Electricity Meters IEC/MID

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ZMX300Px (Software Version V09.xx.xx)

E450 PLC 3-phase S2

User Manual

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Revision History

Version	Date	Comments
a	29.12.2009	First edition
b	06.07.2010	Corrected broken cross references
c	09.12.2010	Re-structuring and content update
d	18.04.2011	Note about inverse relay function added in sections 1.3 and 1.5.1. New section 1.6 "Relay outputs". Additional warning text added in section 4.3.2 (concerning inputs/outputs).
e	10.06.2011	New item "relays" in install menu list (Fig. 4.6). Section 4.5.3.1 "PLC Menu" PLC device communication status updated. Section 4.5.7 "Setting-up Relay Inversion" added. Relay output numbers added in sections 1.3, 1.6 and 3.2. Central system specific text removed from section 1.2. Section 3.1: Slider is optional. Connection diagram example without disconnector added in section 3.6. Section 4.4: Correct status inserted and remark about disconnector state added. Section 5.1.2, tampering and alarm: note added that tempering indications are depending on configuration. Adaptation to SW version V03.02.11: Wired M-Bus with 1 multi-energy device, no wireless M-Bus, 5 independent measurement channels, 5 disconnector operating modes, accuracy class, type designation.
f	24.10.2011	Layout of front page, 2nd page, last page, headers and footers adapted to new template. Section 2 "Security" standardized. Other minor corrections.
g	07.11.2011	Section 1.2: Note concerning restriction of use in networks with significant disturbances in the frequency range of 2 kHz to 150 kHz inserted.
h	21.05.2012	Generation 2 (MMI3D) changes. Section 1.2: Note concerning restriction of use removed. Section 1.3: Compatible with micro-generation sources. Section 1.4: Type designation updated. Section 5.4: Disconnector push button without LED. Section 6.3: Minimum test times increased to 300 s.
k	04.07.2012	Generation 2 HW (MMI3D) changes: Software version updated. Reference document names updated. Type designation table updated. Company name changed to “Landis+Gyr AG”.

About this Document

Range of validity

The present manual applies to the second generation **E450 ZMX310Px** and **ZMX320Px PLC 3-phase** electricity meters.

For a detailed explanation of the type designation see *section 1.4*.

Purpose

The user manual contains all information required for meter applications for the intended purpose. This includes:

- Provision of knowledge concerning the characteristics, construction and knowledge of meters
- Information about possible dangers, their consequences and measures to prevent any danger
- Details concerning the performance of all work throughout the service life of the meters (parameterisation, installation, commissioning, operation, maintenance, decommissioning and disposal)

Target group

The content of this user manual is intended for technically qualified personnel of energy supply companies, responsible for system planning, installation and commissioning, operation, maintenance, decommissioning and disposal of meters.

Reference documents

The following documents provide further information related to the subject of this document:

- D000031863 "E450 ZMX300Px PLC 3ph S2 Technical Data"
- D000031861 "E450 ZxX Functional Description"

Typographical conventions

The following typographical conventions are used throughout this document:

Font	Description
Bold	Font style used for menu items and keys in user interface and for keys on keyboard.
Italics	Font style for *new terminology* and for references to other documents or other parts within this document. For example: A general description of the display user interface is given in *section 5.1 "Display*".
i	Symbol for additional information, hints and other important notifications.

Table of Contents

1 Description of Unit

1.1 General View

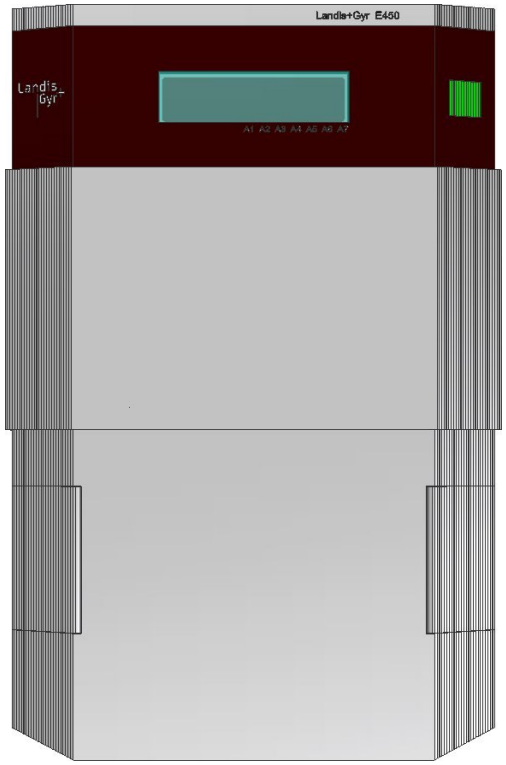


Fig. 1.1 General view of meter

1.2 Functional Overview

E450 is a smart electricity meter offering reliable performance with versatile functionality including support for multi energy reading and control. Two-way communication using Power Line Carrier (PLC) technology enables integration to AMM systems and multi-energy support extends the reading and control possibilities even further. E450 also supports personal energy management.

As PLC communication in the low voltage network is free of charge, the network is fully available for advanced metering applications. Therefore, mission critical communication tasks can be dispersed over time in order to achieve maximum reliability.

The E450 meter communicates with the data concentrator using PLAN+ (Power Line Automation Network) low voltage PLC communication. The protocol over the communication is always dlms. The PLC communication between the meter with a PLC-module and the data concentrator is based on standard protocols (IEC61334 series). Thus PLC communication technology represents the best trade-off in the context of conflicting technological and economic requirements.

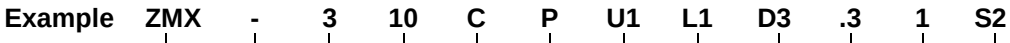
1.3 Characteristics

E450 meters have the following main characteristics:

- Recording of active and reactive energy in all 4 quadrants with up to 6 rates
- Data display on LCD
- Measuring element in DFS technology (Direct Field Sensor) with excellent measuring characteristics, including flat load curve, high stability and good protection against interference.
- Active energy measurement accuracy: Class 1 (IEC 62052-11/62053-21) and MID accuracy classes B (EN 50470-1/50470-3)
- Reactive energy measurement accuracy: Class 2 (IEC62053-23)
- Compatible with micro-generation sources.
- Wide range measurement from starting current to maximum current
- Serial interface with optical input/output for automatic readout of data on the spot and for service functions
- Two-way communication to metering system with integrated PLC transceiver
- Wired M-Bus interface supports 1 multi-energy device (gas, water, district heating)
- Internal disconnector for full disconnection of energy, controllable remotely from AMM system, or locally with a push button or via local communication interfaces
- Inputs and Outputs
  - One digital input configured as S0, alert or local disconnector command
  - 2 relay outputs: Relay output 1 configured as solid state relay output or mechanical on-off latching relay, relay output 2 as normal open relay (inverse relay function supported for both relays)
- Installation aids (e.g. phase voltages and direction of energy)
  - Presence of phase voltages (voltage values are displayed)
  - Visual output (creep indicator) on LCD
  - Display of energy direction
  - Wrong phase rotation indication
- Anti-tampering measures
  - Detection of terminal cover opening
  - Detection of strong DC magnetic field
  - Detection of disconnector tampering
- Storage of event information (e.g. power outages)

1.4 Type Designation

The exact configuration of E450 meters is expressed in a type code printed on the device faceplate. The type code can also be read by the metering system.



Network type

ZMX 3-phase, 4-wire (M-connected)
ZFX 3-phase, 3-wire (F-connected)
ZCX 1-phase, 2-wire (C-connected)

Build option

- Standard variant
i IDIS standard meter

Connection type

1 Direct connected (1-phase)
3 Direct connected (3-phase)

Accuracy class

10 MID class B; IEC class 1
20 MID class A; IEC class 2

Measured quantities

A Active energy, bi-directional
C Active and reactive energy (Combi)

System communication

P PLAN+
G GPRS/UMTS

Built-in local communication options

U0 Optical port
U1 Optical + Wireless M-Bus (868 MHz)

Extension port options

L0 Not in use
L1 Wired M-Bus

Disconnector options

D0 No disconnector fitted
D1 1-pole disconnector (1-phase meters only)
D2 2-pole disconnector (1-phase meters only)
D3 3-pole disconnector (3-phase meters only)

Relay options

2 90 mA OptoMOS solid-state relay + 8 A mechanical relay
3 5 A mechanical latching relay + 8 A mechanical relay

Other options

0 Not in use
1 Supercap as RTC reserve power (PLC & 2G/3G)

S2 Second generation HW (E450 PLAN+ PLC)

1.5 Measuring Principle

1.5.1 Overview

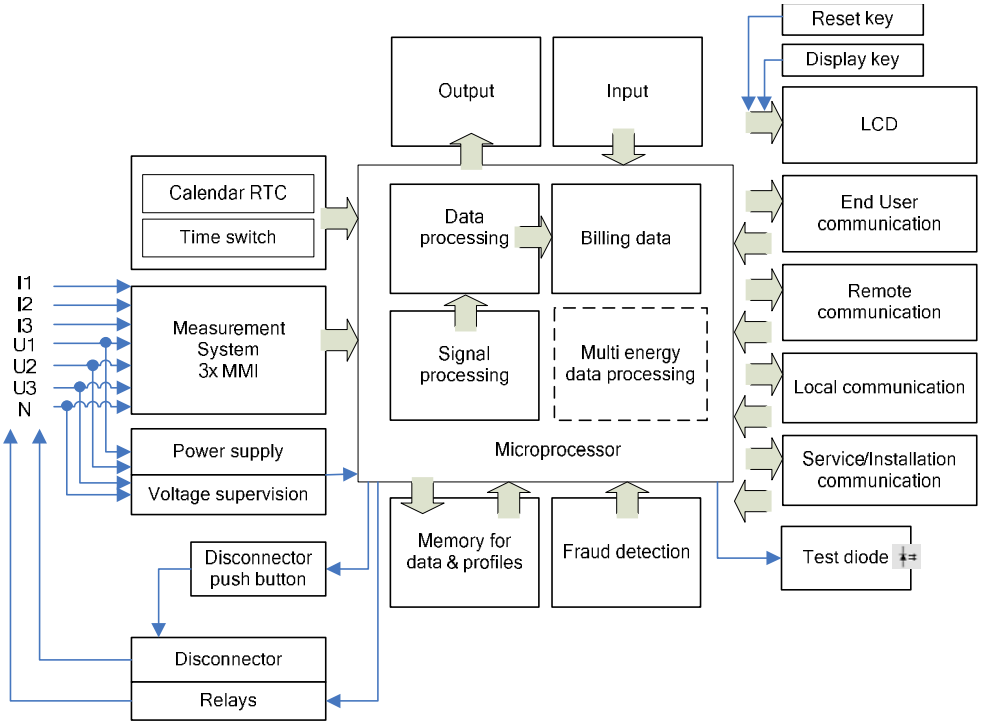


Fig. 1.2 Block diagram

Inputs

The main meter inputs are:

- Phase connection (L1, L2, L3) and neutral for
  - energy measurement
  - power supply to the meter
  - PLC communication with communication module
- Display key
- Reset key
- Disconnector push button
- S0 pulse input
- Wired M-Bus interface supporting 1 multi-energy device

Outputs

The main meter outputs (some of which are also inputs) are:

- LCD to display measured values and the corresponding OBIS code
- Optical test output (red, for active and reactive energy)
- Mechanical on-off latching relay 5 A, 230 VAC or digital solid state relay 90 mA, 230 VAC (inverse function supported)
- Mechanical, normal open relay 8 A, 230 VAC (inverse function supported)
- Optical interface for automatic data readout on site by means of a suitable HHT (Hand Held Terminal) (also input)
- PLAN+ PLC communication interface for connection to a metering system via the low voltage network (also input)

Power supply The supply voltage for the meter electronics is taken from the three-phase system. It works correctly as soon as at least one phase and neutral are connected to mains voltage. In the event of mains failure a voltage monitor ensures the safe storage of meter data and manages the restart when mains voltage is restored.

Memory Meter parameters are stored in non volatile (FLASH) memory which protects the parameters in the event of power failure.

1.5.2 Signal Generation

Three DFS (Direct Field Sensor based on embedded coil measuring principle) measuring elements (one for each phase) measure the phase currents using the magnetic field of the current loops, and the phase voltages over a resistor divider. The analogue/digital converters transform both signals into digital voltage and current data. This data is then multiplied by a digital multiplier to produce an energy proportional value. The resulting value is fed into the microprocessor, which adds the value to the corresponding values of the other phases and the sum is then transferred into the corresponding energy registers (rate-dependent).

The microprocessor generates pulses for the test diode from the digital sum of the measured phase values according to the meter constant R.

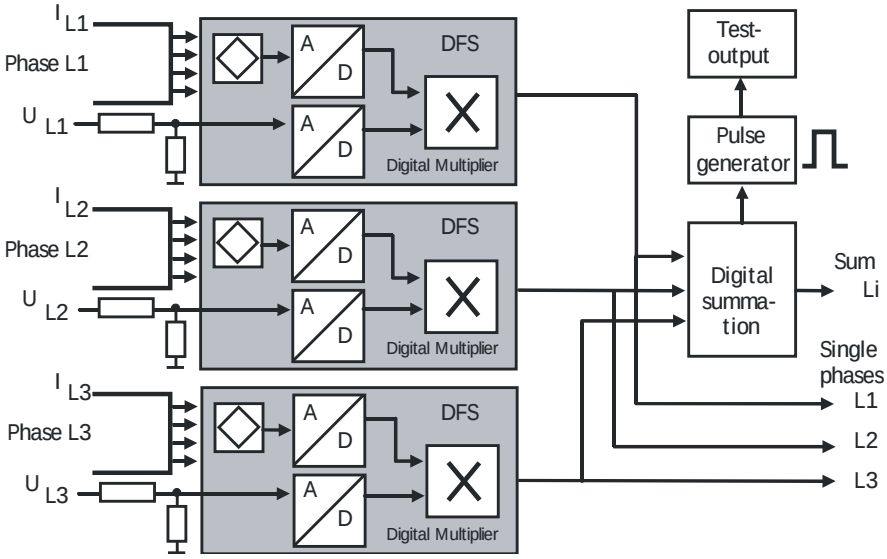


Fig. 1.3 Measurement block diagram

1.5.3 Signal Processing

The output values of the DFS are used as a basis for further calculations.

