SINGLE-PHASE ENERGY METER
MID certified with Modbus output - 2 Mod. DIN

ENGLISH

CE

Art. 1SDSD05CEM2MID

MID
Modbus

COMPLETE INSTRUCTIONS

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Introduction

The **1SDSD05CEM2MID** with white back-lighted LCD screen for prefect reading is used to measure single-phase like residential, utility and industrial application. The unit measures and displays various important electrical parameters, and provides a communication port for remote reading and monitoring. Bi-directional energy measurement makes the unit a good choice for solar PV energy metering.

Safety Instructions

● **Information for your own safety**

This manual does not contain all of the safety measures for operation of the equipment(module,device),because special operating conditions,and local code requirements or regulations may necessitate further measures. However, it does contain information which must be read for your personal safety and to avoid material damages. This information is highlighted by a warning triangle and is represented as follows, depending on the degree of potential danger.

Read this manual carefully before using the product as it provides important guidelines regarding safety, installation and use. The manual must be preserved with care for future reference. The manufacturer reserves the right to introduce any technical and/or constructive changes deemed necessary, with no prior notice.

● **Warning**

This means that failure to observe the instruction can result in death, serious injury or considerable material damage.

● **Caution**

This means hazard of electric shock and failure to take the necessary safety precautions will result in death, serious injury or considerable material damage.

● **Qualified personnel**

Operation of the equipment (module, device) described in this manual may only be performed by qualified personnel. Qualified personnel in this manual means person who are authorized to commission, start up, ground and label devices, systems and circuits according to safety and Regulatory standards.

● **Use for the intended purpose**

The equipment (device, module) may only be used for the application specified in the catalogue and the user manual.

● **Proper handling**

The prerequisites for perfect, reliable operation of the product are proper transport, proper storage, installation and assembly, as well as proper operation and maintenance. When operating electrical equipment, certain parts of this equipment automatically carry dangerous voltages. Improper handling can therefore result in serious injuries or material damage.

- Use only insulating tools
- Do not connect while circuit is live (230V~).
- Place the meter only in dry surroundings.
- Do not mount the meter in an explosive area or expose the meter to dust, mildew and insects.
- Make sure the used wires are suitable for the maximum current of this meter.
- Make sure the AC wires are connected correctly before activating the current/voltage to the meter.
- Make sure the used wires are suitable for the maximum current of this meter.
- Do not touch the meter connecting clamps directly with your bare hands, with metal, blank wire or other material as you may get an electrical shock.
- Make sure the protection cover is placed after installation.
- Installation, maintenance and reparation should only be done by qualified personnel.
- Never break the seals and open the front cover as this might influence the functionality of the meter, and will avoid any warranty.
- Do not drop, or allow physical impact to the meter as there are high precision components inside that may break.

PART 1 - Specifications and electrical connections

General Specifications

Voltage AC (Un)	230V~
Voltage Range	80%÷120% Un
Base Current Ib (Iref)	10A AC
Max. Current (Imax)	100A AC
Min. Current (Imin)	0,5A AC
Starting Current	0,4% di Ib (Iref)
Power Consumption	≤ 2W/10VA
Frequency	50Hz (MID)
AC Voltage Withstand	4KV for 1 minute
Impulse Voltage Withstand	6KV-1.2µs
Overcurrent Withstand	30 Imax per 0,01 s
Pulse Output Rate - Pulse Output 1 - Pulse Output 2	 1000/100/10/1 imp/Exp/kWh/kVArh (configurable) 1000imp/kWh (default) for import kWh
Display	LCD with white backlit
Max. Reading	999999,9 kWh/kVArh

Accuracy

Voltage	0,5% of range maximum
Current	0,5% of nominal
Frequency	0,2%
Power factor	1%
Active power	1% of range maximum
Reactive power	1% of range maximum
Apparent power	1% of range maximum
Active energy	Class 1 IEC62053-21 Class B EN50470-1/3 (MID)
Reactive energy	Class 2 IEC62053-23

Environment

Operating temperature	da -25°C a +55°C
Storage and transportation temperature	da -40°C a +70°C
Reference temperature	23°C ± 2°C
Relative humidity	0 to 95% on-condensing
Altitude	up to 2000m
Warm up time	5s
Installation category	CAT III
Mechanical Environment	M1
Electromagnetic environment	E2
Degree of pollution	2

Pulse Output

The meter provides two pulse outputs. Both pulse outputs are passive type.Pulse output 1 is configurable. The pulse output can be set to generate pulses to represent total / import/export kWh or kVArh.

