

inepro[®]



**Ambition 2PU CT Series
MID
Three phase energy meter**

User manual

Version: 0.08

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2 Safety instructions

Information for your own safety

This manual does not contain all of the safety measures for operation of this meter because special operating conditions, local code requirements or local regulations may necessitate further measures. However, it does contain information which must be adhered to for your own personal safety and to avoid material damage. This information is highlighted by a warning triangle with an exclamation mark or a lightning bolt depending on the degree of actual or 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

Installation and operation of the device described in this manual may only be performed by qualified personnel. Only people that are authorized to install, connect and use this device, are considered qualified personnel in this manual. They have the proper knowledge about labeling and grounding electrical equipment and circuits. They can do so in accordance with local (safety) regulations.

Use for the intended purpose

This device may only be used for the application cases specified in the catalog and the user manual and only in connection with devices and components recommended and approved by Inepro Metering B.V.

Proper handling

The prerequisites for perfect, reliable operation of the product are proper transport, storage, installation and connection, as well as proper operation and maintenance. During its operation certain parts of the meter might carry dangerous voltages.

- Only use insulated tools suitable for the voltages this meter is used for.
- Do not connect while the circuit is connected to a power or current source.
- Only place the meter in a dry environment.
- The meter is intended to be installed in a Mechanical Environment 'M1', with Shock and Vibrations of low significance and Electromagnetic Environment 'E2', as per 2014/32/EC Directive. The meter is intended for indoor use. The meter shall be installed inside a suitable IP rated enclosure, in accordance with local codes and regulations.
- Do not mount the meter in an explosive area or exposed to dust, mildew and/or 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.
- Do not touch the meter's connection clamps directly with your bare hands, with metal, blank wire or other conducting material as you will risk an electric shock that could cause possible injury, serious injury or death.
- Make sure the protection covers are replaced after installation.
- Maintenance and repair of the meter should only be carried out by qualified personnel.
- Never break any seals (if present on this meter) to open the front cover as this might influence the functionality or accuracy of the meter, and will void all warranty.
- Do not drop, or allow physical impact to the meter as there are high precision components inside that may break and affect the meter measurement negatively.
- All clamps should be properly tightened.
- Make sure the wires fit properly in the connection clamps.
- If the wires are too thin it will cause a bad contact which can spark causing damage to the meter and its surroundings.
- If the product has become wet, we advise to send back the product and let the manufacturer evaluate the product to see if it is still safe to use or not. Do not install products that have been wet inside the plastic housing.
- Do not install in explosive atmospheres. If this product will be used in ambient condition with flammable or explosive material, please take additional measures in accordance to EN 50281-1-1.

- If the product has been dropped from more than 1 meter high on a concrete floor and no obvious damage is visual, we advise to send back the product and let the manufacturer evaluate the product to see if it is still safe to use or not. Do not install products that has fallen from more than 1m high on solid surfaces.
- Do not install in explosive atmospheres.

Exclusion of liability

We have checked the contents of this manual 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 or omissions in the information given. The data in this manual are checked regularly and the necessary corrections will be included in subsequent editions. If you have any suggestions, please do not hesitate to contact us.

Subject to technical modifications without notice.

No liability will be assumed for any detail when technical modifications are executed without prior notice to, and agreement with, the supplier.

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3 Foreword

Thank you for purchasing this energy meter. Inepro has a wide product range of devices. We have introduced a large number of energy meters on the market suitable for 110V AC to 400V AC (50 or 60Hz). Besides the normal energy meters we also developed our own pre-paid meters with chip card, chip card re-loaders and a complete PC management control system. For more information on other products please contact our sales department at sales@ineprometering.com or visit our website at www.ineprometering.com.

Although we produce this device according to international standards and our quality inspection is very accurate it's still possible that this device shows a defect or failure for which we do apologize. Under normal conditions your product should give you years of trouble free operation. In case there is a problem with the energy meter you should contact your distributor immediately. Most of our energy meters are sealed with a special seal. Once this seal is broken there is no possibility to claim any warranty. Therefore NEVER open an energy meter or break the seal of the device. The limited warranty is 5 years after production date, divided into various periods, after production, and only valid for production faults.

4 Certificates

	We, Inepro Metering BV
	Address Pondweg 7 2153 PK Nieuw-Vennep The Netherlands
	Declare under our sole responsibility that the product; 2PU CT
	Static Active Electrical Energy Meter With the measurement range of; 230V; 3x230/400V, 1(5)A, 50/60Hz, 10.000imp/kWh
<p>This declaration of conformity is suitable to the European Standard EN 45014 General Certificate for Supplier's Declaration of Conformity. The basis for the criteria has been found in international documentation, particularly in ISO / IEC, clause 27, 1992, Information on manufacturer's Declaration of Conformity with standards or other technical specifications</p>	To which this declaration relates in conformity with the following European harmonized and published standards at date of this declaration EN 50470
	Following the provisions of the Directives (if applicable) <input type="checkbox"/> N/A
	Place and date of issue Nieuw-Vennep, October 15, 2021
	Name of responsible for CE-Marking D. van der Waart

	Declaration of Conformity
	We, Inepro Metering BV
	Address Pondweg 7 2153 PK Nieuw-Vennep The Netherlands
	Ensure and declare that the apparatus 2PU CT
	Static Active Electrical Energy Meter With the measurement range of; 230V; 3x230/400V, 1(5)A, 50/60Hz, 10.000imp/kWh
	Is in conformity with the type as described in the EC-TEC (type examination certificate): T12229
	Nieuw-Vennep, October 15, 2021
	Name of responsible for DoC-Marking D. van der Waart Product manager

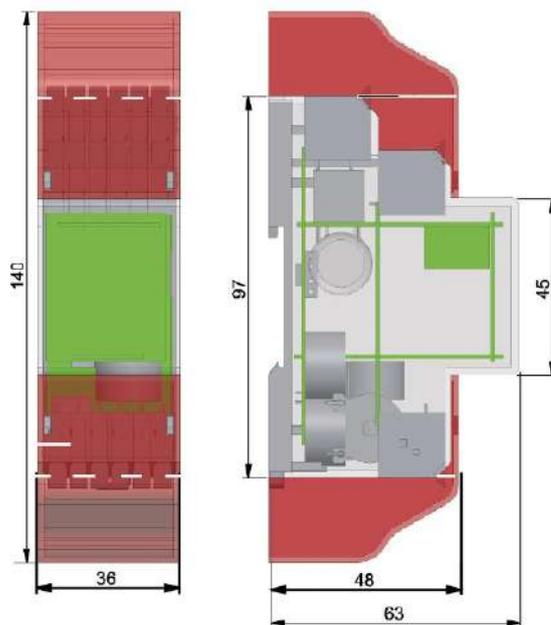
5.5 RS485 communication specifications

Bus type	RS485
Protocol	MODBUS RTU with 16 bit CRC
Baud rate	1200, 2400, 4800, 9600 (default), 19200, 38400, 57600 and 115200
Address range	1-247 user settable
Maximum bus load	60 meters per bus*
Range	1000m

*Note that the maximum number of meters is dependent on the converter, baudrate (the higher the baudrate, the smaller the number of meters which can be used) and the circumstances under which the meters are installed.

5.6 Dimensions

Height without protection cover	98 mm
Height	140,5 mm
Width	36 mm
Depth	65 mm
LCD	35x45 mm
Weight without protection covers	162 gr (net)