Calibration The measurement system is calibrated during the manufacturing process of the meter. Calibration data is stored in a non-volatile memory and cannot be altered.

Start detection The microprocessor compares the measured power with the minimum starting power. Signals are only passed on for summation if the minimum starting power is exceeded.

Measured quantities The following energy values can be measured and stored in the registers:

- Active energy (A)
- Reactive energy (R)
- Apparent energy (VA)

The signals +A and +R are calculated by the summation of *imported* measured active and reactive energy.

The signals -A and -R are calculated by the summation of *exported* measured active and reactive energy.

The combined totals are the sum of the absolute values of +A and -A or +R and -R.

Energy type:	kWh, kvarh, kVAh
Direction:	Import, export, ± reactive, reactive by quadrant
Instantaneous Values:	Voltage, current, frequency, active power, power factor

Measurement channels

There are 5 independent measurement channels. Each of the measured quantities is assigned to one of these channels.

Energy registers

Each measurement channel has a total energy register assigned to it.

24 rated energy registers can be assigned to one of the measurement channels by means of parameterisation.

All internal registers have 9 digits. The internal register magnitude is Wh (Watt-Hours). Internal registers cannot be reset, when the register reaches 999999999, it rolls over to 0. The display and readout formats vary from the internal format.

Rates

The meter is designed for up to 6 rates. The assignment of the rate registers is done by means of parameterisation.

Rate control

Rate control is performed by the built-in time of use (TOU).

Summation methods

Summation of the single phase values is done as follows:

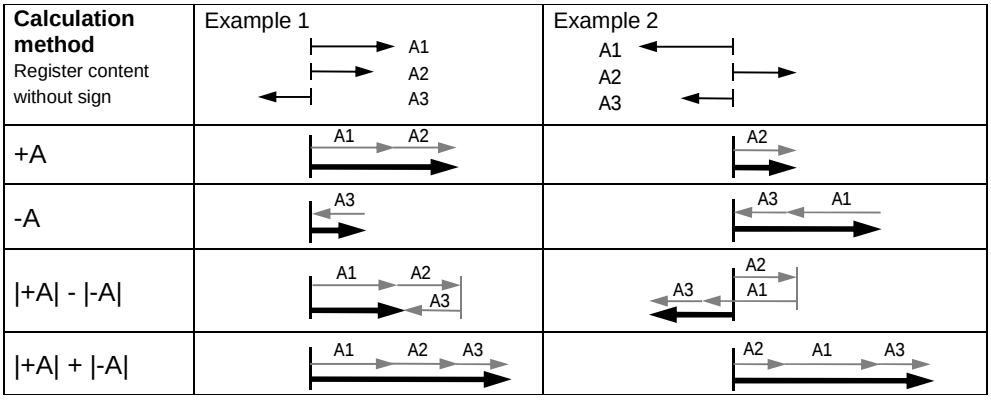


Fig. 1.4 Phase summation examples

Summation by magnitude: +A, -A

Summation by magnitude separates the positive from the negative values of the individual phases. Measured quantity +A therefore only includes the positive values of the individual phases (+A1 and +A2 in example 1), measured quantity -A only the negative values of the individual phases (-A3 in example 1), provided any are present.

In case of a connection error, the meter measures the real import and export energy correctly in the +A and -A registers.

Summation by absolute value: |+A| + |-A|

With this method the meter adds exported and imported energy. This method should only be used if the utility is sure there is no energy export.

The absolute magnitude summation can be used as an anti-tampering measure. Here negative magnitudes of A1, A2, A3 are added to the positive magnitudes of A1, A2, A3. See example above.

Subtraction by absolute value: |+A| - |-A|

With this method the meter subtracts the exported energy from the imported energy. It cannot detect a connection error.

Four-quadrant measurement

The reactive energy (±Rc, ±Ri) is allocated to the four quadrants as follows:

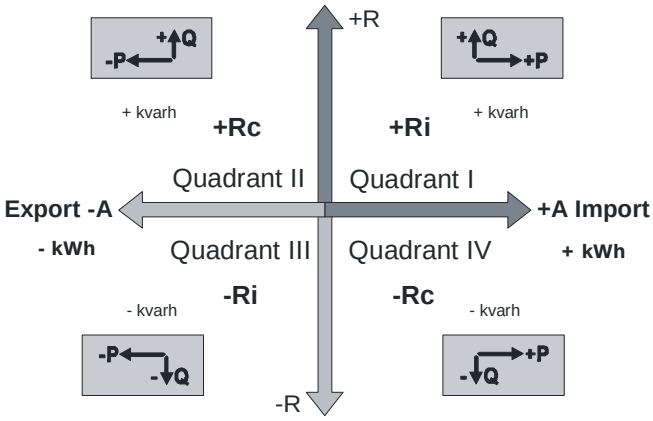


Fig. 1.5 Four-quadrant measurement

Channel configuration

The 5 measurement channels register fixed defined measurement quantities as given in the table below:

Description			OBIS code
ME1	Active energy import	+A (QI+QIV)	1.8.0
ME2	Active energy export	-A (QII+QIII)	2.8.0
ME3	Active energy combined total, absolute value	|+A|+|-A|	15.8.0
ME9	Reactive energy import	+R (QI+QII)	3.8.0
ME10	Reactive energy export	-R (QIII+QIV)	4.8.0

1.6 Relay Outputs

Relay output 1 (terminals 23 and 24) can be configured either as 90 mA solid state relay or as 5 A mechanical on-off latching relay.

Relay output 2 (terminals 25 and 26) is an 8 A mechanical normal open relay.

Both relay outputs of the E450 meters can be operated in normal mode or inverted mode. The inversion can be controlled either remotely or via the user interface.

In the inverted mode the relay functions are inverted, i.e. the relay will report state "open" if it is closed, and state "closed" if it is open. Similarly, the inverted relay will open after command "close", and will close after command "open".

The inverted mode allows to switch loads, e.g. boilers, by opening relay contacts, as common in specific countries.

In order to avoid many meters switching at the same time, the meter can be configured to randomly delay the switching instance for each relay output.

1.7 Disconnector

The E450 meter is equipped with a disconnector to connect or disconnect the premises of the consumer. The disconnector can be operated manually via push button, remotely by commands via any communication channel, via input or locally through control functions integrated in the meter itself.

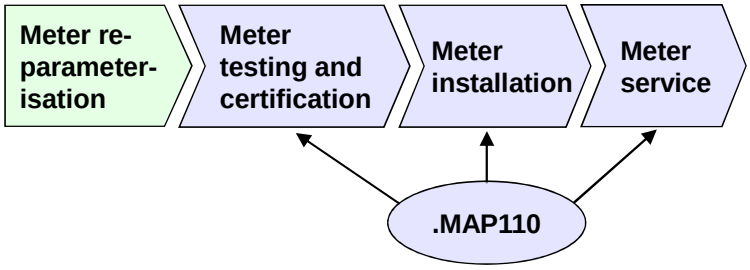
Disconnector control is designed so that it enables the customer to use the disconnector as:

- A manual switch for connecting or disconnecting the customer premises
- A manual switch for disconnecting the premises when the customers move away
- Disconnection if max. power has been exceeded over a specified time
- Bad payers can be either completely disconnected, with no possibility to reconnect locally or alternatively, the maximum demand can be limited remotely.
- Others

Disconnector not suitable as main switch
Do not use the disconnector as a main switch for installation or maintenance purposes. The disconnector is not equipped with a thermal and/or short circuit protection device.

1.8 Software Tools

Landis+Gyr provide software tools to ensure optimum support of the meters throughout the products life. The Landis+Gyr .MAP110 Service Tool is used for the test and installation of meters and for field servicing.



For a list of functions available in the .MAP110 Service Tool, please see .MAP documentation and the functional description of E450 meters.

2 Safety

2.1 Safety Information

The following symbols are used to draw your attention to the relevant danger level, i.e. the severity and probability of any danger, in the individual chapters of this document:

Danger
Identifies an extraordinarily great and immediate danger that could lead to serious physical injury or death.

Warning
Indicates a potentially hazardous situation that may result in minor physical injury or material damage.

Note
Indicates general details and other useful information to help you with your work.

In addition to the danger level, safety information also describes the type and source of the danger, its possible consequences and measures for avoiding the danger.

2.2 Responsibilities

The owner of the meters – usually the utility company – is responsible for assuring that all persons engaged in working with meters:

- Have read and understood the relevant sections of the user manual.
- Are appropriately qualified for the work to be performed.
- Strictly observe the safety regulations (laid down in *section* 2.3) and the operating instructions as specified in the individual sections.

In particular, the owner of the meters bears responsibility for the protection of persons, prevention of material damage and the training of personnel.

For this purpose, Landis+Gyr provides training on a variety of products and solutions. Please contact your local Landis+Gyr representative if interested.

2.3 Safety Regulations

The following safety regulations must be observed at all times:

- The meter connections must be disconnected from all voltage sources during installation or when opening.
- Contact with live parts can be fatal. The main 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. Only technically qualified and appropriately trained personnel are authorised to install the meters.
- Protection earth connection must not be switched with the disconnector.
- Only "useful" tools have to be used. This means a screw driver has to have the correct size for the screws and the metallic part of a screw driver has to be insulated.
- The meters must be held securely during installation. They can cause injuries if dropped.
- Meters that have been dropped must not be installed, even if no damage is apparent, but must be returned to the service and repair department (or the manufacturer) for testing. Internal damage may result in malfunctions or short-circuits.
- The meters must never be cleaned under running water or with compressed air. Water ingress can cause short-circuits.

3 Mechanical Construction

3.1 Case

The meter case is made of antistatic plastic (polycarbonate). The LCD display and the display key are always visible. The (optional) sliding cover protects the optical port, pulse LED, disconnector push button and utility sealable reset key.

Sliding cover

The E450 sliding cover has three positions:

- Normal position (see *Fig. 3.1*)
- Service position (see *Fig. 3.2*)
- Read out position (see *Fig. 3.3*)
- Installationsposition (see *Fig. 3.4*)

In the **normal position** the display and display key are visible but the optical port and disconnector push button are covered.

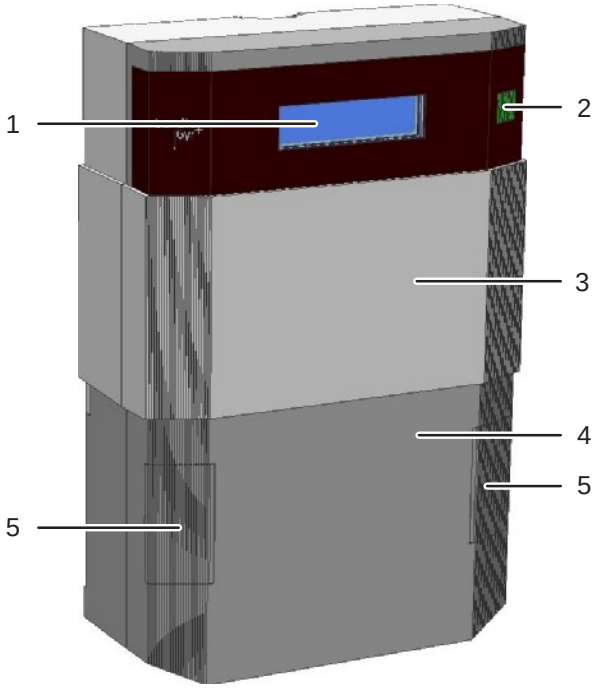


Fig. 3.1 Sliding cover in its normal position

1 Display
2 Display key
3 Sliding cover (optional)
4 Terminal cover
5 Sealing screw covers

When the cover is slid upwards to the **service position** the bar code is visible underneath the sliding cover.

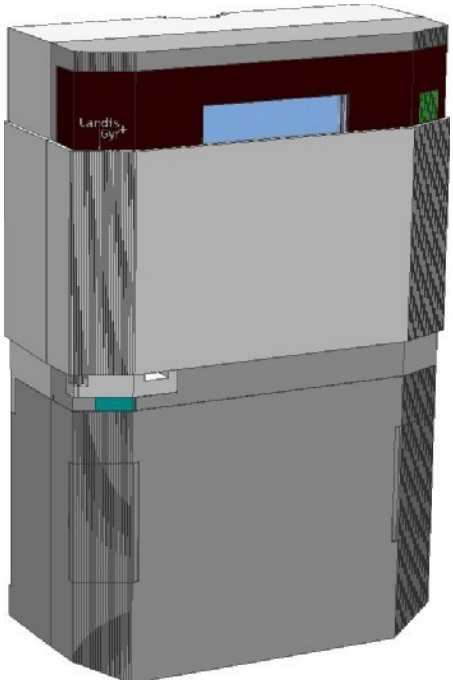


Fig. 3.2 Sliding cover in the service position

In the **read out position** the cover is slid downward so that the optical port and disconnector push button are revealed. In this position the cover for the reset key can be opened.

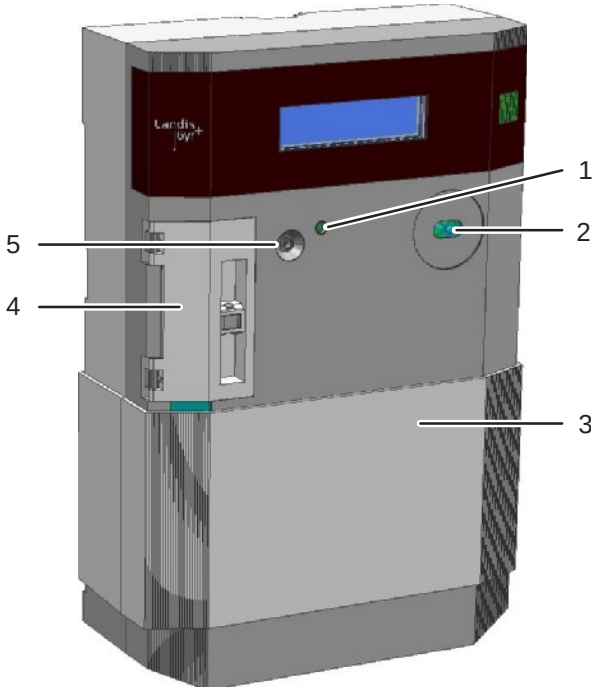


Fig. 3.3 Sliding cover in the read out position

1 Pulse output LED
2 Optical interface
3 Sliding cover (optional)
4 Sealable reset key cover
5 Disconnector push button

When the cover is slid downwards to the **installation position** the sealing screw covers can be opened and the terminal cover can be removed together with the sliding cover.

