



User manual

Part: MPM3PM (Modbus)
 Three phase four wires energy meter
 10(100)A direct, 35mm DIN Rail
 four module, 4TE, 70mm width
 With RS485 Modbus Protocol RTU
 Manual Revision: 1V04



MECHATRONIC



Product Picture



removed sealable protection covers

Enclosure in anthracite grey RAL7016

EAN: 798003850837
 ASIN: B073K11PPQ



Notes:

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1. Foreword

The MPM3PModBus series meter is produced according to EN50470-3 and fulfils strict quality inspection.

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 meter by yourself or break the seal of the energy meter. The warranty time is 12 months after installation, and only valid for construction faults.

2. Installation

 CAUTION
<ul style="list-style-type: none">◆ Turn off all the power before working on it.◆ Always use a properly rated voltage sensing device to confirm that power is off.
 WARNING
<ul style="list-style-type: none">◆ Installation should be performed by qualified personnel familiar with related procedures and regulations.◆ Use insulating 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.◆ The case is sealed, do not broken it

- ◇ 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 capacity 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 building 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 (IP67), 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.
- ◇ 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.

2.1. Connection

Connection of the wires should be done in accordance with the underneath connection diagram.

connection diagram	
L1	L1 phase wire IN,OUT
L2	L2 phase wire IN,OUT
L3	L3 phase wire IN,OUT
N	Neutral wire IN,OUT
32	active pulse output contact "-"
33	active pulse output contact "+"
34	RS485 B "-"
35	RS485 A "+"

Screw terminals L1,L2,L3,N:

maximum Torque is 1.2Nm !

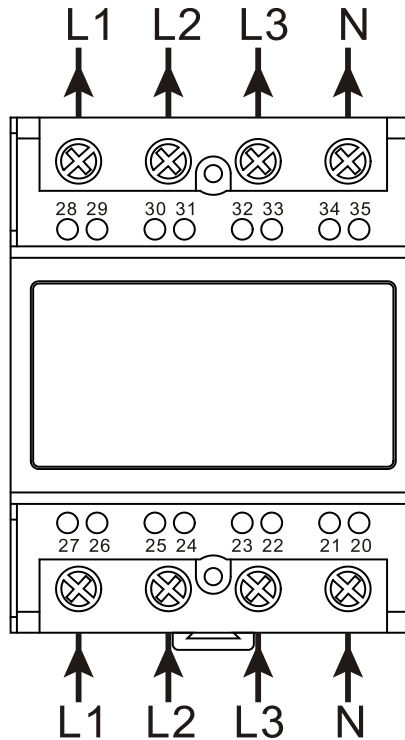
Wire range 0.8-35(50)mm²

(cage opening size min. 7.5x8.0mm)

Screw terminals 20-35:

maximum Torque is 0.2Nm !


Wire range 0.12-1.5mm²



3. Performance criteria:

Operating humidity	≤ 75%
Storage humidity	≤ 95%
Operating temperature	-10°C - +50°C
Storage temperature	-30°C - +70°C
International standards	
Active energy meters of class 1	IEC62052-11, IEC62053-21
Reactive energy meters of class 2	IEC62053-23
Active energy meters class A, B	EN50470-1, EN50470-3
	Accuracy class
Voltage, LN & LL (Phase 1, 2, 3)	±0.5%
Amps (Phase 1, 2, 3)	±0.5%
PF (Phase 1, 2, 3 & Σ)	±0.2%
Active power (Phase 1, 2, 3 & Σ)	±0.5%
Reactive power (Phase 1, 2, 3 & Σ)	±0.5%
Apparent power (Phase 1, 2, 3 & Σ)	±0.5%
Frequency	±0.2%
Active energy	±1%
Reactive energy	±2%
Protection against penetration of dust and water	IP51

