SIEMENS

Landis & Gyr Combimeter

for active and reactive energy

User manual

Landis & Gyr ZFB / ZMB310
Landis & Gyr ZFB / ZMB405/410

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Revision history

Information about document indexes, and revisions carried out respectively.

Revision	Date	Name/phone	Comments
-	04.05.98	D. Opitz - 2892	replaces M13 138 187c E
a	03.02.99	D. Opitz - 2892	Frontpage faceplate Siemens, page 12 ch. 4.4 Line fuses completed page 14 ch. 4.7 Clamping screws add. Type Z
b	30.06.99	D. Opitz - 2892	replacement of mercury-wetted reed relay r14 by solid-state relay: Pages 8, 18, 19, 20, 37 and 51.

Quality and environmental approval

ISO/EN 9001
ISO/EN 14001

Table of Contents

1 General Remarks

The user manual for the product series Landis & Gyr ZFB/ZMB310CT and Landis & Gyr ZFB/ZMB405/410CT (ZFB/ZMB being designated hereafter as Z.B) provides information about the installation, operation, and testing of these modern Siemens Metering combi meters.

Please read this user manual carefully before installing the meter.

The installation should only be carried out by qualified personnel. Ensure that local safety regulations are adhered to during the process.

When installing or opening the meter the connections must be free of voltage. Touching parts under voltage is dangerous to life.

The combi meters Z.B310CT and Z.B405/410CT are very easy to handle. The following sections provide a step-by-step guide to installation and commissioning.

For a more in-depth specialised knowledge about the function of the Z.B310CT and Z.B405/410CT models, Siemens Metering offers model-specific training courses within the framework of its customer education function. For further information about such training, please contact your local Siemens Metering representative.

This user manual deals with general information and does not take into account any of the special country-specific functions. It is intended to serve as the basis for country-specific or language-specific manuals.

All data are up-to-date at the time of printing. The right to make modifications is therefore reserved.

Conditions of guarantee

Siemens Metering Ltd. is obligated for the duration of one year, from the date of invoicing or from the date of readiness for shipment, to repair or replace, as quickly as possible, all parts which become impaired or unusable as a provable consequence of defective material, defective construction, or faulty manufacture.

The guarantee is only valid if the meter has been used as intended and the meter electronics have not been interfered with. Faulty meters must be immediately submitted, freight-free, to a representative of Siemens Metering Ltd.

2 Product Overview

The combi meters Z.B405/410CT and Z.B310CT encompass several products which address various requirements related to tariffs and measurement technology.

The summary below provides information about the product range offered. The vertical axis of the table indicates the type of tariff structure, while the horizontal axis indicates the type of tariff control.

Metering units

ZMB meters for three-phase four-wire networks
ZFB meters for three-phase three-wire networks

405 transformer connection with accuracy class 0.5S for active energy in accordance with IEC 60687 and class 2 for reactive energy in accordance with IEC 61268

410 transformer connection with accuracy class 1 for active energy in accordance with IEC 61036 and class 2 for reactive energy in accordance with IEC 61268

310 direct connection with accuracy class 1 for active energy in accordance with IEC 61036 and class 2 for reactive energy in accordance with IEC 61268

CT.. active, reactive, and apparent energy
AT.. active energy, only for meters with T647 and load profile

Tariff units

Tariff functions	Type of tariff control	
	external	integrated time switch
Tariffs: **8 energy E** without stored values	**T116**	**-**
Tariffs: **8 energy E** **8 demand P** 15 stored values per tariff	**T416**	**T446**
Tariffs: **8 energy E** **8 demand P** 15 stored values per tariff **load profiles**	**T647**	**T647**

The entire product range is not offered in certain countries. More detailed information is available from your Siemens Metering representative.

3 Operating Data

The following points **must** be observed during installation of the meters:

1. Always install the meters in accordance with the nominal data indicated on the name plate.

2. Always connect the meters in accordance with the connection diagram contained inside the terminal cover.

3.1 Operating Limits

Measurement voltage:	min.:	0.8 U_n
	max.:	1.15 U_n
Power consumption in voltage circuit:	typical	< 2 VA / 2 W per phase
	maximum	3 VA / 3 W per phase
Maximum current Z.B310:	metering	max. 100 A
	thermal:	max. 120 A
	starting current	typical 40 mA
Power consumption in current circuit:	approx. 0.03 VA per phase at Ib = 10 A	
Maximum current Z.B410:	metering	max. 10 A
	thermal:	max. 12 A
	starting current	typical 4 mA
Power consumption in current circuit:	approx. 0.3 VA per phase at In = 5 A	
Tariff control voltage:	min.:	0.8 U_t
	max.:	1.15 U_t
Current per tariff control input:	< 4 mA	
Frequency range:	min.:	0.95 of nominal frequency f_n
	max.:	1.05 of nominal frequency f_n
Ambient temperature range:	specified operating range:	-20 to +55 °C
	limit range of operation:	-25 to +60 °C
	transport and storage:	-25 to +70 °C
Insulation strength:	> 4 kV at 50 Hz for 1 minute (double insulation strength)	
Voltage impulse strength:	> 8 kV with 1.2/50 µs	
Electromagnetic compatibility (EMC):		
- Electrostatic discharges	to IEC 61000-4-2, contact discharges, 8 kV	
- Electromagnetic high frequency fields	to IEC 61000-4-3, 27 MHz until 500 Mhz, 10 V/m (typical 30 V/m)	
- Electrical fast transient/burst	to IEC 61000-4-4, 2 kV for current and voltage circuits, 1 kV for aux. circ. <40 V	
- Radio interference	to IEC/CISPR 11, Class A equipment	

3.2 Outputs

	series 2	*series 3 (1999)
Transmitting contact r14 a and transmitting contact of the integration period e	mercury-wetted reed type relay	solid state relay
- max. loading capacity (AC/DC)	250 V, 1 A, 50 VA	250 V, 100 mA
- Operating data (AC/DC)		min. 5 V, 0.1 mA
- Life time / failure rate	- $3x10^9$ pulses at 50 mA	< 0.5 % in 15 years
- Pulse length / Pulse frequency	- programmable	- programmable
Contact protection	laid out for 0.1 A	zinc oxide – protection resistor
Resistance of closed contact		typ. 30 Ω, max. 50 Ω

*S3: The transmitting contacts r14 or r14a resp. consisting of mercury-wetted reed type relays have been replaced by environmentally friendly solid-state relays on the series 3. The face plates of these meters are marked with “S3”.

Loading, output K4 and K5 (e/a):	max.:	250 V, 2 A, 500 VA, 200 W without contact protection
Current loop serial interface CS:		in accordance with IEC 61107 max.: 27 V, 20 mA DC

3.3 Meter Constants

		Nominal voltage: (voltage range)	Meter constant R:
Direct connection:	ZFB310	3 x 230 V (200 ... 240 V)	1,000 pulses/kWh or kvarh
	ZMB310	3 x 230 / 400 V (202/350 ... 240/415 V)	500 pulses/kWh or kvarh
Transformer connection:	ZFB405/410	3 x 100 V	20,000 pulses/kWh or kvarh
		3 x 200 V (200 ... 240 V)	10,000 pulses/kWh or kvarh
		3 x 400 V (350 ... 415 V)	5,000 pulses/kWh or kvarh
	ZMB405/410	3 x 58 / 100 V (58/100 ... 66/115 V)	20,000 pulses/kWh or kvarh
		3 x 115/200 V (115/200 ... 133/230 V)	10,000 pulses/kWh or kvarh
		3 x 230 / 400 V (202/350 ... 240/415 V)	5,000 pulses/kWh or kvarh

3.4 Other Data

Gross weight:	Z.B405 / 410 / 310 approx. 1.6 kg
Packaging:	Carton, 250 g protected against falls up to 1 m
IP protection class:	splashproof IP 52
Operating reserve of calendar clock:	
- with supercaps (T416/446)	5 days
- with battery (T446/647)	see 13.4 page 48
Recharging of supercap:	max. 3 hours

4 Installation in the Field

4.1 Mechanical Installation

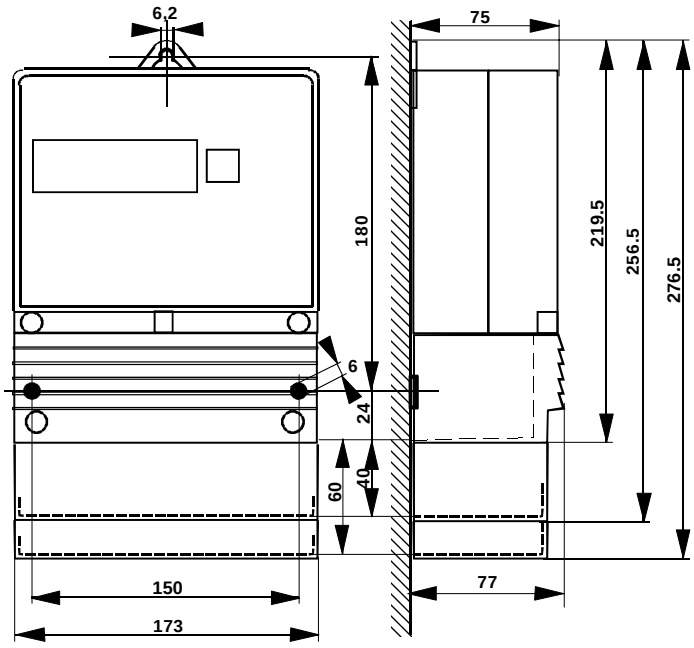


Figure 4.1 Dimensional diagram of Z.B405/410/310T

The mechanical attachment of the meter is carried out in accordance with current standard practice. The two lower attachment points to the left and right of the terminal block, being separated by 150 mm, conform to the dimensions in accordance with DIN 43 857. The suspension eyelet permits an open or hidden attachment of the meter, and the height of the suspension triangle configuration is 180 mm or 162 mm. Using these three attachment points, the meter can be mechanically mounted on a switchboard or similar installation. The measurement-related characteristics of the meter remain unaffected in the presence of skewed, or even horizontal installation.

4.2 Arrangement of the Seals

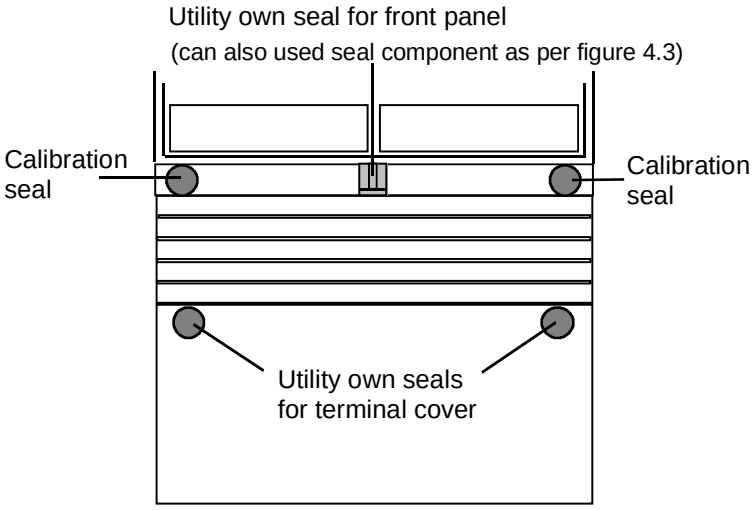


Figure 4.2 Arrangement of the seals

The meters of the Z.B series are protected from unauthorised access by a total of 5 seals (see Figure 4.2):

- Two official seals (calibration seals) are situated to the left and right, respectively, of the lower end of the upper enclosure half. They protect the calibration validity of the meter.
- Two further seals (utility own seals) prevent interference with the terminal lid or the terminals which are situated below that lid.
- A seal (utility own seal) situated between the two calibration seals prevents the front cover from being hinged upwards and thus secures the dial face and the reset button. An additional component, which is easy to install, allows the use of a standard padlock instead of a utility seal. (see Figure 4.3).

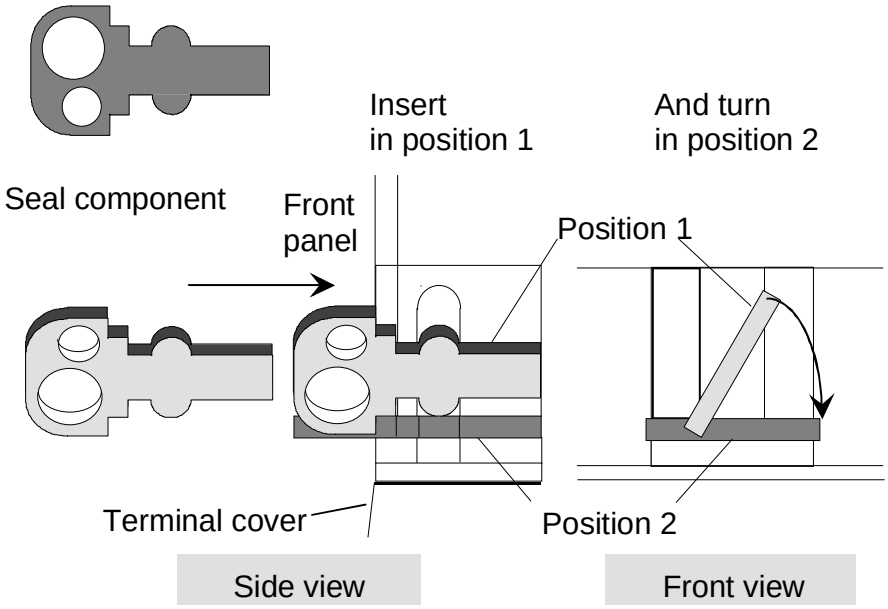


Figure 4.3 Seal component for use with padlock

Slide the seal component into the vertical slot at an angle, as shown, (position 1) until it contacts the rear wall. Now turn the component until it is horizontal and slide it down into position 2 as illustrated. The two bulges firmly fix the seal component into the lateral grooves.

4.3 Front Panel

When the utility own seal or the padlock on the front panel is opened, the cover can be swung up beyond the horizontal position until it reaches a fixed position. The opened front panel allows the reset button to be activated and the paper labels or the name plate to be replaced. On closing the panel, the resistance of the cam which holds the cover in the horizontal position must be overcome. This is accompanied by a characteristic cracking sound.