The pulse constant can be set to generate 1 pulse per:

0.001(default) /0.01/0.1/1kWh/kVArh.Pulse width: 200/100/60ms

Pulse output 2 is non-configurable. It is fixed to import kWh. The constant is 1000imp/kWh.

RS485 output for Modbus RTU

The meter provides a RS485 port for remote communication. Modbus RTU is the protocol applied. For Modbus RTU, the following RS485 communication parameters can be configured from the Set-up menu.

Baud rate: 2400, 4800, 9600,19200,38400 bps. Default: 9600bps

Parity: NONE/EVEN/ODD

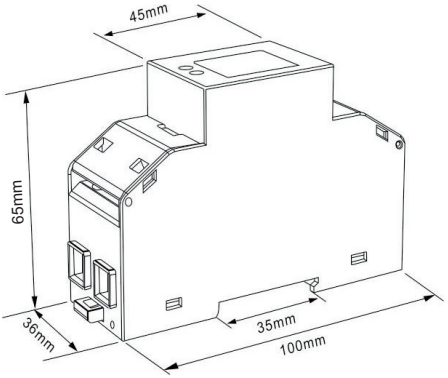
Stop bits: 1 or 2

RS485 Modbus Address: 1 to 247

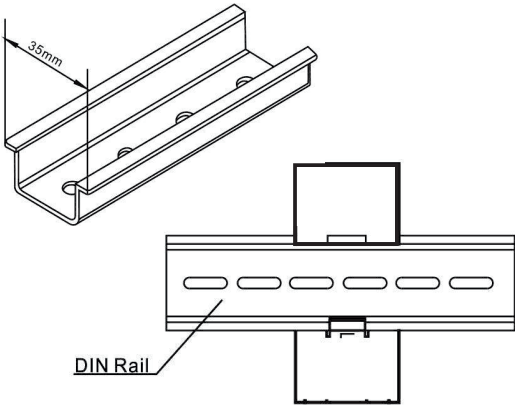
Mechanics

Din rail dimensions	36x100x65 (WxHxD) DIN 43880
Mounting	DIN rail 35mm
Protection against ingress of dust and water	IP51 (indoor)
Material	self-extinguishing UL94V-0

Dimensions



Installation



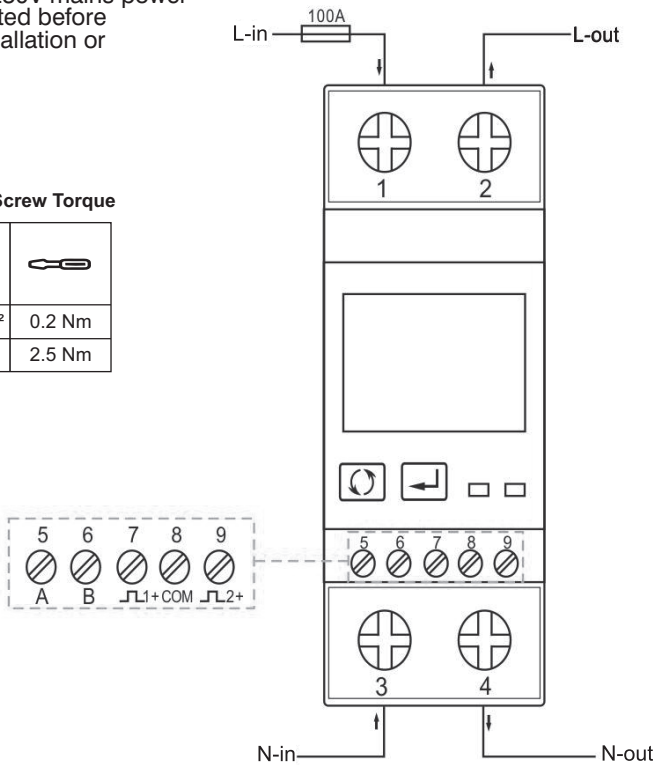
The digital energy meter has to be installed in switchboards granting an protection degree of at least IP51 or superior.

Electrical wiring

Make sure that the 230V mains power supply is disconnected before proceeding with installation or maintenance.

