Electricity meters MID

Residential

Landis+
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manage energy better

E220-AMxD

E220 Series 3

User manual

Revision history

Version	Date	Comments
a	14.06.2021	First release.
b	16.12.2021	Editorial corrections. Wireless M-Bus rate use cases added. Updated sections for product safety and temperature ranges.
c	19.01.2022	Updated screw head type.
d	02.03.2022	Updated with aluminium wire compatible option
e	05.04.2022	Updated type designation.
f	12.05.2022	Updated cover picture and other pictures.

Table of contents

About this document

Range of validity   The present User Manual applies to **E220 Series 3** electricity meters. It is valid for the variants:

- E220-AM1D 60 A electricity meter

- E220-AM1D 60 A electricity meter with aluminium compatible clamps

The manual also describes all measurement modes:

• +A with return stop	Active plus only
• -A with return stop	Active minus only
• +A / -A	Active plus and active minus
• -A balanced without return stop	Active totalised

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

- Provision of knowledge concerning the characteristics, construction and function of the meters

- Information about potential dangers, their consequences and measures to prevent any danger

- Details about the performance of all activities 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:

- D000070821 E220-AMxD Series 3 Technical data en

Typographical conventions   The following typographical conventions are used in this document:

Font	Description
Bold	Font style used for menu items and buttons in the user interface and for keyboard keys.
Italics	Font style used for captions and new terminology.
`Courier`	Font for file names, paths and code examples.

Terms and abbreviations A list of terms and abbreviations used in this document is available at the end of this document.

1   Safety and regulations

1.1   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 sections of this document.

Warning
Used to indicate a dangerous situation that could cause bodily injury or death.

Caution
Used to indicate a situation/ action that could result in material damage or loss of data.

Note
Used to indicate general guidelines and other useful information.

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.

1.2   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 *1.3 "Safety regulations"*) 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. Contact your local Landis+Gyr representative for more information.

1.3   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.

- Only appropriate tools shall be used for the job. This means, e.g. that the screwdriver must be of the correct size for the screws, and the handle of the screwdriver must 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.

1.4   Measurement accuracy remarks

For the devices described here, the MessEV §17, paragraph (4) applies.

Note
When connected to a Smart Meter Gateway, values measured with the meter may only be used for billing purposes, if the voltage supply of the Smart Meter Gateway conforming to the MessEV is obtained from an unmetered area.

Note
Historical energy registers and instantaneous values are provided exclusively for information purposes and may not be used for billing.

2   Description of unit

2.1   General view

Figure 1.   General view of the device

2.2   Functional overview

The E220 is a standalone meter ("modern Messeinrichtung") according to the German Digitisation Act. It was designed close to the FNN specification for base meters. In the module slot you can install one of several different dual rate modules, an RS-485 LMN interface or a wireless M-Bus LMN interface for communication with a Smart Meter Gateway and to be integrated into an intelligent Metering System (iMsys).

The E220 is available in the following meter variant:

- E220-AM1D 60 A meter

- E220-AM1D 60 A meter with aluminium compatible clamps

The meter can be configured to one of the following measurement modes during the manufacturing process:

- +A with return stop   Active plus only

- -A with return stop   Active minus only

- +A / -A   Active plus and active minus

- -A balanced without return stop   Active totalised

2.3   Technical overview

See faceplate for information on specific meter types. The following information are general applicable technical data for E220-AM1D Series 3.

Meter electrical connection data		
Reference current		5 A
Current range		0.25 - 5(60) A
Nominal voltage		3 x 230/400V
Nominal frequency		50 Hz (± 2%)
Self-consumption per phase	voltage path	< 0.7 W
	current path	< 0.01 VA
Environmental conditions		
Specified operating range		-25 °C … +70 °C
Specified limit operating range		-40 °C … +70 °C
Specified transport and storage range		-40 °C … +70 °C
Ingress protection	IEC 60529	IP54
Humidity	IEC 62052-11, EN50470-1, IEC 60068-2-30	maximum 95%, non-condensing
Mechanical conditions	MID 2014/32/EU	M1
Electromagnetic conditions	MID 2014/32/EU	E2
Location of installation	EN 50470-1	indoor
Flammability	IEC 62052-11	
Product safety		
Protection class	IEC 62052-11	▢ II
Overvoltage category	IEC 62052-31	III
Rated impulse voltage	IEC 62052-31	6 kV
Utilisation category	IEC 62052-31	UC2
Extended environmental conditions		3K6
Pollution degree		2
Operating altitude		< 2,000 m
Insulation		
L1 – L2 – L3 – N	Reinforced	6 kV
L1+L2+L3+N – LMN	Reinforced	6 kV
L1+L2+L3+N – Rate input	Reinforced	6 kV
Rate input: Clamping of overvoltage		2 kV

2.4   Type designation

Example	E220	- A	M	1	D.	A	3	A.	A	0	- S	0	0	- S3

Brand name

E220 Residential smart meter

Product family

A   Product family residential

Network and mechanical standard

M   3-phase, 4-wire DIN

Maximum current

1   Maximum current 60 A

Voltage level

D   230 V phase – neutral / 400 V phase – phase

Measurement modes

A   Active, no reactive; vector value measurement

Measurement modes 2

1   +A with return stop; active plus only
2   -A with return stop; active minus only
3   +A / -A; active plus and minus
4   -A balanced without return stop; active totalised

Additional quantities

A   Energy only

Accuracy active measurement

A   Class A (MID)
B   Class B (MID)

Accuracy reactive measurement

0   No reactive measurement

Basic meter measurement

S   SLP Standard Load Profile

Tariffication

0   Optional
2   Yes (dual-rate module)

LMN interface

0   Optional

B   RS-485 module

C   Wireless M-Bus module

Hardware series

S1   Series 1
S2   Series 2
S3   Series 3
A3   Series 3 with aluminium wire compatible terminals

2.5   Technical details

2.5.1   Overview
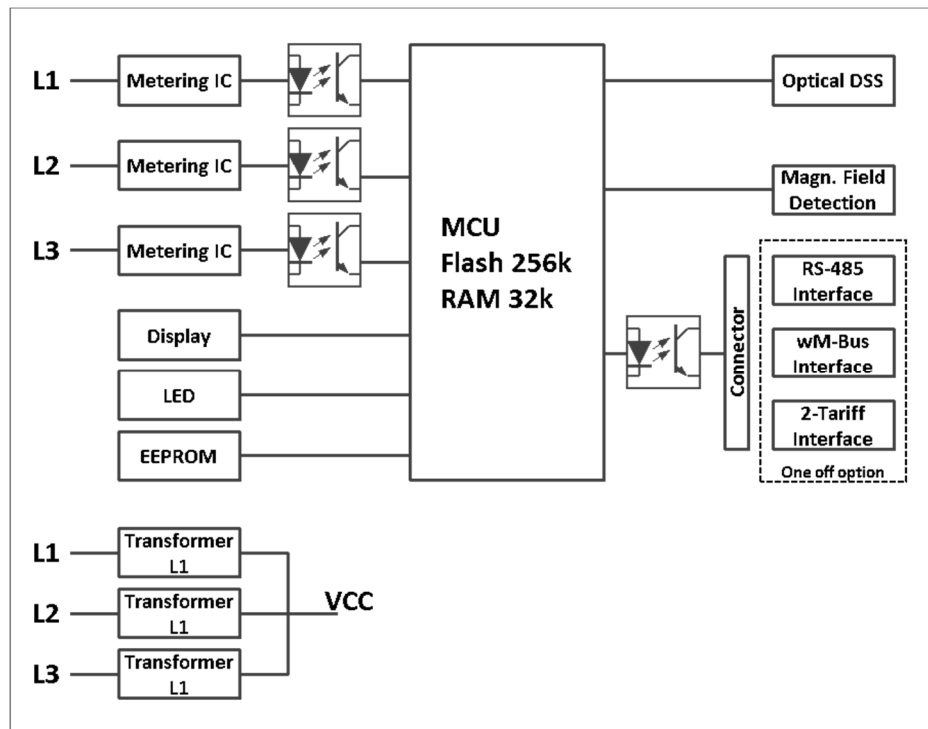
Architectural overview

Figure 2.   Architectural overview

Measurement technology

The measurement technology used in the E220 meters is based on current shunts. Three measuring elements (one for each phase) measure the phase currents using shunts, and the phase voltages over resistor dividers. The analogue/digital converters transform both signals into digital voltage and current data. This data is then fed into the microprocessor, which produces the energy proportional values and adds the value to the corresponding values of the other phases. The sum is then transferred into the corresponding energy registers.

