LamaPLC: Eastron SDM 630 Energy Meter with Modbus communication

The Eastron SDM630 is a series of three-phase, multifunctional DIN-rail-mounted energy meters used to measure and monitor electrical parameters in industrial, commercial, and residential applications. It is known for its high accuracy, compact design, and communication interfaces.

Key Features

- **Multifunctional Measurement:** The meter measures a wide range of parameters, including active energy (kWh), reactive energy (kVArh), active power (W), apparent power (VA), voltage (V), current (A), power factor (PF), frequency (Hz), and total harmonic distortion (THD) for all phases.
- **Direct Connection:** Most models support direct connection for loads up to 100 A, eliminating the need for external current transformers (CTs) for many applications. Other variants, such as the SDM630MCT, are designed to operate with external CTs for higher-current applications.
- **Communication:** It features built-in interfaces, including RS485 Modbus RTU and dual pulse outputs, for remote monitoring and integration into Building Management Systems (BMS), energy management systems, or solar inverters (e.g., Deye, Growatt).
- **Display and Usability:** The meter has a clear, backlit LCD and user-friendly, password-protected menu navigation via touch-sensitive buttons on the front panel.
- Certification: Many models, such as the SDM630-Modbus-MID V2, are MID-certified, making them suitable for legally compliant billing.
- **Versatility:** It is compatible with single-phase two-wire, three-phase three-wire, and three-phase four-wire network configurations.

Technical Specifications

According to Eastron Europe datasheets and user manuals, the specifications for the standard SDM630 models are as follows:

Parameter	Specification
Nominal Voltage (Un)	3×230/400 V AC
Maximum Current (Imax)	100 A (direct measurement)
Accuracy Class	Class 1 (IEC 62053-21) / Class B (EN50470-3)
Frequency Range	50 or 60 Hz
Communication	RS485 Modbus RTU, two pulsed outputs
Display	Backlit LCD
Mounting	35mm DIN rail
Protection Degree	IP51 (indoor use)
Operating Temperature	-25°C to +55°C

Eastron SDM630 Version V1, V2, and V3

The primary difference among the Eastron SDM630 V1, V2, and V3 versions lies in the firmware and specific energy calculation methods, particularly how the meters handle imported and exported energy.

Key Differences Summary

- **V1 (Legacy):** The initial version with basic functionality and limited register addresses. It is supported only by certain software configurations at baud rates of 9600 or higher.
- **V2 (Standard/Net-Counting):** Introduced “net-counting” calculation, meaning the total energy measurement combines (Import minus Export) values. It added features such as a second resettable total energy counter and had slightly different default Modbus settings and options in its menus.
- **V3 (Enhanced Functionality/MID):** The latest version is often certified for commercial billing (MID certification). Functionally, it is very similar to V2 but ensures compliance with newer standards, includes updated firmware (typically post-2022 build dates), and may have slightly different default configurations in some supplier-specific models.

Detailed Comparison Points

Feature	SDM630 V1	SDM630 V2	SDM630 V3
Energy Calculation	Basic Import/Export	Net-counting (Total = Import - Export)	Net-counting, often with separate registers
Resettable Energy	Limited options	Includes second resettable total energy counter	Same as V2, possibly enhanced options
Firmware Date	Older builds	Typically prior to 2022	Typically 2022 or later
Modbus Registers	Limited set	More extensive, with added registers	Largely consistent with V2 core registers
Certifications	Standard	Standard, and MID options	Standard and MID options, focus on recent compliance

Modbus Protocol Consistency

Crucially, the core Modbus register addresses for real-time measurements (*voltage, current, power, frequency*) are largely identical across all versions. The main differences users encounter typically relate to the interpretation of the total energy registers and minor menu/configuration variations.

The default Modbus communication settings (Address 1, 9600 baud, 8N1) are generally consistent across all three versions, though supplier customizations exist.

