Electricity Meters IEC
High precision metering

Qualigrid

ZMQ200, ZFQ200, ZCQ200

User Manual

Filename: H71 0200 0215 en ZxQ User Manual

Revision history

Version	Date	Comments
a	20.12.2002	First release, for approbation.
b	07.01.2003	New layout
c	07.03.2003	Chapter 2 updated, various changes: hazard symbols, sealing, LP memory, starting load
d	19.03.2003	Minor changes to paragraph 6.3 Errors
e	30.06.2003	Updates according to the safety review (preliminary edition) and to final review
f	19.12.2003	Updates according to product risk analysis and firmware H00
g	31.03.2004	Updates for firmware H01
h	31.01.2005	Amendments for firmware version H02/H90 (registration of delta values, demand and power factor, stored billing value profile, IEC870 subset, transmitting contact test mode)
k	06.02.2006	Amendments for paragraph 7.3.2 (New version of battery holder)
m	14.11.2008	Various text corrections and picture improvements, H03 update, corrections
l	10.04.2014	Various text updates

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About this Document

Range of validity

The present user manual applies to the meters specified on the title page with firmware H03 and H90.

Purpose

The user manual contains all the information required for the use of the meters for the intended purpose. This includes:

- Provision of knowledge concerning characteristics, construction and function of the meters
- Information about possible dangers, their consequences and measures to prevent any danger
- Details concerning the tasks to be performed work throughout the service life of the meters (parameterisation, installation, commissioning, operation, maintenance, shutting down and disposal)

Target group

This user manual is intended for technically qualified personnel of meter owners responsible for system planning, installation and commissioning, operation, maintenance, decommissioning and disposal of the meters.

Conditions

Personnel performing tasks according to this manual is familiar with the basic principles of electrical engineering, in particular with the principles of energy measurement, including circuitry types, connection technology, etc.

Reference documentation

The following documents complement this user manual:

Functional description: Explains the functionality of the ZxQ meter and the parameterisation using the MAP tool.

Technical data: States the technical data of the ZxQ meter.

Type designation

The following conventions are used in this user manual to represent type designations:

- The lower case letter "x" can be used as an unknown to indicate different versions (e.g. ZxQ202 for the ZMQ202 and ZFQ202 meters).
- The digit pair "00" can be used to indicate accuracy data (e.g. ZxQ200 for the ZxQ202 and ZxQ205 meters).
- The abbreviated type designation ZMQ or ZFQ meters can be used when all three-phase four-wire meters or three-phase three-wire meters are meant.

C.2 and C.7

Versions C.2 and C.7 are described in detail separately in the appendix as they are special versions (meter with software configuration **C.2** need SW-version **H90** instead of H03, **C.7**-versions are exclusively intended for the Indian market).

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1 Description of Unit

1.1 Application

The ZxQ is a high precision combimeter of class 0.2S designed for energy measurement in the following applications:

- energy production applications
- energy transmission applications
- industrial consumer applications
- in special, high-precision metering applications

1.2 Features

The ZxQ is the answer to customer needs, providing

- More measurement quantities (e.g. single phase, U, I, VA)
- Installation diagnostics for easy commissioning
- Quick network diagnostics on site
- Standard protocols for the communication of the meter with the billing station.

Excellent measurement features for Cl.0.2S

- Landis+Gyr-proven long-term stability and reliability
- All requirements guaranteed according to IEC 62053-22
- Excellence in measurement from starting load to P_{max} in both energy directions
- Negligible influence if power factor is below 1
- Reactive energy Cl. 0.5 S, 1 S and 0.5 according IEC 62053-24 Ed. 1.0.

Special grid functions

- Measurement system five times faster than in industrial meters, giving sufficient resolution for capture periods less than 15 minutes (1 to 5 minutes) and accurate measurement when energy direction changes
- Measurement of losses if the billing point and the metering point are not identical
- Easy customer calibration for all-phase corrections
- Transmitting meter with concentrator (extension for existing equipment)
- An additional power supply secures communication even if the measuring voltage fails. In addition, the additional power supply prevents improper voltage drops at the line between transformer and meter.

Communication

- Standard dlms communication protocol with the possibility of other standard protocols for network management
- Use of modular communication units separated from measurement (same solution as ZMD400).

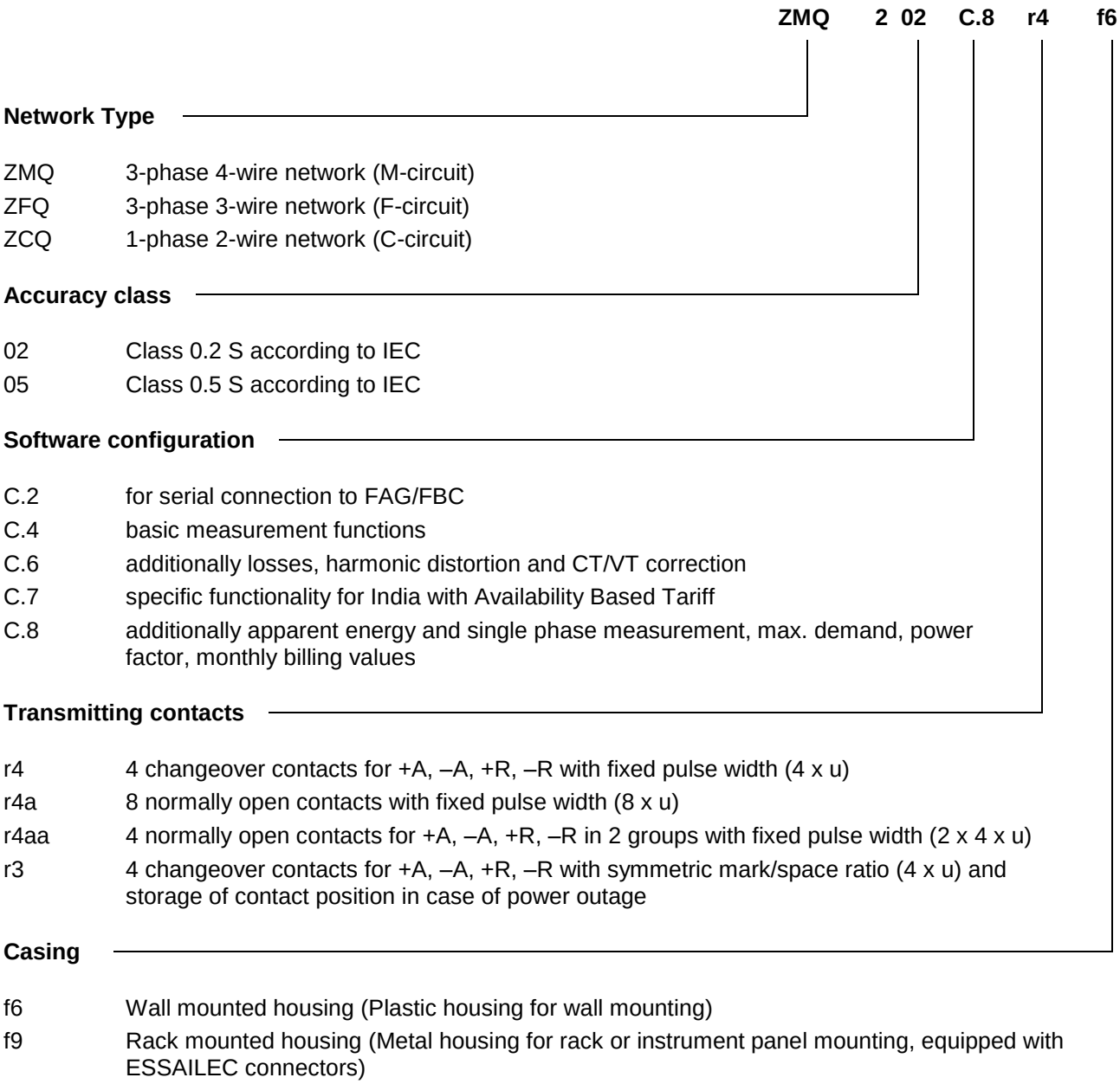
Transmitting contacts

None, 4, or 8 transmitting contacts, constant impulse frequency up to 40 imps/s, possibility for two contacts with the same value or quadrant splitting.

Broad range of applications

Wall / projection-mounting and rack / flush-mounting with the same printed circuit boards give more flexibility at the place of installation and saves money on spare parts. Plug-in compatible version with ESSAILEC connectors for replacement or extension of system.

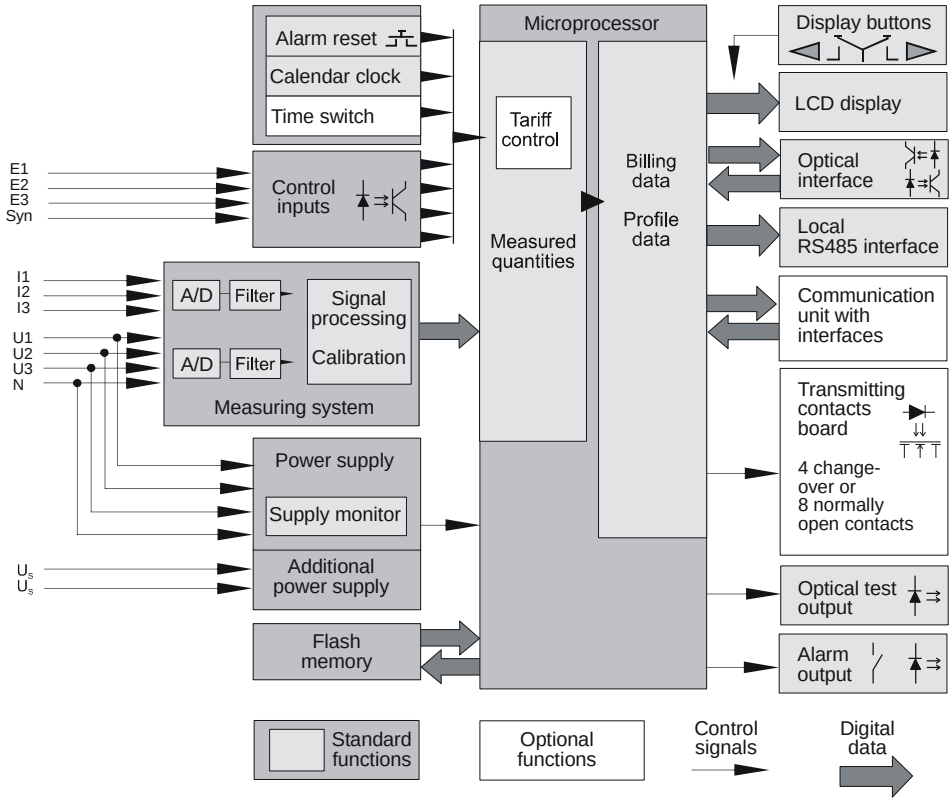
1.3 Type Designation



For information concerning C.2 meters see section 8 on page 96, for information concerning C.7 meters see section 9 on page 102.

In this user manual, the communication according to the IEC870 subset will be referred to as IEC870 communication hereafter.

1.4 Block Schematic Diagram



Inputs

The main inputs to the meter are:

- Phase voltages U1, U2, U3 and neutral conductor N
  - to be processed in the measuring system
  - to be monitored by the voltage monitor
  - for the three-phase power supply of the meter
- Phase currents I1, I2, I3
  - to be processed in the measuring system
  - to be monitored by the current monitor
- Control inputs used for:
  - selecting of energy tariffs (3 control inputs: E1, E2, E3)
  - synchronising the internal calendar clock (1 control input: Syn)

Opto-couplers provide the galvanic isolation and protect the electronic circuits of the meter from interference, which could otherwise enter via the control inputs.

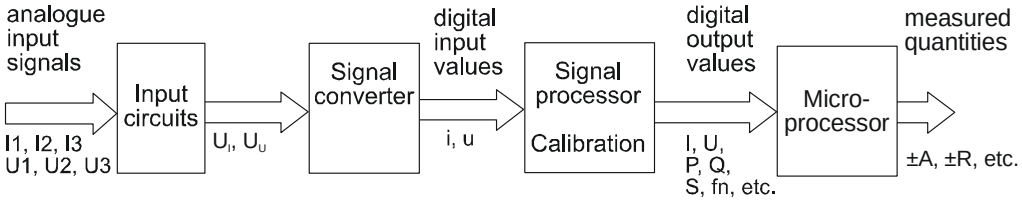
- Additional power supply U_S to ensure the operation of the meter during interruptions of the measurement voltage
- Push buttons
  - for display control (2 buttons)
  - for service functions and alarm reset (1 button)

Outputs

The meter has following outputs:

- Single line, 8-digit liquid crystal display (LCD) with back light for local reading of billing data and profile data and additional information, such as energy flow, type of energy, presence of phase voltages and identification numbers
- Optical test outputs (green LEDs) for either active and reactive energy or I^2 and U^2
- Alarm output (relay and red LED)
- Up to 8 transmitting contacts with selectable signal assignment on the transmitting contacts board (solid-state relays)
- Optical interface for the download of parameterisation data and for local data acquisition by a suitable data acquisition unit (e.g. laptop)
- Local serial interface RS485 for the daisy-chain connection between the individual meters
- Various communication interfaces (e.g. RS485, RS232, modem) for the transfer of billing data and profile data to the central station.

1.5 Measuring System



1.5.1 Input Signals

The input signals of the meter's measuring system are the analogue current values I1, I2, I3 and the analogue voltage values U1, U2, U3.

1.5.2 Input Circuits

Voltage input High resistance voltage dividers reduce the voltages U1, U2, U3 applied to the meter (57.7 V to 132.8 V) to a proportional value of a few mV (U_U) for further processing.

Current input Compensated current transformers similarly reduce the input currents I1, I2, I3 applied to the meter (0 to 2 A or 0 to 7.5 A). The secondary currents of these current transformers develop voltages over burden resistors. These voltage values are proportional to the input currents, also of a few mV (U_I).

1.5.3 Signal Converter

The analogue input signals U_U and U_I are converted to digital values by a signal converter.

Digital instantaneous values of voltage (u) and current (i) for all three phases are then available at the output of the signal converter.

1.5.4 Signal Processor

Over an integration interval of 0.2 seconds, the signal processor calculates active, reactive and apparent energy. As a general rule, the measuring system of the ZMQ produces single-phase data while the ZFQ provides data corresponding to its two measuring elements.

The signal processor also provides various instantaneous values such as phase voltages and phase currents as well as diagnostic values (total harmonic distortion, voltage failures etc.).

The values will be available as digital data. They are stored in the output buffer of the signal processor from where they are transferred to the micro-processor by an interface.

1.5.5 Microprocessor

Based on the data of the signal processor, the microprocessor calculates the measured quantities.

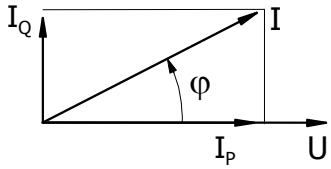
Single phase energy calculation

The calculation of the energy per phase is a two-step procedure:

1. The instantaneous, single-phase values of power are produced by multiplying the instantaneous, single phase values of voltage U and current I.
2. The single-phase values of power are then integrated over the integration period.

Active energy

The active power is the product of the voltage multiplied by the current component parallel to the voltage I_P.



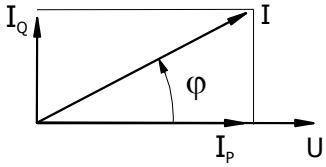
Calculation per phase of
$P = U \cdot I \cdot \cos \varphi$
$P = U \cdot I_P$

The instantaneous value of active power P is then integrated over the integration period of 0.2 seconds to form a digital value of active energy.

Reactive energy

For the instantaneous value of reactive power Q the instantaneous values of voltage U and current I must be rotated by +45° and –45° respectively prior to the multiplication.

The reactive power is the product of the voltage multiplied by the current component vertical to the voltage I_Q.



Calculation per phase of
$Q = U \cdot I \cdot \sin \varphi$
$Q = U \cdot I_Q$

The instantaneous value of reactive power Q is then integrated over the integration period of 0.2 seconds to form a digital value of reactive energy.

1.6 Measured Values

Depending on the functional range (software configuration) of the meter, different sets of measured quantities are available.

C.4

With the C.4 meters, the following measured quantities are available:

Measured quantity		**ZMQ**	**ZFQ**	**ZCQ**
Active energy import	+A	Sum	Sum	L1
Active energy export	–A	Sum	Sum	L1
Reactive energy import	+R	Sum	Sum	L1
Reactive energy export	–R	Sum	Sum	L1
Reactive energy in quadrant I	+Ri	Sum	Sum	L1
Reactive energy in quadrant II	+Rc	Sum	Sum	L1
Reactive energy in quadrant III	–Ri	Sum	Sum	L1
Reactive energy in quadrant IV	–Rc	Sum	Sum	L1
Phase voltages (RMS)		U1, U2, U3	U12, U32	U1
Phase currents (RMS)		I1, I2, I3	I1, I3	I1
Network frequency	fn	yes	yes	yes
Phase angle between voltages	φ U	U1-U2 / U1-U3	U12-U32	
Phase angle between voltage and current	φ U-I	U1-I1, U1-I2, U1-I3	U12-I1, U12-I3	
Direction of rotating field		yes	yes	
Phase outage		yes	yes	yes
Voltage dip table		Sum	Sum	L1
Energy flow of active energy	EFA	Sum	Sum	L1
Energy flow of reactive energy	EFR	Sum	Sum	L1

The ZMQ will only measure the phase angles if voltage L1 is present.

The ZFQ will only measure the phase angles if all voltages are present.

Instantaneous values are set in **bold,** *Diagnostic values* in *italics*.

C.6

With the C.6 meters, the following measured quantities are available in addition to C.4:

Measured quantity		**ZMQ**	**ZFQ**	**ZCQ**
Active copper losses (line)	OLA	Sum	Sum	L1
Active iron losses (transformer)	NLA	Sum	Sum	L1
Reactive copper losses (line) [1)]	OLR	Sum	Sum	L1
Reactive iron losses (transformer) [1)]	NLR	Sum	Sum	L1
Voltage square hours (internal value only)	U^2h	Sum	Sum	L1
Current square hours (internal value only)	I^2h	Sum	Sum	L1
Primary active power	P	Sum	Sum	L1
Primary reactive power	Q	Sum	Sum	L1
Total losses of active energy in positive direction [2)]	+TLA	Sum	Sum	L1
Total losses of active energy in negative direction [2)]	–TLA	Sum	Sum	L1
Total losses of reactive energy in positive direction [1) 2)]	+TLR	Sum	Sum	L1
Total losses of reactive energy in negative direction [1) 2)]	–TLR	Sum	Sum	L1
THD of active energy	THD_A	Sum	Sum	L1
THD of phase voltage	THD_U	Sum / Phases	Sum	L1
THD of phase current	THD_I	Sum / Phases	Sum	L1

1) Values for reactive losses are intended for compatibility reasons with third-party products. However, Landis+Gyr do not recommend to measure losses of reactive energy.

2) Maximum two of these four values can be selected.

Instantaneous values are set in **bold,** *Diagnostic values* in *italics*.

C.8

With the C.8 meters, the following measured quantities are available in addition to C.4 and C.6:

Measured quantity		**ZMQ**	**ZFQ**	**ZCQ**
Active energy import	+A	single-phase		
Active energy export	–A	single-phase		
Reactive energy import	+R	single-phase		
Reactive energy export	–R	single-phase		
Reactive energy in quadrant I	+Ri	single-phase		
Reactive energy in quadrant II	+Rc	single-phase		
Reactive energy in quadrant III	–Ri	single-phase		
Reactive energy in quadrant IV	–Rc	single-phase		
Apparent energy import	+S	Sum / Phases	Sum	L1
Apparent energy export	–S	Sum / Phases	Sum	L1

Measured quantity		ZMQ	ZFQ	ZCQ
Apparent energy in quadrant I	+Si	Sum / Phases	Sum	L1
Apparent energy in quadrant II	+Sc	Sum / Phases	Sum	L1
Apparent energy in quadrant III	–Si	Sum / Phases	Sum	L1
Apparent energy in quadrant IV	–Sc	Sum / Phases	Sum	L1
Net/gross active energy in positive direction	+CA	Sum	Sum	L1
Net/gross active energy in negative direction	–CA	Sum	Sum	L1
Net/gross reactive energy in positive direction	+CR	Sum	Sum	L1
Net/gross reactive energy in negative direction	–CR	Sum	Sum	L1
Total losses of active energy in positive direction	+TLA	Sum	Sum	L1
Total losses of active energy in negative direction	–TLA	Sum	Sum	L1
Total losses of reactive energy in positive direction [1)]	+TLR	Sum	Sum	L1
Total losses of reactive energy in negative direction [1)]	–TLR	Sum	Sum	L1

[1)] Values for reactive losses are intended for compatibility reasons with third-party products. However, Landis+Gyr do not recommend to measure losses of reactive energy.

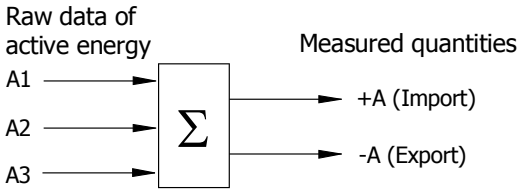
Due to the different type of measurement of the Aron circuit, data for the individual phases are not provided by the ZFQ.

1.6.1 Calculation of Measured Quantities

By scanning the digital output values of active energy A and reactive energy R every 0.2 seconds, energy components (Ws or vars) with varying energy magnitudes are produced at fixed intervals.

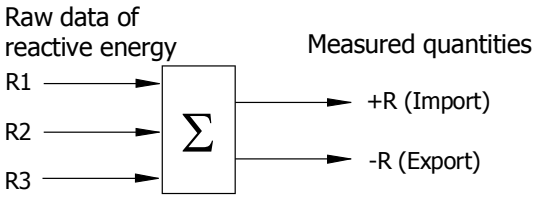
Active energy

The microprocessor calculates the total active energy import +A and the total active energy export -A by summating the raw data of active energy A1, A2 and A3.



Reactive energy

The microprocessor calculates the total reactive energy import +R and the total reactive energy export -R by summating the raw data of reactive energy R1, R2 and R3.

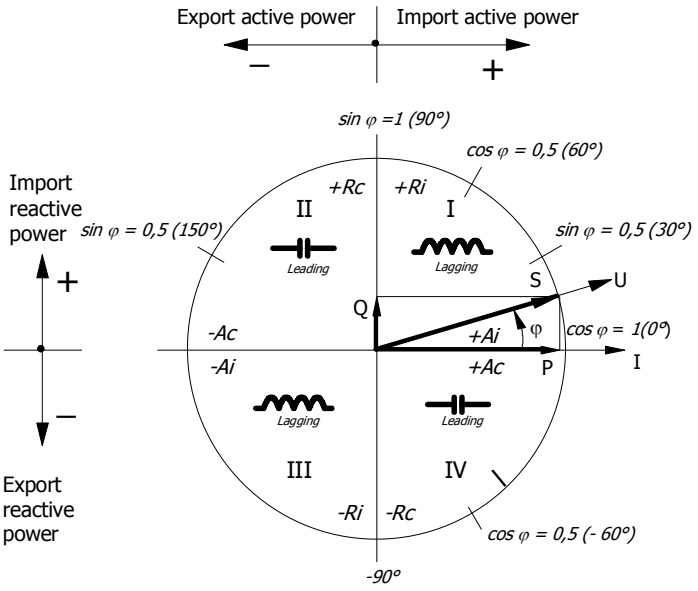


These energy components are scaled by the microprocessor corresponding to the meter constant (primary data) and are then available as measured quantities. The measured quantities can be selected by parameter setting. Their measured values are fed directly to the registers to record the energy.