5.7 Wire connection

Connection technology	Push-in CAGE CLAMP®
Actuation type	Lever

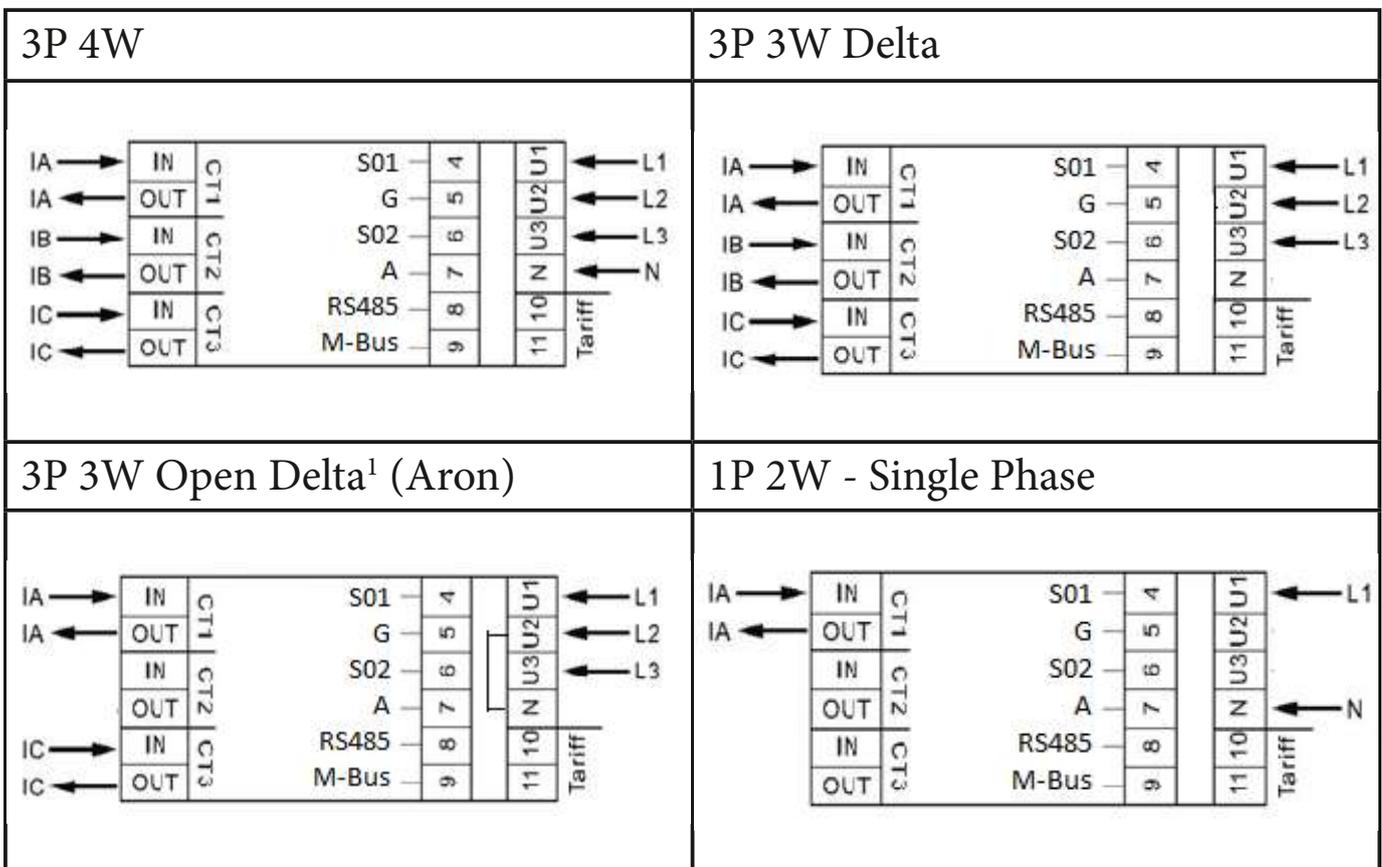
WAGO serie 2604

Solid conductor	0.2 ... 4 mm ² / 24 ... 12 AWG
Fine-stranded conductor	0.2 ... 4 mm ² / 24 ... 12 AWG
Fine-stranded conductor; with insulated ferrule	0.25 ... 2.5 mm ²

*Push-in technology can be used for Solid conductors and fine-stranded conductors with insulated ferrule.
Fine-stranded conductors require opening the levers for connection.*

5.8 Connection diagram

	Connection Diagram	Maximum allowed load
IA, IB, IC	In and Out CT's	5 A, 27 VDC
U1	L1 (in) Phase 1 input - L1 (out) Phase 1 output	400 VAC, 5A; 4kV 1 min.; 300A for 0.01s
U2	L2 (in) Phase 2 input - L2 (out) Phase 2 output	400 VAC, 5A; 4kV 1 min.; 300A for 0.01s
U3	L3 (in) Phase 3 input - L3 (out) Phase 3 output	400 VAC, 5A; 4kV 1 min.; 300A for 0.01s
N	Neutral input	0 VDC, 3 mA
4	S0 output 1 (+) industry-standard pulse output	I _{max} = 100 mA, 5 - 27 VDC
5	Ground (-); Signal wire connection	0 VDC, 3 mA
6	S0 output 2 (+)	I _{max} = 100 mA, 5 - 27 VDC
7	Modbus communication contact A	3.3 V, 3 mA
8	Modbus communication contact B / M-bus communication contact (-) - connector RS485	3.3V, 3 mA; $\pm 5V?$
9	M-bus communication contact (+)	3.3V, 3 mA
10, 11	Tariff switching	230 VAC?



1 Norwegian IT network is the same as Open Delta with Aron connection

6 Installation

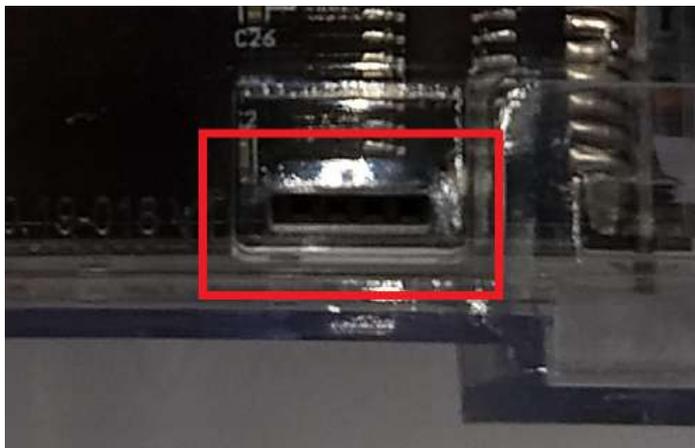
5.9 UART-port

UART port 3.3 mV
4 pins connection
RS485 connection RTU

The UART port is essential for the connection to the interface adjacent. This keeps the meter MID-certified. This adjacent interface can be delivered by any organisation, containing all kind of protocols to read out the energy information and transfer it to a computer or website.

For remote access you need to register via a "Cyclic Redundancy Check (CRC). The CRC value is actually calculated by the software. The CRC-value will change every time the code is modified.

With the software version 102 --> CRC = 21001416 (59629173)



6 Installation

6.1 Check meter

Before mounting the meter please check visual from the outside on damage.

*NOTE: The housing is sealed, do not open the meter!
No warranty if the housing is opened or the seal is removed.*

This meter is delivered with protection covers for wiring.

6.2 Mount the meter on a DIN-rail

Before mounting the meter pull the slide outward (1), place the meter in the DIN-rail and push the slide inwards (2).
On photograph: slide in inward position.

6.3 Disassemble the meter from the DIN-rail

Pull the slide outward (1), remove the meter and push the slide inwards (2).



6.4 Installation warnings



Caution

- Turn off and if possible lock all sources supplying the energy meter and the equipment that is connected to it before working on it.
- Always use a properly rated voltage sensing device to confirm that power is off.



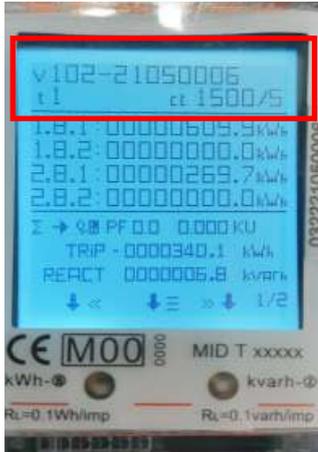
Warning

- The installation should be performed by qualified personnel familiar with applicable codes and regulations.
 - Use insulated tools to install the device.
 - A fuse, thermal cut-off or single-pole circuit breaker should be fitted on the supply line and not on the neutral line.
- The connecting wire, connecting the device to the outside circuit, should be sized in accordance with local regulations for the maximum amount of the current breaker or other overcurrent protection devices used in the circuit.
 - An external switch or a circuit-breaker should be installed on the supply wires, which will be used to disconnect the meter and the device supplying energy. It is recommended that this switch or circuit-breaker is placed near the meter because that is more convenient for the operator. The switch or circuit-breaker should comply with the specifications of the building's electrical design and all local regulations.
 - An external fuse or thermal cut-off used as an overcurrent protection device for the meter must be installed on the supply side wires. It's recommended that this protection device is also placed near the meter for the convenience of the operator. The overcurrent protection device should comply with the specifications of the building's electrical design and all local regulations.
 - This meter can be installed indoor, or outdoor enclosed in a meter box which is sufficiently protected, in accordance with local codes and regulations.
 - To prevent tampering, an enclosure with a lock or a similar device can be used.
 - The meter has to be installed against a fire resistant wall.
 - The meter has to be installed in a well-ventilated and dry place.
 - The meter has to be installed in a protective box if the meter is exposed to dust or other contaminants.
 - The meter can be installed and used after being tested and can be sealed afterwards.
 - The device can be installed on a 35mm DIN rail.
 - The meter should be installed on a location where the meter can be read easily.
 - In case the meter is installed in an area with frequent surges for example due to thunderstorms, welding machines, inverters etc., the meter is required to be protected with a Surge Protection Device.
 - The device should be sealed immediately after installing it in order to prevent tampering.

7 Operation

7.1 Display part 1

Part 1 of the display shows the MID relevant software version number, the meter serial number, the CRC code, the actual tariff. Meter serial number and CRC code are scrolling every 10 seconds. When Bluetooth communication is activated, icon 1 will be shown. When Modbus or M-bus communication is activated, a telephone hook sign will be shown on the display. The display also shows the present CT ratio set in the meter.



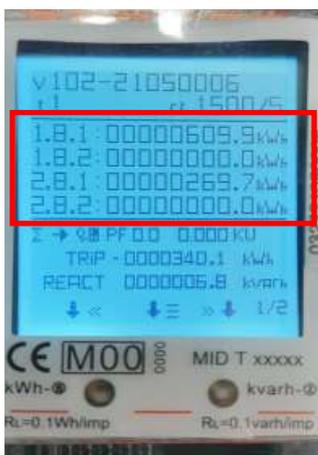
7.2 Display part 2

Part 2 of the display shows the MID relevant measurement values.

