F&F Filipowski sp.j.
ul. Konstantynowska 79/81
95-200 Pabianice
Tel./fax (42) 215 23 83, 227 09 71
e-mail: biuro@fif.com.pl
www.fif.com.pl

# LE-03MB

## Electric energy meter

## 3-phase

## Bidirectional with network parameters analysis

User manual

v. 4.6 (220713)

# CONTENTS

# 1. Purpose

LE-03MB is a static (electronic), calibrated electricity meter of single-phase and three-phase alternating current in direct system. It is used for reading and recording of imported electricity and parameters of the power supply with the ability of remote reading through a wired M-Bus network. Configuration of the meter is done through the configuration menu accessible from the front panel and through the communication port according to the software features of the M-Bus.

# 2. Unit characteristics

## 2.1. Measured value

The unit can measure and display:

- ✓ Line voltage and THD% (total harmonic distortion) of all phases;
- ✓ Line frequency;
- ✓ Currents, current demands and current THD% of all phases;
- ✓ Power, maximum power demand and power factor;
- ✓ Active energy imported and exported;
- ✓ Reactive energy imported and exported.

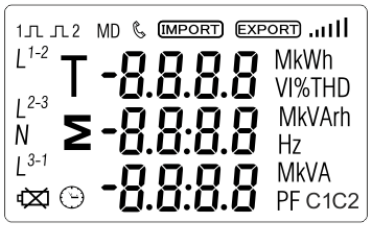
## 2.2. M-Bus protocole and communication port

Meter has a port with support for M-Bus protocol.
The M-Bus communication port allows you to combine the counters in the remote reading network.

## 2.3. Pulse output

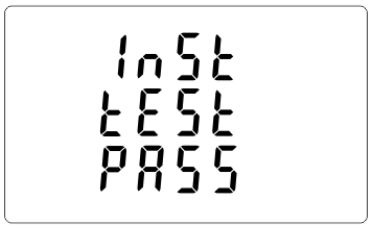
The meter has two pulse outputs for mapping the counting of active and reactive energy.
Output 1 - terminals 9/10 - programmable, can be set to work for active or reactive energy and parameters: impulsing and pulse length.
Output 2 - terminals 11/12 - for active energy, impulsing is 3200 pulse / kWh.

# 3. Start-up screens




The first screen lights up all display segments and can be used as a display check.


Information about software version.




The interface performs a self-test and indicates the result if the test passes.

## 4. Operator panel

Buttons features:


Select the voltage and current display screens. In set up mode, this is the "Left" or "Back" button.


Select the frequency and power factor display screens. In set up mode, this is the "Up" button.


Select the power display screens. In set up mode, this is the "Down" button.


Select the energy display screens. In set up mode, this is the "Enter" or "Right" button.

### 4.1. Voltage and current, harmonic

Each successive pressing of the V/A ESC buton select a new range:


Phase to neutral voltages (3p4w)


Current on each phase

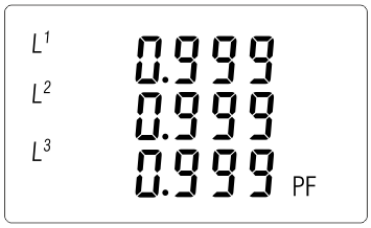

Phase to neutral voltage THD% (3p4w)


Current THD% for each phase

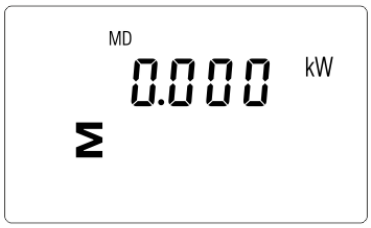
### 4.2. Frequency, power factor and demand

Each successive pressing of the MD/ PF/HZ button selects a new range:

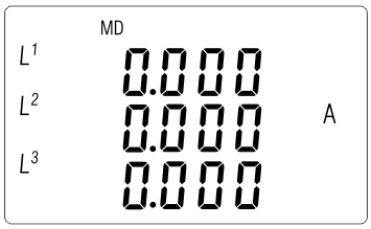

Frequency and power factor (total)




Power factor of each phase



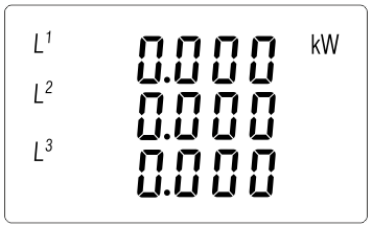

Maximum power demand




Maximum current demand

### 4.3. Power

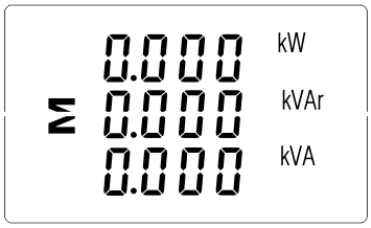
Each successive pressing of the P button select a new range:




Instantaneous active power in kW


Instantaneous reactive power in kVAr

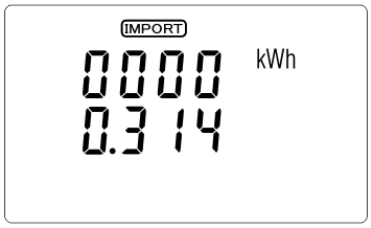

Instantaneous Volt-amps in KVA




Total: kW, kvar, kVA

### 4.4. Energy measurements

Each successive pressing of the E buton select a new range:

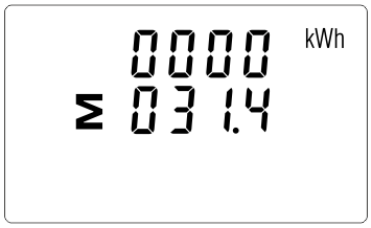



Imported active energy in kWh


Exported active energy in kWh


Imported reactive energy in kVArh


Exported reactive energy in kVArh




Total active energy in kWh


Total reactive energy in kVArh

The total value of the given energy is presented in two rows.
The top row presents the higher values, the bottom row presents the lower values + fractional value.
For example:
Indications: 0027 - top row; 845.3 - bottom row presents the value of 27845.3 kWh.

# 5. Setup

## 5.1.Setup entry methods

Some menu items, such as password, require a four-digit number entry while others, such as supply system, require selection from a number of menu options. After confirming the settings the meter confirms the adoption of a new parameter by displaying for a moment the word "good".