Power supply

The supply voltage for the meter electronics is taken from the three-phase system. The meter will work correctly as soon as neutral and at least one phase 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.

Auxiliary power supply

The auxiliary power terminal (L3) can be used supply external devices installed on or close to the meter. The auxiliary voltage output is tapped in the unfused and unmetered area.

Auxiliary power supply	
Reference current	1.6 A
Nominal voltage	230 VAC

Auxiliary power supply	
Nominal frequency	50 Hz (± 2%)
Maximum power consumption	0.37 VA

Memory

Meter parameters are stored in a non-volatile (Flash) memory, which protects the parameters in the event of power failure.

Seconds counter

The meter features a seconds index counter. The seconds index counter starts at 0 the first time the meter firmware is run, and will, from this moment on, be incremented by 1 every second. In the event of voltage loss, the seconds counter value at the time of voltage loss will be saved. When restarting the firmware after voltage recovery, the seconds counter will resume operation with the reading at the moment of voltage loss incremented by 1. In all operating situations, the counter never jumps backwards, but will always increase in a strictly monotonous manner.

Summation method

Vector summation for 3-phase 4-wire summation over all phases is done as follows:

Calculation method	Example 1	Example 2
+A with return stop		
-A with return stop		
+A / -A		
-A balanced without return stop		

2.5.2 Push button

INFO interface is used to communicate with the meter. The meter is set to the menu mode using the push button.

2.5.3 Optical input

Optical INFO interface is used to communicate with the meter. The meter is set to the menu mode using a flashlight.

The illuminance of the flashlight must be at least 400 lux.

2.5.4 Optical output (INFO interface)

The E220 has a unidirectional optical interface. It is designed according to the DIN EN 62056-21 standard.

The meter pushes a defined set of values every second to the optical interface.

3 Mechanical construction

3.1 Case

The meter case is made of antistatic plastic (polycarbonate). The LCD display, the push button, the optical interface and the pulse output LED are always visible. Installed modules must be covered by a sealable terminal cover.
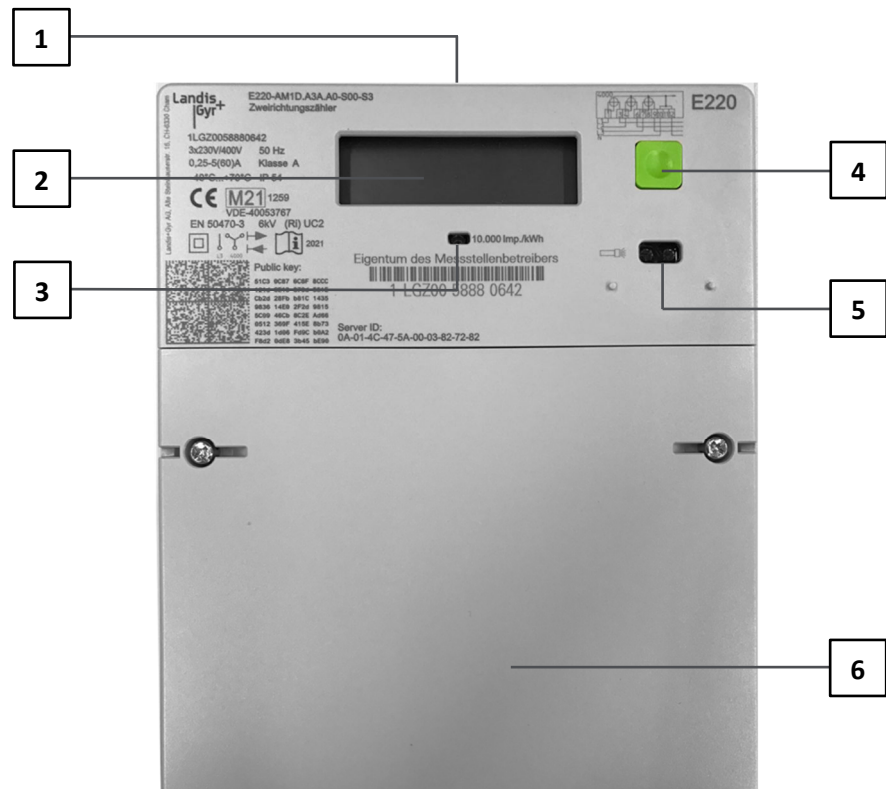

Figure 3.   Meter case

1   *Position for flexible hook (rear side)*
2   *LCD display*
3   *Pulse output LED (metrological LED)*
4   *Push button*
5   *Optical interface*
6   *Terminal cover*
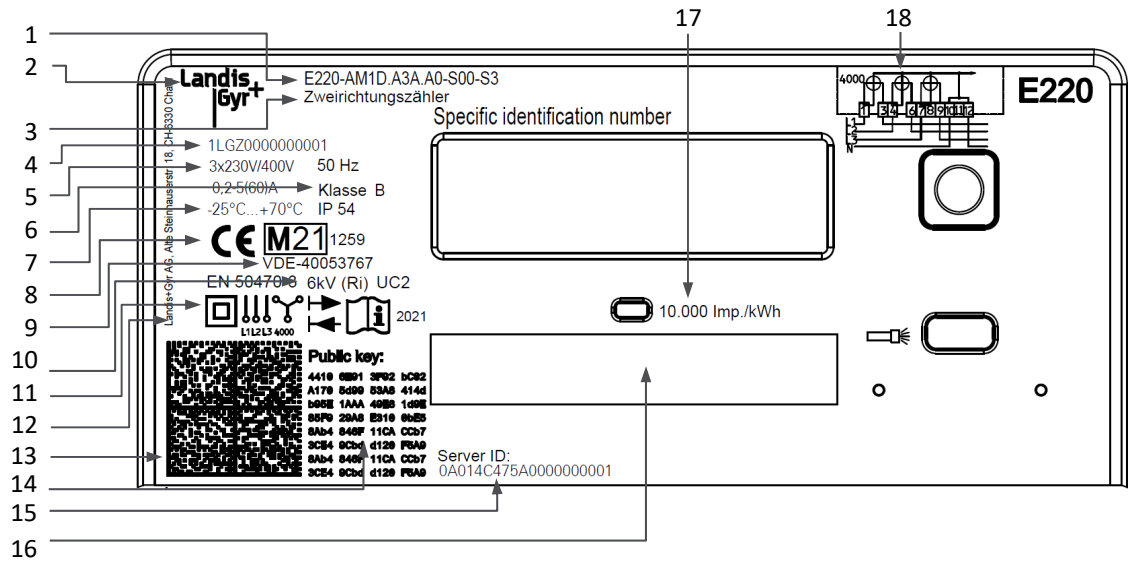
3.2   Faceplate markings

Figure 4.   Faceplate markings

1   Meter type designation
2   Brand name
3   Measurement mode:

Einrichtungszähler +A	=	+A with return stop
Einrichtungszähler -A	=	-A with return stop
Zweirichtungszähler	=	+A / -A
Saldierender Zähler -A	=	-A balanced without return stop

4   Unique device ID manufacturer serial number (14 characters) according DIN 43863-5
5   Nominal connection values (voltage, frequency, current range)
6   Accuracy class active energy, if appropriate accuracy class reactive energy
7   Nominal operating temperature range
8   CE conformity, metrological approval, EU type examination certificate
9   German national type approval certificate (only relevant with the LMN module plugged-in)
10 Rated impulse voltage and utilization category
11 Symbols:
    Isolation
    Measurement mode
    Calibrated single-phase meter
    Calibrated three-phase meter
    Read User Manual
    Year of calibration
12 Manufacturer address
13 2-D barcode including: manufacturer serial number, device ID, server ID, public key
14 Public key NIST curve
15 Server ID
16 Property plate
17 Impulse constant of pulse output LED
18 Connection diagram

3.3   Control elements

The E220 meter has as two control elements, the push button and the optical interface. These interfaces are used by the end-user to communicate with the device.