4. Meter specifications:

Meter type	MPM3PModbus
Nominal voltage (Un)	230/400V AC (3~)
Operational voltage	161/279 – 300/520V AC (3~)
Insulation capabilities:	
- AC voltage withstand	4KV for 1 minute
- Impulse voltage withstand	6KV – 1.2µS waveform
Basic current (Ib):	
Directly connect	10A
Maximum rated current (Imax)	
Directly connect	100A
Power loss of current path	<1,5W per phase at Maximum rated current
Operational current range	0.4% Ib- Imax
Over current withstand	30Imax for 0.01s
Operational frequency range	50Hz ±10%
Internal power consumption	≤1W / 1VA
Consumption indicator	
PULSE LED	400imp/kWh
SO Output	400imp/kWh
each impulse 1/400[imp/kWh]=0,0025kWh	
Power [W]=2.5Wh*pulse frequency[Hz=1/s]*3600[s/h]	
SO Pulse length 80ms	
! Info: energy flow through the meter, independent on current scale other than 1:1 Eg when using external current transformer.	
Communication indicator symbol	 twinkle on LCD Display
Data communication port	RS485 and far infrared (option)
Data save retention	more than 20 years, power off

4.1. RS485 communication specifications:

Bus type	RS485
Protocol	MODBUS RTU with 16 bit CRC
baud rate	1200,2400,4800,9600
Address range	1-255 user settable
Bus Loading	64 meters per bus
Rage	1000m

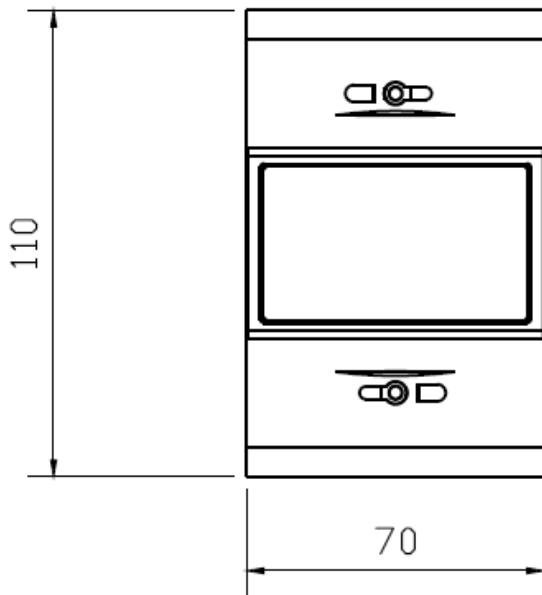
4.2. Far Infrared communication specifications(optional feature):

infrared wavelengths	900- 1000nm
baud rate	1200bps
communication distance	5m
communication angle	-15°~+15°
protocol	ModBus RTU with 16 bit CRC

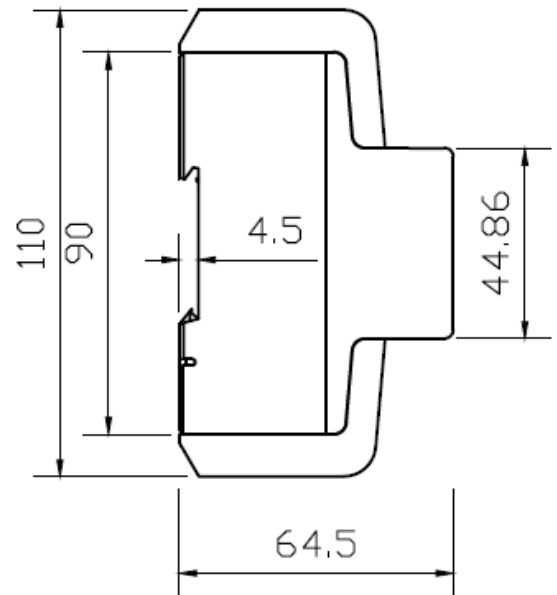
4.3. Basic errors:

Current value	Active class 1.0		Reactive 2.0	
	Power factor COSΦ	Error %	Power factor SINΦ	Error %
$0.05I_b \leq I < 0.1I_b$	1.0	±1.5	1.0	±2.5
$0.1I_b \leq I < I_{max}$	1.0	±1.0	0.5L or 0.8C	±2.0
$0.1I_b \leq I < 0.2I_b$	0.5L or 0.8C	±1.5	1.0	±2.5
$0.2I_b \leq I < I_{max}$	0.5L or 0.8C	±1.0	0.5L or 0.8C	±2.0