### 5.1.1. Navigation

1. P MD/PF/HZ Transition to the next position configuration menu.
2. Press E to confirm your selection.
3. P MD/PF/HZ Edition of value (change of position numer by +/-1)
4. Having selected an option from the current layer, press E to confirm your selection. The SET indicator will appear.
5. V/A ESC Back to the higher menu level. The SET indicator will disappear and you will be able to use the buttons, P MD/PF/HZ again to select further options.
6. V/A ESC Exit the configuration menu to the measurements screen.

### 5.1.2. Number entry procedure

When setting up the unit, some screens require the entering of a nuber. In particular, on entry to the setting up section, a password must be entered. Digits are set individually, from left to right. The procedure is as follows:

1. The current digit to be set flashes and is set using the P and MD/PF/HZ buttons.
2. Press E to confirm each digit setting. The SET indicator appears the last digit has been set.
3. After setting the last digit, press V/A ESC , to exit the numer setting routine. The SET indicator will be removed.

## 5.2. Setup parameters

### 5.2.1. Entry into configuration menu

To enter setup mode, pressing the E button for 2 seconds, until the password screen appears.


Setting up is password-protected so you must enter the correct password (default "1000") before processing.

Press the E button for 2 seconds.


If an incorrect password is entered, the display will show:

PASS Err

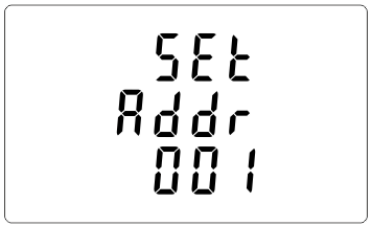
To exit setting-up mode, press V/A ESC repeatedly until the measurement screen is restored.

### 5.2.2. M-Bus communication

Setting the communication port parameters.

#### 5.2.2.1. (Slave ID) Address

(Range 1 to 250)




From the set up menu, use P and MD/ PF/HZ, buttons to select the address ID.


Press E, button to enter the selection routine. The current setting will be flashing.


Use P and MD/PF/HZ to change digits and E to change position, to choose Modbus address (001 to 250).

Press E button, to confirm the selection.

Press V/A ESC, button to return the main set up menu.

Extended address (Range 0 to 99999999).

ATTENTION!
This setting is located in the menu before the CLR feature setting.


From the setup menu, use P and MD/PF/HZ buttons to select extended address option.


Press E buton to enter the selection routine. The current setting will be flashing.


Use P and MD/PF/HZ buttons to change digits and E to change position, to choose Modbus address (00000000 to 99999999).

Press E button to confirm the selection.

Press V/A ESC, button to return the main set up menu.

#### 5.2.2.2. Baud rate


From the set up menu, use P and MD/PF/HZ buttons to select the Baud rate option.


Press E button to enter the selection routine. The current setting will flash.


Use P and MD/PF/HZ buttons to choose Baud rate: 0.3 / 0.6 / 1.2 / 2.4 / 4.8 / 9.6 [kbps].

Press E button, to confirm the selection.

Press V/A ESC button, to return the main set up menu.

#### 5.2.2.3. Parity


From the set up menu, use P and MD/PF/HZ buttons to select the parity option.

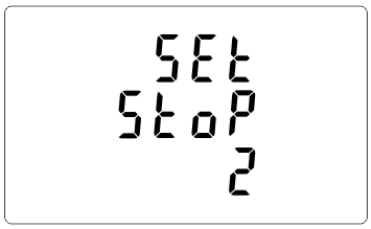

Press E to enter the selection routine. The current setting will flash.


Use P and MD/PF/HZ buttons to choose parity: EVEN / ODD / NONE (default).

Press E buton to confirm selection.

Press V/A ESC buton to return to the main set up menu.

#### 5.2.2.4. Stop bits




From the set up menu, use P and MD/PF/HZ buttons to select the stop bit option.


Press E to enter the selection routine.

The current setting will flash.


Use P and MD/PF/HZ buttons to choose stop bits: 2 or 1.

NOTE: Default value is 1. Only in case parity set up NONE, to change stop bits to 2.

Press E to confirm the selection.

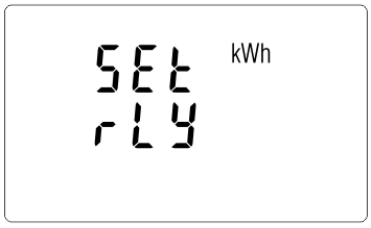
Press V/A ESC to return to the main set up menu.

### 5.2.3. Pulse output

Pulse output configuration no. 1.

#### 5.2.3.1. Energy setup

The output can be set to provide a pulse for a definied amount of Energy active (kWh) or reactive (kvarh).




From the setup menu, use P and MD/ PF/HZ buttons to select the pulse output option.


Press E to enter the selection routine.
The unit symbol will be flash.


Use P and MD/ PF/HZ buttons to choose kWh or kvarh.
Press E to confirm selection.

Press V/A ESC to return to the main set up menu.

#### 5.2.3.2. Pulse rate

Setup value option kWh/kvarh per 1 pulse. Values: 0.01 / 0.1 / 110 / 100.

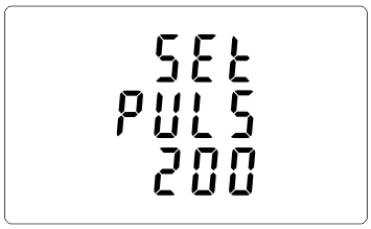

From the setup menu, use P and MD/ PF/HZ buttons to select the pulse rate option.


Press E to enter the selection routine.
The current setting will flash.
Use P and MD/PF/HZ buttons to select value:
0.01 /0.1 /1 /10 /100 per 1 pulse.
Press E to confirm selection.

Press V/A ESC to return to the main set up menu.

#### 5.2.3.3. Pulse duration

Option of setting pulse length for output. Values: 200, 100 lub 60 ms.



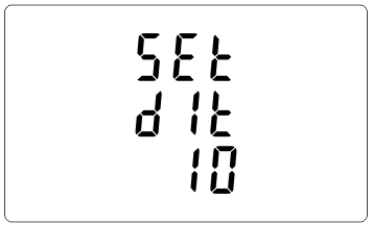

From the setup menu, use P and MD/PF/HZ buttons to select the pulse width option.


Press E to enter the selection routine.
The current setting will flash.
Use P and MD/PF/HZ buttons to choose value:
200, 100 or 60 ms.
Press E to confirm the selection.

Press V/A ESC to return to the main setup menu.

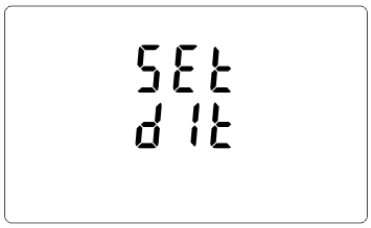
### 5.2.4. DIT - Demand Integration Time

The options are: 5, 10, 15, 30, 60 minutes.