3.4   Dimensions
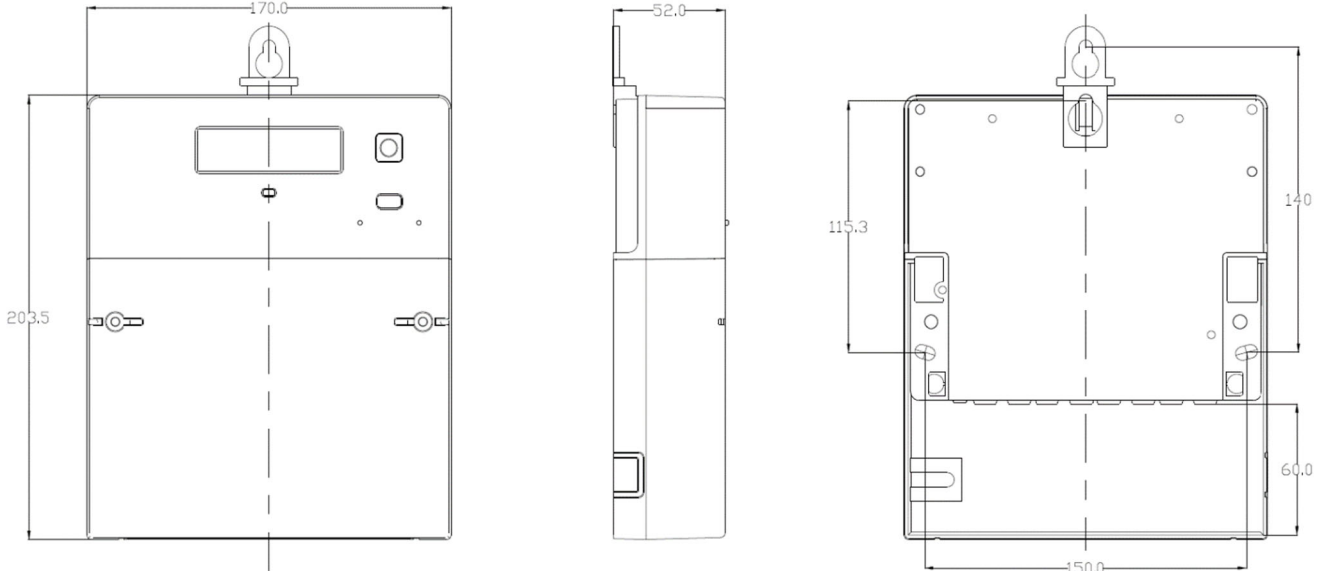
3.5   Connections

3.5.1   E220 60A direct connected
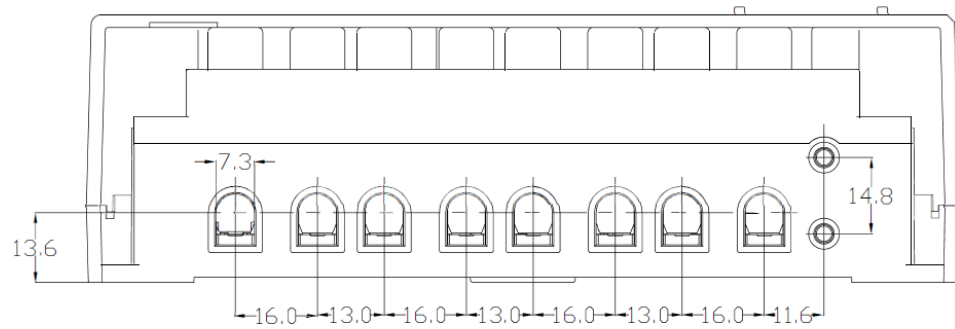
Terminal type	Cage clamp terminal
Diameter	7.3 mm
Maximum wire diameter (Cu)	7.0 mm
Minimum wire diameter (Cu)	1.5 mm
Cable cross sections (solid wires only)	1.5 to 25 mm²
Screw head	Pozidriv no. 2 PlusMinus
Tightening torque (using cables)	2.0 – 3.0 Nm

Flexible wires must always be fitted with ferrules.

A meter variant with aluminium compatible clamps for installations in locations with aluminium wiring is available.

3.5.2 Auxiliary voltage connections

The meter has auxiliary voltage terminals to supply external devices with power.

Terminal type	Cage-clamp terminal
Diameter	3.0 mm
Screw head	Pozidriv no. 1

3.6 Connection diagrams

According to the German standard DIN 43856, connection and circuit diagrams are labelled with numbers.

Direct connected meters

Direct connected (4-wire) meters are connected as follows (use in 1-wire 2-phase networks is permitted on phases L1, L2 and L3).
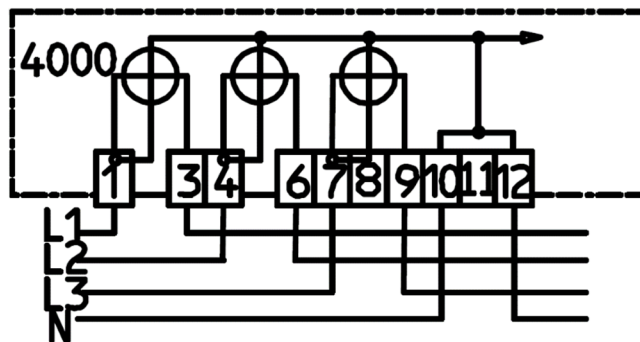

Figure 5.   DIN 43856 Electricity meters, rate time switches and ripple control receivers. Diagram number 4000

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 directive 2014/32/EU.

- The meter is intended to be installed in electromagnetic environment "E2", as per directive 2014/32/EU.

- The meter is intended to be installed indoors in non-condensing humidity conditions.

- The meter should be installed with copper conductors. The use of aluminium conductors is only supported with the aluminium conductor compatible variant.

- For installation, flexible wires with ferrules may be used.

- The installation site must meet the requirements of:

    - The meter's ingress protection rating (IP54),

    - The specified operating temperature range (-25 °C … +70 °C) and

    - The specified limit operating temperature range (-40 °C … +70 °C).

- Avoid installing the meter on south-facing walls and in direct sunlight. If necessary, use an additional shield or visor to protect the installation from direct sunlight (shield not provided by Landis+Gyr).

⚠ **This meter is intended for indoor use only**
In cases where an outdoor installation is unavoidable, care must be taken to ensure the meter is installed within a suitable enclosure to maintain the operating environment in accordance with the meter specification. Such enclosures must be securely sealed to avoid the risk of meter damage as a consequence of exposure to the external environment including (but not limited to) extreme temperatures, humidity and insect ingress.

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 *1 "Safety"*, in particular the safety regulations, as well as safe operation.

- Before starting work, ensure that the materials and tools required are all present.

- The installer is responsible for coordinating the rating and the characteristics of the supply side overcurrent protection devices with the maximum current rating and, in the case of direct connected meters, with the utilisation category rating of the metering equipment.

4.2   Before installation

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 fuse should be removed and kept in a safe place until work is completed, so that it cannot be replaced by anyone unnoticed.

No overcurrent protection or 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.

4.3   Mounting

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

Observe E VDE-AR-N 4101:2014-03
Requirements for metering points in electrical installations in the low voltage network.

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. Make sure there are no wires underneath the holes to be drilled.

2. Determine the desired type of mounting (open or covered mounting).

3. For covered mounting, use the fixed bracket at the back of the meter. For open mounting, move the mounting bracket (provided with the unit) to the top of the meter. See the following figure.
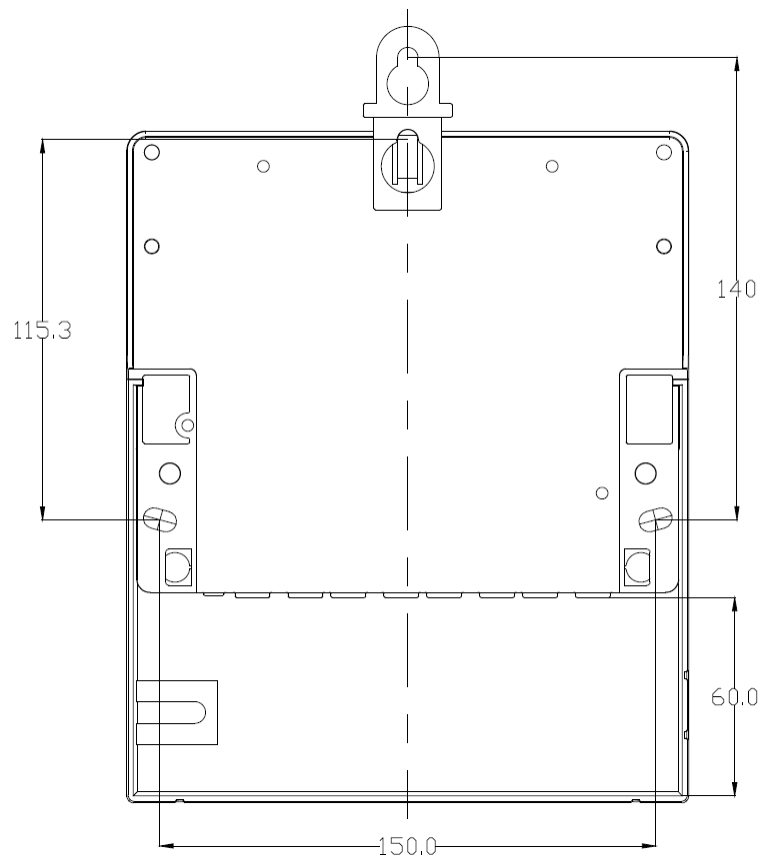
Figure 6.   Mounting bracket location at the back of the meter (standard terminal cover)

4.4   Connecting

Before putting the meter into operation, the following items 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 terminal 10?