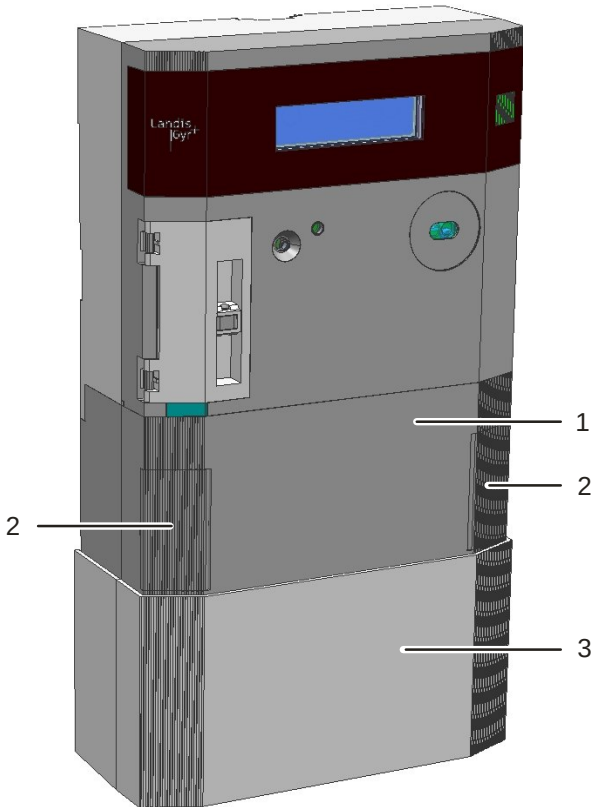


Fig. 3.4 Sliding cover in the installation position

1 Terminal cover
2 Sealing screw covers
3 Sliding cover (optional)

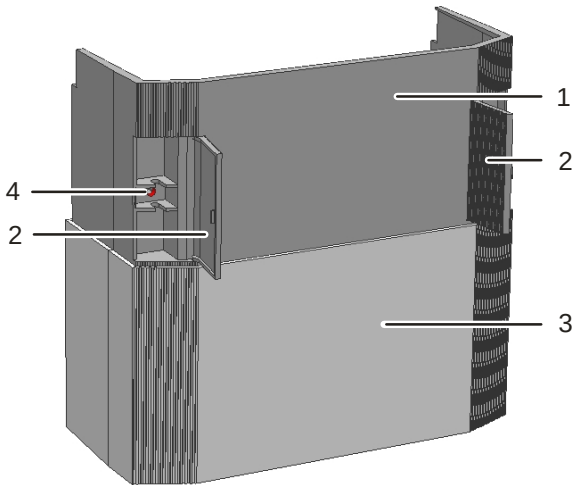


Fig. 3.5 Removed terminal cover with sliding cover

1 Terminal cover
2 Sealing screw covers (open)
3 Sliding cover (optional)
4 Terminal cover sealing screw

3.2 Faceplate

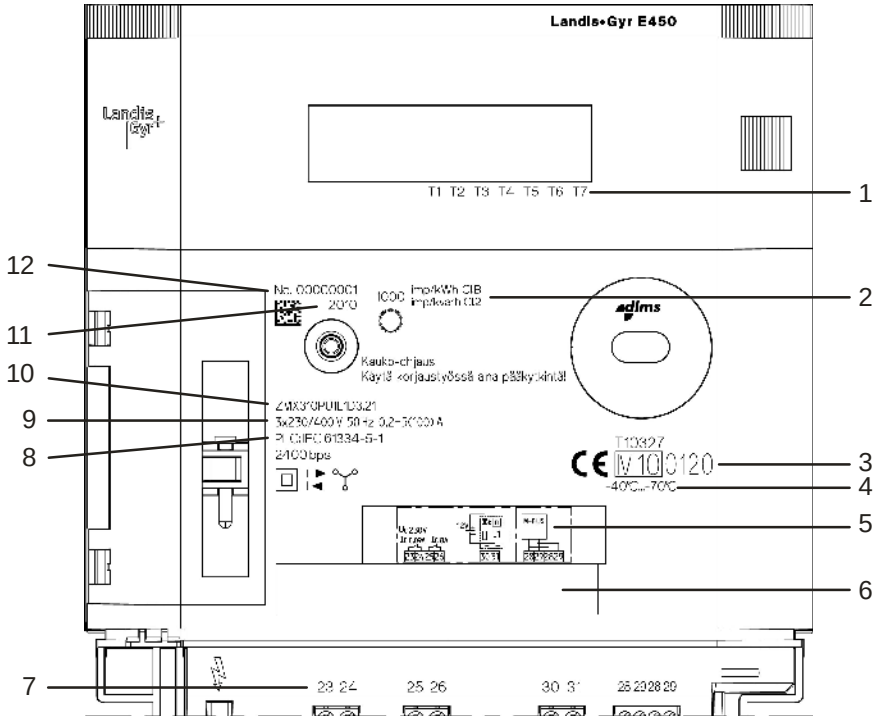


Fig. 3.6 E450 faceplate

1 Display arrow inscription
2 Impulse constant of test LED and class for active and reactive measurement
3 Approval number
4 Nominal operating temperature range
5 Auxiliary terminal connection diagram
6 Property plate
7 Auxiliary terminal number inscription
23/24: 90 mA solid state relay or optional 5 A latching relay (relay output 1)
25/26: 8 A mechanical relay (relay output 2)
30/31: S0 input
28/29: Optional wired M-Bus
8 Remote communication type
9 Nominal connection values (voltage, frequency, current range)
*10 Meter type (post-fix .**S2** indicates second generation)*
11 Year of manufacture
12 Serial number with a 2D bar code

3.3 Control Elements

The E450 meter has three control buttons:

- A display key for scrolling through menus.
- A disconnector push button for locally resetting the disconnector.
- A reset key for entering the service menu, setting the time and date or manual billing reset, located under a sealable cover.

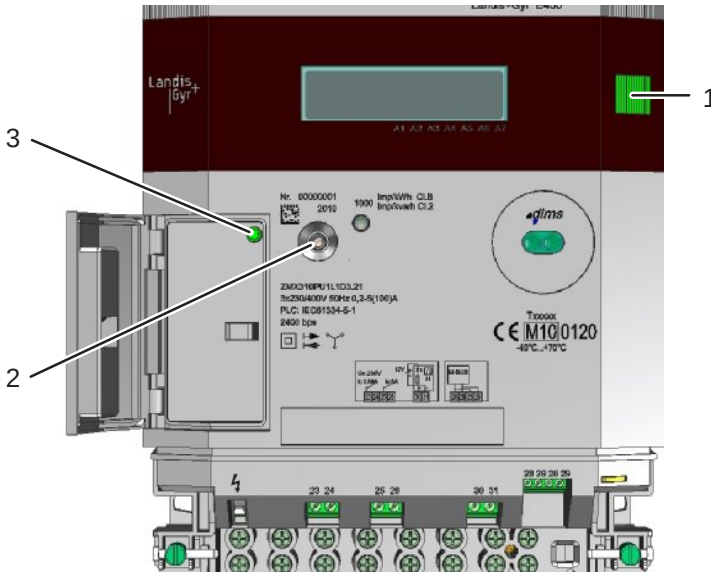


Fig. 3.7 Control elements

1 Display key
2 Disconnector push button
3 Reset key

The reset key can be protected with an utility seal by using a standard plastic pin.

The disconnector push button is protected by the slider. This button is positioned in a depression in the case to prevent accidental operation of the button.

3.4 Dimensions

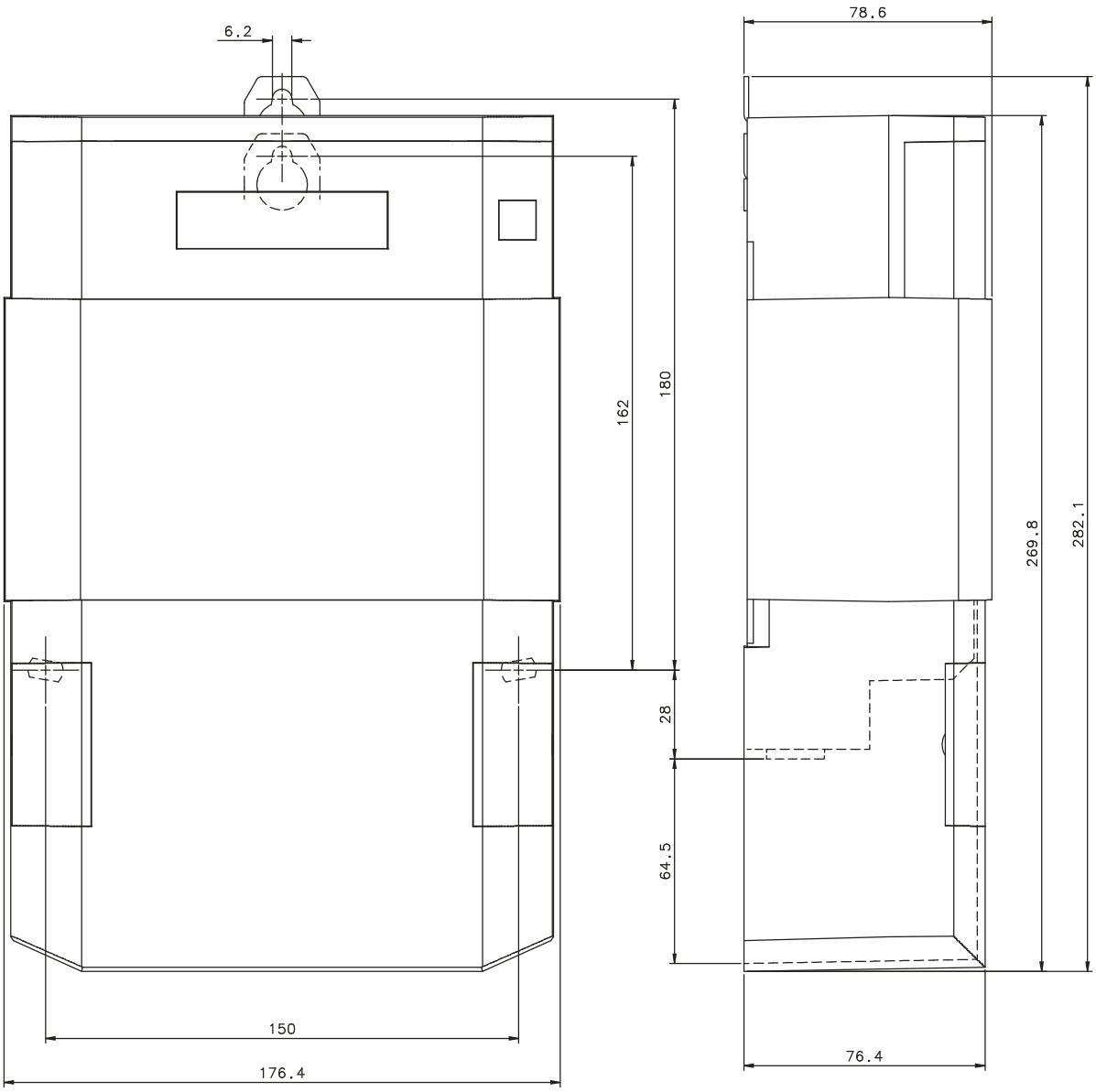


Fig. 3.8 Meter dimensions

3.5 Connections

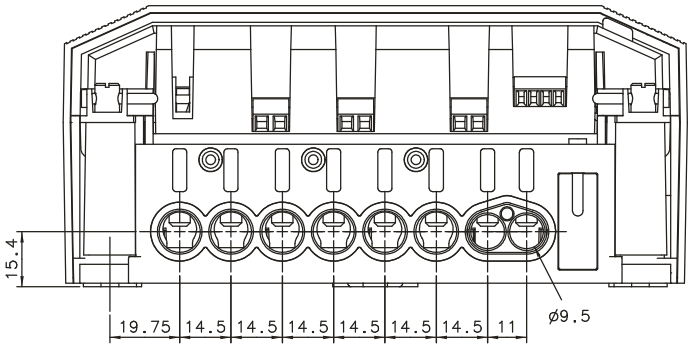


Fig. 3.9 Terminal layout and dimensions

The terminals have an opening diameter of 9.5 mm.

3.6 Connection Diagrams (Examples)

Where to find relevant diagrams
The diagrams relevant for the installation are shown on the meter's face-plate (inputs/outputs) and inside the terminal cover (mains connections).

