inepro®

PRO1-S
PRO1-2T
PRO1-Mb
PRO1-Mod

PRO1 Series MID
Single phase energy meter

User manual

Version: 2.18-5

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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, who have the proper knowledge about labeling and grounding electrical equipment and circuits and can do so in accordance with local (safety)regulations, are considered qualified personnel in this manual.

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.

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.

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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

NMi

EU-type examination certificate

Number **T11037** revision 1
Project number 1902376
Page 1 of 3

Issued by	NMi Certin B.V., designated and notified by the Netherlands to perform tasks with respect to conformity modules mentioned in article 17 of Directive 2014/32/EU, after having established that the Measuring Instrument meets the applicable requirements of Directive 2014/32/EU, to:
Manufacturer	Inepro Metering BV Pondweg 7 2153 PK Nieuw-Vennep The Netherlands
Measuring instrument	A static **Active Electrical Energy Meter**
Type	: PRO1-S I, PRO1-2T I, PRO1-Mb I, PRO1-Mod I
Manufacturer's mark or name	: Inepro
Reference voltage	: 230 V
Reference current	: 5 A
Destined for the measurement of	: electrical energy, in a - single-phase two-wire network
Accuracy class	: A or B
Environment classes	: M1 / E2
Temperature range	: -25 °C / +55 °C
Further properties are described in the annexes: – Description T11037 revision 1; – Documentation folder T11037-1.	
Valid until	3 April 2027
Remark	This revision replaces the earlier version, except for its documentation folder.
Issuing Authority	**NMi Certin B.V., Notified Body number 0122** 15 May 2018 C. Ouiterman Head Certification Board

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This document is issued under the provision that no liability is accepted and that the manufacturer shall indemnify third-party liability.

The designation of NMi Certin B.V. as Notified Body can be verified at http://ec.europa.eu/growth/tools-databases/nando/

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INSPECTION BvA I 122

Declaration of Conformity

We

Inepro Metering BV

Of

Inepro Metering BV
Pondweg 7
2153 PK Nieuw Vennep
The Netherlands

Ensure and declare that the apparatus:

PRO1-S I, PRO1-2T I, PRO1-Mb I and PRO1-Mod I

With the measurement range

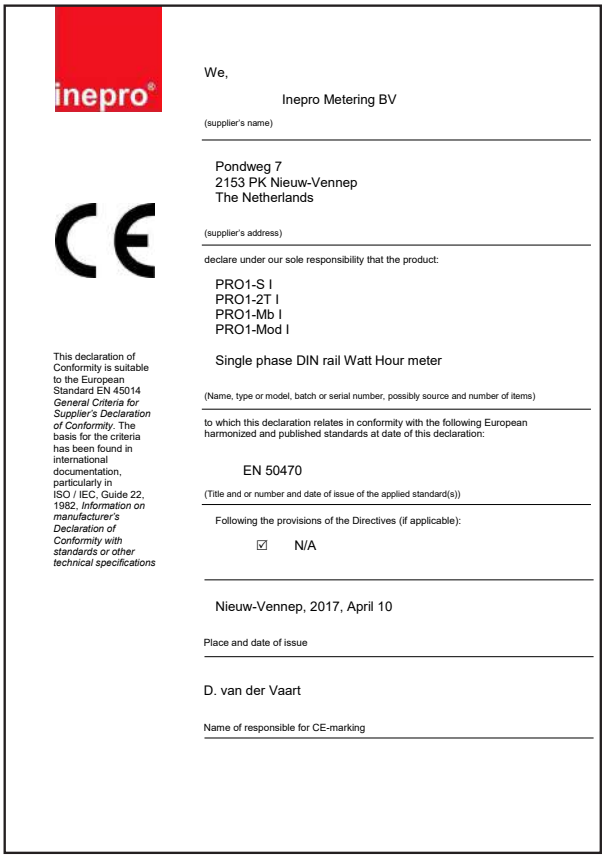
230V, 5(45)A, 50Hz, 10.000imp/kWh

are in conformity with the type as described in the

EC-type examination certificate T11037

and satisfy the appropriate requirements of the Directive 2014/32/EU

April 10, 2017



inepro®

CE

This declaration of Conformity is suitable to the European Standard EN 45014 *General Criteria for Supplier's Declaration of Conformity*. The basis for the criteria has been found in international documentation, particularly in ISO / IEC, Guide 22, 1982, *Information on manufacturer's Declaration of Conformity with standards or other technical specifications*

We,

Inepro Metering BV

(supplier's name)

Pondweg 7
2153 PK Nieuw-Vennep
The Netherlands

(supplier's address)

declare under our sole responsibility that the product:

PRO1-S I
PRO1-2T I
PRO1-Mb I
PRO1-Mod I

Single phase DIN rail Watt Hour meter

(Name, type or model, batch or serial number, possibly source and number of items)

to which this declaration relates in conformity with the following European harmonized and published standards at date of this declaration:

EN 50470

(Title and or number and date of issue of the applied standard(s))

Following the provisions of the Directives (if applicable):

☑ N/A

Nieuw-Vennep, 2017, April 10

Place and date of issue

D. van der Vaart

Name of responsible for CE-marking

5 Specifications

Casing	PC flame resistant plastic
Nominal voltage (Un)	230V AC
Operational voltage	195-253VAC
Insulation capabilities:	
- AC voltage withstand	4KV for 1 minute
- Impulse voltage withstand	6KV – 1,2µS waveform
Basic current (Ib)	5A
Maximum rated current (Imax)	45A
Operational current range	0,4%Ib-Imax
Overcurrent withstand	30Imax for 0,01s
Operational frequency range	50Hz ±10%
Internal power consumption	≤2W/Phase - ≤10VA/Phase
Test output flash rate (RED LED)	10.000 imp/kWh
Pulse output rate	10.000/2.000/1.000/100/10/1/0,1/0,01 imp/kWh
Pulse width	
- ≤ 5625W	32ms
- > 5625W	11.2ms
Data store	The data can be stored for more than 10 years without power

5.1 Performance criteria

Operating humidity	≤ 75%
Storage humidity	≤ 95%
Operating temperature	-25°C - +55°C
Storage temperature	-30°C- +70°C
International standard	EN50470-1/3
Accuracy class	B (=1% accuracy)
Protection against penetration of dust and water	IP51
Insulating encased meter of protective class	II

5.2 Basic errors

0,05Ib	Cosφ = 1	±1,5%
0,1Ib	Cosφ = 0,5L	±1,5%
	Cosφ= 0,8C	±1,5%
0,1Ib - Imax	Cosφ = 1	±1,0%
0,2Ib - Imax	Cosφ = 0,5L	±1,0%
	Cosφ = 0,8C	±1,0%

5.3 Infrared specification

Infrared wavelengths	900- 1000nm
Communication distance	Direct contact
Protocol	IEC62056-21:2002 (IEC1107)

5.4 M-bus communication specifications (PRO1-Mb only)

Bus type	M-bus
Baud rate	300, 600, 1200, 2400 (default), 4800 and 9600
Range	≤1000m 64PCS*
Downlink signal	Master to slave. Voltage modulation
Uplink signal	Slave to master. Current modulation
Cable	JYSTY (nx2x0,8)
Protocol	EN13757-3
Unit loads	± 2
Max. number of meters	64*

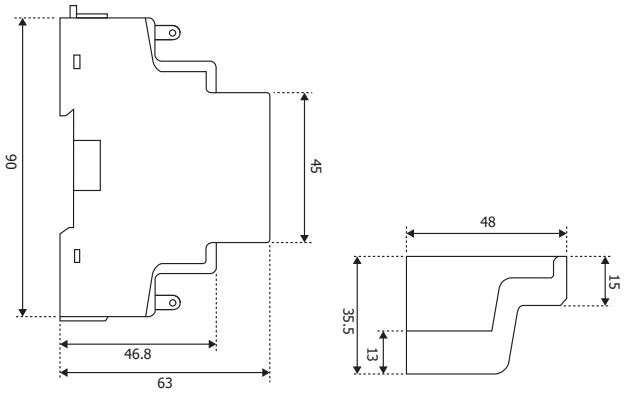
*Note that the maximum number of meters is dependent on the converter, baudrate (the higher the baudrate the smaller the number of meters which can be used) and the circumstances under which the meters are installed.

