

1.Eastron SDM230Modbus Smart Meter Modbus Protocol Implementation V1.2

1.1 Modbus Protocol Overview

This section provides basic information for interfacing the Eastron Smart meter to a Modbus Protocol network. If background information or more details of the Eastron implementation is required, please refer to section 2 and 3 of this document.

Eastron offers the option of an RS485 communication facility for direct connection to SCADA or other communications systems using the Modbus Protocol RTU slave protocol. The Modbus Protocol establishes the format for the master's query by placing into it the device address, a function code defining the requested action, any data to be sent, and an error checking field. The slave's response message is also constructed using Modbus Protocol. It contains fields confirming the action taken, any data to be returned, and an error-checking field. If an error occurs in receipt of the message, SDM230Modbus will make no response. If the SDM230Modbus is unable to perform the requested action, it will construct an error message and send it as the response.

The electrical interface is 2-wire RS485, via 2 screw terminals. Connection should be made using twisted pair screened cable (Typically 22 gauge Belden 8761 or equivalent). All "A" and "B" connections are daisy chained together. Line topology may or may not require terminating loads depending on the type and length of cable used. Loop (ring) topology does not require any termination load. The impedance of the termination load should match the impedance of the cable and be at both ends of the line. The cable should be terminated at each end with a 120 ohm (0.25 Watt min.) resistor. A total maximum length of 1200 meters is allowed for the RS485 network. A maximum of 32 electrical nodes can be connected, including the controller. The address of each Eastron can be set to any value between 1 and 247. Broadcast mode (address 0) is supported.

The format for each byte in RTU mode is:

Coding System: 8-bit per byte
Data Format: 4 bytes (2 registers) per parameter.
Floating point format (to IEEE 754)
Most significant register first (Default). The default may be changed if required -See Holding Register "Register Order" parameter.
Error Check Field: 2 byte Cyclical Redundancy Check (CRC)
Framing: 1 start bit
8 data bits, least significant bit sent first
1 bit for even/odd parity (or no parity)
1 stop bit if parity is used; 1 or 2 bits if no parity

Data Coding

All data values in the SDM230Modbus smart meter are transferred as 32 bit IEEE754

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floating point numbers, (input and output) therefore each SDM230Modbus meter value is transferred using two Modbus Protocol registers. All register read requests and data write requests must specify an even number of registers. Attempts to read/write an odd number of registers prompt the SDM230Modbus smart meter to return a Modbus Protocol exception message. However, for compatibility with some SCADA systems, SDM230Modbus Smart meter will response to any single input or holding register read with an instrument type specific value.

The SDM230Modbus can transfer a maximum of 40 values in a single transaction; therefore the maximum number of registers requestable is 80. Exceeding this limit prompts the SDM230Modbus to generate an exception response.

Data transmission speed is selectable between 1200, 2400, 4800, 9600

1.2 Input register

Input registers are used to indicate the present values of the measured and calculated electrical quantities. Each parameter is held in two consecutive 16 bit register. The following table details the 3X register address, and the values of the address bytes within the message. A (*) in the column indicates that the parameter is valid for the particular wiring system. Any parameter with a cross(X) will return the value zero. Each parameter is held in the 3X registers. Modbus Protocol function code 04 is used to access all parameters.

For example, to request: Amps 1 Start address=0006
 No. of registers =0002
 Amps 2 Start address=0008
 No. of registers=0002

Each request for data must be restricted to 40 parameters or less. Exceeding the 40 parameter limit will cause a Modbus Protocol exception code to be returned.

Address (Register)	SDM230-Modbus Input Register Parameter		Modbus Protocol Start Address Hex	
	Description	Units	Hi Byte	Lo Byte
30001	Line to neutral volts.	Volts	00	00
30007	Current.	Amps	00	06
30013	Active power.	Watts	00	0C
30019	Apparent power	VoltAmps	00	12
30025	Reactive power	VAr	00	18
30031	Power factor	None	00	1E
30037	Phase angle.	Degree	00	24
30071	Frequency	Hz	00	46