From the setup menu, use P and MD/PF/HZ buttons, to select the DIT option.
The screen will show the currently selected integration time.


Press E to enter the selection routine.
The current time interval will flash.




Use P and MD/PF/HZ buttons to select the time required.


Press E to confirm selection.
SET indicator will appear.

Press V/A ESC to exit the DIT selection routine and return to the menu.

### 5.2.5. Backlit setup

The meter allows you to set the time of the backlight.
Time: 0 / 5 / 10 / 30 / 60 / 120 minutes.
**Value 0 means that the backlight is always on.**


Default lasting time is 60 minutes.
if it's setted as 5, the backlit will be off in 5 minutes from the last time operation on the meter.


Use P and MD/PF/HZ buttons to select the time.
Press E to confirm the selection.

### 5.2.6. Measuring system

Setting options for measuring system:
1P2W – 1-phase 2-wire system;
3P3W – 3-phase 3-wire system (without neutral wire);
3P4W – 3-phase 4-wire system


From the set up menu, use P and MD/PF/HZ buttons to select the system option.
The screen will show the currently selected power supply.


Press E to enter the selection routine.
The current selection will flash.

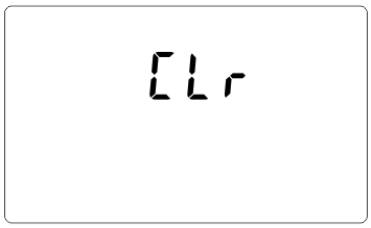

Use P and MD/PF/HZ buttons to select the required system option: 1P2(W), 3P3(W), 3P4(W).


Press E to confirm selection.
SET indicator will appear.

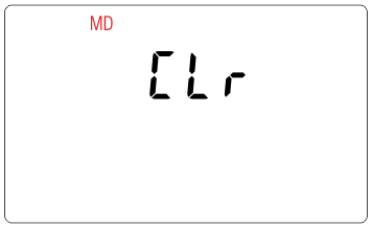
Press V/A ESC to exit the system selection routine and return to the menu.
SET will disappear and you will be returned to the main set up menu.

### 5.2.7. CLR

The meter provides a function to reset the maximum demand value of current and power.



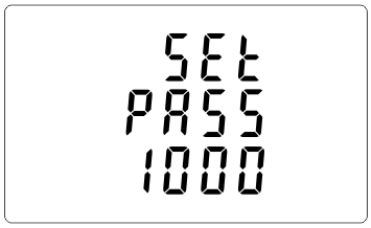

From the setup menu, use P and MD/PF/HZ buttons to select the reset option.



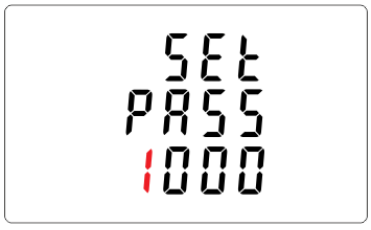

Press E to enter the selection routine.
The MD will flash.
Press E to confirm selection.

Press V/A ESC to return to the main set up menu.

### 5.2.8. Change password

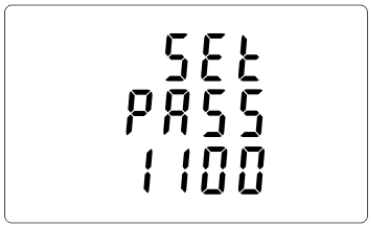



Press P and MD/PF/HZ buttons to choose the change password option.

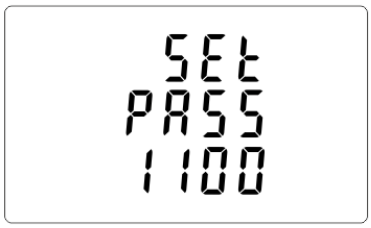



Press and hold E to enter the change password routine. The new password screen will appear with the first digit flashing.


Use P and MD/PF/HZ buttons to set the first digit and press E to confirm your selection. The next digit will flash.




Repeat the procedure for the remaining three digits.




After setting the last digit, press and hold E to confirm selection.

Press V/A ESC to exit the numer setting routine and return to the setup menu. SET will be removed.

# 6. Technical specification

## 6.1. Measured parameters

The unit can monitor and display the following parameters of:
1P2W – 1-phase 2-wire system (230V+N)
3P3W – 3-phase 3-wire system (3×400V; without neutral wire)
3P4W – 3-phase 4-wire system (3×230V+N)

### 6.1.1. Voltages and currents

| | |
|---|---|
| Reference voltage: | 3×230/400V |
| Base current: | 0.25÷10A |
| Maximum current: | 100A |
| Minimum current measured: | 0.02A |
| Overload: | 30×Imax/10ms |
| Measuring range phase voltages: | 100÷289 VAC (for 1P2W and 3P4W system) |
| Range of interphase voltages: | 173÷500 VAC (for 3P3W system) |

Percentage overall factor of total harmonic distortion (THD%) for the phase voltages (for systems 1P2W and 3P4W).
Percentage overall factor of total harmonic distortion (THD%) for interphase voltages (for 3P3W system).
Percentage overall factor of total harmonic distortion (THD%) for the phase currents.
Insulation: 4kV/1min; 6kV/1,2µs

### 6.1.2. Power factor, frequency and maximum demand

- ✓ Frequency in Hz
- ✓ Instantaneous power:

  active: 0÷3600 MW

  reactive: 0÷3600 Mvar

  volt-amps: 0÷3600 MVA
- ✓ Maximum power consumption (with RESET function)
- ✓ Maximum power consumption neutral wire (with RESET function)

### 6.1.3. Energy measurements

- ✓ Imported/exported active energy: 0÷9999999.9 kWh
- ✓ Imported/exported reactive energy: 0÷9999999.9 kvarh
- ✓ Total active energy: 0÷9999999.9 kWh
- ✓ Total reactive energy: 0÷9999999.9 kvarh

## 6.2. Terminal

| | |
|---|---|
| Current terminals | 25mm² screw terminals |
| Pulse outputs | 2.5mm² screw terminals |
| M-Bus port | 2.5mm² screw terminals |