OBIS codes are used to identify the corresponding measurement values:

- 1.8.1: Positive active energy in tariff 1
- 1.8.2: Positive active energy in tariff 2
- 1.8.3: Positive active energy in tariff 3 (will be shown in the display when T3 and/or T4 are activated)
- 1.8.4: Positive active energy in tariff 4 (will be shown in the display when T3 and/or T4 are activated)

- 2.8.1: Negative active energy in tariff 1
- 2.8.2: Negative active energy in tariff 2
- 2.8.3: Negative active energy in tariff 3 (will be shown in the display when T3 and/or T4 are activated)
- 2.8.4: Negative active energy in tariff 4 (will be shown in the display when T3 and/or T4 are activated)



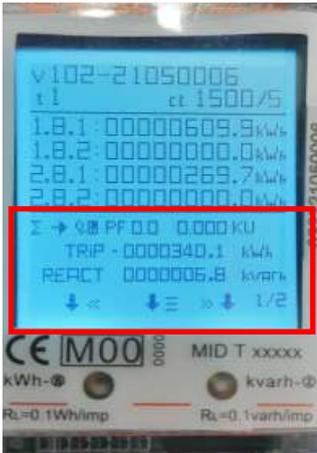
The meter has a 6+3 digit display for kWh values. When reaching 999999,999 the kWh value goes back to 000000,000.

Scrolling time for T1/T2 and T3/T4 is 10 seconds.

7.3 Display part 3

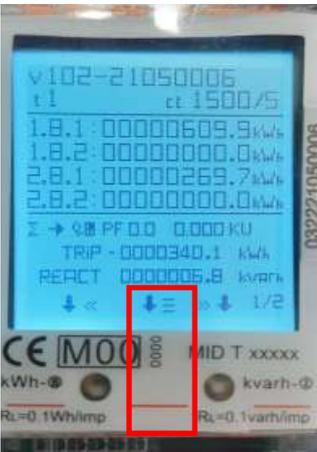
Part 3 of the display shows data like current direction, trip counter, reactive energy, power factor, present quadrant, frequency, active power, apparent power, reactive power, voltage and current.

Scroll through the display pages (Total - L1 - L2 -L3) using the capacitive touch buttons on the frontside of the meter. In display part 3 the CT history pages become visible after activation (see 7.6.15 CT ratio).



7.4 Settings

Activate settings mode by holding the middle button (*) for >3 seconds.



The following display will appear:



7.5 Bluetooth

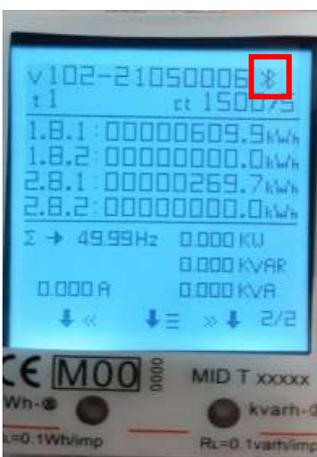
Select the Bluetooth icon  and press the middle button to activate the Bluetooth function:



Scan the QR code on the display using the inepro Metering mobile phone app.



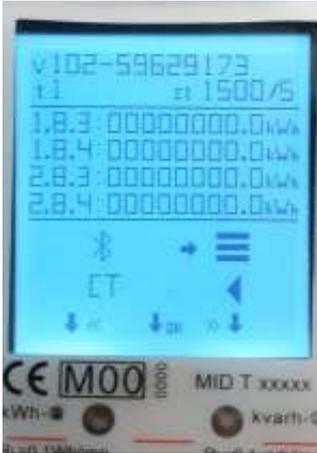
When Bluetooth connection is active, the Bluetooth activation icon  will be shown on the display:



Go to [Appendix 4 - Bluetooth](#) for the inepro Metering mobile phone app user guide.

7.6 Button settings

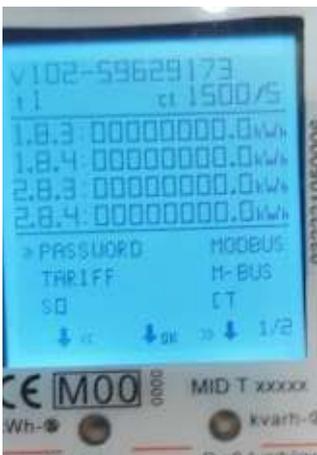
Settings can also be done using the capacitive touch buttons on the front of the meter. Scroll through the options using the left << and right >> button. Confirm the setting using the middle button. **When the middle button is pressed long to enter the setting page, without pressing the button to select, it automatically time out and exit.** Select the following page to go to the settings menu:



Enter the password to get access to the settings menu (default 0000). Confirm each digit (1-9) using the middle button:



The settings menu will appear after entering the password correctly:



7.6.1 Password

The button setting function can be protected by setting a password. This password is also valid for settings via Bluetooth. The default password is 0000. This password can only be changed using the button function.



7.6.2 Tariff

The default tariff is 1. The tariff can be set to T2, T3 or T4. The active tariff is always in LCD part 1, T3 and T4 will be added to the automatic scroll of LCD part 2.



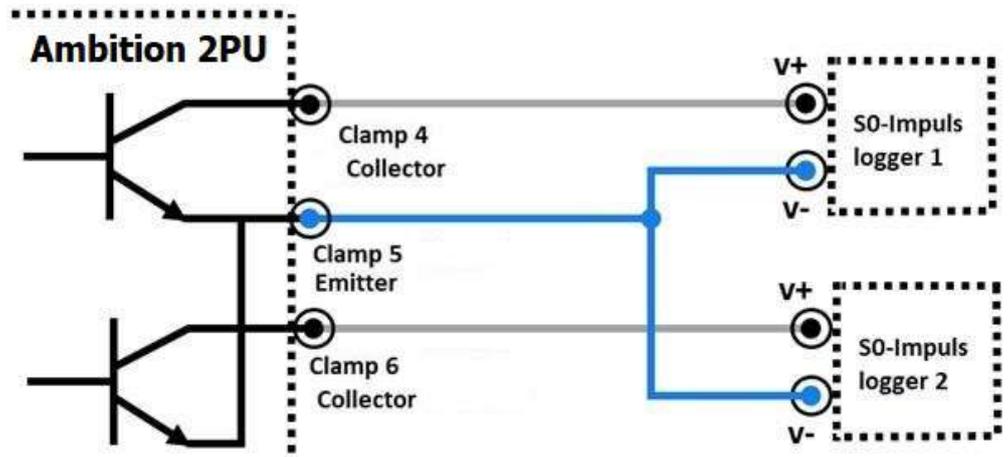
7.6.3 S0 output

The energy meter is equipped with two pulse outputs (forward & reverse or active & reactive) which are optically isolated from the inside circuit. It generates pulses in proportion to the measured consumption for purpose of remote reading or accuracy testing.

The function of the S0 can be set via Bluetooth or via buttons in the setting menu.

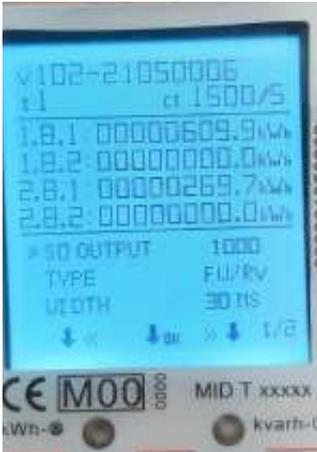
The pulse output is a polarity dependent, open-collector transistor output requiring an external voltage source for correct operation. For this external voltage source, the voltage (U_i) should be lower than 27V DC. The maximum switching current (I_{max}) is 100mA. To connect the impulse output, connect 5-27V DC to connector 4/6 (collector), and the signal wire (S) to connector 5 (emitter).

The default imp/kWh setting for the S0 output is 1.000. The S0 output setting can be modified to 10.000 / 2.000 / 100 / 10 / 1 / 0,1 / 0,01 imp/kWh.



7.6.4 Pulse type setting

The default pulse type setting is active & reactive. This means that the two pulse outputs pulse based on the active and reactive energy. The pulse type can be set to forward & reverse, which means that the pulse outputs pulse based on forward and reverse active energy.



7.6.5 S0 Pulse width

The default S0 pulse width is 30ms. The pulse width setting can be modified to 2-99ms (depending on the imp/kWh setting).



7.6.6 Modbus ID

The Modbus ID can be set from 001 to 247, the default Modbus ID is 001.



7.6.7 Modbus baud rate

The default Modbus baud rate setting is 9600. The Modbus baud rate setting can be modified to 115.200 / 56.700 / 38.400 / 19.200 / 4800 / 2400 / 1200 / 600 / 300 bps.



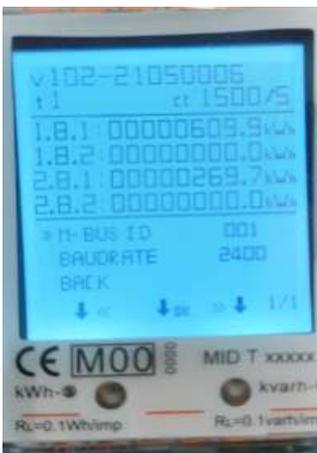
7.6.8 Modbus parity

The default Modbus parity setting is even. The Modbus parity can be modified to none or odd.



7.6.9 M-bus ID

The M-bus ID can be set from 000 to 250, the default M-bus ID is 000.



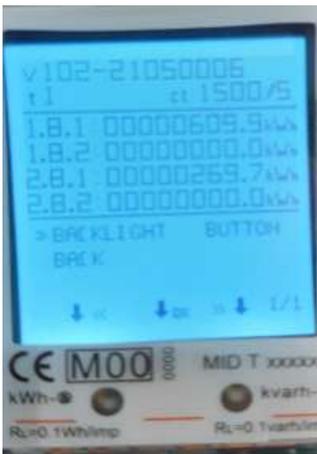
7.6.10 M-bus baud rate

The default M-bus baud rate setting is 2400. The M-bus baud rate setting can be modified to 9600 / 4800 / 1200 / 600 / 300 bps.