Terminals Capacity and Screw Torque

Terminals		
Pulse	0.5 ÷ 1.5 mm²	0.2 Nm
Load	4 ÷ 25 mm²	2.5 Nm



PART 2 - Operation

INITIALIZATION DISPLAY

When it is powered on, the meter will initialize and do self-checking.

	Full screen
	Software version
	Hardware version
	Self-test ok

BUTTON FUNCTIONS

There are two buttons on the front panel:

"Scroll" button 

- **Scroll** the display for data-check
- **Change** option at Set-up mode
- **Exit** the Set-up mode

"Enter" button 

- **Set-up mode entry**
- **Confirmation**

Scroll display by Button

After initialization and self-checking program, the meter display the measured values. The default page is total kWh. If the user wants to check other information, he needs to press the scroll button on the front panel.

The display order by scroll button  :

Total kWh → Resettable kWh → Import kWh → Export kWh → Voltage → Current → W → VA → Power demand → Power factor → Frequency

Display	Descriptions
	Total active energy Example: 8888,88kWh
	Total resettable energy Example: 8888,88kWh
	Import active energy Example: 8888,88kWh
	Export active energy Example: 8888,88kWh
	Voltage Example: 223,0 V

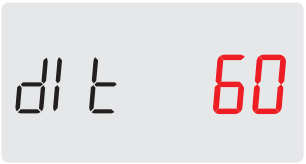
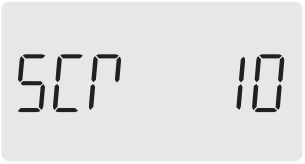
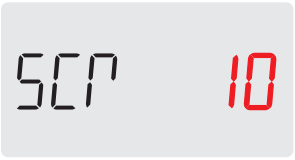
	Current Example: 10.505A
	Power Example: 8888W
	Apparant power Example: 2908 VA
	Max. Active Power demand Example: 508W
	Power Factor Example: 1.000
	Frequency Example: 50Hz

SET-UP MODE

To get into Set-up Mode, the user need press the “Enter” button per 3 secondi.

Display	Descriptions
	**PASSWORD** To get into Set-up mode, it asks a password confirmation. Press the “Scroll” button to change and "Enter" to confirm. Default password: 1000
	**Address ID** Default ID is 001 Range: 001～247
	Press the “Enter” button, the first digit flash.Press the “Scroll” button to change the value. After choosing the new address value, the user needs to press the “Enter” button to confirm the setting.
	**Baud rate** Default value: 9600bps Range: 2400, 4800, 9600,19200, 38400bps.
	Press the “Enter” button, the red digit flash. Press the “Scroll” button to change the value.After choosing the new baud rate, the user needs to press the “Enter” button to confirm the setting.
	**Parity** Default: N = None Option: N = None, E = Even, O = Odd
	Press the “Enter” button, the red part will flash. Press the “Scroll” button to change the option. After choosing the new Parity, the user needs to press the “Enter” button to confirm the setting.

	**Stop Bit** Default: 1 Option: 1,2
	Press the “Enter” button, the read part will flash. Press the “Scroll” button to change the option. After choosing the stop bit, the user needs to press the “Enter” buttong to confirm the setting.
	**Pulse Output** Default: Export kWh Option: kWh / kVArh / Imp. kWh / Exp.kWh / Imp.kVArh / Exp.kVArh
	Press the “Enter” button, the red part flash. Press the “Scroll” button to change the option.After choosing the new Pulse output option, the user needs to press the “Enter” button to confirm the setting.
	**Pulse costant** Default: 1000 Option: 1000 / 100 / 10 / 1
	Press the “Enter” button, the red part flash. Press the “Scroll” button to change the option. After choosing the new Pulse constant option, the user needs to press the “Enter” button to confirm the setting.

	**Pulse Duration** Default: 100mS Option: 200 / 100 / 60 ms
	Press the “Enter” button, the red part flash. Press the “Scroll” button to change the option.After choosing the new Pulse duration option, the user needs to press the “Enter” button to confirm the setting.
	**Integration time of** **«Maximum active power required»** Default: 15 minuti Option: 5 / 10 / 15 / 30 / 60 / OFF
	Press the “Enter” button, the red part flash. Press the “Scroll” button to change the option. After choosing the new DIT option, the user needs to press the “Enter” button to confirm the setting.
	**Automatic Scroll Time Interval (0 ÷ 240s)** Default: OFF Option: OFF / 5 / 10 / 20 / 30 / 60 / 120 / 240
	Press the “Enter” button, the red part flash. Press the “Scroll” button to change the option.After choosing the new “Scrl” option, the user needs to press the “Enter” button to confirm the setting.
	**Backlit lasting time set-up** Default: 60 min Option: ON/ 5/ 10/ 30/ 60/ 120/ OFF Long press “Enter” button to enter set-up mode.