## 6.3. Accuracy

| | |
|---|---|
| Measurement class | B |
| Voltage | 0.5% of range maximum |
| Current | 0.5% of nominal |
| Frequency | 0.2% of mid-frequency |
| Power factor | 1% of unity (0.01) |
| Active power (W) | ±1% of range maximum |
| Reactive power (VAr) | ±1% of range maximum |
| Apparent power (VA) | ±1% of range maximum |
| Active energy (Wh) | ±1% 1 IEC 62053-21 |
| Reactive energy (VArh) | ±1% of range maximum |
| Total harmonic distortion | 1% up to 31st harmonic |
| Response time to step input | 1s, typical, to >99% of final reading at 50 Hz. |

### 6.4. Power supply and power meter

85÷275 V AC 50/60 Hz ±10%
120÷380 V DC ±20%
<10VA; <2W

### 6.5. Measurement inputs

| | |
|---|---|
| Voltage: | 3×230V/400V |
| Current: | 100A |

### 6.6. Pulse outputs

Output type: OC (open collector); 27V DC/50mA
Pulse:

Pulse output 1 is configurable: for kWh or kvarh. Value set kWh/kvarh per 1 pulse:
0.01 = 10 Wh/VArh
0.1 = 100 Wh/VArh
1 = 1 kWh/kVArh
10 = 10 kWh/kVArh
100 = 100 kWh/kVArh
Pulse output 2 is non-configurable for kWh: 3200pulse/kWh

Pulse width:

| | |
|---|---|
| Output 1 - configurable: | 200 / 100 / 60 ms |
| Output 2 – non-configurable: | 200ms |

### 6.7. M-Bus output

Baud rate: 300, 600, 1200, 2400, 4800, 9600 bps
Parity: NONE - deafault / ODD / EVEN
Stop bits: 1 / 2
Network address: basic 1÷250, expanded 0÷99999999;

### 6.8. Reference conditions of influence quantities

Influence quantities are variables that effect measurement errors to a minor degree.
Accuracy is verified under nominal value (within the specified tolerance) of these conditions.

| | |
|---|---|
| Ambient temperature | 23°C ±1°C |
| Input frequency | 50 or 60 Hz ±2% |
| Input waveform | sinusoidal (distortion factor <0.005) |
| Auxiliary supply voltage | ±1% nominal |
| Auxiliary supply frequency | ±1% nominal |
| Auxiliary supply waveform (if AC) | sinusoidal (distortion factor <0.05) |
| Magnetic field of external origin | terrestial flux |

### 6.9. Environment

| | |
|---|---|
| Operating temperature | -25÷55°C |
| Storage temperature | -40÷70°C |
| Relative hummidity | 0÷95%, non-condensing |
| Altitude | Up to 3000 m |
| Warm up time | 1 minute |
| Vibration | 10÷50Hz, IEC 60068-2-6, 2 g |
| Limitation | 30g in 3 planes |

### 6.10. Structure

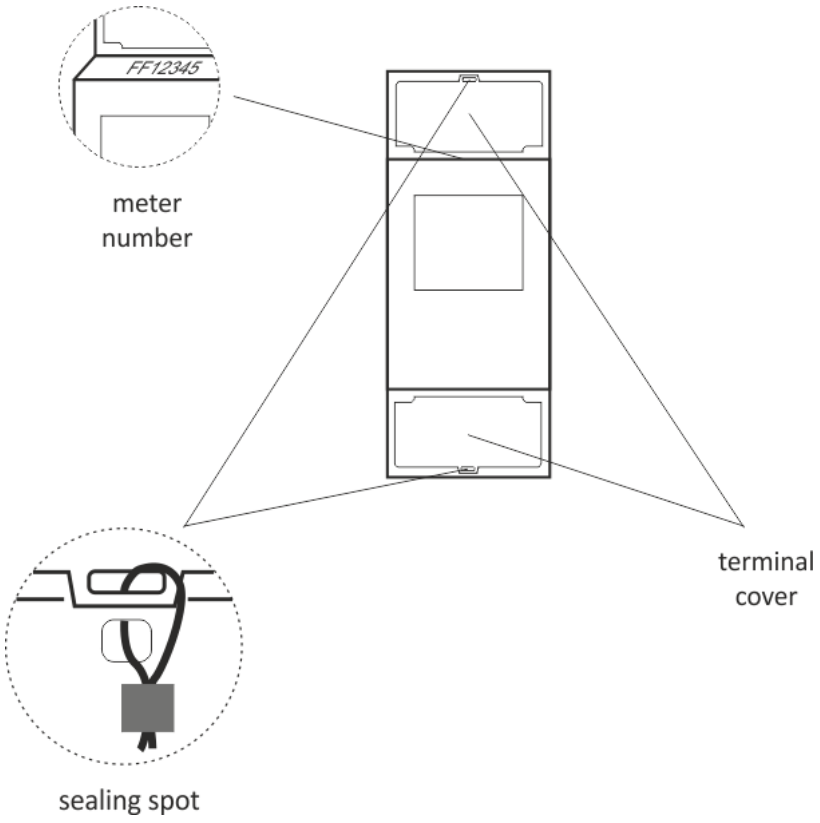
| | |
|---|---|
| Mounting | on DIN rail |
| Cover | Ul94 V-0 self-extinguishing material |
| Ingress protection | IP51 (inside) |

### 6.11. Compliance and sealing

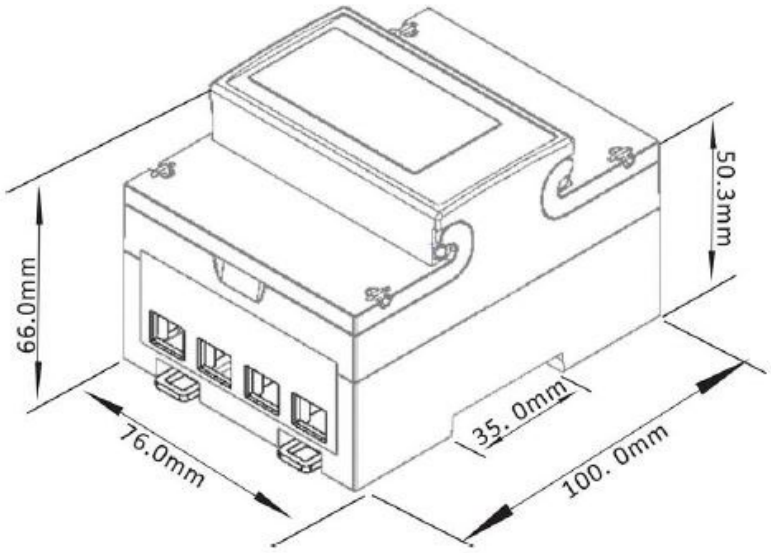
2004/22/EC Directive
Certificate number: 0120/SGS0215

The meter is marked with individual serial numer allowing its explicit identification.
The marking is laser engraved and cannot be removed.