7.6.11 Backlight

The meter is equipped with a blue backlight. The backlight can be set to always on, off or button mode.



7.6.12 Powerdown counter

The powerdown counter registers the number of times that the meter has been turned off. The counter can be reset via Bluetooth or buttons.



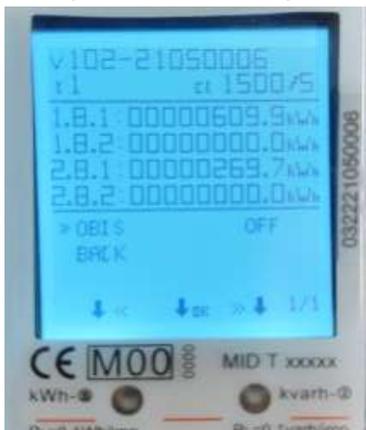
7.6.13 Trip counter

The meter is equipped with a trip counter that can be set to zero by the user. This is the energy calculated based on the combination code setting (see 7.6.15).



7.6.14 OBIS codes

OBIS is default set to ON. This can be set OFF for part 3 of the LCD via BT or the buttons. LCD part 2 always shows OBIS and kWh and here OBIS cannot be set off. The OBIS code is a text string composed according to the OBIS standard (see IEC 62056-61).



7.6.15 Combination code (Modbus, M-bus & Bluetooth setting only)

The meter allows you to display the total energy (usage) shown on the display in accordance to different calculation methods. This meter gives five different ways to calculate and display your energy, defined with a code. You can use the following calculation methods for total energy:

Code	Total (active) energy
C-01	Forward only
C-02	Reverse only
C-03	Forward + Reverse
C-04	Forward - Reverse
C-05	Forward - Reverse*

Example of flow through the meter	
L1	+5 kWh
L2	+5 kWh
L3	-12 kWh

LCD reading and calculation of total energy					
Code	C-01	C-02	C-03	C-04	C-05*
Total	10	-12	22	-2	-2
Forward	10	10	10	10	0
Reverse	-12	-12	12	-12	-2

*Meters ordered or set afterwards to C-05 cannot be set to another calculation mode.

7.6.16 Scroll time

The scrolling time for LCD part 3 can be modified. It can be programmed between 1 - 30 seconds. Default is 5 seconds.

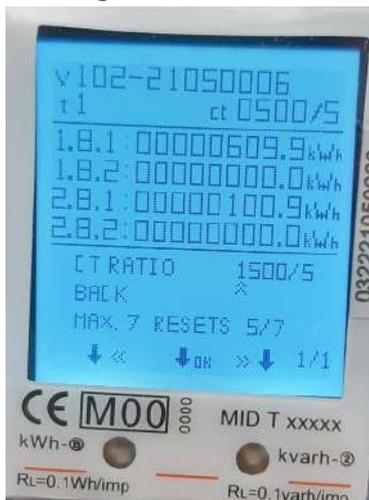


7.6.17 CT ratio

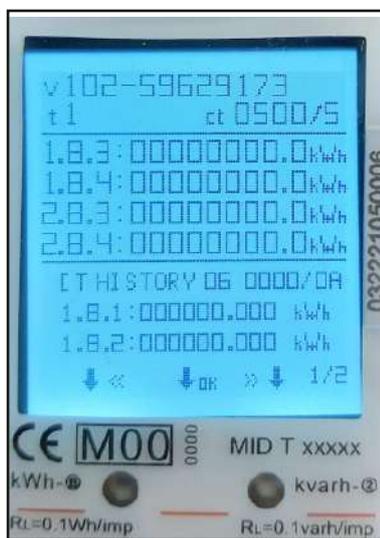
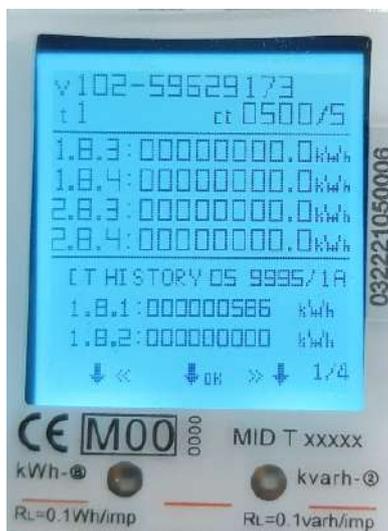
The CT-ratio is default set on 5/5. In the screen here below the CT ratio is set on 0500/5. That means that with a basic current of 500A the 2PU CT meter will have a current of 5A.

The primary current can be modified to 0001 - 9999A (when secondary current is /1A) or 0005 - 9995A (when secondary current is /5A). The secondary current can be set to /1A or /5A.

Each time you set a CT ratio the previous ratio and value is stored in the CT history. You can do this 7 times maximum. At start-up the ratio is set to 5/5. After first time setting the CT ratio, the kWh value in part 2 will start counting according to this ratio.



In the CT history menu, the meter will also continue counting based on the 5/5 ratio in register CT history 1. After every CT ratio reset, the kWh value + CT ratio from display part 2 will be stored in a new CT history register.



8 Troubleshooting



Caution

- During repair and maintenance, do not touch the meter connecting clamps directly with your bare hands, with metal, blank wire or other conducting material as that will cause an electric shock and possibly cause injury, serious injury or even death.
- Turn off and if possible lock all sources supplying the energy meter and the equipment that is connected to it before opening the protection cover and working on it.
- Turn off and lock all power supply to the energy meter and the equipment to which it is installed before opening the protection cover to prevent the hazard of electric shock.



Warning

- Maintenance or repair should only be performed by qualified personnel familiar with applicable codes and regulations.
- Use insulated tools to maintain or repair the meter.
- Make sure the protection cover is in place after maintenance or repair.
- The case is sealed, failure to observe this instruction can result in damage to the meter.

Problem	Possible cause	Check/solution
The red consumption LED is not flashing (PULSE LED).	There is no load connected to the meter. The load on the line is very low.	Connect a load to the meter. Check with an Ohm-meter if the load value is very low.
The register doesn't count.	There is almost no load connected to the meter.	Check if the red consumption LED is flashing.
No pulse output.	The pulse output is not supplied with DC power. The pulse output is not connected correctly.	Check the external voltage source (Ui) is 5-27V DC with a voltage meter. Check if the connection is correct: the 5-27V DC should be connected to the collector connection (pin 18/20+) and the signal wire (S) to the emitter connection (pin 19/21-).
If none of the above works, please contact technical support		

8.1 Errors / Diagnostics display

All measurement values are stored twice with the accompanying checksums. In case the checksum fails, the backup data is used. If both the normal storage and backup fail, the meter will stop working and indicate error XX:

XX is the hexadecimal data, convert the data to binary to analyze the data

bit0: The data in the main storage area and backup area of the energy is wrong or cannot be operated

bit1: The energy mantissa area cannot be operated

bit2: The energy backup area cannot be operated

bit3: The main energy storage area cannot be operated

bit4: Data error in the energy mantissa area

bit5: Data error in the energy backup area (integer bit)

bit6: Data error in the main energy storage area (integer bit)

bit7: EEPROM cannot be fully initialized

8.2 Technical support

For questions about one of our products please contact:

- Your local Inepro Metering distributor
- Email: support@ineprometering.com
- Website: www.ineprometering.com

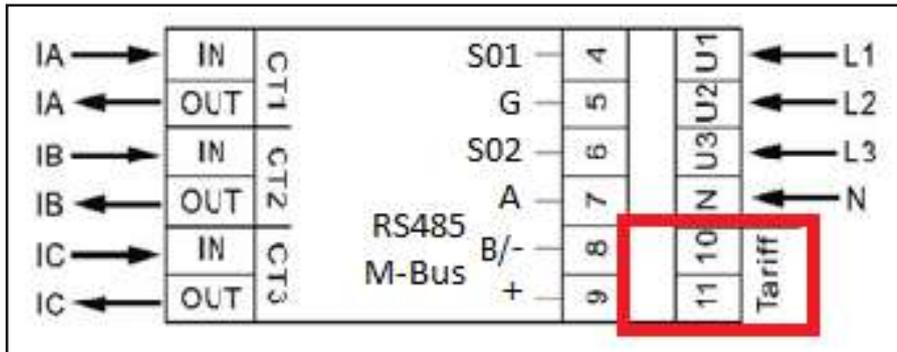


Appendix 1 - Multi tariff function

A1.1 How to switch between T1 and T2

The meter is equipped with a multi tariff functionality. T1 and T2 can be activated by an external voltage connected to the terminals 10/11.

This is an AC voltage between 10 and 11:



A1.2 How to switch between T3 and T4

T3 and T4 can only be activated by Bluetooth, Modbus, M-bus or using the button function. After activating T3 and/or T4 once, the energy values per tariff (3 / 4) will be displayd in the MID relevant part of the display. This cannot be undone.

