GND	Connect to Analog Ground
	RTN	Connect to Power 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
	Phase L1	Voltage measurement
19–20	ANALOG GND	Reference for analog input
	ANALOG VCC	Reference for analog input

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
	Phase L	Voltage measurement
19–20	ANALOG GND	Module ground
	POWER GND	Power supply

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

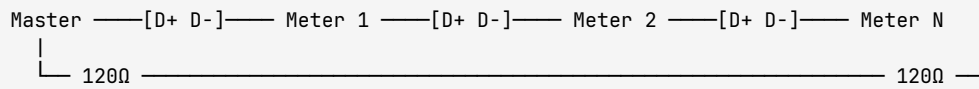
The meter requires auxiliary power independent of voltage measurement inputs.

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	PowerDelta <0-5> <unit>	Power resolution decimal places unit	PowerDelta 3 12345.67

MQTT Commands

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

Wi-Fi Commands

Command	Syntax	Description	Example
SSID	SSID1 <name>	Set Wi-Fi SSID	SSID1 MyNetwork

System Commands

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

Telemetry Commands

Command TelePeriod	Syntax	Description	Example
	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 <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>	Set device name	SetOption19 228SL
			EMON3P

Time & Location

Command	Syntax	Description	Example
Timezone	Timezone <offset>	Set timezone (Thailand: 7)	Timezone 7
Latitude	Latitude <deg>	Set NMEA0183 Latitude	Latitude 10.75018
Longitude	Longitude <deg>	Set NMEA0183 Longitude	Longitude 107.5018 pool.ntp.org

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
```

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- Apparent Power — Chapter 8 (Operation)

B

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C

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