Modbus communication

Read Limits: Do not attempt to read more than 40 parameters (80 registers) in a single Modbus request to avoid exception errors.

RS485 communication interface, MODBUS RTU protocol:

- Baudrate: 9600 Baud (default, can be set)
- Parity: Even

- Databits: 8
- Stopbits: 1
- Default slave ID: 1 (SMD72D), 45 (SDM72CTM)
- Number of Drivers and Receivers: 32 Drivers, 32 Receivers (without repeater)
- Maximum Cable Length: 1200 m
- Maximum Data Rate: 10 Mbaud
- Maximum Common Mode Voltage: 12 V .. –7 V
- Minimum Driver Output Levels (Loaded): +/– 1.5 V
- Minimum Driver Output Levels (Unloaded): +/– 6 V
- Drive Load: Minimum 60 ohms
- Driver Output Short Circuit Current Limit: 150 mA to Gnd, 250 mA to 12 V, 250 mA to -7 V
- Minimum Receiver Input Resistance: 12 kΩ
- Receiver Sensitivity: +/- 200 mV

32-bit (2 words) input registers

The registers are read-only.

Register Nr	32 bit address	Description	Unit
30001	1	Phase 1 line to neutral volts	Volts
30003	2	Phase 2 line to neutral volts	Volts
30005	3	Phase 3 line to neutral volts	Volts
30007	4	Phase 1 current	Amps
30009	5	Phase 2 current	Amps
30011	6	Phase 3 current	Amps
30013	7	Phase 1 power	Watts
30015	8	Phase 2 power	Watts
30017	9	Phase 3 power	Watts
30019	10	Phase 1 volt amps	VA
30021	11	Phase 2 volt amps	VA
30023	12	Phase 3 volt amps	VA
30025	13	Phase 1 volt amps reactive	VAr
30027	14	Phase 2 volt amps reactive	VAr
30029	15	Phase 3 volt amps reactive	VAr
30031	16	Phase 1 power factor (1)	VAr
30033	17	Phase 2 power factor (1)	VAr
30035	18	Phase 3 power factor (1)	VAr
30037	19	Phase 1 phase angle	Degrees
30039	20	Phase 2 phase angle	Degrees
30041	21	Phase 3 phase angle	Degrees
30043	22	Average line to neutral volts	Volts
30047	24	Average line current	Amps
30049	25	Sum of line currents	Amps
30053	27	Total system power	Watts
30057	29	Total system volt amps	VA
30061	31	Total system VAr	VAr
30063	32	Total system power factor (1)	-

Register Nr	32 bit address	Description	Unit
30067	34	Total system phase angle	Degrees
30071	36	Frequency of supply voltages	Hz
30073	37	Total Import kWh	kWh
30075	38	Total Export kWh	kWh
30077	39	Total Import kVArh	kVArh
30079	40	Total Export kVArh	kVArh
30081	41	Total VAh	kVAh
30083	42	Ah	Ah
30085	43	Total system power demand (2)	W
30087	44	Maximum total system power demand (2)	VA
30101	51	Total system VA demand	VA
30103	52	Maximum total system VA demand	VA
30105	53	Neutral current demand	Amps
30107	54	Maximum neutral current demand	Amps
30201	101	Line 1 to Line 2 volts	Volts
30203	102	Line 2 to Line 3 volts	Volts
30205	103	Line 3 to Line 1 volts	Volts
30207	104	Average line to line volts	Volts
30225	113	Neutral current	Amps
30235	118	Phase 1 L/N volts THD	%
30237	119	Phase 2 L/N volts THD	%
30239	120	Phase 3 L/N volts THD	%
30241	121	Phase 1 Current THD	%
30243	122	Phase 2 Current THD	%
30245	123	Phase 3 Current THD	%
30249	125	Average line to neutral volts THD	%
30251	126	Average line current THD	%
30255	128	Total system power factor (5)	Degrees
30259	130	Phase 1 current demand	Amps
30261	131	Phase 2 current demand	Amps
30263	132	Phase 3 current demand	Amps
30265	133	Maximum phase 1 current demand	Amps
30267	134	Maximum phase 2 current demand	Amps
30269	135	Maximum phase 3 current demand	Amps
30335	168	Line 1 to line 2 volts THD	%
30337	169	Line 2 to line 3 volts THD	%
30339	170	Line 3 to line 1 volts THD	%
30341	171	Average line to line volts THD	%
30343	172	Total kwh	kwh
30345	173	Total kvarh	kvarh
30347	174	L1 import kwh	kwh
30349	175	L2 import kwh	kwh
30351	176	L3 import kwh	kwh
30353	177	L1 export kwh	kwh
30355	178	L2 export kwh	kwh