Appendix 2 - M-bus

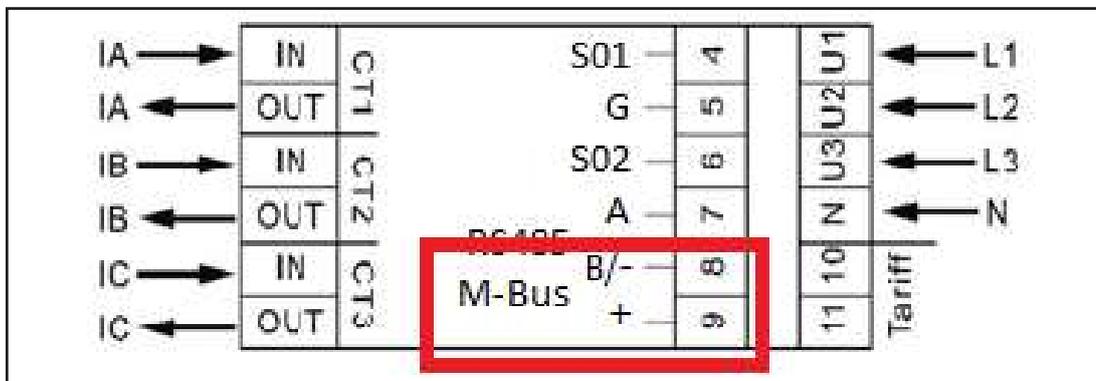
A2.1 Communicating via the M-bus output

The 2PU CT meter is equipped with an M-bus port, the data can be read out via this port. The communication protocol conforms to the EN13757-3 standard.

The meter can communicate with your PC. In order to read out the meter registers first install and configure the PC software. Use an M-bus level converter to connect the PC and the meter. The cable should be connected to terminals 8 and 9. The default communication address of the meter is 000.

The defaults for M-bus communication are:

- Baud rate 2400
- 8 data bits
- Even parity
- 1 stop bit



The secondary addressing (253/FD) is preset to the last 8 digits of the serial number printed on the side of the meter. However this can be changed to a more convenient number through IR or M-bus communication.

The baud rate can be changed to values 9600, 4800, 1200, 600 and 300 baud. Data, parity and stop bit cannot be changed.

For the registers used in the meter and how to interpret the data, please use the M-bus register map on the next page.

More detailed information on M-Bus can be found:

www.m-bus.com

A2.2 M-bus register map

Read

M-bus Command	Contents	M-bus register header DIF	M-bus register VIF	Response/example	Remarks
1. REQ UD2: 10 5B xx				68 xx xx 68 08 xx 72	68 [data length] 68 08 [address] 72 [header] [datablocks] [checksum] 16
	Serial number	Header		46 02 02 19	
	Manufacturer ID			CD 25	
	Version			01	Same as the mayor version of the software
	Medium			02	Electricity
	Acces number			04	Every time the meter is read this number is increased by 1 up to 255, then it becومه 0 again
	Status			00	00 = OK 02 = error
	Signature			00 00	Always 00 00
Datablocks	Total forward active energy	04	03	15 CD 5B 07	123456789 Wh
	Forward active energy T1	84 10	03	15 CD 5B 07	123456789 Wh
	Forward active energy T2	84 20	03	15 CD 5B 07	123456789 Wh
	Forward active energy T3	84 30	03	15 CD 5B 07	123456789 Wh
	Forward active energy T4	84 80 10	03	15 CD 5B 07	123456789 Wh
	Total reverse active energy	04	83 3C	15 CD 5B 07	123456789 Wh
	Reverse active energy T1	84 10	83 3C	15 CD 5B 07	123456789 Wh
	Reverse active energy T2	84 20	83 3C	15 CD 5B 07	123456789 Wh
	Reverse active energy T3	84 30	83 3C	15 CD 5B 07	123456789 Wh
	Reverse active energy T4	84 80 10	83 3C	15 CD 5B 07	123456789 Wh
	Total kWh (resettable)	04	83 FC 10	15 CD 5B 07	123456789 Wh
	Forward reactive energy	04	FB 82 73	15 CD 5B 07	123456,789 kVARh
	Reverse reactive energy	04	FB 82 F3 3C	15 CD 5B 07	123456,789 kVARh
	L1 voltage	02	FD C7 FC 01	E4 59	230,12 V
	L2 voltage	02	FD C7 FC 02	E4 59	230,12 V
	L3 voltage	02	FD C7 FC 03	E4 59	230,12 V
	L1 current	03	FD D9 FC 01	1B 87 01	100123 mA
	L2 current	03	FD D9 FC 02	1B 87 01	100123 mA
	L3 current	03	FD D9 FC 03	1B 87 01	100123 mA
	Total active power	03	2B	87 D6 12	1234567 W
	L1 active power	03	AB FC 01	87 D6 12	1234567 W
	L2 active power	03	AB FC 02	87 D6 12	1234567 W
	L3 active power	03	AB FC 03	79 29 ED	-1234567 W
	Total reactive power	03	FB 14	87 D6 12	1234,567 kVAR

Read (2)

M-bus Command	Contents	M-bus register header DIF	M-bus register VIF	Response/example	Remarks
	L1 reactive power	03	FB 94 FC 01	87 D6 12	1234,567 kVAR
	L2 reactive power	03	FB 94 FC 02	87 D6 12	1234,567 kVAR
	L3 reactive power	03	FB 94 FC 03	87 D6 12	1234,567 kVAR
	Total apparent power	03	FB 34	87 D6 12	1234,567 kVA
	Total power factor	0A	FD 3A	00 01	1,00
	Grid frequency	03	FB 2C	37 C7 00	50,999Hz
	Tariff	09	7C 01 54	01	T1
	CT rate (only for CT version)	0A	FD 3A	05 95 99	9995/5
	Checksum			xx xx	

Write

Contents	Command part 1	Address	Command part 2	New value	Response	Remarks
Baudrate	68 03 03 68 53	01	-	BB	E5 (new Baud 2400)	B8 = 300; B9 = 600; BA = 1200; BB = 2400; BC = 4800; BD = 9600
Primary address	68 06 06 68 53	01	51 01 7A	01	E5 (new id 01)	000 - 250 write in HEX
Secondary address	68 09 09 68 53	01	51 0C 79	15 01 23 45	E5 (new address 1501 2345)	4 bytes BCD same as read
Tariff mode	68 08 08 68 53	01	51 09 7C 01 54	02	E5 (tariff 2)	T1 = 01 ; T2 = 02 ; T3 = 03 ; T = 04
Combined code	68 07 07 68 53	01	51 09 FD 3A	05	E5 (combined code 05)	01, 02, 03, 04 and 05
S0 rate	68 0A 0A 68 53	01	51 0C FD 3A	00 00 01 00	E5 (S0 rate 100)	10.000 / 2.000 / 1.000 / 100 / 10 / 1 / 0,1 / 0,01
Resettable kWh	68 09 09 68 53	01	51 0C 04	00 00 00 00	E5	Value is ignored, always set to 0
Reset power down counter	68 08 08 68 53	01	51 0A FD 60	00 00	E5	Value is ignored, always reset to 0
SND NKE	10 40	01	-	-	E5	Can be send to primary or secondary address and resets all communication values
Selecting slave by secondary addressing						
	Serial number		Manufacturer ID	Generation version		Medium
	68 0B 0B 68 53 FD 52		aa aa aa aa	bb bb	cc	dd
	Input		01 00 07 13	CD 25	01	02
	Remarks		59269903	-	Major version of the software	Electricity

Appendix 3 - Modbus

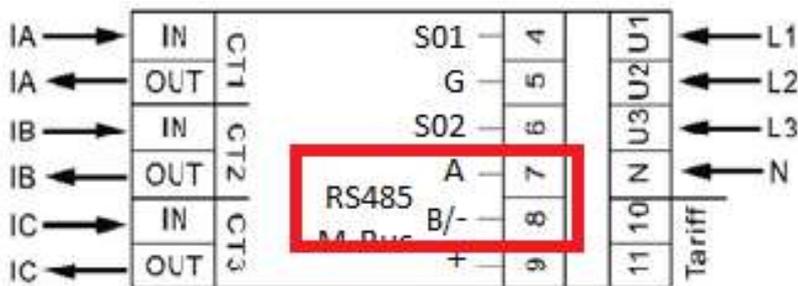
A3.1 Communicating via the Modbus output

The meter can communicate with your PC. In order to read out the meter registers first install and configure the PC software. Use an RS485 level converter to connect the PC and the meter. The cable should be connected to terminals 7 and 8. The default communication address of the meter is 001.

The PRO380-Mod can be connected for Modbus communication. The Modbus implementation used is Modbus basic (standard). This means the following:

- Baud rate 9600
- 8 data bits
- Even parity
- 1 stop bit

The baud rate can be changed to values 115200, 56700, 38400, 4800, 2400, 1200, 600 and 300. The parity can be set to none or odd. Data and stopbit cannot be changed.



When connecting the meter through a serial converter (RS485) for testing, please be aware that because of not implementing the complete Modbus infrastructure, there will be a need to put an additional resistor (120 ohms/ 0,25 watts) across the terminals (7 & 8) on the meter side.

For the registers used in the meter and how to interpret the data, please use the Modbus register map on the next pages.