	Press the “Enter” button, the red part flash. Press the “Scroll” button to change the option. After choosing the new “Scrl” option, the user needs to press the “Enter” button to confirm the setting.
	**Password** Default: 1000
	Press the “Enter” button, the red part flash. Press the “Scroll” button to change the value.After choosing the new password, the user needs to press the “Enter” button to confirm the setting.
	**Reset** Long press “Enter” to enter, Press the “Scroll” button to select the desired counter to reset.
	**Reset Active Power Demand** Long press “Enter” button to confirm the operation.
	**Reset resettable energy Demand** Long press “Enter” button to confirm the operation.

To exit the configuration mode, the user must hold down the button  for 3 seconds, or wait 60 seconds after the last key press.

PART 3 - MODBUS Protocol

1. Perry Smart Meter Modbus Protocol Implementation

1.1 Modbus Protocol Overview

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

Perry offers the option of an **RS485** communication facility for direct connection to communications systems using the **Modbus RTU** 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, meter will make no response. If the meter 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 Perry can be set to any value between 1 and 247.

The format for each byte in RTU mode is:

Coding System:	4 byte (2 registers) per parameter. Floating point format (to IEEE 754) Most significant register first (Default).
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 meter are transferred as 32 bit IEEE754 floating point numbers, (input and output) therefore each 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 meter to return a Modbus Protocol exception message. However, for compatibility with some SCADA systems, meter will response to any single **Input Register** (entry register) or **Holding register** (setup log).

The meter 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 SDM210-M to generate an exception response.

Data transmission speed is selectable under 2400, 4800, 9600, 19200, 38400.

1.2 Input Register (Entry register)

Input registers are used to indicate the present values of the measured and calculated electrical quantities. Each parameter is held in two consecutive16 bit register. The following table details the 3X register address, and the values of the address bytes within the message.

Each parameter is held in the 3X registers. Modbus Protocol function code 04 is used to access all parameters.

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)	Input Register Parameter			Modbus protocol start address hex	
	Parameters	Unit	Format	Hi Byte	Lo Byte
30001	Voltage	Volt	Float	00	00
30007	Current	Amp	Float	00	06
30013	Active power	Watt	Float	00	0C

30019	Apparent power	VA	Float	00	12
30025	Reactive power	VAr	Float	00	18
30031	Power factor	N.	Float	00	1E
30037	Phase angle	Degree	Float	00	24
30071	Frequency	Hz	Float	00	46
30073	Import active energy	kWh	Float	00	48
30075	Export active energy	kWh	Float	00	4A
30077	Import reactive energy	kVArh	Float	00	4C
30079	Export reactive energy	kVArh	Float	00	4E
30085	Total system power demand	W	Float	00	54
30087	Maximum total system power demand	W	Float	00	56
30089	Import system power demand	W	Float	00	58
30091	Maximum Import system power demand	W	Float	00	5A
30093	Export system power demand	W	Float	00	5C
30095	Maximum Export system power demand	W	Float	00	5E
30259	Current demand	Amp	Float	01	02
30265	Maximum current demand	Amp	Float	01	08
30343	Total active energy	kWh	Float	01	56
30345	Total reactive energy	kVArh	Float	01	58
30385	Resettable total active kWh	kWh	Float	01	80
30387	Resettable total reactive kVarh	kVArh	Float	01	82
310001	Total import active energy	Wh	Int64	27	10
310005	Total export active energy	Wh	Int64	27	14
310009	Total import reactive energy	VArh	Int64	27	18
310013	Total export reactive energy	VArh	Int64	27	1C

1.3 Modbus Protocol Holding Registers (Setup logs) 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 (10 hex) is used to write.

Write to only one parameter per message.

