ENERMET

E600 Integrated Meter

Manual for Installation and Use

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aim ACTIVE INFORMATION MANAGEMENT

Contents

1 Introduction

1.1 Introduction to the E600 Manual for Installation and Use

This manual contains instructions on how to install and use Enermet's E600 meter.

The manual contains information on the meter types, installation requirements and the actual installation instructions. In addition, there are chapters that describe the meter's visible features such as nameplate, display and the LED.

The E600 meter's internal features are explained in the *E600 Product Description*. For instructions on how to use the E600 User Interface, see *E600UI Manual for Installation and Use*.

1.2 Introduction to the E600 meter

The E600 meter is a three-phase electricity meter for industrial and commercial metering applications.

The energy measurement of E600 meters is based on A/D conversion and digital signal processing.

As an integrated meter, the E600 is a cost-efficient solution for use with Enermet's AIM metering system. It can also be used in other metering systems using IEC 61107 or DLMS/Cosem protocol.

The E600 meter fulfils the requirements of the following standards:

- IEC/EN 62052-11:2003; Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
- IEC/EN 62053-21:2003; Electricity metering equipment (a.c.) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)
- IEC/EN 62053-23:2003; Electricity metering equipment (a.c.) - Particular requirements - Part 23: Static meters for reactive energy (classes 2 and 3)
- DIN 43857; The dimensions of the case
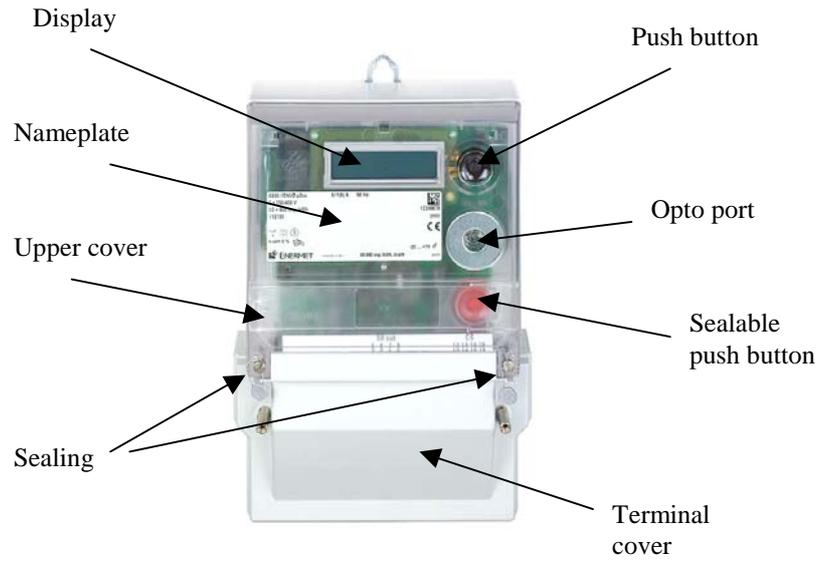
Figure 1. The E600 meter

2 E600 meter types

2.1 Type codes

The types of E600 meters denote the following:

Code		Explanation
E600	=	Product family
-1	=	Class 1
-2	=	Class 2
D	=	Terminal configuration according to DIN standard
N	=	3-system meter for 4 wire network
Without N	=	2-system meter (no neutrals) for 3 wise networks
V	=	Current transformer connected meter
Without V	=	Direct connected meter
Z	=	Two-directional active and 1 to 4 quadrant reactive measurements
-i2	=	S0-input channels
-p2	=	S0-output channels
-I3	=	High voltage input channels (control inputs)
-P2	=	2 pulse/control outputs (semiconductor relay 24V or 230V AC)
-rs232	=	RS-232 serial channel
-rs485	=	RS-485 serial channel
-cs	=	CS serial channel
-P5	=	5 pulse/control outputs (semiconductor relay 24V or 230V AC)
-P6	=	6 pulse/control outputs (semiconductor relay 24V or 230V AC)

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2.2 Meter types

The E600 meter types are presented in the following table.

Contact Enermet marketing for information on the availability of the different meter types.

