inepro®

PRO2DM
DIN rail single phase two wire energy meter

User manual
Version 1.04

DMMetering®

1 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
- 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.

2   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 warranty period is 3 years after production, and only valid for production faults.

3 CE Certificate

We,

DMMetering

(supplier's name)

Pondweg 7
2153 PK Nieuw-Vennep
The Netherlands

(supplier's address)

declare under our sole responsibility that the products:

PRO-2D v10.1xx series LC-Display
PRO-2D v10.2xx series LC-Display
PRO-2TE v10.3xx series Mechanical
PRO-2DM LC-Display

Single module 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:

IEC EN50470

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

Following the provisions of the Directives (if applicable):

☑ EMC-directive : 89/336/EC

These conclusions are based on the test reports:

Nieuw-Vennep, 2010, August 5

Place and date of issue

D. van der Vaart

Name of responsible for CE-marking

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*

4 Performance criteria

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

5 Specifications

Meter type	PRO2DM
Nominal voltage (Un)	230 V AC
Operational voltage	195~253V AC
Insulation capabilities:	
- AC voltage withstand	4kV for 1 minute
- Impulse voltage withstand	6kV – 1.2µS waveform
Basic current (Ib)	10A
Maximum rated current (Imax)	80A
Operational current range	0.4% Ib- Imax
Over current withstand	30Imax for 0.01s
Operational frequency range	50 or 60 Hz ±10%
Internal power consumption	≤2W / 10VA
Test output flash rate (RED LED)	1000
Pulse output rate	1000, 100, 10, 1 or 0.1 imp/kWh
Data store	The data can be stored for more than 10 years without power

6 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%

7 RS485 communication specifications

Bus type	RS485
protocol	MODBUS RTU with 16 bit CRC
baud rate	1200（default），2400,4800,9600.
Address range	1-247 user settable（default：1）
Bus Loading	32 meters per bus

8 Tariff specifications

Number of tariffs: 2
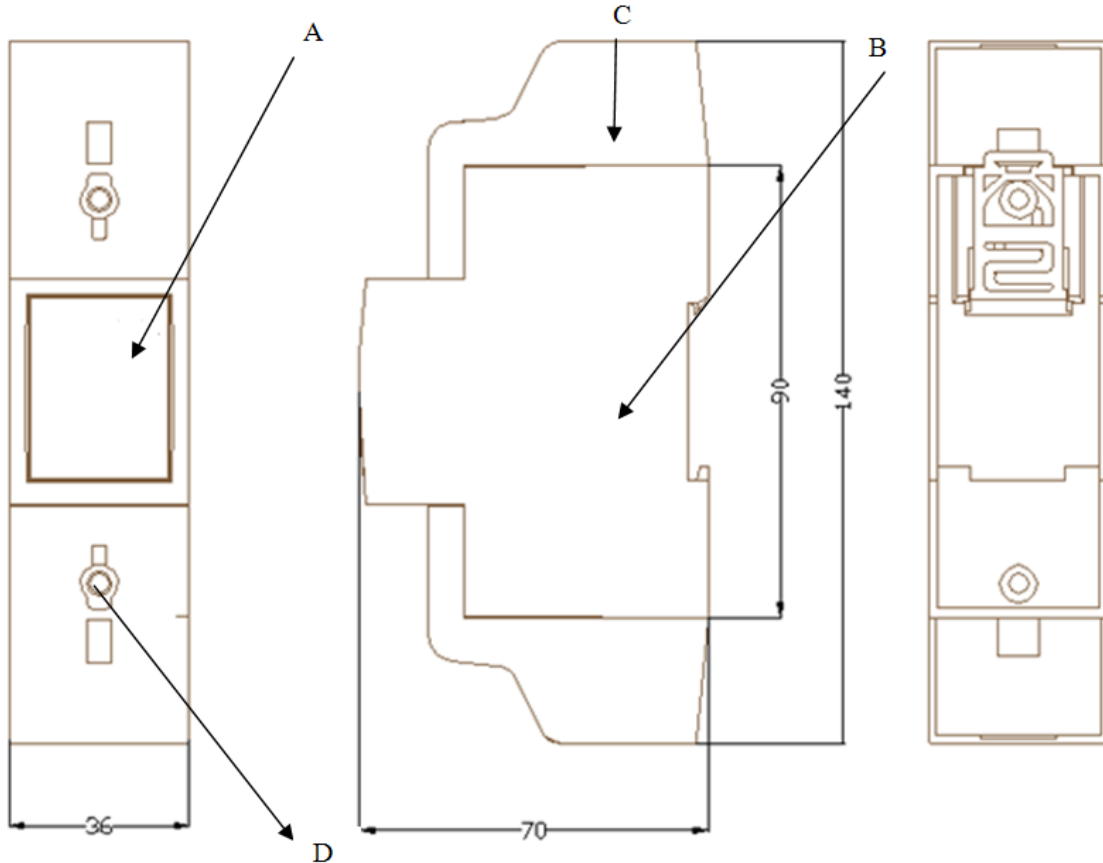Two tariffs can be set using an external time relay connected to the terminals 26 and 27, see section 11.