5.5 RS485 communication specifications (PRO1-Mod only)

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

5.6 Dimensions

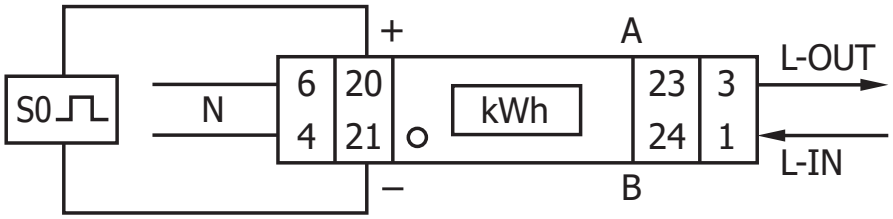
Height without protection cover	90 mm
Height	117 mm
Width	17,5 mm
Depth	63 mm
Max. diameter power connection clamps	8 mm^2 (Solid copper)
Weight	0,08 Kg (net)



5.7 Connection diagram

Connection of the wires should be done in accordance with the connection diagram as shown below:

1	Phase line in (L-IN)	
3	Phase line out (L-OUT)	
4	Neutral line in (N)	
6	Neutral line out (N)	
20 and 21	Pulse output contact (S0)	
23 and 24	PRO1-S	Not in use
	PRO1-2T	External tariff input (230V)
	PRO1-Mb	M-Bus communication contact
	PRO1-Mod	Modbus communication contact



6 Installation

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 Energy flow indication

The red LED on the front panel indicates the power flow measured by the meter. When power flows, the LED will flash. The faster the LED flashes, the more power flows. For this meter, the LED will flash 10.000 times per kWh. The first display indication of the meter in the scrolling mode is either FW (forward) or RV (reverse).

7.2 Reactive energy indication

The display will show kvarh to indicate the meter is measuring reactive energy.

7.3 Tariff indication

The LCD will show a dot underneath the word tariff on the nameplate to indicate tariff 2 is active.

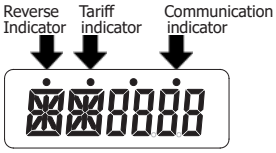
7.4 Reading the meter

A red LED on the front panel indicates the consumption measured by the meter. When power is consumed, the LED will flash. The faster the LED flashes, the more power is consumed. For this meter, the LED will flash 10.000 times per kW.

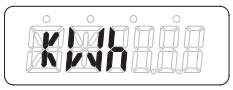
The meter is equipped with a 6 digit LCD. For the energy consumption the meter will display 9999.99 kWh and switch to 99999.9 kWh when over this value and so on.

7.5 LCD display of the meter

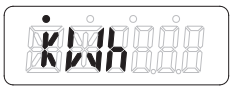
The LCD display has two rows. The upper row contains dots. The most left one is for indicating energy flow direction (forward/reverse). The most right one will flash when there is communication to an external device (only on selected models). The lower row is used to show al other metering info.



This means that certain displays have the same abbreviations, but the dot above will distinguish if it is for forward (no dot) or reverse (dot). Please compare the displays below:



Total <u>forward</u> active energy



Total <u>reverse</u> active energy

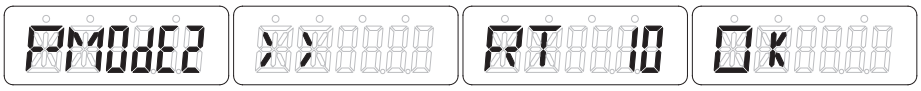
7.6 Scrolling function

7.6.1 Automatic scroll

Every 10 seconds the meter will display the next programmed data page (depending on the setting).

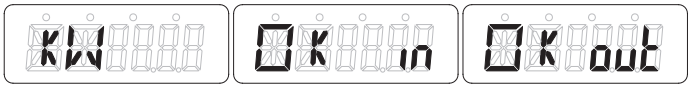
7.6.2 Change scrolling time by button

- Scroll with the button to Program mode 2.
- Hold the button for 3 seconds to enter the menu.
- Scroll to LCD page LCD cycle time (RT xx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: select the new value 1-30 seconds.
- Confirm the new scrolling time by holding the button for 3 seconds.
- The LCD will show OK when the setting is confirmed.



7.6.3 Add/remove registers to/from automatic scroll

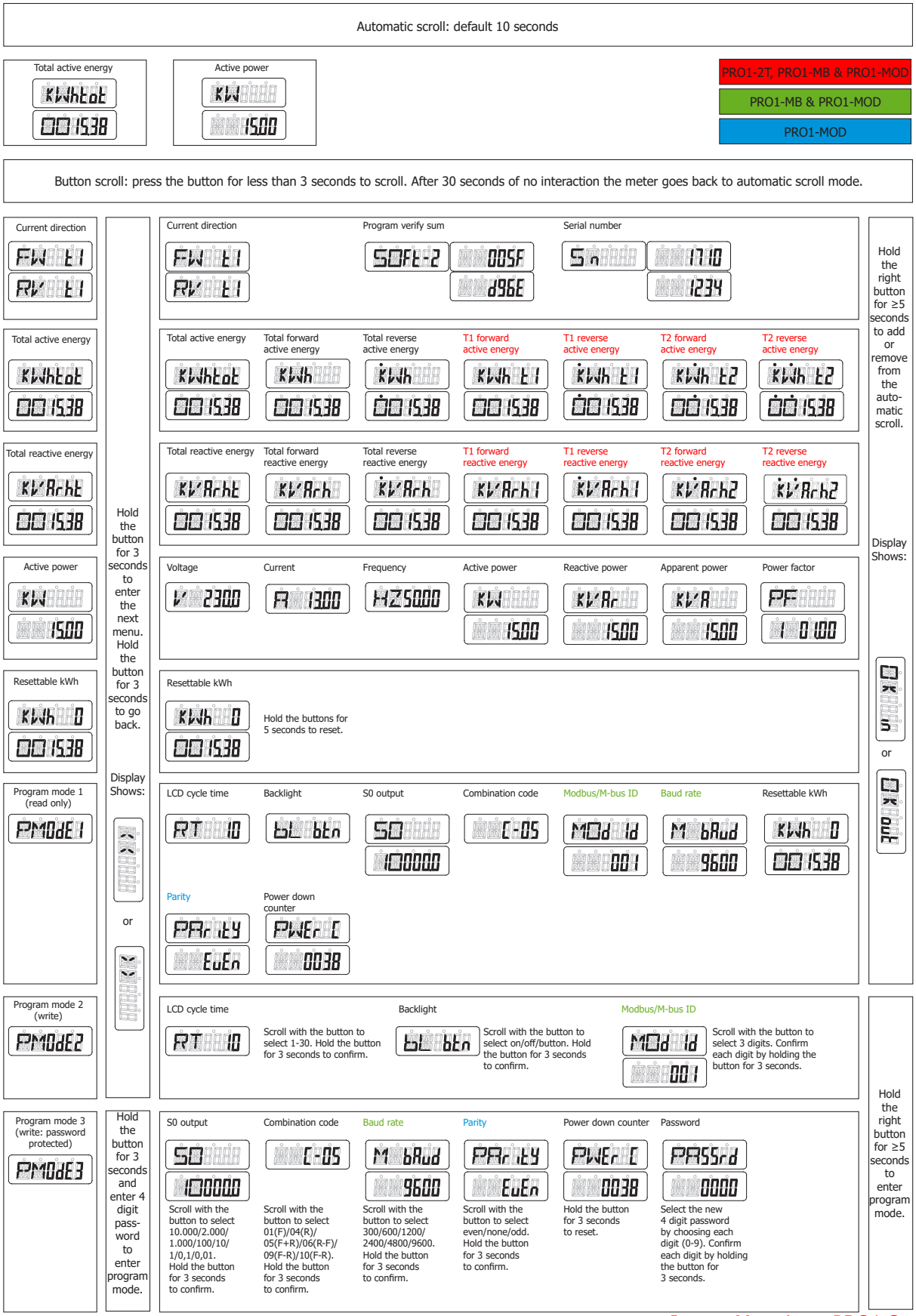
- Scroll to the register* that you would like to add or remove.
- Hold the button for 5 seconds to add or remove.
- The LCD will show OK in or OK out.