Type	Class, Active energy	Voltage V	Current A	Pulse constant
E600-1DNVZ	1	3 x 230/400	5(6), 5//1(6), 5(15)	50 000 imp/kWh
E600-1DVZ	1	3 x 230	5(6), 5//1(6)	50 000 imp/kWh
E600-2DNZ	2	3 x 230/400	5-10(100)	10 000 imp/kWh
E600-2DZ	2	3 x 230	5-10(100)	10 000 imp/kWh
E600-1DNZ	1	3 x 230/400	5-10(100)	10 000 imp/kWh

The reactive energy class is class 2 in all meter types.

2.3 I/O options

Contact Enermet marketing for information on the availability of the I/O option combinations.

I/O options	Description
i2P2rs232	S0 Inputs (2), High voltage outputs (2), RS-232
i2rs232	S0 Inputs (2), RS-232
i2p2rs232	S0 Inputs (2), S0 Outputs (2), RS-232
i2P5CS/rs232	S0 Inputs (2), High voltage outputs (5), CS/RS-232
I3P2rs232	Control Inputs (3), High voltage outputs (2), RS-232
I3P2rs485	Control Inputs (3), High voltage outputs (2), RS-485
i2P6rs232	S0 Inputs (2), High voltage outputs (6), RS-232
I3i2P2rs232	Control Inputs (3), S0 Inputs (2), High voltage outputs (2), RS-232
I3i2P2cs	Control Inputs (3), S0 Inputs (2), High voltage outputs (2), CS
I3i2P2rs485	Control Inputs (3), S0 Inputs (2), High voltage outputs (2), RS-485
P5cs/rs232	High voltage outputs (5), CS/RS-232
P2rs232	High voltage outputs (2), RS-232

3 Nameplate, LED and push buttons

3.1 Nameplate and LED

The nameplate of E600 meter has information on the manufacturer, CE marking, required voltage and frequency, and the type of the device.

There is one yellow LED indicating pulses relational to the measured energy. The pulse constant is 50 000 imp/kWh for CT-connected meters and 10 000 imp/kWh for direct connected meters.
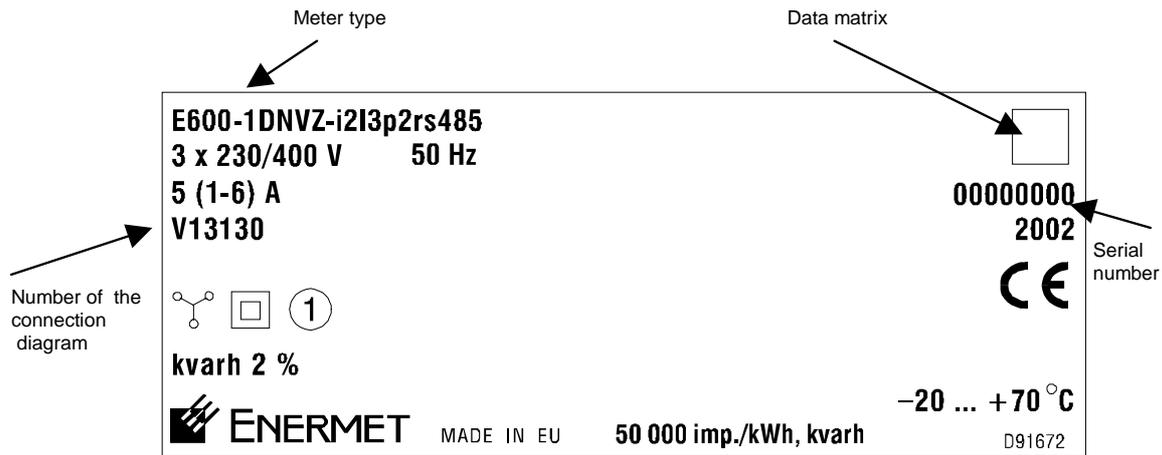
Figure 2. Nameplate of the E600

3.2 Push buttons

The E600 has two push buttons. A black push button is located in the upper right corner of the front cover and a red button is located under the sealable cover. See figure 1.

The black button is used to scroll the meter's display. The red button is used to end the meter's billing period (see *9 Ending billing period*). Both push buttons are needed in setting meter date and time (see 8 *Setting date and time manually*).

4 Installation requirements

4.1 Installation conditions

The installation site must meet the requirements of the meter's protection class (IP54) and the operating temperature range (-20… +70 ºC). There must be no harmful, corrosive gases or dust on the installation site.