9 Description

A	Front panel
B	Case
C	Protection cover
D	Security wire slot

Material

Front panel	PC inflammable plastic
Protection cover	ABS/PC inflammable plastic
Base	ABS/PC inflammable plastic

10 Dimensions

Height	140 mm
Height without protection cover	90 mm
Width	36 mm
Depth	70 mm
Weight	0.240 Kg (net)

11 Installation

<table>
<tr><td colspan="2" align="center">⚡ CAUTION</td></tr>
<tr><td>

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.

</td></tr>
<tr><td align="center">⚠ WARNING</td></tr>
<tr><td>

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.

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- 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
- Connection of the wires should be done in accordance with the connection diagram as shown below:
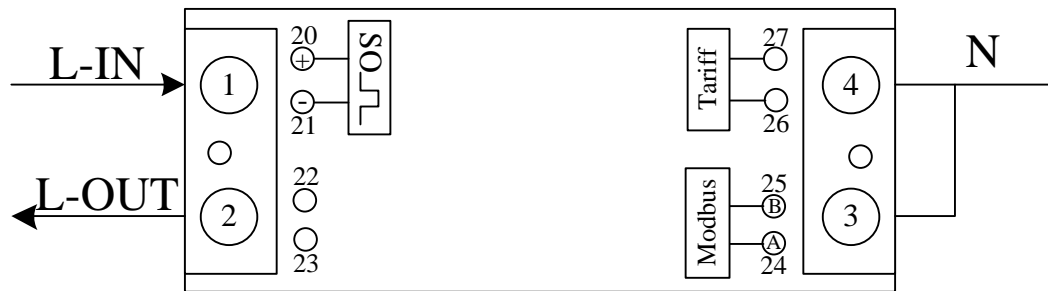
|	
1/2	Phase line IN/OUT
3/4	Neutral line IN/OUT
20 and 21	Test pulse output contact
24(A) and 25(B)	A and B RS485 contact
27 and 26	Tariff setting contact

12 Operation

12.1 Consumption indication

There is a red LED on the front panel which displays 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 1000 times per kWh.

12.2 Reading the meter

The energy meter is equipped with a 5+1 digit LCD which is used to record consumption and can't be reset to zero. The display has 5 digits before and 1 decimal after the dot on the display. The reading accuracy is 1/10 kWh. For this meter, the LED will flash 1000 times per kWh.

LCD layout
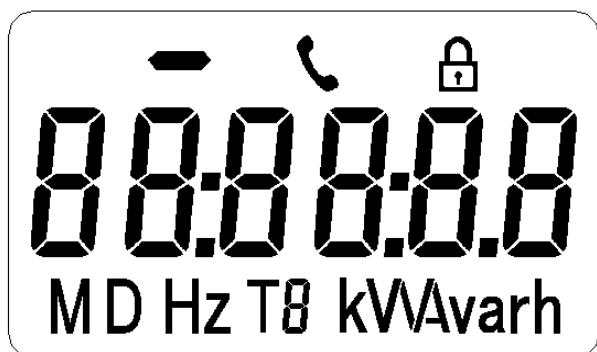
LCD symbol explanation

（**1**） ： **Negative symbol** : **total energy** ，**reverse energy** ，**current** ，**active power** ，**negative power** ，**apparent power** ;

（**2**） ： **communication symbol: this symbol will appear for 1s when communicate through 485**

(3) 🔒 : **lock :** Only for the Accumulated method of total energy values.