Allocation to the four quadrants

Based on the signs of A and R, the microprocessor can allocate the reactive energy to the four quadrants.

- Reactive energy in quadrant I: +Ri
- Reactive energy in quadrant II: +Rc
- Reactive energy in quadrant III: –Ri
- Reactive energy in quadrant IV: –Rc



1.6.2 Demand

The ZxQ meters with the functional range C.8 register the demand of the measured values +A, –A, +S and –S. The meters may register the average demand of the current and the last integration period as well as maximum demand and cumulated maximum demand.

1.6.3 Power Factor

The ZxQ meters with the functional range C.8 register the power factor. The meters may register the instantaneous power factor as well as the average power factor of the current and the last integration period for both energy directions (import and export).

1.7 Tariff Control

Various signal sources can be used to select the required tariff. Tariff control may be performed:

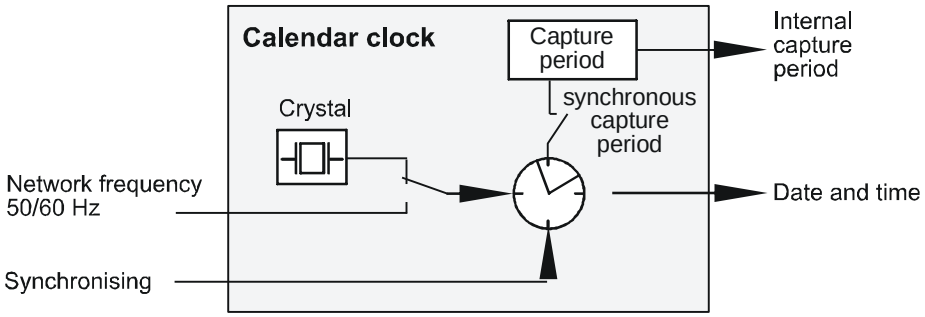
- Externally by the three input control signals E1, E2, E3 (with selectable control voltage ranges: 24 V to 230 V; the control voltage must be specified by the customer). The control input E1 may also be used to enable the bypass feeder operation mode.
- Internally by the calendar clock and the time switch
- By event signals based on threshold values of the monitoring functions, e.g. frequency, voltage

Signals from various signal sources can be combined to realise a complex tariff structure.

1.8 Calendar Clock

The internal calendar clock of the ZxQ generates the date and time information, which is used:

- for the date and time information to be displayed
- to control the time switch TOU
- for the time stamps in the profiles, snapshot, stored billing value profile and event log
- for the controlling of the capture period of the load profile



Time base

The calendar clock either uses the internal crystal or the network frequency as time base (depending on parameterisation).

The network frequency (50 Hz or 60 Hz) may be used as time base, provided it is sufficiently accurate. Tuning is then performed after each full wave, i.e. after 20 ms at 50 Hz. If the network frequency happens to vary by more then 5% the calendar clock automatically switches to the crystal time base.

Accuracy

The crystal features a maximum deviation of 0.5 s per day (<6 ppm).

Synchronisation

The calendar clock can be synchronised in regular intervals:

- via communication (e.g. by the central station).
- by an external master clock via synchronisation input Syn

Time-setting The time and date of the calendar clock can be set:

- via communication
- manually in the set mode in the service menu of the meter

Power reserve A supercap (capacitor of a very large capacity) provides the power reserve for the calendar clock. The power reserve may be extended with a battery.

- Power reserve without battery: 20 days (only after the meter has been connected to the network for at least 300 hours)
- Power reserve with battery: 10 years

1.8.1 Synchronisation and Time-Setting

Synchronisation We talk about synchronisation when the clock is adjusted to an external reference in regular intervals. The synchronisation signal is sent to the meter within a predefined time window. Synchronisation is performed in order to make sure that all meters within the network show the same time.

Synchronisation of the meter may take place via the control inputs or via communication.

Time-setting We talk about time-setting when the time is adjusted outside the synchronisation window. This is the case when, for instance, during meter installation the calendar clock is set to the local time.

The time may be set manually in the set mode or via communication.

1.8.2 Synchronising the Calendar Clock via the Synchronisation Input

The calendar clock can be synchronised by an external master clock (e.g. central station), which sends synchronisation pulses at regular intervals.

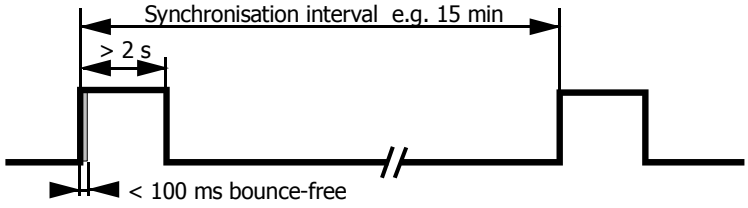
There are three possibilities of synchronising the calendar clock using the external synchronisation signal:

- The synchronisation takes place several times per day
  - To the minute or
  - To the capture period
- The synchronisation takes place once per day.

Use only one type of synchronisation
Only one type of synchronisation can be used at a time, either several times per day **or** once per day.

several times per day

The "several times per day" synchronisation takes place at regular intervals. The interval is defined by parameter setting.



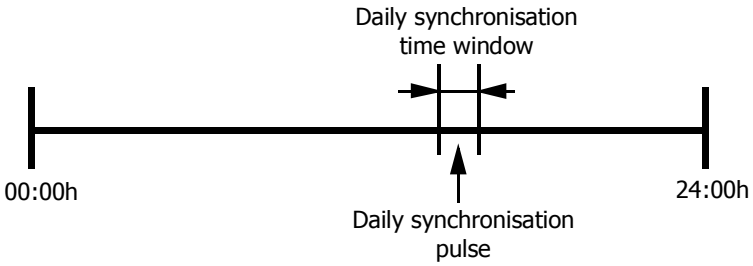
Since the synchronisation signal is transmitted at regular intervals (e.g. 00:00h, 00:15h, 00:30h etc) it carries a time information. When, for instance, the meter receives the third synchronisation signal of the day (00:30h) the calendar clock is synchronised to 00:30h. The reaction of the meter to the synchronisation signal depends on the detected deviation (see section 1.8.5 “Handling Time Deviations”).

The meter will accept the synchronisation pulse any time but only once within one synchronisation interval.

Ignoring second synchronisation pulse
A second synchronisation pulse within the same synchronisation interval will be ignored.

Once per day

With the daily synchronisation, the meter allows one time window per day within which the synchronisation pulse must be sent to the meter. The time of the day (e.g. 22:00h) and the width (e.g. one minute) of the window can be defined by parameter setting.



If the "time of the day" parameter is set to 22:00h and the meter receives a synchronisation signal within the defined window, the calendar clock is synchronised to 22:00h. The reaction of the meter to the synchronisation signal depends on the deviation (see section 1.8.5 “Handling Time Deviations”).

The meter will not accept any synchronisation pulses outside the time window and the signal will therefore have no effect.

1.8.3 Synchronising the Calendar Clock via Communication

The calendar clock can be synchronised by the central station, which sends the time information to the meter via the selected communication interface.

The time information received is compared with the local time of the meter. The reaction of the meter to the time information depends on the deviation (see section 1.8.5 “Handling Time Deviations”).

Via communication, the time may be synchronised only once per synchronisation interval.

Time synchronisation twice within synchronisation interval
If the time is synchronised a second time within the same synchronisation interval, the capture period is reset no matter how small the deviation. This is to prevent multiple synchronisations with a small time shift resulting in a large time shift that, if made in one single approach, would have reset the capture period.

Disabling the synchronisation via communication
The synchronisation of the calendar clock via communication may be disabled by setting the parameters of the security system accordingly.

1.8.4 Setting the Time

Date and time of the calendar clock can be set manually in the set mode or via communication (e.g. with a laptop).

The time information received is compared with the local time of the meter. The reaction of the meter to the time information depends on the deviation (see section 1.8.5 “Handling Time Deviations”).

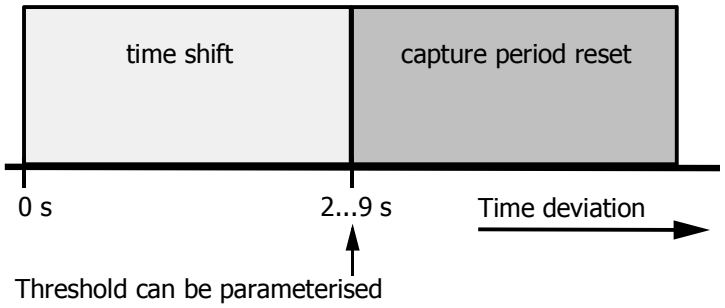
Setting the time twice within capture period
If the time is set a second time within the same capture period, the capture period is reset no matter how small the deviation.

1.8.5 Handling Time Deviations

Depending on the time deviation of the internal clock from the external master clock, the adjustment has different effects on the calendar clock.

The following two cases are possible:

- the time deviation is shorter than 2 to 9 seconds (depending on parameter setting) => time shift
- the time deviation is longer than 2 to 9 seconds (depending on parameter setting) => capture period reset



Time shift

If the difference between the internal clock and the master clock is between one second and the parameterised threshold, the time is adjusted to the synchronisation time. Advancing or setting back the clock is only allowed once per synchronisation interval. The affected capture period is shortened or elongated by the number of seconds of the time shift.

This time shift is allowed only once per synchronisation interval. Thus further time shifts within the same synchronisation interval will restart the capture period.

Capture period reset

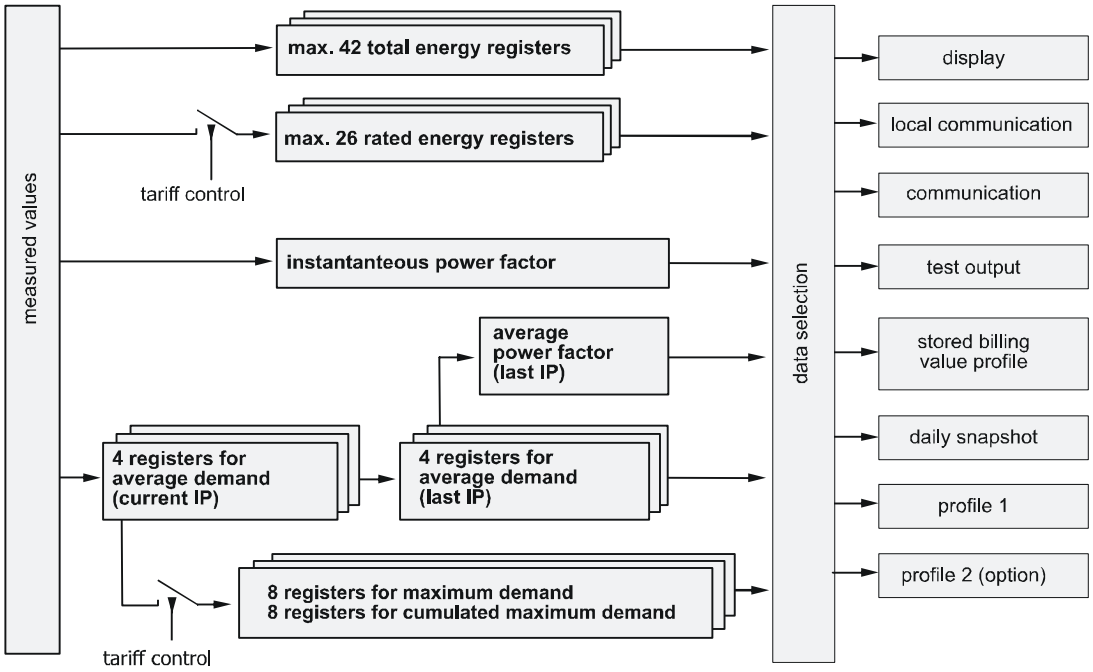
If the difference between the internal clock and the master clock is bigger than the parameterised threshold, the time for the calendar clock is set to the synchronisation time. Setting the time always causes the termination of the present capture period and the start of a new period. An entry will also be made in the event log.

Setting the time either to the start or the end of the capture period or setting the time to a time within the capture period results in at least one shortened capture period. Load profile entries for shortened capture periods are identified by a corresponding status entry and are declared invalid.

1.9 Registers

The following registers are available for the analysis of the individual measured values:

- max. 42 total energy registers (no tariffs)
- max. 26 rated energy registers
- 1 register for the instantaneous power factor (C.8 only)
- 2 registers for the average power factor of the last integration period for energy import and export (C.8 only)
- 4 registers for average demand of the current integration period (C.8 only)
- 4 registers for average demand of the last integration period (C.8 only)
- 8 registers for maximum demand (C.8 only)
- 8 registers for cumulated maximum demand (C.8 only)
- other registers for values of voltage and current, network frequency, phase angles etc.



1.10 Memory

A non-volatile memory (FLASH memory) contains the configuration and parameterisation data of the meter. It also contains the profile(s), the snapshot, the stored billing value profile and the event log data.

The flash memory stores data without data loss in case of voltage failures. A battery is not required for this.

1.10.1 Profile 1 and Profile 2 (option)

Profiles are used to save the values of various registers at regular intervals. The measured values that are captured in a profile can be selected by parameterisation and may include energy advance, total energy, demand and power factor registers as well as instantaneous values.

Profile 2 is optional
A second profile can be activated in the configurations C.4, C.6 and C.8.

Profile 1 The first profile is generally used for billing purposes. It has a capture time range of 1...60 min., the standard value is 15 min. This profile also contains detailed status information for data processing in central stations.

Profile 2 The second profile can either be used for operation control (SCADA supervision, with a short capture period of 1 to 5 min.) or for billing (with a capture period of 1 h for countries which have not yet changed to the standard capture period of 15 min.). This makes it possible to change from a capture period of 1 h to 15 min. without a modification of the capture period parametrisation (sealed).

Memory size Each load profile entry consists of the measured value itself (energy registers = 8 bytes, diagnostic values = 4 bytes), a time stamp of 5 bytes and a status code of 4 bytes.

The ZxQ meter features two profile memories of 2.88 MB each.

A minimum of 100 days is guaranteed with 36 captured registers and a capture period of 15 minutes.

A maximum of 800 days can be covered no matter how long the capture period and how few registers are captured.

The load profile is organised as a circular buffer, i.e. the oldest entry will be overwritten by the most recent entry.

1.10.2 Snapshot

The meter stores the current value of the energy registers to the snapshot profile every day. Which registers are stored to the snapshot profile and at what time of the day the storage takes place can be selected by parameterisation.

The snapshot profile may register a maximum of 36 registers with a maximum of 40 entries each.

1.10.3 Stored Billing Value Profile

At the end of the billing period, the meter stores the current value of the registers to the stored billing value profile. The billing period always corresponds with the capture period of the load profile. Which energy registers and/or demand registers are stored to the stored billing value profile can be selected by parameterisation.

The stored billing value profile is available with meters with the functional range C.8 only. The stored billing value profile may register a maximum of 36 registers with a maximum of 40 entries each.

1.10.4 Event Log

Events that occur sporadically are stored in the event log. The user may select which events trigger an entry in the event log. The event log is used to analyse the behaviour of the network as well as to supervise the correct function of the meter.

Memory size

In the event log, a minimum of 256 event entries can be stored, all of which consist of the time stamp and the event number.

The event log is organised as a circular buffer, i.e. the oldest entry will be overwritten by the most recent entry.

1.11 Power Supply

The supply voltages for the meter are obtained from the three-phase network, whereby the phase voltage may vary over the entire voltage range without the power supply having to be adjusted. As the power supply even works with only one phase voltage available, single-phase voltage dips do not affect the operation of the meter.

A voltage monitor ensures correct operation and reliable data recovery in the event of an all-phase voltage interruption and correct restarting when the voltage is restored.

1.12 Additional Power Supply

Because the three-phase network can be switched off in grid metering applications, the meter is equipped with an additional power supply in order to prevent the meter from switching off.

The additional power supply supplies its voltage in parallel to the normal network supply and ensures an uninterrupted operation of the meter, so that the meter can be read at any time. In a special mode, the meter may also be powered by the additional power supply only (optional, depending on parameter settings). As a result, there is no load on the line between transformer and meter and voltage drops on the line are prevented.

1.13 Transmitting Contacts Module

The transmitting contacts module is fitted inside the meter and is therefore secured by verification seals. It features up to four changeover contacts or up to eight normally open contacts (solid-state relays). The contacts are used to transmit energy pulses and/or energy direction information or status information.

r4 transmitting contacts transmit pulses with a defined pulse length (20 ms, 40 ms or 80 ms). r3 transmitting contacts transmit pulses with a mark-to-space-ratio of 1. Polarity changes are evaluated.

There are transmitting contact modules with a pre-defined terminal allocation while the terminal allocation of other modules can be parameterised according to the customer’s specification.

1.14 Communication Unit (Option)

The optional communication unit is a complete unit housed in its own case. If mounted, it is situated under the front cover or connected via an adapter, depending on meter casing and type of communication unit. Therefore, in wall-mounted meters it is secured by a utility seal and can be mounted and replaced in the field if necessary. In rack-mounted meters, it is secured by the verification seal. An exchange in the field is therefore not possible. It contains communication interfaces (e.g. RS232, RS485, modem) as required for remote reading of the meter data.

For the ZxQ meter the following communication units (CU) are available:

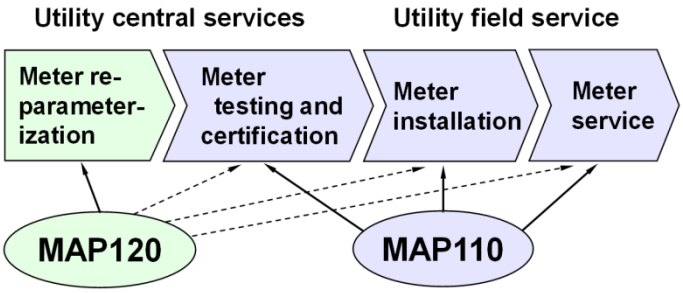
- B4 (RS232 / RS485)
- M22/V34b (PSTN / RS485)
- E2x (Ethernet)
- Q22 IEC60870 (RS485 / RS485), only for special applications
- Q22 dlms (RS485 / RS485)
- G32 (GSM / RS485)
- P32 (GPRS/GSM / RS485)

CU-adapter ADP1 needed for CU-Gxx and CU-Pxx in f9
Modules with an antenna cannot be used in the metal rack housing. Instead, they have to be connected to f9 ZxQ-meters with a CU-adapter ADP1. This applies to the following CUs: G22, P22, G32, P32.

1.15 MAP-Software Tools

There are two software tools available for the parameterisation of the ZxQ meter and for communication with the meter: MAP110 and MAP120

Areas of application



MAP110

The MAP110 Service Tool covers all the following applications normally required for meter installation and in the service sector:

- Billing data readout
- Readout and export of profiles (load profile, stored values and event log)
- TOU (Time of Use) readout and modification
- Billing period reset
- Register and profile resets
- Setting of certain parameter ranges such as primary data, time switch etc.
- Communication input settings
- Communication settings for Landis+Gyr communication units readout and modification
- GSM installation aid for Landis+Gyr communication units (field strength indicators, telephone number information, PIN-code handling)
- Test SMS message transmission
- Analysis and diagnostic functions

MAP120

The software Landis+Gyr MAP120 is used to reparameterise the meter and the communication unit, i.e. it is possible to read out and modify all device parameters.

2 Safety

This chapter explains the safety information used in this user manual, describes the responsibilities and lists the safety instructions to be obeyed.

2.1 Safety Information

Attention is drawn as follows in the individual chapters of this user manual with classified word symbols and pictographs to the relevant danger level, i.e. the severity and probability of any danger:

Definition of Danger
For a possibly dangerous situation, which could result in severe physical injury or fatality.

Definition of Warning
For a possibly dangerous situation, which could result in minor physical injury or material damage.

Definition of Note
For general details and other useful information to simplify work.

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

2.2 Responsibilities

The owner of the meters – usually the utility – is responsible that all persons engaged on work with meters:

1. Are competent and qualified in accordance with national regulations (see ISSA “Guideline for Assessing the Competence of Electrically Skilled Persons”).
2. have read and understood the relevant sections of the user manual.
3. strictly observe the safety instructions (according to section 2.3) and the operating information in the individual chapters.

In particular, the owner of the meters bears responsibility for

- the protection of persons,
- the prevention of material damage
- and the training of personnel.

Landis+Gyr AG provides training courses for this purpose on specific equipment; please contact the relevant agent if interested.

2.3 Safety Instructions

The following safety regulations must be observed at all times.

Do not open the meter when energised
When the meter is connected and energised, there are live parts inside the meter. Do not open the meter when energised.
Disconnect the measuring voltage and all other circuits before opening the meter housing.

Dangerous voltage on conductors
Dangerous voltage is present on the conductors that the meter is to be connected to. Contact with the conductors when under voltage will result in severe personal injury or death.
The conductors must not be under voltage when connecting or disconnecting the meter. The relevant preliminary fuses must therefore be removed and kept in a safe place until the work is completed, so that other persons cannot replace them unnoticed.

Dangerous voltage on transformers
Dangerous voltage is produced by the current transformers when the secondary circuit is broken while current is flowing in the primary.
Contact with the transformers when under voltage will result in severe personal injury or death. The high voltage produced will also destroy the transformers.
The current transformer secondary circuit must be short-circuited before de-installing the meter.

Missing transformer earthing
Voltage transformers that are not earthed on the secondary may reach dangerously high voltage values on the secondary.
Voltage transformers are usually earthed on the secondary. As an exception for special connections, the earthing can be omitted unless possible otherwise.
If the voltage transformer is not earthed, severe personal injury or death can result if contact is made with the meter and the meter will be damaged beyond repair.
If the voltage transformers are not earthed, special precautions must be taken when working at the meter.

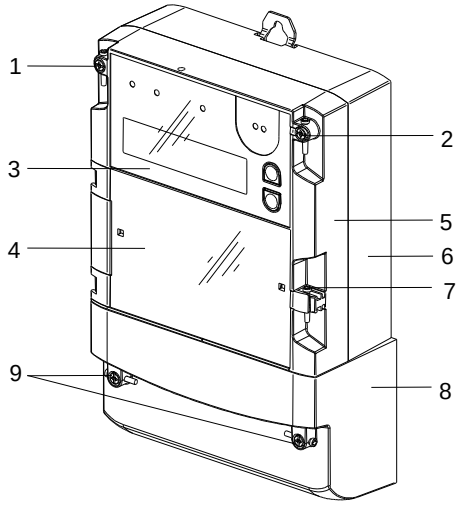
Galvanic isolation
The measuring circuits and auxiliary circuits (additional power supply, tariff control input, synchronisation input, transmitting contacts, communication interfaces) must be galvanically isolated.