4.2 Installation place

The E600 meter can be installed

- on a meter grid

- directly on an unflammable wall.

There must be enough space in front of the meter for reading and maintenance purposes. The installation place must be open and spacious enough to allow the cooling of the meter.

If you install the meter outdoors, do not expose the meter to direct sunshine.

4.3 Voltage systems

4.3.1 Electricity network

The connection to the electricity network is 3 x 230/400 V, 3 x 240/415 V or 3 x 230 V Check that the voltage marked to the meter's nameplate is the same as the voltage used on the installation site. Use the wires and cables designed for the used voltage and current.

ⓘ During the installation, keep the low voltage wires separated from the 230 V wires. If you do not use a pre-fabricated wire set, bundle the different types of wires into separate groups starting immediately from the terminal block.

ⓘ Do not open the case when the meter is connected to the electricity network. Life hazard!

Warning!

4.4 Inputs

The E600 meter has maximum of five inputs. Two of them are S0-inputs, and the other three inputs are control inputs. Make sure that the input type corresponds to the used voltage.

4.4.1 S0-inputs

Two inputs are S0-inputs. The S0-input connections are SELV –circuits (Safety Extra Low Voltage). The measuring voltage that the E600 feeds to the S0-connections is 24 VDC (20 mA). Low-voltage wires can be used.

If an input device does not meet the SELV requirements (for example, a transistor output that is not opto-insulated), all circuits become immediately 230 V circuits. In such case, use 230 V wires.

The 24 V SELV –circuit is internally connected to the serial communication outputs. There is no insulation between the serial communication outputs and the S0-inputs. 24 VDC is the maximum voltage for S0-inputs and outputs. Do not use higher voltage. The maximum pulse frequency for the S0-inputs is 17 Hz, which is in accordance with the DIN 43864 standard.

4.4.2 Control inputs

For external tariff control and for ending the billing period there are three configurable control inputs. The control inputs are high-voltage connections: 230 V. Use the wires and the cables designed for the used voltage and current.

ⓘ All the inputs must be connected in the same phase voltage (L1, L2 or L3). Connecting to two or three phases is NOT allowed.

4.5 Outputs

The E600 meter has maximum of six outputs. When ordering the meter, it is specified if the outputs are low voltage outputs (S0, typing option –p2) or high voltage pulse/control outputs (semiconductor relay 230 V, typing option –P2 or P5 or P6). Both types of outputs can be configured to function as S0 pulse outputs or status/relay outputs.

4.5.1 S0 pulse outputs

The outputs can be configured to function as S0 pulse outputs. The S0-output is in accordance with DIN 43864 standard. The low voltage output connections are SELV-circuits. The measuring voltage that can be fed to the E600 meter's low voltage S0-connections is 24 VDC (20 mA). Low-voltage wires can be used. Do not connect pulse outputs to ground.

ⓘ 24 V is the maximum voltage for low voltage outputs. Do not use higher voltage. You can use high voltage outputs also as S0 pulse outputs by using 24 V measuring voltage. When you connect the S0-outputs to other device's inputs, make sure that the inputs are filtered concerning high frequency interference.

4.5.2 Status/relay outputs

The output channels can be configured to function as status/relay outputs, for example one output channel can be configured to function as an alarm output relay. The E600 meter controls low voltage outputs with a measuring voltage of 24 V, max 20 mA. The E600 meter controls high voltage outputs with a measuring voltage of 24 – 230 V, max 120 mA. Use the wires and the cables designed for the used voltage and current.

ⓘ   All relays must have the same supply voltage.

5 Installation

5.1 Installation sequence

1) Check the meter for any visible damage caused by shipping.

2) Make sure that the voltage is NOT on!

3) Make sure that the meter type is correct for the installation site.

(i) If the meter has been stored in temperatures below zero and it is installed in a warm environment, let the meter warm up before connecting it to the electricity network. Condensing moisture may otherwise present a safety hazard.

4) Remove the terminal block cover.

5) *Installing the meter on the grid*: Fix the meter on the grid with screws. Adjust the fixing eye if necessary.

   Installing the meter on the wall: Mount the upper screw and hang the meter on it. Adjust the fixing eye if necessary. Fasten the two bottom screws.

6) Make the required wiring carefully according to the appropriate connection diagram (see *11.2 Connection diagrams*). The number of the connection diagram is located inside the terminal block cover.

