SDM530C

THREE PHASE FOUR WIRE ENERGY METER WITH RS485 MODBUS RTU
(SEVEN MODULE)

User Manual

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1.1 Safety instructions

Information for Your Own Safety
This manual does not contain all of the safety measures operating the equipment (module, device) for different conditions and requirements. However, it does contain information which you must know for your own safety and to avoid damages. This information is highlighted by a warning triangle indicating the degree of potential danger.

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, and only be connected with devices and components recommended and approved by the Eastron Electronic Instruments.

Proper handling
The prerequisites for perfect, reliable operation of the product are proper transport, proper storage, installation and proper operation and maintenance. When operating electrical equipment, 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 (hot).
- ✧ 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 wires are suitable for the maximum current of this meter.
- ✧ Make sure the AC wires are connected correctly before activating the current/voltage to meter.
- ✧ Do not touch the meter connecting clamps directly with metal, blank wire and your bare hands as you may get 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 function of the meter, and will cause no warranty.
- ✧ Do not drop, or allow strong physical impact on the meter as the high precisely components inside may be damaged.

Disclaimer
We have checked the contents of this publication and every effort has been made to ensure that the descriptions are as accurate as possible.

However, deviations from the description cannot be completely ruled out, so that no liability can be accepted for any errors contained in the information given. The data in this manual is checked regularly and the necessary corrections are included in subsequent editions. We are grateful for any improvements that you suggest.

Subject to technical modifications without notice.

1.2 Foreword

The Eastron SDM530C is a DIN rail three phase four wire energy meter with RS 485 Modbus RTU protocol. Output is LCD displayed based on kWh and the data can be transported by isolated RS485. The meter is provided with a non-volatile memory system that ensures that the readings are not lost or altered when power off.

The SDM530C has both direct connection version and CT connection version. The direct connection version meter measures up to 100A load. And the CT connection type request an external current transformer with 5A secondary input.

Although we produce the SDM530C meter according to IEC 62053-21 and our quality inspection is very accurate there might always be a possibility that your product shows a fault or failure for which we do apologize. Under normal conditions your product should give you years of benefit and pleasure. In case there is a problem with the energy meter you should contact your dealer immediately. All energy meters are sealed with a special seal. Once this seal is broken there is no possibility to claim for warranty. Therefore NEVER open an energy meter or break the seal of the energy meter. The warranty time is 6 months, after installation, and only valid for construction faults.

1.3 Performance criteria

Operating humidity	≤ 85%
Storage humidity	≤ 95%
Operating temperature	-20°C - +50°C
Storage temperature	-30°C - +70°C
International standard	IEC 62053-21 IEC61010
Accuracy class	0.5 or 1.0
Protection against penetration of dust and water	IP51
Insulating encased meter of protective class	II

1.4 Meter specifications

Meter type	SDM530C
Nominal voltage (Un)	230/400V AC (3~) 110/220V AC
Insulation capabilities - AC voltage withstand - Impulse voltage withstand	 4KV for 1 minute 6KV – 1.2μS waveform
Basic current (Ib) - CT type - Directly connect	 5 A 10A
Maximum rated current (Imax) - CT type - Directly connect	 6A 100A
Operational current range	0.4% Ib- Imax
Over current withstand	30Imax for 0.01s
Operational frequency range	50Hz ±10%
Internal power consumption	≤2W / 10VA per phase
Test output flash rate (PULSE LED) - CT type - Directly connect	 1600imp/kWh 400imp/kWh
Test pulse output rate (pins 8 & 9) - CT type - Directly connect	 1600imp/kWh 400imp/kWh
CT Changing-Ratio	27 ratios optional
Phase voltage missing indicator (Phase A,B & C LED)	LED turn on when the phase voltage is missing
Consumption indicator (PULSE&SO LED)	Flashing at load running
Communication indicator	Flashing at communication running
Data communication port	RS485 and far infrared
Data save	The data can be stored more than 20 years when power off