Voltage paths must be fused
When installing the meter, all auxiliary circuits such as the additional power supply and the tariff control voltage must be fused by max. 6A delay fuses. It is recommended to fuse the measurement voltage, too.

Damage of dust, water, incorrect cleaning and handling
Damage to the meter could occur if the meter is subjected to running water or high-pressure devices, e.g. for cleaning purposes. The meter may be cleaned with a damp cloth.

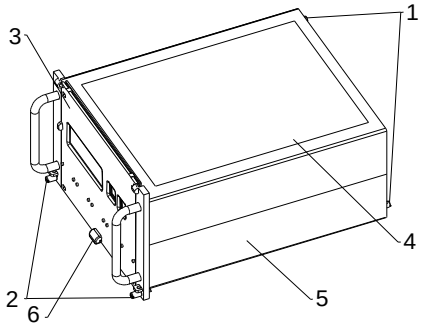
3 Mechanical Description

Wall-mounting f6



1 Manufacturer's seal
2 Manufacturer's or verification seal
3 Front window with face plate
4 Front door with information plate and terminal connection diagram on rear side
5 Cover
6 Base
7 Utility's seal
8 Terminal cover
9 Utility's seal after installation

Rack-mounting f9



1 Manufacturer's or verification seal
2 Utility's seal after installation
3 Front cover with face plate and additional information
4 Connection diagram
5 Housing
6 Utility's seal

Usage of Seals

Wall-mounting f6

	Sealing at manufacturer's site	Sealing at utility's site, no verification needed	Sealing at utility's site, verification necessary
1	manufacturer's seal	manufacturer's seal	manufacturer's seal
2	manufacturer's seal	manufacturer's seal	verification seal
7	none	utility's seal	verification or utility's seal
9	none	utility's seal	utility's seal

Rack-mounting f9

	Sealing at manufacturer's site	Sealing at utility's site, no verification needed	Sealing at utility's site, verification necessary
1 left	manufacturer's seal	manufacturer's seal	manufacturer's seal
1 right	manufacturer's seal	manufacturer's seal	utility's seal
2	none	utility's seal	utility's seal
6	binder	utility's seal	utility's seal

3.1 Manufacturer's Seal

The manufacturer's seal is secured after the meter has been assembled, tested, and calibrated.

Wall-mounting f6 For f6, the manufacturer's seal secures the meter cover. The front window cannot be opened without removing the seal. The ZxQ is delivered with two manufacturer's seals; one on the upper left side of the front window and one on the upper right side. Once certified, the manufacturer's seal on the upper right side of the front window is replaced with the verification seal.

Rack-mounting f9 For the f9, the manufacturer's seal secures the meter base so that it cannot be opened without removing the seal. The ZxQ is delivered with two manufacturer's seals at the back of the base; one at the upper right side and one at the lower left side. Once certified, one or both of the manufacturer's seals is replaced with the verification seal.

3.2 Verification Seal

The verification seal is secured after the official verification of the meter.

Damaging the verification seal
In countries with an obligatory verification, the verification seal is awarded by the verification body and guarantees the correct measurement performance of the meter according to the local regulations.
Breaking a verification seal renders the official verification invalid. Breaking a verification seal also renders the guarantee invalid, as defined in the general delivery conditions.

Wall-mounting f6 Once certified, the manufacturer’s seal on the upper right side of the front window is replaced with the verification seal.

Rack-mounting f9 Once certified, one or both of the manufacturer's seal at the back of the meter case is replaced with the verification seal.

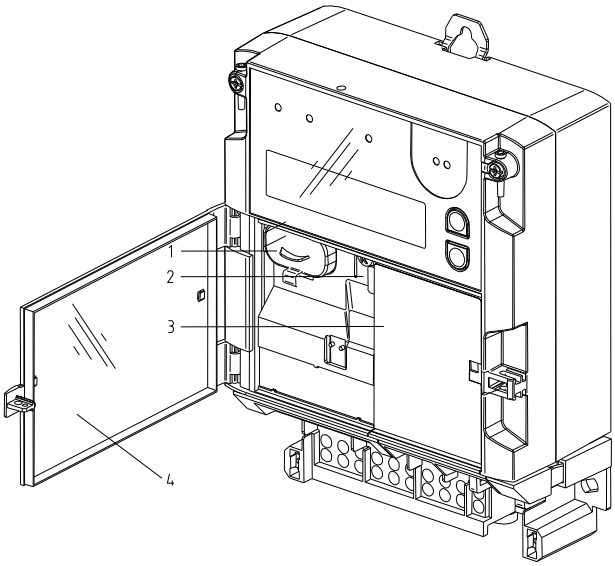
Removal of communication unit on rack mounted version f9
For f9, the communication unit can only be removed or exchanged for another communication unit or dummy by opening the meter case and breaking the verification seal.

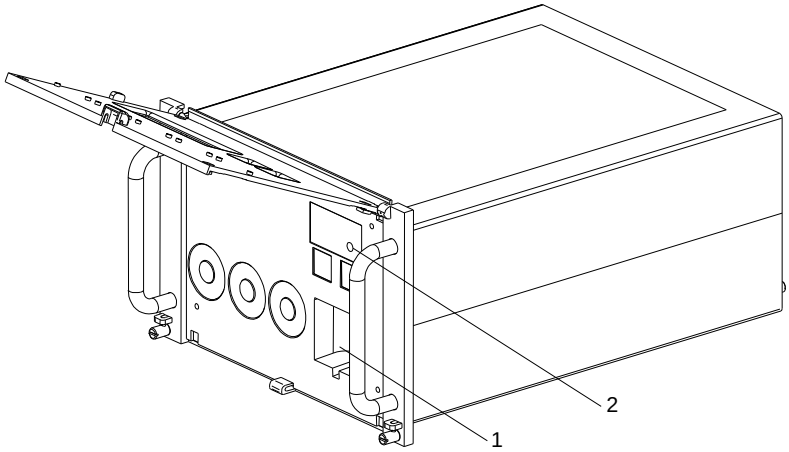
3.3 Utility's Seals

The utility's seals are secured after the meter is prepared for use and commissioning.

Wall-mounting f6 For the f6, the utility's seal secures the hinged front door, which allows access to the battery compartment, the alarm reset button and the communication unit. The information plate with the connection diagram on the rear side is also located in the front door.

Rack-mounting f9 For the f9, the utility's seal secures the hinged front cover, which allows access to the battery compartment and the alarm reset button.





1 Battery compartment

2 Alarm reset button

3 Communication unit or dummy

4 Information plate with connection diagram

A 6 V lithium battery can be inserted in the **battery compartment** to provide power to the calendar clock and display.

The **alarm reset button** has three functions:

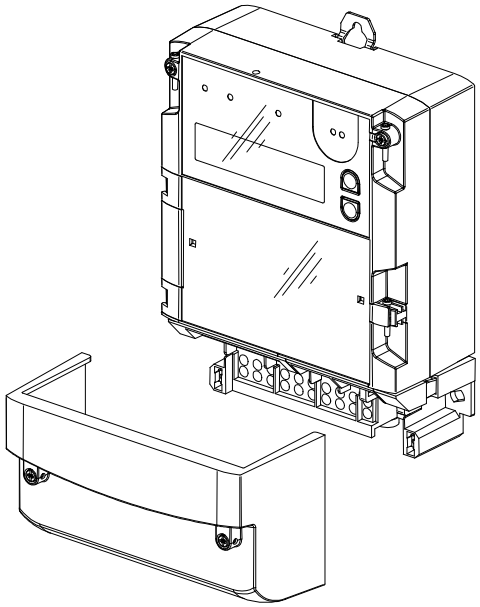
1. Reset an alarm.
2. Select the service menu from the display check.
3. Perform the cursor function in the set mode.

A **communication unit** is installed when the meter is used in a system where remote meter reading is employed as remote meter reading requires communication between the meter and the **central station.**

Remote meter reading, time synchronisation with the central station time, meter check to ensure the meter is functioning correctly, and parameter setting can be performed using the communication unit.

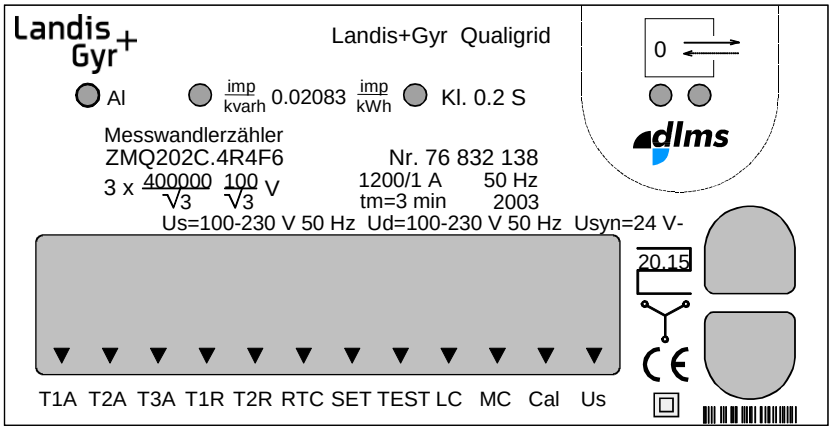
If a communication unit is not required, a dummy is inserted.

For f6, the terminal cover protects the meter terminal connecters. The terminal cover is secured with two utility’s seals to prevent unauthorised access, both for safety and anti-tampering reasons.



3.4 Face Plate f6

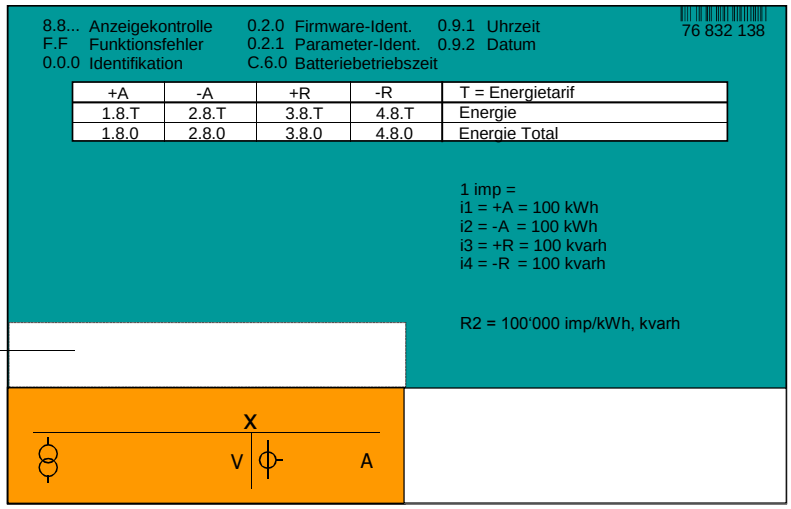
The face plate is located behind the front window, which is secured by a manufacturer's or verification seal. The face plate is designed to customer specifications. It contains all relevant data about the meter.



Recesses in the front window permit operation of the display buttons UP and DOWN for control of the liquid crystal display.

3.5 Information Plate f6

The information plate is located in the hinged front door. It contains all relevant data about the meter. The front door is secured by the utility's seal after the meter has been connected according to the terminal connection diagram which is located on the back of the face plate. The terminal connection diagram is only visible with the door open.

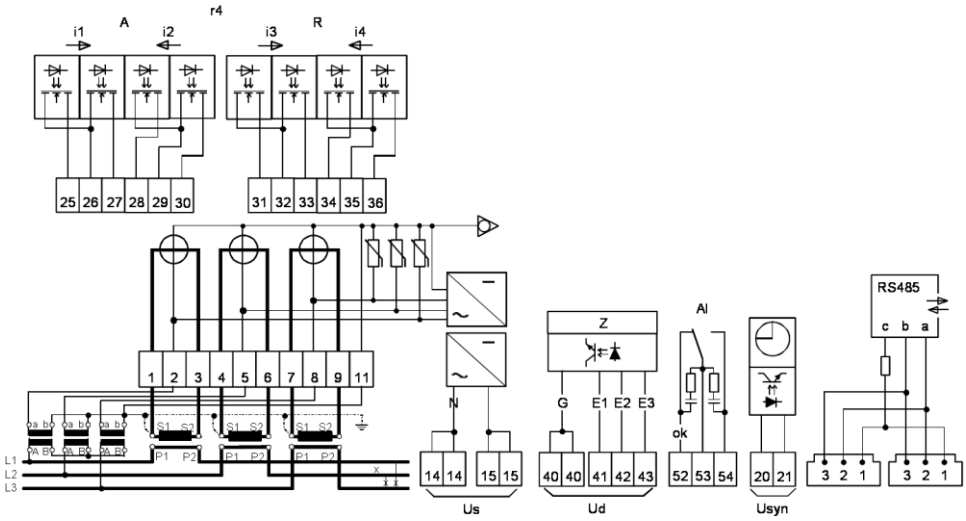


On the information plate you will find:

- explanations for the display
- pulse values of the transmitting contacts
- the note "U_S < 0.1 VA" if the meter is supplied via an additional power supply only (max. load 0.1 VA on the measurement voltage, optional)
- the meter constant R2 for testing meters with primary data on the testing station (this is to avoid roundoff errors when calculating the secondary meter constant).

3.6 Terminal Connection Diagram f6

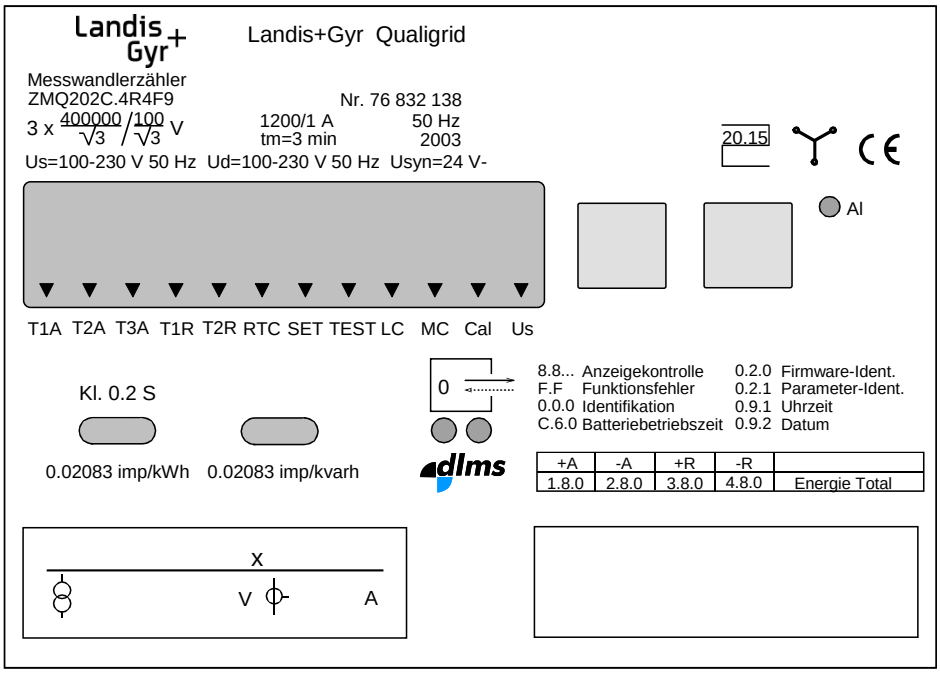
The terminal connection diagram is located on the back of the face plate and specifies how the meter is to be connected. It is only visible with the front door open. After the connections have been made, the front door is secured by the utility's seal.



3.7 Face Plate and Information Plate f9

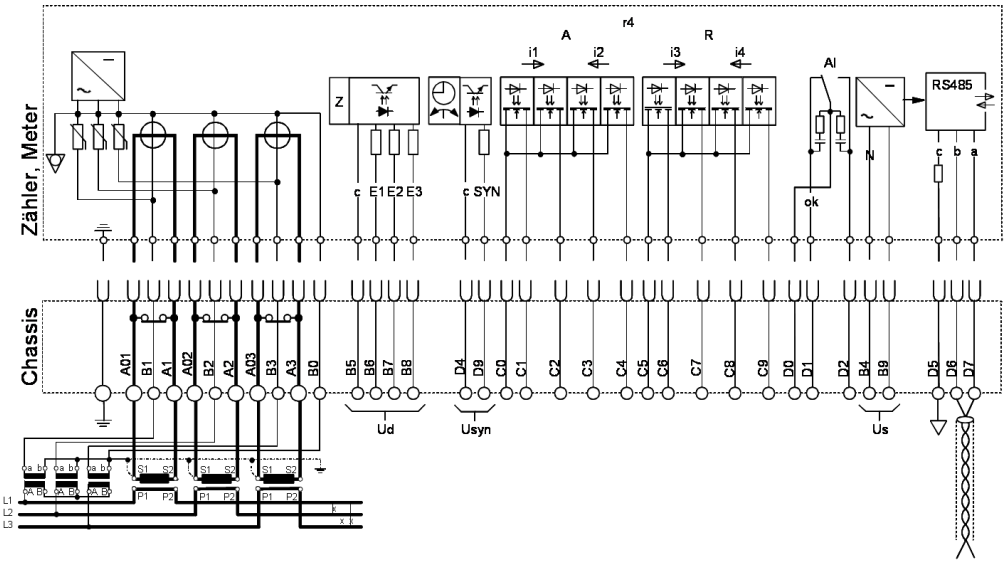
The f9 face plate and information plate are located on the front cover, which is secured by the utility's seal. When the utility's seal is broken, the front cover can be opened. The face plate and information plate is designed to customer specifications. It contains all relevant data about the meter.

Recesses in the front cover permit operation of the display buttons "up" and "down" for control of the liquid crystal display.

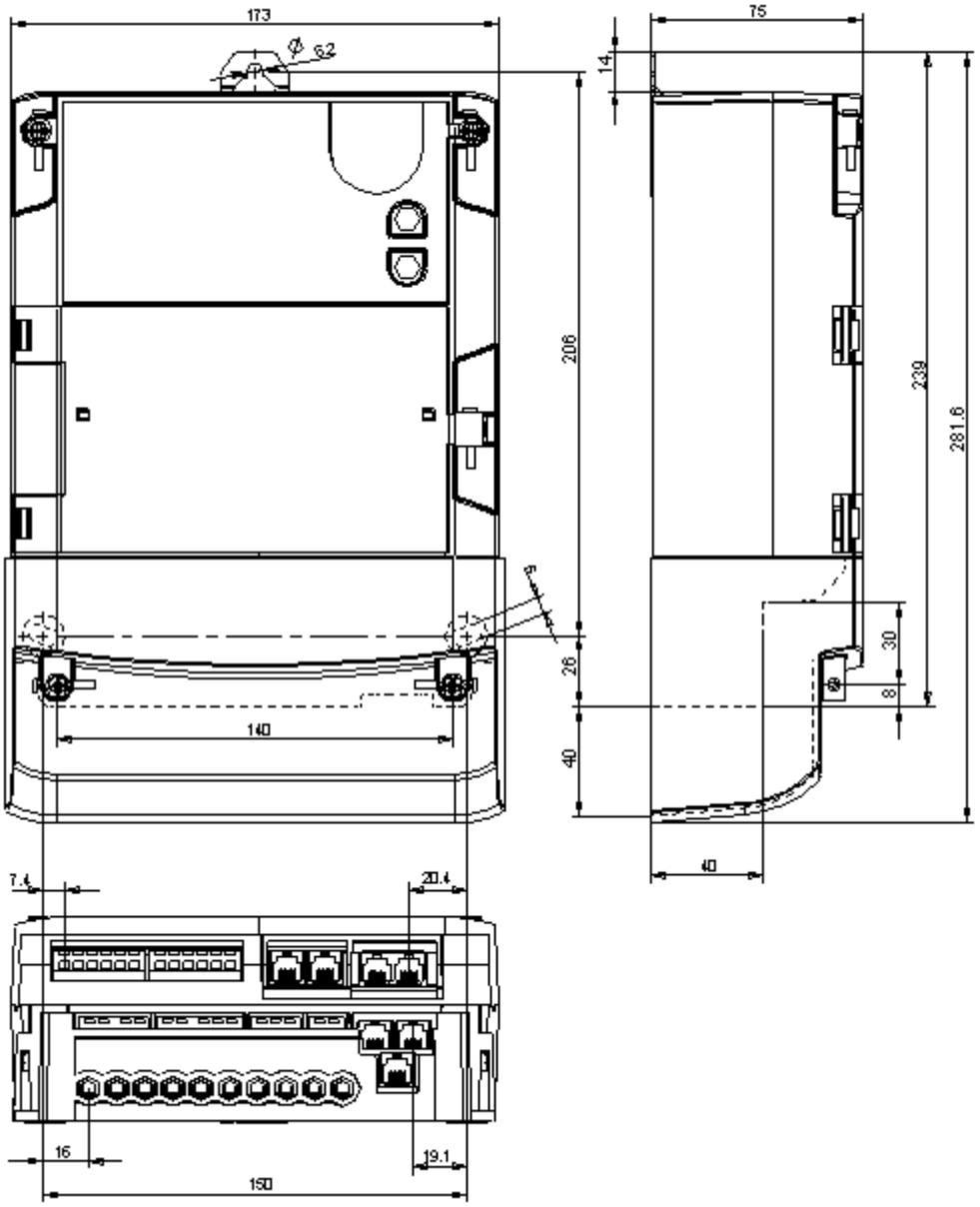


3.8 Connection Diagram f9

The connection diagram is located on the top of the case and specifies how the meter is to be connected. The connection diagram is visible when the meter is drawn out of the rack.