5. Attach the terminal cover.

6. Close the terminal cover with screws.

7. Check the installation as described in section *0 "*

8. *During installation the* oxidation layer on the stripped cable ends must be removed. The use of oxidation inhibiting compound, according to the manufacturer's instructions, is recommended.

9. Commissioning and functional check*"*.

4.4.1   Aluminium conductors

⚠ **Aluminium compatible terminals required**
Only meters with aluminium compatible terminals shall be used in installations with aluminium conductors.

Meters with aluminium compatible terminals are suitable for use with both copper and aluminium conductors.

ⓘ **Preparation**
Aluminium conductors require appropriate preparation of the wires prior to connection.

During installation the oxidation layer on the stripped cable ends must be removed. The use of oxidation inhibiting compound, according to the manufacturer's instructions, is recommended.

4.5   Commissioning and functional check

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

1. Insert the main fuses removed before installation. The meter is switched on.

2. After 2 seconds, the display lights up with the display test. It shows all segments of the upper line and the lower line for 2 seconds each. This sequence is repeated three times.

3. The upper line shows the OBIS code 0.2.0 for firmware version, the lower line shows the firmware version.

4. The upper line shows the OBIS code C.90.2 for firmware checksum, the lower line shows the firmware checksum.

5. Check the display for error messages and connect a load.

6. Check that the meter is measuring correctly. Display indicators and their functions are described in section *5.1 "Display"*.

4.6   Uninstalling the meter

⚡ **Remove main fuse 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 fuse must be removed and kept in a safe place until work is completed, so that it cannot be replaced by anyone unnoticed.

Remove the meter from the mains network as follows:

1. Switch off the voltage by detaching the main fuse. The display goes off.

2. Remove the seals from terminal cover screws.

3. Release and remove the terminal cover.

4. Ensure with a phase checker that the connecting wires have no voltage. If there is voltage, remove the main fuses.

5.   Remove the connecting wires of the auxiliary inputs and outputs, if available.

6.   Loosen the terminal screws of the phase and neutral connecting wires with a suitable screwdriver and withdraw the wires from the terminals.

7.   Unscrew and remove the meter.

8.   Fix a replacement meter with the three fixing screws on the mounting surface.

9.   Connect the replacement meter as described in section *4.4 "Connecting"* and the following sections.

5   Operation

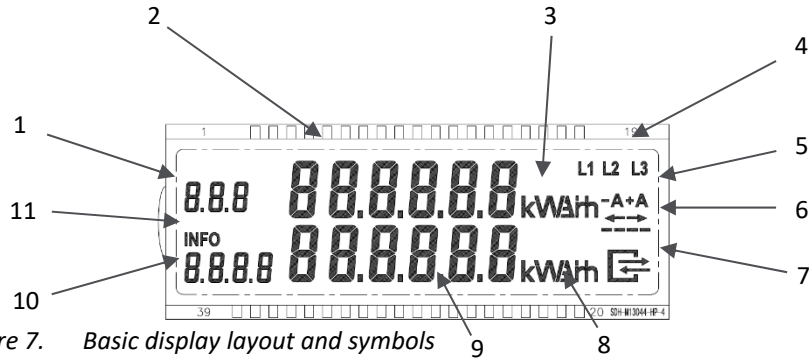## 5.1   Display

5.1.1   Basic layout and symbols

Figure 7.   Basic display layout and symbols

Billing-relevant:
1   *OBIS code*
2   *Value field*
3   *Energy measurement units*

Status information:
4   *Phase voltage presence indications*
5   *Energy direction*
6   *Simulation of rotating disk*
7   *Status of LMN communication (only relevant with optional RS-485 LMN interface)*

Information display:
8   *Measurement units*
9   *Value field*
10   *OBIS code*
11   *Info for running pushes on optical INFO interface*

5.1.2   Billing-relevant line

The following tables show a list of commonly used OBIS codes. The display list of the E220 meter depends on the measurement mode.

+A with return stop (Einrichtungszähler +A)

Upper line

OBIS code	Value
F.F.	Error code (see section *6.2.1 "Error codes"*)
1.8.0	Active energy +A (import), total

-A with return stop (Einrichtungszähler –A)

Upper line

OBIS code	Value
F.F.	Error code (see *6.2.1 "Error codes"*)
2.8.0	Active energy -A (export), total

+A / -A (Zweirichtungszähler)

Upper line

OBIS code	Value
F.F.	Error code (see *6.2.1 "Error codes"*)
1.8.0	Active energy +A (import), total
2.8.0	Active energy -A (export), total

-A balanced without return stop (Saldierender Zähler –A)

Upper line

OBIS code	Value
F.F.	Error code (see section *6.2.1 "Error codes"*)
2.8.0	Active energy -A (export), total

5.1.3   Status information on the display

Phase voltage presence indications

If phase L1, L2 or L3 is present, the corresponding segment lights up. The threshold is 0.8 U_n.

Energy direction

-A or +A represents the actual energy direction. An additional arrow below the corresponding A symbol is also lit.

Simulation of rotating disk

The four horizontal bars simulate the rotating disk of Ferraris meters. The disk always runs left to right regardless of the energy direction. With each pulse of the pulse output LED (metrological LED), the rotating disk switches to the next segment.

Terminal cover detection

The INFO symbol on the display is blinking 2s on / 1s off as long as the terminal cover is missing or not fitted properly. If the terminal cover is removed whilst the meter is powered, the activation of the tamper flag is not delayed.
The delayed activation of the tamper flag does not affect the blinking of the INFO symbol on meter display.

Status of LMN communication

This symbol is only relevant with the LMN module plugged-in. The symbol represents the different statuses of the LMN interface:

Symbol	Status
OFF	No communication on the LMN interface.
Blinking 0.5 s on/0.5 s off	Any layer 2 telegrams detected.
Blinking 2 s on/ 2 s off	HDLC connection telegrams detected.

Symbol	Status
ON	TLS connection ready. The meter communicates in secure mode.

5.1.4   Information display line

Measurement units

Lower line

| OBIS-Code	Value
P	Instantaneous power balance +A – -A (if enabled)

Value field and OBIS code

Field for displaying instantaneous power and to provide information about installed LMN or Dual Rate module according to the following table.

Code	Installed module
LMN	LMN RS-485 module
Mbus	Wireless M-Bus module
TA	B2T/L2T 230 V (x.8.1) module
TB	B2T/L2T 230 V (x.8.2) module
TC	B2T/L1T 230 V (1.8.1) module
TD	B2T/L1T 230 V (1.8.2) module

Module codes are displayed in the OBIS code area of the display.
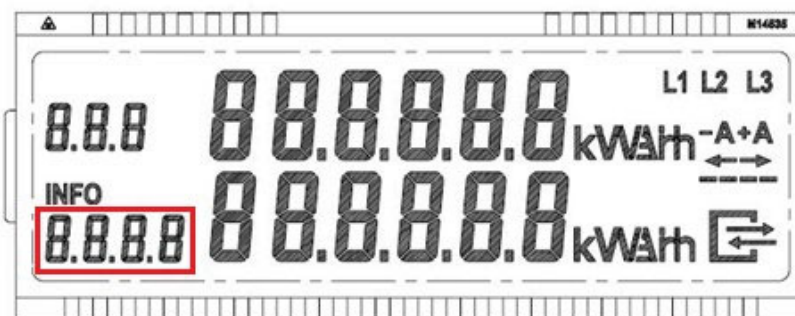
Info for running pushes on optical INFO interface

The INFO symbol indicates to the end-user that the second line is for information purposes only. It also indicates data pushes on the optical INFO interface.

