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## 1. Introduction

### 1.1. General

The Load Control Mini-Meter **M160R** is a single phase, direct measurement static watt-hour meter with Power Line Communication (PLC) interface for operation in Advanced Metering Infrastructure (AMI).

The M160R communicates with central unit – concentrator, over the power network using two way PLC interface. The concentrator transfer data to Control Center of AMI system by cellular communications - GSM/GPRS.

M160R meter contains load control switch and can remotely disconnect and reconnect power to customer by command received from central unit.

M160R meter is designed to be mounted on DIN standard rail (2 DIN width case) in a distribution boards or in a standard cabinet with protection of at least class IP51 according to IEC 60259.

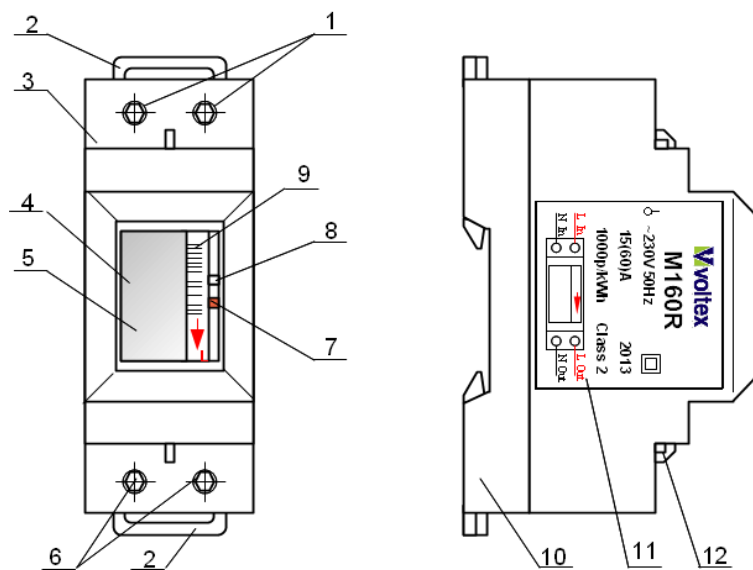


**Fig. 1.1 Meter view**



## 2. Product information

### 2. 1. Meter parts



|   |   |    |                          |
|---|---|----|--------------------------|
| 1 | Input Terminals                               | 7  | Red LED (under window)   |
| 2 | DIN-rail locks (2)                            | 8  | IrDA port (under window) |
| 3 | Case upper part                               | 9  | Barcode label            |
| 4 | Transparent window                            | 10 | Case lower part          |
| 5 | LCD display (protected by transparent window) | 11 | Side Label               |
| 6 | Output Terminals                              | 12 | Sealing points           |

**Fig. 2.1 Meter front/side view**



## 2.2. Technical Data

| General                                  |                          |
|--|--------------------------|
| Nominal Voltage (Un)                     | 230V                     |
| Supply Voltage range                     | 80% - 115% Un            |
| Nominal Frequency (fn)                   | 50Hz                     |
| Meter Consumption at Un                  | 1.2W-8Var                |
| System connections                       | 1 phase 2 wire           |
| Measurement                              |                          |
| Class Index according to IEC62053-21     | Class 2                  |
| Basic Current (Ib)                       | 15A                      |
| Maximum continuous current (Imax)        | 60A                      |
| Environmental                            |                          |
| Temperature range                        |                          |
| operation                                | -10°C to 55°C            |
| storage                                  | -25°C to 70°C            |
| Relative humidity (R.H.) for annual mean | < 75%                    |
| R.H. occasionally on some days           | 85%                      |
| Insulation Strength                      |                          |
| Protective Class acc. to IEC62052-11     | Class II                 |
| Display                                  |                          |
| Type                                     | LCD                      |
| Format                                   | 8 Characters x 2 Lines   |
| Character size                           | 4.3mm x 2.95 mm          |
| LED Indicator                            |                          |
| Flash rate                               | 1000 imp/kWh             |
| Communication Interfaces                 |                          |
| Optical communication port               | According to IEC62056-21 |
| PLC Frequency range                      | "A"-band                 |
| PLC Method                               | Spread FSK               |