**Only the registers in the sub-menu after: Current direction, Total active energy, Total reactive energy, Active power and Program mode 1 can be added or removed to/from the automatic scroll.*

7.7 Button scroll

By pressing the button for 1, 3 or 5 seconds you will go through all data pages one by one.

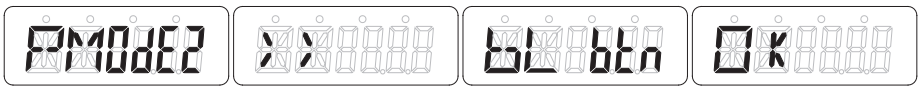


7.8 Backlight

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

7.8.1 Change the backlight setting

- Scroll with the button to Program mode 2.
- Hold the button for 3 seconds to enter the menu.
- Scroll to LCD page Backlight setting (bL xx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: select button/on/off.
- Confirm the new setting by holding the button for 3 seconds.
- The LCD will show OK when the setting is confirmed.



7.9 Resettable day counter

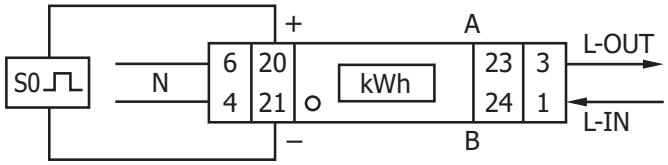
The meter is equipped with a day counter for consumed energy. This is the energy forward calculated and can be reset to zero by the user.

7.9.1 How to reset the day counter back to 0

- Scroll to LCD page Resettable kWh in the main menu.
- Hold the button for 3 seconds to enter the menu.
- The value starts blinking: hold the button for 5 seconds to reset.
- The LCD will show OK when the value is reset.

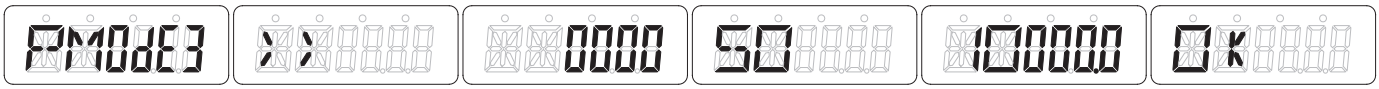
7.10 S0 output rate

The energy meter is equipped with a pulse output which is optically isolated from the inside circuit. It generates pulses in proportion to the measured consumption for purpose of remote reading or accuracy testing. 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 (Ui) should be lower than 27V DC. The maximum switching current (Imax) is 100mA. To connect the impulse output, connect 5-27V DC to connector 20 (collector), and the signal wire (S) to connector 21 (emitter).



7.10.1 How to change the S0 output rate

- Scroll with the button to Program mode 3.
- Hold the button for 3 seconds to enter the menu.
- Enter the 4 digit password: scroll with the button and select each digit 0-9, hold the button for 3 seconds to confirm each digit.
- Scroll to LCD page S0 output (S0 xxxxxx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: select 10.000/2.000/1.000/100/10/1/0,1/0,01.
- Confirm the new setting by holding the button for 3 seconds.
- The LCD will show OK when the setting is confirmed.



7.11 Combination code

The meter allows you to display the total energy (usage) shown on the display in accordance to different calculation methods. You can use the following calculation methods for total energy:

Code	Total (active) energy
C-01	Forward only
C-04	Reverse only
C-05	Forward + Reverse
C-06	Reverse - Forward
C-09	Forward - Reverse
C-10	Forward - Reverse

7.11.1 How to change the combination code

- Scroll with the button to Program mode 3.
- Hold the button for 3 seconds to enter the menu.
- Enter the 4 digit password: scroll with the button and select each digit 0-9, hold the button for 3 seconds to confirm each digit.
- Scroll to LCD page Combination code (C-xx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: select 01/04/05/06/09/10.
- Confirm the new setting by holding the button for 3 seconds.
- The LCD will show OK when the setting is confirmed.

7.12 Modbus/M-bus ID

The Modbus ID can be set from 001 to 247, the default Modbus ID is 001. The M-bus ID can be set from 000 to 250, the default M-bus ID is 000.

7.12.1 How to change the Modbus/M-bus ID

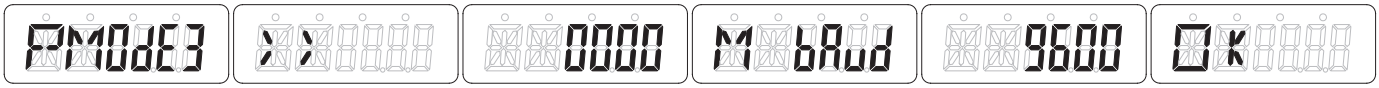
- Scroll with the button to Program mode 2.
- Hold the button for 3 seconds to enter the menu.
- Scroll to LCD page Modbus/M-bus ID (Mbs Id xxx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: select 3 digits (Modbus: 001-247 or M-bus: 000-250).
- Confirm each digit by holding the button for 3 seconds.
- The LCD will show OK when the setting is confirmed.

7.13 Baud rate

The Modbus baud rate can be set from 1200 to 9600. The M-bus baud rate can be set from 300 to 9600.

7.13.1 How to change the baud rate

- Scroll with the button to Program mode 3.
- Hold the button for 3 seconds to enter the menu.
- Enter the 4 digit password: scroll with the button and select each digit 0-9, hold the button for 3 seconds to confirm each digit.
- Scroll to LCD page Baud rate (M bAud xxxx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: select 9600/4800/1200/600/300.
- Confirm the new setting by holding the button for 3 seconds.
- The LCD will show OK when the setting is confirmed.