5. Dimension



Weight



0.355 kg (net)
 0.385 kg (packed in carton)

5.1.1. Material

Front panel
 Cover
 Base

PC inflammable retarding
 ABS inflammable retarding
 ABS inflammable retarding

6. Operating



Consumption indication:

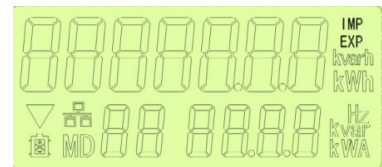
The LED flashes when Power flows through the meter, independent of power flow direction. The more quickly LED flash, the more consumption there is.

6.1. Reading the meter:

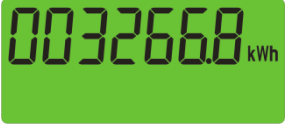
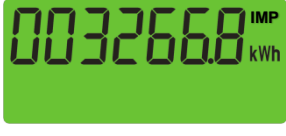
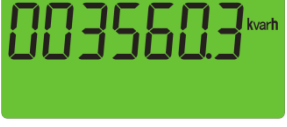
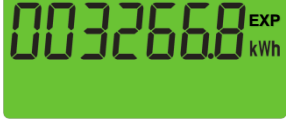
Digits of display: 7 digits for the main display items (6+1 or 5+2)
 6 digits for the sub display items

LCD display, the display is as below when power on :

Content	Display format
The display of full screen	
The constant (Pulse / kWh)	

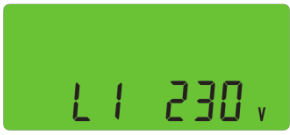





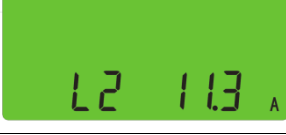





6.2. Main display items

Active kWh absolute (import total-export total)		import Active total kWh	
Reactive kvarh Absolute (import-export)		export Active total kWh	

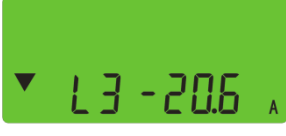

Info: Display is set 2 decimal coma: when become greater 99999.99 it will show 100000.0 (switch to one coma) and when become greater 999999.9 it will show 1000000 (no coma).

6.3. Sub display items

Content	Format of display	LCD display
L1 voltage		Display in cycle
L2 voltage		Display in cycle

L3 voltage		Display in cycle
L1 current		Display in cycle
L2 current		Display in cycle
L3 current		Display in cycle
Active power		Display in cycle
Reactive power		Display in cycle
Power factor		Display in cycle
Frequency		Display in cycle

6.4. Alarming display

Display of reverse phase		▼ will flash to indicate that the value of current is negative
Display of phase loss		▼ will flash to indicate that the value of display is zero

It is used as recording consumption and can't be reset to zero. The reading accuracy is 1/100 kWh.

7. Pulse output S0

The meter is equipped with a pulse output which is fully separated from the inside circuit. That generates pulses in proportion to the measured energy for accuracy testing. Output performance: Voltage range 5-27V DC, Current maximum 20mA.

Info: the pulse rate is based on energy flow through the meter, independent on current scale other than 1:1 (can be modified by ModBus).

Eg 100A/5A current transformer is used; the current scale is set to 1:20 the pulse rate need to multiplied by 20 on detector side. Meter C400=400imp/kWh→0,0025kWh/imp will be then C20=20imp/kWh→0,05kWh/imp.

8. Technical supports

Problem	Check	Solution
No light for the consumption indicator.	Is there current ? Maybe there is a fault in the inside circuit.	Only when there has current, this LED will flash. Please contact your technical supporter to replace this meter.
The register can't run.	Is there a power supply inside the meter? Is the operating power too low? Maybe there is a fault in the inside circuit.	Check that the power supply If the operating power is too low, the spacing interval of the pulses will take some more time, this is why it seems like the meter won't count. Please contact your technical supporter to replace this meter.
No pulse output.	Is the connecting correct ? Maybe there is a fault in the inside circuit.	Check correct connecting: Check polarity of Anode and Cathode of S0 output, Voltage range 5-27V DC. Please contact your technical supporter to replace this meter.
Pulse output rate wrong.	Maybe there is a fault in the inside circuit.	Please contact your technical supporter to replace this meter.