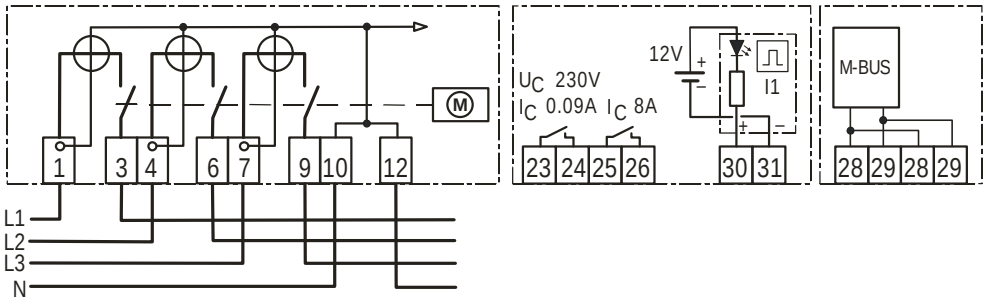


Fig. 3.10 Connection diagram with disconnector and 90 mA solid state relay option

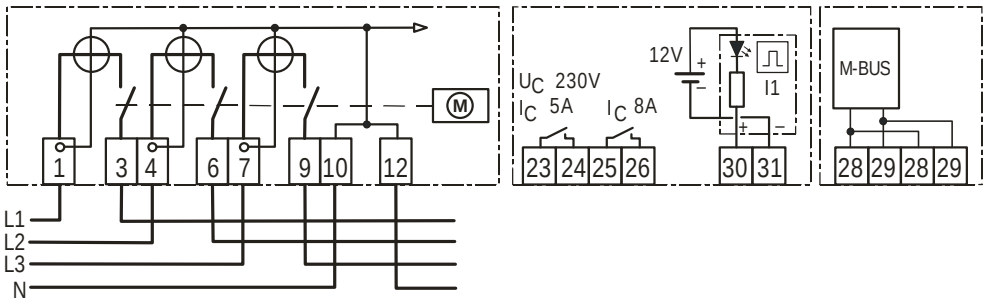


Fig. 3.11 Connection diagram with disconnector and 5 A mechanical relay option

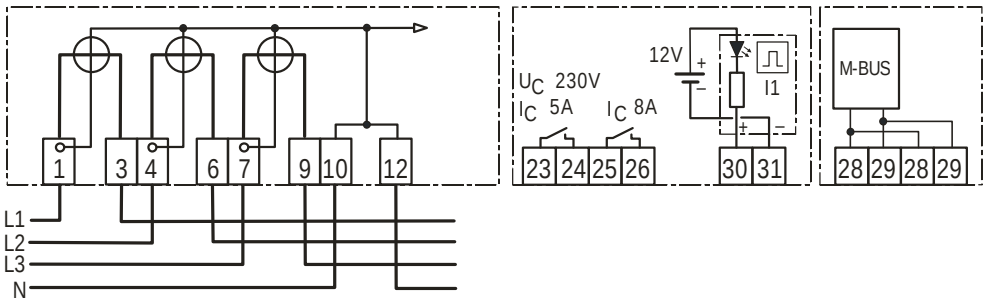


Fig. 3.12 Connection diagram without disconnector and 5 A mechanical relay option

4 Installation

Do not touch live parts
Dangers can arise from live electrical installations to which the meters are connected. Touching live parts is dangerous to life. All safety information should therefore be strictly observed.

Intended environmental conditions for meter installations:

- The meter is intended to be installed in a mechanical environment "M1", with shock and vibrations of low significance, as per 2004/22/EC Directive.
- The meter is intended to be installed in electromagnetic environment "E2", as per 2004/22/EC Directive.
- Meters are to be installed indoors.
- Meters are to be installed in non condensing humidity conditions.
- Meter should be installed with copper conductors. The use of aluminium conductors can result in corrosion. Please seek advice before using this meter with aluminium conductors.
- The installation site must meet the requirements of the device's protection class (IP53) and the operating temperature range (-40 … +70°C). The E450 is intended for indoor use, but outdoor installation is possible with external housing and warming/cooling (then other temperatures are possible). Avoid installing the device on south-facing walls and direct sunlight. If necessary, use an additional shield or visor to protect the outdoor installation case from direct sunlight (shield not provided by Landis+Gyr).

4.1 Introduction

The following conditions must be met for installation and commissioning of the meter:

- The work described below must only be conducted by technically qualified and suitably trained persons.
- These persons must be familiar with and observe the local safety regulations.
- Strict observance of the details contained in *section* 2 *"Safety"*, in particular the safety regulations, as well as safe operation.
- Before starting work ensure that the materials and tools required are all present.

4.2 Before Installation

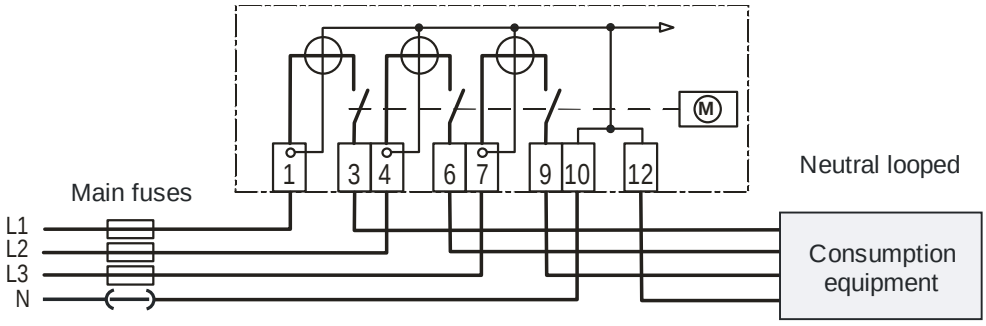


Fig. 4.1 Meter connection with 3 phases and neutral

Dangerous voltage on conductors
The connecting wires at the place of installation must not be live when fitting the meter. Touching live parts is dangerous to life. The main fuses should be removed and kept in a safe place until work is completed, so that they cannot be replaced by anyone unnoticed.

No overcurrent protection and automatic disconnection
As the meter has no internal overcurrent protection and no method of disconnection from the mains, this must be provided by the end installation.

Protect disconnector against overcurrent
In case the meter has a disconnector, this must be protected against overcurrent. As the disconnector is not equipped with a thermal and/or short circuit protection device, it needs to be protected with an external fuse or overload switch.

4.3 Mounting

Observe safety instructions
Prior to start mounting of the meter read and strictly observe the general safety instructions given in *section 4.2 "Before Installation"*.

The meter should be mounted as follows on the meter board or similar device provided for this purpose (see also *section 3.4 "Dimensions"*):

1. Find the correct position for the meter. Ensure there are no wires underneath the holes to be drilled.
2. Determine the desired form of fixing (open or covered meter mounting).

3. Set the meter suspension eyelet in the correct position. It can be moved up or down over the stop on the back side of the meter. See following figure.

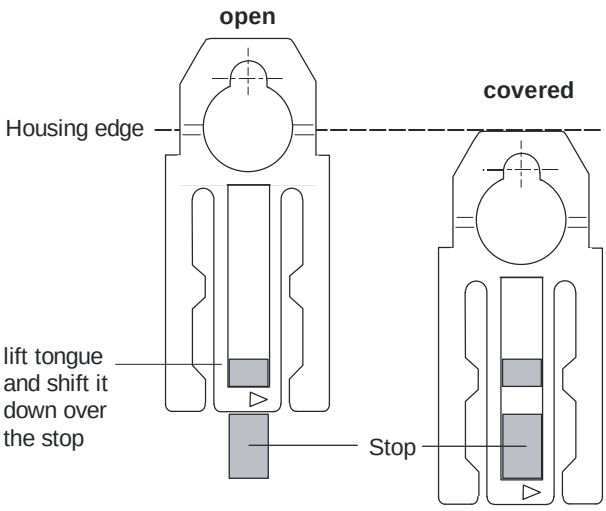


Fig. 4.2 Suspension eyelet positions

4. Check whether the connecting wires are live using a phase tester or universal measuring instrument. Remove the main fuses and keep them in a safe place until installation is completed.
5. Mark the three fixing points on the mounting surface (see *Fig. 4.3*):
   - horizontal base of suspension triangle = 150 mm
   - height of suspension triangle = 162/180 mm

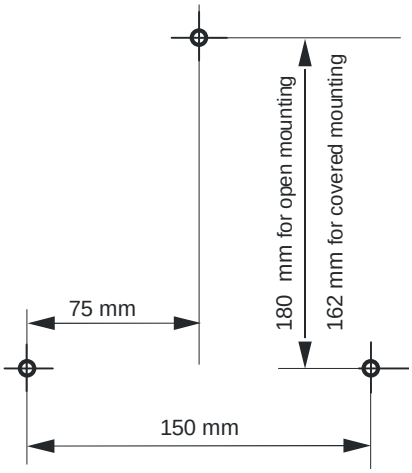


Fig. 4.3 Drilling plan

6. Drill the three holes.
7. Move the sliding cover to its installation position, open the sealing screw covers and unscrew the meter terminal cover.
8. Fit the meter with the three fixing screws on the mounting surface.
9. Connect the phase connection wires and the inputs and outputs as described in *section 4.4 "Connecting"*.

4.4 Connecting

Observe safety instructions
Prior to start connecting of the meter read and strictly observe the general safety instructions given in *section 4.2 "Before Installation"*. The meter must be mounted as described in *section 4.3 "Mounting"* before it is connected.

4.4.1 Connecting the Phase and Neutral Connection Wires

1. Cut the phase and neutral connecting wires to the required length and strip their ends.
   The insulation of the connecting line must extend as far as the terminal indentation, i.e. there must be no further bare part of the connecting line visible above the terminal edge. The stripped part of the connecting wire should be shortened if necessary.
2. If stranded wire is used as a phase and neutral connection line, it has to be provided with a ferrule for connection.

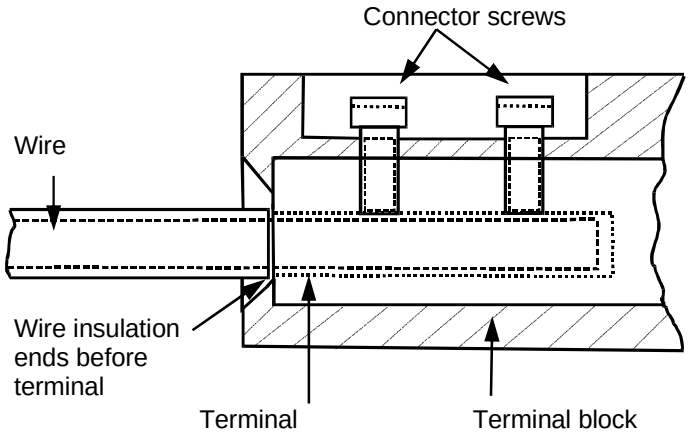


Fig. 4.4 Phase connection terminal

3. Insert the phase and neutral connecting wires in the relevant terminals (the terminals are numbered as shown in the connection diagram) and tighten the terminal screws firmly (torque max. 3 Nm).
   - For wires with small conductor cross-sections (≤ 6 mm^2) the connecting line must be placed carefully in the middle of the terminal, so that it cannot move sideways when tightening the terminal screws. When tightening, ensure that the connecting line remains between the copper inside the terminal and the screw.
   - It is recommended that the beginning and end of the relevant conductors are identified using a suitable test unit (e.g. buzzer) to ensure that the right consumer is connected to the meter output.

Insufficiently tightened screws causes power loss
Failure to tighten terminal screws sufficiently can lead to power loss and heating. Note: A contact resistance of 1 mΩ causes a power loss of 10 W at 100 A.

Do not withdraw connecting wires with closed terminals
Never withdraw connecting wires with the terminal closed, as this can damage the terminal.

4.4.2 Connecting Inputs and Outputs

Avoid any contact of input and output wires with mains terminals
The inputs and outputs are usually insulated circuits or extra-low voltage circuits. Avoid any contact of input and output wires with phase connection terminals by proper arrangement of the wires under the terminal cover. Make sure that the input and output wires are not squeezed or damaged in the vicinity of the phase connection terminals.

Connect the respective wires to the S0-input, the relay outputs and the M-Bus interface (if required).

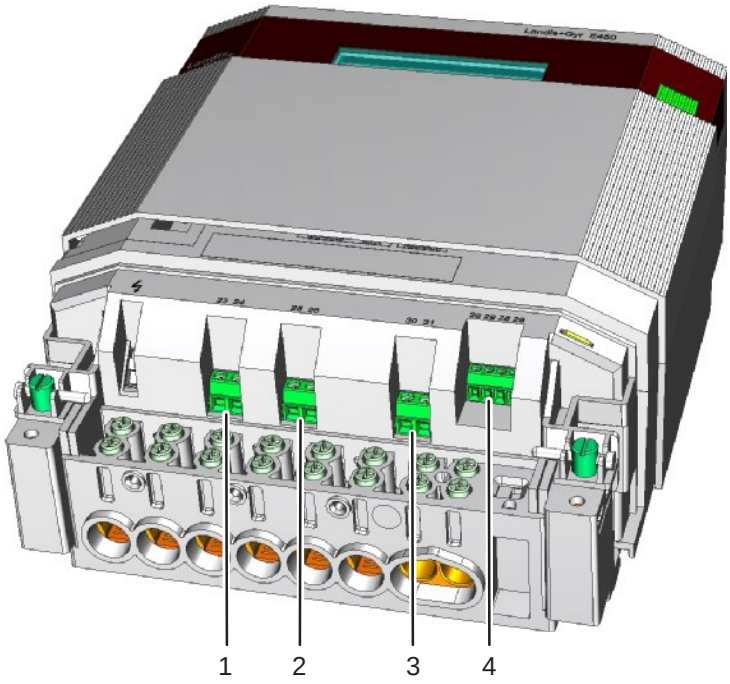


Fig. 4.5 I/O terminal positions

1 Relay output 1: connectors 23, 24
2 Relay output 2: connectors 25, 26
3 S0 input: connectors 30, 31
4 M-Bus: connectors 28, 29 (optional)

Relay outputs require overcurrent protection
The relay outputs 1 and 2 must be protected against overcurrent by external fuses. Overcurrent will damage the relay!
Relay output 1: 250 VAC/90 mA or optional 5 A maximum current (depending on configuration)
Relay output 2: 250 VAC/8 A maximum current

4.4.3 Checking the Phase Connections and the Input/Output Connections

Before putting the meter into operation the following points must be checked and corrected if necessary:

1. Has the correct meter (with correct identification number) been installed at the measuring point of the relevant consumer?
2. Are all thrust screws for the phase connections and neutral tightened sufficiently?
3. Are the mains inputs and outputs connected correctly? The conductor from the house connection or from the main fuse must be present at the input, those of the meter to the consumer at the output.
4. Is the neutral conductor connected to terminals 10 and 12?
5. Are the auxiliary inputs (S0, M-Bus) and outputs (relays) connected correctly?
6. Attach the terminal cover.
7. Close the terminal cover's sealing screw covers.
8. Move the sliding cover to its normal position.
9. Check the installation as described in *section 4.5 "Commissioning and Functional Check"*.

4.5 Commissioning and Functional Check

The installed meter should be put into service and checked as follows:

1. Insert the main fuses removed before installation. The meter is switched on.
2. Check the display (no error message) and with no load connected that the virtual output (creep indicator) is displayed.
3. Connect a load and check that the output LED starts blinking.
4. Check that the meter is measuring correctly. Display indicators and their functions are described in *section 5.1 "Display".*
5. Perform the set-up process for the required communication devices (PLC interface, connected M-Bus devices) as described in *section 4.6 "Installation Support for Communication* Devices". If PLC concentrators have already been installed on the network and if the new meter search has been activated in the concentrator also check the PLC device communication status in the installation list: **PLc100.00** must be displayed.