5.2   Faceplate description

Device ID

The Device ID is a unique identifier according to the DIN 43863-5 standard. The 14 characters are defined as follows:

14	13	12	11	10	09	08	07	06	05	04	03	02	01	Characters total
Section	Manufacturer			Production block		Serial number								Description
1	L	G	Z	0	0	6	3	5	3	9	4	2	1	Identifier
OBIS	DLMS (FLAG)			Production block		Serial number								Description

The first character represents the branch according to the OBIS code. For electricity meters it is a "1".

Characters 2 to 4 represent the manufacturer. In our case "LGZ".

Manufacturer block is "00".

The last 8 characters are the manufacturer serial number.

2D barcode

The 2D barcode is generated according to ISO/IEC 16022:2000 and ISO/IEC 24720:2006. The 2D barcode includes:

- Prefix AA: Device ID
- Prefix AB: Server ID
- Prefix AC: Public key

See also FNN document *"Data Matrix Code für Messeinrichtungen und Komponenten für Messsysteme"*.

Server ID

At the optical INFO interface, data is pushed in SML (Smart Message Language). The server ID is part of the SML response. The server ID is derived out of the device ID.

Public key NIST curve

TLS communication on LMN requires the NIST curve. The public key of the meter is printed on the faceplate.

5.3   Meter configuration

The initial configuration of the meter is defined when ordering the meter from Landis+Gyr.

5.3.1   Mechanical variants

Parameter	Values
Meter variants	• E220 – 60A, 0.25-5 (60) A
Module slot	• RS-485 LMN interface pre-installed • Wireless M-Bus LMN interface pre-installed • Dual rate module pre-installed

Parameter	Values
Terminal cover	• Standard terminal cover (60 mm) • Long terminal cover (80 mm) • Mounting terminal cover (80 mm)

5.3.2 Faceplate

Parameter	Values
Property plate	• Property plate, standard • Property plate, customer-specific

5.3.3 Firmware parameters

Parameter	Values
Measurement mode	• +A with return stop; active plus only • -A with return stop; active minus only • +A / -A; active plus and active minus • -A balanced without return stop; active power totalised
Signature curve	• NIST P-256 • Brainpool
PIN protection	• With PIN protection • Without PIN protection
Active power	• Not shown in the 2nd line • Shown in the 2nd line
End-user settings at power-down	• Save end-user data protection settings at power-down • Reset data protection settings at power-down
Status bit for tamper detection when opening the terminal cover	• The tamper detection status bit is set when the terminal cover is opened. • Optionally, and on customer request, activation of the bit may be delayed after voltage application (between 0 min and 60 min in 5 min increments) to suppress activation upon installation of the meter. • This parameter is selectable at the time of ordering and cannot be changed after production. The default value is 0 min
Module detection	• The module code is displayed in the OBIS code field for 30 minutes after the meter is powered up and the terminal cover is removed. When the terminal cover is installed, the code display disappears. • After the new removal of the terminal cover, the module OBIS code is again displayed for 30 minutes or until the terminal cover is re-installed.

5.3.4   Logistics

Parameter	Values
Packaging variant	• Single boxes
	• Layers in gitter boxes

5.4   End-user operations

5.4.1   User menu

The end-user can enter the user menu using the optical interface. The menu has the following items.

Menu ID	Displayed information
	Display test
	Upper line
	Lower line
PIn	Enter the PIN code
P	Instantaneous power
E	Total energy since last reset
1d	Energy (consumption/generation) last day
7d	Energy (consumption/generation) last 7 days (week)
30d	Energy (consumption/generation) last 30 days (month)
365d	Energy (consumption/generation) last 365 days (year)
HIS	Reset historical values
InF	Push reduced data set or extended data set
PIn	Activate/deactivate PIN code

ⓘ **Note**
Historical energy registers and instantaneous values are provided exclusively for information purposes and may not be used for billing.
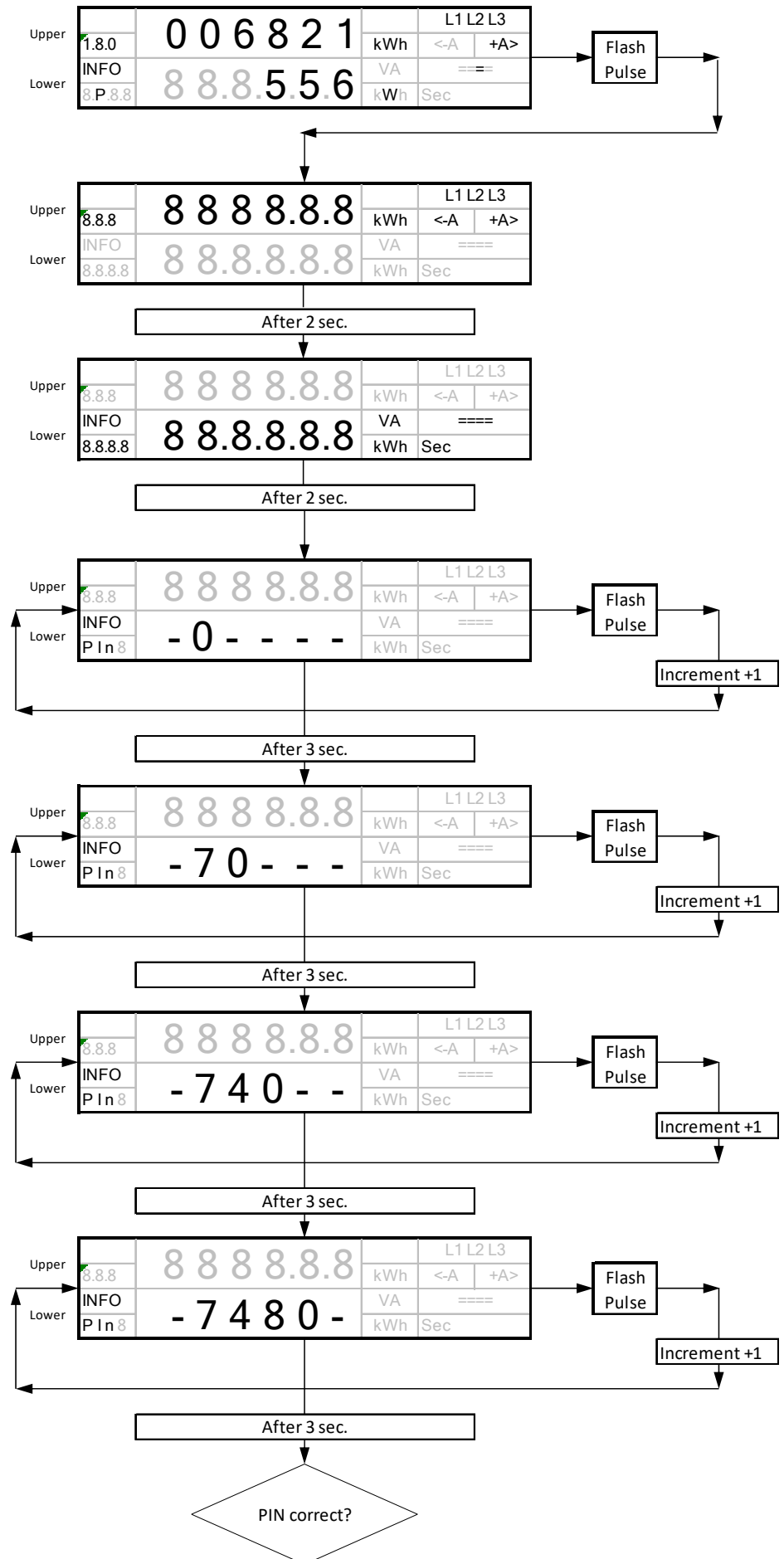
Optical interface

The optical interface has two functions:

• Short flash from a flashlight (shorter than 2 seconds)

• Long flash from a flashlight (longer than 5 seconds)

After a period of 120 seconds without any action on the optical interface, the meter will fall back to the standard display (rolling list in case two energy registers are available).

5.4.1.1 Enter PIN

5.4.1.2 Instantaneous power

If the PIN is not accepted, the meter switches back to the standard display.