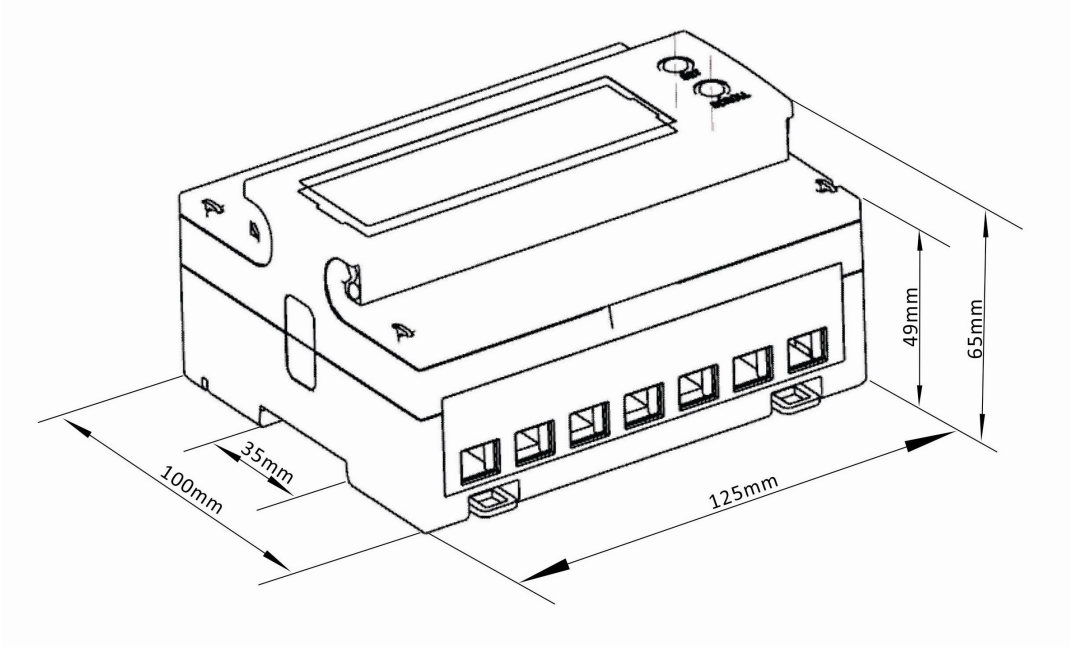
1.5 RS485 communication specifications

Bus type	RS485
Protocol	MODBUS RTU with 16 bit CRC
Baud rate	1200(default)/2400/4800/9600bps
Address range	1-247 user settable
Bus Loading	32 meters per bus (recommend)
Rage	1200m

Infrared communication specifications

Infrared wavelengths	900- 1000nm
Baud rate	1200bps(default),
Communication distance	5m
Communication angle	-15° ~+15°

1.6 Dimensions



1.7 Installation

⚠CAUTION
♦ Turn off all the power before working on it. ♦ Always use a properly rated voltage sensing device to confirm that power is off.

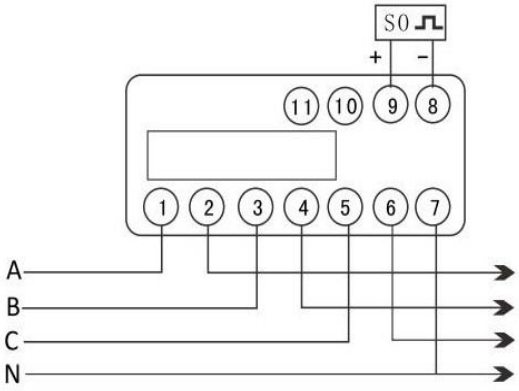
⚠WARNING
♦ Installation should be performed by qualified personnel familiar with applicable codes and regulations. ♦ Use isolated tools to install the meter. ♦ Fuse or thermal cut-off or single-pole circuit breaker can't be fitted on the supply line and not the neutral line.

- ✧ We recommend that the connecting wire which is used to connect the meter to the outside circuit should be sized according to local codes and regulations for the amp city of the circuit breaker or over current device used in the circuit.
- ✧ An external switch or a circuit-breaker should be installed on the inlet wire, which will be used as a disconnection device for the meter. And there it is recommended that the switch or circuit-breaker is near the meter so that it is more convenience for the operator. The switch or circuit-breaker should comply with the specifications of the buildings electrical design and all local regulations.
- ✧ An external fuse or thermal cut-off which will be used as a over current protection device for the meter must be installed on the supply side wire, and it is recommended that the over current protection device is near the meter so that it is more convenience for the operator.