Address Register	Holding Register Parameter		Modbus Protocol Start Address Hex		Description
	Parameters	Format	Byte Hi	Byte Lo	
40001	Demand Time	Float	00	00	Read minutes into first demand calculation. When the Demand Time reaches the Demand Period then the demand values are valid. **Length : 4 byte**
40003	Demand Period	Float	00	02	Demand period: default 60 Unit: min Range 0÷60 means real time refresh (refresh evey 1second) **Length: 4 byte**
40013	Pulse 1 Width	Float	00	0C	Write Pulse 1 Width in milliseconds: 60, 100 or 200, default 100 ms. **Length: 4 byte**
40019	Network Parity Stop	Float	00	12	Write the network port parity/stop bits for MODBUS Protocol, where: 0 = One stop bit and no parity 1 = One stop bit and even parity(default) 2 = One stop bit and odd parity 3 = Two stop bits and no parity **Length: 4 byte**

40021	ID Modbus	Float	00	14	Ranges from 1 to 247. Default ID is 1. **Length: 4byte**
40023	Pulse 1 Rate	Float	00	16	Write pulsa rate index: n=0 to 3 0=0.001 kWh/imp (default) 1=0.01 kWh/imp 2=0.1 kWh/imp 3=1 kWh/imp **Length: 4 byte**
40025	Password	Float	00	18	Read meter Password orWrite password for access to protected registers. Default: 1000. **Length: 4byte**
40029	Baud rate	Float	00	1C	Write baud rate for MODBUS Protocol, where: 0 = 2400 baud 1 = 4800 baud 2 = 9600 baud (default) 3 = 19200 baud 4 = 38400 baud **Length: 4 byte**
40059	Scroll time	Float	00	3A	Unit: seconds (s) Range: 0÷255, 0= no scroll (default) **Length: 4 byte**
40061	Backlit time	Float	00	3C	Unit: minutes (min) Range: 0÷121 0= always on (default) 121= always off **Length: 4byte**
40087	Pulse 1 output mode	Float	00	56	Write MODBUS Protocol input parameter for pulse out 1: 1 = Import active energy, 2 = Total active energy (imp + exp) 4 = Export active energy (default) 5 = Import reactive energy 6 = Total reactive energy (imp + exp) 8 = Export reactive energy. **Length: 4 byte**

461457	Reset historical data	Hex	F0	10	0 = reset demand info 3 = reset the resettable energy **Length: 2 byte**
463761	Pulse 1 output	Hex	F9	10	0=0.001kWh/imp (default) 1=0.01kWh/imp 2=0.1kWh/imp 3=1kWh/imp **Length: 2 byte**
463777	Measurement mode Total Energy	Hex	F9	20	1= import 2=import + export (default) 3=import - export **Length: 2 byte** **(* Note)**
463793	Continuous Running Time	Float	F9	30	Continuous Running Time, unit hours (h) **Length: 4 byte**
464513	Serial number	Unsigned int32	FC	00	Serial number (only read) **Length: 4 byte**
464515	Meter code	Hex	FC	02	Meter code = 00 F2 (only read) **Length: 2 byte**

***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 also to other families of digital meters 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	32
Maximum Cable Length	1200 m
Maximum Data Rate	10M baud
Maximum Common Mode Voltage	da 12V a -7V
Minimum Driver Output Levels (Loaded)	+/- 1.5V
Minimum Driver Output Levels (Unloaded)	+/- 6V
Drive Load	Minimum 60 ohm
Driver Output Short Circuit Current Limit	150 mA a Gnd. 250 mA a 12V 250 mA a -7V
Minimum Receiver Input Resistance	12 kohm
Receiver Sensitivity	+/- 200mV

Further information relating to RS485 may be obtained from either the EIA or the various RS485 device manufacturers, for example Texas Instruments or Maxim Semiconductors. This list is not exhaustive.

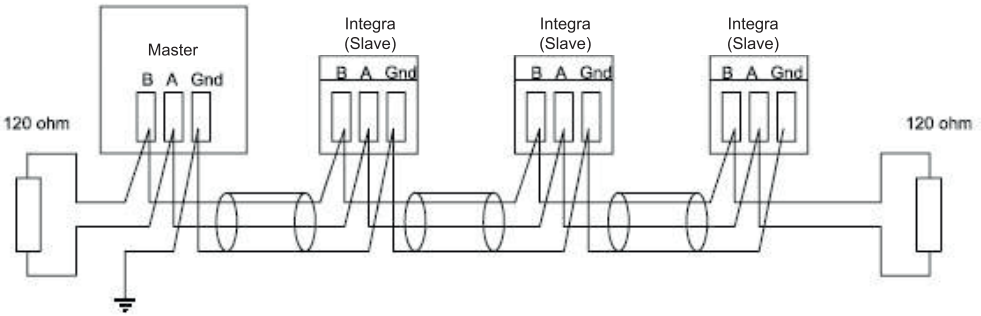
2.1 - Connecting the Instruments

You must use a shielded twisted pair cable. For longer cable runs or noisier environments, use of a cable specifically designed for RS485 may be necessary to achieve optimum performance. All “A” terminals should be connected together using one conductor of the twisted pair cable, all “B” terminals should be connected together using the other conductor in the pair. The cable screen should be connected to the “Gnd” terminals.