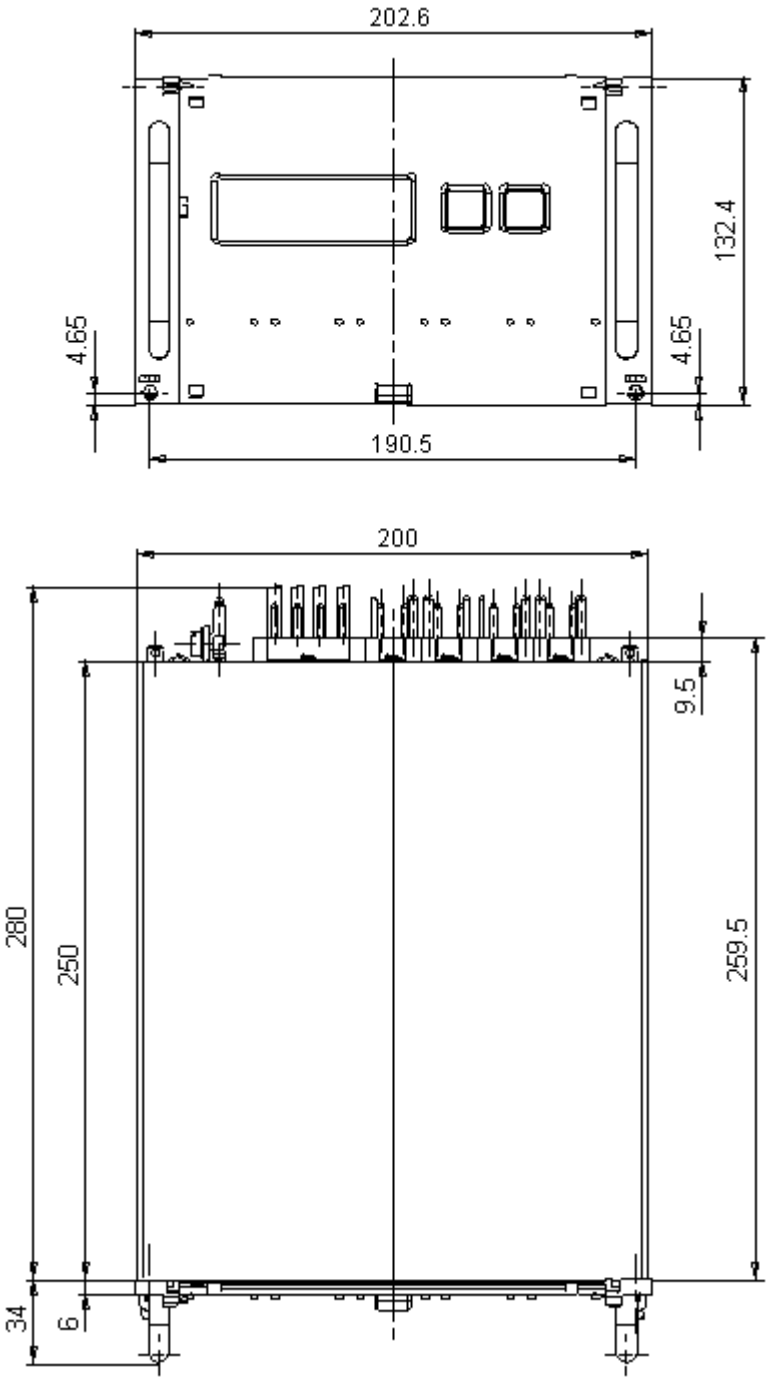


3.9 Dimensions f6 Casing



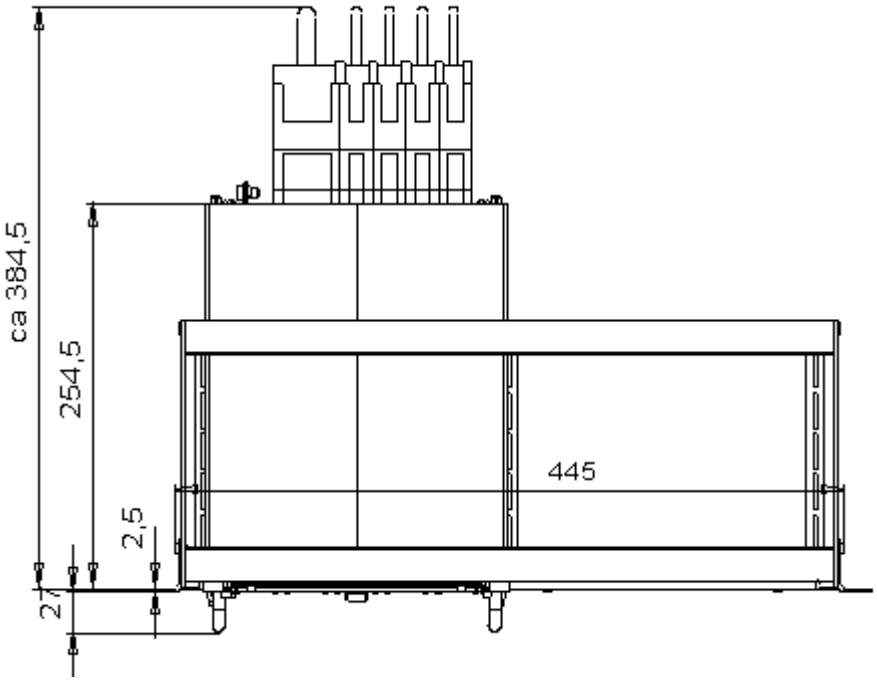
3.10 Dimensions f9 Casing

3.10.1 Rack Mounting

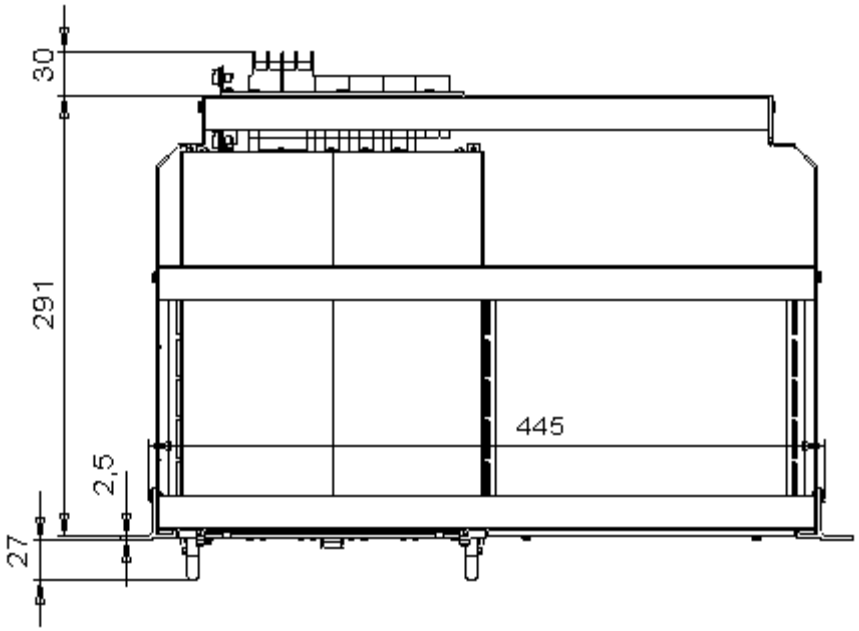


3.10.2 Racks

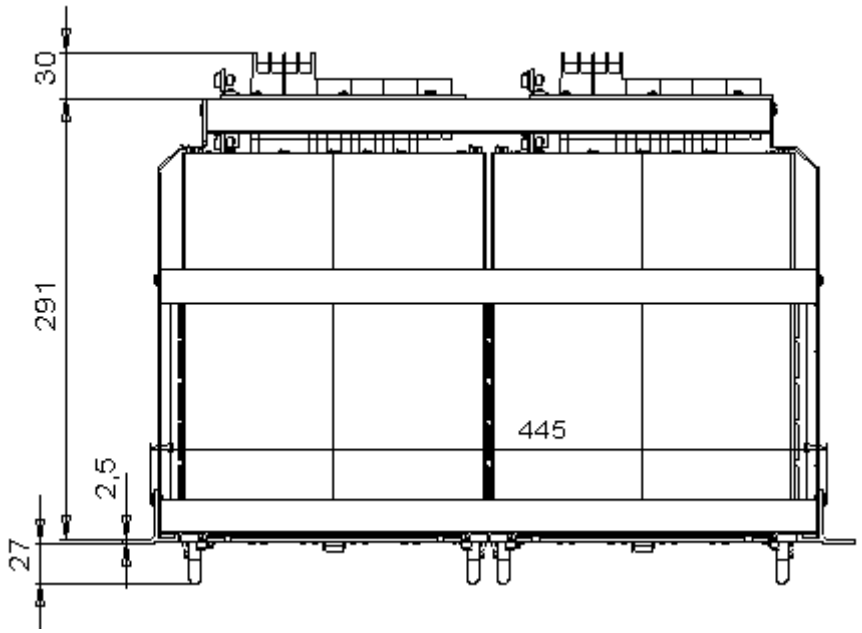
f9.10 for meters with cable connection



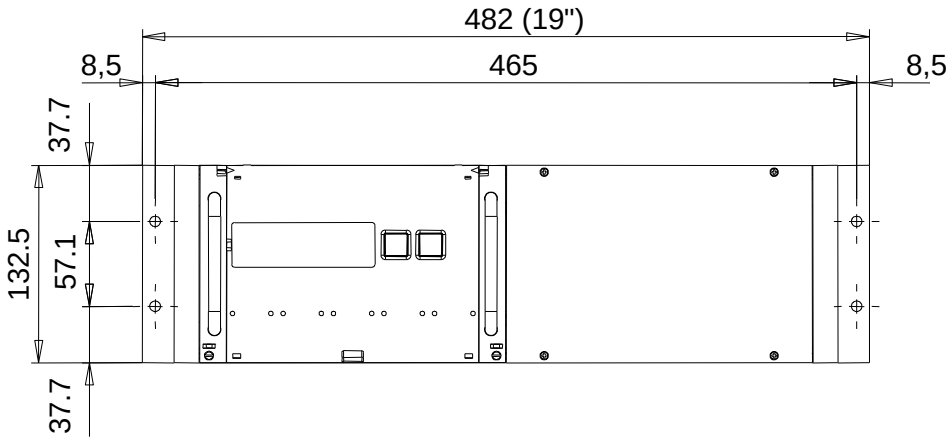
f9.11 for one meter with direct connection



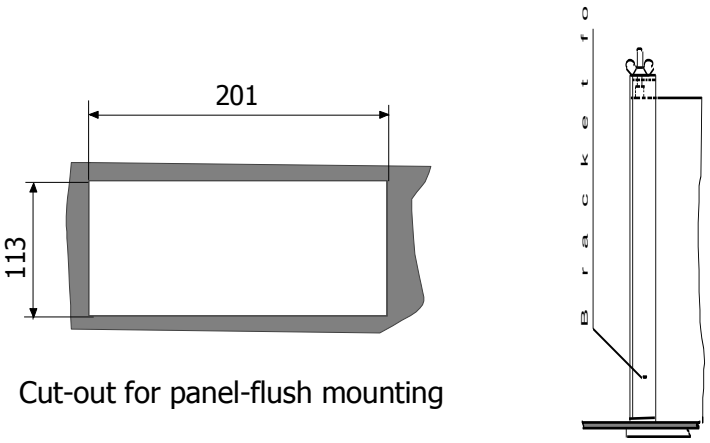
f9.12 for two meters with direct connection



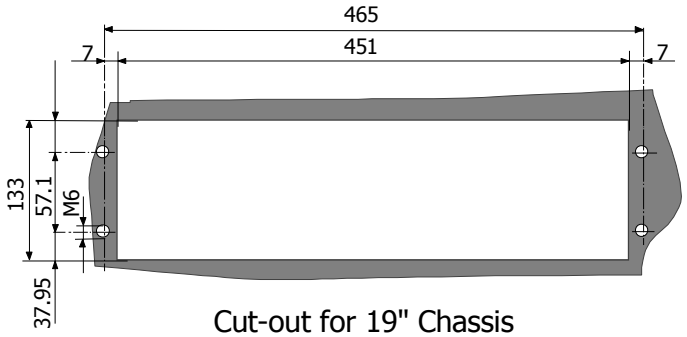
Front view



3.10.3 Flush Mounting



Cut-out for panel-flush mounting



Cut-out for 19" Chassis

4 Installation / De-installation

4.1 Prerequisites

Galvanic isolation
The measuring circuits and auxiliary circuits (additional power supply, tariff control input, synchronisation input, transmitting contacts, communication interfaces) must be galvanically isolated.

Voltage paths must be fused
When installing the meter, all voltage paths (measurement voltage and all auxiliary circuits such as the auxiliary power supply and the tariff control voltage) must be fused by max. 6 A delay fuses.

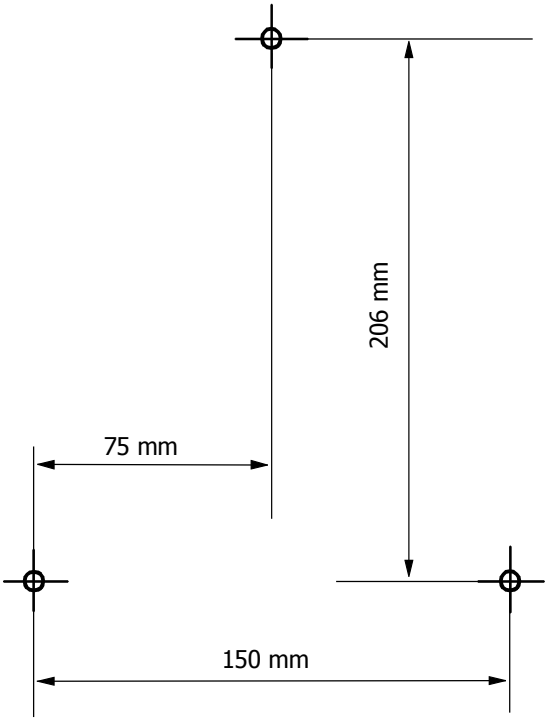
Separation of voltage connections and communication lines
The voltage connections must be physically separated from the communication lines in accordance with local laws and regulations.

Recommendation
We recommend that twisted and shielded cables are used for the communication lines. One end of the cable shield should be connected to the ground.

4.2 Mounting the f6 Meter

Dropping meters
The meters can cause injuries if dropped. They must be held securely during installation.
Meters which have dropped must not be installed, even if no damage is apparent. They must be returned for testing to an authorised service and repair center (or the manufacturer). Internal damage can result in functional disorders or short-circuits.

1. Select the position for mounting the meter.
2. Mark the three fixing points (suspension triangle) on the mounting surface:
   horizontal base of suspension triangle = 150 mm
   height of suspension triangle for open mounting = 206 mm

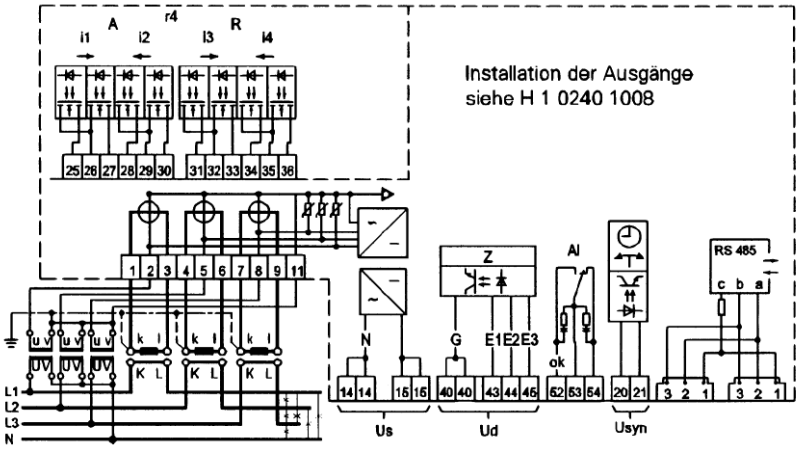


3. Drill the three holes for the fixing screws.
4. Remove the meter terminal cover.
5. Fix the meter with the three fixing screws on the mounting surface.

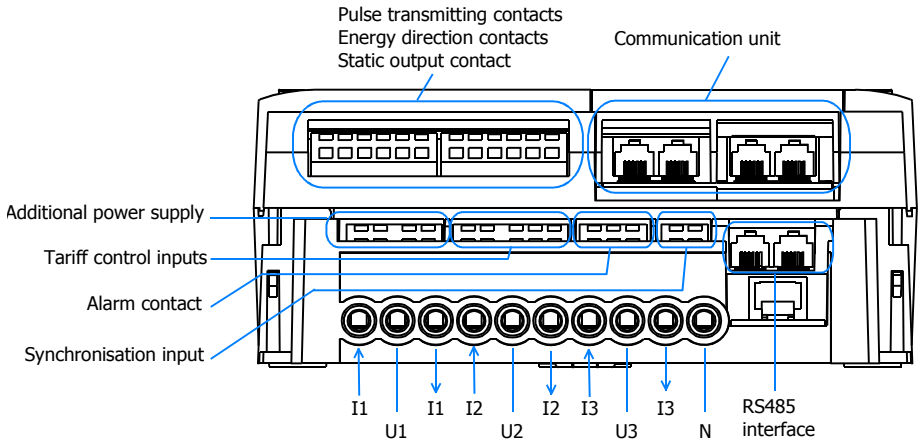
4.3 Connect the f6 Meter

4.3.1 Connection Diagram

The f6 is connected according to the terminal connection diagram located in the front door. The following is an example.



4.3.2 Terminal Layout



Transmitting contacts

The 12 spring clamp connectors are located on the transmitting module and transmit measured values as pulses to telemetering instruments. They are passive output contacts, i.e. energised by the receiver.

The function of each output depends on the connected PCB. Assigning the functions to the corresponding connector is determined in the software. The connector numbers remain the same, whichever PCB is connected.

Communication interface

Depending on the communication unit type, the number of RJ-12 connectors can vary. When spring clamp connectors are available (e.g. at B4 and M4) they are not used. The RJ-12 connectors are located on the communication unit.

Additional power supply

The four spring clamp connectors on the left provide connection for the additional power supply.

Inputs and outputs

The five spring clamp connectors on the right of the additional power supply provide connection for **tariff control inputs**. If the meter is shipped without external tariff control, these terminals will not be labelled.

The three spring clamp connectors on the right of the tariff control inputs is the **synchronisation input**.

The two spring clamp connectors on the right of the synchronisation input is the **alarm contact**.

Serial interface

The two RJ-12 connectors are located on the power supply board, and provide local serial RS485 connection of other meters (daisy chain). They are connected in parallel so that the use of a T-piece is not necessary.

4.3.3 Procedure

Dangerous voltage on conductors
Dangerous voltage is present on the conductors that the meter is to be connected to. Contact with the conductors when under voltage will result in severe personal injury or death.
The conductors must not be under voltage when connecting or disconnecting the meter.
Installation and de-installation of the meter must only be performed by qualified meter installers, with strict adherence to the utility's safety regulations.

Dangerous voltage on current transformers
Dangerous voltage is produced by the current transformers when the secondary circuit is broken while current is flowing in the primary. Contact with the transformers when under voltage will result in severe personal injury or death. The high voltage produced will destroy the transformers. The current transformer secondary circuit must be short-circuited before de-installing the meter.

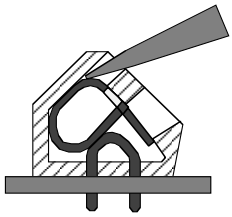
Missing transformer earthing
Voltage transformers in medium and high voltage systems that are not earthed on the secondary may reach dangerously high voltage values on the secondary.
Voltage transformers are usually earthed on the secondary. If the voltage transformer is not earthed, severe personal injury or death can result if contact is made with the meter and the meter will be damaged beyond repair. If the voltage transformers are not earthed, special precautions must be taken when working at the meter.

Connect Current and Voltage Connectors

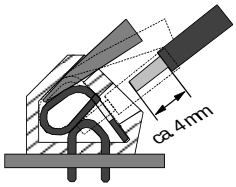
1. Shorten the current and voltage connecting wires to the required length and then strip them to fit the connectors.
2. Insert the current and voltage connecting wires to the terminal numbers as shown in the connection diagram.
3. Tighten (torque up to 1.7 Nm) the terminal screws using the torque screwdriver size 2.

Connect Control Inputs and Outputs and Transmitting Contacts

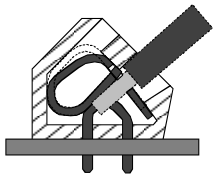
4. Shorten the connecting wires of the control inputs and outputs to the required length and strip them for approx. 4 mm (wires and strands up to 2.5 mm² can be connected).
5. If stranded wire is used, it is recommended to fit it with ferrules for connection.
6. Connect the connecting wires of the control inputs and outputs as shown on the terminal connection diagram to the spring clamp connectors as follows:



Insert a size 1 screwdriver, turning it slightly upwards, in the upper opening.



Place the stripped connecting wire in the lower opening and hold it there securely.



Withdraw the screwdriver. The connecting wire is now firmly fixed.

Avoid bare parts of wire
When voltage is applied, any bare part of the wire will become live. Ensure no bare wire is visible above the terminal edge. If this is not the case, the stripped part of the wire must be shortened as necessary.

Connect Communication and Serial Interfaces

7. Plug in the required cables as shown on the terminal connection diagram.

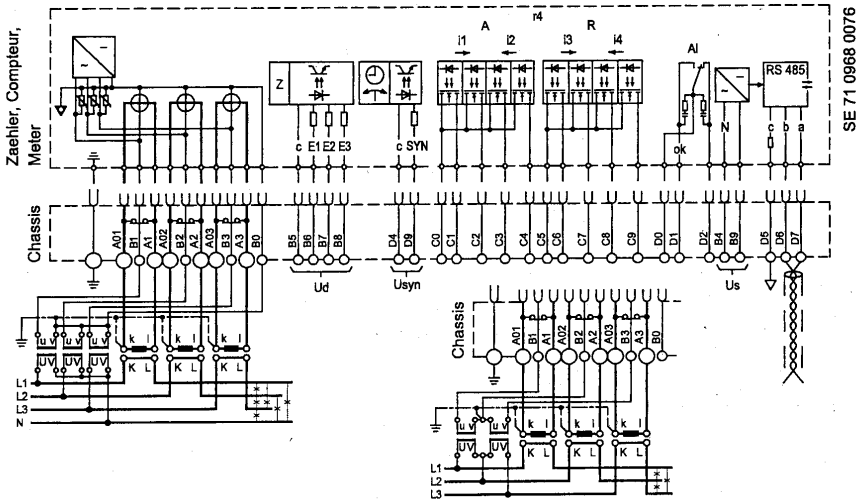
Power on
Incorrect connections could damage the meter or result in the meter measuring incorrectly. Check all connections before applying power.

8. Open circuit the current transformer secondary circuit using the provided assembly.
9. Switch on the voltage and current.

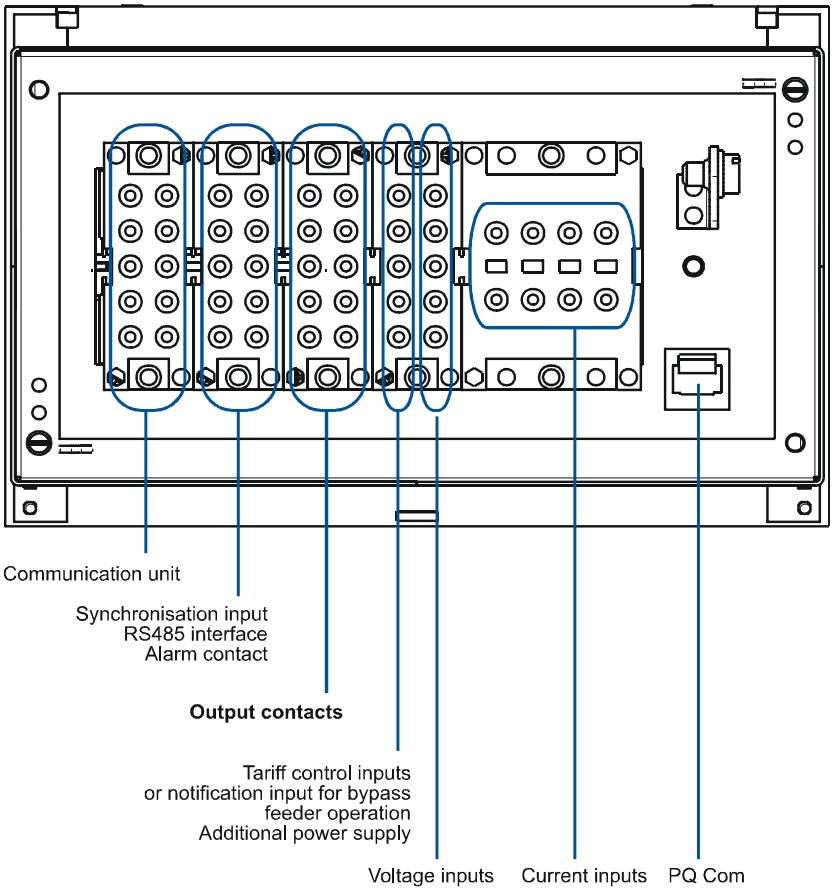
4.4 Connect the f9 Meter

4.4.1 Connection Diagram

The f9 is connected according to the connection diagram located on the top of the case. The following is an example.