8.1. Your technical supporter

TEL: OEM phone number

Email: OEM email address

[OEM Website](#)

9. ModBus Communication Protocol

9.1. format of byte RS485

1 starting bit „0“	8 data bit Lowest digit first	(1 parity bit) „1“ or „0“	1 stop bit „1“
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9.2. Frame format

ID, address of device	function code	data field	CRC
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ID, address of device : 1 byte. Value range 0~255,
 among which 0 is broadcast address.

Function code : 1byte. Please refer to the followed for more information.

Data field : it changes with the different function codes. The max is 252 bytes.
 The high bytes come first.

CRC : The schooling field of frame, 2 bytes, the lower bytes come first.

9.3. function codes

Function code	Operation	Command of broadcast
0x04	Reading the register	Allowed
0x10	Setting several registers	Allowed

9.4. Read command of register value (04H)

Request of master device:

ID, address of device		1 byte	01H~F7H
function code		1byte	04H
starting register address to be read	reg high	1 byte	xx
	reg low	1 byte	xx
numbers of registers to read		1 byte	N
CRC		2 bytes	CRC_Lo, CRC_Hi

Return:

ID, address of device	1 byte	01H~F7H
function code	1 byte	04H
number of data, following	1 byte	N
content of data	N byte	
CRC	2 bytes	CRC_Lo, CRC_Hi

9.5. *command to set the value of several registers (10H)*

The request from master device :

ID, address of device	1 byte	00H~FFH	
function code	1 byte	10H	
starting register	reg high	1 byte	xx
address to be written	reg low	1 byte	xx
number of registers to be written	2 bytes	N	
number of following data bytes	1 byte	2xN	
Register value	2xN	xxxx	
CRC	2 bytes	CRC_Lo, CRC_Hi	

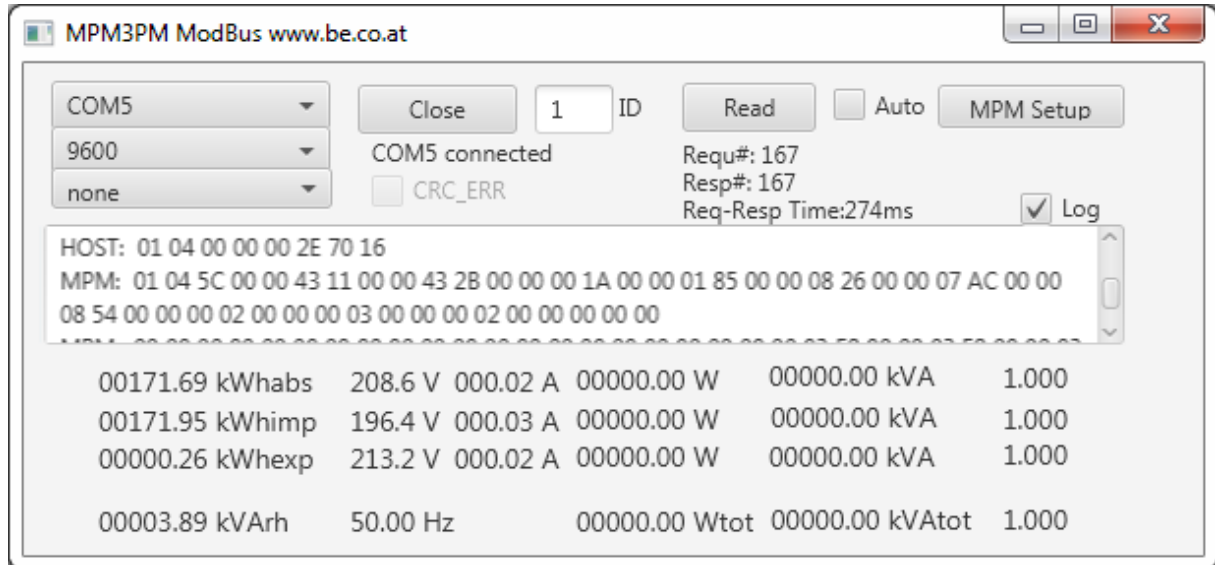
Return :