A Belden 9841 (Single pair) or similar cable with a characteristic impedance of 120 ohms is recommended.

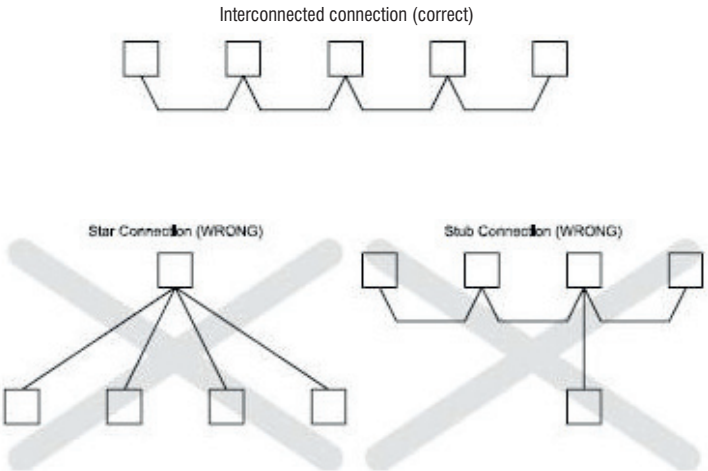
The cable should be terminated at each end with a 120 ohm, quarter watt (or greater) resistor.

Note: Diagram shows wiring topology only.



There must be no more than two wires connected to each terminal, this ensures that a “Daisy Chain or “straight line” configuration is used.

The use of a "star" or "matrix" network **is not recommended,** as reflections within the cable can cause data corruption.

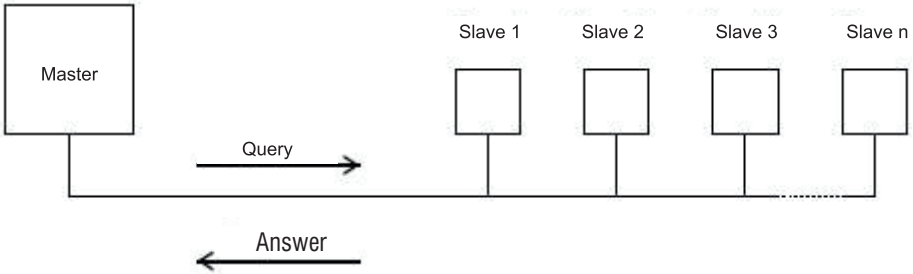


2.2 Troubleshooting

- Start with a simple network, one master and one slave. With Eastron Digital meter products this is easily achieved as the network can be left intact whilst individual instruments are disconnected by removing the RS485 connection from the rear of the instrument.
- Check that the network is connected together correctly. That is all of the “A’s” are connected together, and all of the “B’s” are connected together, and also that all of the “Gnd’s” are connected together.
- Check that the data “transmitted” onto the RS485 is not echoed back to the PC on the RS232 lines.(This facility is sometimes a link option within the converter). Many PC based packages seem to not perform well when they receive an echo of the message they are transmitting. SpecView and PCView (PC software) with a RS232 to RS485 converter are believed to include this feature.
- Check that the Address of the instrument is the same as the “master” is expecting.
- If the “network” operates with one instrument but not more than one check that each instrument has a unique address.
- Each request for data must be restricted to 40 parameters or less. Violating this requirement will impact the performance of the instrument and may result in a response time in excess of the specification.
- Check that the MODBUS Protocol mode (RTU or ASCII) and serial parameters (baud rate, number of data bits, number of stop bits and parity) are the same for all devices on the network.
- Check that the “master” is requesting floating-point variables (pairs of registers placed on floating point boundaries) and is not “splitting”.
- Check that the floating-point byte order expected by the “master” is the same as that used by Perry Digital meter products.
- If possible obtain a second RS232 to RS485 converter and connect it between the RS485 bus and an additional PC equipped with a software package, which can display the data on the bus. Check for the existence of valid requests.