Register Nr	32 bit address	Description	Unit
30357	179	L3 export kwh	kwh
30359	180	L1 total kwh	kwh
30361	181	L2 total kwh	kwh
30363	182	L3 total kwh	kwh
30365	183	L1 import kvarh	kvarh
30367	184	L2 import kvarh	kvarh
30369	185	L3 import kvarh	kvarh
30371	186	L1 export kvarh	kvarh
30373	187	L2 export kvarh	kvarh
30375	188	L3 export kvarh	kvarh
30377	189	L1 total kvarh	kvarh
30379	190	L2 total kvarh	kvarh
30381	191	L3 total kvarh	kvarh

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32-bit (2 words) holding registers

The registers are read/write.

Address register	Parameter number	Parameter	Valid range	type	mode
40003	2	Demand period	Write demand period: 0, 5,8, 10, 15, 20, 30, or 60 minutes, default 60. Setting the period to 0 will cause the demand to show the current parameter value, and demand max to show the maximum parameter value since the last demand reset.	Length: 4 byte, Data Format: Float	rw
40011	6	System type	Write system type: 3p4w = 3, 3p3w = 2 & 1p2w= 1 Requires password, see parameter 13	Length : 4 byte, Data Format : Float	rw
40013	7	Pulse 1 width	Write pulse1 on period in milliseconds: 60, 100, or 200, default 100.	Length: 4 byte, Data Format: Float	r
40015	8	Password lock	Write any value to password lock-protected registers. Read password lock status: 0 = locked. 1 = unlocked. Reading will also reset the password timeout back to one minute.	Length: 4 byte, Data Format: Float	r

Address register	Parameter number	Parameter	Valid range	type	mode
40019	10	Network Parity Stop	Write the network port parity/stop bits for MODBUS Protocol, where: 0 = One stop bit and no parity, default. 1 = One stop bit and even parity. 2 = One stop bit and odd parity.3 = Two stop bits and no parity.Requires a restart to become effective.	Length : 4 byte, Data Format : Float	rw
40021	11	Network Node	Write the network port node address: 1 to 247 for MODBUS Protocol, default 1. Requires a restart to become effective.	Length : 4 byte, Data Format : Float	rw
40023	12	Pulse1 Divisor1	Write pulse divisor index: n = 0 to 5 0: 0.0025 kWh(kVArh)/imp 1: 0.01 kWh(kVArh)/imp 2: 0.1 kWh(kVArh)/imp 3: 1 kWh(kVArh)/imp 4: 10 kWh(kVArh)/imp 5: 100 kWh(kVArh)/imp	Length : 4 byte, Data Format : Float	rw
40025	13	Password	Write password for access to protected registers. Default: 0000	Length: 4 byte, Data Format: Float	rw
40029	15	Network Baud Rate	Write the network port baud rate for MODBUS Protocol, where: 0: 2400 baud 1: 4800 baud 2: 9600 baud, default 3: 19200 baud 4: 38400 baud Requires a restart to become effective	Length: 4 byte, Data Format: Float	rw
40087	44	Pulse 1 Energy Type	Write MODBUS Protocol input parameter for pulse output 1: 1: import active energy 2: total active energy 4: export active energy, default 5: import reactive energy 6: total reactive energy 8: export reactive energy	Length : 4 byte, Data Format : Float	rw
461457	30729	reset	00 00 reset the Maximum demand	Length : 2 byte, Data Format : Hex	w