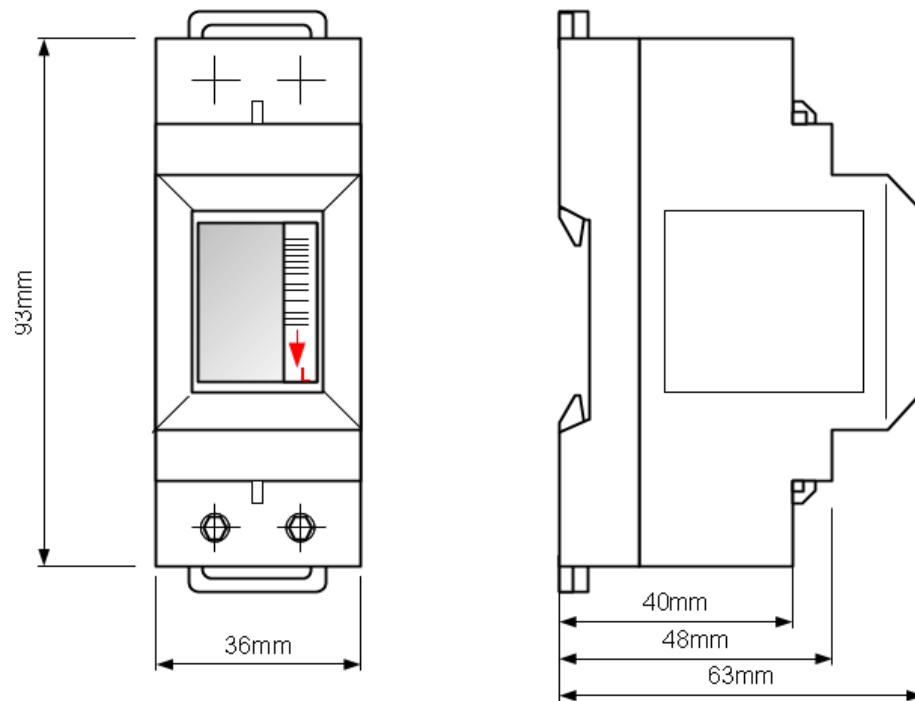


| Disconnection Device      |                                |
|---------------------------|--------------------------------|
| Type                      | Single pole latching contactor |
| Maximum switching current | 60A                            |
| Maximum switching voltage | 250VAC                         |
| Mechanical life           | 100 000 operation minimum      |

| Electromagnetic Compatibility         |                                |
|---------------------------------------|--------------------------------|
| Impulse voltage test                  | 6 kV, 1.2/50µs IEC 60060-1     |
| Fast transient /burst test            | 4 kV, IEC61000-4-4             |
| Immunity to electromagnetic RF fields | 80MHz - 2 000MHz, IEC61000-4-3 |
| Immunity to conducted disturbance     | 150 kHz – 80MHz, IEC 61000-4-6 |
| Radio frequency emission              | EN 55022, class B (CISPR 22)   |
| Electrostatic discharge (ESD)         | 15kV, IEC61000-4-2             |

| Weight and Dimensions/ Case protection |       |
|--|-------|
| Weight                                 | 195 g |
| Width                                  | 36 mm |
| Height                                 | 93 mm |
| Depth                                  | 63 mm |
| Enclosure protection (IEC60529)        | IP51  |
| Protection for connection terminals    | IP20  |

| Connections                     |                          |
|---------------------------------|--------------------------|
| Connection system type          | Clamping yoke connection |
| Maximum conductor cross-section | 16 mm <sup>2</sup>       |
| Minimum conductor cross-section | 6 mm <sup>2</sup>        |
| Clamping screw                  | M5x17                    |
| Head of clamping screw          | Socket hex cap 4 mm      |
| Tightening torque, min          | 3.5 Nm                   |
| Tightening torque, max          | 4.5 Nm                   |



***Fig.2.2 Meter Dimensions***



### 3. Safety regulations

**The following safety regulations must be observed at all times:**

- The meter connections must not be under voltage during installation or when opening. Contact with live parts is dangerous to life. The relevant preliminary fuses should therefore be removed and kept in a safe place until the work is completed, so that other persons cannot replace them unnoticed.
- Local safety regulations must be observed. Installation of the meters must be performed by qualified industrial electricians only.
- Meters which have fallen must not be installed, even if no damage is apparent, but must be returned for testing to the service or the manufacturer. Internal damage can result in functional disorders or short circuits.
- The meters must on no account be cleaned with water or with high pressure devices.