7) Peel the wires so that the peeled part of the wire is long enough to reach under both terminal screws. Make sure the wire insulation ends before the terminal. The insulation must, however, reach the inside of the terminal block, so that it cannot be touched.
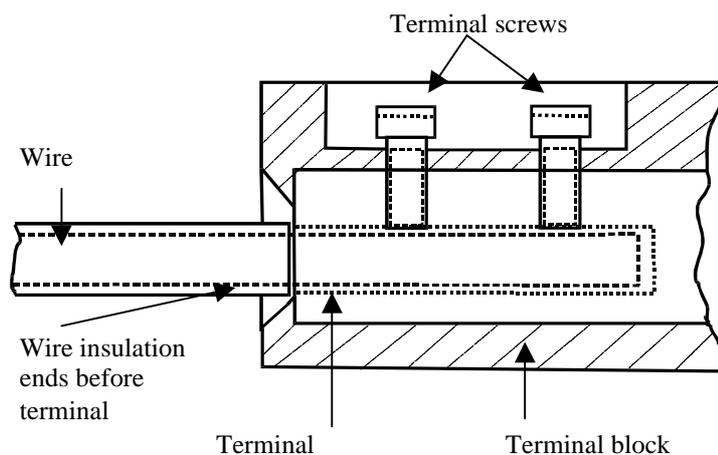
8) Screw all connections tight, but be careful not to break the screws.

9) If you want to attach the tamper protection piece to a direct connected meter, see *5.3 Tamper protection*.

10) Attach the terminal block cover and seal it.

11) If you want to install an auxiliary nameplate, open the sliding cover. For information on how to open the sliding cover, see *5.2 Sliding cover*).

12) Switch on the voltage.

5.2 Sliding cover

The E600 meter cover includes a separate sliding cover for an auxiliary nameplate (see figure 1).

To remove the sliding cover

1) Remove the possible sealing from the left side of the upper cover (see figure 1).

2) Lift the left side of the sliding cover 5 mm and simultaneously slide it to the right. The cover opens.

To attach the sliding cover

1) Check that the sliding cover is on its slide rails.

2) Close the cover by sliding it from the right side to the left.

3) Seal the cover, if necessary.

5.3 Tamper protection

You can mount a tamper protection piece to a direct connected E600 meter. To attach the piece, press it down on the terminal block as shown in Figure 3, until it clicks tight to its place.

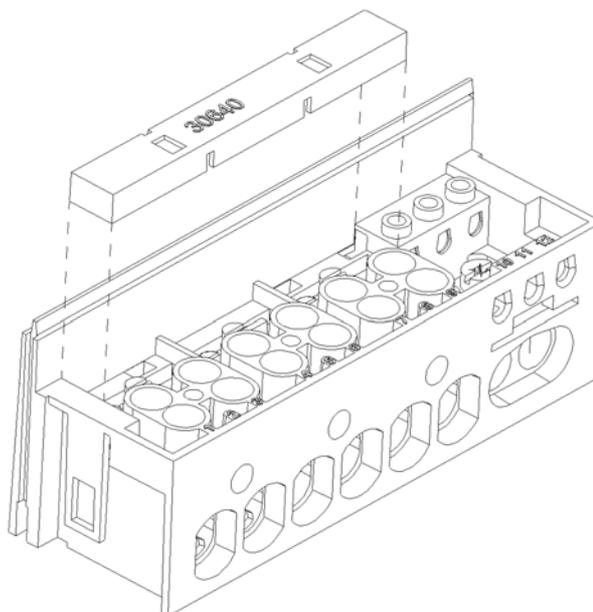The tamper protection piece prevents all deliberate as well as unintentional tampering on the metering.

Figure 3. Tampering protection

5.4 Checking the installation

When you have installed the meter, the meter performs an automatic installation check. The meter gives immediate feedback if something has gone wrong. For example, the wrong connection of the voltage or the current cables is indicated as an alarm message on the meter's display. The E600 meter's LED is lit if the meter is on but there is no load.

After the installation, check the following things:

1) There are no error messages on the display.

2) Give a medium press with the black push button. The meter shows text "Installation OK" or "Installation OK, no load". The latter is shown if voltages are connected, but loads are not yet connected.

3) If there are error messages on the display, move to error submenu to see description of errors (see *13.2 Alarm messages on display*). Make the necessary connection changes.