The meter has sealable input and output terminal cover to prevent any attempts to bypass the meter.

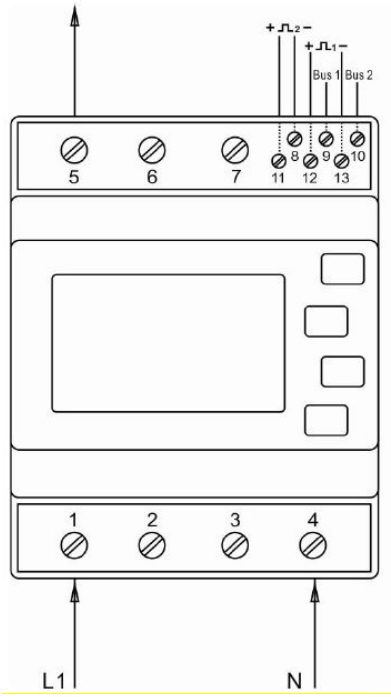


## 7. Dimensions

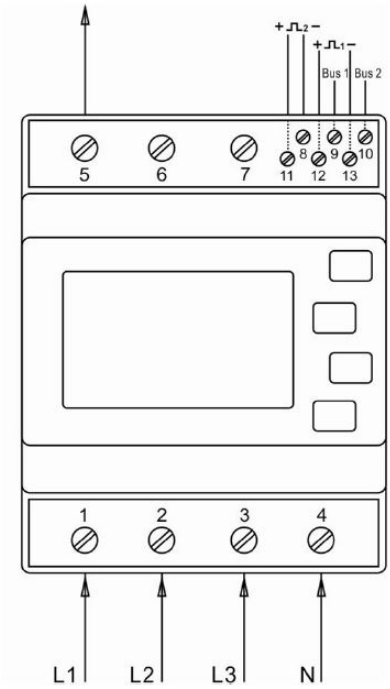



## 8. Wiring diagram

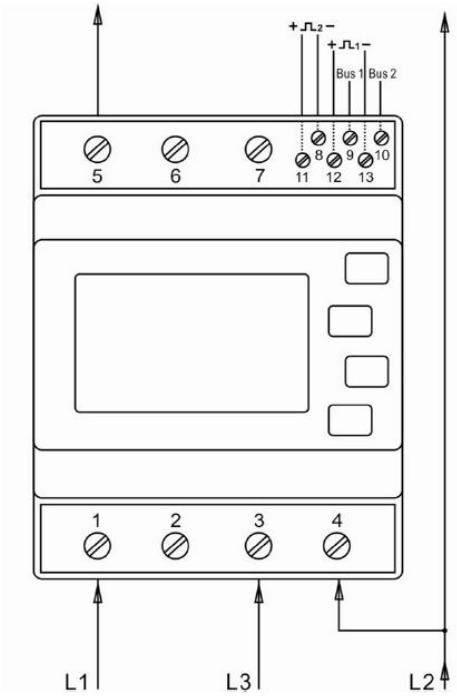
Single-phase 2-wire



Three-phases 4-wire




Three-phases 3-wire




# 9. M-Bus protocole

## 9.1. Initialization Slave

Format:

| Start | C field | A field | Check sum | Stop |
|---|---|---|---|---|
| 10 | 40 | XX | CS | 16 |

XX=1 to FF

The address field serves to address the recipient in the calling direction,and to identify the sender of information in the receiving direction. The size of this field is one byte, and can therefore take values from 0 to 255. The addresses 1 to 250 can be allocated to the individual slaves, up to a maximum of 250. Unconfigured slaves are given the address 0 at manufacture, and as a rule are allocated one of these addresses when connected to the M-Bus. The addresses 254 (FE) and 255 (FF) are used to transmit information to all participants (Broadcast). With address 255 none of the slaves reply, and with address 254 all slaves reply with their own addresses. The latter case naturally results in collisions when two or more slaves are connected, and should only be used for test purposes. The address 253 (FD) indicates that the addressing has been performed in the Network Layer instead of Data Link Layer, the FD used when using the second level address. The remaining addresses 251 and 252 have been kept for future applications.

#### 9.1.1. How to initialize a meter which you don't know the address

Master to Slave: 10 40 FE 3E 16
Slave to Master: E5 (success)

#### 9.1.2. Remove the secondary address matching symbol of all the meters on Bus

Master to Slave: 10 40 FD 3D 16
Slave: No answer

#### 9.1.3. How to initialize all meters on the bus line by using FF as broadcast address

Master to Slave: 10 40 FF 3F 16
Slave: No answer

#### 9.1.4. How to initialize a Slave with specific address

Example: address 01
Master to Slave: 10 40 01 41 16
Slave to Master: E5

### 9.2. How to set baud rate

#### 9.2.1. Point to point baud-rate setting command format (Control frame)

| Start | L field | L field | Start | C field | A field | CI field | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|
| 68H | 03 | 03 | 68H | 53/73 | FE | B8-BD | CS | 16 |

L field - Byte length
C field - Control field, function field
A field - Address field
CI field - Control information field
Check sum - The Check sum is calculated from the arithmetical sum of the data mentioned above, without taking carry digits into account.

B8-------300
B9-------600
BA-------1200
BB-------2400
BC-------4800
BD-------9600

Example: (Meter address is 01)
(1) How to change baud rate to 2400 bps.
Master to Slave: 68 03 03 68 53 01 BB 0F 16
Slave to Master: E5
(2) How to change baud rate to 9600 bps.
Master to Slave: 68 03 03 68 53 01 BD 11 16
Slave to Master: E5

### 9.2.2. How to use broadcast command to set baud rate

Format:

| Start | L field | L field | Start | C field | A field | CI field | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|
| 68H | 03 | 03 | 68H | 53/73 | FF | B8-BD | CS | 16 |

Slave to Master: No answer

B8-------300
B9-------600
BA-------1200
BB-------2400
BC-------4800
BD-------9600

Example:
Change all the meter's baud rate to 2400 bps.
Master to Slave: 68 03 03 68 53 **FF** BB 0D 16
Slave to Master: No answer

## 9.3. How to set primary address

### 9.3.1. How to set the address of a Slave to 01

Format:

| Start | L field | L field | Start | C field | A field | CI field | DIF | VIF | Address data | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68H | 06 | 06 | 68H | 53/73 | FE | 51 | 01 | 7A | XX | CS | 16 |

Example:
Master to Slave: 68 06 06 68 53 FE 51 01 7A **01** 1E 16
Slave to Master: E5