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30073	Import active energy	kwh	00	48
30075	Export active energy	kwh	00	4A
30077	Import reactive energy	kvarh	00	4C
30079	Export reactive energy	kvarh	00	4E
30085	Total system power demand	W	00	54
30087	Maximum total system power demand	W	00	56
30089	Current system positive power demand	W	00	58
30091	Maximum system positive power demand	W	00	5A
30093	Current system reverse power demand	W	00	5C
30095	Maximum system reverse power demand	W	00	5E
30259	Current demand.	Amps	01	02
30265	Maximum current demand.	Amps	01	08
30343	Total active energy	kwh	01	56
30345	Total reactive energy	kvarh	01	58
30385	Current resettable total active energy	kwh	01	80
30387	Current resettable total reactive energy	kvarh	01	82

1.3 Modbus Protocol Holding Registers and Digital meter set up

Holding registers are used to store and display instrument configuration settings. All holding registers not listed in the table below should be considered as reserved for manufacturer use and no attempt should be made to modify their values.

The holding register parameters may be viewed or changed using the Modbus Protocol. Each parameter is held in two consecutive 4X registers. Modbus Protocol Function Code 03 is used to read the parameter and Function Code 16 is used to write. Write to only one parameter per message.

Address Register	Parameter	Modbus Protocol Start Address Hex		Valid range	Mode
		High Byte	Low Byte		
40013	Pulse output 1 Width	00	0C	Write relay on period in Milliseconds: 60, 100 or 200, default 100. Data Format: float (length: 4 byte)	r/w
40019	Network Parity	00	12	Write the network port parity/stop bits for MODBUS Protocol, where: 0 = One stop bit	r/w

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				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. Data Format: float (length: 4 byte)	
40021	Network port Node	00	14	Write the network port node Address: 1 to 247 for MODBUS Protocol, default 1. Data Format: float (length: 4 byte)	r/w
40029	Network Baud Rate	00	1C	Write the network port baud rate for MODBUS Protocol, where: 0 = 2400 bps (default) . 1 = 4800 bps. 2 = 9600 bps. 5=1200 bps Data Format: float (length: 4 byte)	r/w
40087	Pulse1 Energy Type	00	56	Write MODBUS Protocol input parameter for pulse relay 1: 1=Import Wh; 2=Import and ExportWh; 4=Export Wh; (default) 5=Import VARh; 6=Import and Export VARh; 8=Export VARh. Data Format: float (length: 4 byte)	r/w
462721	Demand interval , slide time, automatic scroll display interval (scroll Time), Backlight time	F5	00	min-min-s-min scroll time=0: the display does not scroll automatically. Backlight time=0 Backlight always on Data Format: BCD (length: 4 byte)	r/w

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463761	Pulse 1 constant	F9	10	0000: 0.001kwh (kvarh) /imp (default) 0001: 0.01kwh (kvarh) /imp 0002: 0.1kwh (kvarh) /imp 0003: 1kwh (kvarh) /imp Data Format: Hex (length: 2 byte)	r/w
463776	Measurement mode	F9	20	0001:mode 1(total = import) 0002:mode 2(total = import + export) (default) 0003:mode 3 (total = import - export) Data Format: Hex (length: 2 byte)	r/w
463792	Running time	F9	30	Continuous working period--hour Data Format: float (length: 4 byte)	r/w

Note:

Mode 1: Measure imported energy, Total energy=Imported energy.

Mode 2: Measure imported energy and exported energy, Total energy=Import energy + export energy(default).

Mode 3: Measure imported energy and exported energy, Total energy=Imported energy- exported energy.

2 RS485 General Information

Some of the information in this section relates to other Eastron Digital meter product families, and is included to assist where a mixed network is implemented. RS485 or EIA (Electronic Industries Association) RS485 is a balanced line, half-duplex transmission system allowing transmission distances of up to 1.2 km. The following table summarizes the RS-485 Standard:

PARAMETER	
Mode of Operation	Differential
Number of Drivers and Receivers	32 Drivers, 32 Receivers
Maximum Cable Length	1200 m
Maximum Data Rate	10 M baud
Maximum Common Mode Voltage	12 V to -7 V
Minimum Driver Output Levels (Loaded)	+/- 1.5 V
Minimum Driver Output Levels (Unloaded)	+/- 6 V
Drive Load	Minimum 60 ohms

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