## 4. Installation

### Installation and commissioning must be performed by a qualified industrial electricians only!

The persons installing the meter must be familiar with and observe the normal local safety regulations and safety regulations specified in this "Installation Instruction".

The installer is responsible that the electricity meter is correctly and safety installed.

### 4.1. Protection requirements

M160R meter is for mounting on standard DIN - rail (2 DIN width case) in a distribution boards or in a standard cabinet, with protection of at least class IP51 according to IEC 60259.

### 4.2. Mounting and commissioning

**WARNING!** The voltage connected to M160R meter is dangerous and can be lethal, Therefore all voltage must be switched OFF before the installation of M160R meter.

**WARNING!** The connecting wires at the place of installation must **not** be live when fitting the meter. Touching live parts is dangerous to life. The corresponding preliminary fuses should therefore be removed and kept in a safe place until work is completed, so that they cannot be replaced by anyone unnoticed.

**1.** Shut off power to line. Make sure voltage is zero. Check with a phase tester or universal measuring instrument whether the connecting wires are live. If so, remove the corresponding preliminary fuses and keep them in a safe place until installation is completed, so that they cannot be replaced by anyone unnoticed.

**2.** Fasten the meter on the DIN rail so that the two meter's plastic DIN-rail locks, see

Fig. 2.1 position 2, placed on the back of the meter snap onto the rail. Fig 4.1 (2) (3)

**3.** Connect the meter to the power line according to Connections diagram presented on the side label of the meter Fig 2.1 position 11 and according to meter installation diagram Fig. 4.1

(6)

Meter's input screws terminals are positioned on the top of the Meter, see Fig. 2.1 position 1.





The input terminals should be connected to a source of power after the fuse or circuit- breaker with rated switching current less than max current of meter in order to provide circuit protection.

Meter's output screws terminals are positioned on the bottom of the Meter ,see Fig.

2.1 position 6.

The output terminals should be connected to wires going to the customer's residence. It is very important to keep polarity: connect the phase to phase and the neutral to

neutral according to connections diagram Fig. 4.1 **6**

Recommended connections wire for input and output:

conductor cross section 6 mm<sup>2</sup> – 16 mm<sup>2</sup>, isolation 600V, 105°C, VW-1.

If stranded wire is used, this must be provided with ferrules for connection.

**4.** Check that the electricity meter is correctly installed and connected to specified voltage (230V).

**5.** Make sure that the screws are tightened properly and the wires are not loose. **WARNING!** Insufficiently tightened screws at the phase connections can lead to increased power losses at the terminals and therefore to undesirable heating.