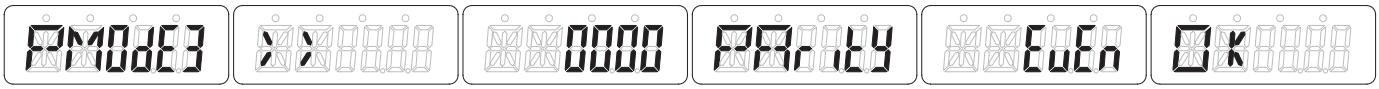


7.14 Parity

The Modbus parity can be set to even, none or odd. The M-bus parity is always even.

7.14.1 How to change the parity

- Scroll with the button to Program mode 3.
- Hold the button for 3 seconds to enter the menu.
- Enter the 4 digit password: scroll with the button and select each digit 0-9, hold the button for 3 seconds to confirm each digit.
- Scroll to LCD page Parity (PArity xxxx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: select even/none/odd.
- Confirm the new setting by holding the button for 3 seconds.
- The LCD will show OK when the setting is confirmed.

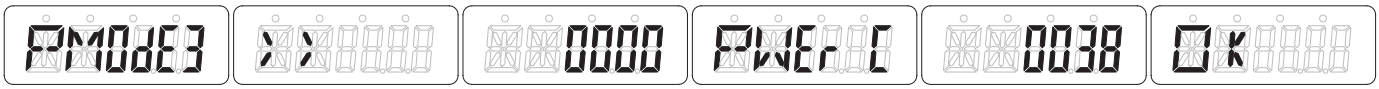


7.15 Power down counter

The power down counter registers the number of times that the meter has been turned off.

7.15.1 How to reset the power down counter

- Scroll with the button to Program mode 3.
- Hold the button for 3 seconds to enter the menu.
- Enter the 4 digit password: scroll with the button and select each digit 0-9, hold the button for 3 seconds to confirm each digit.
- Scroll to LCD page Power down counter (PWEr C xxxx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: hold the button for 3 seconds to reset.
- The LCD will show OK when the value is reset.

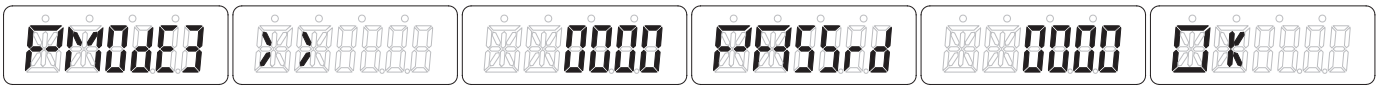


7.16 Password

Program mode 3 is protected with a password. The default password is 0000.

7.16.1 How to change the password

- Scroll with the button to Program mode 3.
- Hold the button for 3 seconds to enter the menu.
- Enter the 4 digit password: scroll with the button and select each digit 0-9, hold the button for 3 seconds to confirm each digit.
- Scroll to LCD page Password (PASSrd xxxx).
- Hold the button for 5 seconds to enter program mode.
- The value starts blinking: select each digit (0-9) confirm each digit by holding the button for 3 seconds.
- The LCD will show OK when the setting is confirmed.



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 20+) and the signal wire (S) to the emitter connection (pin 21-).
The pulse output rate is wrong.	Is the correct pulse rate set via the infrared software or in Program mode 3?	Download or request the software and use the infrared eye which can be bought seperately.
If none of the above works, please contact technical support		

8.1 List of errors in display

It could be that one of the following errors is displayed on the meter:

Display shows	Kind of errors	Measures
Err 01	EEPROM error	Please contact technical support for a meter replacement.
Err 02	Program code checksum error	Please contact technical support for a meter replacement.

8.2 Technical support

For questions about one of our products please contact:

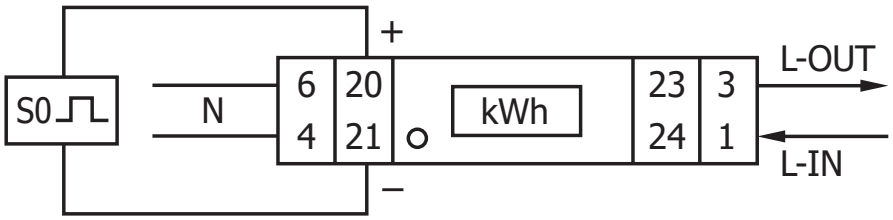
- Your local Inepro Metering distributor
- Email: support@ineprometering.com
- Website: www.ineprometering.com

Appendix 1 - PRO1-2T

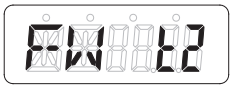
A1.1 How to switch between T1 and T2

The meter is equipped with 2 tariff functionality which need to be activated by an external voltage connected to the terminals 23/24.

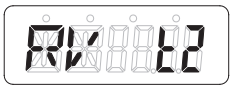
This is an AC voltage between 23 and 24:



A1.2 Additional LCD readings for the 2 tariff version



Indicating that the current energy direction is Forward and T2 is active



Indicating that the current energy direction is Reverse and T2 is active

Forward active energy for tariff 2

Reverse active energy for tariff 2

Forward reactive energy for tariff 2

Reverse reactive energy for tariff 2

Appendix 2 - PRO1-Mb

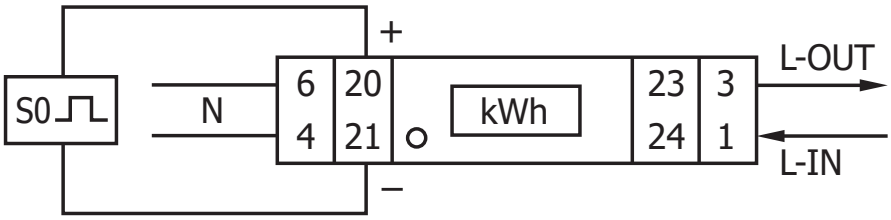
A2.1 Communicating via the M-bus output

The PRO1-Mb 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 23 and 24. The default communication address of the meter is 00.

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 interpreted 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

M-bus command	Contents	M-bus register header DIF	M-bus register VIF	Response	Remarks
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**		00 00 00 00	00000000
Manufacturer ID				25 CD	INM
Version				01	Version
Medium				02	Electricity
Acces number				02	Number of accesses
Status				00	00 = OK 02 = error
Signature				00 00	Always 00 00

REQ UD2					
10 5B 00 5B 16				68 4B 4B 68 08 00 72	68 xx xx [Data length] 68 08 xx [Address] 72
		Datablocks:			
	Total active energy	0C	04	14 48 60 01	01604814 Energy 10 (Wh) =16048,14kWh
	Total active energy T1	8C10	04	23 80 35 00	00358023 Energy 10 (Wh) = 3580,23 kWh
	Total active energy T2	8C20	04	91 67 24 01	01246791 Energy 10 (Wh) = 12467,91kWh
	Total forward active energy	1C	04	46 13 69 00	00691346 Energy 10 (Wh) = 6913,46 kWh
	Forward active energy T1	9C10	04	56 34 12 00	00123456 Energy 10 (Wh) = 1234,56 kWh
	Forward active energy T2	9C20	04	90 78 56 00	00567890 Energy 10 (Wh) = 5678,9 kWh
	Total reverse active energy	2C	04	68 34 91 00	00913468 Energy 10 (Wh) = 9134,68 kWh
	Reverse active energy T1	AC10	04	67 45 23 00	00234567 Energy 10 (Wh) = 2345,67 kWh
	Reverse active energy T2	AC20	04	01 89 67 00	00678901 Energy 10 (Wh) = 6789,01 kWh
	Checksum			7C 16	xx 16