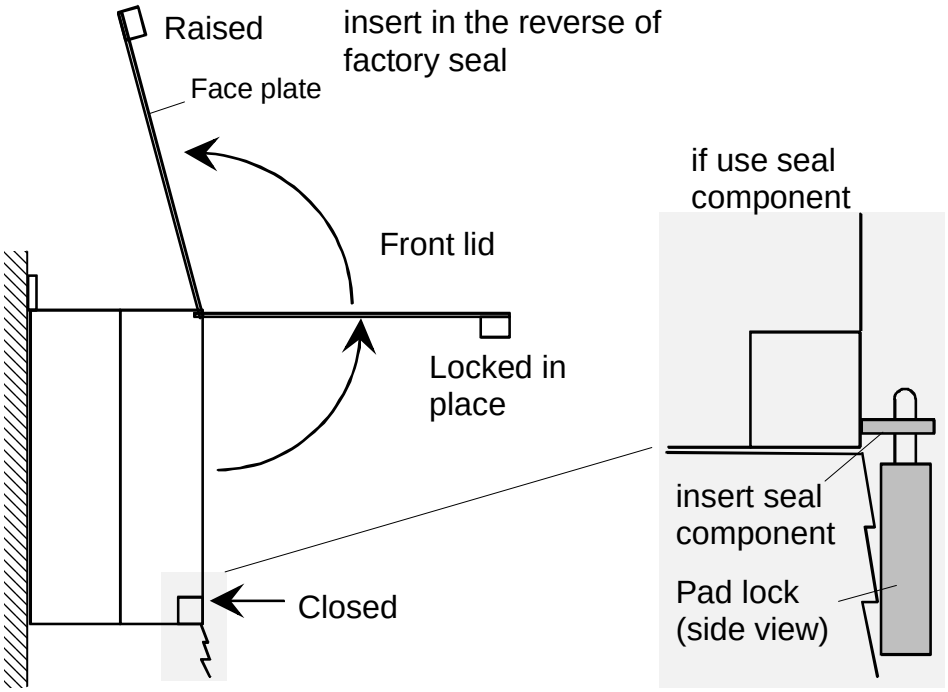


Figure 4.4 Front cover opened

4.4 Electrical Installation

The meter must be connected in accordance with the connection diagram inside the terminal cover. The terminals of the metering unit will have the following aperture diameters, depending on the model :

	Diameter	Limiting current	Terminal separation	Conductor cross-section
Z.B405/410	5.2 mm	10 A	10 mm	max. 5 mm ∅ (dia.)
Z.B310	7.2 mm	60 A	13 / 16 mm	25 mm2 cable
Z.B310	8.5 mm	100 A	14.3 / 14,7 mm	35 mm^2 cable 25 mm^2 flex Flex always fitted with cable end cap

Ensure that the terminal screws of the metering unit (phase connections) are always tightened to the indicated torque as per section 4.7.

Badly tightened screws at the phase connections can result in increased power losses at the terminals, and thus unwanted heating. A contact resistance of 1 mΩ will cause a power loss of 10 W at 100 A.

If the cross section of the connection wires does not correspond with the maximum current of the meter, i. e. 2.5 mm^2 for a direct-connected meter, please ensure that the connection wires are securely fitted.

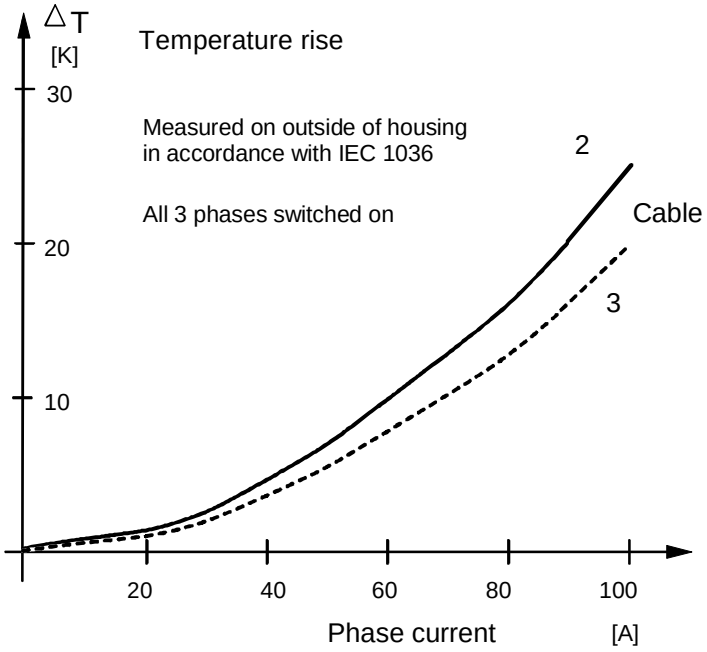


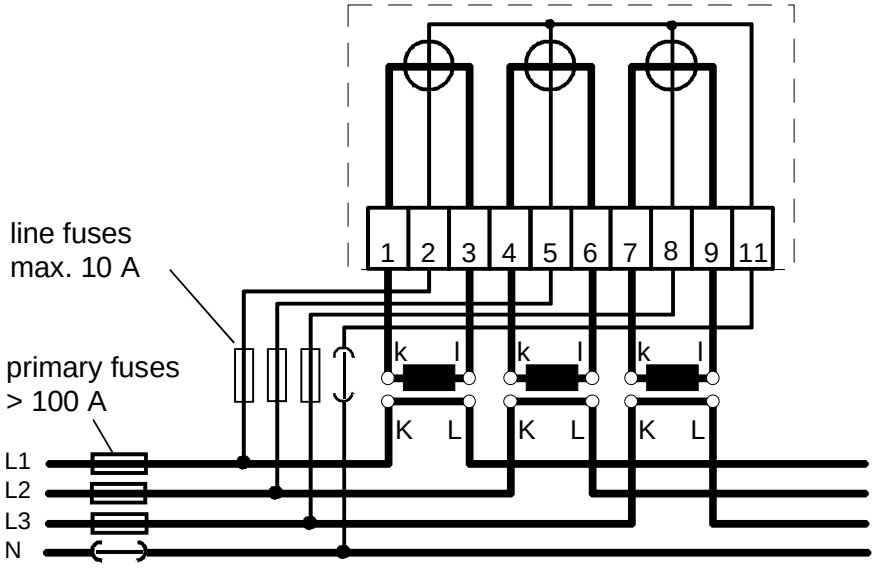
Figure 4.5 Temperature rise vs phase current, measured on the outside of the housing

CAUTION

When connected to low level voltage, the meter voltage circuits are connected directly to the phases. The only protection is the 100 A primary fuses.

A very high current will result if a short circuit occurs in the meter, between the phases, or between a phase and neutral.
The resulting electrical arc will destroy the meter and could damage the surrounding area, e.g. by fire.

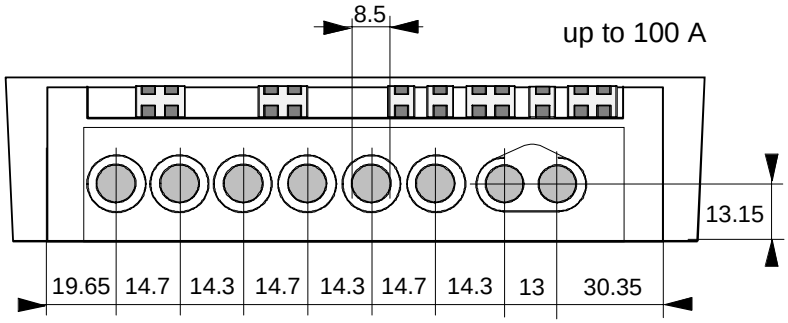
A line fuse, maximum value = 10 A, must be installed in each voltage circuit of low voltage level meters connected to current transformers. The location of the fuses is shown in figure 4.6



4.5 Terminal Dimensions

Terminal for direct connection

Z.B310 ...100 A



Z.B310 ...80 A

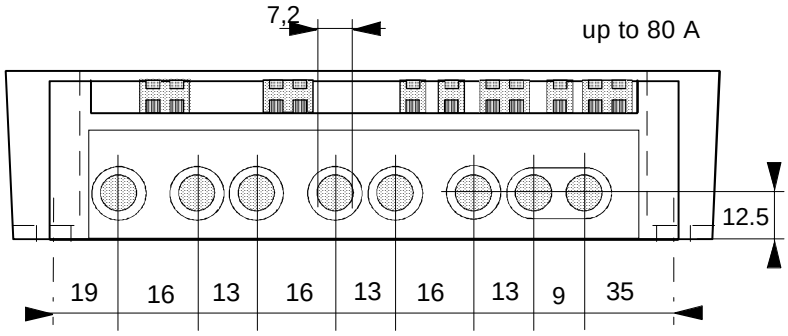


Figure 4.6 Terminal dimensions for universal terminal, ZMB310

Terminal for transformer connection

Z.B405/410

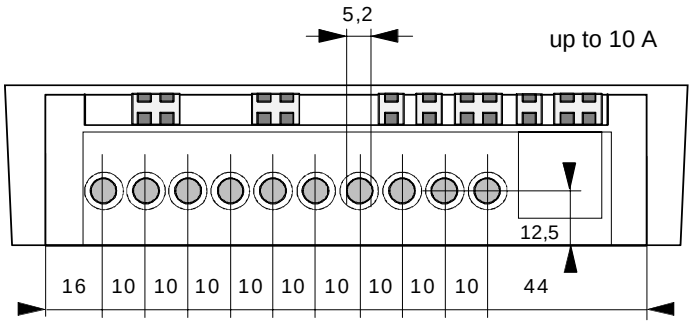


Figure 4.7 Terminal dimensions for terminal for transformer connection, Z.B405/410CT

4.6 Configuration of the Terminals

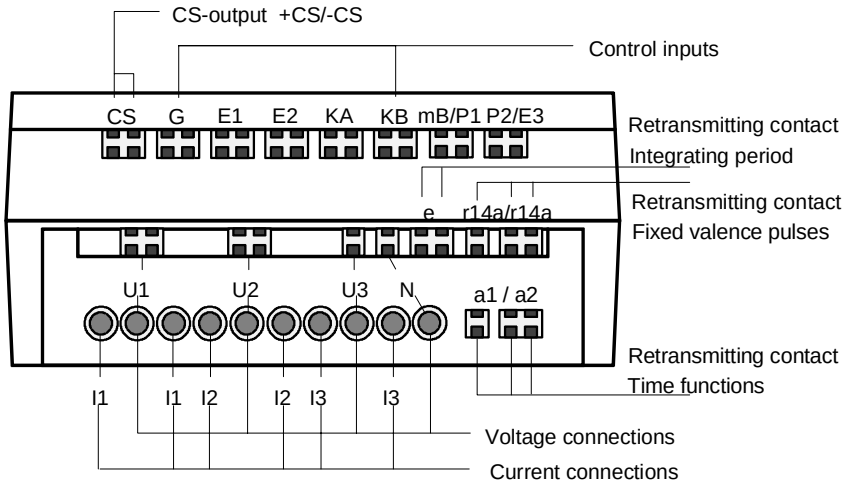


Figure 4.8 Terminal configuration illustrated on a ZMB405/410CT416...

4.7 Clamping Screws

Combination clamping screw for direct connection: Z.B310	Dimensions:	M6 x 14, head diameter max. 6.6 mm Slot 0.8 +0.2/+0.06 mm Type H, size 2, as per ISO-4757-1983 resp. DIN 7962 - H2 (Philips crossed slot) or Type Z, size 2, as per ISO-4757-1983 resp. DIN 7962 - Z2 (Pozidriv crossed slot)
	Screwdriver:	for crossed slot, tip as per DIN 5260-PH2/PZ2 for slot, blade or bit 0.8 x 5.5 mm screwdriver size 3 (CH) or as per DIN 5264
	Tightening torque:	max. 3.0 Nm
Combination clamping screw for transformer connection: Z.B410	Dimensions:	M4 x 8, head diameter max. 5.5 mm Slot type H, size 2, as per ISO-4757 or DIN 7962 - H2
	Screwdriver:	for crossed slot, tip as per DIN 5260-PH2 for slot, blade or tip 0.8 x 5.5 mm Screwdriver size 3 (CH) or as per DIN 5264
	Tightening torque:	max. 1.7 Nm

The combination clamping screw permits the use of various screwdrivers, including automatic screwdrivers.

4.8 Installation of the Signal Inputs and Outputs

The connection of the control signals and output signals takes place quickly and reliably with the aid of screw-less terminals based on the principle of the WAGO brand cage tension spring.

With the aid of a standard size 1 screwdriver (or a WAGO screwdriver), insert the cables into the apertures provided for the purpose in the WAGO terminal. Figure 4.9 below demonstrates this process. Using a light upwards movement, press the screwdriver into the upper aperture of the terminal, thus causing the contact components immediately underneath to open up. Now insert the cable end and then withdraw the screwdriver.

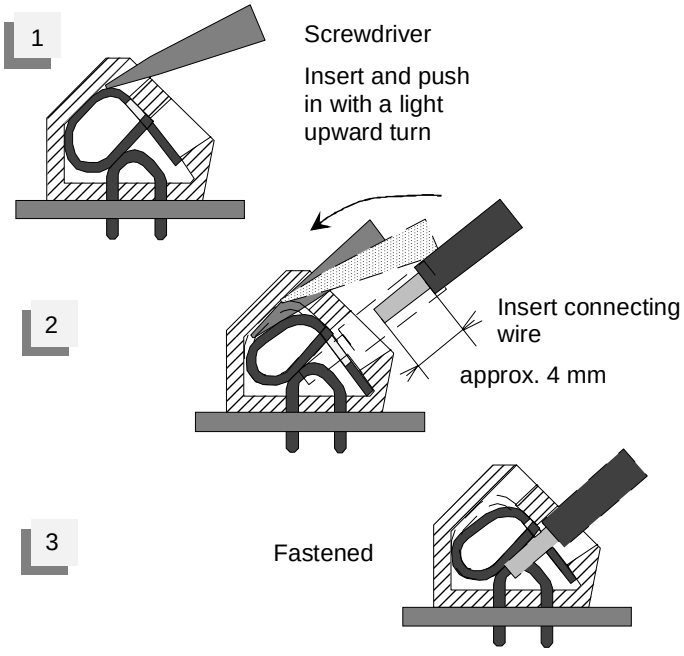


Figure 4.9 Wire connection with WAGO terminals

Disassembly is performed in a similar manner. Instead of inserting the end of the cable, pull the cable out of the opened terminal. On no account must the cable be pulled out of a closed terminal. If this is performed, there is a danger of damaging the terminal.

This type of wiring represents a modern technique which is widely accepted in the area of installation and guarantees a high level of contact quality.

Wires and flexes (the latter always fitted with end caps) of up to 2.5 mm^2 can be connected. To allow looping of connections, single terminals have been implemented as dual terminals, although only one wire can be connected to each pole. The terminals have been numbered in accordance with the connection diagram.