---

i **PLC concentrators must have been installed**
Communication check can be performed only if PLC concentrators have already been installed on the network. A PLC concentrator automatically identifies devices operating in its communication area and adds them to the concentrator's topology in the system and automatic reading can begin. See concentrator and system documentation for more information.

---

6. Check that the disconnector is closed (see disconnector state indication on display), otherwise press disconnector push button.
7. When the meter is successfully installed and PLC device communication status is OK, seal the terminal cover and move the sliding cover to its normal position.

4.6 Installation Support for Communication Devices

Remote and local communication devices can be installed using the display user interface. A general description of the display user interface is given in *section 5.1 "Display"*.

4.6.1 Entering the Service Menu

The service menu can be entered as follows:

1. Briefly press the display key. The display check appears on the display.
2. Briefly press the reset key. The first item of the service menu **Ser_dAtA** appears on the display.
3. Once **Ser_dAtA** is displayed, the other menu items can all be obtained by briefly pressing the display key. Press the display key until the menu item **InStALL** is displayed and then press the display key for > 2 seconds.

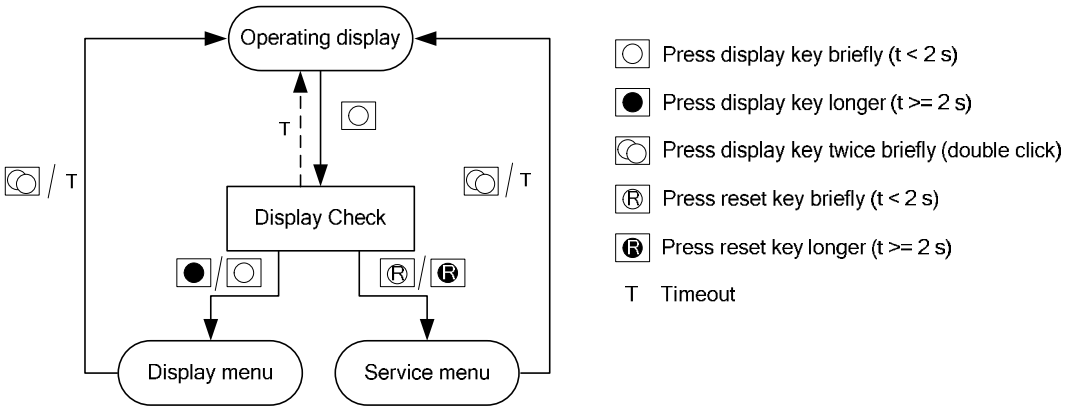


Fig. 4.6 Entering the service menu

Fig. 4.7 shows the submenus which can be accessed from the installation menu. Navigation within the installation menu follows the same guidelines as for the display menu: One short key press to go to the next submenu or a long key press to enter the submenu.

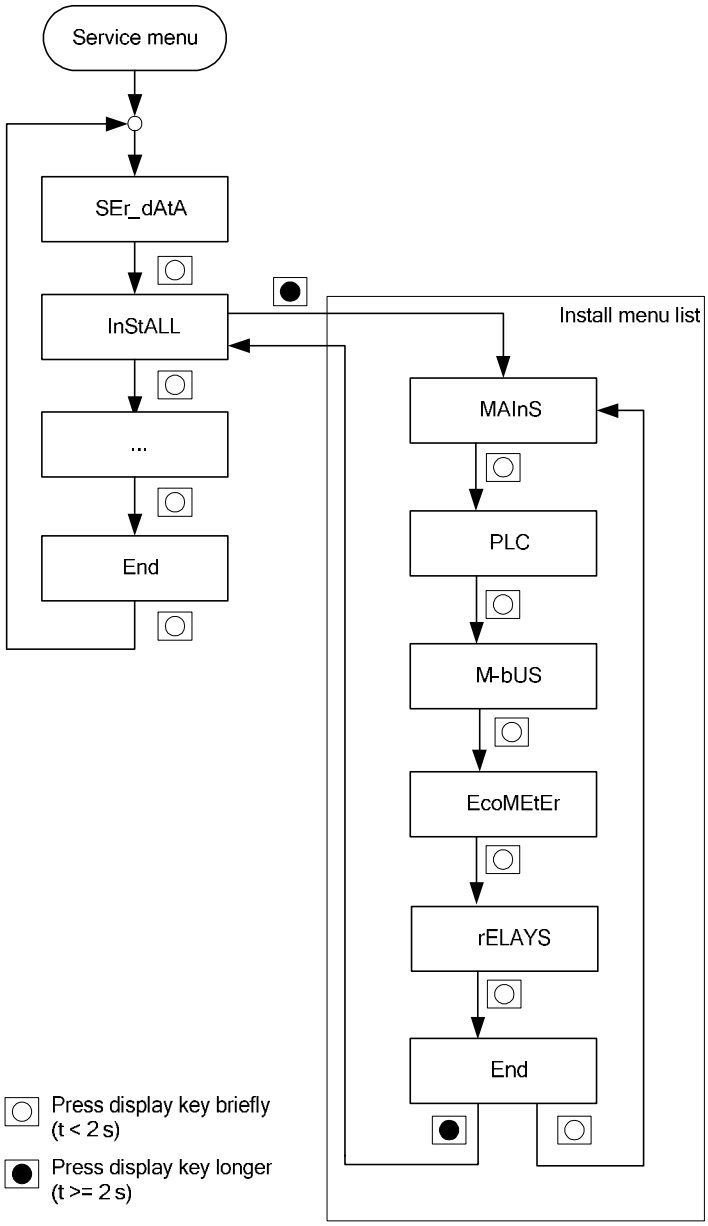


Fig. 4.7 Install menu list

4.6.2 Mains Connection

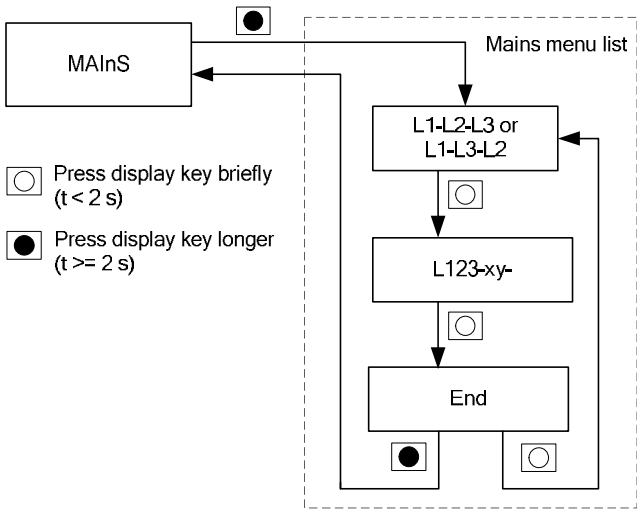


Fig. 4.8 Mains menu list

The **MAInS** submenu indicates whether the mains connection is done in the correct manner, i.e. if all three phases are connected in the correct order.

The **L1-L2-L3** or the **L1-L3-L2** indication displays field rotation information. The value shows the phase directional rotation for example L1-L2-L3 indicates anticlockwise with angles 0, 240 and 120, while L1-L3-L2 indicates clockwise with angles 0, 120 and 240.

L123-xyz indicates the energy directions for L1 (x), L2 (y) and L3 (z), where x, y and z can have the values "n" for negative energy direction, "P" for positive direction or "-" if there is no current flowing through the phase.

4.6.3 PLC Communication

4.6.3.1 PLC Menu

The **PLC** menu helps during the installation of a meter with a PLC module or if communication problems are found. The **PLC** menu consists of four displays (see *Fig. 4.9*): PLC device communication status, MAC address, initiator MAC address and Reset PLC.

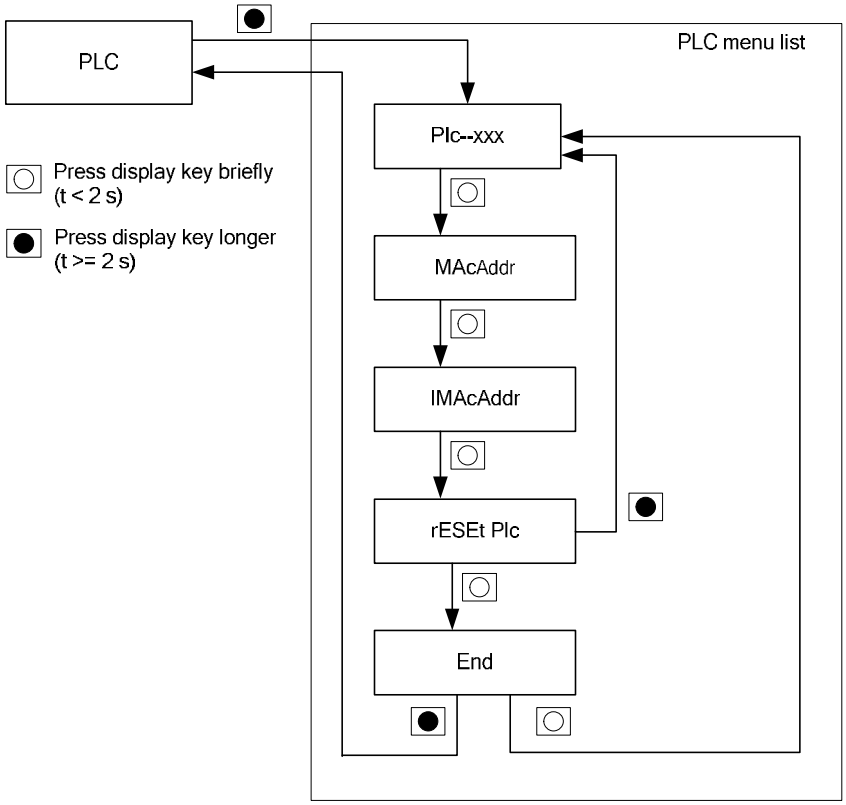


Fig. 4.9 PLC menu list

PLC device communication status

The **Plcxxx.xx** indication displays the PLC device communication status, where xxx.xx has the meaning shown in the following table:

Display (value field)	Description
	Error (no information from PLC chip – failure).
	Meter is not synchronised to the 50 Hz mains, the meter at this time is not registered at data concentrator & data concentrator is also still unknown (unlocked) – coldstart state when no DC in the network.
	Meter is not synchronised to the 50 Hz mains and meter is not registered at data concentrator but data concentrator known (locked).
	Meter is not synchronised to the 50 Hz mains but meter is registered at data concentrator.
	Meter is synchronised to the 50 Hz mains and meter is not registered at data concentrator, data concentrator unknown (unlocked).
	Meter is synchronised to the 50 Hz mains and meter not registered at data concentrator but data concentrator known (locked) – synchronisation in progress.
	Meter is synchronised to the 50 Hz mains and meter is registered at data concentrator – Correct installation!

MAC address

The MAC address indication displays the OBIS code (hex coded with 3 characters i.e. "FFE") together with **MAcAddr** in the value field.

Initiator MAC address

The Initiator MAC address indication displays the OBIS code (Hex coded with 3 characters i.e. "FFE") together with **IMAcAddr** in the value field.

Reset PLC

When pressing the display key for > 2 seconds, the meter will be set to PLC NEW state, i.e. the data concentrator and the meter get "un-bundled". The PLC device communication status is displayed again afterwards.

4.6.4 Wired M-Bus Communication

4.6.4.1 Installation of Wired M-Bus Devices

i For a successful installation of an M-Bus device, the meter must be properly pre-configured. The configuration can be changed with the Landis+Gyr .MAP110 Service Tool.

Fig. 4.10 shows the process for installation of a wireless M-Bus device to channel 1. The same procedure applies to any of the 4 available channels.

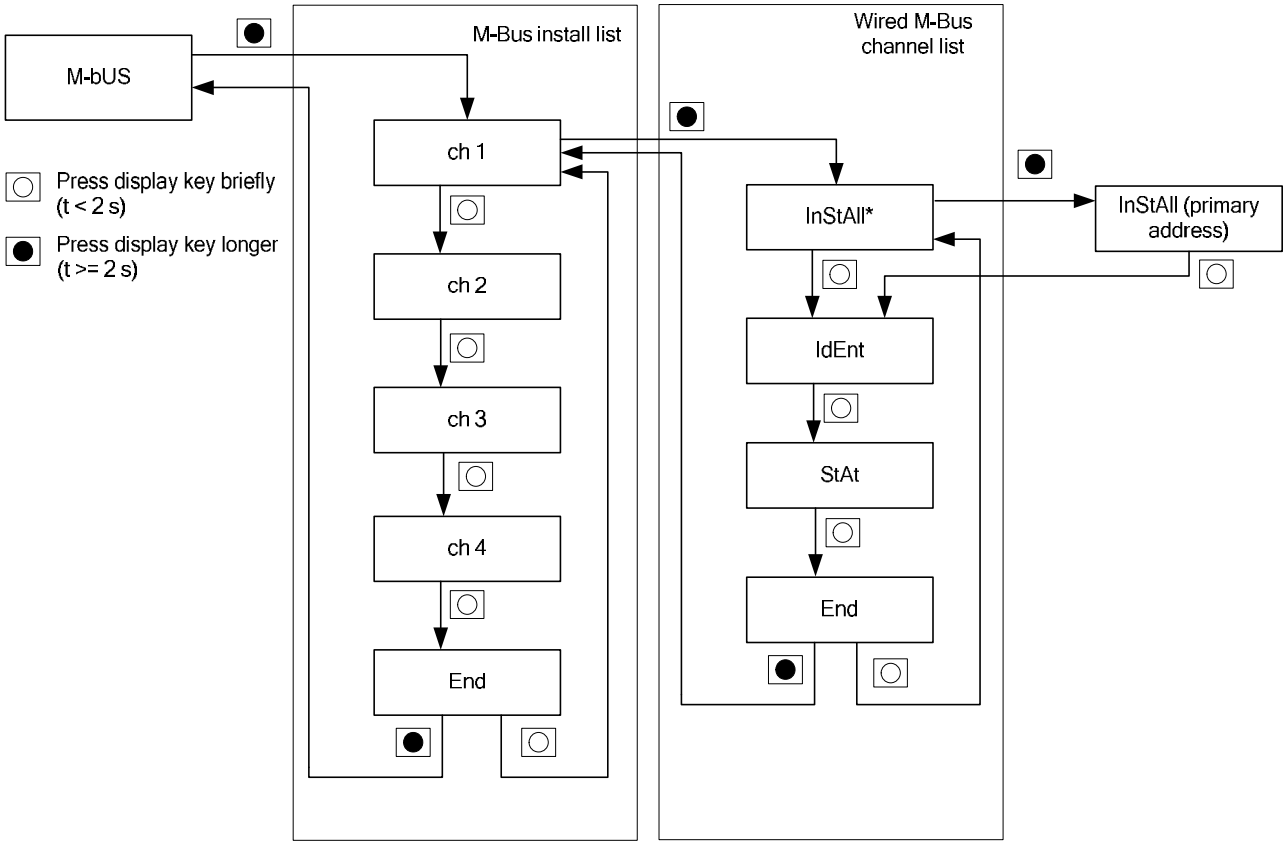


Fig. 4.10 Installation of a wired M-Bus device

4.6.4.2 De-installation of Wired M-Bus Devices

If an M-Bus device was already successfully installed, it is possible to de-install the device from the selected channel by entering the **unInSt** menu. After de-installing, the **InStaLL** display is shown again.