3. MODBUS Protocol General Information

Communication on a MODBUS Protocol Network is initiated (started) by a “Master” sending a query to a “Slave”. The “Slave“, which is constantly monitoring the network for queries addressed to it, will respond by performing the requested action and sending a response back to the ”Master”. Only the “Master” can initiate a query.



3.1 MODBUS Protocol Message Format

The data used by the Eastron Digital meter is in 32 bit IEEE 754 floating point format. Thus each instrument parameter is conceptually held in two adjacent MODBUS Protocol registers.

Query

The following example illustrates a request for a single floating point parameter i.e. two 16-bit Modbus Protocol Registers.

First Byte — Last Byte

Slave Address	Function Code	Start Address (Hi)	Start Address (Lo)	Number of Points (Hi)	Number of Points (Lo)	Error Check (Lo)	Error Check (Hi)

Slave Address: 8-bit value representing the slave being addressed (1 to 247).

Function Code: 8-bit value telling the addressed slave what action is to be performed (3, 4 or 16 are valid for Perry meter). **Start Address (Hi)**: The top (most significant) eight bits of a 16-bit number specifying the start address of the data being requested.

Start Address (Lo): The bottom (least significant) eight bits of a 16-bit number specifying the start address of the data being requested. As registers are used in pairs and start at zero, then this must be an even number.

Number of Points (Hi): The top (most significant) eight bits of a 16-bit number specifying the number of registers being requested.

Number of Points (Lo): The bottom (least significant) eight bits of a 16-bit number specifying the number of registers being requested. As registers are used in pairs, then this must be an even number.

Error Check (Lo): The bottom (least significant) eight bits of a 16-bit number representing the error check value.

Error Check (Hi): The top (most significant) eight bits of a 16-bit number representing the error check value.

Response

The example illustrates the normal response to a request for a single floating point parameter i.e. two 16-bit Modbus Protocol Registers.

First Byte — Last Byte

Slave Address	Function Code	Byte Count	First Register (Hi)	First Register (Lo)	Second Register (Hi)	Second Register (Lo)	Error Check (Lo)	Error Check (Hi)

Slave Address: 8-bit value representing the address of slave that is responding.
Function Code: 8-bit value which, when a copy of the function code in the query, indicates that the slave recognised the query and has responded (See also Exception Response).
Byte Count: 8-bit value indicating the number of data bytes contained within this response.
First Register (Hi)*: The top (most significant) eight bits of a 16-bit number representing the first register requested in the query.
First Register (Lo)*: The bottom (least significant) eight bits of a 16-bit number representing the first register requested in the query.
Second Register (Hi)*: The top (most significant) eight bits of a 16-bit number representing the second register requested in the query.
Second Register (Lo)*: The bottom (least significant) eight bits of a 16-bit number representing the second register requested in the query.
Error Check (Lo): The bottom (least significant) eight bits of a 16-bit number representing the error check value.
Error Check (Hi): The bottom (least significant) eight bits of a 16-bit number representing the error check value.

***These four bytes together give the value of the floating point parameter requested.

Exception Response

If an error is detected in the content of the query (excluding parity errors and Error Check mismatch), then an error response (called an exception response), will be sent to the master. The exception response is identified by the function code being a copy of the query function code but with the most-significant bit set. The data contained in an exception response is a single byte error code.

First Byte — Last Byte

Slave Address	Function Code	Error Code	Error Check (Lo)	Error Check (Hi)

Slave Address: 8-bit value representing the address of slave that is responding.
Function Code: 8 bit value which is the function code in the query OR'ed with 80 hex, indicating that the slave either does not recognise the query or could not carry out the action requested.
Error Code: 8-bit value indicating the nature of the exception detected.
Error Check (Lo): The bottom (least significant) eight bits of a 16-bit number representing the error check value.
Error Check (Hi): The top (most significant) eight bits of a 16-bit number representing the error check value.