4.9 Installation of an External Ripple Control Receiver

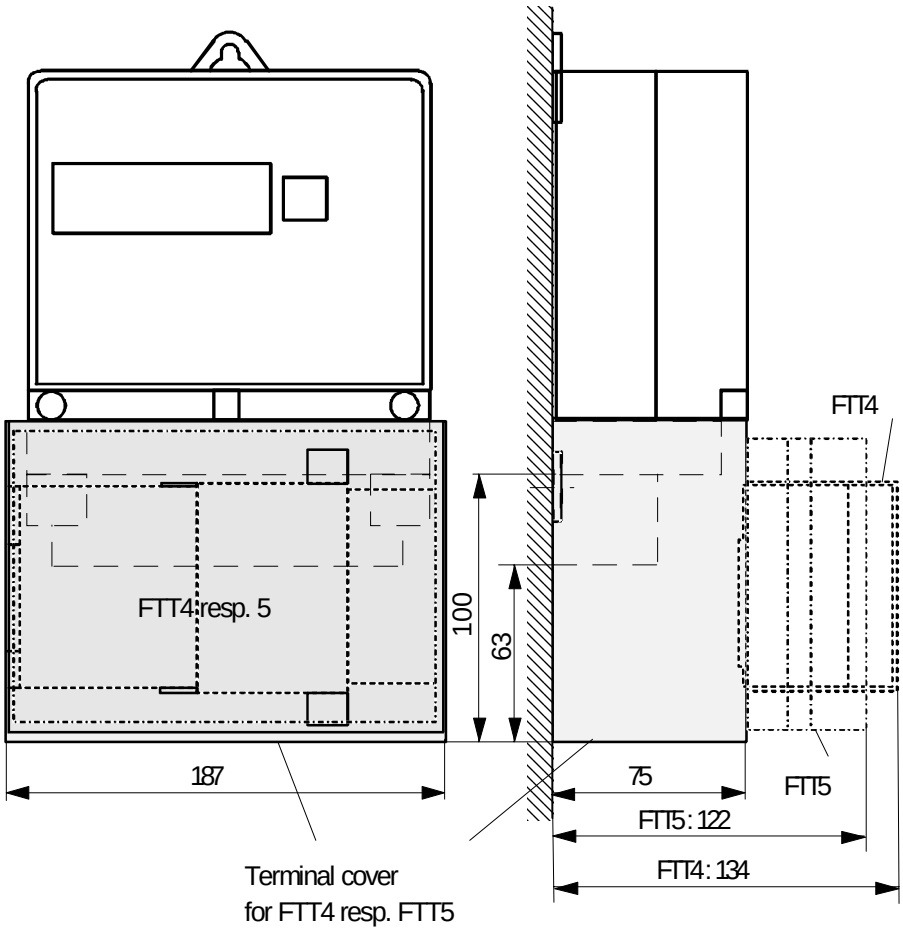


Figure 4.11 Installation of an external ripple control receiver FTT4 or FTT5 from Siemens Metering

In the event of space shortage on the meter switchboard, an external ripple control receiver, model FTT4 or 5 from Siemens Metering, can be installed over the metering unit terminals as shown above. For this, a suitable terminal socket is required (order number 4 111 2361 0)

4.10 Installation into a Switchboard

The meters in the Z.B405/410CT and Z.B310CT series can be mounted on a switch-board using a mounting frame as illustrated below. The components required for this purpose are available as an installation kit from Siemens Metering (order number 4 107 5215 0).

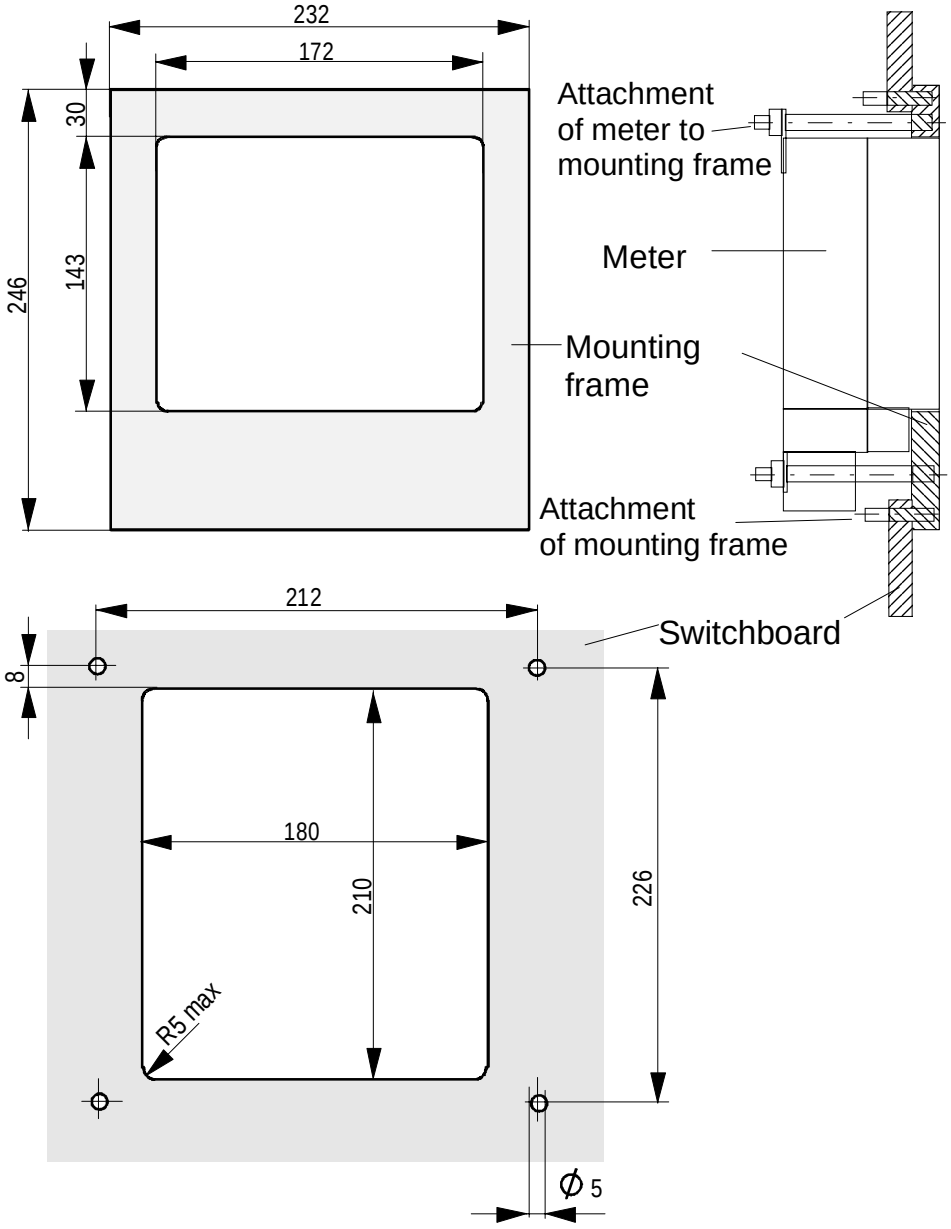


Figure 4.11 Installation into switchboards

4.11 Synchronization

In tariff units with integrated time switch T446 and T647 the clock module can be synchronized. To achieve this, a signal input SYN15 is installed in the upper terminal row. Alternatively, a utility can use one of the relays K4 or K5 (option) as a synchronization output SYN60 to realize a master-slave operation. In this case, the following should be considered:

Synchronization input SYN15

The SYN15 input requires the following signal conditions:

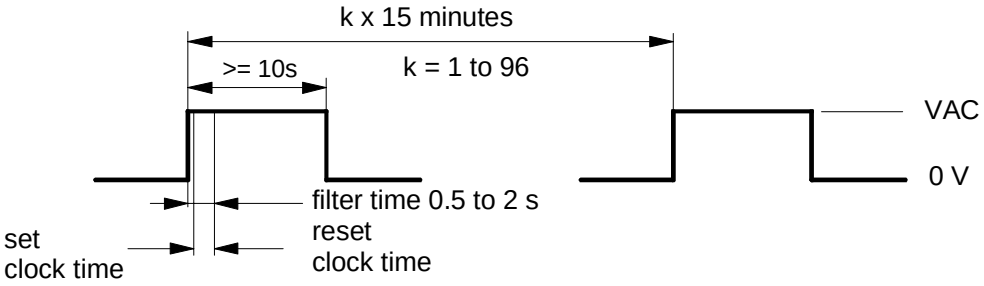


Figure 4.12 Signal on synchronization input SYN15

If the synchronization changes the time by more then 2 seconds, the tariff unit will start a new integrating period, as long as it is parameterized to do so (see information on your model).

Tariff units produced up to version 14 are not equipped with new start. Resetting the time can lengthen the integrating period by a short amount.

Synchronization output SYN60

The SYN60 output requires the following signal conditions:

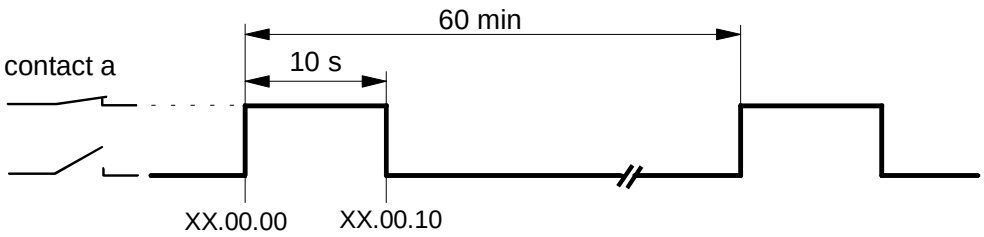


Figure 4.13 Signal on synchronization output SYN60

A synchronization signal allways occurs on the full hour.

Before synchronization can start, all time switches must be set to the correct time and date.

4.12 Connection Diagrams

Examples Tariff terminal numbering, depending on model

Explanation of abbreviations

G:	Common of control inputs
E1, E2; E3:	Control inputs for energy tariffs
KA and KB:	Control inputs for reset
mB	Control input for integrating period and/or inhibition of demand measurement
P1 and P2:	Control inputs for demand tariffs
a:	Retransmission of a control signal with working contact
e:	Retransmission, integrating period
CS:	Interface for data readout (CS : Current loop serial interface)
r14a:	Retransmission, fixed valency pulses, via solid-state relay (S0 interface in accordance with DIN 43 864)
SYN15	Synchronization of clock module (for special applications)