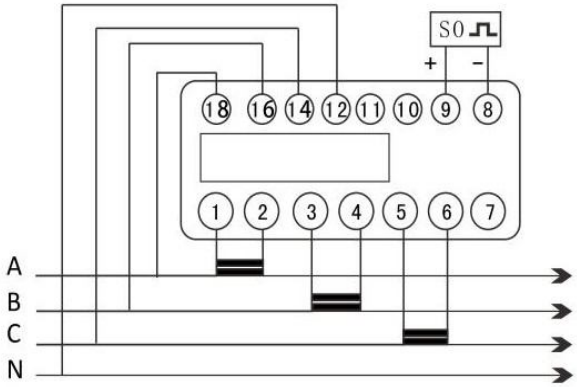
The over current protection device should comply with the specifications of the buildings electrical design and all local regulations.

- ✧ This meter can be installed indoor directly, or in a meter box which is waterproof outdoor, subject to local codes and regulations.
- ✧ To prevent tampering, secure the meter with a padlock or a similar device.
- ✧ The meter has to be installed against a wall which is fire resistant.
- ✧ The meter has to be installed in a good ventilated and dry place.
- ✧ The meter has to be installed in a protection box when placed in dangerous or dusty environment.
- ✧ The meter can be installed and used after being tested and sealed with a letter press printing.
- ✧ The meter can be installed on a 35mm DIN rail or direct on a meter board with screws.
- ✧ The meter should be installed in an available height so that it is easy to read.
- ✧ When the meter is installed in an area with frequent surges due to e.q. thunderstorms, welding machines, inverters etc, protect the meter with Surge Protection Devices
- ✧ After finishing installation, the meter must be sealed to prevent tampering.
- ✧ Connection of the wires should be done in accordance with the underneath connection diagram.

Direct connection



CT connection



1.8 Operating

Consumption indication

On the SDM530C'S front panel, there are four LED, in which three LED are for three phase voltage and another one for impulse. The constant of the impulse is shown on the nameplate of the meter.

Reading the meter

The SDM530C energy meter is equipped with 6+1 or 5+2 LCD display, which is used as recording consumption and can't be reset to zero. The number system is based on units of 10. And unit is kWh. Another way through RS485 and PC software or HHU (hand held unit) unit can read power consumption. For HHU information, please contact sales@eastrongroup.com

Pulse output

SDM530C DIN rail energy meter is equipped with a pulse output which is fully separated from the inside circuit. That generates pulses in proportion to the measured energy. They are test pulse output (pins 8 & 9). Usually, the test pulse output is used as testing accuracy or reading purpose in close quarters.

The test pulse output is a polarity dependant, passive transistor output requiring an external voltage source for correct operation. For this external voltage source, the voltage (Ui) should be 5-27V DC, and the maximum input current (Imax) should be 27mA DC. To connect the impulse output, connect

5-27V DC to connector 9 (anode), and the signal wire (S) to connector 8 (cathode). The meter pulses is indicated on the front panel.

Communication port
SDM530C has equipped a far infrared port and a RS485 port, we can program the meter's operation data or reading via these 2 ports. The communication protocol conforms with MODBUS RTU protocol.

Far infrared communication port
The far infrared communication port is on the left of LCD screen. It is infrared wireless communication port. The hand-held programmer can directly communicate the data between the meter and this port.
The data transmission speed is 1200bps(default)
The communication distance is not less than 5m.

Rs485 output
RS485 communication port is between the meter terminal 11 and 10.
It is a synchronization wire port. Installing a software in PC, via RS485 adapter
Connecting the terminal 11 and 10, PC can communicate with the meter immediately.

LEDs
There are four LEDs on the front panel, they are marked with A B C and imp/kwh. A B C are phase voltage missing indicators , and imp/kwh is pulse output indicator.