### 9.3.2. How to use broadcast command to set primary address to 01

Format:

| Start | L field | L field | Start | C field | A field | CI field | DIF | VIF | Address data | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68H | 06 | 06 | 68H | 53/73 | FF | 51 | 01 | 7A | XX | CS | 16 |

Example:
Master to Slave: 68 06 06 68 53 **FF** 51 01 7A **01** 1F 16
Slave: No answer

### 9.3.3. How to change address from 01 to 02

Format:

| Start | L field | L field | Start | C field | A field | CI field | DIF | VIF | Address data | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68H | 06 | 06 | 68H | 53/73 | XX | 51 | 01 | 7A | YY | CS | 16 |

XX - current primary address
YY - new primary address
Master to Slave: 68 06 06 68 73 **01** 51 01 7A **02** 42 16
Slave to Master: E5

### 9.3.4. How to set primary address to 01 by using secondary address

Example: secondary address: 12345678

**Step 1**
Initialize the Slave
Master to Slave: 10 40 FF 3F 16
Slave to Master: No answer

**Step 2**
Check the secondary address. After receiving the command, the Slave will check if the secondary address in the command is same with its secondary address or not.
Master to Slave: 68 0B 0B 68 73 **FD** 52 **78 56 34 12** FF FF FF FF D2 16
FD --- the primary address used when you use secondary address to read data.
78 56 34 12 - the meter's secondary address is 12 34 56 78
Master to Slave: E5 (success)

**Step 3**
Change the primary address to 01
Master to Slave: 68 06 06 68 73 FD 51 01 7A **01** 3D
01 --- new primary address
Slave to Master: E5

### 9.4. Set the complete identification of the Slave

(ID=12345678, Man=4024h (PAD), Gen=1, Med=02 (energy)

| Start | L field | L field | Start | C field | A field | CI field | DIF | VIF |
|---|---|---|---|---|---|---|---|---|
| 68H | 0D | 0D | 68H | 53/73 | addr | 51 | 07 | 79 |

| Identification No | Manufacturer ID | Generation | Medium | Check sum | Stop |
|---|---|---|---|---|---|
| 4 byte | 2 byte | 1 byte | 1 byte | CS | 16 |

For example: (Meter address is 01)
Master to Slave: 68 0D 0D 68 53 **01** 51 07 79 78 56 34 12 24 40 01 02 A0 16
Slave to Master: E5

## 9.5. How to read out of energy information

### 9.5.1. Use primary address 01 to read energy information

Format:
Master to Slave: 10 7B/5B adr CS 16
Slave to Master: Variable data structure
Example: 10 7B 01 7C 16

### 9.5.2. How to read out a meter's energy information by using broadcast address 254 (FE)

Master to Slave: 10 7B/5B FE CS 16
Slave to Master: Variable data structure
Example: 10 5B FE 59 16

### 9.5.3. How to read out the meter's energy information by using secondary addres

Example:
Secondary address: 12 34 56 78

**Step 1**
Initialize the Slave
Master to Slave: 10 40 FF 3F 16
Slave to Master: No answer

**Step 2**
Check the secondary address. After receiving the command, the slave will check if the secondary address in the command is same with its secondary address or not.
Master to Slave: 68 0B 0B 68 73 FD 52 78 56 34 12 FF FF FF FF D2 16
Slave to Master: E5

**Step 3**
Read the energy information
Master to Slave: 10 7B **FD** 78 16
Slave to Master: DIF===== Coding of the Data Information Field
VIF===== Codes for Value Information Field

| Bytes | Parameters | Data structure | Notice |
|---|---|---|---|
| 4 | Header telegram | 68 5D 5D 68 | Header of RSP_UD telegram |
| 3 | | 08 A 72 | C field=08 address A CI field 72 |
| 4 | | 78 65 34 21 | Identification number =12345678 |
| 2 | | 24 40 | Manufacturer ID 4024 |
| 1 | | 01 | Generation 1 |
| 1 | | 02 | Energy meter |
| 1 | | 55 | ACCESS NO |
| 1 | | 00 | STATUS |
| 2 | | 00 00 | Signature |
| 6 | Current total active energy | 0C | DIF: 8 digit BCD , Current value |
| | | 04 | VIF: 10 W (0.01 kW) |
| | | 78 56 34 12 | 123456.78 kWh |
| 7 | Current import active energy | 0C | DIF: 8 digit BCDFIE, Current value |
| | | 04 | VIF: 10 W (0.01 kW) |
| | | 78 56 34 12 | 123456.78 kWh |
| 7 | Current export active energy | 0C | DIF: 8 digit BCDFIE, Current value |
| | | 04 | VIF: 10 W (0.01 kW) |
| | | 78 56 34 12 | 123456.78 kWh |
| 6 | Current resettable total active energy | 0C | DIF: 8 digit BCD, Current value |
| | | 04 | VIF: 10 W (0.01 kW) |
| | | 78 56 34 12 | 123456.78 kWh |
| 7 | Current resettable import active energy | 0C | DIF: 8 digit BCDFIE, Current value |
| | | 04 | VIF: 10 W (0.01 kW) |
| | | 78 56 34 12 | 123456.78 kWh |
| 7 | Current resettable export active energy | 0C | DIF: 8 digit BCDFIE, Current value |
| | | 04 | VIF: 10 W (0.01 kW) |
| | | 78 56 34 12 | 123456.78 kWh |

| Bytes | Parameters | Data structure | Notice |
|---|---|---|---|
| 7 | Current total reactive energy | 0C | DIF: 8 digit BCD , Current value |
| | | FD | VIF: FD |
| | | 3A | VIFE: bezwymiarowe / no VIF |
| | | 78 56 34 12 | 123456,78 kVarh |
| 8 | Current import reactive energy | 0C | DIF: 8 digit BCDFIE, Current value |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 78 56 34 12 | 123456.78 kVarh |
| 8 | Current export reactive energy | 8C | DIF: 8 digit BCDFIE, Current value |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 78 56 34 12 | 123456.78 kVarh |
| 7 | Current total resettable reactive energy | 0C | DIF: 8 digit BCD, Current value |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 78 56 34 12 | 123456.78 kVarh |
| 8 | Current resettable import reactive energy | 0C | DIF: 8 digit BCDFIE, Current value |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 78 56 34 12 | 123456.78 kVar |
| 8 | Current resettable export reactive energy | 0C | DIF: 8 digit BCDFIE, Current value |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 78 56 34 12 | 123456.78 kVar |
| 1 | CHECK SUM | CS | |
| 1 | End | 16 | |