ID, address of device	1 byte	00H~F7H	
function code	1 byte	10H	
starting register	reg high	1 byte	xx
address to be written	reg low	1 byte	xx
number of data bytes, which where written and confirmed	1 byte	2xN	
CRC	2 bytes	CRC_Lo, CRC_Hi	

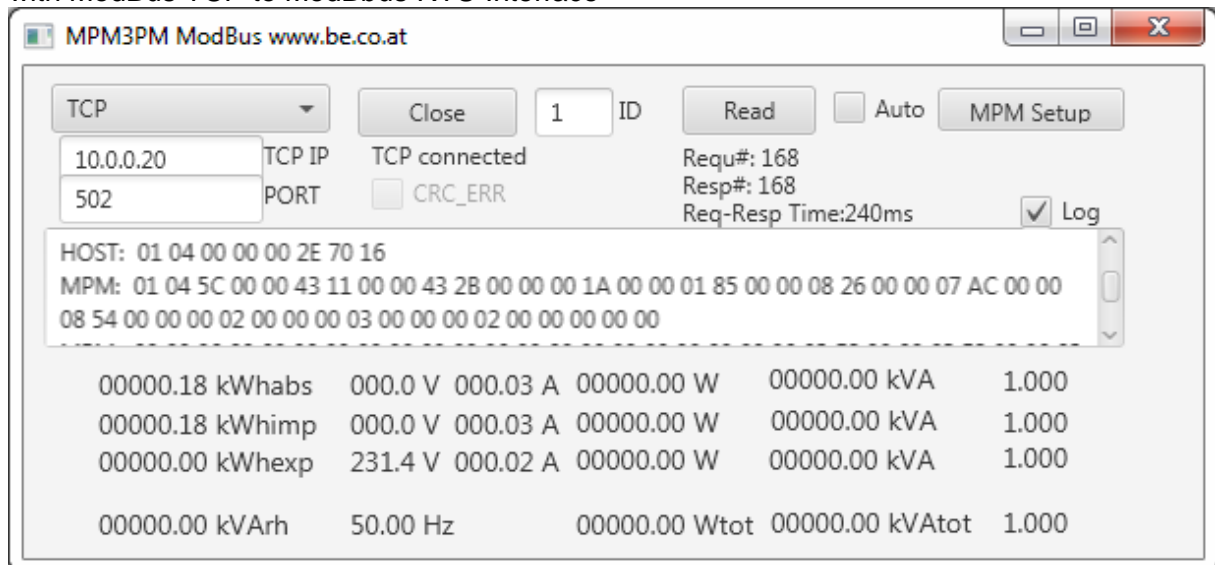
10.Free Software for Winows, Linux and Apple

www.qrck.info/modbus.jar

requires Java Runtime



Can connect with any serial com port with RS485 or with USB-RS485 interface (with virtual com port driver like FTDI...) or with ModBus TCP to ModBbus RTU Interface



11. ModBus Register, Address and Data format

Function	Register Address	Register Number	Byte	Format	Access (R/W)	Note
Active kWh Total	0x0000	2	4	Signed 32	R	Unit: 0.01kWh Import-Export
Import Active kWh Total	0x0002	2	4	Unsigned 32	R	Unit: 0.01kWh
Export Active kWh Total	0x0004	2	4	Unsigned 32	R	Unit: 0.01kWh .9
Reactive kvarh Total	0x0006	2	4	Unsigned 32	R	Unit: 0.01kvarh Import+Export
Voltage L1	0x0008	2	4	Unsigned 32	R	Unit : 0.1V
Voltage L2	0x000A	2	4	Unsigned 32	R	Unit : 0.1V
Voltage L3	0x000C	2	4	Unsigned 32	R	Unit : 0.1V
Current L1	0x000E	2	4	Unsigned 32	R	Unit : 0.01A
Current L2	0x0010	2	4	Unsigned 32	R	Unit : 0.01A
Current L3	0x0012	2	4	Unsigned 32	R	Unit : 0.01A
Power L1	0x0014	2	4	Unsigned 32	R	Unit : 0.01W
Power L2	0x0016	2	4	Unsigned 32	R	Unit : 0.01W
Power L3	0x0018	2	4	Unsigned 32	R	Unit : 0.01W
Reactive power L1	0x001A	2	4	Unsigned 32	R	Unit : 0.01var
Reactive power L2	0x001C	2	4	Unsigned 32	R	Unit : 0.01var
Reactive	0x001E	2	4	Unsigned 32	R	Unit : 0.01var