Default	
Baudrate	2400
Databits	8
Parity	Even
Stopbit	1
Address	00
Broadcast primary address	FE (only for read)

CRC settings without checksum	
Start byte REQ UD2	2
Start byte write commands	5
CRC type	SUM
Terminating symbol	16
HEX	-
Low byte first	-
1 byte	-

CRC settings with checksum	
No CRC	-

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 - 247 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
Combined code	68 07 07 68 53	01	51 09 FD 3A	05	E5 (combined code 05)	01, 04, 05, 06, 09 and 10
S0 rate	68 0A 0A 68 53	01	51 0C FD 3A	00 00 01 00	E5 (S0 rate 100)	10000, 2000, 1000, 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	25 CD	01	02
Remarks	13070001	-	Major version of the software	Electricity

Appendix 3 - PRO1-Mod

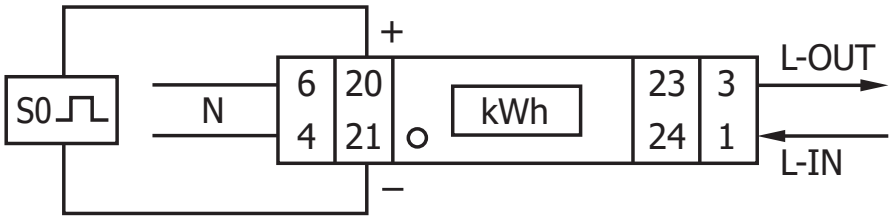
A3.1 Communicating via the Modbus output

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 23 and 24. The default communication address of the meter is 01.

The PRO1-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 lowered to values 4800, 2400, 1200. 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 (23 & 24) on the meter side.

For the registers used in the meter and how to interpreted 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	Register length	Unit	Data type
4000	Serial number	03	2	-	HEX
4002	Meter code	03	1	-	HEX
4003	Modbus ID	03	1	-	Signed
4004	Baud rate	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	S0 output rate	03	2	imp/kWh	Float ABCD
400F	Combination code	03	1	-	Signed
4010	LCD cycle time	03	1	sec.	HEX
4011	Parity setting	03	1	-	Signed
4012	Current direction	03	1	-	ASCII
4013	L2 Current direction*	03	1	-	ASCII
4014	L3 Current direction*	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 mode*	03	1	A	Signed

Reg. address	Content	Function code	Register length	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

Reg. address	Content	Function code	Register 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

Write

Reg. address	Content	Function code	Register 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 25 80 (new Baudrate: 9600)		300* - 600* - 1200 - 4800 - 9600		
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 000A (new code: 10 F-R)		01, 04, 05, 06, 09, 10, 11*		
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)		01: T1 - 02: T2 - 11: T1 not saved - 12: T2 not saved		
6049	Resettable day counter	06	1	kWh	Float ABCD
Command:	01 10 6049 0002 04 0000 0000		Reset to 0		

**PRO380 only*

Appendix 4 - Infrared PC software

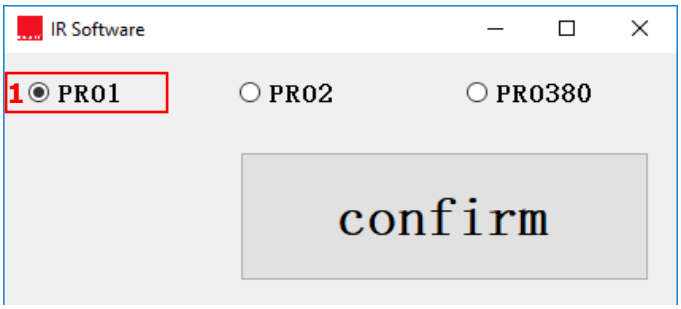
All PRO1-series meters are capable to be read out and configured by IR. The standard used is IRDA (IEC62056-21:2002 (IEC1107)).

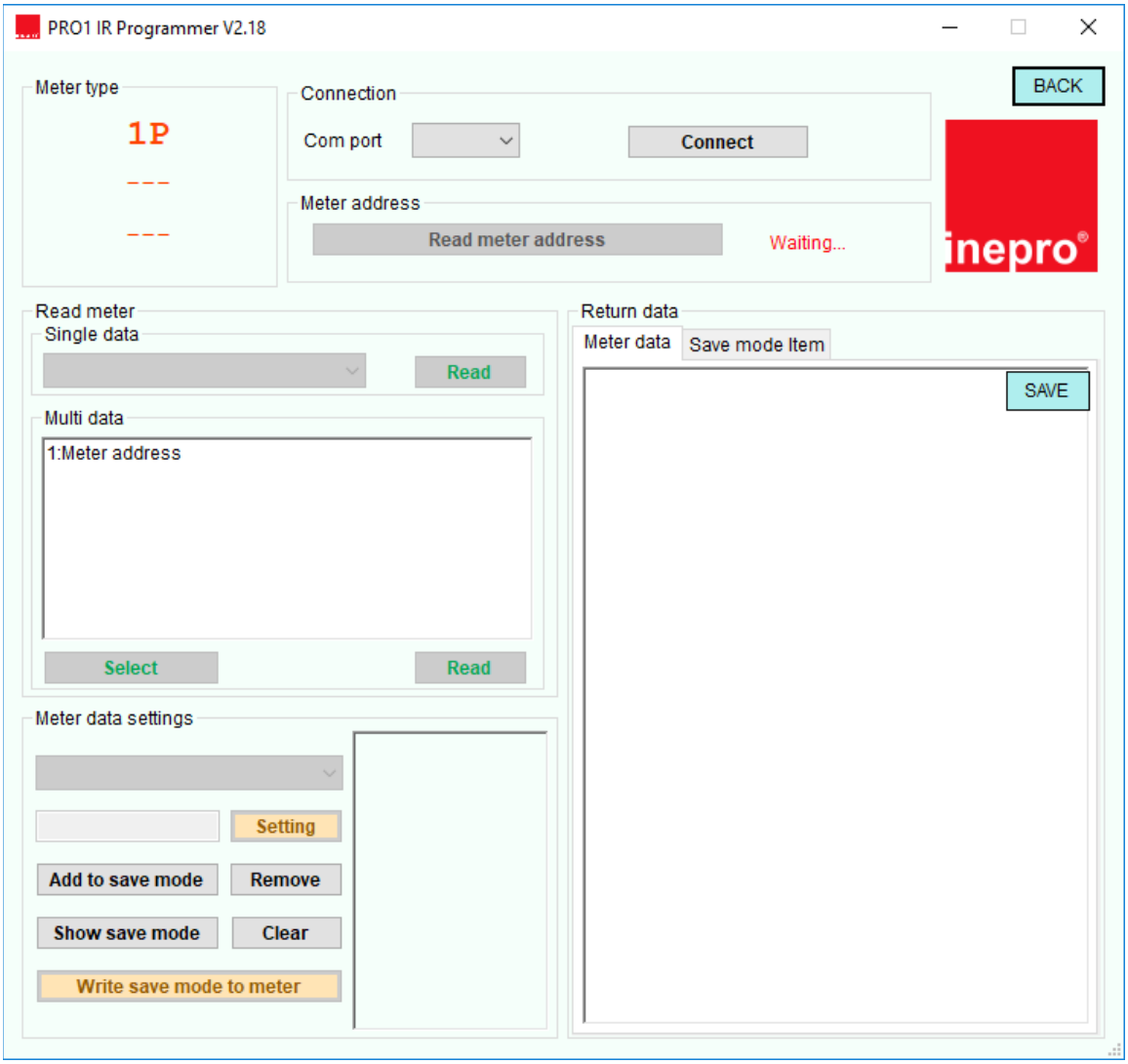
IR converter and accompanying software are sold separately. Please contact your dealer.