Fig. 4.11 shows the process for de-installation of a wireless M-Bus device from channel 1. The same procedure applies to any of the 4 available channels.

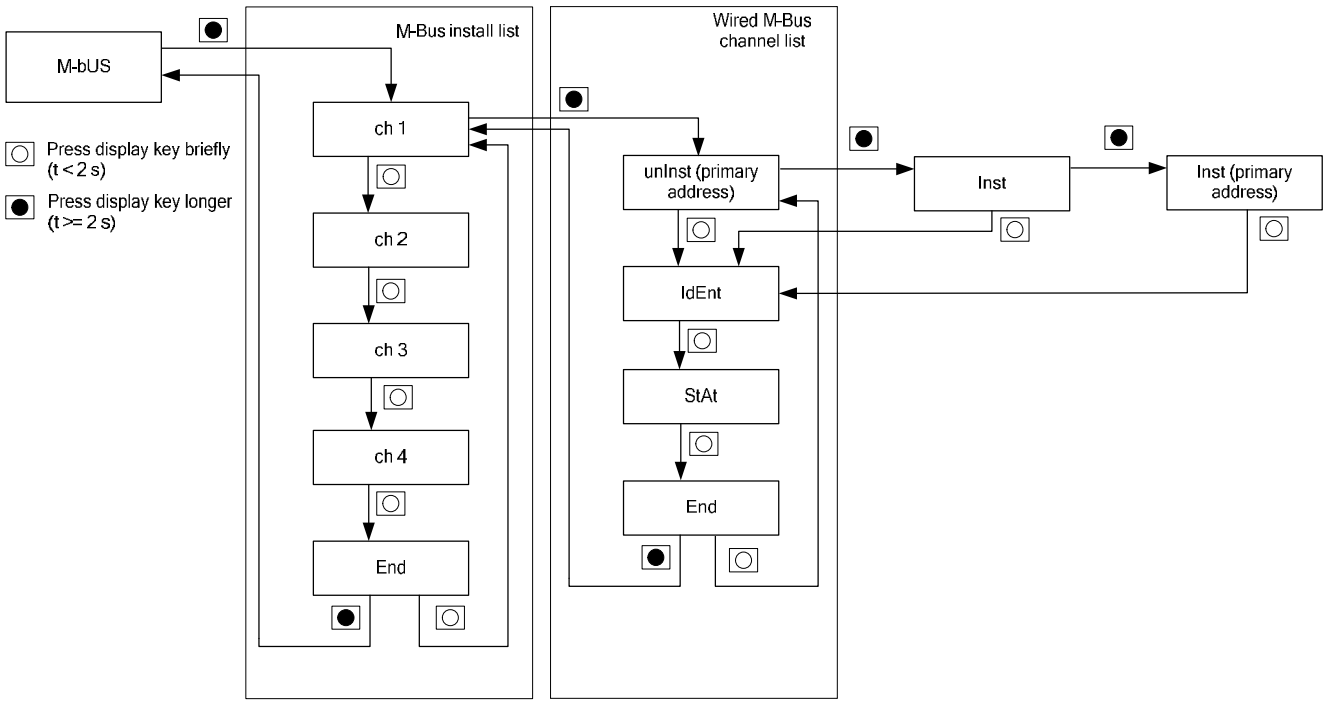


Fig. 4.11 De-installation of a wired M-Bus device

4.6.5 Setting-up Relay Inversion

In the **rELAYS** menu the mode of the two relays can be configured either for normal mode or for inverted mode (description see *section 1.6 "Relay Outputs"*).

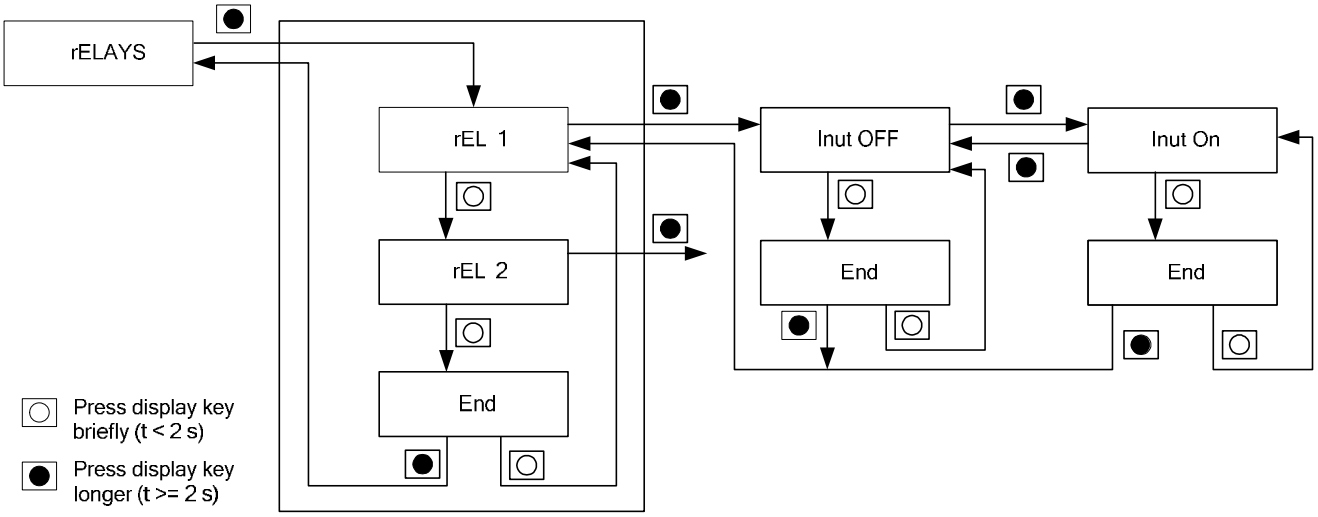


Fig. 4.12 Relay mode selection

Proceed as follows to set the mode for relay 1 or 2:

1. Browse to the **rELAYS** service menu.
2. Choose a relay submenu (**rEL 1** for relay 1 or **rEL 2** for relay 2).
   The data field shows the current mode: "Inut OFF" (normal mode, i.e. inversion is off) or "Inut On" (inverted mode, i.e. inversion is on).
   The index field shows "rELAY".
3. Select normal mode **Inut OFF** or inverted mode **Inut On** by pressing the display key for > 2 seconds while in the **rEL 1** or **rEL 2** submenu.
   The display will flash "On" (if you are turning the inversion on) or "OFF" (if you are turning the inversion off) for three seconds, then it will show the new state "Inut On" or "Inut OFF".
4. Briefly pressing the display key terminates the setting.
   The value field shows **End**.
5. Pressing the display key for > 2 seconds returns from the current relay submenu back to the **rELAYS** service menu.

4.7 De-installing the Meter

Remove main fuses before disconnecting
The connecting wires at the place of installation must not be live when removing the meter. Touching live parts is dangerous to life. The corresponding main fuses should be removed and kept in a safe place until work is completed, so that they cannot be replaced by anyone unnoticed.

Remove the meter from the network as follows:

1. Switch off the voltage. The display goes off.
2. Move the sliding cover to the installation position.
3. Open the sealing screw covers and remove the seals.
4. Release and remove the terminal cover.
5. Ensure with a phase checker that the connecting wires have no voltage. If there is voltage, remove the main fuses.
6. Remove the connecting wires of the inputs and outputs, if available.
7. Loosen the terminal screws of the phase and neutral connecting wires with a suitable screwdriver and withdraw the wires from the terminals.
8. Unscrew and remove the meter.
9. Fix a substitute the meter with the three fixing screws on the mounting surface.
10. Connect the substitute meter as described in *section 4.4 "Connecting"* and the following sections.

5 Operation

5.1 Display

5.1.1 Basic Layout

The basic layout shows all indication possibilities of the display.

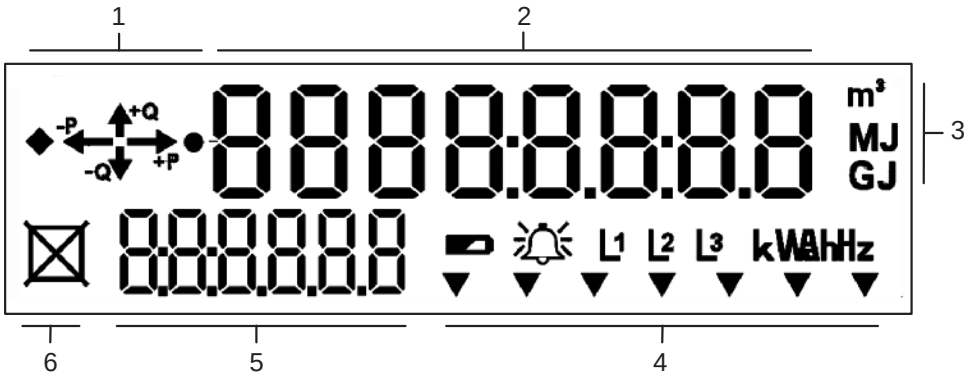


Fig. 5.1 LCD display

1 Energy direction and creep indication
2 Value field
3 Multi-energy measurement units
4 General purpose arrows and symbols (battery exhausted, alarm, phase presence and field rotation, electricity measurements units)
5 Index field
6 Disconnector state indication

5.1.2 Display Symbols

Energy direction

The energy direction field shows energy flow by quadrants, e.g. if the energy is in the 1st quadrant, +Q and +P arrows are lit. If in the same time in at least in one of the phases the reverse active energy is measured also the -P arrow is shown but as blinking.

Creep indication

As soon as the meter starts with the energy registration, active or/and reactive, the corresponding symbol is turned off.

Event	Symbol
Active energy below starting current	●
Reactive energy below starting current	◆
Active and reactive energy below starting current	◆ ●

Value field

Up to 8-digit values can be displayed in the value field. The 7 segment digits are able to display numeric data or limited alpha numeric text. Additional decimal points and colons enhance the 7 segment digits. This allows the representation of values with decimal places as well as date and time formats.

Disconnector state indication

The current state of the disconnector control unit is indicated by symbols on the display (a square and a cross) as follows:

State	Display	Symbol
Premises connected	The square is turned on	
Premises disconnected	The cross is, additionally to the square, turned on.	

If the meter does not have a disconnector control unit fitted the two symbols are not displayed.

Index field

Up to 5-digit indices are displayed in this field which define the value in the value field with groups C, D and E of the OBIS identification code.

Examples:

1.8.0 indicates that the status (group D = 8) of total (group E = 0) active energy import of all phases (group C = 1) is displayed in the value field.

0.9.1 indicates that the local time is displayed in the value field.

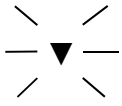
Phase voltage presence indications

The phase voltage presence indication is shown in the segment fields as "L1", "L2" and "L3". The segments are also used to show incorrect field rotation or phase leakage.

Event	Display
Incorrect field rotation or phase leakage	**L1 L2 L3** are blinking
All phase voltages applied and field rotation correct	**L1 L2 L3** are turned on
Phase failure in 1st phase	**L2 L3** are on
Phase failure in 2nd phase	**L1 L3** are on
Phase failure in 3rd phase	**L1 L2** are on

Tampering and alarm

Depending on the customer specific configuration various tampering indications can be shown (as per the example below) with the general purpose arrows, e.g.:

Event	Display	Symbol
Terminal cover removed	Selected arrow is blinking.	
Main cover opened	Selected arrow is lit.	▼
Clock invalid	Selected arrow is lit.	▼
Critical error detected	The alarm symbol is blinking. The error code is displayed with obis code F.F.	

Unit indications

With the electricity measurement units indications below and the multi-energy measurement units on the right side of the value field the following units can be displayed: V, A, kWh, kVah, kVarh, kW, kVa, kVar, m^3, MJ, GJ.

5.2 Display Modes

E450 meter has three display modes:

- Operating display (default)
- Display menu
- Service menu

The operating display is the default mode and the display will return to it from other modes after a set time (typically 60 seconds).

The display key is located on the right side of the display. To navigate through the display the following key presses are used:

- Display key
  - A short press < 2 seconds will scroll to the next displayed item.
  - A long press > 2 seconds will enter the item shown , i.e. menu, or in jumping over any items with several values to display, i.e. registers with additional time stamp stored as maximum demand, etc.
  - Double clicking the display key briefly will set the display back to the default operating display regardless of which menu or display sequence the key was pressed.
- Reset key
  - Pressing the reset key whilst in operating display will result in billing reset.
  - Pressing the reset key whilst the display check is displayed will result in entering the service menu.
  - Pressing the reset key whilst in set mode will result in editing digits of values shown in the menu.

5.2.1 Operating Display

The values displayed are considered as the operating display. The operating display is a rolling display, i.e. several values alternate at a fixed rate (default scroll rate is 10 seconds). The meter returns automatically from any of the display lists to the operating display after a programmable time (typically 60 seconds).