4.4.2 Terminal Layout



The f9 is equipped with Essailec connectors for direct plug-in into a pre-wired rack. The rack is pre-wired according to the plug connection diagram.

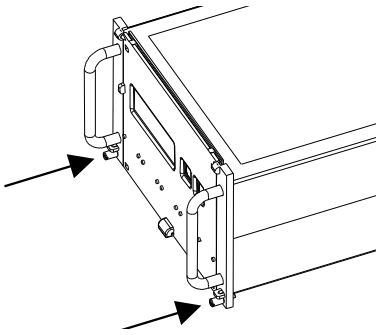
4.4.3 Procedure

High voltage on transformer
High voltage is produced by the current transformers when the secondary circuit is broken while current is flowing in the primary.
Contact with the transformers when under voltage will result in severe personal injury or death. In addition, the high voltage produced will destroy the transformers.
The current transformer secondary circuit must be short-circuited before de-installing the meter. Connecting and disconnecting the meter must only be performed by qualified meter installers, with strict adherence to the utility's safety regulations.

Power on
Incorrect connections could damage the meter or result in the meter measuring incorrectly. Check all connections before applying power.

Dropping meters
The meters can cause injuries if dropped. They must be held securely during installation.
Meters which have dropped must not be installed, even if no damage is apparent. They must be returned for testing to an authorised service and repair center (or the manufacturer). Internal damage can result in functional disorders or short-circuits.

1. Open-circuit the current transformer secondary circuit using the provided assembly. (The detailed procedure depends on the transformers being used.)
2. Plug the f9 into the pre-wired rack.
3. Tighten both meter fixing screws.



4. Switch on the voltage and current.

4.5 Installation Check

The power must be connected and all 3 phases under load. If the phase voltages are present only, the optical test outputs are continuously lit.

Keys

▽ Short press display button DOWN (<2s)

▼ Long press display button DOWN (>2s)

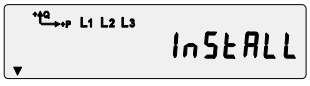
△ Short press display button UP (<2s)

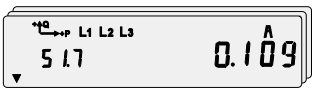
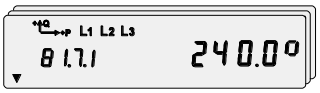
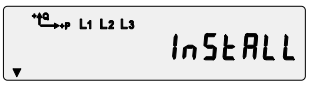
▲ Long press display button UP (>2s)

▽▼ Short press display button DOWN until "End" is displayed then long press display button DOWN

Ⓡ Alarm reset button (under utility's seal)

4.5.1 Check Procedure

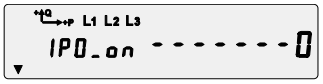
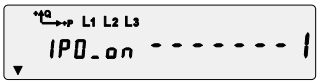
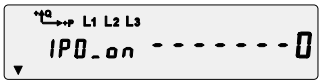
1.		Check whether the operating display is shown. An 'FF' indicates errors.		Operating display
2.		Check phases L1, L2, and L3 are present and in the correct phase sequence, i.e. L1-L2-L3.		Phase check
		If one phase is not present or the voltage is < 45% U_n, the relevant symbol is absent. With the normal phase sequence the symbols are displayed continuously. If the meter is connected with reversed phase sequence (e.g. L_2-L_1-L_3) the symbols flash.		
3.		The energy direction arrows indicate whether energy is imported (+) or exported (–). P: active energy, Q: reactive energy.		Energy direction indicator
4.	▽	All segments of the display are lit		Display check
5.	Ⓡ	Enter service menu		Set mode
6.	▽	Select menu item		Installation diagnostic
7.	▼	Enter installation diagnostic list		

8.	▽	Check the phase voltages: Voltage L1: Code 32.7 Voltage L2: Code 52.7 Voltage L3: Code 72.7		
	▽	Check the phase currents: Current L1: Code 31.7 Current L2: Code 51.7 Current L3: Code 71.7		
	▽	Check the phase angles: Phase angle U(L1) Code 81.7.0 Phase angle U(L2) Code 81.7.1 Phase angle U(L3) Code 81.7.2 Phase angle I (L1) Code 81.7.4 Phase angle I (L2) Code 81.7.5 Phase angle I (L3) Code 81.7.6		Note: Current must be flowing to show the phase angles
9.	▽	Advance display until **End**.		End of installation diagnostic
10.	▼	Back to the service menu.		Service menu
11.	▽	Advance display until **End**.		End of service menu
12.	▼	Exit service menu.		Operating display

4.5.2 Testing the Transmitting Contacts

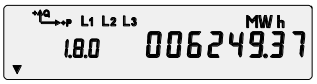
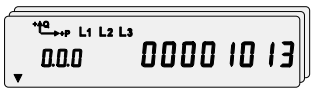
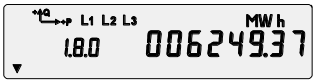
In order to check the wiring of the transmitting contact the meter is switched to transmitting contact test mode. While in the test mode, the meter sends pulses with a frequency of 1 Hz to the pulse receiver.

The transmitting contact test mode is only available with meters with the functional range C.4, C.6 and C.8.

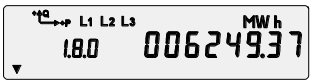
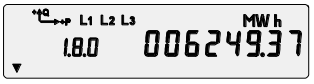
				Operating display
1.	▽	All segments of the display are lit		Display check
2.	Ⓡ	Enter service menu		Set mode
3.	▽	Select required setting		Transmitting contact test mode display
4.	▼	Switch on transmitting contact test mode 1 = transmitting contact test mode switched on 0 = transmitting contact test mode switched off		
5.		Check whether the 1 Hz pulses of the transmitting contacts are received by the transcoder and whether they are allocated to the correct registers		
6.	▼	Switch off transmitting contact test mode		
7.	▽	Advance display until **End**		End of transmitting contact test mode display
8.	▼	Exit service menu		Operating display

Availability
The transmitting contact test mode is not available in some countries. In these countries it cannot be activated.

4.5.3 Set Date and Time

				Operating display
1.	▽	All segments of the display are lit		Display check
2.	Ⓡ	Enter service menu		Set mode
3.	▼	Enter set mode		Identification number
4.	▽	Select required setting		Date, old value
5.	Ⓡ	Select next digit to be changed		Digit flashes
6.	Ⓡ	digit to be changed is selected		Digit flashes
7.	▽	Change digit value		Digit flashes
8.	Ⓡ	Select next digit to be changed		Next digit flashes
9.	▽	Change digit		Digit flashes
10.		Repeat steps 5 – 6 for all digits to be changed		All digits flash
11.	Ⓡ	Confirm new setting		Date, new value
12.		Repeat steps 4–10 for all settings to be changed		
13.	▽	Advance display until **End**		End of set mode
14.	▼	Back to service menu		Service menu
15.	▽	Advance display until **End**		End of service menu
16.	▼	Exit service menu		Operating display

4.5.4 Set Battery Low Indicator

				Operating display
1.	▽	All segments of the display are lit		Display check
2.	Ⓡ	Enter service menu		Set mode
3.	▽	Select menu item		Battery on / off display
4.	▼	Change setting: 1 = battery low indicator on 0 = battery low indicator off		
5.	▽	Advance display until **End**		End of battery on / off display
6.	▼	Exit service menu		Operating display

4.6 Sealing

When the installation check is complete, the utility's seals may be applied.

1. Screw on the terminal cover (f6 only).
2. Apply utility seals using the sealing pliers.

4.7 Disconnect the f6 Meter

4.7.1 Procedure

Dangerous voltage on conductors
Dangerous voltage is present on the conductors that the meter is connected to. Contact with the conductors when under voltage will result in severe personal injury or death. The conductors must not be under voltage when connecting or disconnecting the meter.
Installation and de-installation of the meter must only be performed by qualified meter installers, with strict adherence to the utility's safety regulations.

Dangerous voltage produced by current transformers
Dangerous voltage is produced by the current transformers when the secondary circuit is broken while current is flowing in the primary. Contact with the transformers when under voltage will result in severe personal injury or death. The high voltage produced will destroy the transformers. The current transformer secondary circuit must be short-circuited before de-installing the meter.

Power off

1. Short-circuit the current transformers (the detailed procedure depends on the current transformers used).
2. Switch off the voltage. The phase voltage display (L1 L2 L3) disappears.
3. Switch off tariff inputs and synchronisation input. Check if the corresponding indicators disappear from the display.
4. Switch off the voltage for the additional power supply.
5. Check that all connections are free from voltage.
6. Remove the two utility's seals on the terminal cover, release the two screws and remove the terminal cover.

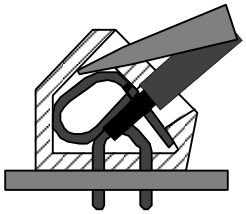
Disconnect Voltage and Current

7. Loosen the terminal screws and remove the wires of the measuring voltage and current.

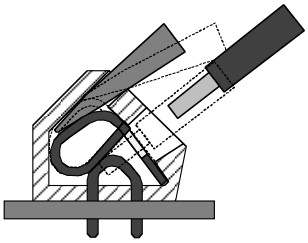
Disconnect Control Inputs and Outputs

8. Disconnect the connecting wires of the supply inputs and outputs from the spring clamp connectors as follows:

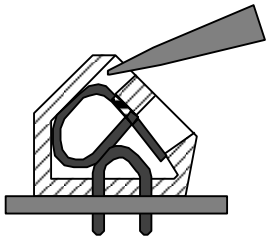
Withdrawing the wire
Withdrawing the wire with the terminal closed can damage the terminal.



Insert a size 1 screw-driver, turning it slightly upwards, into the upper opening



Withdraw the wire from the connector.



Withdraw the screw-driver.

Precautions on disconnected wires
The disconnected wires should be isolated and may also be numbered for convenience when reconnecting.

Disconnect Communication Interfaces

Unplug the connecting cables from modems and serial interfaces.

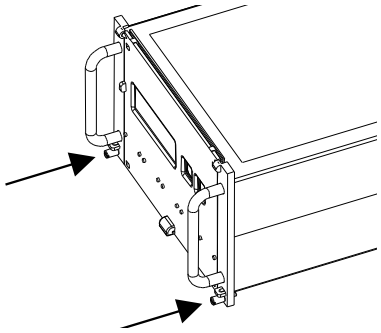
4.8 Disconnect the f9 Meter

4.8.1 Procedure

The f9 can be directly connected or cable connected.

Direct connection

1. Loosen both meter fixing screws.



2. Carefully withdraw the meter from the rack.

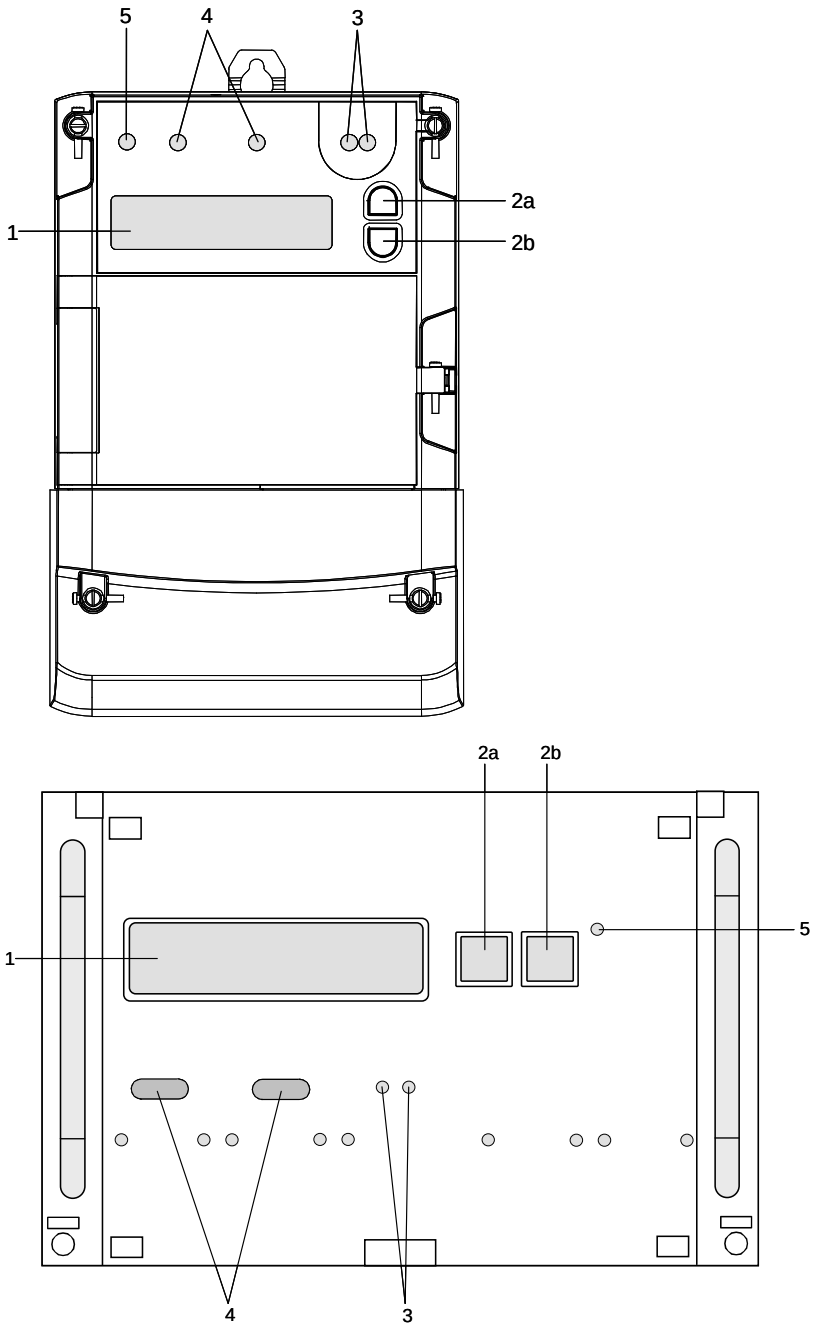
Cable connection

Dangerous voltage on current transformers
Dangerous voltage is produced by the current transformers when the secondary circuit is broken while current is flowing in the primary. Contact with the transformers when under voltage will result in severe personal injury or death. The high voltage produced will also destroy the transformers.
The current transformer secondary circuit must be short-circuited before de-installing the meter. Installation and de-installation of the meter must only be performed by qualified meter installers, with strict adherence to the utility's safety regulations.

1. Short-circuit the current transformers using the provided assembly. (the detailed procedure depends on the transformers used.)
2. Switch off the voltage. The phase voltage display (L1 L2 L3) disappears.
3. Switch off the voltage for the tariff inputs and the synchronisation input. Check if the corresponding indicators disappear from the display.
4. Switch off the voltage for the additional power supply.
5. Loosen both meter fixing screws.
6. Carefully withdraw the meter from the rack.

5 Operation

5.1 Operating Elements

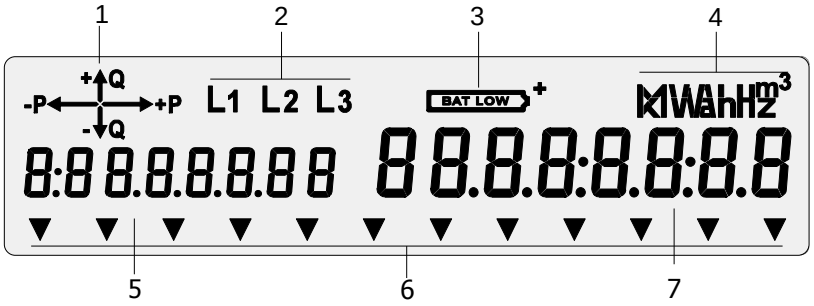


1	Display
2a	Display button UP
2b	Display button DOWN
3	Optical interface
4	Optical test outputs
5	Alarm LED

5.1.1 Display

The LCD (liquid crystal display) is provided with background lighting for easier reading.

When a display check is made, all segments of the display are illuminated.



1 Energy direction indicator
P = Active energy (A) Q = Reactive energy (R)
+ = import – = export

2 Phase voltage display (flashes if phase sequence is reversed)

3 Battery low indicator

4 Unit field (W, var, VA, k…, M…, …h, V, A, h, Hz)

5 Display code (8 digits). A code identifying the values in the value field. The code corresponds to the Object Identification System, described in section 10.

6 Arrow symbols for status information according to face plate

7 Value field (8 digits)

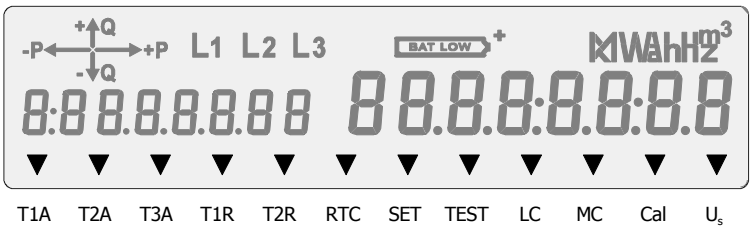
Display code
The display codes are parameterisable for all measured quantities. Therefore, they may differ from the OBIS code.
The most important display codes are listed on the face plate.

5.1.2 Arrows in Display

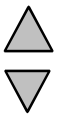
The arrow symbols in the display are used to give status information according to the face plate.

Example The twelve arrows may be used to indicate the following status:

Currently active tariff for active energy	T1A, T2A, T3A
Currently active tariff for reactive energy	T1R, T2R
Time/date is invalid	RTC
The meter is in the set mode	SET
The meter is in the test mode	TEST
The meter communicates locally	LC
The meter communicates with the master station	MC
A customer calibration has been made	Cal
The additional power supply U_S is present	U_S



5.1.3 Display Buttons



display button **UP**

display button **DOWN**

The display is controlled with the display buttons UP and DOWN.

A **short** press of either button (< 2 seconds):

- Changes the operating display to display check
- Opens the display menu from the display check
- Runs sequentially through menus from item to item, and in lists from value to value (either forwards or backwards).

A **long** press of either button (> 2 seconds):

- Opens a selected sub-menu
- Returns to the next higher level when **End** is displayed
- Browses through lists from main value to main value (either forwards or backwards).

Simultaneously pressing both buttons cancels the function in use and returns to the operating display.

5.1.4 Optical Interface

The optical interface enables:

- Readout of meter data
- Parameter setting using the MAP110 or MAP120 service tool.

These functions are performed via a magnetically attached optical reading head.

The optical interface also functions as an optical switch. A light beam, e.g. from a torch (except LED-torches), has the same function as the down display button. This enables reading to be made from a distance, e.g. through a protective glass screen in front of the meter.

5.1.5 Optical Test Outputs

The two green optical test outputs, one for **active energy** and one for **reactive energy** are used to test the meter. They transmit pulses corresponding to the power applied.

In a no load state, when no current is flowing, the optical test outputs are continuously illuminated.

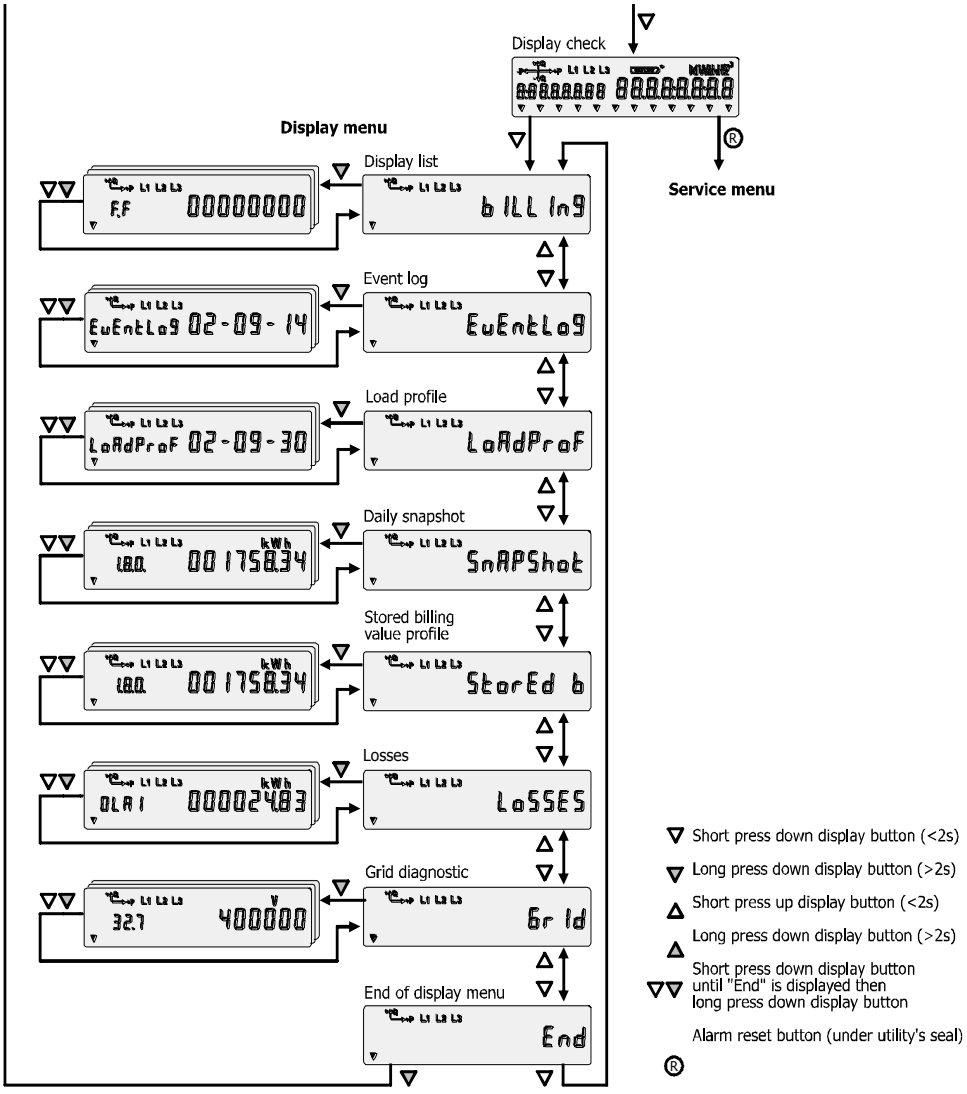
5.1.6 Alarm LED

The red alarm LED indicates that the meter is not functioning correctly.