You can download the infrared software from www.ineprometering.com/download.

Infrared PC software

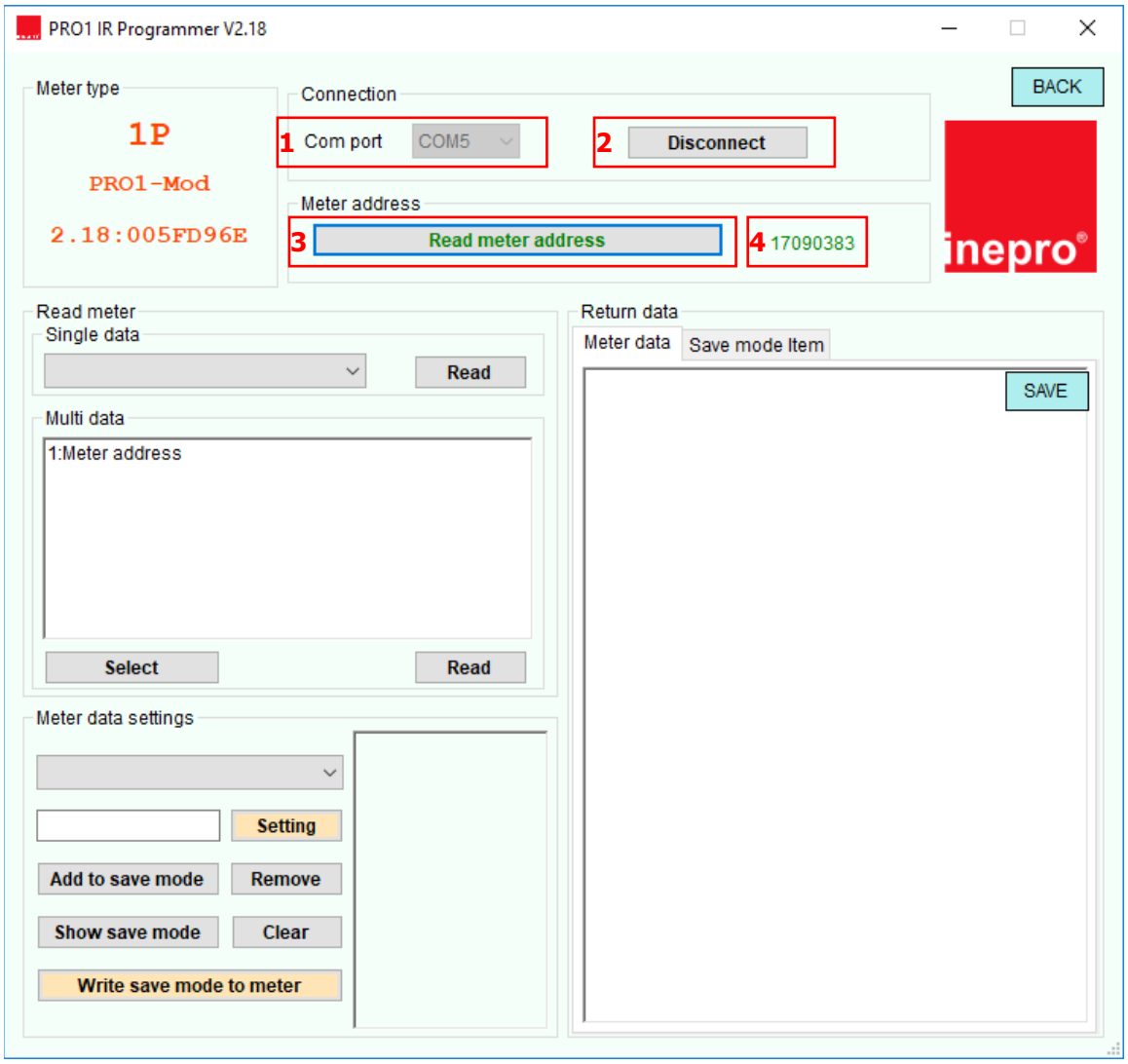
Connect the meter to the PC using the Inepro Infrared eye and PRO1 bracket.
1. Open the Inepro metering IR software program and select PRO1.