(4) **M D** : **only applies to specific models of the meter** ;

(5) **Hz** : **frequency symbol**

(6) **T8** : **tarriff** : **T1: tarriff 1**
T2:tarriff 2

(7) **kVVAvarh** : This symbol can show the following combinations depending on the selected view
- kW
- V
- A
- KWh
- Var
- VA

12.3 Readout possibilities

The following variables can be readout in the order as described below from the display.
- (Total Σ) active energy may be positive or negative, forward active energy, reverse active energy, tariff 1 total active energy, tariff 2 total active energy, accumulated method for total active energy, pulse output rate code (table in section 11.5), MODBUS baud rate, meter ID, meter serial number, Current, Voltage, Frequency, active Power, Reactive power, Apparent power, Power factor.

12.4 Backlight

You have three options to choose from:

1. The backlight is constantly on
2. The backlight is constantly off
3. The backlight turns on when you press the SET button

In order to set the backlight option you:

1. press the program button (left button just under the meter display) for several seconds.
2. the display will show "set"
3. in order to select the right program, press the right button (just under the display), so you can go upward or downward (LED1=the backlight is constantly on, LED2=the backlight is constantly off, LED3= the backlight turns on when you press the SET button)
4. in order to save the option you press the left button (just under the display). After a few seconds the word "end" will appear in the display. The button should be kept pressed until you get the measurement energy value on the display.

12.5 Pulse output

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 and the maximum switching current (Imax) is 27mA. To connect the impulse output, connect 5-27V DC to connector 3+ (collector), and the signal wire (S) to connector 2- (emitter).
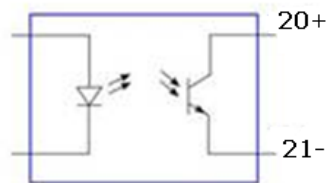
20+ = emitter
21- = collector

 =light bundle from the LED

The pulse output is 1000 per kWh and is settable using the RS485 communication protocol, the table below outlines the possibilities.

SO pulse output can set through 485 , there are 5 possibilities

SO	the speed of pulse output （kwh/pulse）	Number of pulses per kWh
1	0.001（default）（kwh/pulse）	1000
2	0.01（kwh/pulse）	100
3	0.1（kwh/pulse）	10
4	1（kwh/pulse）	1
5	10（kwh/pulse）	1 pulse per 10kWh

13 Troubleshooting

<div style="border: 1px solid black;">

⚠️ 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.

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Problem	Possible cause	Check/solution
The register doesn't count.	There is almost no load connected to the meter	Check if the red consumption LED is flashing. 100 flashes of the LED at 1000 pulses per kWh equals 0.1kWh. This is default value, in case the RS485 is set at another rate is the number of flashes might be different, see the table in section 12.5.
	Maybe there is a fault inside the meter.	Please contact technical support for a meter replacement.
No pulse output.	The pulse output is not supplied with DC power	Check the external voltage source (Ui) is 5-27V DC with a voltage meter
	The pulse output is not connected correctly	Check if the connection is correct: the 5-27V DC should be connected to the collector connection (pin 3+) and the signal wire (S) to the emitter connection (pin 2-).
	Maybe there is a fault inside the meter.	Please contact technical support for a meter replacement.
The pulse output rate is wrong.	Maybe there is a fault inside the meter.	Please contact technical support for a meter replacement.
The display is totally off	The meter is not connected to a power source	Are the fuses or/and surge protection defect?
	L1 and N are not connected correctly	Make sure the wires are connected properly and tighten the screws if possible.
	There is no 230V AC between the N and the L connection when power is supplied to the meter.	Check if there is 230V AC voltage between N and the L connection with a voltage meter.
		If the checks above don't solve the problem, please contact technical support for a meter replacement.

RS485 communication is not working.	The meter ID is incorrect	Check and use the correct meter ID. The default meter ID is 1.
	The RS485 wire is too long to properly communicate with the meter.	Make sure that the length of the RS485 wire is no more than 1000 meters.
	There are too many devices connected to the same RS485 bus	Check that there are no more than 32 devices or the maximum amount supported by your receiver connected to one bus
	The cables are not correctly connected to the RS485 port	The correct connection is RS485 wire A (D+) to terminal 24, RS485 wire B (D-) to terminal 25.
	The polarity of the cables is wrong	Swap the MODBUS communication wires if you are not sure if the wires are correctly connected
	Maybe there is a fault inside the meter.	Please contact technical support for a meter replacement.
The consumption red 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.
	There is a fault inside the meter.	Check with an Ohm-meter if the load value is very low.
		If the checks above don't solve the problem, please contact technical support for a meter replacement.

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14 Technical support

For questions about one of our products please contact:

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

www.ineprometering.com