3.1 How Characters are Transmitted Serially

When messages are transmitted on standard MODBUS Protocol serial networks each byte is sent in this order (left to right):
Transmit Character = Start Bit + Data Byte + Parity Bit + 1 Stop Bit (11 bits total):

Transmit Character = Start Bit + Data Byte + 2 Stop Bits (11 bits total):

Start	1	2	3	4	5	6	7	8	Stop	Stop

Perry Digital meters additionally support No parity, 1 stop bit.
Transmit Character = Start Bit + Data Byte + 1 Stop Bit (10 bits total):

Start	1	2	3	4	5	6	7	8	Stop

3.2 MODBUS Protocol Commands supported

All Perry Digital meters support the “Read Input Register” (3X registers), the “Read Holding Register” (4X registers) and the “Pre-set Multiple Registers” (write 4X registers) commands of the MODBUS Protocol RTU protocol. All values stored and returned are in floating point format to IEEE 754 with the most significant register first.

3.2.1 Read Input Registers

MODBUS Protocol code 04 reads the contents of the 3X registers.

Example

The following query will request ‘Volts 1’ from an instrument with node address 01:

Field Name	Example (hex)
Slave Address	01
Function Code	04
Start Address (Hi)	00
Starti Address (Lo)	00
Number of Points (Hi)	00
Number of Points (Lo)	02
Error Check (Lo)	71
Error Check (Hi)	CB

The following response returns the contents of Volts 1 as 230,2 V.

Field Name	Example (hex)
Slave Address	01
Function Code	04
Byte Count	04
First Register (Hi)	43
First Register (Lo)	66
Second Register (Hi)	33
Second Register (Lo)	34
Error Check (Lo)	1B
Error Check (Hi)	38

3.3 Holding Register
3.3.1 Read Holding Register

MODBUS Protocol code 03 reads the contents of the 4X registers.
Example
The following query will request the prevailing 'Pulse output 1 Width'

Field Name	Example (hex)
Slave Address	01
Function Code	03
Start Address (Hi)	00
Start Address (Lo)	0C
Number of Points (Hi)	00
Number of Points (Lo)	02
Error Check (Lo)	04
Error Check (Hi)	08

The following response returns the contents of pulse width 1 as 100 ms.

Field Name	Example (hex)
Slave Address	01
Function Code	03
Byte Count	04
First Register (Hi)	42
First Register (Lo)	C8
Second Register (Hi)	00
Second Register (Lo)	00
Error Check (Lo)	6F
Error Check (Hi)	B5

3.3.2 Write Holding Registers

MODBUS Protocol code 10 (16 decimal) writes the contents of the 4X registers.
Example
The following query will set the Pulse output 1 Width to 60 ms.

Field Name	Example (hex)
Slave Address	01
Function Code	10
Start Address (Hi)	00
Start Address (Lo)	0C
Number of Points (Hi)	00
Number of Points (Lo)	02
Byte Count	04
First Register (Hi)	42
First Register (Lo)	70
Second Register (Hi)	00
Second Register (Lo)	00
Error Check (Lo)	E6
Error Check (Hi)	59

The following response indicates that the write has been successful.

Field Name	Example (hex)
Slave Address	01
Function Code	10
Start Address (Hi)	00
Start Address (Lo)	0C
Number of Points (Hi)	00
Number of Points (Lo)	02
Error Check (Lo)	81
Error Check (Hi)	CB

Conformity Declaration (MID)

The Manufacturer, **Perry Electric S.r.l.**
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Declare under our sole responsibility as manufacturer that the single phase active energy (kWh) indoor electricity meter **1SDSD05CEM2MID** with the measurement range **230V~, 0.5-10(100)A, 50Hz, 1000imp/kWh** is in conformity with the type as described in the **EU-type examination certificate 0120/SGS0695** and satisfy the appropriate requirements of the Directive2014/32/EU with the relevant harmonized standards by the European Union
EN50470-1: 2006
EN50470-3: 2006

Identification Number of the: **NB0598**

07/03/2024

Perry Electric S.r.l.
Matteo Galimberti
Sales & Marketing Manager

Company stamp and signature

DISPOSAL OF ELECTRICAL & ELECTRONIC EQUIPMENT

This symbol on the product or its packaging to indicates that this product shall not be treated as household waste. Instead, it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment, such as for example:
-sales points, in case you buy a new and similar product;
-local collection points (waste collection centre, local recycling center, etc...).
By ensuring this product is disposed of correctly, you will help prevent potential negative consequence for the environment and human health, which could otherwise be caused by inappropriate waste handing of this product.The recycling of materials will help to conserve natural resources. For more detailed information about recycling of this product, please contact your local city office, your house hold waste disposal service or the shop where you purchased the product.

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