Readable Blocks in Modbus

Nr. of block	Start address	number of registers
1	3000	100
2	3100	8
3	3200	70
4	3300	82
5	4000	100

Arduino & Eastron SDM 630

The Eastron SDM630 communicates via Modbus RTU over an RS-485 interface, requiring an RS-485 converter module and a dedicated library to read data on an Arduino. The **SDM_Energy_Meter library** simplifies this process.

Hardware Required

- **Arduino Board:** Any compatible board (Uno, Nano, Mega, ESP32).
- **RS485 to TTL Converter:** A module using chips like MAX485, MAX3485, or SN75176 to convert RS485 signals to Arduino's 5V/3.3V logic levels. These typically have Data Enable (DE) and Receive Enable (RE) pins that need to be controlled by the Arduino.
- **Eastron SDM630:** Configured with default settings: Modbus address 1, baud rate 9600, 8 data bits, no parity, 1 stop bit (8N1).

Wiring Schematic (MAX485 Module)

- MAX485 VCC → Arduino 5V
- MAX485 GND → Arduino GND
- MAX485 DI (Driver Input) → Arduino Pin 4 (TX for SoftwareSerial)
- MAX485 RO (Receiver Output) → Arduino Pin 3 (RX for SoftwareSerial)
- MAX485 DE (Driver Enable) → Arduino Pin 2 (Control pin)
- MAX485 RE (Receiver Enable) → Arduino Pin 2 (Connect DE and RE together as you only need one-way communication at a time)
- MAX485 A (RS485+ / Data+) → SDM630 A terminal
- MAX485 B (RS485- / Data-) → SDM630 B terminal

Arduino Example Code

This example uses the S**DM_Energy_Meter** library by reaper7 and the standard **SoftwareSerial** library.

```
#include <SoftwareSerial.h>
#include <SDM.h>

// Pins for the SoftwareSerial communication
// RX pin: 3, TX pin: 4
SoftwareSerial sdmSerial(3, 4);

// Pin 2 is used to control the DE/RE pins of the MAX485 converter
#define RS485_EN    2

// Create an SDM object (SoftwareSerial instance, Enable Pin)
SDM sdm(&sdmSerial, RS485_EN);

void setup() {
  Serial.begin(115200);   // Serial monitor output
  sdmSerial.begin(9600);  // SDM630 default baud rate

  Serial.println("\nEastron SDM630 Reader");
```

```
}

void loop() {
  // Read Voltage (Register 0x0000)
  float voltage = sdm.readVal(SDM_PHASE_1_VOLTAGE);
  if (!isnan(voltage)) {
    Serial.print("Voltage L1: ");
    Serial.print(voltage);
    Serial.println(" V");
  } else {
    Serial.println("Failed to read Voltage");
  }

  // Read Total System Power (Register 0x0034 or 0x0052 depending on
V1/V2/V3 meter version)
  // Check documentation for the specific register address
  float power = sdm.readVal(SDM_TOTAL_SYSTEM_POWER);
  if (!isnan(power)) {
    Serial.print("Total Power: ");
    Serial.print(power);
    Serial.println(" W");
  } else {
    Serial.println("Failed to read Power");
  }

  // Read Total Import Energy (Register 0x0048 or 0x0072 depending on
version)
  float energy = sdm.readVal(SDM_TOTAL_IMPORT_ENERGY);
  if (!isnan(energy)) {
    Serial.print("Import Energy: ");
    Serial.print(energy);
    Serial.println(" kWh");
  } else {
    Serial.println("Failed to read Energy");
  }

  delay(3000); // Wait 3 seconds before next read
}
```

modbus, modbus rtu, eastron, modbus map, MID, SDM, SDM 630, Arduino, code