	Yellow	Green	Red
A-phase power	Does not shine	Bright	Bright
B-phase power	Bright	Does not shine	Bright
C-phase power	Bright	Bright	Does not shine
Only AB power	Does not shine	Does not shine	Bright
Only AC power	Does not shine	Bright	Does not shine
ABC together on the power	Does not shine	Does not shine	Does not shine

LCD display

When the meter is power on, the meter will display:

Full screen

2S

Software version 7P 1.0

5S

1600imp/kWh (CT type) ; 400imp/kWh (direct type)

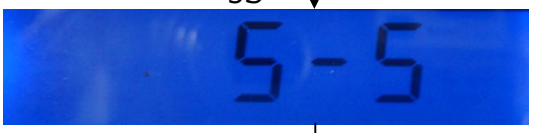
5S

Baud rate 1200bps (default)

5S

Modbus ID 001 (default)

5S



CT ratio (CT type only)

5S

Accumulated used energy

If the CT ratio is less than 150:5, the LCD display will shows 6 integrals plus 1 decimal.
If the CT ratio is set bigger than 150:5, then the LCD will show 7 integrals.

Two button functions:

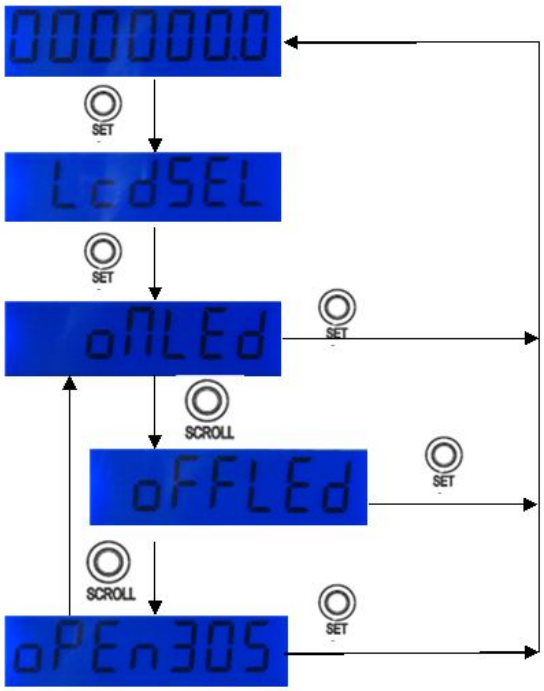
To set the meter LCD backlight modes, confirm the option and get into set-up mode

To scroll the LCD backlit mode and exit

Backlit Setting

SDM530C is equipped with highlight blue color backlit, which provide a clear view of reading when the meter is installed in a dark condition.

There are three modes optional:
ONLED: the backlit always on
OFFLED: the backlit always off
OPEN30S: the backlit will turn on after each click of button
You need pressing the SET button for 5 second to get into the Backlit setting mode



1.9 Protocol

SDM530C has a RS485 port with Modbus RTU protocol.
RS485 is a balanced line, half-duplex transmission system allowing transmission distances of up to 1 km. The following table summarizes the RS485 Standard:

PARAMETER	
Mode of Operation	Differential
Number of Drivers and Receivers	32 Drivers 32 Receivers
Maximum Cable Length	1200M
Maximum Data Rate	10M baud
Maximum Common Mode Voltage	12V to -7V
Minimum Driver Output levels(loaded)	±1.5V
Minimum Driver Output Levels(uploaded)	±1.5V
Drive load	Minimum 60 ohms
Driver Output Short Circuit Current Limit	150mA to Gnd 250mA to 12V 250mA to -7V
Minium Receiver Input Resistance	12Kohms
Receiver Sensitivity	±200mV