If the PIN is accepted, the meter switches to display the instantaneous power on the lower line.
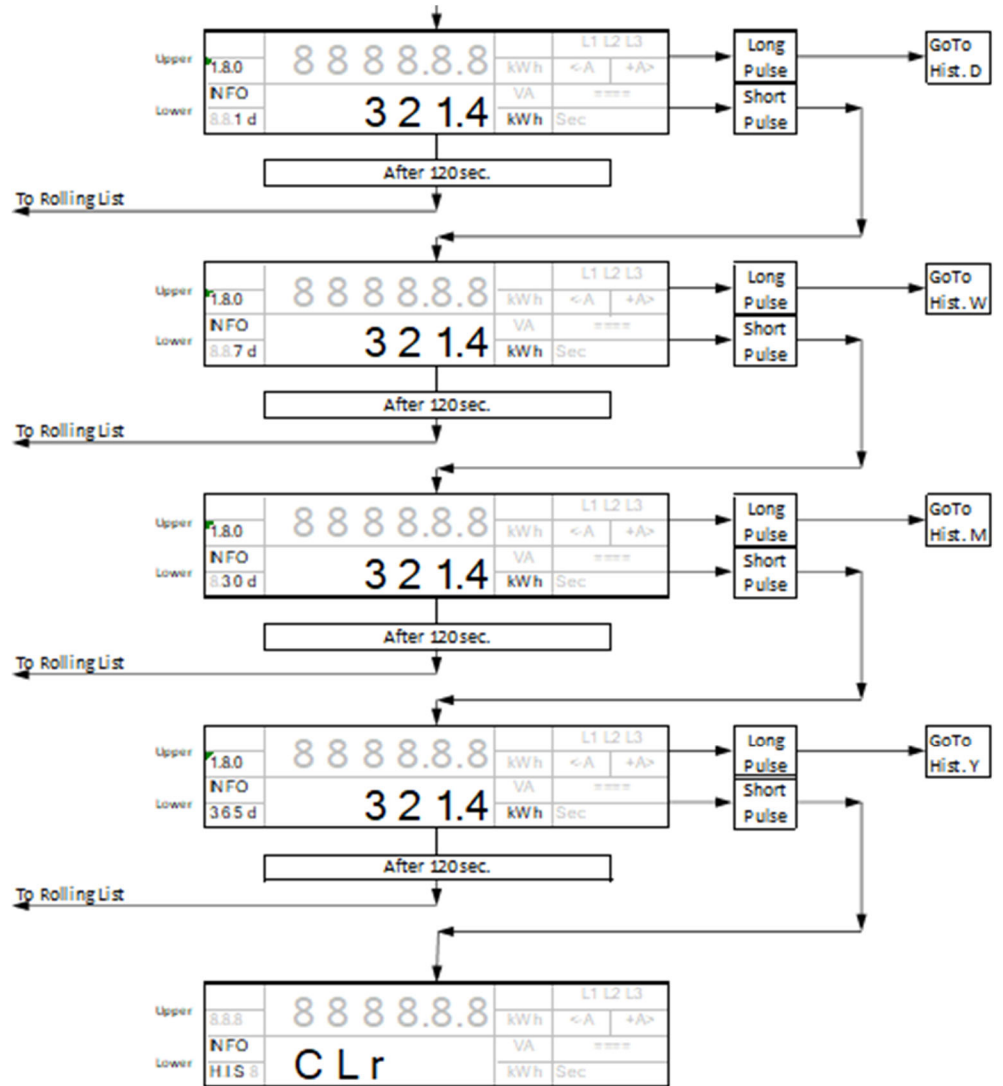
5.4.1.3 Total energy since last reset

With a short press or flash, the menu switches to total energy since last reset. With further short presses or flashes, the menu switches to historical values, and with long presses or flashes, the total energy register may be reset.
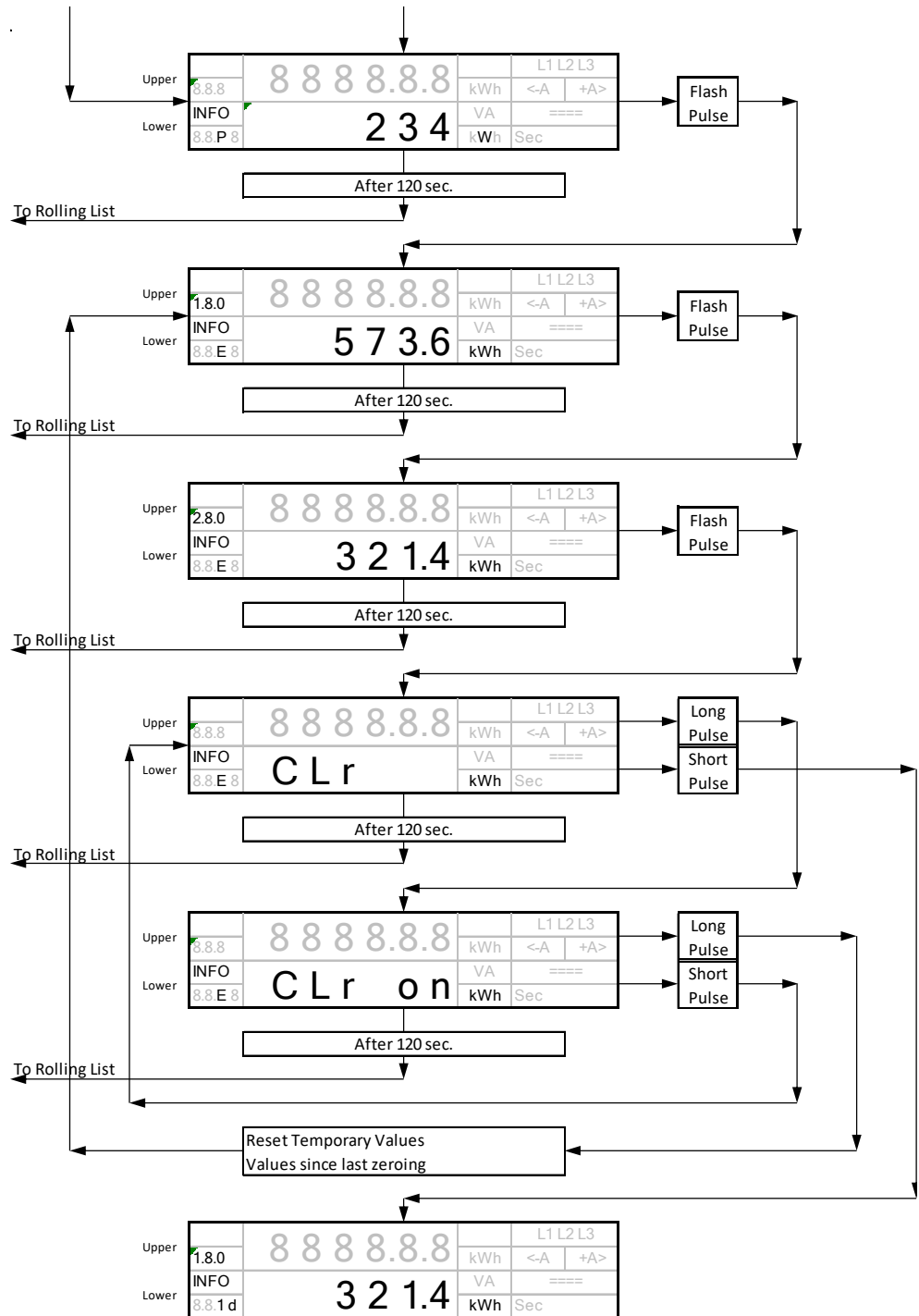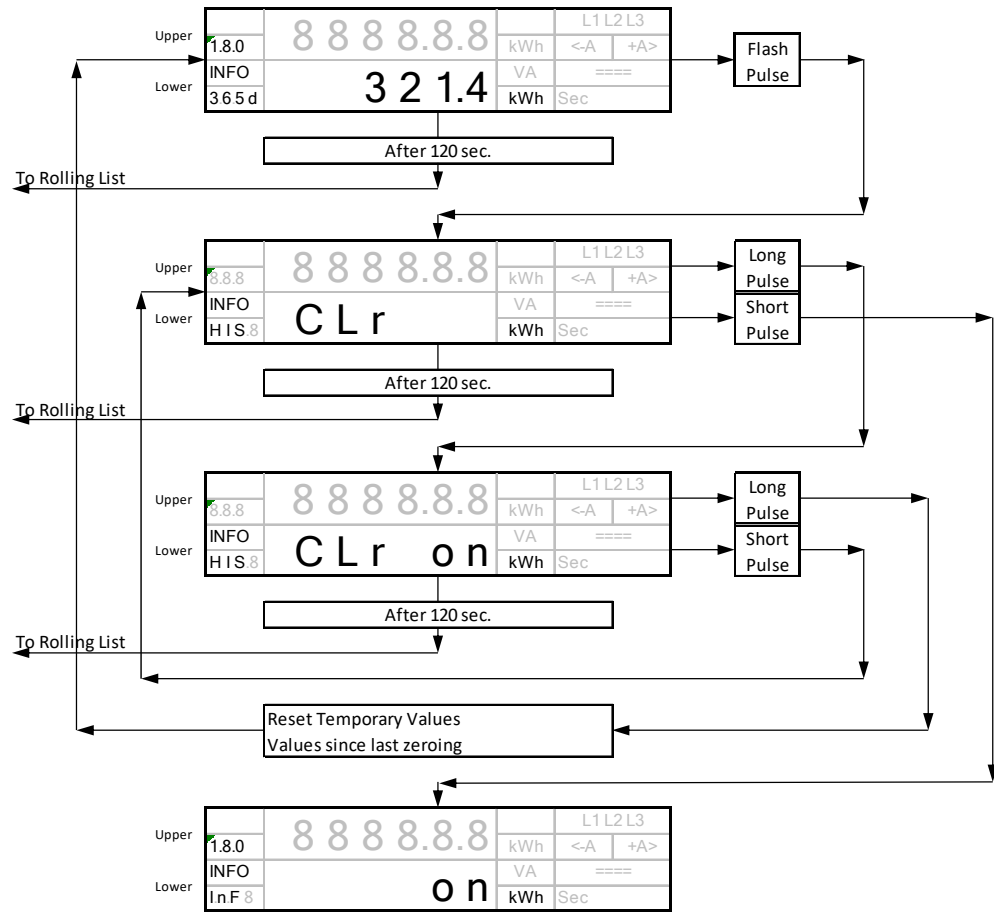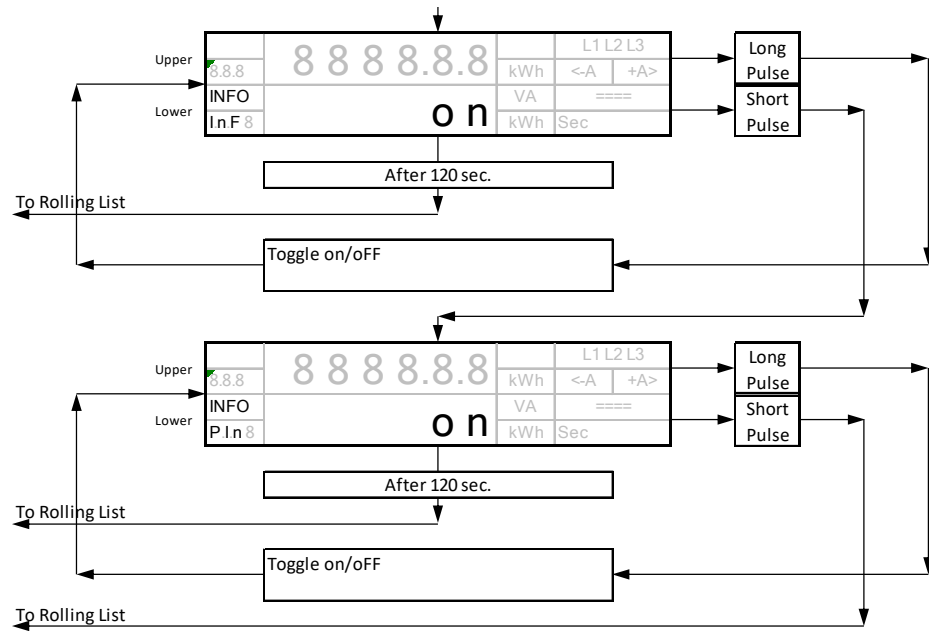
5.4.1.4 Historical values