4) The yellow LED starts to blink. If in doubt, connect and load one phase at a time and see if the LED blinks.

5) The meter starts scrolling the items on the display automatically. The displayed values on the scroll list and the time between the displays are configurable.

6) Check that the meter has the correct date and time. If necessary, update them using the push buttons (see *8 Setting date and time manually*) or the E600UI software.

Ⓘ Automatic installation check requires that the alarm limits are correctly configured.

Ⓘ The correct direction of current flow is checked automatically only in case of meters used for 1-direction metering (import only). If meter measures both import and export, current connections must be checked manually using power factors; all the power factors for L1/L2/L3 must be positive or negative.

Ⓘ Correct current flow direction can be checked automatically only with 3-system meters.

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6 Installation to a metering system

6.1 Communication protocols

The E600 meter can be used in systems like Enermet's AIM system that support the following protocols:

- DLMS / Cosem protocol

- IEC 61107 / Enermet protocol

- IEC 61107 data-read-out

- IEC 61107 /VDEW

The E600 meter can be used with external modems like Enermet's GSM modem M100-G and PSTN modem M100-T that can be easily connected to the E600 meter's terminal cover. It is also possible to connect a LON transmitting terminal unit to E600 meter.

Communication options with external devices	
Modems	Terminal units
GSM modem (M100-G) PSTN modem (M100-T)	LonTalk protocol, ML10-CB

6.2 Connecting modem to E600

6.2.1 Safety notes concerning the GSM module

Due to the possibility of radio frequency (RF) interference, it is very important to follow any regulations regarding the use of radio equipment at the installation place.

There may be a hazard associated with the operation of a GSM module close to inadequately protected personal medical devices such as hearing aids and pacemakers. Consult the manufacturer of the medical device to determine if it is adequately protected.

Operation of the GSM module close to other electronic equipment may cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturer's recommendations. Make sure that the distance between the GSM antenna and any electrical equipment is at least 60 cm.

The following list contains sites referred to in the general safety notes of the GSM module manufacturer. If you are planning to install the E600 meter with a GSM module in the immediate vicinity of any of the following sites, please contact the local Enermet company.

- Airports

- Service stations

- Hospitals or any other places where medical equipment may be in use

- Fuel depots, chemical plants, or other locations with risk of explosion, or sites where blasting work is in progress

6.2.2 Installing an external modem to E600 meter

You can install an external modem directly on the meter's terminal block. On the terminal cover there is an area, which can be easily broken in order to connect an external modem or a terminal unit to the E600 meter.

To install the modem

1) Break the terminal cover (see figure 4).

2) Connect the data and power cables to the modem.

3) Make sure that the communication interface type is correct. Connect the external modem to E600 meter's serial channel.

4) Make sure that the installation of the modem is successful:

   - Make a test call to the modem with any phone. You should hear the modem beeping.

   - Make a test reading using a suitable reading program, for example E600UI or AIM.

For more detailed instructions on installing a modem to E600 meter, see the installation manual of the modem.

1) Push the terminal cover strongly until it cracks.	2) Break off the rectangle piece from the terminal cover.
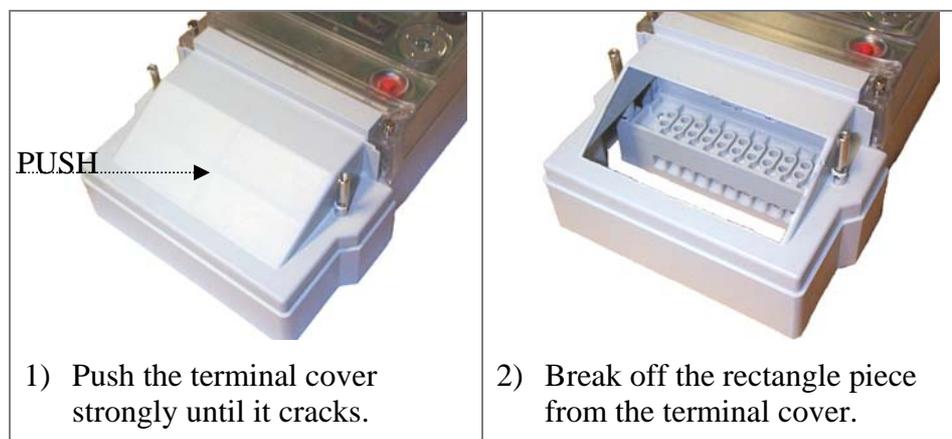
Figure 4. Breaking the terminal cover

6.3 Connecting ML10-CB to E600

The E600 meter can be used also with Enermet's ML10-CB terminal unit.