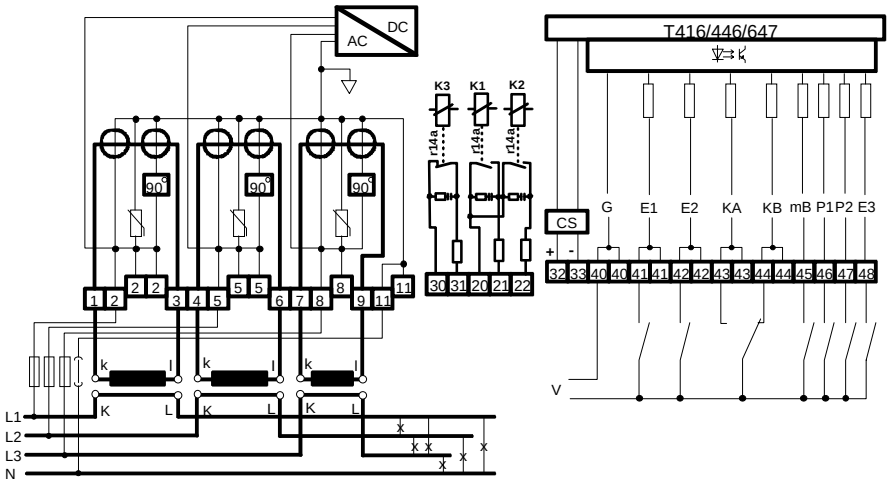


Figure 4.14 Connection diagram, ZMB410CT...eCSr14ar14ar14a **S2**

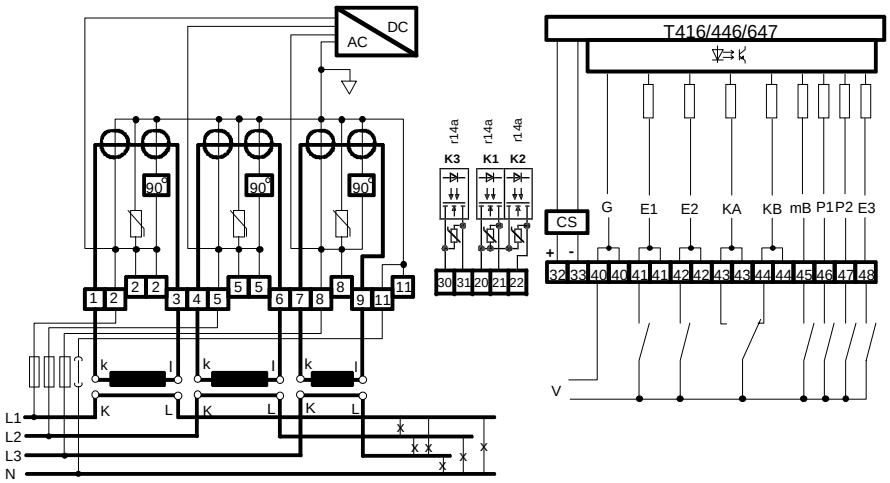


Figure 4.15 Connection diagram, ZMB410CT...eCSr14ar14ar14a **S3**

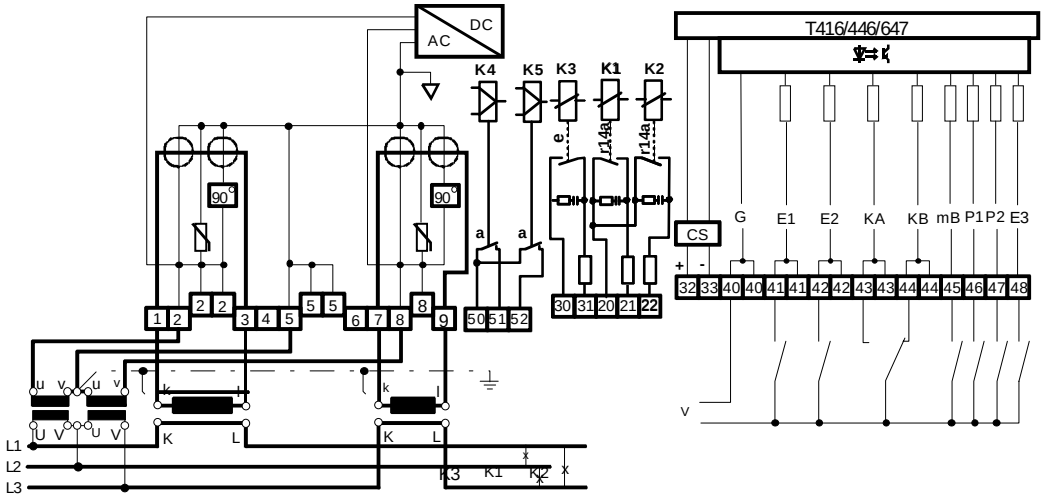


Figure 4.16 Connection diagram of ZFB410CT...a2eCSr14ar14a **S2**

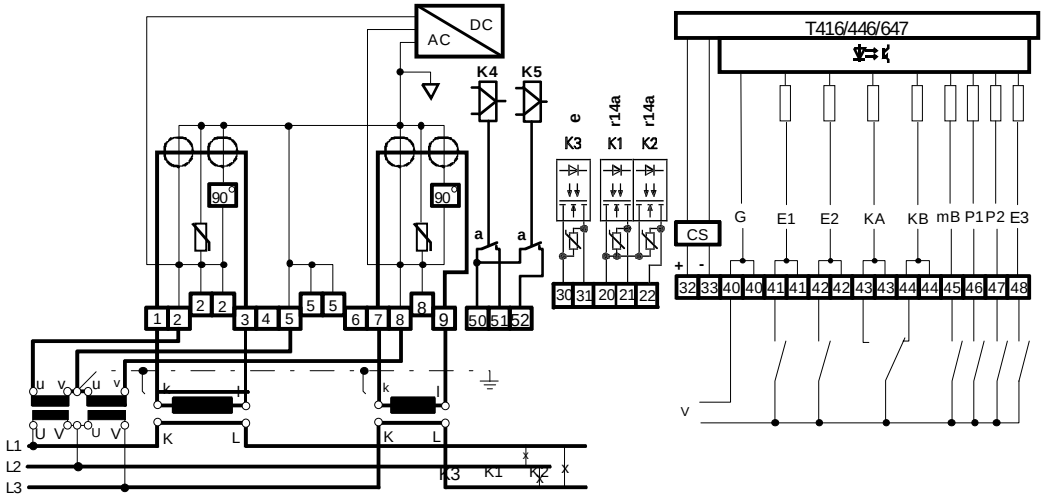


Figure 4.17 Connection diagram of ZFB410CT...a2eCSr14ar14a **S3**

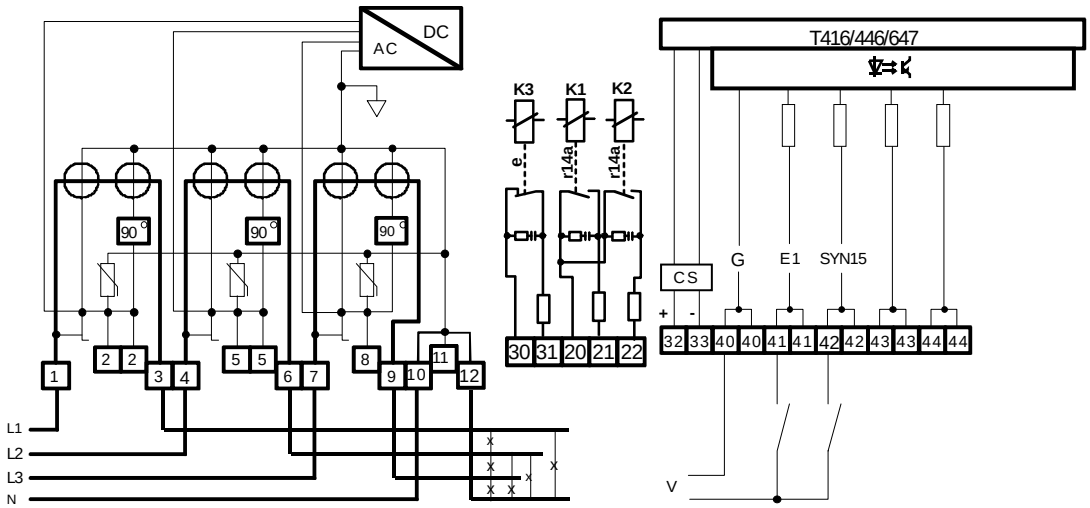


Figure 4.18 Connection diagram of ZMB310CT...eCSr14ar14a **S2**

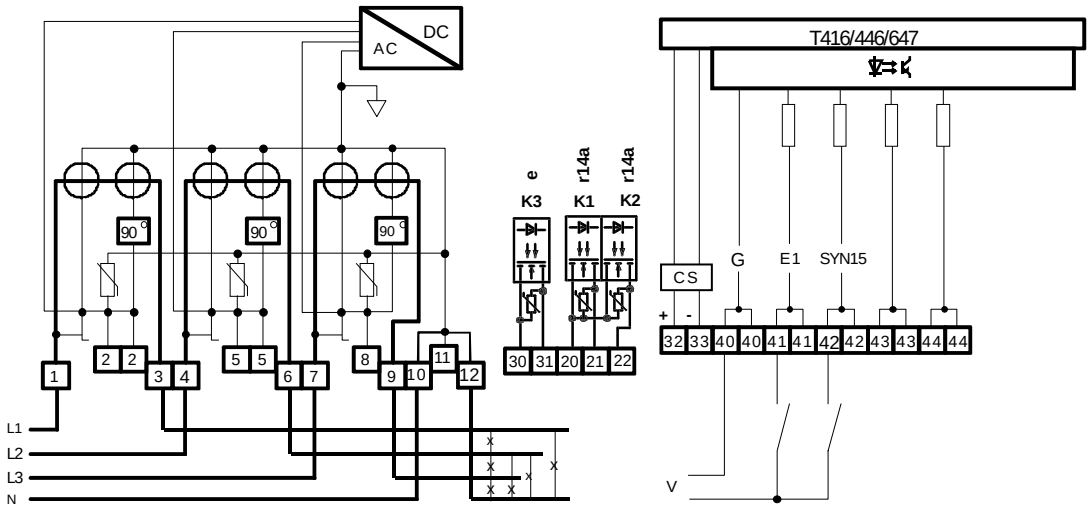


Figure 4.19 Connection diagram of ZMB310CT...eCSr14ar14a **S3**

5 Commissioning and Functional Checks

Neutralization of KA and KB

Before connecting the meter to mains voltage, the control inputs KA and KB can be neutralized by means of a formatted command (see 7.2) to prevent an unintentional reset.

Indication of phase voltages

As soon as the meter is connected to mains voltage, the corresponding indicators show the presence of the phase voltages. The codes L1, L2, and L3 in the LCD serve as indicators.

In the ZFB meters for three-phase three-wire mains, the central L2 code is not displayed, since the middle phase acts as the reference voltage.

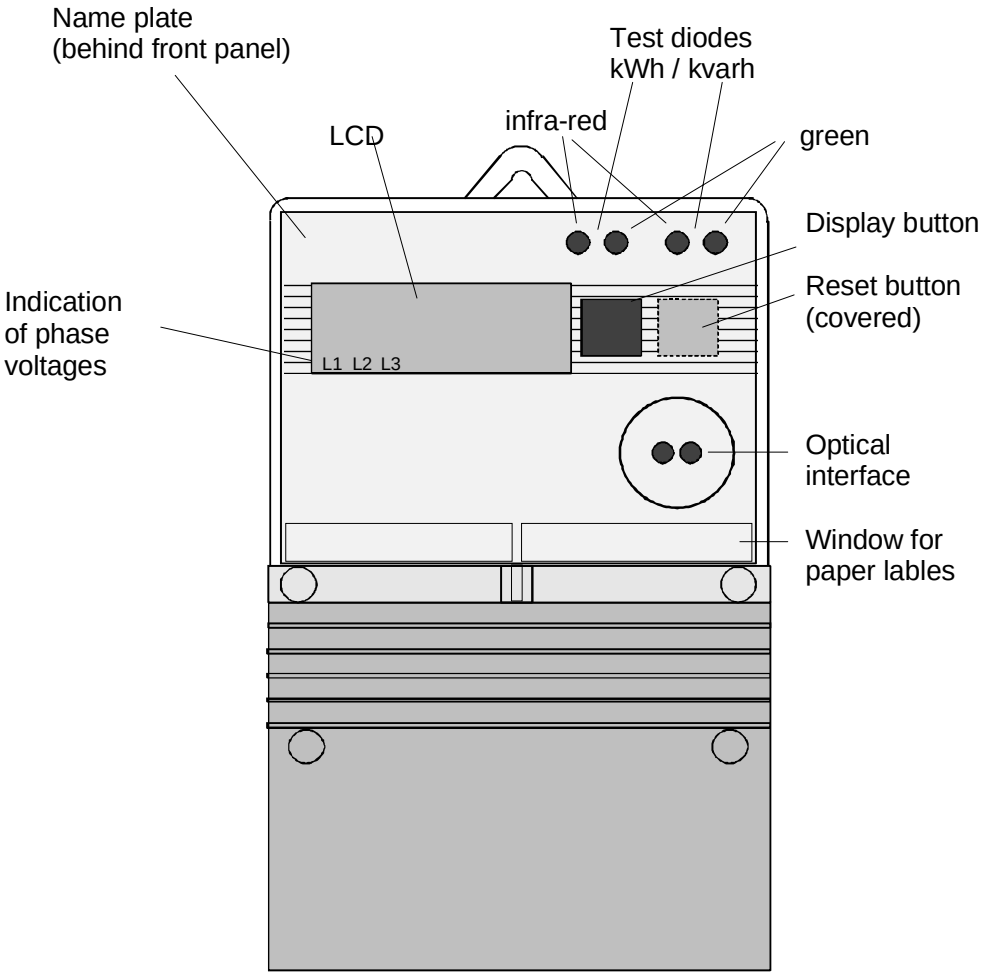


Figure 5.1 Front view of Z.B410CT and Z.B310CT

All Z.B meters make use of so-called supercaps to assure the continuity of operation of the calendar clock in the event of voltage interruptions.

After connection of the mains voltage, there is a lag of between 5 and 10 seconds before the meter will become functional and the display appears.

Time to charge supercap

At first installation or after prolonged voltage break-down, the meter requires up to 3 hours, and if fitted with a time switch up to 5 hours, to fully charge the supercap. Back-up during prolonged voltage break-down (typically 5 days, pre April 94 typically 12 hours) can only be guaranteed when the supercap is fully charged.

5.1 Switching Functions Check

During installation of the meter, take the opportunity to check whether the meter has been connected correctly.

Determine whether all voltages are present by checking for the presence of the codes L1, L2, and L3 for the ZMB or the codes L1 and L3 for the ZFB.

Energy direction check

Furthermore, check that each phase is counting correctly. The two arrows for the direction of energy at the top left of the display indicate the active (Watt) and reactive (var) energy direction. The arrows must point to the right for the positive energy direction (import). This corresponds with the direction of rotation of Ferraris meters. In the event of a low load, the meter will require a certain time to determine the direction of energy. For how to distinguish inductive and capacitive reactive energy, see Figure 5.2.

Test diodes

Functioning of the meter is indicated by flashing of the two green test diodes at top right. These diodes will light continuously if there is no load (see also section 12, Meter Testing).

An infra-red diode is situated next to each green test diode. It operates in parallel with the green diode and is provided to allow meter testing with an optical scanning head.

5.2 Energy Directions

For export of energy (sum of all phases negative), the arrow which appears at the top left of the display will point to the left.

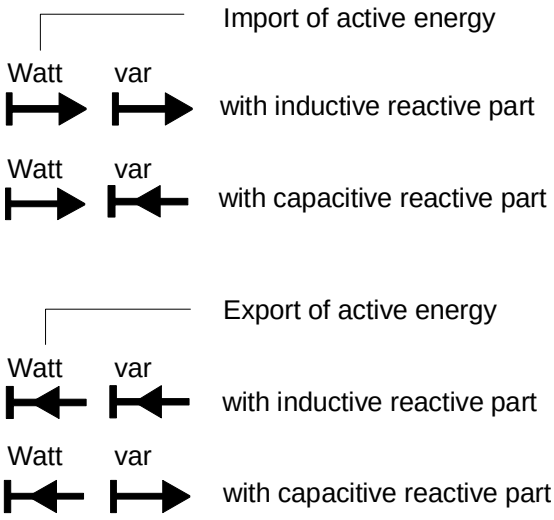


Figure 5.2 LCD display of energy direction

5.3 Display Check

After confirming the correct connection of the meter, test the display list. The values indicated in the LCD should be as follows:

Operating display

1. The meter shows the **operating display**, as long as the display button beside the display is not activated.

This display can consist, depending on the model, of a single value or several values which follow each other at an interval determined by the parameterization (usually 15 seconds).

Display check

2. Now press the display button - the first item to be displayed is the **display check.**

Check that all LCD symbols, and in particular all numerical segments, are present. The significance of the symbols is described in section 6 below.

3. After approx. 5 seconds, or after further activation of the display button, the display switches over to the next display mode, which is generally the identification number.

If the display check is followed by an **error message**, then proceed in accordance with the information in section 10, as long as the number indicated exceeds 00 (eg. F 08).

For every additional press of the display button, the display proceeds to the next value to be displayed.

4. Prolonged pressing of the button (longer than 1 s) causes the stored values to be skipped.

Fast sweep

5. With continuous pressing of the button, all main values intended to be displayed will be shown at 1 second intervals.

Check the indicated values for completeness and correct sequence in accordance with your customer-specific parameterization (see information on the face plate).

6 Significance of the Displayed Data

The LCD display of the Z.B410CT and Z.B310CT provides a simple and comprehensive representation of the various types of data and additional information. The identification of the individual display patterns takes place by means of codes and/or easily recognizable symbols.

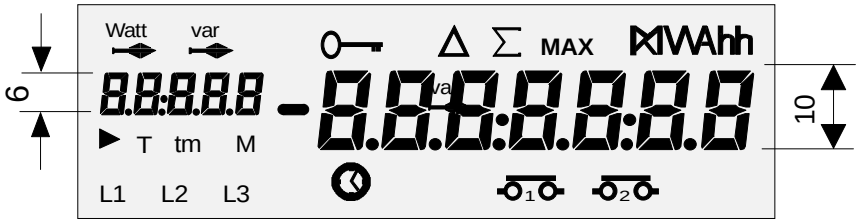


Figure 6.1 Display check, T416/446/647

6.1 Explanation of the Codes and Symbols

Watt var		All segments for the display of energy direction to right : positive, i.e. import to left : negative, i.e. export Watt : active energy var : reactive energy
		Resetting currently barred
Δ	1)	Display of a delta value (the energy consumption between 2 reset events, instead of energy status)
Σ	1)	Display of a cumulative maximum value (together with MAX and e.g. kW) or of an energy total value (with e.g. kWh)
MAX		Display of a maximum or cumulative maximum demand
MWAhh		All segments for the display of energy and demand units
kWh		Unit for active demand (without h) and energy
kVArh		Unit for reactive demand (without h) and energy written "**VAr**" instead of the normal "**var**"
kVAh		Unit for apparent demand (without h) and energy
MWh		Representation of larger quantity of energy and demand
8.8.8.8.8.8		All segments for the representation of codes, tariffs, and stored values
▶	1)	Display of an active tariff
T	1)	Display of a tariff value

tm	1)	Meter is in service mode flashing when meter in the calibration mode
M	1)	Display of a stored value (memory)
L1 L2 L3		Display of the phase voltages. L2 does not appear for 3-phase 3-wire meters (ZFB).
		Flashes in event of a possible time error
O_1		Display of relay contact K4 (working contact) symbol displayed : contact closed
O_2		Display of relay contact K5 (working contact) no symbol displayed : contact open

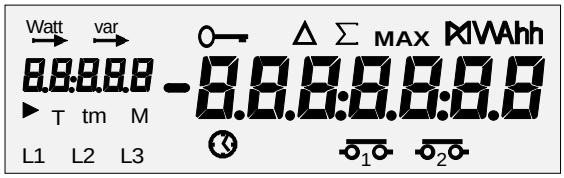
1) If this appears in the display, the symbol can be parameterized.