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

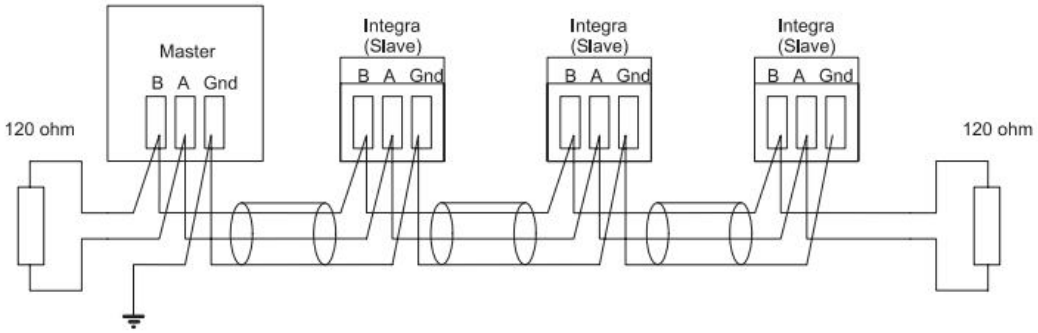
1.9.1 Half Duplex

Half duplex is a system in which one or more transmitters (talkers) can communicate with one or more receivers (listeners) with only one transmitter being active at any one time. For example, a "conversation" is started by asking a question, the person who has asked the question will then listen until he gets an answer or until he decides that the individual who was asked the question is not going to reply. In a 485 network the "master" will start the "conversation" with a "query" addressed to a specific "slave", the "master" will then listen for the "slave's" response. If the "slave" does not respond within a pre-defined period, (set by control software in the "master"), the "master" will abandon the "conversation".

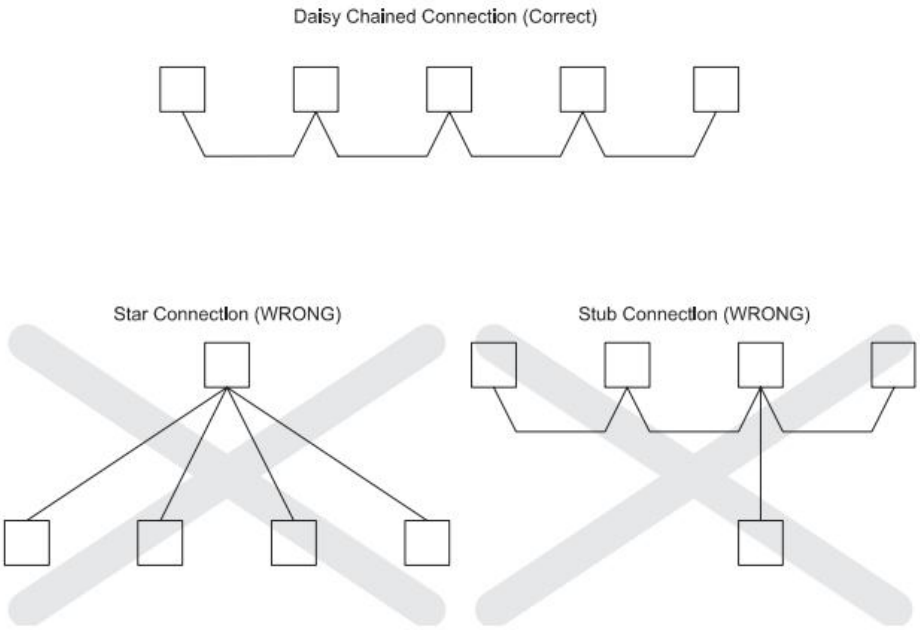
1.9.2 Connecting the Instruments

If connecting an RS485 network to a PC use caution if contemplating the use of an RS232 to 485 converter together with a USB to RS485 adapter. Consider either an RS232 to RS485 converter, connected directly to a suitable RS232 jack on the PC, or use a USB to RS485 converter or, for desktop PCs a suitable plug in RS485 card. (Many 232:485 converters draw power from the RS232 socket. If using a USB to RS232 adapter, the adapter may not have enough power available to run the 232:485 converter.)Screened twisted pair cable should be used. 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 9842 (Two 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. Always follow terminal identification on Integra Digital meter product label.

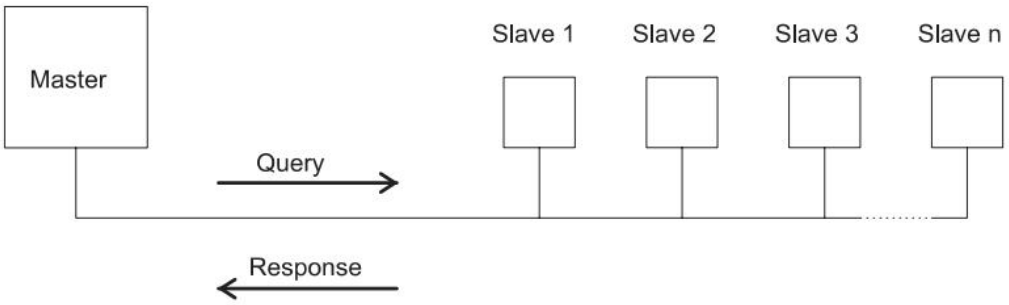


There must be no more than two wires connected to each terminal, this ensures that a "Daisy Chain or "straight line" configuration is used. A "Star" or a network with "Stubs (Tees)" is not recommended as reflections within the cable may result in data corruption.