power L3									
Power Factor L1	0x0020	2	4	Unsigned 32	R	Unit: 0.001			
Power Factor L2	0x0022	2	4	Unsigned 32	R	Unit:0.001			
Power Factor L3	0x0024	2	4	Unsigned 32	R	Unit::0.001			
Active Power Total	0x0026	2	4	Unsigned 32	R	Unit : 0.01W			
Reactive Power Total	0x0028	2	4	Unsigned 32	R	Unit : 0.01var			
Power Factor Total	0x002a	2	4	Unsigned 32	R	Unit: 0.001			
Frequency	0x002c	2	4	Unsigned 32	R	Unit : 0.01Hz			
Baud rate	0x002e	1	2	Unsigned 16	R & W	Parity	Even	odd	none
							Bit Sum 0,2,4...	Bit Sum 0,2,4...	
						1200	0x0004	0x0104	0x0204
						2400	0x0008	0x0108	0x0208
						4800	0x0010	0x0110	0x0210
	9600	0x0020	0x0120	0x0220					
ID (Modbus)	0x002f	1	2	Unsigned 16	R & W	01-255 (01 default) Broadcast is 00.			
Cycle display screen number	0x0030	1	2	Unsigned 16	R & W	1-15 (10 default)			
Display time of each screen	0x0031	1	2	Unsigned 16	R & W	Unit 0.5 second Value=1-20 (0.5-10Seconds) (05 default)			
Digits number of Energy	0x0032	1	2	Unsigned 16	R & W	01: xxxxxx.x 02: xxxxx.xx (01 default)			
Serial Number	0x0033	2	4	Unsigned 32	R	SH+SL unique number			

11.1. *Cycle display items: one display item with one data format.*

Function	Register Address	Register Number	Byte	Format	Access (R/W)	Note
Cycle display Item	0x0035-0x0042	14	28	struct	R & W	write all entry in one write cycle

Function code	Code Instruction	Access (R/W)	Cycle Display Item Code	Data Format
0x00,0x10,	Voltage L1	R	Item 1	Hex
0x00,0x20,	Voltage L2	R	Item 2	Hex
0x00,0x30,	Voltage L3	R	Item 3	Hex
0x00,0x40,	Current L1	R	Item 4	Hex
0x00,0x50,	Current L2	R	Item 5	Hex
0x00,0x60,	Current L3	R	Item 6	Hex
0x00,0x70,	Active power	R	Item 7	Hex
0x00,0x80,	Reactive power	R	Item 8	Hex
0x00,0x90,	Power factor	R	Item 9	Hex
0x00,0xA0,	Frequency	R	Item A	Hex
0x00,0xB0,	Baud rate	R	Item B	Hex
0x00,0xC0,	ID	R	Item C	Hex
0x00,0xD0,	Serial Number of High	R	Item D	Hex
0x00,0xE0,	Serial Number of Low	R	Item E	Hex

Function	Register Address	Register Number	Byte	Format	Access (R/W)	Note
SW Version	0x0043	1	2	Unsigned 16	R	Software Version Firmware
Current Scale ratio	0x0044	1	2	Unsigned 16	R & W	(01 default) 1A:1A, no external current transformer Example 100A:5A, value to be set 20