6.2 Example of a Display List

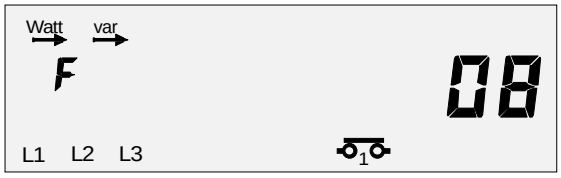
General information

Valid for this example:
Watt and var positive
Phase voltages L1, L2, and L3 are present
Relay K4 closed
Relay K5 open

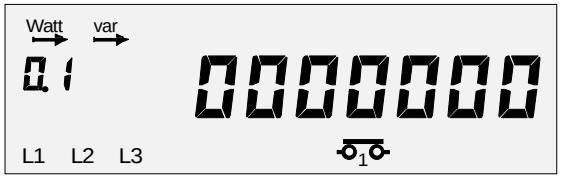
Display check



Error message
(generally only appears in the presence of an error)

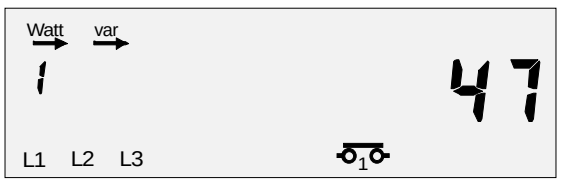


1st identification number
(customer number)
Code 0
Line 1

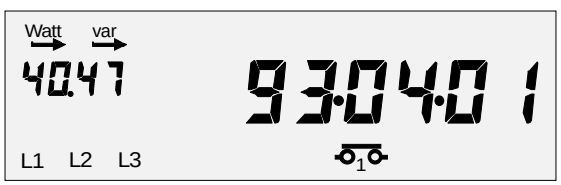


Reset

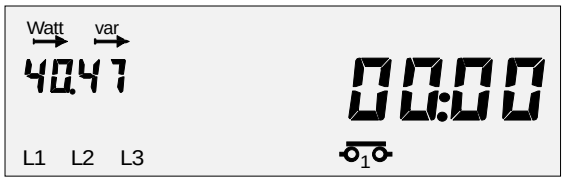
Reset counter n
Code 1



Date of reset event
No. 47
(31st March 1993, midnight)



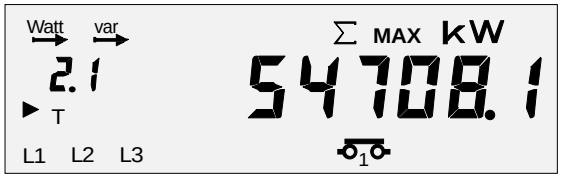
Time of reset
No. 47
(24:00 => 00:00)



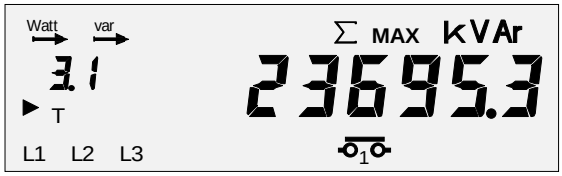
Demand values

Cumulated maximum

P max cumulated
active demand
Code 2
Tariff 1
(active tariff)

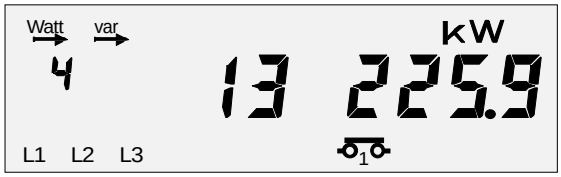


P max cumulated
reactive demand
Code 3
Tariff 1



Running demand

P running active demand with
status of integrating period
Code 4

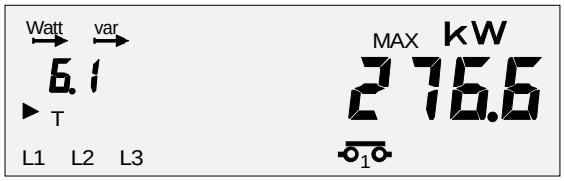


P running reactive demand
with status of integrating
period
Code 5

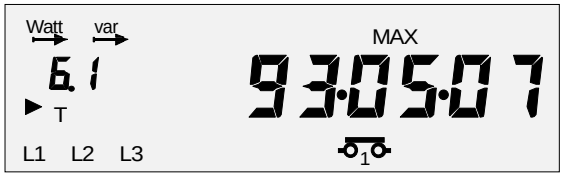
Current maximum

with date and time,
with stored values

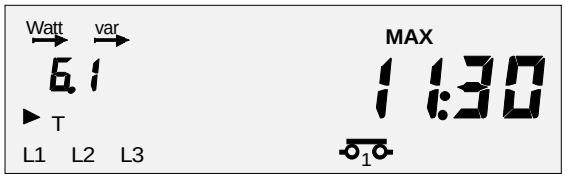
P max current
active demand
Code 6
Tariff 1



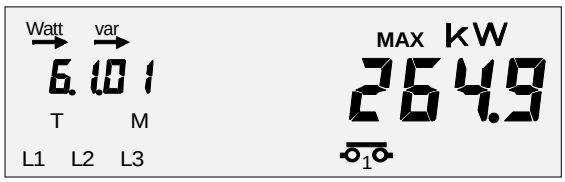
Date of occurrence of
P max current
active demand



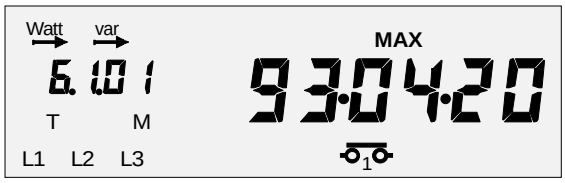
Time of occurrence of
P max current
active demand



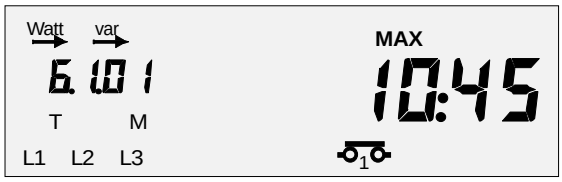
Stored value of P max current,
Tariff 1
active demand
(month 4 = April)



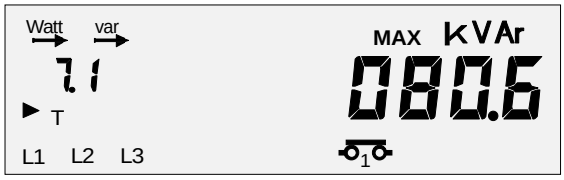
Date of occurrence of
P max in April
active demand



Time of occurrence of
P max in April
active demand

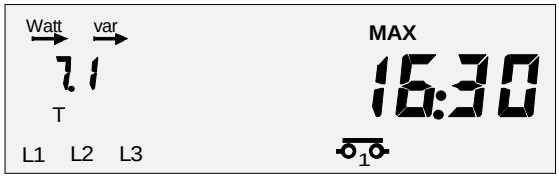


P max current
Code 7
Tariff 1
reactive demand

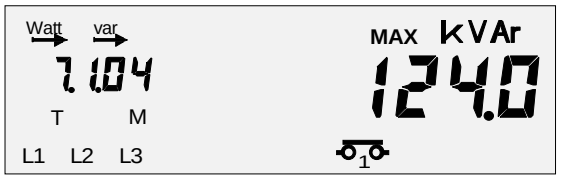


Date of occurrence of
P max current
reactive demand

Time of occurrence of
P max current
reactive demand

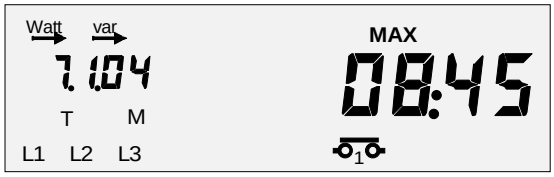


Stored value of P max, Tariff 1
reactive demand
(month 4 = April)



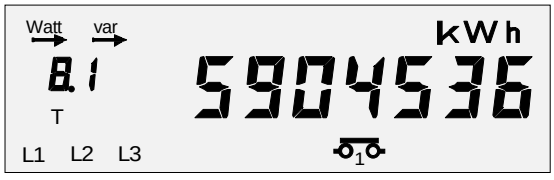
Date of occurrence of
P max in April
reactive demand

Time of occurrence of
P max in April
reactive demand

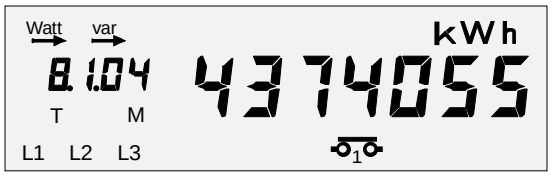


Energy values

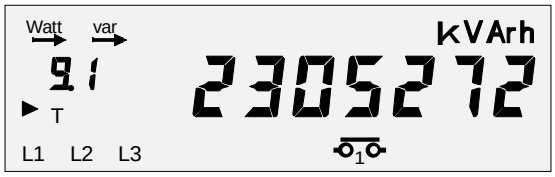
Active energy current status
Code 8
Tariff 1



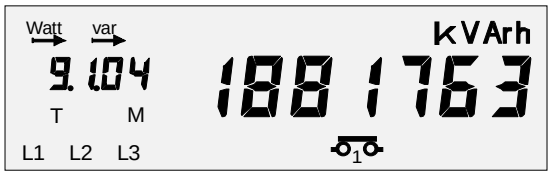
Active energy
stored value for April



Reactive energy current status
Code 9
Tariff 1

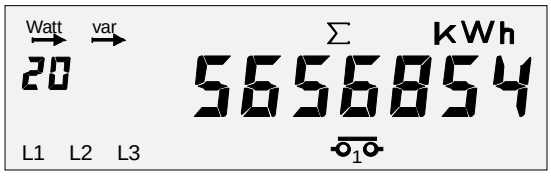


Reactive energy
stored value for April

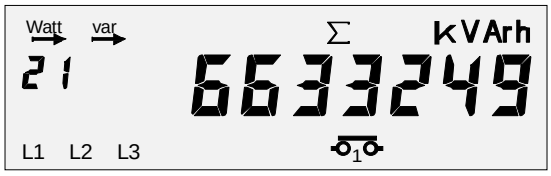


Energy total

Active energy total
Code 20 (or 8.0)



Reactive energy total
Code 21 (or 9.0)



Current time

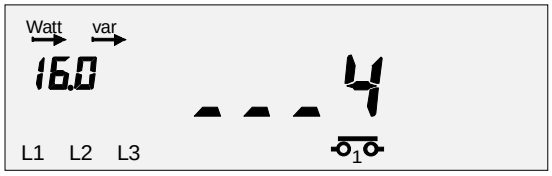
Current time
Code 11

Current date
Code 12
(20th May 1993)

Status of control inputs

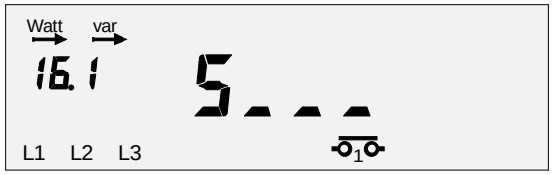
Status of the control signals on the tariff terminals
Code 16

16.0 : terminals 41 ... 44



16.1 : terminals 45 ... 48

Number : Signal = 1
Line : Signal = 0



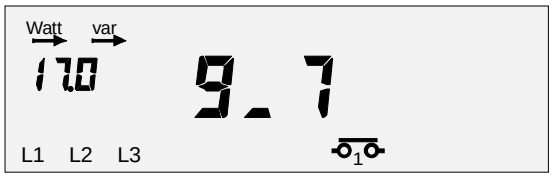
Status of the control signals on the microprocessor
Code 17

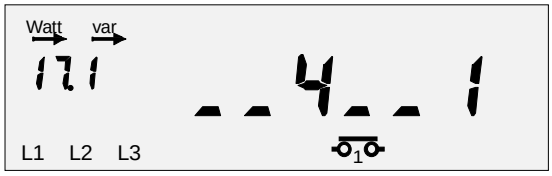
9 = mB, 8 = KA, 7 = KB

6 = P3, 5 = P2, 4 = P1

3 = E3, 2 = E2, 1 = E1

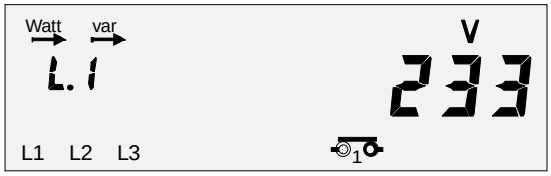
Number : Signal = 1
Line : Signal = 0



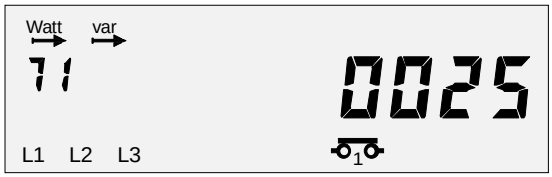


Voltage values and events

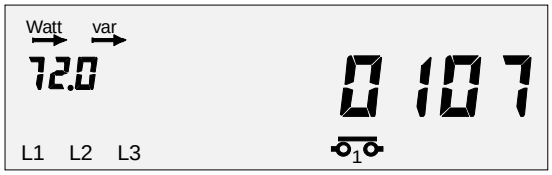
Voltage value
Phase 1 = L1
Phase 2 = L2
Phase 3 = L3



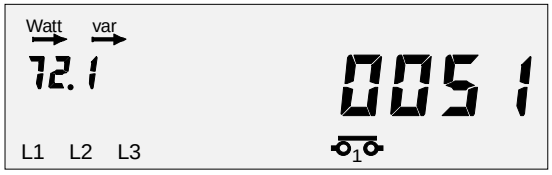
Number of voltage failures
Code 71



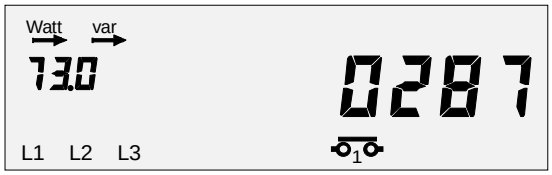
Number of undervoltages
Code 72
all phases = .0



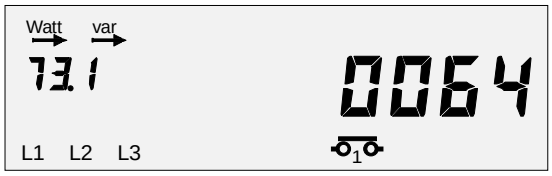
Number of undervoltages
Phase 1 = .1
Phase 2 = .2
Phase 3 = .3



Number of overvoltages
Code 73
all phases = .0



Number of overvoltages
Phase 1 = .1
Phase 2 = .2
Phase 3 = .3



7 Change Operating Data / Parameterization

7.1 Input new Operating Data (Set Mode)

All meters in the Z.B405/410CT and Z.B310CT series permit the input of operating data via the optical interface by means of a hand-held terminal or PC. However, it is not planned also to input the operating data via the display and reset buttons in combi meters.

The following operating data can be modified as long as they have been released for modification in the parameterization process:

- set identification number (customer number)
- reset / set reset counter (delete)
- reset energy and demand values
- reset stored values
- reset error code
- reset counter of under- and overvoltages
- set uncoded password P1
- set time and date

Set, in this context, means to enter a new value (status) or zeros (reset).