1.9.3 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.



In the MODBUS Protocol the master can address individual slaves, or, using a special "Broadcast" address, can initiate a broadcast message to all slaves. The Integra Digital meter do not support the broadcast address.

1.9.3. 1 MODBUS Protocol Message Format

There are two MODBUS Protocol serial transmission modes, ASCII and RTU.320c Meter support the support mode.
The MODBUS Protocol defines the format for the master's query and the slave's response.
The query contains the device (or broadcast) address, a function code defining the requested

action, any data to be sent, and an error-checking field.
The response contains fields confirming the action taken, any data to be returned, and an error-checking field. If an error occurred in receipt of the message then the message is ignored, if the slave is unable to perform the requested action, then it will construct an error message and send it as its response.
The following example illustrates a request for 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 255), 0 is reserved for the
broadcast address. The Integra Digital meters do not support the broadcast address.
Function Code: 8-bit value telling the addressed slave what action is to be performed. (3, 4, 8 or 16 are valid for Integra Digital 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 numberNumber 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 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 top (most significant) eight bits of a 16-bit number representing the error check value.

1.9.3.2 how to communicate with 530C meter
Attention: if you are going to read data from the meter, you can read it from RS485 with correct command. But if you want write data into the meter, the set-up mode of the meter must be open first. The way to get into set-up mode is by click the button "SET" , on the screen you will see "-SET-". Only then you can send correct command, otherwise it will cause failure in communication.

This part describes the register map for SDM-520C, the function codes 0x03 to read register and 0x10 to write register.

Address(hex)	Length	Parameters	Access(R/W)	Data Format	Unit
0x011E	4	Total Energy	R	HEX	Kwh/100
0x000F	2	Modbus ID	W	HEX	
0xF800	2	Baud rate	W	HEX	Bps
0xF900	2	CT ratio	W	HEX	

Example if the meter address is 01
How to Read Total Energy
Send:01 03 01 1E 00 02CRCL CRCH
Receive:01 03 04 XX XX XX XX CRCL CRCH
XX XX XX XX is Energy information，if XX XX XX XX=00 00 00 FF
The 00 00 00 FF converted into decimal 255,So Total Energy is255/100=2.55Kwh

How to change Modbus ID for example : from 01 to 15
First, 15 converted into HEX 0x0f
Send: 01 10 00 0F 00 01 02 00 0F CRCLCRCH
Receive: 01 10 00 0F 00 01 CRCL CRCH

How to change Baud rate
Send:01 10 F8 00 00 01 02 XX XX CRCL CRCH
XX XX=00 01 Baud rate 1200
XX XX=00 02 Baud rate 2400
XX XX=00 03 Baud rate 4800
XX XX=00 04 Baud rate 9600
Receive:01 10 F8 00 00 01 CRCL CRCH

How to change CT ratio

Send: 01 10 F9 00 00 01 02 XX XX CRCL CRCH

CT ratio	XX XX	Measurement interval（160imp）	CT ratio	XX XX	Measurement interval（160imp）
5/5	00 00	0.1 kWh	750/5	00 0D	15 kWh
50/5	00 01	1 kWh	800/5	00 0E	16 kWh
60/5	00 02	1.2 kWh	1000/5	00 0F	20 kWh
75/5	00 03	1.5 kWh	1200/5	00 10	24 kWh
100/5	00 04	2.0 kWh	1250/5	00 11	25 kWh
125/5	00 05	2.5 kWh	1500/5	00 12	30 kWh
150/5	00 06	3 kWh	2000/5	00 13	40 kWh
200/5	00 07	4 kWh	2400/5	00 14	48 kWh
250/5	00 08	5 kWh	2500/5	00 15	50 kWh
300/5	00 09	6 kWh	3000/5	00 16	60 kWh
400/5	00 0A	8 kWh	4000/5	00 17	80 kWh
500/5	00 0B	10 kWh	5000/5	00 18	100 kWh
600/5	00 0C	12 kWh	6000/5	00 19	120 kWh
			7500/5	00 1A	150 kWh

2.0 Technical support

Any questions please contact

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