11.2. Modify the parameters of meters

11.2.1. modify the baud rate, parity setting

Sending data: 01(ID) 10 00 2E 00 01 02 **02 20** (baud rate status word) CRC0,1

Example to set 9600 baud, parity even:

Baud rate register 0x002E = 0x00 20

Raw Data

```
[RTU]>Tx > 07:12:46:479 : 01 10 00 2E 00 01 02 00 20 A1 C6
[RTU]>Rx > 07:12:46:604 : 01 10 00 2E 00 01 61 C0
Sys > 07:12:46:604 : values written correctly.
```

Possible baud rate settings:

baud	parity		
	even	odd	none
1200	0x0004	0x0104	0x0204
2400	0x0008	0x0108	0x0208
4800	0x0010	0x0110	0x0210
9600	0x0020	0x0120	0x0220

11.2.2. modify the number of decimal digits

Sending data : 01(ID) 10 00 32 00 01 02 **00 01** (1 decimal digit for kWh) +CRC0,1

Returning data : 01(ID) 10 00 32 00 01 A0(CRC0) 06(CRC1)

Sending data : 01(ID)10 00 32 00 01 02 **00 02** (2 decimal digits for kWh) +CRC0,1

Returning data : 01(ID) 10 00 32 00 01 A0(CRC0) 06(CRC1)

The number of decimal digits 01: 999999.9

The number of decimal digits 02: 99999.99

11.2.3. modify the item displayed in cycle

For example, you need the meter to display the voltage of phase L1/L2/L3 , current of phase L1/L2/L3, active power, reactive power, power factor, frequency, baud rate, ID ,high digit of serial number, low digit of serial number. 14 items = 0x0E

The first step: modify the number of screen displayed in cycle :

Sending data : 01(ID) 10 00 30 00 01 02 **00 0E** 22(CRC0) 64(CRC1)

Returning data : 01(ID) 10 00 30 00 01 01(CRC0) C6(CRC1)

The second step: modify the item displayed in recycle, struct data :

IT IS NECESSARY TO SEND a multiple register write with 14 entry values!

Sending data :

01(ID) 10 00 35 00 0E 1C 00 10 00 20 00 30 00 40 00 50 00 60 00 70
 00 80 00 90 00 A0 00 B0 00 C0 00 D0 00 E0 89(CRC0) 34(CRC1)

Returning data:01(ID) 10 00 35 00 0E 51(CRC0) C3(CRC1)

11.2.4. To read the data module

Sending data : 00(ID) 04 AA AA 00 BB CRC0 CRC1

AA AA The starting add of register

BB The number of registers read by you

For example, reading the voltage of phase L1, L2, L3 and current of phase L1, L2, L3. Read the Voltage of L1, I2, I3.

Sending data : 00(ID) 04 00 08 00 08 CRC0 CRC1

12. **ABB23 compatible registers:**

These registers are shadow registers, to be compatible to ABB23 meters

12.1. *Data format*

Register Number 2 and Unsigned 32 means 0 digit is 0x0000 0000 and the highest possible value is 0xffff ffff

Example Register 0x5B00 Res 0.1 unit V, voltage 237,3V is 2373digits and is 0x0000 0945

Register Number 2 and Signed 32 means 0 digit is 0x0000 0000 and the highest possible value is 0x7fff ffff and minus 1 is 0xffff ffff, lowest negative value is 0x8000 0000

Example Register 0x5B14 Res 0.01W unit W, 1234,67W is 123467digits and is 0x0001 e24b,

Negative power -136,82W is -13682digits and is 0xffff ca8e

12.2. Register BLOCK 1

Function	Register Address	Register Number	Unit	Format	Access (R/W)	Note
Active import kWh	0x5000	4	0,01 kWh	Unsigned 64	R	
Active export kWh	0x5004	4	0,01 kWh	Unsigned 64	R	
Active net kWh	0x5008	4	0,01 kWh	Signed 64	R	=Active import kWh - Active export kWh
Reactive inductive kvarh	0x500C	4	0,01 kvarh	Unsigned 64	R	Independ import-export
Reactive capacitive kvarh	0x5010	4	0,01 kvarh	Unsigned 64	R	Independ import-export
Reactive total kvarh	0x5014	4	0,01 kvarh	Unsigned 64	R	Inductive +capacitive
Apparent import kVAh	0x5018	4	0,01 kVAh	Unsigned 64	R	Not implemented, readout 0xffff ffff ffff ffff
Apparent export kVAh	0x501C	4	0,01 kVAh	Unsigned 64	R	Not implemented, readout 0xffff ffff ffff ffff
Apparent net kVAh	0x5020	4	0,01 kVAh	Signed 64	R	Not implemented, readout 0xffff ffff ffff ffff