- A **constantly lit** alarm LED indicates that an alarm has been issued. An alarm indicates an internal meter error that prevents the meter from measuring correctly.
- A **flashing** alarm LED indicates that an operational indication has been issued. An operational indication can indicate an internal condition such as a low battery voltage or an external condition such as a missing phase voltage.

For more details concerning functional errors please refer to section 6.3.4 “Error Groups” on page 78.

5.2 Display Menu

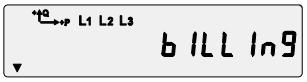
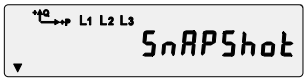
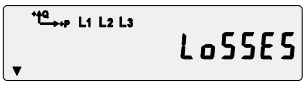


The **operating display** is shown when the display buttons have not been operated. It can be fixed, showing only one value or rolling, showing several values alternately.

The **display menu** is accessed using the display buttons.

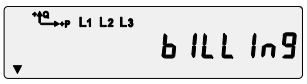
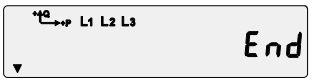
The above allocation of displays to the display menu is an example.

5.2.1 Select Display Menu

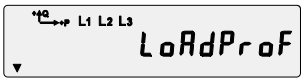
				Operating display
1.	▽	All segments of the display are lit		Display check
2.	▽	Display first menu item		Display list
3.	▽	Select menu item		Load profile
				Event log
				Daily snapshot
				Stored billing value profile
				Losses
				Grid diagnostic
4.	▽	Back to operating display		End of display menu

5.2.2 Display List

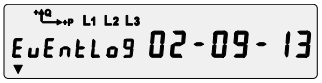
For Germany
In Germany, this list may only contain certified values.

1.	▽	Select display list		Display list
2.	▽	Enter display list		First main value
3.	▽	Select main value		Other main values
4.	▽	Select required value (main value or stored value)		Main value or stored value
5.		Repeat steps 3 and 4 for all required readouts Long press: display main values only Short press: display main values or stored values		
6.	▽	Advance display until **End**		End of display list
7.	▽	Exit display list		

5.2.3 Load Profile

1.	▽	Select load profile		Load profile
2.	▼	Enter load profile		Date of last entry
3.	▽	Select required entry		Date x
4.	▼	Enter related load profile value list		Time of first entry
5.	▽	Select entry		Time of next entry
6.		Automatic display of all entries (max. 36) AutoScroll changes every 2 sec.	 	Status code Active energy import
7.		Repeat steps 5 and 6 for all entries to be checked		
8.	▼	Back to date selection		End of value list
9.	▽	Select the next date, open list as step 4		Next date
10.		Advance display until **End** (at the end of date list)		End of load profile
11.	▼	Exit load profile		

5.2.4 Event Log

1.	▽	Select event log		Event log
2.	▼	Enter event log		Date of last entry
3.	▽	Select required entry		Time
	▽			Event number
	▽			+A energy register
	▽			-A energy register
	▽			+R energy register
	▽			-R energy register
	▽			Date of next entry
4.		Repeat step 3 for all entries to be checked		
5.	▼	Jump to end of event log		End of event log
6.	▼	Exit event log		

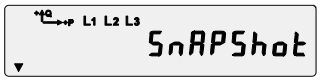
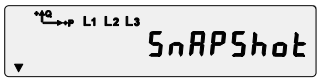
Which events are recorded in the event log is determined by the parameter settings. The time and date of the event is recorded together with a code determining the cause of the event. The most important events are:

Number	Event
1	Parameters influencing the measurement data changed
2	Energy tariff register deleted
3	Profile 1 and/or energy profile cleared
4	Event log reset
5	Battery voltage low
7	Battery voltage OK
8	Billing period reset
9	Daylight saving time (summer time) changeover
10	Clock adjusted (old date/time)
11	Clock adjusted (new date/time)
17 – 19	Undervoltage phases L1, L2, L3
20 – 22	Overvoltage phases L1, L2, L3
23	Power down (meter is switched off)

24	Power up (meter is switched back on)
25 – 27	Overcurrent phases L1, L2, L3 (if parameterised)
43	Tariff switching at end of integration period
44	Invalid measurement: Measuring period length wrong
45	Certain error bits were reset
47	Bypass feeder operation mode active
55 – 57	Current without phase voltage L1, L2, L3
58	Missing additional power supply U_S
61	Active power too high (if parameterised)
62	Reactive power too high (if parameterised)
66 – 93	Event log entries resulting from error messages
94	Communication locked (wrong password)
108	Phase failure (all-phase)
109	Missing measuring current in all phases
110	Undervoltage in all phases
121 – 123	Phase voltage without current L1, L2, L3
124	Compensation value for transformer changed (if parameterised)
125 – 127	Phase failures L1, L2, L3
128	Energy registers cleared (if parameterised)
132	I without U in all phases
159	Profile 1 or Energy values profile reset
191	Average voltage high (only C.7)
192	Average voltage low (only C.7)
193	Profile 2 reset
195	SOI of period 2
196	Current asymmetrical

Further information on events is given in the Functional Description, H71 0200 0216.

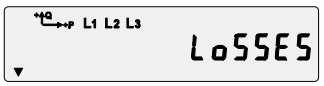
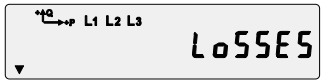
5.2.5 Daily Snapshot

1.	▽	Select daily snapshot		Daily snapshot
2.	▼	Open daily snapshot		Date of last storage
3.	▽	Show time of snapshot		Time of last storage
4.	▽	Show number of snapshots		Number of snapshots
5.	▽	Show snapshot		Most recent snapshot of the first register
6.	▽	Select required entry		Most recent snapshot of the second register
7.		Repeat step 6 for all required snapshots	After displaying the most recent snapshots of all registers, the meter shows the penultimate snapshots of all registers and so on.	
8.	▼	Jump to end of daily snapshot		End of daily snapshot
9.	▼	Exit daily snapshot		

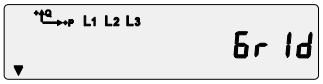
5.2.6 Stored Billing Value Profile

1.	▽	Select stored billing value profile		Stored billing value profile
2.	▼	Open stored billing value profile		Most recent stored value of the first register
3.	▽	Select required value		Most recent stored value of the second register
4.		Repeat step 3 for all required readings	After displaying the most recent stored value of all registers, the meter displays the penultimate stored value of all registers and so on.	
5.	▽	Advance display until **End**		End of energy profile
6.	▼	Exit stored billing value profile		

5.2.7 Losses

1.	▽	Select losses		Losses
2.	▼	Open losses		First losses value
3.	▽	Select required value		Selected value
4.		Repeat step 3 for all required readings		
5.	▽	Advance display until **End**		End of losses
6.	▼	Exit losses		

5.2.8 Grid Diagnostics

1.	▽	Select grid diagnostics		Grid diagnostics
2.	▼	Open grid diagnostics		First grid diagnostic value
3.	▽	Select required value		Selected value
4.		Repeat step 3 for all required readings		
5.	▽	Advance display until **End**		End of grid diagnostic values
6.	▼	Exit grid diagnostics		

5.3 Meter Operation in Systems

5.3.1 Remote Meter Reading in Energy Production Applications

The ZxQ is most suitably employed in production and transmission networks and by large industrial consumers. Such networks and consumers seldom read their meters manually on-site but employ automatic **remote meter reading**.

dlms Protocol

The communication with the meter takes place using the dlms protocol according to the IEC62056 series.

Remote meter reading requires communication between the meter and the **central station**. This is achieved using a communication unit. Normally the central station is scheduled to call each meter in the system and to acquire the required data. The following functions can be performed:

- Meter reading; acquisition of meter reading and meter status information
- Time synchronisation; with the central station time

IEC870 Protocol

Meters with the functional range C.2 can communicate using the protocol according to the IEC870 subset.

The meter is connected to a **transcoder** (e.g. Landis+Gyr FAG) via the local RS485 interface. The transcoder requests the meter every minute to send the current data. Every measured value that is transmitted to the transcoder carries a unique identification number.

For more detailed information please refer to Chapter 8.1 on page 96.

5.3.2 Types of Communication

Communication between the central station and the meter can be performed using any of the following types of communication:

- Dedicated (leased) lines
- Permanently installed connections, bus systems, etc.
- Public telephone network using PSTN modems
- Public mobile telephone network using GSM modems
- Others such as Ethernet.

You can find an overview of the communication modules available for the ZxQ in section 1.14 “Communication Unit (Option)” on page 28.

The communication possibilities with the MAP software tools are described in section 1.15 “MAP-Software Tools” on page 29.

6 Service

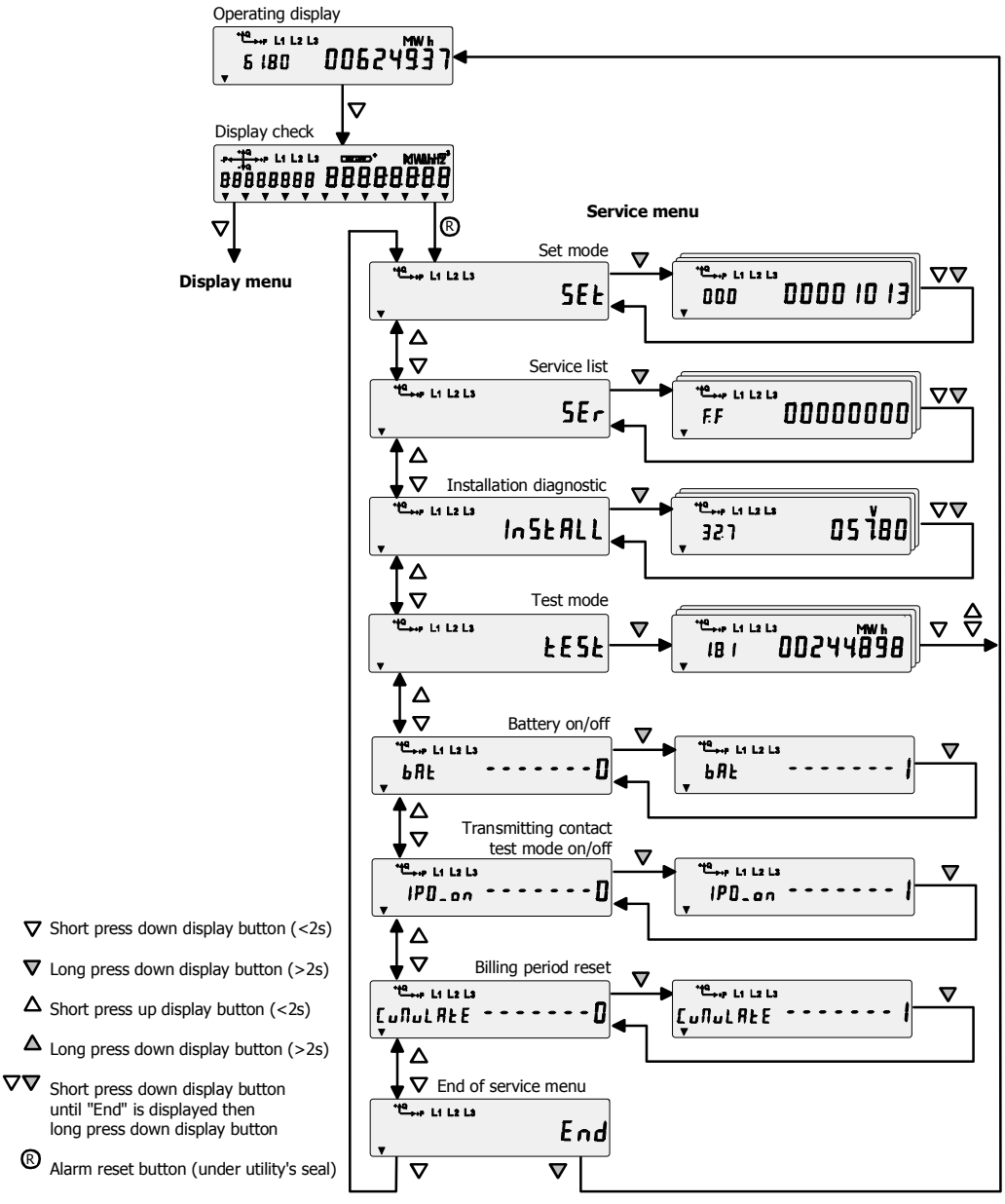
6.1 Service Button

Ⓡ Access to the alarm reset button is protected by the verification seal or by the utility's seal. The button is located behind the front door of the wall-mounted f6 and behind the front cover of the rack-mounted f9.

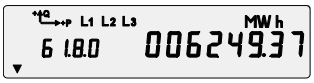
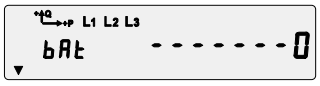
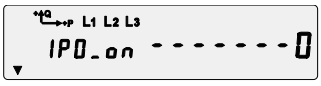
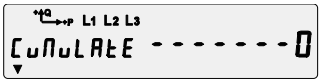
The alarm reset button has three functions:

1. Reset of critical errors and alarms.
2. Select the service menu from the display check.
3. Perform the cursor function in the set mode.

6.2 Service Menu



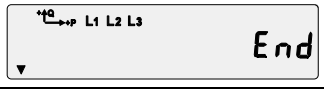
6.2.1 Select Service Menu

				Operating display
1.	▽	All segments of the display are lit		Display check
2.	Ⓡ	Display first menu item		Set mode
3.	▽	Select menu item		Service list
				Installation diagnostic list
				Test mode
				Battery on/off display
				Transmitting contact test mode on/off
				Billing period reset
4.	▽	Back to operating display		End of service menu

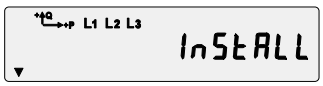
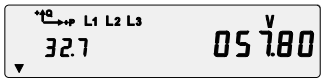
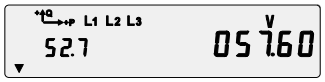
6.2.2 Set Mode

The Set mode is explained in section 4.5.3 “Set Date and Time”.

6.2.3 Service List

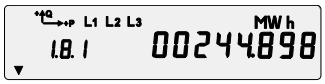
1.	▽	Select service list		Service list
2.	▽	Enter service list		Error code
3.	▽	Select the required main value		Main values
4.	▽	Select required value (main value or stored value)		Main value or stored value
5.		Repeat steps 3 and 4 for all values to be checked. Long press: display main values only Short press: display main values and stored value		
6.	▽	Advance display until **End**		End of service list
7.	▽	Exit service menu		

6.2.4 Installation Diagnostic List

1.	▽	Select installation diagnostic list		Installation diagnostic list
2.	▼	Enter installation diagnostic list		First value
3.	▽	Select required value		Value x
4.		Repeat step 3 for all values to be checked		
5.	▽	Advance display until **End**		End of diagnostic list
6.	▼	Exit installation diagnostic list		

6.2.5 Test Mode

The test mode enables you to select which measuring quantity (active, reactive, I², U²) is shown on the optical test output. Depending on parameter setting, the resolution of the display register can be increased for faster testing, using the time-power-method.

				Operating display
1.	▽	All segments of the display are lit		Display check
2.	Ⓡ	Enter service menu		Set mode
3.	▽	Select test mode		Test mode
4.	▼	Enter test mode		First value
5.	▽	Select required value		Value x
6.		Repeat step 5 for all values to be tested.		
7.	▲ ▽	Exit test mode		Operating display

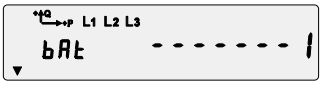
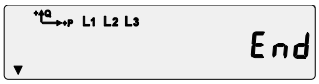
Example
The first value and value x are examples. The real values are defined in the parameter settings and are the same as on the operating display.

The measured values are displayed at the optical test outputs as shown in the following table:

Mode	Register on Display	Test output reactive	Test output active
Normal mode	Some sort of register	|R|	|A|
Test mode	NLA register (Transformer losses per phase NLA1,NLA2,NLA3; Total Transformer Losses NLA)	I^2 with R_{CU}=1 Ω	U^2 with R_{FE}=1 MΩ
	OLA register (Line losses per phase OLA1, OLA2, OLA3; Total line losses OLA)	U^2 with R_{FE}=1 MΩ	I^2 with R_{CU}=1 Ω
	Reactive energy register	|A|	|R|
	Active energy register or one of not mentioned registers in this table.	|R|	|A|

6.2.6 Set Battery Low Indicator

With this setting you can define whether the “Low Bat” symbol is shown on the display or not, if the battery is low.

				Operating display
1.	▽	All segments of the display are lit		Display check
2.	Ⓡ	Enter service menu		Set mode
3.	▽	Select menu item		Battery on/off display
4.	▼	Change setting: 1 = battery low indicator on 0 = battery low indicator off		
5.	▽	Advance display until **End**		End of battery on/off display
6.	▼	Exit service menu		Operating display

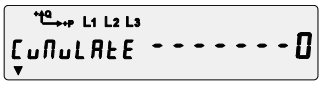
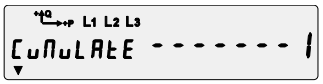
6.2.7 Transmitting contact test

For a detailed description of the test procedure see section 4.5.2 “Testing the Transmitting Contacts”.

6.2.8 Billing Period Reset

At the end of the billing period the reset signal triggers the entry of the current values into the stored billing value profile (C.8 only). Control of the billing period is usually automatic and synchronous to the capture period of the load profile.

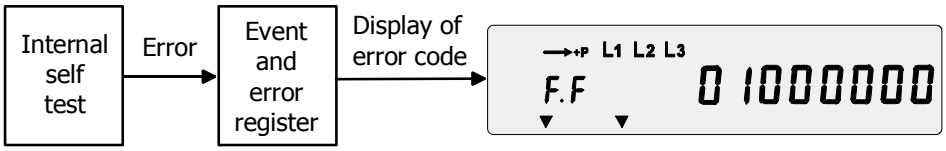
Using the following procedure, you can trigger a billing period reset manually.

				Operating display
1.	▽	All segments of the display are lit		Display check
2.	Ⓡ	Enter service menu		Set mode
3.	▽	Select required entry		Billing period reset
4.	▼	Perform a billing period reset Change from 0 to 1 = billing period reset Change from 1 to 0 = billing period reset		
5.	▽	Advance display until **End**.		End of service menu
6.	▼	Exit service menu		Operating display

6.3 Errors

6.3.1 Overview

The meter regularly performs an internal self-test which checks the correct function of all vital parts of the meter.



In the event of an error, an entry to the event and error register is made and the meter displays an error code. The error code appears in the display as an F.F followed by an 8-digit figure. The error code is always included in the readout log (e.g. error code F.F 0000 0000 = no error).

6.3.2 Structure of the Error Code

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

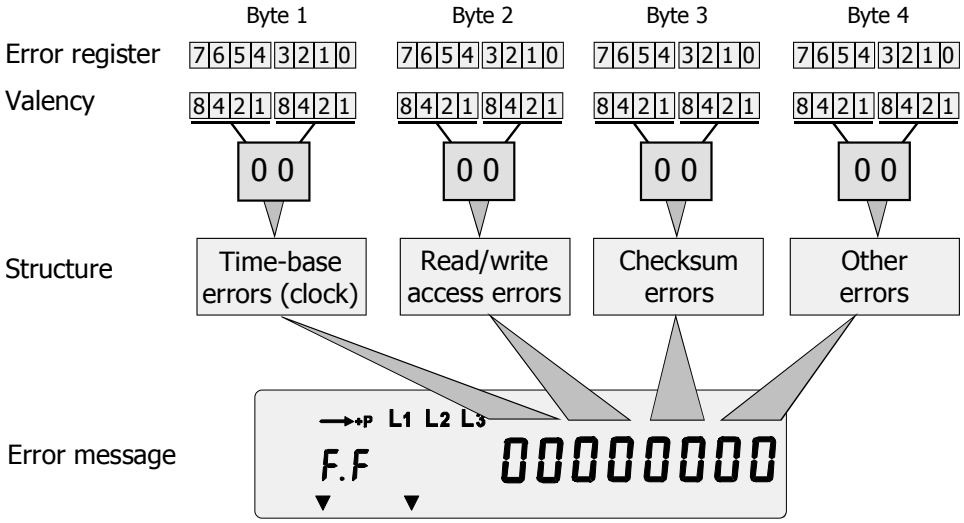
The four groups represent the four error types (i.e. time base errors, read/ write errors, checksum errors and other errors).

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

Error codes are added
As all errors are displayed in hexadecimal code a single error message can appear in the display in various ways depending on the presence of other error messages.

Example:

Two errors are displayed as:	FF **01**00**02**00
Another two errors occur:	FF **02**00**08**00
The display reads:	FF **03**00**0A**00



6.3.3 Degree of Severity of Errors

From firmware version H03, the degree of severity of an error occurring is assessed as follows (up to and including firmware version H02 there are only fatal and non-critical errors):

Fatal errors

A fatal error indicates a severe problem which prevents the meter from operating, e.g. a defective hardware component. As fatal errors occur during start-up, the alarm LED cannot be lit.

The alarm contact remains closed because the start-up sequence has not been completed. The meter stops its operation and the error code is displayed permanently. **The meter must be exchanged immediately.**

Critical errors

A critical error indicates a severe problem, despite which the meter continues to function and measurement is still possible. The data is stored in the memory and suitably marked in case of doubt.

If an alarm system is connected to an alarm contact of the meter, an alarm should be assigned to each critical error (parameterisation). If an alarm is reset, the critical error is also cleared and vice versa.

After a critical error, the error code is displayed and the alarm LED is lit until the error is acknowledged with the display key or the error register is reset, e.g. via the electrical interface. The alarm contact is closed until the error is reset or a timeout period has elapsed. The error can be read out via communication or displayed in the manual display list.

Depending on the type of error, it can reoccur, since with the acknowledgement the error cause has not been eliminated.
The meter must be exchanged as soon as possible.

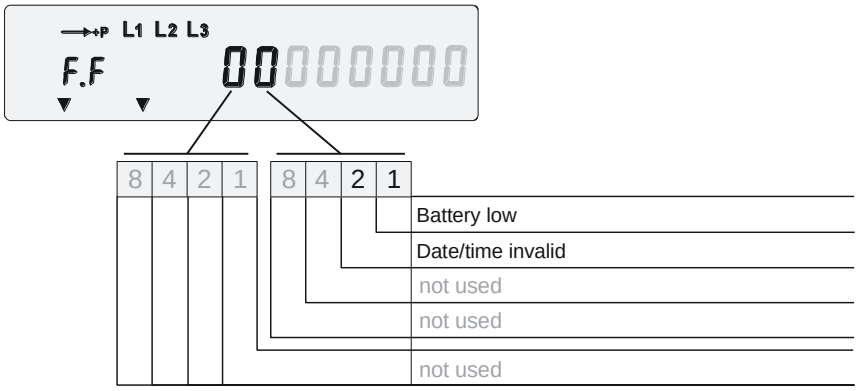
Non-critical errors

Non-critical errors can influence the meter functions (temporarily or permanently). These errors are recorded in the error register. If parameterised accordingly, the alarm LED flashes.