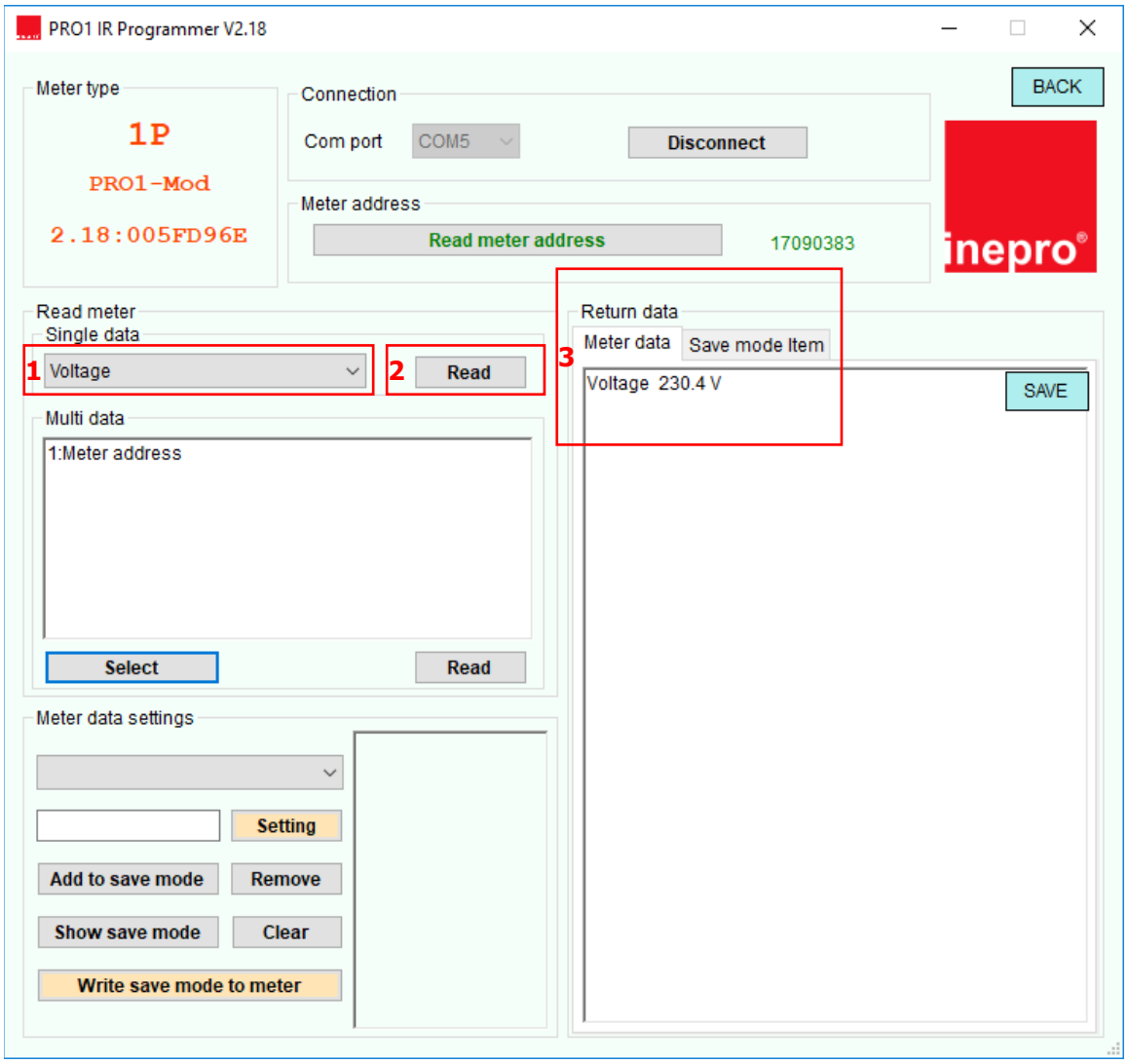
Connect the meter

1. Select the correct COM port.
2. Press Connect.
3. Click on Read meter address.
4. The serial number of the connected meter will appear under meter address.



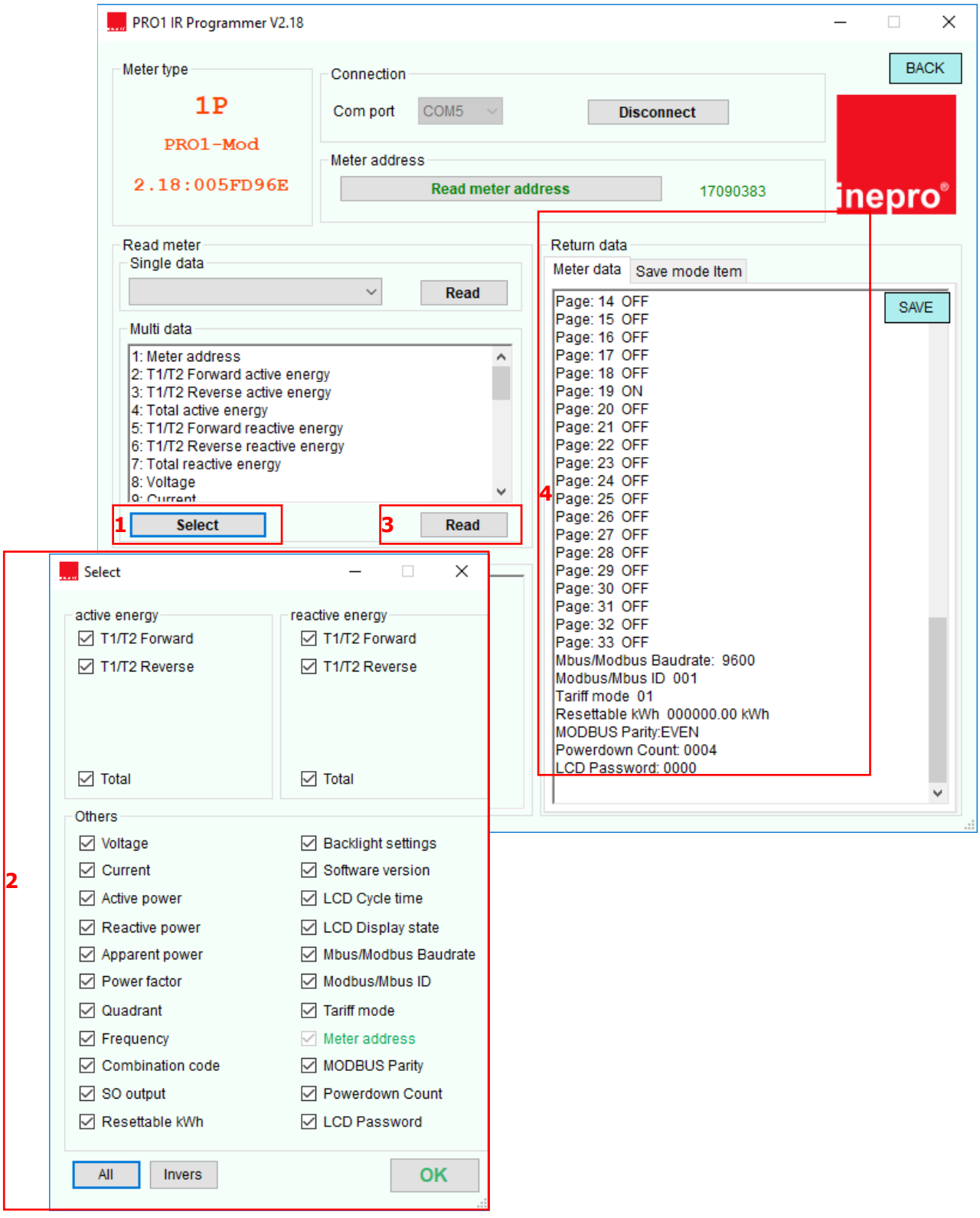
Read single data

1. Select the value that you would like to read, in the dropdown menu under Read meter - Single data.
2. Press Read.
3. The meter data will be displayed under Return data - Meter data.