More info on Modbus can be found:

Physical: http://www.modbus.org/docs/Modbus_over_serial_line_V1_02.pdf

Protocol: http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf

A3.2 Modbus register map

Reg. address	Content	Function code	Length	Unit	Data type
4000	Serial number	03	2	-	HEX
4002	Meter code <i>4PU: 1111 - 4PS: 1112 - 2PCT: 1113</i>	03	1	-	HEX
4003	Modbus ID	03	1	-	Signed
4004	Baud rate <i>1: 300 - 2: 600 - 3: 1200 - 4: 2400 5: 4800 - 6: 9600 - 7: 19200 - 8: 38400 9: 57600 - 10: 115200</i>	03	1	-	Signed
4005	Protocol version	03	2	-	Float ABCD
4007	Software version	03	2	-	Float ABCD
4009	Hardware version	03	2	-	Float ABCD
400B	Meter amps	03	1	A	Signed
400C	CT ratio	03	1	A	HEX
400D	SO output rate	03	2	imp/kWh	Float ABCD
400F	Combination code <i>1: forward only - 2: reverse only 3: forward+reverse - 4: import-export 5: import-export (10)</i>	03	1	-	Signed
4010	LCD cycle time*	03	1	sec.	HEX
4011	Parity setting <i>1: even - 2: none - 3: odd</i>	03	1	-	Signed
4012	Current direction <i>F: forward - R: reverse</i>	03	1	-	ASCII
4013	L2 Current direction <i>F: forward - R: reverse</i>	03	1	-	ASCII
4014	L3 Current direction <i>F: forward - R: reverse</i>	03	1	-	ASCII
4015	Error code*	03	1	-	Signed
4016	Power down counter	03	1	-	Signed
4017	Present quadrant	03	1	-	Signed
4018	L1 Quadrant	03	1	-	Signed
4019	L2 Quadrant	03	1	-	Signed
401A	L3 Quadrant	03	1	-	Signed
401B	Checksum	03	2	-	HEX
401D	Active status word	03	2	-	HEX
401F	CT ratio <i>9995 005 = 9995/5</i>	03	2	A	Signed
4021	Pulse width <i>Value between 2-99 ms</i>	03	1	ms	Signed
4022	Pulse type setting <i>1: active & reactive 2: forward & reverse</i>	03	1	-	HEX
4023	Checksum 2 (non-relevant)	03	2	-	HEX
4025	Reserved	-	1	-	-

4026	Data type setting <i>1: standard - 2: integer</i>	03	1	-	Signed
4027	Reserved	-	11	-	-
4032	Screen direction <i>0: standard - 1: turn 180 degrees</i>	03	1	-	Signed
4033	OBIS code ON/OFF <i>0: OFF - 1: ON</i>	03	1	-	Signed

Reg. address	Content	Function code	Register	Unit	Data type
5000	Voltage*	03	2	V	Float ABCD
5002	L1 Voltage	03	2	V	Float ABCD
5004	L2 Voltage	03	2	V	Float ABCD
5006	L3 Voltage	03	2	V	Float ABCD
5008	Grid frequency	03	2	Hz	Float ABCD
500A	Current*	03	2	A	Float ABCD
500C	L1 Current	03	2	A	Float ABCD
500E	L2 Current	03	2	A	Float ABCD
5010	L3 Current	03	2	A	Float ABCD
5012	Total active power	03	2	kW	Float ABCD
5014	L1 Active power	03	2	kW	Float ABCD
5016	L2 Active power	03	2	kW	Float ABCD
5018	L3 Active power	03	2	kW	Float ABCD
501A	Total reactive power	03	2	kvar	Float ABCD
501C	L1 Reactive power	03	2	kvar	Float ABCD
501E	L2 Reactive power	03	2	kvar	Float ABCD
5020	L3 Reactive power	03	2	kvar	Float ABCD
5022	Total apparent power	03	2	kVA	Float ABCD
5024	L1 Apparent power	03	2	kVA	Float ABCD
5026	L2 Apparent Power	03	2	kVA	Float ABCD
5028	L3 Apparent Power	03	2	kVA	Float ABCD
502A	Power factor	03	2	-	Float ABCD
502C	L1 Power factor	03	2	-	Float ABCD
502E	L2 Power factor	03	2	-	Float ABCD
5030	L3 Power factor	03	2	-	Float ABCD
5032	L1-L2 Voltage	03	2	V	Float ABCD
5034	L1-L3 Voltage	03	2	V	Float ABCD

5036	L2-L3 Voltage	03	2	V	Float ABCD
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Reg. address	Content	Function code	Length	Unit	Data type
6000	Total active energy	03	2	kWh	Float ABCD
6002	T1 Total active energy	03	2	kWh	Float ABCD
6004	T2 Total active energy	03	2	kWh	Float ABCD
6006	L1 Total active energy	03	2	kWh	Float ABCD
6008	L2 Total active energy	03	2	kWh	Float ABCD
600A	L3 Total active energy	03	2	kWh	Float ABCD
600C	Forward active energy	03	2	kWh	Float ABCD
600E	T1 Forward active energy	03	2	kWh	Float ABCD
6010	T2 Forward active energy	03	2	kWh	Float ABCD
6012	L1 Forward active energy	03	2	kWh	Float ABCD
6014	L2 Forward active energy	03	2	kWh	Float ABCD
6016	L3 Forward active energy	03	2	kWh	Float ABCD
6018	Reverse active energy	03	2	kWh	Float ABCD
601A	T1 Reverse active energy	03	2	kWh	Float ABCD
601C	T2 Reverse Active Energy	03	2	kWh	Float ABCD
601E	L1 Reverse active energy	03	2	kWh	Float ABCD
6020	L2 Reverse active energy	03	2	kWh	Float ABCD
6022	L3 Reverse active energy	03	2	kWh	Float ABCD
6024	Total reactive energy	03	2	kvarh	Float ABCD
6026	T1 Total reactive energy	03	2	kvarh	Float ABCD
6028	T2 Total reactive energy	03	2	kvarh	Float ABCD
602A	L1 Total reactive energy	03	2	kvarh	Float ABCD
602C	L2 Total reactive energy	03	2	kvarh	Float ABCD
602E	L3 Total reactive energy	03	2	kvarh	Float ABCD
6030	Forward reactive energy	03	2	kvarh	Float ABCD
6032	T1 Forward reactive energy	03	2	kvarh	Float ABCD
6034	T2 Forward reactive energy	03	2	kvarh	Float ABCD
6036	L1 Forward reactive energy	03	2	kvarh	Float ABCD
6038	L2 Forward reactive energy	03	2	kvarh	Float ABCD

603A	L3 Forward reactive energy	03	2	kvarh	Float ABCD
603C	Reverse reactive energy	03	2	kvarh	Float ABCD
603E	T1 Reverse reactive energy	03	2	kvarh	Float ABCD
6040	T2 Reverse reactive energy	03	2	kvarh	Float ABCD
6042	L1 Reverse reactive energy	03	2	kvarh	Float ABCD
6044	L2 Reverse reactive energy	03	2	kvarh	Float ABCD
6046	L3 Reverse reactive energy	03	2	kvarh	Float ABCD
6048	Tariff	03	1	-	Signed
6049	Resettable day counter	03	2	kWh	Float ABCD
604B	T3 Total active energy	03	2	kWh	Float ABCD
604D	T4 Total active energy	03	2	kWh	Float ABCD
604F	T3 Forward active energy	03	2	kWh	Float ABCD
6051	T4 Forward active energy	03	2	kWh	Float ABCD
6053	T3 Reverse active energy	03	2	kWh	Float ABCD
6055	T4 Reverse Active Energy	03	2	kWh	Float ABCD
6057	T3 Total reactive energy	03	2	kvarh	Float ABCD
6059	T4 Total reactive energy	03	2	kvarh	Float ABCD
605B	T3 Forward reactive energy	03	2	kvarh	Float ABCD
605D	T4 Forward reactive energy	03	2	kvarh	Float ABCD
605F	T3 Reverse reactive energy	03	2	kvarh	Float ABCD
6061	T4 Reverse reactive energy	03	2	kvarh	Float ABCD
6063	Imp. Inductive reactive energy in Q1 (total)	03	2	kWh	Float ABCD
6065	Imp. Inductive reactive energy in Q1 (T1)	03	2	kWh	Float ABCD
6067	Imp. Inductive reactive energy in Q1 (T2)	03	2	kWh	Float ABCD
6069	Imp. Inductive reactive energy in Q1 (T3)	03	2	kWh	Float ABCD
606B	Imp. Inductive reactive energy in Q1 (T4)	03	2	kWh	Float ABCD
606D	Imp. capacitive reactive energy in Q2 (total)	03	2	kWh	Float ABCD
606F	Imp. capacitive reactive energy in Q2 (T1)	03	2	kWh	Float ABCD
6071	Imp. capacitive reactive energy in Q2 (T2)	03	2	kWh	Float ABCD
6073	Imp. capacitive reactive energy in Q2 (T3)	03	2	kWh	Float ABCD
6075	Imp. capacitive reactive energy in Q2 (T4)	03	2	kWh	Float ABCD

6077	Exp. Inductive reactive energy in Q3 (total)	IE	2	kWh	Float ABCD
6079	Exp. Inductive reactive energy in Q3 (T1)	IE	2	kWh	Float ABCD
607B	Exp. Inductive reactive energy in Q3 (T2)	IE	2	kWh	Float ABCD
607D	Exp. Inductive reactive energy in Q3 (T3)	IE	2	kWh	Float ABCD
607F	Exp. Inductive reactive energy in Q3 (T4)	IE	2	kWh	Float ABCD
6081	Exp. capacitive reactive energy in Q4 (total)	IE	2	kWh	Float ABCD
6083	Exp. capacitive reactive energy in Q4 (T1)	IE	2	kWh	Float ABCD
6085	Exp. capacitive reactive energy in Q4 (T2)	IE	2	kWh	Float ABCD
6087	Exp. capacitive reactive energy in Q4 (T3)	IE	2	kWh	Float ABCD
6089	Exp. capacitive reactive energy in Q4 (T4)	IE	2	kWh	Float ABCD
608B	Resettable day counter L1	IE	2	kWh	Float ABCD
608D	Resettable day counter L2	IE	2	kWh	Float ABCD
608F	Resettable day counter L3	IE	2	kWh	Float ABCD