The alarm contact is closed until the error is cleared. The meter remains serviceable and generally **doesn't have to be exchanged**.

6.3.4 Error Groups

Time-Base Errors (Clock)



F.F 01 00 00 00 **Battery low (event no. 5)**

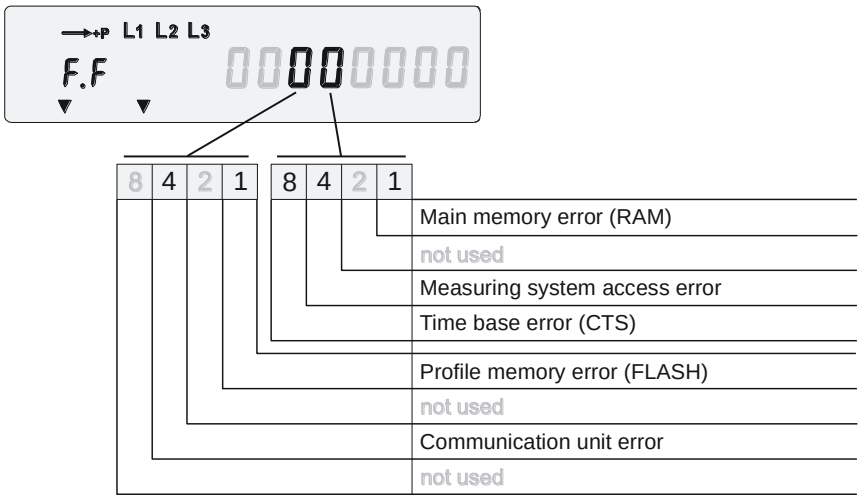
Purpose:	Indicates a discharged or removed battery
Checked:	Continuously, several times per minute
Set:	If the voltage drops below a certain level or the battery is removed
Meter reaction:	Battery indicator on the LCD is lit, alarm-LED is flashing (if parameterised)
Severity:	Non-critical
Consequence:	None as long as the meter is powered correctly. If the supercap is discharged due to a power cut, the time/date is lost.
Rectification:	If the voltage reaches a certain level or a new battery is installed

This error message only appears if the meter is parameterised as being equipped with a battery and if the battery check is activated (bat …. 1 in the service menu). Otherwise no battery condition check is performed.

F.F 02 00 00 00 **Date/time invalid (event no. 66)**

Purpose:	Indicates an invalid time/date
Checked:	Event driven
Set:	If the power reserve is exhausted during power down with low battery
Meter reaction:	The clock arrow is displayed, alarm-LED is flashing (if parameterised)
Severity:	Non-critical
Consequence:	After power up, the clock runs again but shows incorrect time/date (1.1.2000 00:00h). Entries in the profiles will be marked with wrong time stamps.
Rectification:	The error is automatically cleared when the clock is set (and the battery has been replaced, if necessary).

Read/Write Access Errors



Communication problem
Read/write errors indicate a communication problem between the microprocessor and the various components.

F.F 00 01 00 00 Main memory error (RAM, event no. 73)

Purpose:	Indicates an internal RAM check failure
Checked:	On power-up
Set:	On power-up if RAM access fails several times
Meter reaction:	The software is restarted (loop if RAM check fails again)
Severity:	Fatal
Consequence:	The meter may contain incorrect data
Rectification:	The meter must be replaced

This error can only occur at start-up and stops the meter in the start-up process. Therefore, the alarm LED cannot be lit and no event log entry is possible. The alarm contact remains active.

F.F 00 04 00 00 Measuring system access error (event no. 75)

Purpose:	Indicates measuring system access failures
Checked:	On each access to the measuring system
Set:	If access to measuring system failed several times. The error may occur if meters are installed with a completely discharged supercap which causes an incorrect start-up.
Meter reaction:	none
Severity:	Non-critical
Consequence:	The meter may contain incorrect measurement data
Rectification:	Power-up meter and wait for a short time, then clear error via communication. If the error doesn't occur, the meter should be equipped with a battery. If the error reoccurs, replace the meter

F.F 00 08 00 00 **Time base error (RTC) (event no. 76)**

Purpose:	Indicates that the real time clock was without power and the clock has lost its time
Checked:	On power-up
Set:	After repeated failures of the internal time base test
Meter reaction:	The clock arrow is displayed
Severity:	Non-critical
Consequence:	The calendar clock may display incorrect/invalid time/date
Rectification:	By pressing the alarm reset button or via communication. If it occurs repeatedly, the meter must be replaced

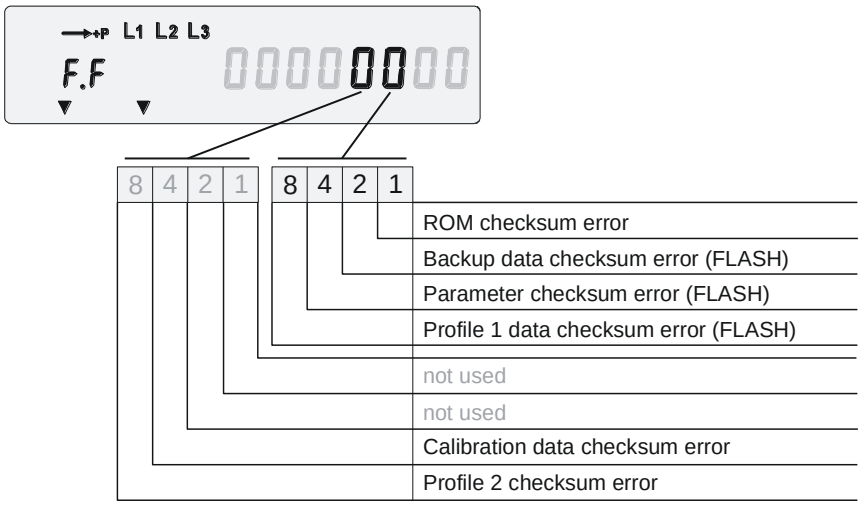
F.F 00 10 00 00 **Profile memory error (event no. 77)**

Purpose:	Indicates profile memory access failures
Checked:	At each read/write access
Set:	After repeated failures to access the internal memory
Meter reaction:	Profile data will be marked in the status code, alarm-LED is on
Severity:	Critical
Consequence:	It may be impossible to access the profile or it may contain incorrect data
Rectification:	By pressing the alarm reset button or via communication

F.F 00 40 00 00 **Communication unit access error (event no. 79)**

Purpose:	Indicates a failure to access the communication unit
Checked:	At each read/write access
Set:	After repeated failures of the internal CU test
Meter reaction:	The meter may stop to communicate with the CU, alarm-LED is flashing (if parameterised)
Severity:	Non-critical
Consequence:	Communication via the CU may not work or is slow
Rectification:	Clear error via communication or by pressing the alarm reset button. If it occurs repeatedly, replace CU first, check function and if the error reoccurs, replace meter.

Checksum Errors



F.F 00 00 01 00 ROM checksum error (event no. 81)

Purpose:	Indicates a microprocessor ROM code checksum failure
Checked:	On power-up
Set:	On power-up if the ROM checksum test fails
Meter reaction:	The software is restarted (loop if ROM check fails again)
Severity:	Fatal
Consequence:	The meter will no longer work
Rectification:	The meter must be replaced

This error can only occur at start-up and stops the meter in the start up process. Therefore, the alarm LED cannot be lit and no event log entry is possible. The alarm contact remains active.

F.F 00 00 02 00 Backup data checksum error (FLASH) (event no. 82)

Purpose:	Indicates a backup data checksum failure
Checked:	On start-up
Set:	Temporarily set after a faulty checksum test
Meter reaction:	Profile data will be marked in the status code, alarm-LED is on
Severity:	Critical
Consequence:	Meter may contain incorrect data
Rectification:	The meter needs to be replaced

F.F 00 00 04 00 **Parameter data checksum error (FLASH) (event no. 83)**

Purpose:	Indicates a parameter data checksum failure
Checked:	On power-up and every 24 hours
Set:	Set after a faulty checksum test
Meter reaction:	Profile data is marked in status code, alarm-LED is on
Severity:	Critical
Consequence:	Meter may contain incorrect data
Rectification:	The meter must be replaced

F.F 00 00 08 00 **Profile 1 data checksum error (FLASH) (event no. 84)**

Purpose:	Indicates a profile 1 data checksum failure
Checked:	Continuously (page by page)
Set:	After repeated failures of the profile data checksum test
Meter reaction:	Profile data of the page concerned will be marked in the status code
Severity:	Non-critical
Consequence:	Pages affected may contain faulty data but the measuring system works correctly
Rectification:	Reset the profile and then the error via communication. If it occurs repeatedly, the meter must be replaced.

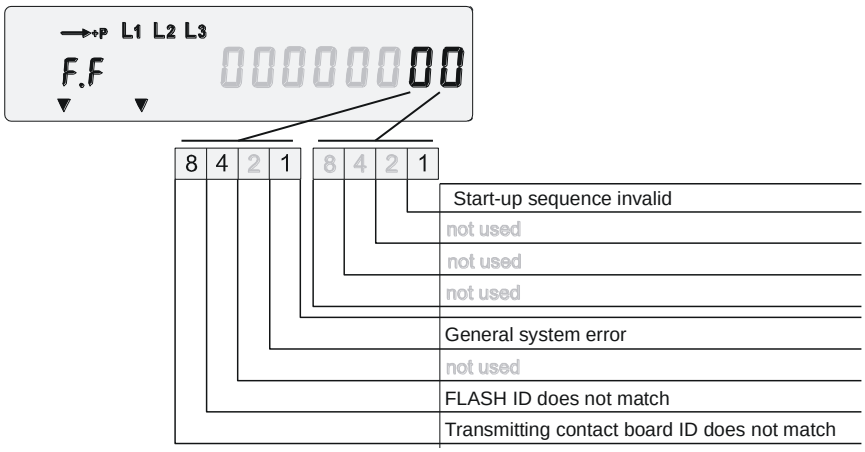
F.F 00 00 40 00 **Calibration data checksum error (event no. 87)**

Purpose:	Indicates a calibration data checksum failure
Checked:	Continuously
Set:	After repeated failures of the profile data checksum test
Meter reaction:	The meter might not measure accurately
Severity:	Critical
Consequence:	The meter might contain incorrect data
Rectification:	The meter must be replaced

F.F 00 00 80 00 **Profile 2 data checksum error (event no. 88)**

Purpose:	Indicates a profile 2 data checksum failure
Checked:	Continuously (page by page)
Set:	After repeated failures of the profile data checksum test
Meter reaction:	Profile data of the page concerned will be marked in the status code
Severity:	Non-critical
Consequence:	Pages affected may contain faulty data but the measuring system works correctly
Rectification:	Reset profile 2 and then the error via communication. If it occurs repeatedly, the meter must be replaced.

Other Errors



F.F 00 00 00 01 Start-up sequence invalid (event no. 89)

Purpose:	Indicates an invalid start-up sequence
Checked:	On power-up
Set:	If the power up procedure detects that no valid power down took place
Meter reaction:	none
Severity:	Non-critical
Consequence:	The meter might have lost data since the last storage (storage every 24 h and at power down of the meter)
Rectification:	By pressing the alarm reset button or via communication. If it occurs repeatedly, contact Landis+Gyr Customer Services.

F.F 00 00 00 10 General system error (event no. 93)

Purpose:	Indicates a fatal system failure within the microprocessor
Checked:	Event driven
Set:	If the microprocessor was restarted due to a disturbance (e.g. lightning)
Meter reaction:	The software is restarted
Severity:	Non-critical
Consequence:	All actual data (since the last storage – storage takes place every 24 h and at power down of the meter) is lost
Rectification:	By pressing the alarm reset button or via communication. If it occurs repeatedly, contact Landis+Gyr Customer Services.

F.F 00 00 00 20 Communication locked (event no. 94)

Purpose:	Indicates access attempts with a wrong password via the communication interface
Checked:	At every access via communication
Set:	After using wrong passwords several times
Meter reaction:	Access to the meter via communication at levels requiring passwords will be locked for a parameterised time, but maximum until midnight. An alert can be triggered, alarm-LED is flashing (if parameterised)
Severity:	Non-critical
Consequence:	No access at levels requiring passwords will be possible until the inhibition time expires
Rectification:	Wait until expiration of the inhibition time

F.F 00 00 00 40 Wrong EEPROM/Flash (event no. 95)

Purpose:	Indicates that an incorrect EEPROM/Flash is installed
Checked:	On power-up
Set:	If reference identification of the firmware is different from the one stored in the EEPROM/Flash memory
Meter reaction:	The error code is displayed and the meter will stop
Severity:	Fatal
Consequence:	Meter will no longer work
Rectification:	The meter must be replaced

6.4 Repair

When a fatal error or an alarm occurs that cannot be cleared (see previous paragraph Errors), the meter must be repaired by the authorised service and repair centre.

1. If installed, de-install the meter as described in chapter 4 “Installation / De-installation”.
2. Describe the error clearly and state the name and telephone number of the person responsible in case of inquiries.
   Whenever possible, fill out an error description form and attach it to the meter.
3. Pack the meter using the original packing. Do not enclose any loose components.
4. Send the meter to the responsible service and repair centre.
5. Quote the meter serial number from the face plate in all communication!

Shipment of the meter
The meter may only be shipped in its original packing.

Do not repair f9 meters with fire damage
Meters with an f9 housing contain isolation material made of polyvinyl chloride (PVC).
In the unlikely event of a fire, this isolation material may be burned and deposited on the PCBs.
No attempts must be made to repair f9 meters with fire damage. The meters must be disposed of in accordance with local laws and / or regulations. For details please refer to chapter 11.

7 Maintenance

ZxQ meters require no maintenance.

Meter modification
No conversion, modification or retrofitting of the meter is allowed unless stated in this chapter!

7.1 Meter Tests

A meter accuracy check should be performed periodically according to national regulations, usually every 8 years.

When testing the meter, the measuring conditions and the measuring points must follow the IEC meter standards.

Use test equipment according to regulations for Cl.0.2S.

7.1.1 Measuring Times

	Metering Point	Measuring Time
all-phase	1% I_n cosφ = 1	90 s
	2% I_n cosφ = 0.5	90 s
	100% I_n cosφ = 1	10 s
single phase	100% I_n cosφ = 0.5	40 s

7.1.2 Optical Test Outputs

The green optical test outputs supply pulses at a frequency dependent on the load applied and the meter constant R. The pulse's rising edge is always decisive for the test.

After switch on of voltage and current, wait 1 second for measurement to be started.

The pulse frequency at nominal load P_n is between 4 and 6 Hz.

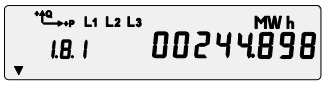
7.1.3 Test via Transmitting Contacts

For the accuracy test of the transmitting contacts the same test is performed as for the optical test outputs.

7.1.4 Test Mode

The test mode enables you to select which measuring value (active, reactive, I^2, U^2) is shown on the optical test output.

In the display, values for active, reactive and apparent energy are available. Depending on parameter setting, the resolution of the display register can be increased for faster testing. In the test mode, the resolution is increased by one decimal point compared with the normal mode. A maximum of 5 decimal points is possible.

1.	▽	Select test mode		Test mode
2.	▽	Enter test mode		First value
3.	▽	Select required value		Value x
4.		Repeat step 3 for all values to be tested		
5.	△ ▽	Exit test mode		Operating display

Examples
First value and value x are examples. The real values are defined in the parameter settings and are the same as the operating display.

The measured values are displayed at the optical test outputs as shown in the following table:

Mode	**Register on Display**	**Test output reactive**	**Test output active**
Normal mode	Some sort of register	|R|	|A|
Test mode	NLA register (Transformer losses per phase NLA1,NLA2,NLA3; Total Transformer Losses NLA)	I^2 with R_{CU}=1 Ω	U^2 with R_{FE}=1 MΩ
	OLA register (Line losses per phase OLA1, OLA2, OLA3; Total line losses OLA)	U^2 with R_{FE}=1 MΩ	I^2 with R_{CU}=1 Ω
	Reactive energy register	|A|	|R|
	Active energy register or one of not mentioned registers in this table.	|R|	|A|

7.1.5 No Load Test

Test voltage U_p = 1.15 x nominal voltage U_n

Test current I_p = 0.3 x starting load

1. Switch off the current for at least 10 seconds.
2. Switch on the test voltage Up and current Ip (0.3 x starting load). The green optical test outputs must be permanently lit.
3. Run the test for 5 minutes. The meter must not deliver more than one pulse during the test. Check the energy reading for changes in test mode. The last digit of the display must not increase by more than 1.

Local regulations
In some countries, the observation time must be longer than 5 minutes. Follow the local the local regulations.

7.1.6 Starting Load for Active Energy

Apply a load current of **0.05%** of the nominal current I_n (other values may be selected in the parameter setting) and the voltage U_n (three-phase in each case) at cosφ= 1. The meter must start registering. The green optical test output must start flashing.

7.1.7 Starting Load for Reactive Energy

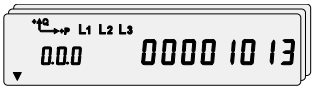
Apply a load current of **0.1%** of the nominal current I_n (other values may be selected in the parameter setting) and the voltage U_n (three-phase in each case) at sinφ = 1. The meter must start registering. The green optical test output must start flashing.

7.2 Set Time & Date, ID Numbers, Battery Time

The following values can be changed at any time from the service menu (set mode):

- Date and time
- Identification numbers
- Operating time of battery

Below is an example on how to set the date and time.

				Operating display
1.	▽	All segments of the display are lit		Display check
2.	Ⓡ	Enter service menu		Set mode
3.	▼	Enter set mode		Identification number
4.	▽	Select required setting		Date, old value
5.	Ⓡ	Select digit to be changed		Digit flashes
6.	▽	Change digit value		Digit flashes
7.	Ⓡ	Select digit to be changed		Next digit flashes
8.		Repeat steps 5 – 7 for all digits to be changed.		All digits flash
9.	Ⓡ	Confirm new setting		Date, new value
10.		Repeat steps 4 – 9 for all settings to be changed.		
11.	▽	Advance display until **End**		End of set mode
12.	▼	Back to service menu		Service menu
13.	▽	Advance display until **End**		End of service menu
14.	▼	Back to operating display		Operating display

7.3 Change Battery

7.3.1 When to Change the Battery

For meters with battery: Change the battery if one of the following events occurs:

- The BAT LOW symbol appears on the display.
- During the regular calibration cycle of the meter.
- If the battery voltage drops below 4.8 V (this can be checked in the service list under code C.6.3).

Indication of symbol "BAT LOW"
Only meters parametrised to enable the battery symbol BAT LOW will display it when the battery is low.
The meter functions perfectly well without a battery.

7.3.2 How to Change the Battery

Presence of dangerous voltage
Dangerous voltage may be present on the battery and battery contacts in the battery compartment.
Touching the battery or battery contacts could result in severe personal injury or death.
Only remove and replace the battery with the existing battery holder without touching the contacts.

Wrong battery type
Replacing the battery with the wrong type or voltage rating could result in damage to the meter.
Only use a lithium battery with a rated voltage of 6 V and the same construction as the original battery (type CR-P2) as a replacement.

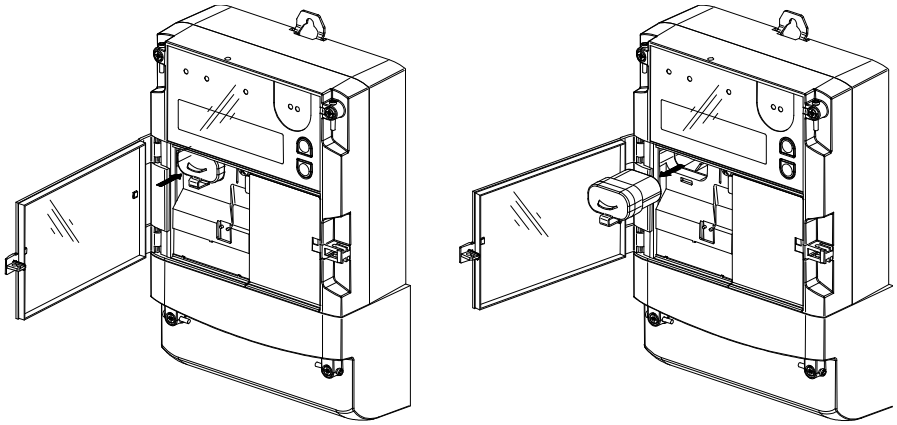
Battery replacement after a long period of non-use
If the meter has been disconnected from the supply for a long time, the power reserve is exhausted. Replacing the battery when the power reserve is exhausted may lead to invalid time/date information without the corresponding error message.
Reconnect the meter to the measurement voltage or additional power supply before replacing the battery.

Replacing the Battery in f6 Meters

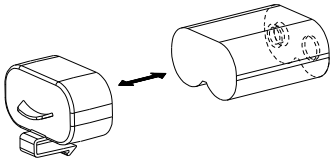
1. Remove the front door seal and open the front door.

Presence of dangerous voltage
Only remove the battery with the existing battery holder without touching the contacts.

2. Lightly press down the latch of the plastic battery holder until it releases and then withdraw the battery holder with the old battery.



3. Mark the current date on the new battery.
4. Draw the old battery from the holder and insert the new 6 Volt rated lithium battery.



Presence of dangerous voltage
Only replace the battery with the existing battery holder without touching the contacts.

5. Push the battery holder with battery in the battery compartment until the latch engages.
6. In the set mode, reset the operating time of the battery to zero and change the time and date if necessary as described earlier in this chapter.
7. Close and re-seal the front door.
8. Dispose of old battery in accordance with local regulations.

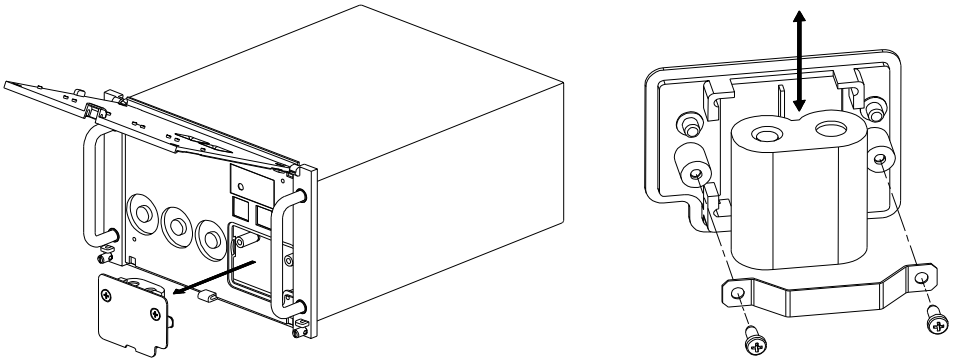
Replacing the Battery in f9 Meters

a) Battery holder with screws

1. Remove the front cover seal and open the front cover.

Presence of dangerous voltage
Only remove the battery with the existing battery holder without touching the contacts.