## 9.6. Read out of instantaneous electrical information

The instantaneous electrical information includes:
V, I, P, Q, S, PF, Hz ect. MD

### 9.6.1. How to read instantaneous electrical information by using primary address

| Start | L field | L field | Start | C field | A field | CI field | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|
| 68H | 3 | 3 | 68 | 53/73 | XX | B1 | CS | 16 |

Master to Slave: 68 03 03 68 53 **XX** B1 05 16
Slave to Master: Variable data structure (instantaneous electrical information)
If the primary address is 01, then XX=01

### 9.6.2. How to use secondary address to read out the instantaneous electrical information

**Step 1**
Initialization Slave
Master to Slave: 10 40 FF 3F 16
Slave to Master: No answer

**Step 2**
Check the secondary address. After receiving the command, the slave will check if the secondary address in the command is same with its secondary address or not.
Master to Slave: 68 0B 0B 68 73 FD 52 78 56 34 12 FF FF FF FF D2 16
Slave to Master: E5

**Step 3**
Use Secondary Address to read out the instantaneous electrical information
Master to Slave: 68 03 03 68 53 **FD** B1 01 16
Slave to Master: Variable data structure

| Bytes | Parameters | Data structure | Notice |
|---|---|---|---|
| 4 | Header telegram | 68 90 90 68 | Header of RSP_UD telegram |
| 3 | | 08 A 72 | C field =08 address A CI field 72 |
| 4 | | 78 65 34 21 | Identification number =12345678 |
| 2 | | 24 40 | Manufacturer ID 4024 |
| 1 | | 01 | Generation 1 |
| 1 | | 02 | Energy meter |
| 1 | | 55 | ACCESS NO |
| 1 | | 00 | STATUS |
| 2 | | 00 00 | Signature |
| 6 | L1 voltage | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 47 | VIFE: 0.01 V |
| | | 56 34 12 | 1234.56 V |
| 6 | L2 voltage | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 47 | VIFE: 0.01 V |
| | | 56 34 12 | 1234.56 V |
| 6 | L3 voltage | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 47 | VIFE: 0,01 V |
| | | 56 34 12 | 1234,56 V |
| 6 | L1 - L2 Voltage | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 47 | VIFE: 0.01 V |
| | | 56 34 12 | 1234.56 V |

| Bytes | Parameters | Data structure | Notice |
|---|---|---|---|
| 6 | L2 - L3 Voltage | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 47 | VIFE: 0.01 V |
| | | 56 34 12 | 1234.56 V |
| 6 | L3 - L1 Voltage | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 47 | VIFE: 0.01 V |
| | | 56 34 12 | 1234.56 V |
| 6 | L1 current | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 59 | VIFE: 1 mA (xxx.xxx A) |
| | | 56 34 12 | 123456 mA (123.456 A) |
| 6 | L2 current | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 59 | VIFE: 1 mA (xxx.xxx A) |
| | | 56 34 12 | 123456 mA (123.456 A) |
| 6 | L3 current | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 59 | VIFE: 1 mA (xxx.xxx A) |
| | | 56 34 12 | 123456 mA (123.456 A) |
| 6 | N current | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 59 | VIFE: 1 mA (xxx.xxx A) |
| | | 56 34 12 | 123456mA (123.456A) |
| 5 | Total active power | 0B | DIF: 6 digit BCD |
| | | 2A | VIF: 0.1 W (xx.xxxx kW) |
| | | 56 34 12 | 12345.6 W (12.3456 kW) |

| Bytes | Parameters | Data structure | Notice |
|---|---|---|---|
| 5 | L1 active power | 0B | DIF: 6 digit BCD |
| | | 2A | VIF: 0.1 W (xx.xxxx kW) |
| | | 56 34 12 | 12345.6 W (12.3456 kW) |
| 5 | L2 active power | 0B | DIF: 6 digit BCD |
| | | 2A | VIF: 0.1 W (xx.xxxx kW) |
| | | 56 34 12 | 12345.6 W (12.3456 kW) |
| 5 | L3 active power | 0B | DIF: 6 digit BCD |
| | | 2A | VIF: 0,1 W (xx.xxxx kW) |
| | | 56 34 12 | 12345.6 W (12.3456 kW) |
| 6 | Total reactive power | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 56 34 12 | 12345.6 W (12.3456 kW) |
| 6 | L1 reactive power | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 56 34 12 | 12345.6 W (12.3456 kW) |
| 6 | L2 reactive power | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 56 34 12 | 12345.6 W (12.3456 kW) |
| 6 | L3 reactive power | 0B | DIF: 6 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 56 34 12 | 12345.6 W (12.3456 kW) |

| Bytes | Parameters | Data structure | Notice |
|---|---|---|---|
| 5 | Total power factor | 0A | DIF: 4 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 00 05 | 0.500 |
| 5 | A power factor | 0A | DIF: 4 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 00 05 | 0.500 |
| 5 | B power factor | 0A | DIF: 4 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 00 05 | 0.500 |
| 5 | C power factor | 0A | DIF: 4 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 00 05 | 0.500 |
| 5 | Frequency | 0A | DIF: 4 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 00 50 | 50.00 Hz |
| 1 | End | CS | |
| 1 | | 16 | |

### 9.7. How to read password

| Start | L field | L field | Start | C field | A field | CI field | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|
| 68 | 3 | 3 | 68 | 11 | addr | **03** | CS | 16 |

Master to Slave: 68 03 03 68 11 address 03 cs 16
Slave to Master: 68 05 05 68 11 address 03 passwordH passwordL cs 16

#### 9.7.1. Change to a new password

| Start | L field | L field | Start | C field | A field | CI field | Data | | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|---|
| 68 | 5 | 5 | 68 | 11 | addr | **04** | password H | password L | CS | 16 |

Master to Slave: 68 05 05 68 11 address 04 passwordH passwordL cs 16
Slave to Master: E5

### 9.8. How to reset all resettable energy data

| Start | L field | L field | Start | C field | A field | CI field | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|
| 68 | 3 | 3 | 68 | 11 | addr | 0D | CS | 16 |

Example: addr: 01
Master to Slave: 68 03 03 68 11 **01** 0D 1F 16
Slave to Master: E5

### 9.9. Set demand interval, slide time, display time, LED time

Send: 68 09 09 68 53 FE 51 30 01 60 01 05 06 3F 16

| Start | L field | L field | Start | C field | A field | CI field | DIF | VIF | Data | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68H | 09 | 09 | 68H | 53/73 | FE | 51 | 30 | 01 | Demand interval, slide time, display time, LED time Display time=0: the display does not scroll automatically. LED time=0: Backlight always on min-min-s-min 4 bytes | CS | 16 |