Write

Reg. address	Content	Function code	Length	Unit	Data type
4003	Modbus ID	06	1	-	Signed
Command:	01 06 4003 000A (new ID: 10)		01~247 - 01 default - 00 broadcast		
4004	Baud rate	06	1	-	Signed
Command:	01 06 4004 00 06 (new Baudrate: 9600)		1: 300 - 2: 600 - 3: 1200 - 4: 2400 5: 4800 - 6: 9600 - 7: 19200 8: 38400 - 9: 57600 - 10: 115200		
400D	S0 output rate	10	2	imp/kWh	Float ABCD
Command:	01 10 400D 0002 04 41 20 00 00 (new S0: 10)		10.000 - 2.000 - 1.000 - 100 - 10 - 1 0,1 - 0,01		
400F	Combination code	06	1	-	Signed
Command:	01 06 400F 0004 (new code: 4 F-R)		1: forward only - 2: reverse only 3: forward+reverse 4: import-export 5: import-export (10)		
4010	LCD cycle time	06	1	sec.	HEX
Command:	01 06 4010 0025 (new time: 25 sec.)		01~30		
4011	Parity setting	06	1	-	Signed
Command:	01 06 4011 0002 (new parity: none)		01: even - 02: none - 03: odd		
4016	Power down counter	06	1	-	Signed
Command:	01 06 4016 0000		Reset to 0		
6048	Tariff	06	1	-	Signed
Command:	01 06 6048 0002 (new tariff: 2)		1: T1 - 2: T2 - 3: T3 - 4: T4		
6049	Resetable day counter	10	1	kWh	Float ABCD
Command:	01 10 6049 0002 04 0000 0000		Reset to 0		
401F	CT ratio		2	-	Signed
Command:	01 10 401F 0002 04 9995 0005		Set to 9995/5		
4021	Pulse width	06	1	ms	Signed
Command:	01 06 4021 0030 (new setting: 30ms)		2~99 ms		
4022	Pulse type	06	1	-	Signed
Command:	01 06 4022 0002 (new setting: forward & reverse)		2 = forward & reverse		
4026	Data type setting	06	1	-	Signed
Command:	01 06 4026 0002 (new setting: integer)		1=standard, 2=Integer		
4032	Screen direction	06	1	°	Signed
Command:	01 06 4032 0001 (new setting: turn 180 degrees)		0: standard - 1: turn 180 degrees		
4033	OBIS code ON/OFF	06	1	0 =	Signed
Command:	01 06 4033 0001 (new setting: OBIS ON)		0: OFF - 1: ON		

Appendix 4 - Bluetooth

All Ambition meters are capable to be read out and configured by Bluetooth communication.

You can download the inepro Meter Manager app for android or IOS in the stores.

Download on the App Store:



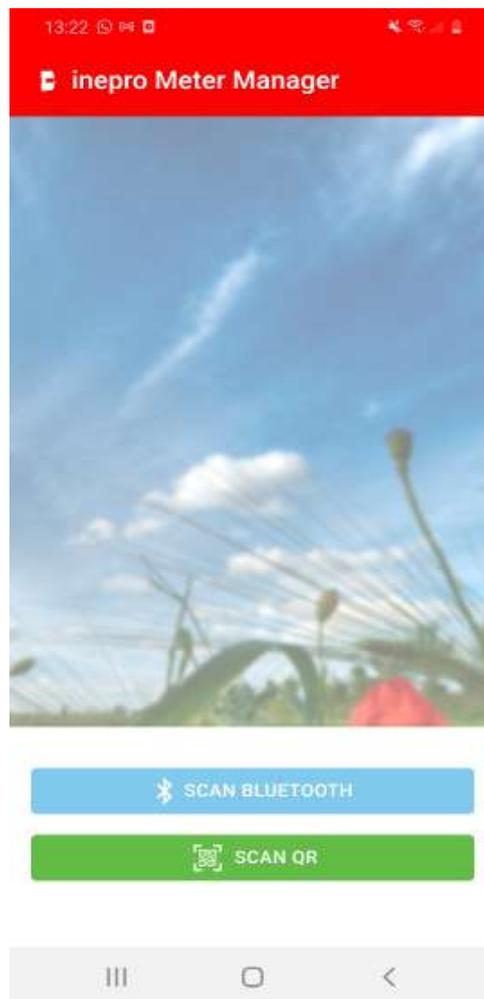
Download on the Google Play store:



A 4.1 Bluetooth app

Activate Bluetooth on the meter following the steps of [7.5 Bluetooth](#).

Start the mobile phone app.

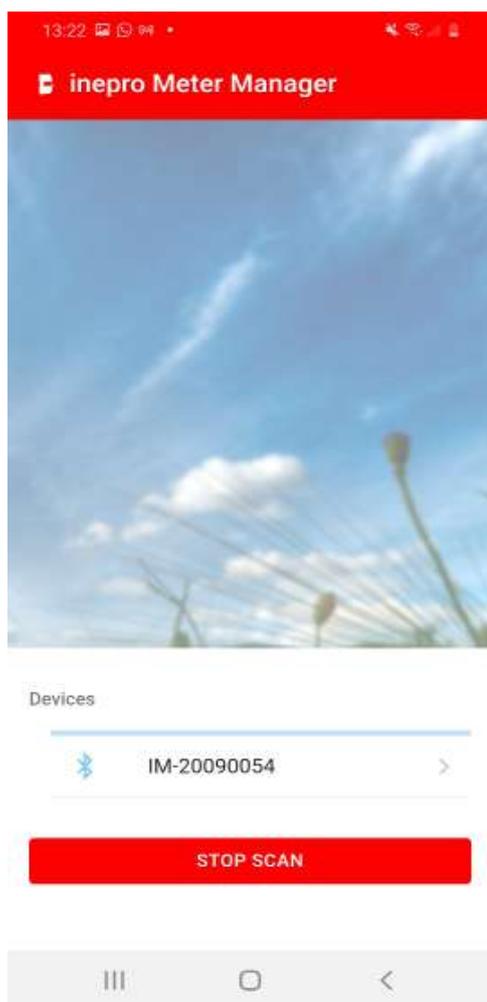


A 4.2 Connect the meter

The meter can be connected using the Scan Bluetooth or Scan QR function.

1. Scan Bluetooth: the app scans for all the Bluetooth meters in the area.

Select the correct serial number for connection.



2. Scan QR: the app opens the mobile phone camera¹ to scan the QR code on the meter display.

Once scanned, the meter is connected.

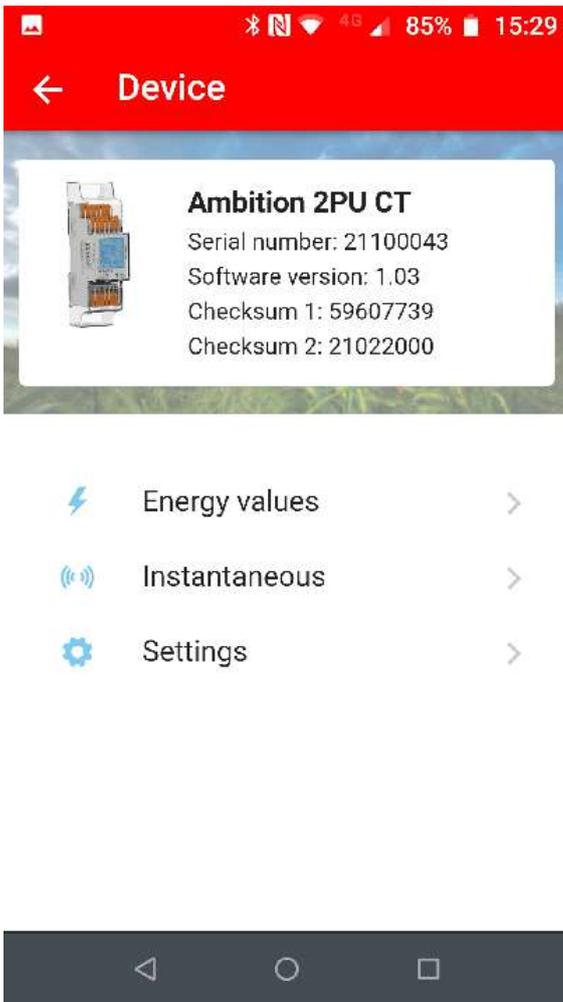


¹ QR-code does not work in China, please use Bluetooth

A 4.3 Device connected

The meter is now connected to the mobile phone app 'inepro meter manager'.

The device page shows the meter type, serial number, software version and check Sum 1&2.