Entry into the set mode

If you wish to enter the set mode via the two buttons, proceed as follows :

Security level SL3 as per 7.4

1. First read through the following steps, observing the indicated time delays during execution of the steps.
2. Remove the utility own seal from the front panel and flip the front panel to the open position.
3. Starting from the operating display mode, briefly press the display button - the display check will appear.
4. Within the next second, continuously press the reset button. Do not release it during the following steps 5. and 6.
5. 1 to 2 seconds after the pressing of the reset button, briefly press the display button again.
6. After a further 2 to 3 seconds, the display will again change to the image with the “quotes” (see Figure 7.1). Now release the reset button.

Entry into the set mode has now been achieved. The operation with formatted commands is now possible as well as a reparameterization, but only when this is allowed in the set mode.

During entry into the set mode no reset takes place.

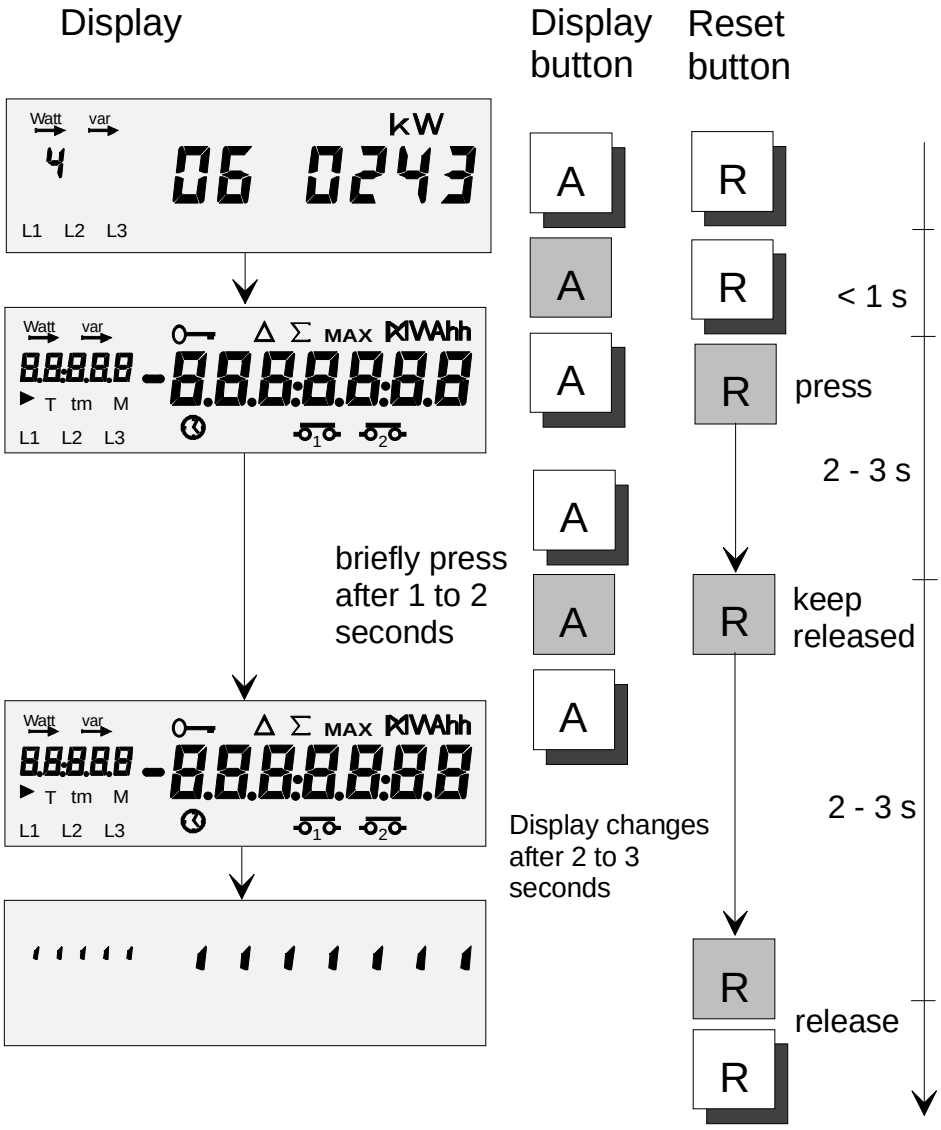


Figure 7.1 Entry into set mode

Exit set mode

You can exit the set mode by pressing the reset button until the operating display appears (3 to 4 seconds).

Error message 08

If you leave the meter in the set mode, it will exit this mode of its own accord after a certain time (e.g. 15 minutes). In this event, an error message F.....08 will appear in the display. The error message 08 will also appear if the voltage is interrupted during the setting process. It shows that the data is not completed.

The error message can be cancelled by again entering the set mode and exiting it as described above.

7.2 Formatted Commands

The meters of the Z.B405/410CT and Z.B310CT series are fitted with an internal command interpreter in accordance with IEC 61107. This interpreter reads a command sent to the meter via the optical or CS interface (formatted command) and automatically triggers the required operation.

The advantage of this formatted or standard command lies in the fact that a uniform command will carry out the same operation in all of the above-mentioned meters. This results in standardisation on the part of the service instruments (hand-held terminal, PC, etc.).

The command “Clear Stored Values”, for example, clears the stored values for all instruments of the ZMB series. The various commands are assigned to one of the security levels in section 7.4 via the parameterization process. Thus you can only clear the stored values if you have the appropriate access authorization.

Formatted commands

- carry out reset
- set identification numbers (customer number)
- set time and date
- read time and date
- reset stored values (delete)
- set or change passwords
- reset energy register, demand register, energy total register
- reset / set reset counter
- reset error message
- switch calibration mode on / off
- reset battery timer (only for meters with T446 and T647)
- neutralize inputs KA and KB
- read out load profile (T647 only)
- reset load profile (T647 only)

FORMAGYR

Under this designation, Siemens Metering supplies simple software which allows the application of the formatted commands. Its use requires an IBM-compatible PC with 386 or greater processor. The program is menu-driven and encompasses all currently known formatted commands.

7.3 Reparameterization

Reparameterization can be done at the factory (authorized laboratory) or on-site. The assistance of the parameterization and service software developed by Siemens Metering allows you to obtain full flexibility with regard to modification of the various parameters (reparameterization).

Reparameterization on site

On-site reparameterization is normally carried out by entering the set mode as described in section 7.1, as long as it is enabled, and requires the aid of a hand-held terminal or laptop computer. In the process you load the parameter file, which has been prepared at the factory, into the meter via the optical interface.

With the same hand-held terminal or laptop computer and the appropriate parameterization software, you are in a position to read a parameterization installed in a Z.B meter, and to proceed to use this in the parameterization software.

In special cases, reparameterization is also enabled via the coded password P2.

In this situation, refer to the information (data sheet) for your model.

7.4 Security Concept

Access authorisation

All data and parameters are stored at various security levels in order to protect them from unauthorized overwriting. The security levels differ in the type of access privileges allocated. A readout of the data is basically always possible.

The security system of the Z.B series for parameterization and data security (access) consists of the steps described below:

Access protection

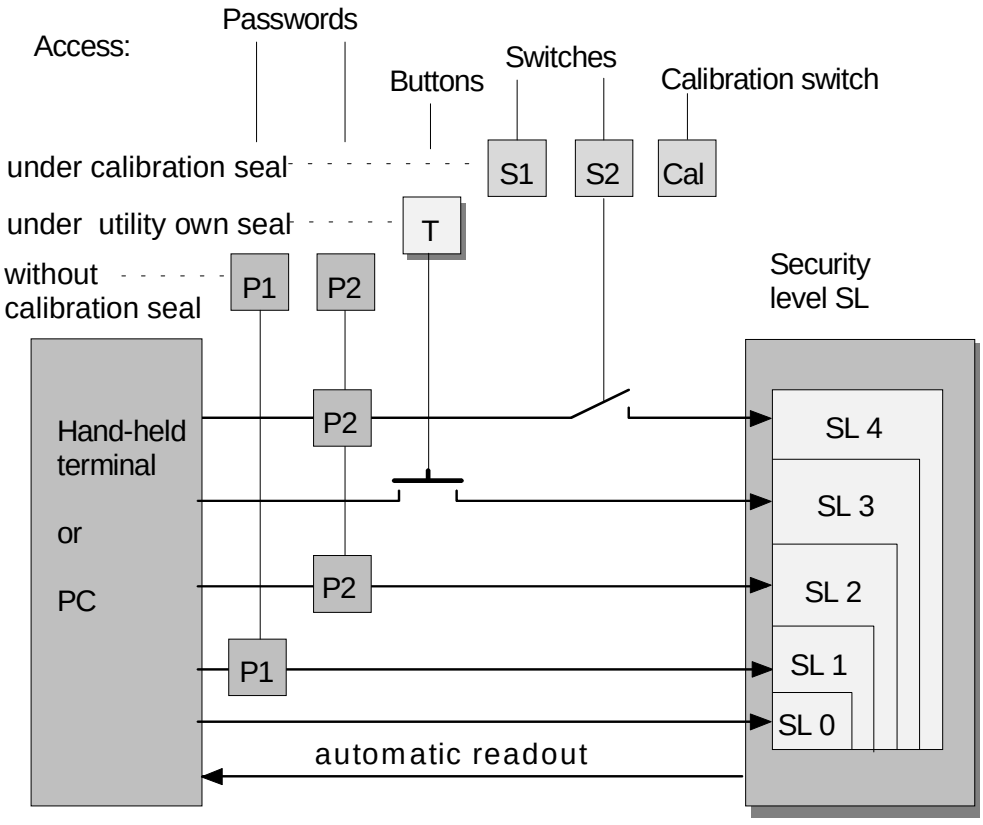


Figure 7.2 Security concept of the combi meters

Security levels

The various security levels determine which functions are accessible with what access authorisation. As an example, the meter data can be read out without special security. However, a password is required in order to be able to execute formatted commands, or the meter must be opened (remove calibration seals) in order to be able to reparameterize it.

In addition to the normal levels, two security levels SE5 and 6 are installed for special applications. They are indepentent to the levels SE0 to 4 and enable access via P2 together with the CS input or P2 together with S1.

Security switches S1, S2, and Cal

The security switches are situated under the meter cover, i.e. under the calibration seals.The switches S1 and Cal serve exclusively for special country-specific functions and will normally not be used by the utilities.

Functions which are protected by S2 can only be executed with an opened meter.

Push buttons T

At this level, those functions and in particular data are stored which are accessible via the two buttons (display and reset button), which are operated in the manner described in section 7.1.

Password P2

The password P2, coded specifically by manufacturer, represents a higher level of security than the uncoded password P1. It can only be used with equipment (hand-held terminals) or with Siemens Metering software. A meter-specific algorithm calculates the ultimate password which finally grants access.

Password P1

The uncoded password P1 consists of an 8-digit number which is sent to the meter by an instrument (T3000® or PC). If the string of digits agrees with that of the meter, the meter will grant access to security level 1.

Wrong password

After the 15th attempt to enter a wrong password P1 or P2, the meter's functions will be blocked and it will issue the error message F 02 (see section 10, Error Messages). Up until midnight on that day, the meter saves every entry requiring one or both passwords.

7.5 Service Mode

In the service mode, the display list generally encompasses more data than it does in normal operation. It is primarily intended for on-site checking purposes.

If you wish to enter the service mode via the two buttons, proceed as follows:

Entry into the service mode

1. First read through the following steps and, while carrying them out, observe the indicated time intervals.
2. Remove the utility own seal from the front panel and flip the front panel open.
3. Starting from the operating display, press the reset button continuously and do not release it during following steps 4. and 5..

4. 2 to 3 seconds after pressing the reset button, briefly press additionally the display button.

5. After a further 2 to 3 seconds, the display will change to the first display image of the expanded display list of the service mode. This display is identified by the code "tm" in the display.

   Now release the reset button.

6. As for the normal display list, you can skip stored values by means of continuous pressing of the display button (fast scrolling mode).

Entry into the service mode

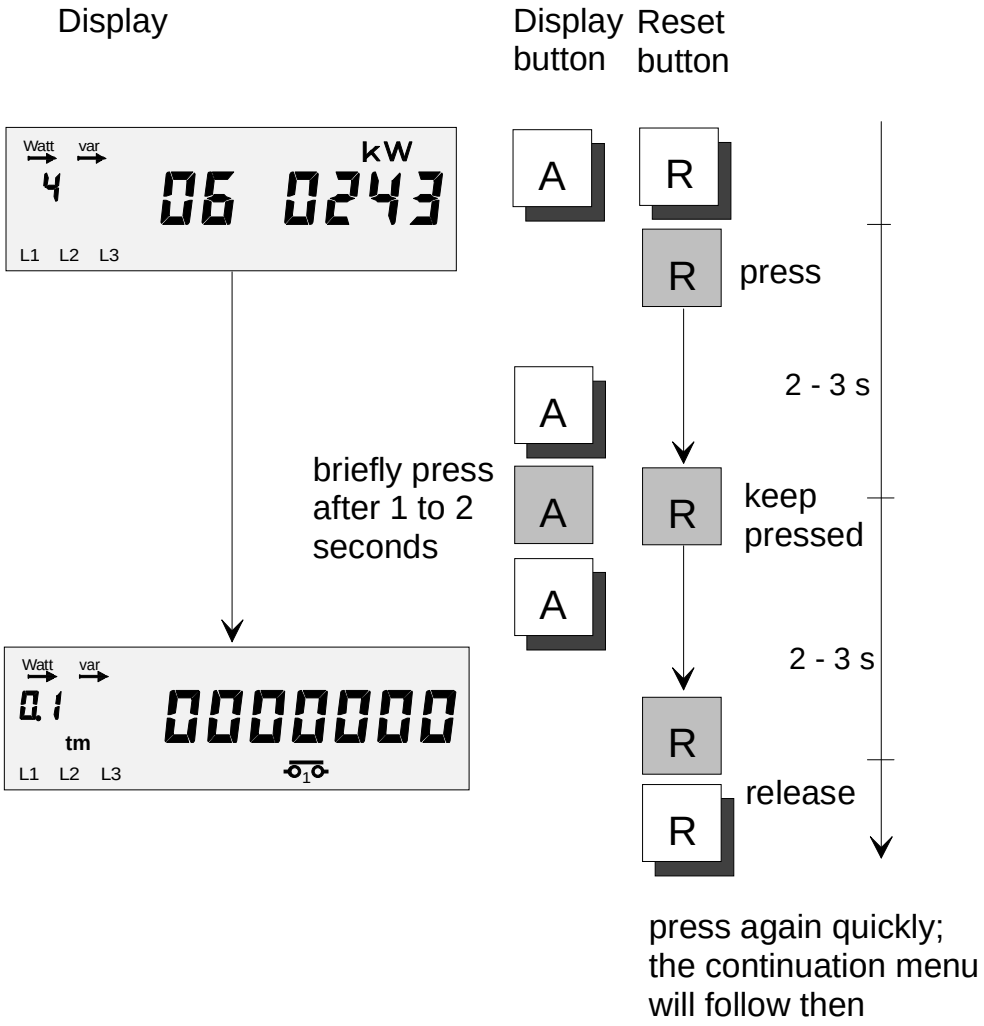


Figure 7.4 Entry into the service mode

Exiting the service mode

You can exit the service mode by pressing the display button until the operating display appears.

In case you do not press the display button anymore during approx. 5 min the meter exits the service mode automatically and the operating display returns.