To install the ML10-CB unit

1) Break the terminal cover (see figure 4).

2) Make the required wiring. The connection diagram is located behind the ML10-CB terminal unit. Connect the ML10-CB to E600 meter using the two pulse output channels of E600.

3) Make sure that the installation of the ML10-CB is successful:

  - Switch on the voltage: the terminal unit's LED should flash once.

  - First the TxD, then RxD LED flashes for a while. This indicates that the communication is working.

For more detailed instructions on installing ML10-CB to E600 meter, see *ML10-CB Manual for Installation and Use*.

7 Display

The E600 meter has a Liquid Crystal Display, which shows two rows, maximum 16 characters on each row. The upper row is the header line for the lower row, which shows the actual values. The display is controlled with the black push button. The meter has five different display modes. The modes are presented in the following chapter.
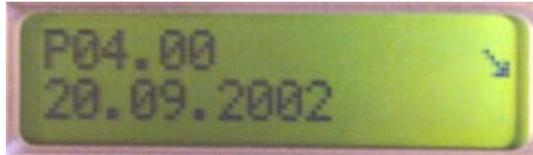
Figure 5. E600 meter's display

7.1 Display modes

7.1.1 Auto-scrolling mode

Auto-scrolling mode is the default display mode. When the display is on the auto-scrolling mode, the meter scrolls the items on the display automatically. The displayed values on the scroll list and the time between the displays are configurable using the User Interface program (see *E600UI Manual for Installation and Use*). The time between the scroll steps can be from 1 second to 255 seconds. Maximum number of displays in one sequence is 384.

As default, the current date and time item is the first item in the auto-scrolling list. This item has two special features; it shows the connected phase voltages using phase symbols L1/L2/L3 and quadrant information using arrows up/down and left/right.

ⓘ If there are active errors/alarms, then error code is shown on auto-scrolling mode. Submenu shows description of errors/alarms (*see 5.4 Checking the installation*).
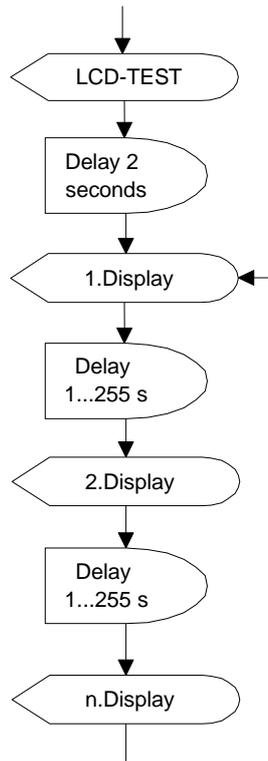
Figure 6. Auto-scrolling sequence

7.1.2 Manual scrolling mode

Switch from the auto-scrolling mode (via display test) to manual mode by pressing the black push button two times. In manual scrolling, control the display with the black push button using different press lengths as follows:

Press length	Action
Short press (< 2 sec)	1. Go to next item on the scroll list
Medium press (> 2 sec, < 5 sec)	2. Move to a submenu or previous level
Long press (> 5 sec)	3. Return to auto scrolling mode
Special tip:	
Both push buttons kept pressed down	4. Fast forward on the scroll list

1. If you make a short press, the display scrolls items on the same menu level, starting from the first item on the scroll list.

    Each menu item can have a submenu, which is indicated by an arrow that points downwards. The arrow is located on the right hand corner of the display. Each menu level ends with an --- End--- -tag.

2. If you make a medium press, you move to the submenu. If you want to move two levels down, release the push button when the display changes for the first time. Then make another medium press. If the arrow on the display points up you can move to the previous menu level by making a medium press.

3. If you make a long press, the display switches back to auto-scrolling mode.

Figure 6 illustrates the manual scrolling sequence.

The display switches automatically back to the auto-scrolling mode after a configurable delay (1 min to 2 h) from the last press at the push button, unless this automatic switching is disabled. After a power break, the display switches to the auto scrolling mode.