With short flashes, the menu switches to the next current values. With long flashes, the menu switches to historical values.
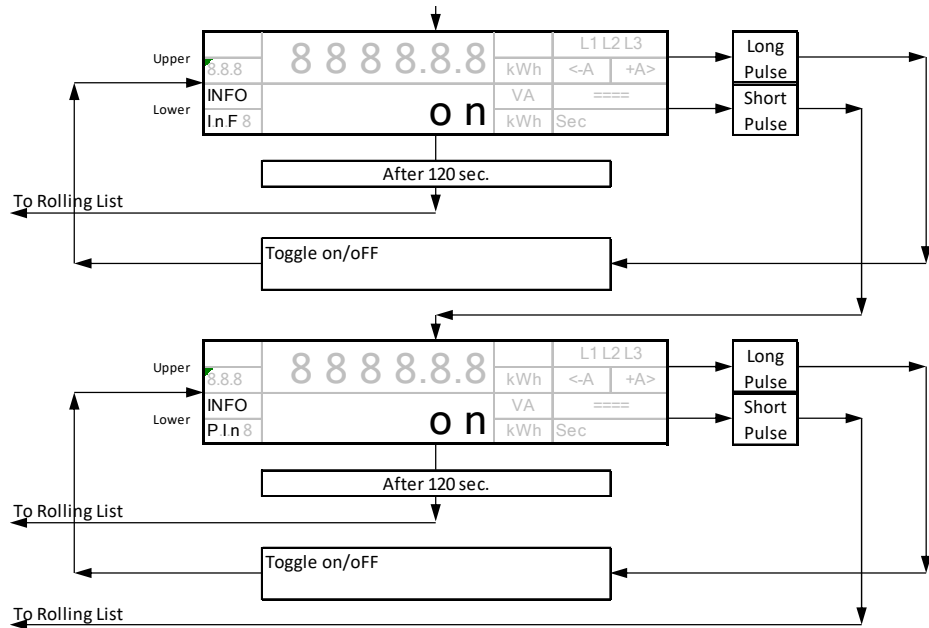
5.4.1.5 Reset historical values

5.4.1.6 Data set on INFO DSS

On: Extended data set

Off: Reduced data set

5.4.1.7 PIN activation

On: PIN activated, instantaneous power not displayed on lower line.

Off: PIN disabled, instantaneous power displayed, if enabled.

5.4.2 Optical interface: INFO DSS

Data pushes

The optical INFO interface operates in two modes: standard and extended. It pushes the following data periodically every second.

- Manufacturer identification

- Device identification

- Meter reading for +A (if present)

- Meter reading for -A (if present)

- Instantaneous power (if activated)

Communication parameters

The communication channel has the following parameters:

- Bitrate 9600 Baud

- Code 8-N-1

5.5 Update

5.5.1 Crypto reset

The command "Reset cryptographic parameters" will reset E220 meters to the customer-specific default values with regard to these parameters. The command can be only executed when the LMN module is plugged-in to the RS-485 interface.

This reset causes the following actions to be performed in the E220 meter:

- The symmetrical key for the exchange of TLS certificates is set to the delivery state (the register "Operational key" is thereby set to "Initial key").

- All TLS certificates and temporary TLS properties including session keys are explicitly headed by '0x00…00'.

- The transmission counter (see FNN LMN requirements for symmetric encryption for the exchange of TLS certificates) will not be reset.

- The state "Operation in a secured SMGw environment" is disabled.

The command "Reset cryptographic parameters" can only be executed, if certain conditions are fulfilled. The time "Tclosed" must be set to 30 seconds.

5.5.2   Firmware update

Firmware updates are not possible.

5.6   Optional modules

5.6.1   General

The E220 meter has a module slot above the terminal block. In a standard delivery, the module slot is covered with a dummy cover. In this case, the meter operates as a standalone 1 rate meter.

⚠️ **Change modules in power OFF mode only**
To install or replace a module, always disconnect the meter from power.

5.6.2   Dual rate module

To plug in the dual rate module to the E220, the power must be switched off. After power-up, the meter switches to the dual rate mode.
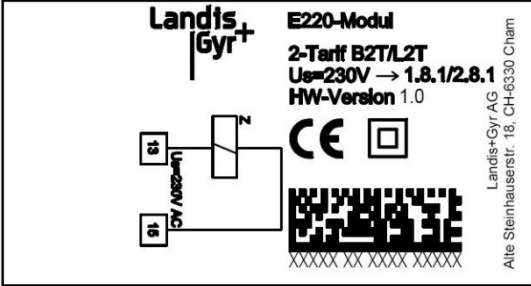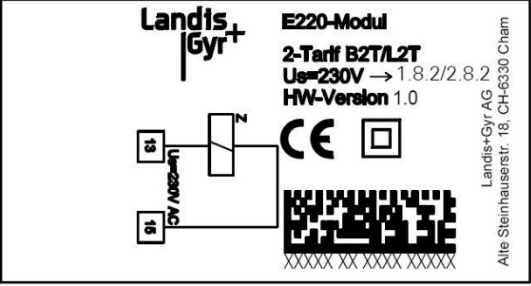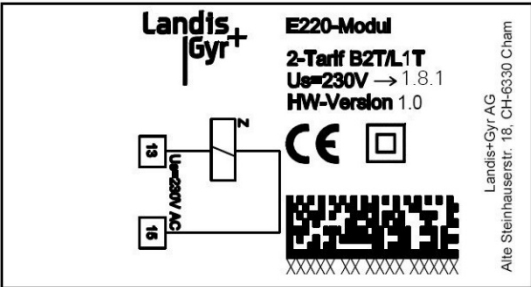
As soon as the meter operates in dual rate mode, it writes to registers x.8.1 and x.8.2. The corresponding registers in the rolling list are displayed on the display with the appropriate OBIS code (see also *5.1.1 "Basic layout and symbols"*). The OBIS code of the respective active register flashes (0.25 s off / 0.75 s on).