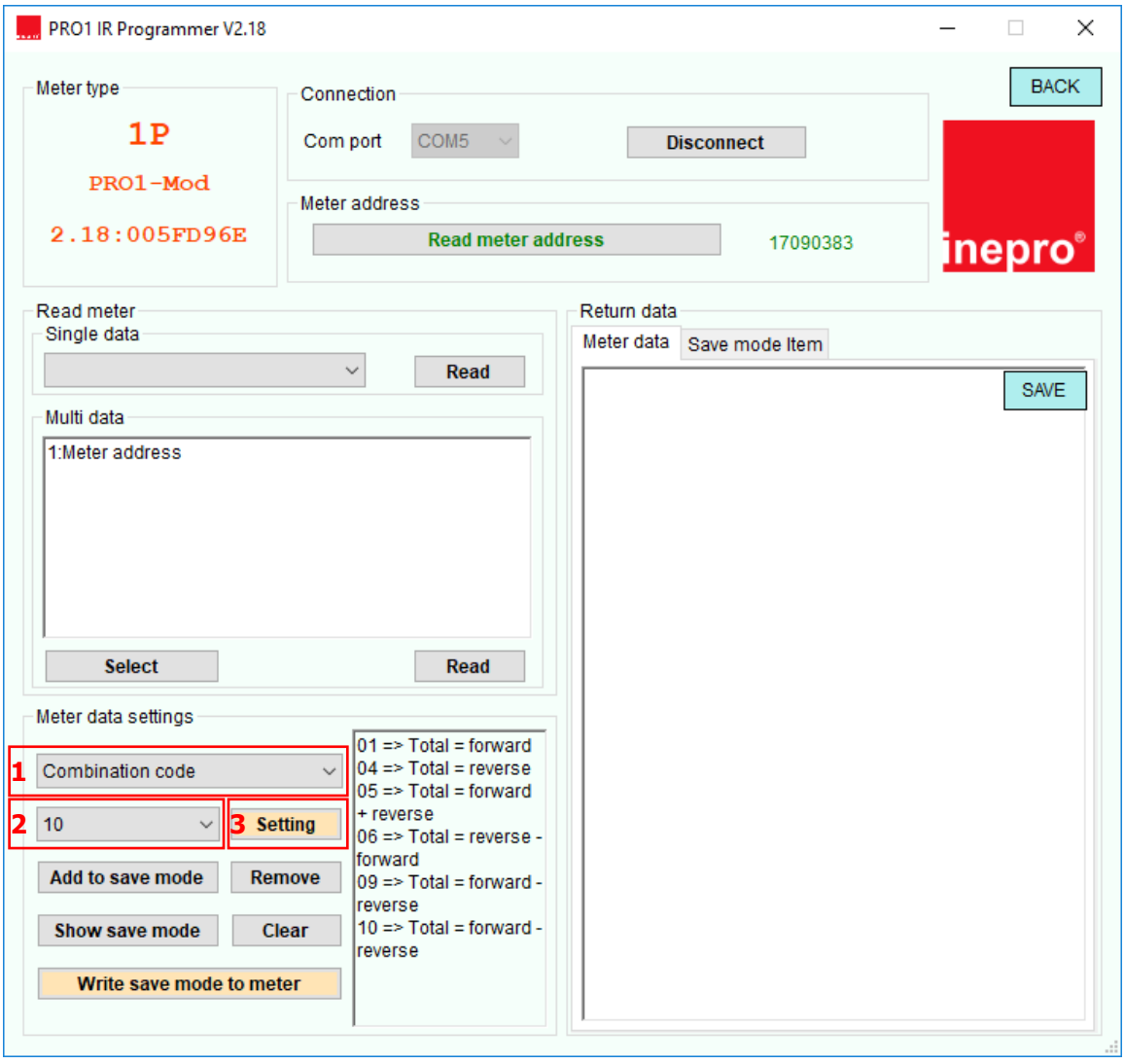
Read multi data

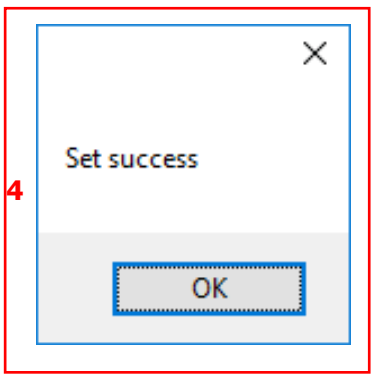
1. Press select.
2. Select the values that you would like to read.
3. Press Read.
4. The meter data will be displayed under Return data - Meter data.

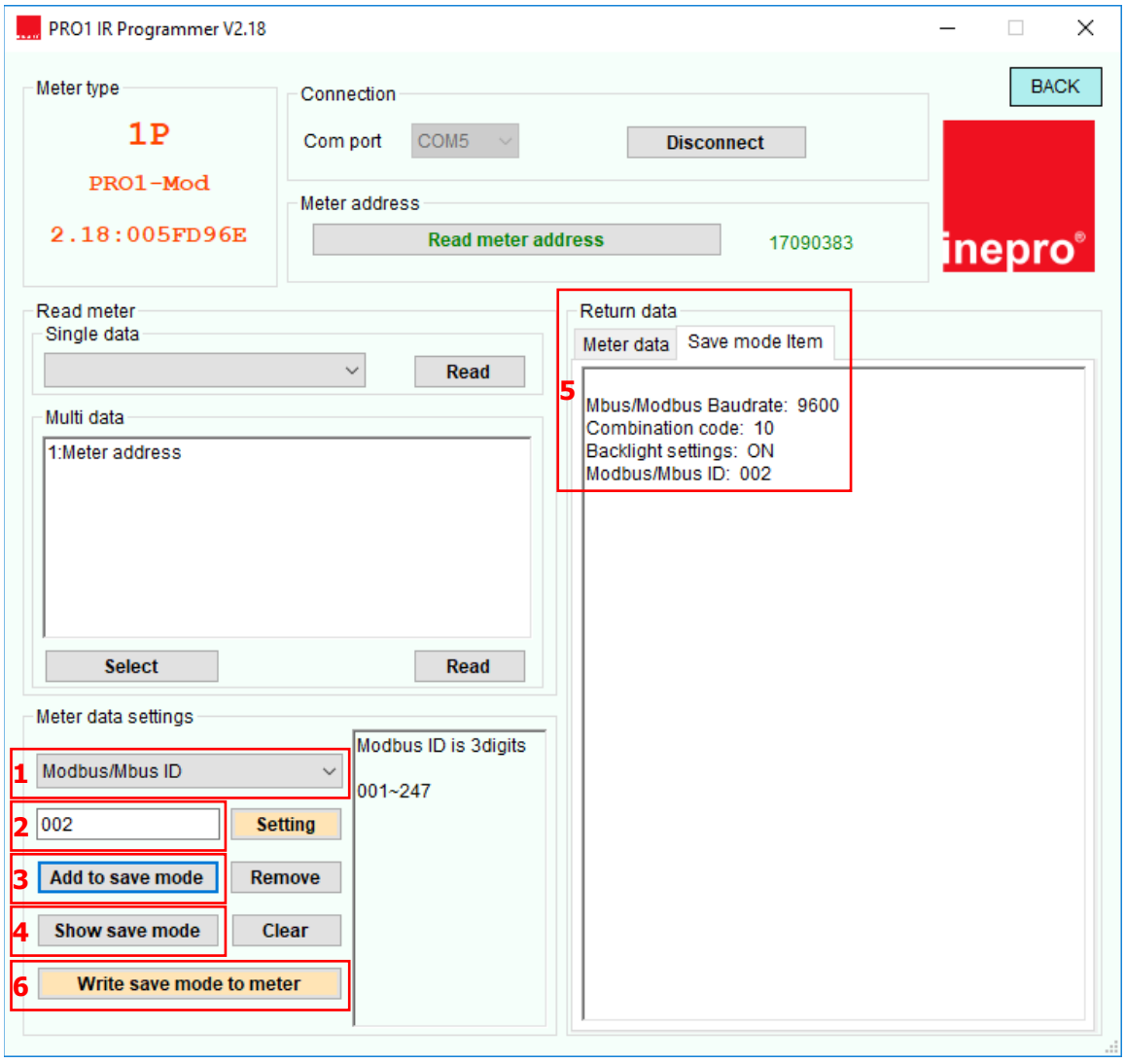
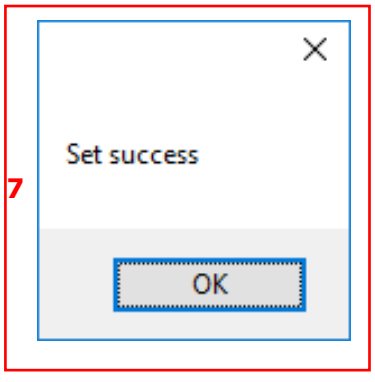


Meter data settings

1. Select the register that you would like to program.
2. Select the new value.
3. Press Setting.
4. The software will show Set success when the setting is confirmed.





Save mode

1. Select the register that you would like to program.
2. Select the new value.
3. Press Add to save mode.
- Select the next register that you would like to program and add to save mode.
4. Press Show save mode.
5. The save mode will be displayed under Return data - Save mode item.
6. Press Write save mode to meter to write the new values to the meter.
7. The software will show Set success when the setting is confirmed.