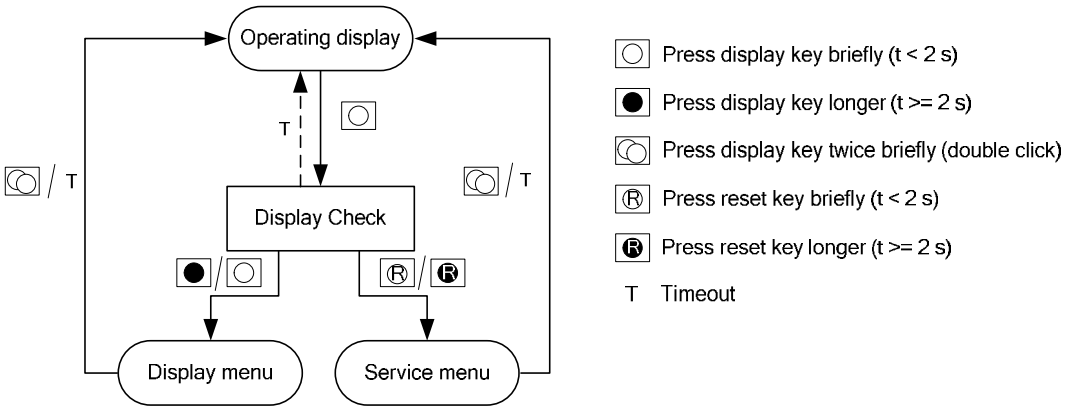


Fig. 5.2 Basic navigation of the display menus

Errors

In the event of a critical error, the operating display is interrupted and the F.F register with an error is shown on the display along with the blinking alarm symbol. The F.F register is displayed as long as no key (display or

reset) is pressed. After pressing the key or clearing the error register, the meter goes into the operating display mode and it continuous in normal operation.

5.2.2 Display Menu

The display menu contains the standard display list under the **Std_dAtA** menu and the MID data is listed under the **MId_dAtA** menu item.

The different menu items can be obtained by briefly pressing the display key.

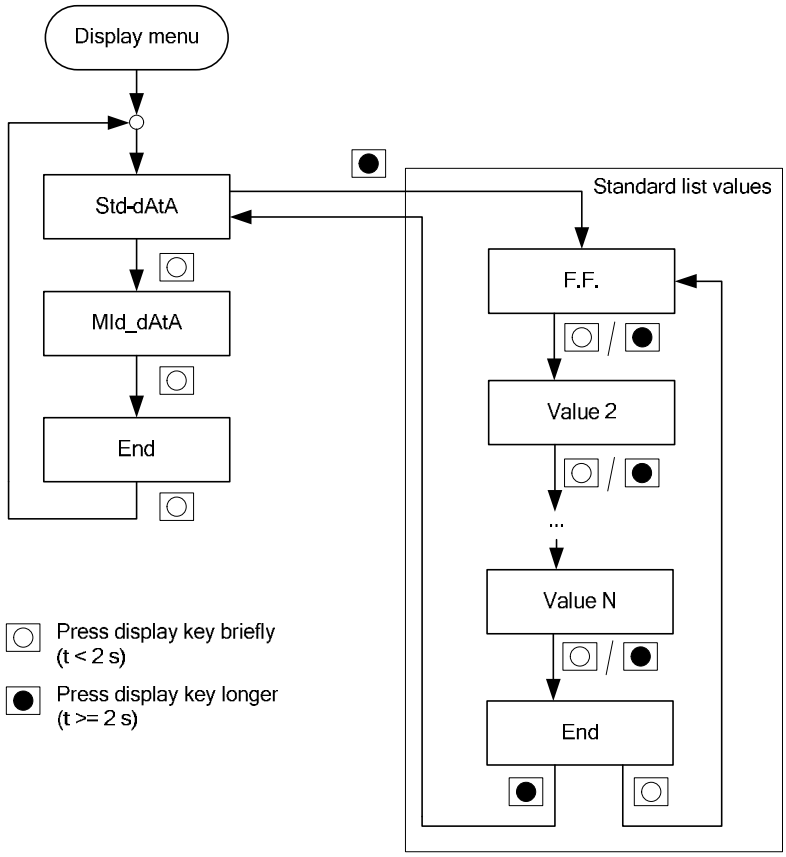


Fig. 5.3 Display menu

Standard Display List

With the **Std_dAtA** menu a pre-configured list of all important metering data can be shown on the display. To enter the standard display list, scroll to the menu item **Std_dAtA** and press the display key for > 2 seconds and release it, then the first value in the display list appears.

Within the display list the following navigation is available:

- Briefly pressing the display key navigates form value to value.
- A long press of the display key (> 2 seconds) skips the previous stored values or "demands" i.e. the next main value will be shown.
- If the display key is held down for more than 10 seconds, the display scrolls through the main values at one second intervals (rapid traverse).

Exit from the display list:

- By holding down the display key for > 2 seconds at the end of the list (**End** position) the menu item **Std_dAtA** re-appears when the key is released.
- By double clicking the display key (within 0.3 seconds) direct to the operating display (interruption).

MID Data List

The **MID_dAtA** list contains data which are relevant for the meter approval as:

- 1.8.0 - Total active energy register import
- 2.8.0 - Total active energy register export
- 0.2.8 - MID checksum of metering code
- F.F - Error register
- n.8.n - All rated energy registers (n = 1 … 8)

To enter the MID data list, scroll to the menu item **MID_dAtA** and press the display key for > 2 seconds and release it, then the first value in the list appears.

Within the MID data list the following navigation is available:

- Briefly pressing the display key navigates form value to value.
- If the display key is held down for more than 10 seconds, the display scrolls through the main values at one second intervals (rapid traverse).

Exit from the MID data list:

- By holding down the display key for > 2 seconds at the end of the list (**End** position) the menu item **Std_dAtA** re-appears when the key is released.
- By double clicking the key (within 0.3 seconds) direct to the operating display (interruption).

5.2.3 Service Menu

i To access the service menu, the sealed reset key cover has to be opened to get access to the reset key. The reset key cover has to be sealed again after the operation.

The service menu contains the display lists under menu item **SEr_dAtA**, **InStALL**, **SEt**, **tESt** and **LEd_ModE**.

The service menu is entered from the operating display via display check by pressing the reset key. Once **Ser_dAtA** is displayed the other menu items can all be obtained by briefly pressing the display key.

To enter any of the lists, press the display key for > 2 seconds until the first value of the desired display list appears.

The menu scrolls from **End** to the first item again. To return to the operating display from the service menu, double-click the key.

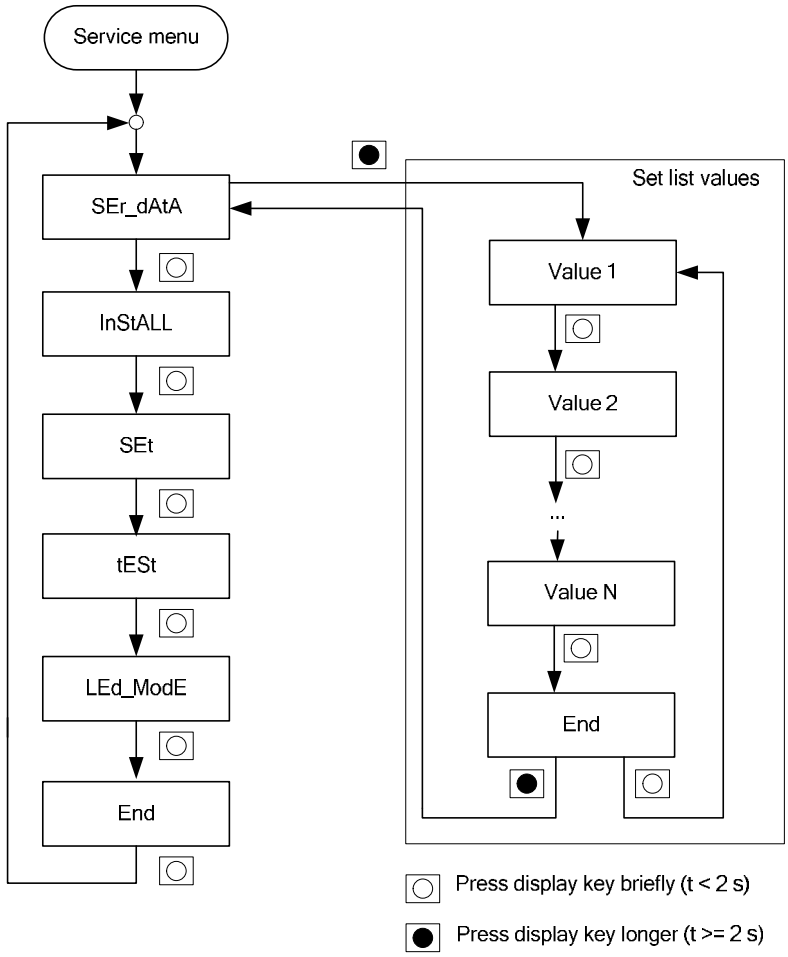


Fig. 5.4 Service menu

5.2.3.1 Service List

SEr_dAtA displays additional service data which are not visible in the standard display.

The following navigation is available:

- Pressing the display key briefly scrolls from value to value.
- Holding down the display key scrolls from main value to main value at one second intervals (rapid traverse).

Exit from the service list:

- Hold down the display key at the end of the menu list (**End** position) until the menu item **SEr_dAtA** appears,
- Or double click the display key to return direct to the operating display.

5.2.3.2 Install

The Install menu is used to support the installation procedure for remote- and local communication devices. This menu item is described in detail in the *section 4.6 "Installation Support for Communication Devices"*.

5.2.3.3 Set List

The values listed in the set list can be changed by using the reset key and the display key. Typical values in set list are time and date.

If one of the general purpose arrows is set to "set mode active" the arrow will become visible as soon as the user enters the set list.

General use of the keys in set mode:

- Display key (hold down): Enter the set mode.
- Display key (short press): Change the value of the selected digit
- Reset key (inside module cover): Edit the digit i.e. go to the next digit

Setting Time and Date

When installing the meter for the first time the time and date may be incorrect. This can be identified by:

- a general purpose arrow set to "Clock invalid" symbol blinks
- an error message in the display list shows F.F 00000001
- the meter has reset the date to 1.1.2000 (00-01-01 or 01.01.2000 displayed) and the time-of-day to 00:00:00 or to the point in time when the last voltage failure occurred and resumes with this time.

It is necessary to set the correct time and date to prevent incorrect time data in the meter. This should be performed either

- by using Landis+Gyr .MAP110 Service Tool,
- during the set up of the metering system or
- manually via keys (shown below).

---

i New time and date values are always validated against the real time calendar before the meter rewrites the time and date register, invalid dates are rejected (e.g. setting Feb 29 for a non-leap year is rejected).

---

i To set the time manually, the service menu has to be accessed, i.e. the sealed reset key cover has to be opened to get access to the reset key. The reset key cover has to be sealed again after the operation.

Manual time-setting

1. Browse to the service menu **SEt.**
2. Hold down the display key for > 2 seconds while in the **SEt** menu.
3. The first value (date) is shown in the display.
4. Press the reset key to edit the value, or press the display key to move to the next item (time).
5. When the reset key has been pressed the first digit of the value is blinking. It can now been changed by pressing the display key.
6. Pressing the reset key stores the value and moves to the next digit.
7. Repeat steps 5 and 6 for all digits of the value.
8. When the last digit of the value has been set all digits are blinking.

9. Confirm the new value by pressing the reset key. To cancel press the display key.
10. Press the display key to move to the next value (time).
11. Repeat now steps 4 to 10 for each item.
12. To exit the set mode go to the menu item **End** and press the display key for > 2 seconds or double click the display key.
13. Double-check the correct time and date is displayed.

5.2.3.4 Test Mode on/off

This function allows switching of test mode by holding down the display key when **tESt** is displayed. When test mode is switched on the **tESt_On** is displayed in values field for 5 seconds.

When test mode is switched on the operating display shows the registers with more decimal places. Auto scroll is disabled. Press display key briefly to move to the next value. By double clicking the display button (or after timeout), the test mode is disabled and the operating display is shown.

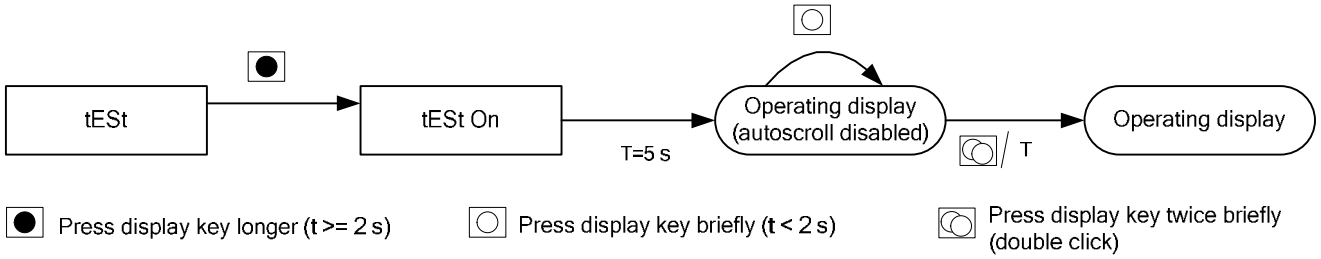


Fig. 5.5 Switching the test mode on/off

If one of the general purpose arrows is set to "test mode active" the arrow will become visible as soon as the user enables test mode.

5.2.3.5 Test Output LED Mode

It is possible to change the operation mode of the test LED output by selecting the mode. Depending on the mode the test output LED shows active or reactive energy.

When the **LEd_ModE** menu is entered (by holding down the display key) string **Act** is displayed. By pressing the display key briefly one can scroll between the two modes **Act** or **rEAct**.

- If **Act** is shown on the display pulses for active energy are transmitted by the LED.
- If **rEAct** is shown on the display pulses for reactive energy are transmitted by the LED.

After a timeout (settable) the LED is switched back to default mode.