**6.** Turn on power to line.

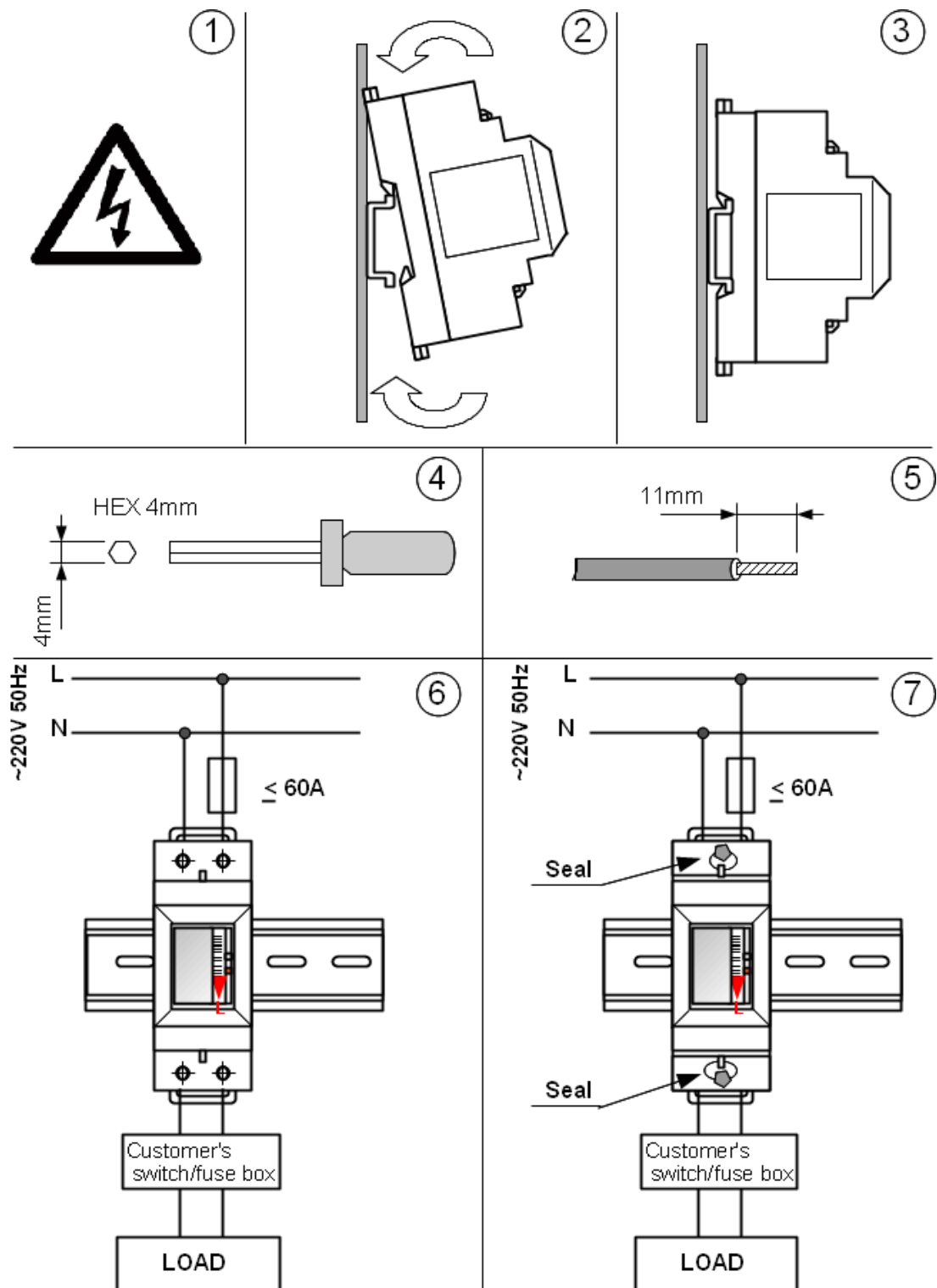
**7.** Make sure red LED is ON or pulsing and LCD display screens are scrolling automatically every 2 second.

**8.** Check if electricity is supplied to the customer.

The meter has a disconnecting unit and it may take up to 2 minutes for the customer receive electricity. If the customer does not receive electricity, shut off power to line and check the meter connections.

**9.** If meter works correctly and customer receives electricity, turn OFF power to line again, make sure voltage is zero and close screw terminals with the plastic closers that are provided with the meter and seal with two seals in order to prevent non- authorized access, Fig.4.1 **7**

**10.** Turn ON power to line and check again that data is being displayed on the LCD.



**Fig. 4.1 Installation Diagram**



## 5. Functions

### 5.1. Reading and Controlling of the meter.

The meter M160R measures electric energy consumption.

Control of the meter can only be done remotely thru the concentrator.

The meter transmits data over the power network, using two way Power Line Communication (PLC), to a central unit in the installation – concentrator – from which data is transmitted to the billing center by GSM/GPRS or Internet communication.

M160R is capable of receiving data from the concentrator such as: **Time Of Use (TOU)** tables, power limit, real time clock, disconnection commands.

M160R is capable of transmitting data to the concentrator such as: energy reading, status and **TOU** reading.

M160R is capable of remotely disconnecting and reconnecting power to customer by command received from central unit.

Reading of the meter data is done by the LCD display placed on the front of the meter.

### 5.2. Operating LCD Display.

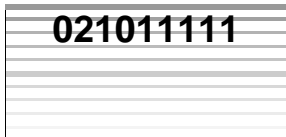
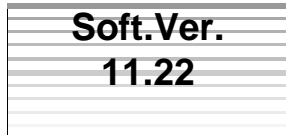
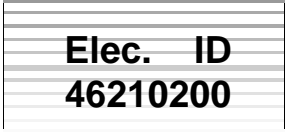
The M160R electricity meter's data is displayed on it's LCD.

The screens scroll automatically every 2 seconds, without the intervention of the customer. The LCD Display of M160R has 2 lines of 8 characters each.