In the background, register x.8.0 continues to grow as the sum of x.8.1 and x.8.2.

There are four different types of dual rate modules for the control of tariffication. The meter automatically switches to the correct rating variant by means of a predefined PIN code in the module (factory setting).

The basic variant of the meter (consumption, generation or bidirectional meter) defines the type of the total registers in the meter (+ A: 1.8.0; -A: 2.8.0). The dual rate module can only operate with an existing total register.

There are four different variants of the Dual Rate Module:

Module type	Description
Module B2T/L2T 230 V (x.8.1)	Import 2-rate, export 2-rate (B2T/L2T); U_S = 230 V for 1.8.1 and 2.8.1 U_S = 0 V for 1.8.2 and 2.8.2
Module B2T/L2T 230 V (x.8.2)	Import 2-rate, export 2-rate (B2T/L2T); U_S = 230 V for 1.8.2 and 2.8.2 U_S = 0 V for 1.8.1 and 2.8.1
Module B2T/L1T 230 V (1.8.1)	Import 2-rate, export 1-rate (B2T/L1T); U_S = 230 V for 1.8.1 and 2.8.0 U_S = 0 V for 1.8.2 and 2.8.0

| Module type	Description
Module B2T/L1T 230 V (2.8.2)	Import 2-rate, export 1-rate (B2T/L1T); U_S = 230 V for 1.8.2 and 2.8.0 U_S = 0 V for 1.8.1 and 2.8.0
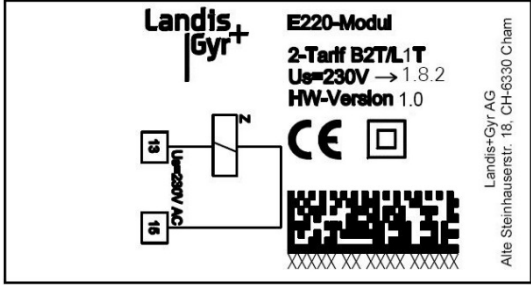
5.6.3 RS-485 LMN interface

The Smart Meter Gateway communicates with one or more meters connected to the LMN (Local Measurement Network) to get values. The meters are either wired or wireless connected.

Applications at the LMN interface are categorised as follows:

1. LMN meter administration

   a. Registration / configuration

   b. Key / certificate management

2. Request and reception of meter values

   a. Single request for meter values

   b. Multiple requests for meter values

The actual status of LMN communication is shown on the display. The symbol represents the different statuses of the LMN interface:

Symbol	Status
OFF	No communication on the LMN interface.
Blinking 0.5 s on/0.5 s off	Any layer 2 telegrams detected.
Blinking 2 s on/ 2 s off	HDLC connection telegrams detected.
ON	TLS connection ready. The meter communicates in secure mode.
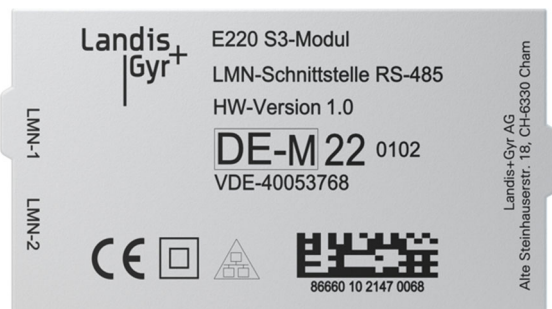
5.6.4   Wireless M-Bus LMN interface

The optional wireless M-Bus module provides a one-way connection from the meter to an M-Bus master, typically a Smart Meter Gateway (SMGW), and ultimately to the central metering system.

If you turn on the meter and the wireless M-Bus module is plugged in, the module will start sending the data automatically every 16 seconds. The recipient (SMGW) only needs the key to decrypt the data.

The wireless M-Bus module complies with the following standards:

- Communication systems for meters and their remote reading - Part 3: Special Application Layer EN 13757-3

- Communication systems for meters and their remote reading - Part 4: Wireless meter reading (radio meter reading between the 868 MHz and 870 MHz SRD band) EN 13757-4

- Communication systems for meters and their remote reading - Part 2: Physical and Link Layer EN 13757-2

Standard	EN 13757-4, T1
Security profile	Encryption mode 7
Frequency	868.95 MHz (minimum 868.7 MHz; maximum 869.2.00 MHz)
Transmission power	Minimum 3.16 mW (5 dBm) to maximum 25 mW (13.9 dBm)
Antenna	Internal antenna
Range in free field*	Up to a maximum of 400 metres
Sending interval	16 seconds
* May vary depending on terrain and building structure.	

In combination with a smart meter gateway, the following rate use cases (TAF) are supported according to PTB 50.8:

Rate use case	Description
TAF1	Data saving rates
TAF2	Time-variable rates *(rate switching ≥ 1 hour)*
TAF6	Retrieval of measured values in case of need

6   Maintenance

6.1   Service

The E220 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). If there is a problem with meter operation, the following points should be checked first:

1.   Is the mains voltage present (check meter display)?

2.   Has the maximum operating temperature been exceeded?

3.   Is the meter visibly damaged?

4.   Is there any error code on the display (code F.F.)? The error codes are described in section *6.2.1 "Error codes"*.

6.2.1   Error codes

Critical Error

A critical error means that a legally relevant function is no longer working properly. Values may not be used for billing without validation.

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 designated Landis+Gyr service centre.

If the device is displaying the F.F. register with an error code, there is a critical error. 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.

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

6.2.1.1 Representation of error codes

The error code is displayed in the upper line of the display.

7   Decommissioning and 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 to an appropriate recycling or disposal facility. When the product is removed from use, the whole product must be sent to a professional electronic waste treatment process. The waste treatment and disposal plants must be approved by local regulatory authorities.

The end processing of the product and recycling of its components must always be carried out in accordance with the rules and regulations of the country where the end processing and recycling are done.

On request, Landis+Gyr will provide more information about the environmental impact 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	Delivered to recycling plants
Metal components	Sorted and delivered to metal recycling plants
Plastic components	Sorted and delivered to re-granulation if at all possible

8   Terms and abbreviations

The following terms and abbreviations are used in this document:

Term	Description
DIN	Deutsche Industrie-Normen.
DSS	Datenschnittstelle. German abbreviation for a data interface.
EEPROM	Electrically Erasable Programmable Read-Only Memory. EEPROM is a type of non-volatile memory used in electronic devices
FNN	Forum Netztechnik/Netzbetrieb. The network technology / network operation forum of the VDE, the German Association for Electrical, Electronic & Information Technologies.
INFO	Optical INFO interface is a standardised interface for the end-user. It is used to communicate with the base meter.
LCD	Liquid Crystal Display.
LED	Light-Emitting Diode.
LMN	Local Metrological Network. LMN provides the communication network between the meter and the gateway. Typically an RS-485 or wireless M-Bus interface.
MCU	Microcontroller Unit. A single computer chip designed for embedded applications.
NIST	National Institute of Standards and Technology. NIST has endorsed elliptic curve cryptography in its set of recommended algorithms for key exchange and digital signature.
OBIS	Object Identification System. OBIS provides standard identifiers for all data within the metering equipment, both measurement values and abstract values.
PIN	Personal Identification Number. PIN is a code asked by the SIM card to authenticate the user.
RAM	Random Access Memory.
RLM	Registered Power Measurement.
SLP	Standard Load Profile.
SMGw	Smart Meter Gateway.
SML	Smart Message Language. SML is a communication protocol for electricity meters.
TLS	Transport Layer Security. TLS is a cryptographic protocol that provides communications security over a computer network.

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