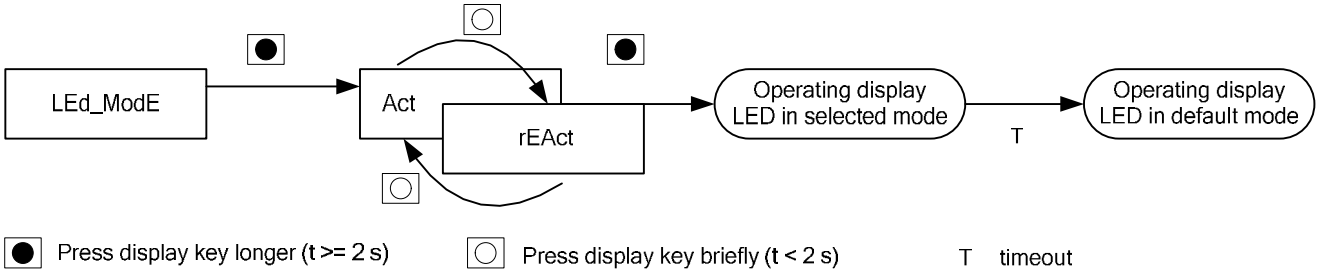


Fig. 5.6 Switching between active or reactive energy on test LED

When choosing the mode, it is possible to exit by double clicking the display key. LED mode will be retained at the state present before entering the **LEd_ModE**.

5.2.4 OBIS Codes of Displayed Values

The following table shows a list of commonly used display items and their OBIS codes. The display list of the E450 meter is programmable and therefore additional codes may appear. Please refer to the E450 functional description for further details.

Value	Displayed OBIS Code
Error	F.F
Time	0.9.1
Date	0.9.2
Actual FW version	0.2.0
Parameterisation ID	0.2.1
MID checksum of metering code	0.2.8
Active energy A+ (import), total	1.8.0
Active energy A- (export), total	2.8.0
Reactive energy R+, total	3.8.0
Reactive energy R-, total	4.8.0
Reactive energy +Ri (quadrant I), total	5.8.0
Reactive energy +Rc (quadrant II), total	6.8.0
Reactive energy -Ri (quadrant III), total	7.8.0
Reactive energy -Rc (quadrant IV), total	8.8.0
Apparent energy +VA, total	9.8.0
Apparent energy +VA, total	10.8.0
Active energy summation (A+) + (A-)	15.8.0
Active energy balance (A+) - (A-)	16.8.0
Active energy A+, rate x	1.8.x
Active energy A-, rate x	2.8.x
Active energy R+, rate x	3.8.x
Active energy R-, rate x	4.8.x
Current average demand A+	1.4.0

Value	Displayed OBIS Code
Current average demand A-	2.4.0
Current average demand R+	3.4.0
Current average demand R-	4.4.0
Last average demand A+	1.5.0
Last average demand A-	2.5.0
Last average demand R+	3.5.0
Last average demand R-	4.5.0
Maximum demand A+	1.6.0
Maximum demand A+, rate x	1.6.x
Maximum demand A-	2.6.0
Maximum demand A-, rate x	2.6.x
Maximum demand R+	3.6.0
Maximum demand R+, rate x	3.6.x
Maximum demand R-	4.6.0
Maximum demand R-, rate x	4.6.x
Power factor	13.7.0
Network frequency	14.7.0
Current L1	31.7.0
Current L2	51.7.0
Current L3	71.7.0
Voltage L1	32.7.0
Voltage L2	52.7.0
Voltage L3	72.7.0
Utility serial number 1 (ID2.1)	C.1.0
Utility serial number 2 (ID2.2)	C.1.1
Utility serial number 3 (ID2.3)	C.1.2
Utility serial number 4 (ID2.4)	C.1.3
IO control signal status register	C.3.0
Internal Control Status register	C.4.0
Internal operating status	C.5.0
Number of power failures in all phases	C.7.0
Number of long power failures in any phase	C.7.9
Number of power failures in any phase	C.7.21
Operating time	C.8.0
Operating time, rate x	C.8.x

where x is the number of the corresponding rate (range 1 … 6)

5.3 Meter Configuration and Update

The initial configuration of the meter is defined when ordering the meter at Landis+Gyr. Configuration files can be uploaded to the AMM system for automatic configuration after the meter is installed to the system.

The configuration ID can be read from the meter by the metering system. Later configuration of parameters and updates can be done remotely from the AMM system, or locally through the optical port using the .MAP120 Parameter Editor (see also .MAP120 Parameter Editor and AMM system documentation).

5.4 Disconnector Control

The E450 meter has an integrated disconnector to connect or disconnect power to the customer premises. The disconnector can be controlled:

- Manually, with an integrated push button or via a pulse input where an external push button is wired
- Remotely, from the metering system
- Locally, with dlms commands via optical port or by demand supervision.

There are five different operating modes for disconnector control available. These modes define in which situation the disconnector can be controlled remotely, locally or manually.

The mode is defined within the meter configuration. Details on the operating modes are described in the E450 functional description.

Disconnector not suitable as main switch
Do not use the disconnector as a main switch for installation or maintenance purposes. The disconnector is not equipped with a thermal and/or short circuit protection device.

The current state of the disconnector is displayed on the meter display (see *section 5.1 "Display"*).

When the disconnector push button is actuated, first the capacitor for the disconnector motor activation will be charged (this lasts about 10 seconds). The disconnector switches therefore with a delay of approx. 10 second after actuating the push button.

6 Maintenance

6.1 Service

The E450 meter has no serviceable parts.

Device service is available from the local Landis+Gyr representative.

6.2 Troubleshooting

If the meter is not operating correctly, check the error displays and LED (see *section 5.1 "Display"* for instructions on how to use the display). The following points should be checked first if there are problems in the meter operation:

1. Is the mains voltage present (check display of meter)?
2. Is the PLC device communication status OK?
3. Has the maximum ambient temperature not been exceeded?
4. Is the meter visibly damaged?
5. Is there any error code displayed (code F.F)?
   The error codes are described in *section 6.2.1 "Error Codes"*.

6.2.1 Error Codes

The meter performs regular internal self-tests. If a problem is detected during self-test an error code is displayed.

Errors are assigned to an error category depending on severity:

- Critical errors
- Communication errors
- Other errors

Critical Errors

Critical errors indicate severe problems but the device can still operate. However the data measured and stored in the meter may be corrupted and it is recommended that meters showing critical errors are returned to the Landis+Gyr service centre.

If the device is displaying the F.F register with an error and blinking alarm symbol there is a critical error.

The F.F register will continue to be displayed until either the display or reset keys are pressed or the error register is cleared. If the error register is not cleared, the failure code can be viewed in the installation/service menu or by reading the F.F register through the communications interface.

Critical errors can only be cleared via communication with a reset command. In order to reset the required access right must be set in the parameterisation.

---

i **F.F register is not cleared with power cycling or key press**
Power cycling or pressing the display or reset key do not clear the F.F register. Pressing the display or reset key only sets the display to normal operation.

Communication Errors

Due to the temporary nature of communication errors they do not cause the F.F register to be displayed. However communication errors do get stored in the error register. They are cleared when communication is restored. Communication errors do not usually require meter replacement.

Other Errors

These errors do not cause the F.F register to be automatically shown on the display but are stored in the error register. The meter continues normal operation and doesn't usually have to be replaced.

6.2.1.1 Representation of Error Codes

The error code is split up in four groups of two digits.

Each digit of the error code represents four errors (i.e. four bits of the error register). The status of the four bits is shown in hexadecimal code i.e. the single digits may show values between 0 (no error message set) and F (all four error messages set).

---

i **Error codes are added**
As all errors are shown in hexadecimal code, a single error can appear in various ways depending on the presence of other errors.

Example:

Two errors are shown as: FF **01**00**02**00

Another two errors occur: FF **02**00**08**00

The register reads: FF **03**00**0A**00

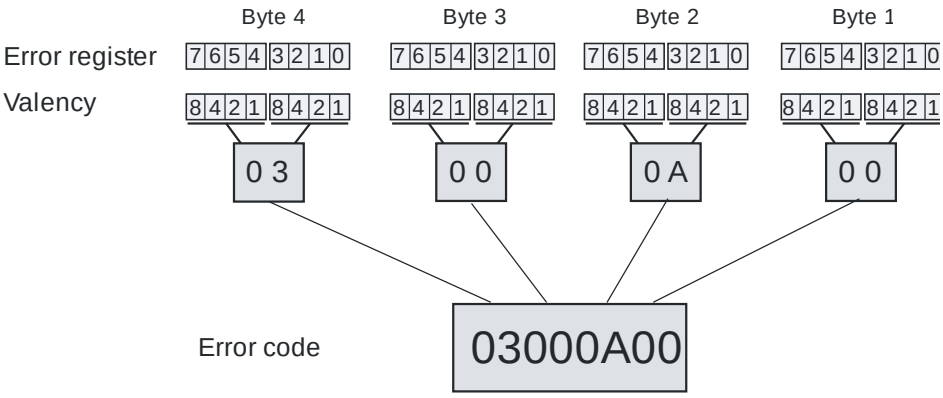


Fig. 6.1 Display of error codes

6.2.1.2 Error Definitions

F.F 00 00 00 01 **Clock Invalid Error**

Purpose: Indicates an invalid time and date. This error appears after long mains power failure when the power reserve of the clock is exhausted

Category: Other errors

Reset: The error is cleared automatically when the clock is reset.

F.F 00 00 00 04 **Unknown or Unsupported Extension Board Error**

Purpose: Indicates an unsupported or corrupted extension board is fitted.

Category: Other errors

Reset: The error is cleared automatically when the board is replaced. Contact a Landis+Gyr service centre.

F.F 00 00 00 08 **Profile(s) Checksum Error**

Purpose: Indicates a logical error on at least one profile, i.e. a checksum error. The checksum is calculated over the whole profile area.

Category: Other errors

Reset: The error is cleared automatically when the checksums are correct again, e.g. with the next read/write to the profiles or reset via communication.

F.F 00 00 00 10 **Disconnector Control Unit Failure Error**

Purpose: Indicates a possible failure of the disconnector control unit.

Category: Other errors

Reset: The error is cleared automatically when the next successful disconnector operation has been made.

F.F 00 00 00 20 **One or more parameter could not be restored after firmware upgrade**

Purpose: Indicates that one or more parameters could not be restored after a firmware upgrade. The objects with parameters which could not be restored will run on the default parameters.

Category: Other errors

Reset: The error is cleared automatically when the next successful firmware upgrade has been made or can be deleted via communication.

F.F 00 00 01 00 **Program Memory Error**

Purpose: Indicates a checksum failure in the parameter data

Category: Critical error

Reset: The error is not reset automatically; the register must be cleared via communication.

F.F 00 00 02 00 **RAM Error**

Purpose: Indicates an error in the internal program memory (RAM)

Category: Critical error

Reset: No reset possible, the device must be replaced.

F.F 00 00 04 00 **Non volatile Memory Access Error**

Purpose:	Indicates an access error (physical error) to the non-volatile memory, i.e. Flash
Category:	Critical error
Reset:	The error is not reset automatically; the register must be cleared via communication. Event 'Error register cleared' is triggered.

F.F 00 00 08 00 **Measurement System Error**

Purpose:	Indicates measuring system access failures
Category:	Critical error
Reset:	The error is not reset automatically; the register must be cleared via communication. Event 'Error register cleared' is triggered. If repeated the meter must be exchanged.

F.F 00 00 10 00 **Watchdog Error**

Purpose:	Indicates an invalid start-up sequence
Category:	Critical error
Reset:	The error is not reset automatically; the register must be cleared via communication. Event 'Error register cleared' is triggered. If repeated the meter must be exchanged.

F.F 00 01 00 00 **Communication M-Bus Channel 1 Error**

Purpose:	Indicates an error in accessing the M-Bus slave on Channel 1
Category:	Communication errors
Reset:	The error is cleared automatically if the communication is successful again.

F.F 00 02 00 00 **Communication M-Bus Channel 2 Error**

See F.F 00 01 00 00

F.F 00 04 00 00 **Communication M-Bus Channel 3 Error**

See F.F 00 01 00 00

F.F 00 08 00 00 **Communication M-Bus Channel 4 Error**

See F.F 00 01 00 00

F.F 00 10 00 00 **Communication Error Home Area Network**

Purpose:	Indicates an error in accessing any of the Home Area Network devices, i.e. *ecoMeter*
Category:	Communication errors
Reset:	The error is cleared automatically if the communication is successful again.

F.F 00 20 00 00 **Remote Communication Error**

Purpose: Indicates an error in setting up a remote data push. This can be initiated by any failure in the communication set-up.

Category: Communication errors

Reset: The error is cleared automatically if the communication is successful again.

6.3 Measuring Times for Meter Testing

For technical reasons, short measuring times result in higher measuring deviations. Therefore, it is recommended to use long measuring times to obtain the desired accuracy.

The following tables show the minimal test times needed to achieve the stated uncertainty. The values do not include any uncertainty due to temperature variation.

Test conditions: nominal voltage (3 x 230V), all phase.

Active energy

Current [% I_{ref}]	Phase [°]	Uncertainty [%]	Minimum Test Time [s]
I_{max}	0	± 0.1	300
I_{max}	60	± 0.1	300
100	0	± 0.1	300
100	60	± 0.1	300
10	0	± 0.1	300
10	60	± 0.2	300
5	0	± 0.1	300

Reactive energy

Current [% I_{ref}]	Phase [°]	Uncertainty [%]	Minimum Test Time [s]
I_{max}	90	± 0.2	300
I_{max}	30	± 0.2	300
100	90	± 0.2	300
100	30	± 0.2	300
10	90	± 0.2	300
10	30	± 0.3	300
5	90	± 0.3	300

7 Decommissioning and Disposal

7.1 Decommissioning

The procedure for disconnecting and removing the meter from the mains is described in *section 4.7 "De-installing the Meter"*.

7.2 Disposal

Electronic waste treatment
This product must not be disposed of in regular waste. Use a professional electronic waste treatment process.

The components used to manufacture the device can, in the main, be broken down into constituent parts and sent for suitable recycling or disposal. When the product is removed from use, the whole product must be sent to a professional electronic waste treatment process. The waste treatment company must be accepted by the officials.

End processing of the product and recycling of its components must always be carried out in accordance with the local laws and instructions given by the officials of the country where the end processing and recycling are done.

By request, Landis+Gyr will give more information about the environmental influence of the product.

Disposal and environmental protection regulations
The following are general guidelines and should NOT take priority over local disposal and environmental policies which should be adhered to without compromise.

Components	Disposal
Printed circuit boards	Electronic waste: delivered to recycling plants.
Metal parts	Sorted and delivered to metal recycling plants.
Plastic components	Sorted and delivered to re-granulation if at all possible.

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Landis+Gyr
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