8 Resetting (Cumulation)

The meters of the series Z.B405/410CT and Z.B310CT can be reset (cumulated) in the following manner:

- remotely controlled via the signal inputs KA and KB
- internally via a reset command from the integrated calendar clock
- by means of formatted commands via the optical or CS interface
- manually, by pressing the reset button

The reset button is situated under the front panel and is secured by means of a factory seal (or padlock with seal component as per section 4).

Reset block

After the activation of the reset button, the meter triggers a reset block which, depending on the parameterization, can last for a period of between 1 minute and up to several hours. During this rest block period, you can not trigger a further reset event.

During the duration of the reset block, the key symbol appears in the display.

The reset block also follows every remotely or internally initiated reset event. However, a voltage failure will interrupt the reset block.

9 Communications and Pulse Retransmission

Various output signals as well as two communications interfaces provide a future-oriented system capability for the Z.B meters.

Observe the output loading capability of the outputs as per section 3.

9.1 Retransmission Contacts

r14a contact

The r14a contact retransmits the measured energy in the form of fixed-valency pulses. The contact is a solid-state relay. The weighting (in Wh/pulse or kWh/pulse) as well as the duration of the pulses (in ms) are also parameterized in the meter and marked on the name plate.

Loading capacity: max. 250 V, 100 mA (AC/DC)

e - contact

The e-contact retransmits the integrating period. With every new integrating period, the contact opens for 1% of the duration of the integrating period (i.e. for 9 s in an integrating period of 15 min). This output is a so-called break contact (normally closed contact), i.e. it retransmits the integrating period by means of the opening of the contact (signal interruption).

Contact capability: max. 250 V, 0.5 A, 30 VA

a - contact

The a-contacts (max. 3 contacts) serve for the retransmission of the control signals which are generated by the integrated time switch. The following control signals may be available:

- Tariff switching energy (E1 / E2)
- Tariff switching demand (P1 / P2)
- Inhibition of maximum demand measurement (B)
- Control signal able to be parameterized without time restriction

Contact capability: max. 250 V, 2 A, 500 VA, 200 W
no contact protection

9.2 Communications Interfaces

CS-interface

The CS interface (**C**urrent loop **S**erial interface) is a current-based interface and serves for hard-wired remote readout. It conforms to the standards in accordance with ZVEI, IEC 61107, and DIN 66 258. It processes the same data as the optical interface.

Apart from the readout of data, the meter can also be set, parameterized, or service functions carried out via this interface.

The externally applied supply voltage is basically 24V and must not exceed 27 V. This causes a current of 10 to 20 mA to flow. The maximum wiring length should not exceed 10 metres but, under certain circumstances (current > 10 mA), can be longer.

Observe polarity, since the output is a transistor output (open-collector circuit).

Optical interface

This interface serves for the automatic readout of the meter and also complies with the standards in accordance with ZVEI, IEC 61107, and DIN 66 258.

You can use the optical interface to readout the meter on-site using a hand-held terminal (e.g. T3000 or M940 from Siemens Metering). In the same manner as with the CS interface, you can also set and parameterize the meter or carry out service functions on the meter via this interface, whether at the factory or on-site.

During placement of the readout head, ensure that the cable at the head is pointing downwards.

Protocol of a readout

During an automatic readout, the data appear in the form described below. The scope of the protocol is contained in the information relating to your model.

The following example shows the data from a

- ZMB410C with T416 tariff module
- Active demand and energy measurement at 2 tariffs
- Reactive energy (inductive) measurement at 2 tariffs
- 2 stored values for each tariff

Protocol	**Significance of the data**
/LGZ4ZMB410CT416.xxx	Meter identification (serves to identify the meter within the route) .xxx : identification of software version
F(00)	Error message
0(00000000000000000000)	Identification number 1 (always printed on one line)
99(00000000000000)	Identification number 2

1(54)	Number of resets
2.1(67082.0*kW)	P max cumulated, tariff 1
2.2(12310.5*kW)	tariff 2
6.1(342.7*kW)(93-05-21 11:30)	P max current, tariff 1
6.1*54(351.8)(93-04-14 14:30)	Stored value No. 54
6.1&53(392.7)(93-03-03 15.15)	Stored value No. 53
6.2(294.6*kW)(93-05-12 22:00)	P max current, tariff 2
6.2*54(255.6)(93-04-24 00:15)	Stored value No. 54
6.2&53(245.2)(93-03-19 21:45)	Stored value No. 53
8.1(8774964*kWh)	Active energy status, tariff 1
8.1*54(8602235)	Stored value No. 54
8.1&53(8427926)	Stored value No. 53
8.2(5144480*kWh)	Active energy status, tariff 2
8.2*54(5134803)	Stored value No. 54
8.2&53(5124979)	Stored value No. 53
9.1(1820395*kvarh)	Reactive energy status, tariff 1
9.1*54(1778866)	Stored value No. 54
9.1&53(1739009)	Stored value No. 53
9.2(1422427*kvarh)	Reactive energy status, tariff 2
9.2*54(1419757)	Stored value No. 54
9.2&53(1396234)	Stored value No. 53
20(2099015*kWh)	Active energy total
21(3118206*kvarh)	Reactive energy total
11(11:42:24)	Time of readout
12(93-05-25)	Date of readout
71(0025)	Number of voltage failures
72(0107)	Number of undervoltages
73(0287)	Number of overvoltages
95(90-07-25)	Date of last parameterization
!	End of protocol

Stored values:

* signifies : reset occurred internally or remotely controlled

& signifies : reset was manual

10 Error Messages

Automatic self-diagnostic test

All meters in the Z.B series regularly carry out a self-diagnostic test in background mode. This test checks the functional capability of all important parts.

In the event of a functional fault or operating error, they issue a detailed error code which appears in the display as a two-digit number after the "F". The error code "00" signifies that no error is present. The error messages are described below.

10.1 Operating Error (Single Error)

The operating errors do not necessarily point to a malfunction in the meter.

The following codes are classed as operating errors:

01 incomplete parameterization (if this has been carried out independently and/or not using the original parameterization software)

02 access to the data or parameterization denied because of repeated use of an invalid password

08 set mode not exited in an orderly manner

Cancel an error message

You can cancel the error message generated by an oparting error by the formatted command "clear error display".

The error messages 01 (incomplete parameterization) and 08 (set mode not exited in an orderly manner) disappear automaticaly by repeating parameterization or entering the set mode and exiting it in an orderly manner.

10.2 Functional Faults (Single Error)

A functional fault corresponds to a serious malfunction of the meter. If such a fault occurs, disconnect the meter if it has already been installed and forward it to the nearest authorized service and repair centre (see section 13).

The following codes refer to a functional fault:

01 incomplete parameterization

04 faulty calculated data

10 control fault

20 fault in addressing external memory

40 fault in parameterization data

80 fault in microprocessor

10.3 Table of Error Codes

	First digit	Second digit	Cause of error
Group 0x	**0**	**0**	**no error present**
	0	**1**	**parameterization incomplete**
	0	**2**	**access denied in consequence to repeated use of incorrect password**
	0	**3**	combination of 01 and 02
	0	**4**	**faulty calculated data**
	0	**5 / 6 / 7**	combination of 04 with 01 / 02 / 03
	0	**8**	**set mode not exited in orderly manner**
	0	**9 / A to F**	combinations of 08 with 01 / 02 to 07
Group 1x	**1**	**0**	**control fault**
	1	**1 to 9** **A to F**	combinations of 10 with 01 to 09 and 0A to 0F
Group 2x	**2**	**0**	**fault in addressing external memories**
	2	**1 to 9** **A to F**	combinations of 20 with 01 to 09 and 0A to 0F
Group 3x	**3**	**0**	combinations of the groups 1x and 2x
	3	**1 to 9** **A to F**	combinations of 30 with 01 to 09 and 0A to 0F
Group 4x	**4**	**0**	**access and/or parameterization fault**
	4	**1 to 9** **A to F**	combinations of 40 with 01 to 09 and 0A to 0F
Groups 5x / 6x / 7x	**5 / 6 / 7**	**0** **1 to 9** **A to F**	combinations of the group 4x with the groups 1x / 2x / 3x
Group 8x	**8**	**0**	**fault in microprocessor**
	8	**1 to 9** **A to F**	combinations of 80 with 01 to 09 and 0A to 0F
Groups 9x / Ax to Fx	**9** **A / B / C** **D / E / F**	**0** **1 to 9** **A to F**	combinations of the group 8x with all previous groups

11 Installation for Meter Testing

Connect the meter to the terminals of the test bench in accordance with the connection diagram supplied in the terminal cover as well as in accordance with the usual test methods.

11.1 Voltage Bridge

on Z.B310CT for direct connection

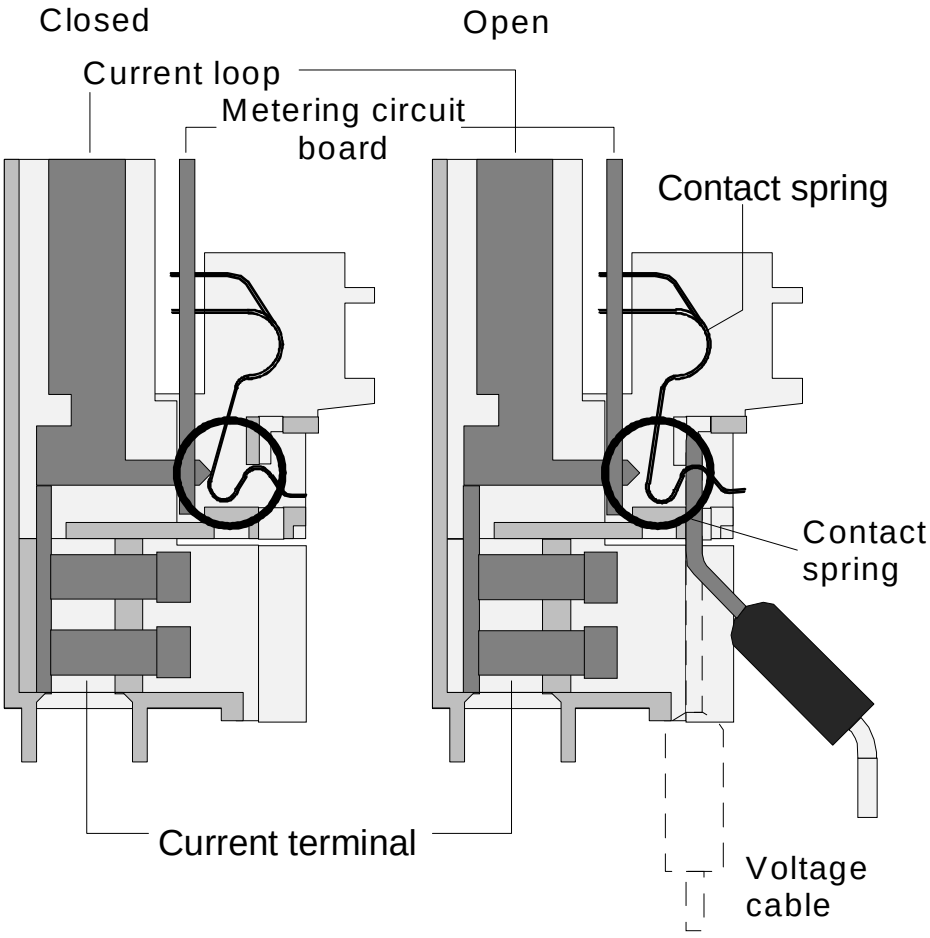


Figure 11.1 Voltage bridge for ZMB310

The voltage bridge represents a considerable innovation for the directly connected meters of the Z.B series. Instead of a screw-terminal bridge, a spring contact connects the voltage circuit of the meter with the phase connection (see left side of Figure 11.1).

For the connection of the test voltage, use a cable with a contact pin having a diameter of 2.5 mm and a length of approx. 40 mm (straight or bent). Insert this contact pin into the circular aperture provided for this purpose in the terminal cover above the metering unit terminals. In the process, the pin lifts the spring from the contact tip of the current loop and thus interrupts the connection.

Warning **The voltage cables must be potential-free during insertion, for reasons of safety. To touch contact pins under voltage is dangerous to life.**

When the test is complete, pull the cables with the (potential-free) contact pins out of the terminal cover. The spring closes the contact to the current loop, and thus the voltage bridge, automatically.

Do not use any tools such as screwdrivers or cables which might bend or damage the springs in any way.

Siemens Metering can supply suitable voltage cables, according to the table below.

Pre-warming

Thanks to the low temperature sensitivity of the Z.B meters, warming of the meters can be fundamentally dispensed with.

Connection voltage

Before switching on the supply voltage, ensure that its value complies with the nominal value indicated on the meter. A supply voltage which exceeds the nominal value by 50 % and more can destroy the meter within a short time.

Voltage cables

Cable type 1)	Order number
700 mm, black	4 421 1438 0
700 mm, red	4 421 1440 0
700 mm, green	4 421 1443 0
700 mm, white	4 421 1447 0
700 mm, blue	4 421 1444 0
700 mm, yellow	4 421 1442 0
700 mm, violet	4 421 1445 0

[1)] other colours and lengths on request.

11.2 Connection of Control Inputs

Connect the control inputs as described in section 4, or use plugs manufactured by the WAGO company which match your terminals. The latter permit a simpler connection of the control inputs. The appropriate components are:

1 WAGO test plug **Art. No. 231-127**

1 WAGO termination plate **Art. No. 231-100**

For connection of the CS interface, you can use the following components from WAGO:

2 WAGO test plugs **Art. No. 231-127**

1 WAGO termination plate **Art. No. 231-100**

Always insert these plugs into the upper aperture of the WAGO terminal, i.e. the place where during installation of the meter you insert the screwdriver for purposes of installing the connection cables.

Complete test cables can also be obtained from Siemens Metering, using the order numbers shown in the table below.

For other test accessories, contact your local Siemens Metering representative.

WAGO test cables

Cable type 1)	Order number
700 mm, black	4 421 3752 0
700 mm, red	4 421 3754 0
700 mm, green	4 421 3756 0
700 mm, white	4 421 3760 0
700 mm, blue	4 421 3757 0
700 mm, yellow	4 421 3755 0
700 mm, violet	4 421 3758 0

1) other colours and lengths on request.

12 Meter Testing

Test conditions

Unless otherwise indicated, the following test conditions apply:

Nominal voltage U_n :	as per data on name plate
Nominal voltage range :	0.8 ... 1.15 U_n
Nominal frequency f_n :	50 Hz
Nominal frequency range :	0.95 ... 1.05 f_n
Current values :	loaded on all phases
Ambient temperature :	23 ° C ± 5 ° C

12.1 Testing No Load and Starting Current

Testing of no load

Test voltage: Up = 1.15 U_n as per IEC 1036
e.g. Up = 265 V with Un = 230 V

1. Disconnect the meter from the mains for at least 10 seconds.
2. Now switch on the test voltage Up and wait for until the test diode has switched to continuous illumination. The maximum waiting time is as follows:

   - ZMB405/410 5 min
   - ZFB405/410 7 min
   - ZMB310 9 min

3. Continuous illumination indicates that the meter has no load. The energy status value, therefore, does not change.

Testing of starting current

Load current I : Z.B405/410 5 mA (three-phase)
Z.B310 50 mA (three-phase)

Switch on the load current I and the voltage Un (in each case three-phase). After approx. 3.5 minutes, the test diode extinguishes indicating that the meter is no longer in the no load state. A pulse is now issued approximately every 3.5 min.