2. Loosen and remove the two battery holder fixing screws. Withdraw the battery holder from the meter.
3. Mark the current date on the new battery.
4. At the rear of the battery holder, loosen the clamp fixing screws and take off the battery.



5. Insert the new battery into the battery holder. Tighten the screws so that the clamp holds the battery.

Presence of dangerous voltage
Only replace the battery with the existing battery holder without touching the contacts.

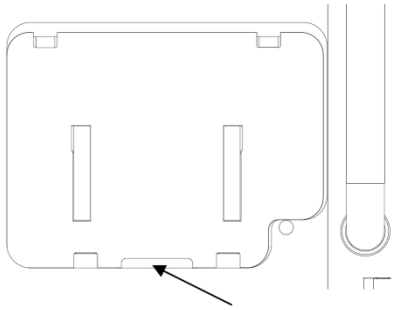
6. Insert the battery holder into the meter. Tighten the two fixing screws.
7. In the set mode, reset the operating time of the battery to zero and change the time and date if necessary as described earlier in this chapter.
8. Close and re-seal the front cover.
9. Dispose of old battery as hazardous waste in accordance with local regulations.

b) Battery holder version without screws

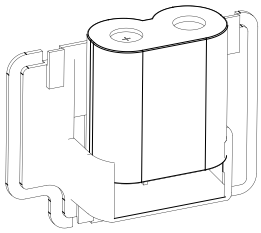
1. Remove the front cover seal and open the front cover.

Presence of dangerous voltage
Remove and replace the battery only with the existing battery holder without touching the contacts.

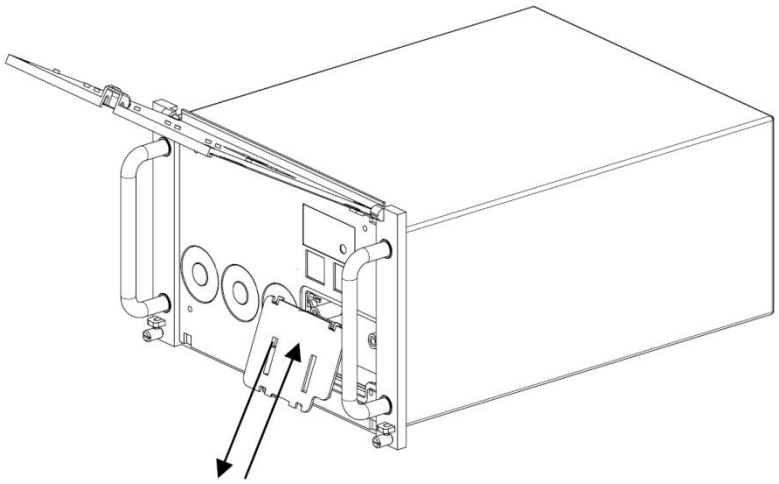
2. Push the battery holder on the marked position upwards and withdraw it.



3. Note the current date on the new battery.
4. Remove the old battery from the holder and insert the new battery.



5. Put the battery holder in the meter. Slide the holder upwards until it snaps in and then let it glide down by pressing.



6. In the set mode, reset the operating time of the battery and change the time and date if necessary as described in earlier in this chapter.
7. Close and re-seal the front cover.
8. Dispose of old battery according to local regulations.

7.4 Change Communication Unit

7.4.1 When to Change the Communication Unit

The communication unit can be changed, if for example, different communication requirements are needed.

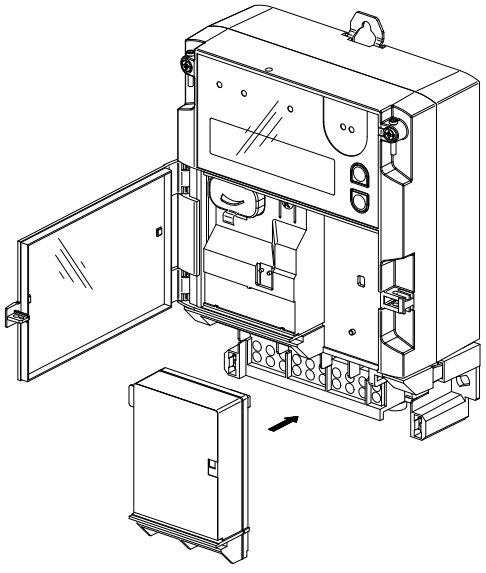
7.4.2 How to Change the Communication Unit

Dangerous voltage when connecting communication unit
Dangerous voltage is present on the meter connections to the communication unit. Contact with the connections will result in severe personal injury or death.
The change or installation of a communication unit must only be performed by personnel who are competent and qualified in accordance with national regulations (see ISSA “Guideline for Assessing the Competence of Electrically Skilled Persons”), with strict adherence to the utility's safety regulations.
For safety reasons, we recommend to switch off all voltages connected to the meter for an exchange of communication units.

Only use specified communication units
Only connect the communication units specified in section 1.14 on page 28 to the ZxQ meter in order to ensure a safe and stable communication.

Changing the Communication Unit in f6 Meters

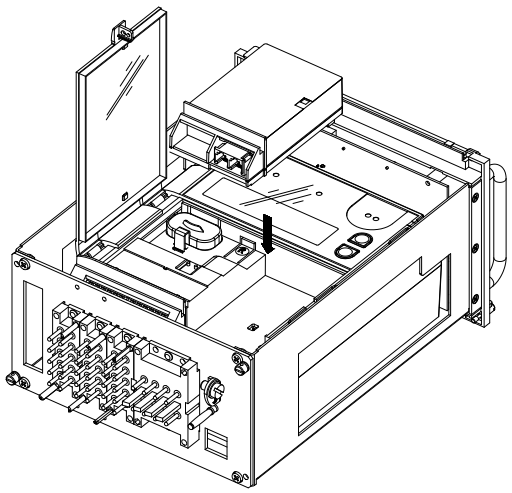
1. Remove the two utility's seals on the terminal cover, release the two screws and remove the terminal cover.
2. Remove the communication unit (or dummy).
3. Carefully insert the new communication unit ensuring that plug and socket are properly engaged.



4. Connect the connecting wires to the terminals of the communication unit.
5. Mount the terminal cover.
6. Carry out functional tests as described in the relevant communication unit manual to ensure it is functioning correctly.
7. Close the front door, and re-seal.

Changing the Communication Unit in f9 Meters

1. De-install the meter (see page 58).
2. Remove the seals at the back of the housing and remove the housing.
3. Remove the communication unit (or dummy).
4. Carefully insert the new communication unit ensuring that plug and socket are properly engaged.



5. Connect the connecting wires to the terminals of the communication unit.
6. Carry out functional tests as described in the relevant communication unit manual to ensure it is functioning correctly.
7. Replace the housing and re-seal.
8. Install the meter (see page 49).

8 Appendix Version C.2

This chapter describes the characteristics of the ZxQ200**C.2**.

Functional range

Unlike the dlms meters C.4, C.6, C.7 and C.8 the C.2 can communicate via the protocol according to the IEC870 subset.

The C.2 meter has been designed for the communication according to the IEC870 subset and therefore, it features:

- no tariff control
  - no tariff control inputs
  - no energy tariff registers
  - no time switch (time of use)
- no synchronisation input

8.1 Communication according to IEC870 Subset

The ZxQ meters with the functional range C.2 are capable of communicating according to the IEC870 subset. These meters are particularly suited for the replacement of previous IEC870 meters such as the Landis+Gyr ZMU. As a result, the ZxQ C.2 is predestined to be used in existing telemetering systems with transcoders such as the Landis+Gyr FAG.

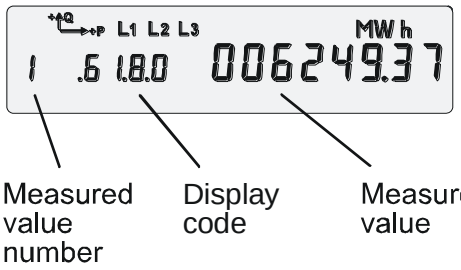
The meter is connected to a transcoder via the local RS485 interface. The transcoder requests the meter every minute to send the current data.

Meter Address

Every meter has its own meter address (Com No) with which it is clearly identified by the transcoder. All meters that are connected to the same transcoder must have a unique meter address. The meter address is a number between 1 and 127.

Measured Value Number

In addition to the display code, the measured values (energy/loss) also feature a number (MV No) between 1 and 255 with which the value is clearly identified by the transcoder. All measured values of the various meters that are connected to the same transcoder must have a unique measured value number.



When setting the parameters, a meter address must be defined for every meter and a measured value number must be defined for every measured value.

8.2 Measured Quantities

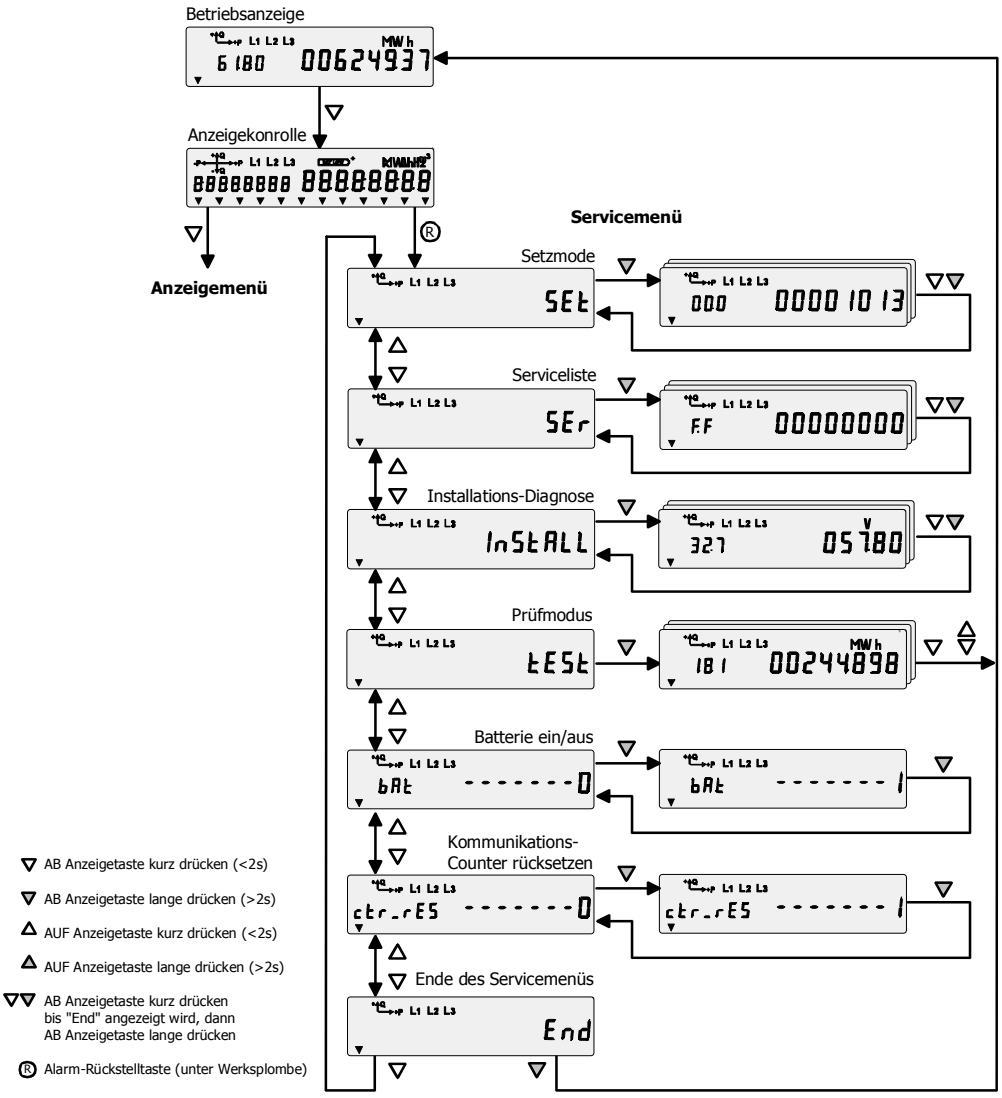
Meters with the functional range C.2 provide the following measured quantities.

Meters with quadrant splitting provide the measured quantities +Ri, +Rc, -Ri and -Rc instead of +R and -R.

Measured quantity		**ZMQ**	**ZFQ**	**ZCQ**
Active energy import	+A	Sum	Sum	L1
Active energy export	–A	Sum	Sum	L1
Reactive energy import	+R	Sum	Sum	L1
Reactive energy export	–R	Sum	Sum	L1
Reactive energy in quadrant I	+Ri	Sum	Sum	L1
Reactive energy in quadrant II	+Rc	Sum	Sum	L1
Reactive energy in quadrant III	–Ri	Sum	Sum	L1
Reactive energy in quadrant IV	–Rc	Sum	Sum	L1
Active copper losses (line)	OLA	Sum	Sum	L1
Active iron losses (transformer)	NLA	Sum	Sum	L1
Total losses of active energy in positive direction	+TLA	Sum	Sum	L1
Total losses of active energy in negative direction	–TLA	Sum	Sum	L1
Phase voltages (RMS)		U1, U2, U3	U12, U32	U1
Phase currents (RMS)		I1, I2, I3	I1, I3	I1
Network frequency	f_n	yes	yes	yes
Phase angle between voltages	φ U	U1-U2 / U1-U3	U12-U32	
Phase angle between voltage and current	φ U-I	U1-I1, U1-I2, U1-I3	U12-I1, U12-I3	
Direction of rotating field		yes	yes	
Phase outage		yes	yes	yes
Voltage dip table		Sum	Sum	L1
Energy flow of active energy	EFA	Sum	Sum	L1
Energy flow of reactive energy	EFR	Sum	Sum	L1

8.3 Service Menu

The service menu of the ZxQ200C.2 is expanded by the functions for the communication according to the IEC870 subset.

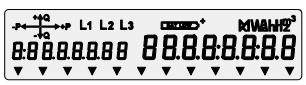


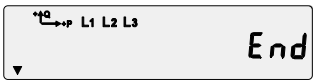
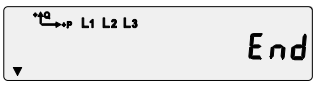
8.4 Installation Check

If the C.2 meter communicates according to the IEC870 subset the following steps must be carried out during the installation check in addition to the steps described in section 4.5 “Installation Check” on page 51.

8.4.1 Check Meter Address

Check whether all meters connected to the same transcoder have a unique meter address.

1.				Operating display
2.	▽	All segments of the display are lit		Display check

3.	R	Enter service menu		Set mode
4.	▽	Select required menu item		Installation diagnostic
5.	▼	Enter installation diagnostic		Check meter address
6.	▽	Advance display until **End**		End of installation diagnostic
7.	▼	Return to service menu		Service menu
8.	▽	Advance display until **End**		End of service menu
9.	▼	Exit service menu		Operating display

8.4.2 Reset Communication Counter

Set the counter of the three communication commands freeze, send and respond to "0".

				Operating display
1.	▽	All segments of the display are lit		Display check
2.	R	Enter service menu		Set mode
3.	▽	Select required menu item		Communication counter reset
4.	▼	Reset communication counter		
		Change from 0 to 1 = reset communication counter Change from 1 to 0 = reset communication counter		
5.	▽	Advance display until **End**		End of display communication counter reset
6.	▼	Exit service menu		Operating display

8.4.3 Check Communication

Sequence of commands of the communication according to IEC870 subset:

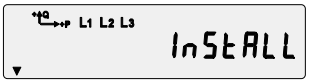
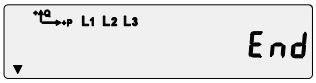
1) Freeze
2) Send
3) Respond

The communication between meter and transcoder is only completed successfully if all 3 commands have been carried out. In order to be able to check the communication the meter features a counter for every command. These counters are always incremented by 1 after the command has been carried out.

Varying counter readings indicate communication problems.

Checking the communication counters

Check whether the counters for the communication commands freeze, send and respond show identical readings.

1.				Operating display
2.	▽	All segments of the display are lit		Display check
3.	Ⓡ	Enter service menu		Set mode
4.	▽	Select required menu item		Installation diagnostic
5.	▼	Enter installation diagnostic		Meter address
6.	▽	Select freeze counter		Check freeze counter
7.	▽	Select send counter		Check send counter
8.	▽	Select respond counter		Check respond counter
9.	▽	Advance display until **End**		End of installations diagnostic
10.	▼	Return to the service menu		Service menu
11.	▽	Advance display until **End**		End of service menu
12.	▼	Exit service menu		Operating display

8.5 Error Messages

If the protocol according to the IEC870 subset is used to communicate between meter and transcoder all meter types that can communicate using this protocol can be utilized (e.g. ZxU, ZxV, ZxQ200C.2).

These different meter types generate different operational indications and alarms.

The table below provides a cross-reference of the error messages of the ZxU/ZxV and the ZxQ.

Message ZxU/ZxV	**Message ZxQ**	**Event No ZxQ**
System restart	Energy register cleared	128
Coldstart	General system error	93
Program error	ROM checksum error	(81, fatal error)
Parameter error	Parameter data checksum error (FLASH)	83
Parameter error M, D	Measuring system access error	75
Data error	Main memory error (RAM)	(73, fatal error)
Current without voltage phase Lx	Current without voltage Lx	55 – 57
Outage Phase Lx	Single-phase failure Lx	125 – 127
Parameter change [1)]	Parameterisation changed	1
Bypass feeder operation [1)]	Bypass feeder operation	47
Power outage [1)]	Power down	23
Set register value[1)]	[2)]	[2)]
Register overflow [1)]	[2)]	[2)]

1) These messages do not appear in the display of the ZxU/ZxV. However, they will be transmitted to the transcoder using the protocol according to the IEC870 subset.

2) These events do not trigger an event log entry at the ZxQ. However, the events will be transmitted to the transcoder using the protocol according to the IEC870 subset.

9 Appendix Version C.7

This appendix describes the functions of the special execution C.7 which is only intended for the Indian market.

9.1 Measured Quantities

With the C.7 meters, the following measured quantities are available in addition to those found in C.4 and C.6:

Measured quantity		**ZMQ**	**ZFQ**	**ZCQ**
Active energy import	+A	single-phase		
Active energy export	–A	single-phase		
Reactive energy import	+R	single-phase		
Reactive energy export	–R	single-phase		
Reactive energy in quadrant I	+Ri	single-phase		
Reactive energy in quadrant II	+Rc	single-phase		
Reactive energy in quadrant III	–Ri	single-phase		
Reactive energy in quadrant IV	–Rc	single-phase		
Apparent energy import	+S	Sum / Phases	Sum	L1
Apparent energy export	–S	Sum / Phases	Sum	L1
Apparent energy in quadrant I	+Si	Sum / Phases	Sum	L1
Apparent energy in quadrant II	+Sc	Sum / Phases	Sum	L1
Apparent energy in quadrant III	–Si	Sum / Phases	Sum	L1
Apparent energy in quadrant IV	–Sc	Sum / Phases	Sum	L1
Net/gross active energy in positive direction	+CA	Sum	Sum	L1
Net/gross active energy in negative direction	-CA	Sum	Sum	L1
Net/gross reactive energy in positive direction	+CR	Sum	Sum	L1
Net/gross reactive energy in negative direction	-CR	Sum	Sum	L1
Total losses of active energy	TLA	Sum	Sum	L1
Total losses of reactive energy	TLR	Sum	Sum	L1

Due to the different type of measurement of the Aron circuit, data for the individual phases are not provided by the ZFQ.

In C.7, vectorial calculation is always used to calculate apparent energy, the leading reactive energy is not taken into account.

9.2 Voltage Monitoring

In C.7 meters, there is an additional over-/undervoltage monitor with preset values and a Missing Voltage Monitor with a parametrisable threshold. These additional functions can be used for tariff control.

10 Appendix OBIS code

Object Identification System

The OBIS code (Object Identification System) is structured as follows:

A	B	C	D	E	F
M -	KK:	GG.	AA.	T	W

A: Medium
[1 ... 9]

Defines the medium used. If only one medium is used it does not have to be specified. The values represent the following objects:

1 Electricity

2, 3 not used

4 Heating costs

5 Cooling system

6 Heating system

7 Gas

8 Cold water

9 Hot water

B: Channel
[1 ... 64]

Defines the channel number, i.e. the number of the input of a metering equipment with several inputs for the measurement of energy of the same or different types (e.g. in data concentrators, registration units). This enables data from different sources to be identified. If only one channel (only one meter) is used, it does not have to be specified.

C: Measured quantity
[1 ... 99]

Defines the abstract or physical data items related to the information source concerned, e.g. active power, reactive power, apparent power, cosφ, current or voltage.

General data		0			
Active energy	**+ (import)**	**∑Li** 1	**L1** 21	**L2** 41	**L3** 61
	– (export)	2	22	42	62
Reactive energy	**+**	3	23	43	63
	–	4	24	44	64
	QI (quadrant I)	5	25	45	65
	QII	6	26	46	66
	QIII	7	27	47	67
	QIV	8	28	48	68
Apparent energy	**+ (import)**	9	29	49	69
	– (export)	10	30	50	70
Current		11	31	51	71
Voltage		12	32	52	72
Power factor		13	33	53	73
Frequency		14			
Service data		C			
Error message		F			
Profile data		P			

D: Measuring type
[1 ... 73, F, P]

Defines types, or the result of the processing of physical quantities according to various specific algorithms. The algorithms can deliver energy and demand quantities as well as other physical quantities.

The following list is an excerpt.

Capture period	1	2	3
Cumulated minimum	1	11	21
Cumulated maximum	2	12	22
Minimum	3	13	23
Running average	4	14	24
Last average	5	15	25
Maximum	6	16	26
Instantaneous value	7		
Time integral 1 (energy status)	8		
Time integral 2 (energy consumption)	9		
Time integral 3 (excess consumption)	10		
...			
Test average	55		
Test time integral 4	58		
...			
Error message	F		
Load profile	01		

E: Tariff
[1 ... 9]

Defines the further processing of measurement results to tariff registers, according to the tariffs in use. Total values are marked with ‘0’. For abstract data or for measurement results for which tariffs are not relevant, this value group can be used for further classification.

F: Stored value
[01 ... 99]

Defines the storage of data according to different billing periods. Where this is not relevant, this value group can be used for further classification.

Display code

To simplify the reading of the display code, individual parts of the OBIS code can be omitted. The abstract or physical data C and type of data D must be shown.

Examples

1.8.0 1 = all-phase active power in positive direction

8 = cumulative value (meter reading)

0 = total energy (no tariffs)

0.9.1 Local time

11 Disposal

11.1 Components

Based on the data specified in environmental certificate ISO 14001, the components used in ZxQ meters are largely separable and can therefore be taken to the relevant disposal or recycling point.

Disposal and environmental protection regulations
For the disposal of meters observe the local disposal and environmental protection regulations in effect without fail.

Dispose of the components as follows:

Component	Disposal
Printed circuit boards, LEDs and LCD	Electronic waste: disposal according to local regulations.
Lithium battery	Hazardous waste: disposal according to local regulations.
Metal parts	Sorted and taken to collective materials disposal point.
Plastic components	Sorted and taken to recycling (regranulation) plant or, if no other possibility, to refuse incineration.

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