12.3. Register BLOCK 2

Function	Register Address	Register Number	Unit	Format	Access (R/W)	Note
Active net L1	0x5478	4	0,01 kWh	Signed 32	R	Not implemented, readout 0xffff ffff ffff ffff
Active net L2	0x547C	4	0,01 kWh	Signed 32	R	Not implemented, readout 0xffff ffff ffff ffff
Active net L3	0x5480	4	0,01 kWh	Signed 32	R	Not implemented, readout 0xffff ffff ffff ffff

12.4. Register BLOCK 3

Function	Register Address	Register Number	Unit	Format	Access (R/W)	Note
Voltage L1-N	0x5B00	2	0,1 V	Unsigned 32	R	
Voltage L2-N	0x5B02	2	0,1 V	Unsigned 32	R	
Voltage L3-N	0x5B04	2	0,1 V	Unsigned 32	R	
Voltage L1-L2	0x5B06	2	0,1 V	Unsigned 32	R	$=\sqrt{((L1-N)^2+(L2-N)^2+(L1-N)*(L2-N))}$
Voltage L3-L2	0x5B08	2	0,1 V	Unsigned 32	R	$=\sqrt{((L2-N)^2+(L3-N)^2+(L2-N)*(L3-N))}$
Voltage L1-L3	0x5B0A	2	0,1 V	Unsigned 32	R	$=\sqrt{((L1-N)^2+(L3-N)^2+(L1-N)*(L3-N))}$

Function	Register Address	Register Number	Unit	Format	Access (R/W)	Note
Current L1	0x5B0C	2	0,01 A	Unsigned 32	R	
Current L2	0x5B0E	2	0,01 A	Unsigned 32	R	
Current L3	0x5B10	2	0,01 A	Unsigned 32	R	
Current N	0x5B12	2	0,01 A	Unsigned 32	R	Not implemented, readout 0xffff or 0x0000, to be calculated extern
Active Power Total	0x5B14	2	0,01 W	Signed 32	R	
Active Power L1	0x5B16	2	0,01 W	Signed 32	R	
Active Power L2	0x5B18	2	0,01 W	Signed 32	R	
Active Power L3	0x5B1A	2	0,01 W	Signed 32	R	
Reactive power Total	0x5B1C	2	0,01 var	Signed 32	R	
Reactive power L1	0x5B1E	2	0,01 var	Signed 32	R	
Reactive power L2	0x5B20	2	0,01 var	Signed 32	R	
Reactive power L3	0x5B22	2	0,01 var	Signed 32	R	

Function	Register Address	Register Number	Unit	Format	Access (R/W)	Note
Apparent power Total	0x5B24	2	0,01 VA	Signed 32	R	
Apparent power L1	0x5B26	2	0,01 VA	Signed 32	R	
Apparent power L2	0x5B28	2	0,01 VA	Signed 32	R	
Apparent power L3	0x5B2A	2	0,01 VA	Signed 32	R	
Frequency	0x5B2C	2	0,01 Hz	Unsigned 32	R	
Unused registers	0x5B2D-0x5B39	1				Not implemented, readout 0xffff or 0x0000
Power factor Total	0x5B3A	1	0,001	Unsigned 16	R	0.000-1.000
Power factor L1	0x5B3B	1	0,001	Unsigned 16	R	0.000-1.000
Power factor L2	0x5B3C	1	0,001	Unsigned 16	R	0.000-1.000
Power factor L3	0x5B3D	1	0,001	Unsigned 16	R	0.000-1.000