The upper line identifies the subject of the screen. The lower line identifies the measurement results.

#### 5.2.1. Display screens when power is ON

The first 3 screens scroll immediately when the M160R unit is turned on. These screens appear only once, scrolling one after the other.

|                 |   |                       |
|-----------------|---|-----------------------|
| <b>Screen 1</b> |  | Program version       |
| <b>Screen 2</b> |  | Software Version      |
| <b>Screen 3</b> |  | Meter's serial number |

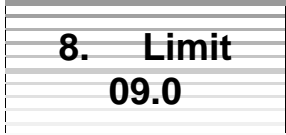
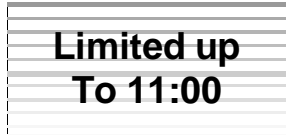


## 5.2.2. Auto-scrolling display screens

The following screens are continuously scrolling and changing every 2 seconds

|                  |  |   |
|------------------|--|---|
| <b>Screen 4</b>  |  | Current Date and Time (updated from Concentrator)                               |
| <b>Screen 5</b>  |  | Reading of accumulated consumption in Of Peak tariff , in kWh                   |
| <b>Screen 6</b>  |  | Reading of accumulated consumption in Standard tariff , in kWh.                 |
| <b>Screen 7</b>  |  | Reading of accumulated consumption in Peak tariff , in kWh                      |
| <b>Screen 8</b>  |  | TOU Duration:<br>Showing the present tariff and the end time of present tariff. |
| <b>Screen 9</b>  |  | Reading of the <b>Total</b> accumulated Power consumption, in kWh.              |
| <b>Screen 10</b> |  | The current measure of the Power Line Voltage, in V                             |
| <b>Screen 11</b> |  | The current measure of the operating Power Demand, in kW                        |



|  |  |  |
|--|--|--|
|  |  |  |
| <b>Screen 12</b>   |   | Shows the maximum power limit.                       |
| <i>In case the customer exceeds maximum power limitation (in kW), the meter will disconnect for a few minutes</i>  |  |  |
| <b>In case of Disconnection:</b><br>In case the customer is remotely disconnected from power line by command received from Central unit (Concentrator), the value of maximum power limit changes to <b>00.0 (Screen 12)</b> and additional screen appears after <b>Screen 8</b> notifying when the customer will be reconnected. |  |  |
|  |  | Shows the Time when the customer will be reconnected |
|  |  |  |

## 5.3 Test LED indicator:

The red LED placed under front transparent window (see Fig. 2.1 ) and should be used for meter testing. The red LED indicates power consumption. While the meter is on, the red light is visible and flashes at a frequency dependent on the present power and LED flash rate.

The Meter Constant (LED flash rate) as designated on side label is 1000 imp/kWh.



## 6. Maintenance instructions:

The following points should be checked on the meters periodically:

- The meter is in operation and serviceable.
- All seals are undamaged
- The condition of connections of screw terminals are unchanged and all screws are tightened properly
- The condition of plastic around the terminals is undamaged
- Wire isolation is undamaged
- The meter is dry.
- The plastic window is clean and transparent

If the meter's transparent window is dirty and need to be cleaned, use damp cleaning cloth to remove the dirt.

**WARNING!** Make sure no liquid enters into the meter as this could damage the meter.

If the meter does not operate correctly, the meter should be disconnected, removed and sent to the responsible service and repair center.

It should not be necessary to recalibrate the meter during its lifetime.  
The meter's calibration is to be checked according to requirements of the Electricity Company.



## 7. Disconnecting meters:

The meter should be removed as follows:

1. Turn OFF power to line.
2. Check that the connecting wires are not live using a phase tester or universal measuring instrument. If they are live, remove the corresponding preliminary fuses and keep these in a safe place until work is completed, so that they cannot be replaced by anyone unnoticed.
3. Remove the two seals and two plastic closers.
4. Check that the meter's terminals are not live using a phase tester or universal measuring instrument. If they are live, repeat step 2.
3. Release the terminal screws of the connecting wires with a suitable screwdriver and withdraw the connecting wires from the terminals.
4. Remove the meter from DIN rail.
5. Fit a substitute meter as described in Section 4 "Installation".

The protection provided by the equipment may be impaired if the product is used in a manner not specified in the Manual.