Example: (Meter address is 01)
Master do Slave: 68 09 09 68 53 FE 51 30 01 60 01 05 06 3F 16
Slave to Master: E5

### 9.10. Read demand interval,slide time, display time, LED time

| Start | L field | L field | Start | C field | A field | CI field | DIF | VIF | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|---|
| 68H | 05 | 05 | 68H | 53/73 | FE | 51 | 30 | 81 | CS | 16 |

Example: (Meter address is 01)
Master to Slave: 68 05 05 68 53 FE 51 30 81 53 16
Slave to Master: E5

| Bytes | Parameters | Data structure | Notice |
|---|---|---|---|
| 4 | Header telegram | 68 16 16 68 | Header telegram RSP_UD |
| 3 | | 08 A 72 | C field =08 address A CI field72 |
| 4 | | 78 65 34 21 | Identification number =12345678 |
| 2 | | 24 40 | Manufacturer ID 4024 |
| 1 | | 01 | Generation 1 |
| 1 | | 02 | Energy meter |
| 1 | | 55 | ACCESS NO |
| 1 | | 00 | STATUS |
| 2 | | 00 00 | Signature |
| 7 | Demand interval, slide time, display time, LED time | 0A | DIF: 30 digit BCD |
| | | FD | VIF: FD |
| | | 3A | VIFE: dimensionless / no VIF |
| | | 15010610 | Demand interval: 15 min.<br>Slide time: 01 min.<br>Display time: 06 sec<br>LED time: 10 sec |
| 1 | CHECK SUM | CS | |
| 1 | End | 16 | |

### 9.11. Read the measurement mode

| Start | L field | L field | Start | C field | A field | CI field | Data | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|
| 68 | 03 | 03 | 68 | 11 | addr | **09** | 01/02/03 | CS | 16 |

Example: (Meter address is 01)
Master to Slave: 68 03 03 68 11 **01** 09 1B 16
Slave to Master: 68 04 04 68 11 01 09 **01** 1C 16

The red-lighted 01 represents the measurement mode:
01: means active energy
02: means active energy + reactive energy
03: means active energy - reactive energy

### 9.12. Set up the measurement mode

| Start | L field | L field | Start | C field | A field | C field | Data | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|
| 68 | 04 | 04 | 68 | 11 | addr | **0A** | 01/02/03 | CS | 16 |

Example: (Meter address is 01)
Master to Slave: 68 04 04 68 11 01 0A **01** 1C 16
Slave to Master: E5

The red-lighted **01** represents the measurement mode:
01: means active energy
02: means active energy + reactive energy
03: means active energy - reactive energy

### 9.13. Read the output mode of pulse 1

| Start | L field | L field | Start | C field | A field | C field | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|
| 68 | 03 | 03 | 68 | 11 | addr | 10 | CS | 16 |

Example: (Meter address is 01)
Master to Slave: 68 03 03 68 11 01 10 22 16
Slave to Master: 68 04 04 68 11 01 10 **01** 23 16

The red-lighted **01** represents the output mode of pulse 1:
01: Import active energy
02: Import + export active energy
04: Export active energy (default)
05: Import reactive energy
06: Import + export reactive energy
08: Export reactive energy

### 9.14. Set up the output mode of pulse 1

| Start | L field | L field | Start | C field | A field | C field | Data | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|
| 68 | 08 | 08 | 68 | 11 | addr | 11 | 01/02/04/05/06/08 | CS | 16 |

Example: (Meter address is 01)
Master to Slave: 68 04 04 68 11 01 11 **01** 24 16
Slave to Master: E5

The red-lighted 01 represents the output mode of Pulse1:
01: Import active energy
02: Import + export active energy
04: Export active energy (default)
05: Import reactive energy
06: Import + export reactive energy
08: Export reactive energy

### 9.15. Read the constant of pulse 1

| Start | L field | L field | Start | C field | A field | C field | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|
| 68 | 03 | 03 | 68 | 11 | addr | 12 | CS | 16 |

Example: (Meter address is 01)
Master to Slave: 68 03 03 68 11 01 12 24 16
Slave to Master: 68 04 04 68 11 01 10 **00** 22 16

The red-lighted **00** represents the constant of pulse 1:
00: 0.0025 kwh (kvarh)/pulse (default)
01: 0.01 kWh (kvarh)/pulse
02: 0.1 kWh (kvarh)/pulse
03: 1 kWh (kvarh)/pulse
04: 10 kWh (kvarh)/pulse
05: 100 kWh (kvarh)/pulse

### 9.16. Set up the constant of pulse 1

| Start | L field | L field | Start | C field | A field | C field | Data | Check sum | Stop |
|---|---|---|---|---|---|---|---|---|---|
| 68 | 08 | 08 | 68 | 11 | addr | 11 | 00/01/02/03/04/05 | CS | 16 |

Example: (Meter address is 01)
Master to Slave: 68 04 04 68 11 01 13 **00** 25 16
Slave to Master: E5

The red-lighted **00** represents the constant of pulse 1:
00: 0.0025 kwh (kvarh)/pulse (default)
01: 0.01 kwh (kvarh)/pulse
02: 0.1 kwh (kvarh)/pulse
03: 1 kwh (kvarh)/pulse
04: 10 kwh (kvarh)/pulse
05: 100 kwh (kvarh)/pulse

## 10. Manufacturer's warranty

1. The product is covered by 24 month warranty from the date of purchase.
2. The warranty is valid only with a proof of purchase.
3. The notification of the complaint must be made at the place of purchase or directly at the manufacturer: (phone: +48 (42) 227 09 71; e-mail: reklamacje@fif.com.pl)
4. During the warranty period in the case of a justified complaint the manufacturer commits in accordance with the provisions of the consumer rights to repair the product, replace it with a new one or refund.
5. The complaint will be processed within 14 days from the date of delivering the product to the service point.
6. Warranty does not cover:
   - mechanical and chemical damages;
   - damages resulting from improper use or from the use inconsistent with the user manual;
   - damages incurred after the sale as a result of accidents or other events for which nor the producer, nor the place of sale are responsible, for example damages in transit, etc.
7. Warranty does not cover actions that user should perform in accordance with the user manual, for example installing multi-meter, building electrical installation, installing other required electrical protection, checking, etc.

**Warning!**
Do not make any changes in the device by yourself. This may cause damage or improper operation of the device, which can lead to damage to the controlled device and may pose a danger to the operators. In such cases, the manufacturer is not liable for consequential events and may refuse the guarantee in case of complaint.