Note cosφ during this test (approx. 1 for the active part, approx. 0 for the reactive part).

The meter uses the sum of the measured energy in all phases in order to set the starting point.

12.2 Measurement Times for Meter Testing

For technical reasons, major measurement deviations can occur during brief measurements. We therefore recommend that the following minimum measurement times shown in the following table be adhered to in order to achieve the accuracy indicated.

ZFB/ZMB405...

load current	measurement accuracy	Measurement times in seconds			
		ZFB405 I_n = 1 A	**ZMB405 I_n = 1 A**	**ZFB405 I_n = 5 A**	**ZMB405 I_n = 5 A**
1% I_n cosφ = 1	± 0.1% ± 0.05%	1261 2522	1017 2033	905 1810	740 1480
1% I_n cosφ = 0.5	± 0.1% ± 0.05%	1261 2522	3017 6034	905 1810	2097 4194
5% I_n cosφ = 1	± 0.1% ± 0.05%	159 318	137 274	126 252	110 220
5% I_n cosφ = 0.5	± 0.1% ± 0.05%	159 318	297 594	126 252	228 456
10% I_n cosφ = 1	± 0.1% ± 0.05%	82 163	72 144	68 135	60 120
10% I_n cosφ = 0.5	± 0.1% ± 0.05%	82 163	137 274	68 135	110 120
20% I_n cosφ = 1	± 0.1% ± 0.05%	48 95	43 86	41 82	38 76
20% I_n cosφ = 0.5	± 0.1% ± 0.05%	48 95	72 144	41 82	60 120
100% I_n cosφ = 1	± 0.1% ± 0.05%	23 46	22 44	22 43	21 42
100% I_n cosφ = 0.5	± 0.1% ± 0.05%	23 46	27 54	22 43	25 50

ZFB/ZMB410...

load current	measurement accuracy	Measurement times in seconds			
		ZFB410 I_n = 1 A	**ZMB410 I_n = 1 A**	**ZFB410 I_n = 5 A**	**ZMB410 I_n = 5 A**
1% I_n cosφ = 1	± 0.1% ± 0.05%	464 928	384 767	346 692	289 577
1% I_n cosφ = 0.5	± 0.1% ± 0.05%	464 928	1009 2017	346 692	729 1457
5% I_n cosφ = 1	± 0.1% ± 0.05%	73 146	64 127	59 118	52 104
5% I_n cosφ = 0.5	± 0.1% ± 0.05%	73 146	129 257	59 118	102 203
10% I_n cosφ = 1	± 0.1% ± 0.05%	39 78	35 70	33 66	30 59
10% I_n cosφ = 0.5	± 0.1% ± 0.05%	39 78	64 127	33 66	52 104
20% I_n cosφ = 1	± 0.1% ± 0.05%	24 47	22 43	21 41	19 38
20% I_n cosφ = 0.5	± 0.1% ± 0.05%	24 47	35 70	21 41	30 59
100% I_n cosφ = 1	± 0.1% ± 0.05%	12 23	11 22	11 22	11 21
100% I_n cosφ = 0.5	± 0.1% ± 0.05%	12 23	14 27	11 22	13 25

ZMB310	Measurement times in seconds			
	I_n = 10 A		I_n =20 A	
measurement accuracy / load current	± 0.1%	± 0.05%	± 0.1%	± 0.05%
1% I_n cosφ = 1	3010	6020	1010	2020
1% I_n cosφ = 0.5	10010	20020	3015	6020
5% I_n cosφ = 1	289	578	129	257
5% I_n cosφ = 0.5	730	1460	289	577
10% I_n cosφ = 1	129	257	64	127
10% I_n cosφ = 0.5	289	577	130	260
20% I_n cosφ = 1	64	127	35	70
20% I_n cosφ = 0.5	129	257	64	127
100% I_n cosφ = 1	19	38	14	27
100% I_n cosφ = 0.5	30	59	19	38

Use the same measurement time for unbalanced load; a 20 % higher measurement time at cos φ = 0.8, the twice measurement time at cos φ = 0.5.

Take notice of the preheating error at 20 % I_n and 100 % I_n.

For higher measurement accuracy the measurement times are to be extended.

Test diodes

As already mentioned in section 5, the two infra-red test diodes at the top right of the meter are provided for testing the meter. They transmit pulses with a duration of approx. 30 ms, which for testing, the rising edge is always important.

The pulse frequency at the test diode is calculated from the meter constant, as per section 3. Multiply the meter constant by the desired power and divide the result by 3,600. This gives the number of pulses per second at the particular power level.

f-diode = R x P / 3,600 in pulses/s

Example: ZMB410 with R = 5000 pulses/kWh
Load I = 5 A or 3.5 kW

f-diode = 5000 x 3.5 / 3600 pulses/s = approx. 5 pulses/s

12.3 Testing the Energy Measurement

The testing of energy measurement corresponds to the so-called register meter test for mechanical registers. The value indicated in the LCD, however, lacks the 10ths division per digit usual for the last digits cylinder.

One ought, therefore, to observe a 10 times longer measuring duration for the same test.

In order to circumvent this, you can switch to a 10 times higher display resolution (and readout) using a formatted command and thus significantly shorten the test duration. The symbol “tm”, which will flash, will appear in the display. You can exit from this calibration mode by using a further formatted command. An interruption of the supply will also result in an exit from the calibration mode. This function of higher resolution is, among other things, a prerequisite for a fully-automatic meter test process.

12.4 Calibration at the Customer’s Premises

The meters of the Z.B405/410 and Z.B310 series are calibrated at the factory and do not require any further calibration during their entire service life. Calibration at the customer’s premises is, therefore, not necessary.

A recalibration is only allowed in an authorized laboratory with the corresponding equipment and training.

Faulty measurement modules can be replaced in a simple manner by new measurement modules as per the service concept. Following such replacement, a new certification of the meter must be carried out.

12.5 Clip for Scanning Head

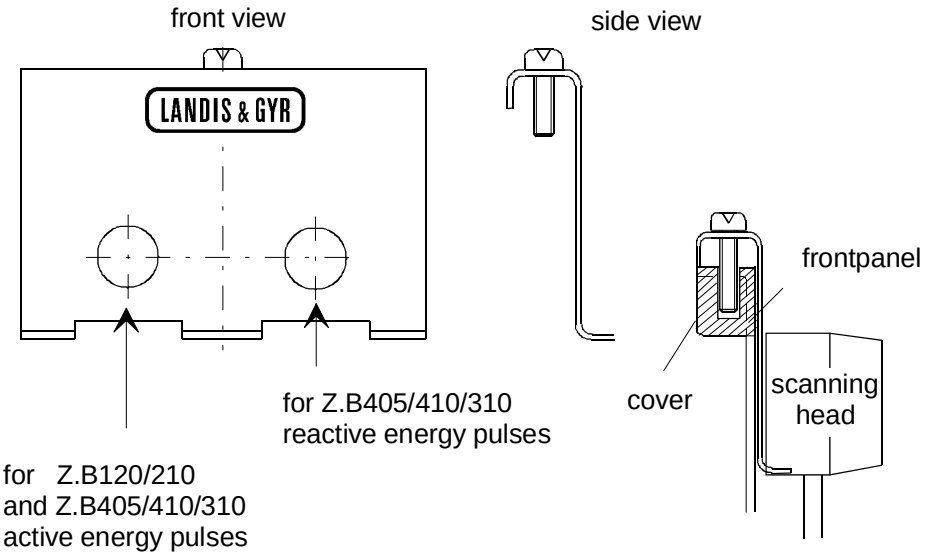


Figure 12.1 Clip for scanning head for meter testing

The clip shown above will be used for the application of magnetically fixed scanning heads, e.g. the TVS.. series from Siemens Metering in all Z.B series meters with electronic tariff units T.. .

13 Maintenance and Service

The meters of the Z.B series fundamentally do not require any maintenance. The models with integrated time switch normally do not incorporate a battery. Replacement is therefore not usually necessary. In the countries with certification requirements, the certification intervals must be observed, as before.

13.1 Parameterization Software

For purposes of parameterization as well as for service functions, Siemens Metering offers a **parameterization and service software package** which is capable of running on IBM-compatible PCs. This comprehensive and user-friendly software package will support you in the flexible management of the meters Z.B405/410 and Z.B310 with integrated tariff units T116, T416, T446 or T647. For detailed information, please contact your nearest Siemens Metering representative.

13.2 Service Software

For managing the use of formatted commands, Siemens Metering provides a **service software package** which runs on IBM-compatible PCs and is designated

FORMAGYR.

A corresponding Operating Instruction M13 313 195 E-HQ describes the use of this simple software in detail.

13.3 Action by Malfunctions

If a malfunction occurs which causes the meter to no longer operate perfectly, proceed as follows:

- If installed, disconnect the meter from the mains.
- Package the instrument in such a manner that it can not sustain additional damage in transit. If still available, the best packaging to use is the original packaging.
- Do not enclose any loose components.
- Describe the fault which you have determined as precisely as possible and indicate the name and telephone number of a contact person for possible enquiries.
- If you have re-parameterized the meter, enclose also the new parameterization data on a diskette, so that we can install your own parameterization into the meter after repair of your unit. Otherwise we will install the original (default) parameterization.
- Return the meter to Siemens Metering for fault analysis and repair.

13.4 Battery Replacement

Meters with tariff unit T647 always contain a battery. For meters with tariff unit T446 (time switch) it depends on the model. The battery is installed above the LCD and is visible when the front panel is opened.

Meters produced on and after April 1994 possess a short-circuit bridge (jumper) beside the minus pole of the battery. The jumper enables the battery to be switched off during the time the meter is not in use. The meter is delivered with jumper set according to parameterization and specification sheets

Meters produced earlier then April 1994 have no jumper. In these models, the battery could either be supplied separately or already inserted. If already inserted, the meter should be installed into the following few weeks.

Battery lifetime

Meters produced up to April 1994:

(type VARTA)		5 years; 6000 h of it without voltage

Meters produced on and after April 1994:

(type MAXELL)	T446	10 years; 4 years of it without voltage
	T647	10 years; 1 year of it without voltage

Battery replacement

1. When opening the meter the risk of touching CMOS components exists. The necessary safety precautions must be taken to avoid body voltage.
2. Open the cover and open the short circuit bridge - if it is installed - by pulling out the jumper.
3. Carefully remove the battery.

   Caution: For meters produced up to April 1994, the battery wires are clamped to soldering pins without solder.
4. Shorten the wires of the new battery to 3 to 4 mm and press them into the soldering pins. The plus pole must always be on the left side, the minus pole on the right side. Solder the wires to the pins.
5. Insert the jumper again - if it is present - on the right side and close the cover.
6. Connect the meter to the voltage (one phase will do) and reset the battery counter to zero by means of the formatted command "reset battery counter". After that switch off the voltage again.

Make sure that no dirt or splashes of solder can penetrate the meter.

Storage

For meters to put into storage, steps 5. and 6. should not be performed. The open short circuit bridge guarantees that the battery does not discharged during storage. When the meter is to be inserted in the network, carry out steps 5. and 6. directly before installation.

14 Disposal Information

Before disposal, the critical components of the Z.B series meters should be removed if practicable. The critical components and their disposal is given in the following table:

	Component	**Disposal**
	Condensators (elco, supercap)	Special refuse
	LED, LCD	Special refuse
series 2	Reed relay r14a 1)	Special refuse
series 3 (as of 1999)	Solid-state relay	Electronic refuse
	Printed circuit boards	Electronic refuse
	Plastic parts	Separate by material designation (regranulation possible)

1) The retransmission contact r14a makes use of a mercury-wetted contact. Its presence can be recognized by the type designation of the tariff module (e.g. T416eCS**r14ar14a**).

   Mercury is a highly toxic material and may on no account make contact with water or ground.

Please dispose all not mentioned parts of the meter in accordance with the agreement reached with Siemens Metering or the local regulations.

Appendix

Operational overview

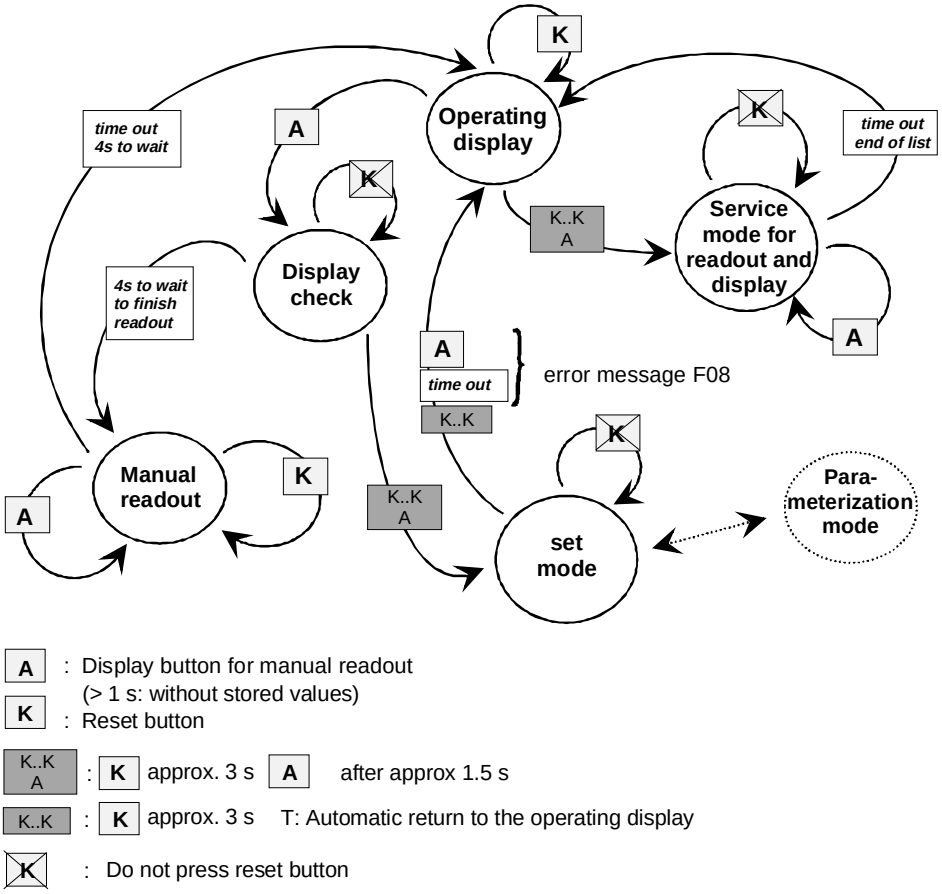


Figure A.1 Operational overview

Proceeding from the operating display you can:

- activate the display list for manual readout
- enter the set mode via display check to perform fomatted commands or reparameterize the meter
- enter the service mode to obtain the expanded data list for readout.