Read data by selecting Energy values or Instantaneous values:

Read meter data

Read data by selecting Energy values or Instantaneous values:

Total active energy	0.073 kWh
T1 Total active energy	0.073 kWh
T2 Total active energy	0 kWh
L1 Total active energy	0.078 kWh
L2 Total active energy	0 kWh
L3 Total active energy	0 kWh
Forward active energy	0.073 kWh
T1 Forward active energy	0.073 kWh
T2 Forward active energy	0 kWh
L1 Forward active energy	0.078 kWh
L2 Forward active energy	0 kWh
L3 Forward active energy	0 kWh
Reverse active energy	0 kWh

Voltage*	0 V
L1 Voltage	238.39 V
L2 Voltage	0 V
L3 Voltage	0 V
Grid frequency	50.01 Hz
Current*	0 A
L1 Current	0 A
L2 Current	0 A
L3 Current	0 A
Total active power	0 kW
L1 Active power	0 kW
L2 Active power	0 kW
L3 Active power	0 kW

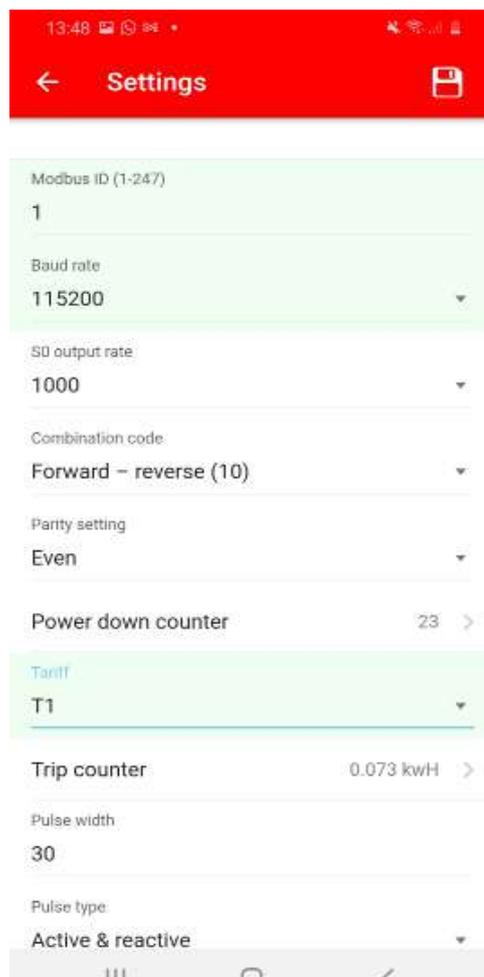
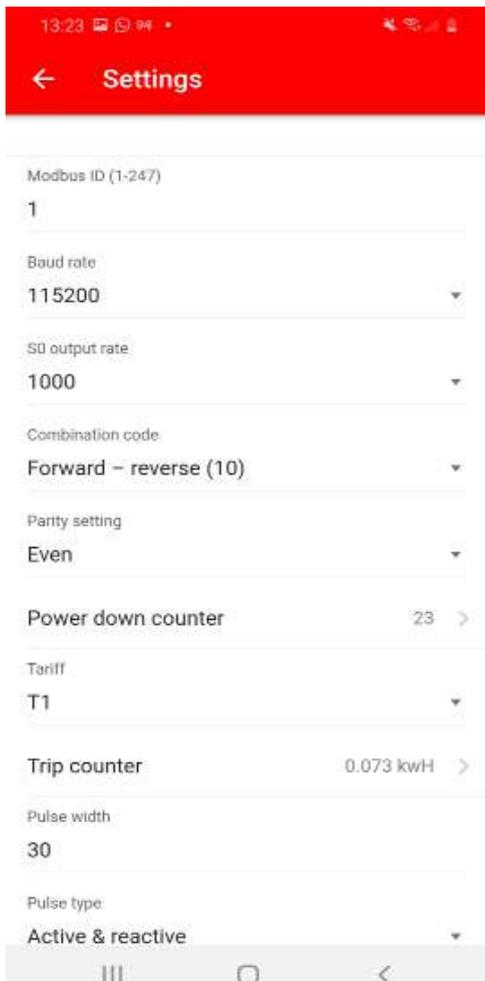
The data format is CSV.

Refresh the data using the refresh button in the right upper corner.

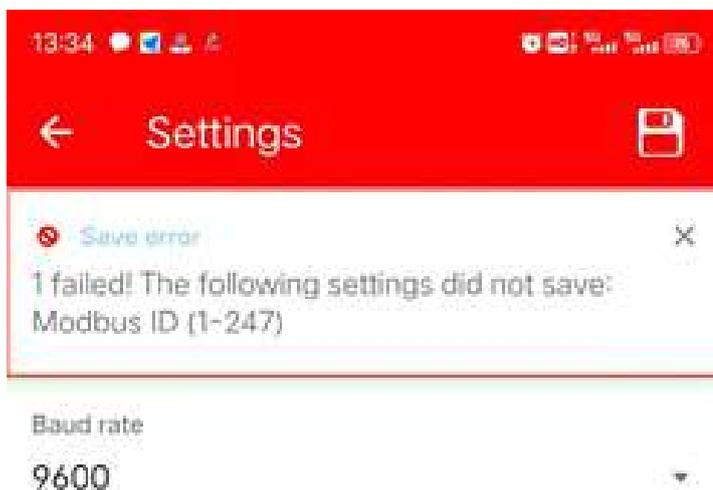
Save the data using the save button. Data can be saved and shared to different mobile phone applications.

Settings

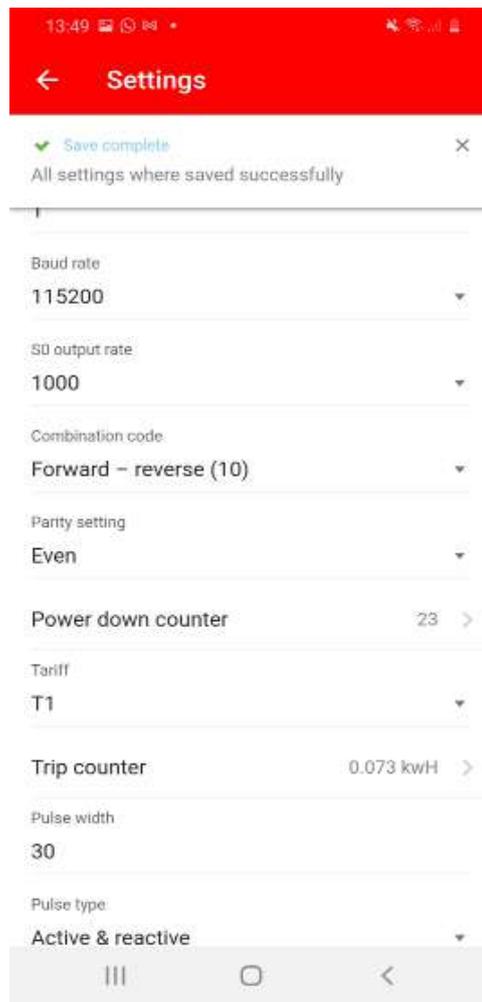
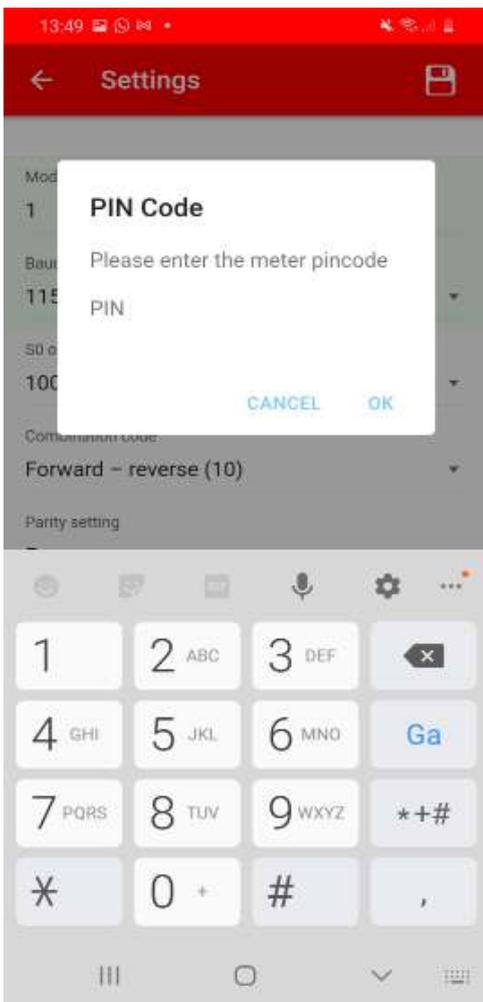
Settings can be selected individually and/or saved all at once. Select the settings that need to be modified. The modified settings will be marked green.



If you set the value over the range and save it, APP will show save error.



The modified setting(s) will only be set, when it is also saved. Press the Save button to store the settings in the meter. First a pop-up menu for password will appear. The default password is 0000. The password can only be modified in the meter using the buttons. After entering the correct password the new settings will be stored in the meter:



Settings

The following settings can be selected in the mobile app "INEPRO METER MANAGER".

2PU CT			
Setting	Default	Range or settings	Unit
Modbus ID (1 - 247)	1	1 - 247	
Baudrate	9600	115.200 / 56.700 / 38.400 / 19.200 / 9600 / 4800 / 2400 / 1200 / 600 / 300	bps.
M-Bus ID (0-250)	1	0 - 250	
M-bus Baud rate	2400	300 / 600 / 1200 / 2400 / 4800 / 9600	
S0 output rate	1000	10.000 / 2.000 / 1000 / 100 / 10 / 1 / 0,1 / 0,01	imp/kWh
Combination code	Forward - reverse (10)	Forward only; Reverse only; Forward + Reverse; Forward - Reverse; Forward - Reverse (10)	
Parity setting	Even	Even / None / Odd	
Power down counter	1 (or higher)	Are you sure you want to reset this to 0? Cancel / OK	
Tariff	T1	T1 / T2 / T3 / T4	
Trip counter	0 kWh	Are you sure you want to reset this to 0? Cancel / OK	kWh
Puls width	30		ms
Pulse Type	Forward & Reverse	Active&reactive / Forward & Reverse	
Data type setting	Standard	Standard / Integer	
Screen direction	Standard	Standard / Turn 180 degrees	
OBIS code ON/OFF	On	Off / On	