4. If you keep both red and black push buttons pressed down, the display scrolls items on the same menu level fast. This is very useful e.g. when you are setting the date and time manually and want to find the right date and time values. (See *8 Setting date and time manually*.) When you release the push buttons, you can continue scrolling the items one by one using the black push button.
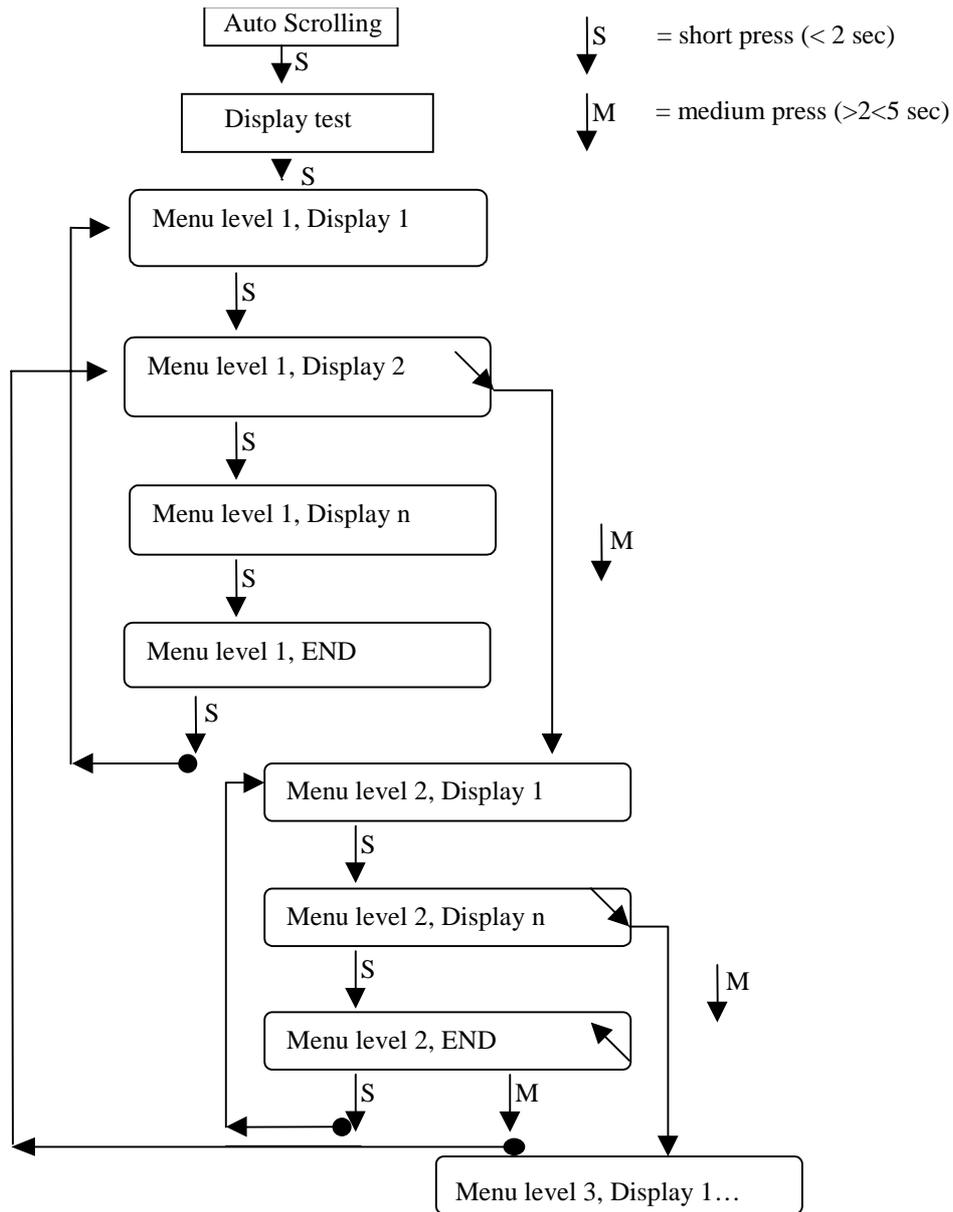
Figure 7. Manual scrolling sequence

7.1.2.1 An example of manual scrolling: browsing all load profile values

You can browse all load profile values with status on the display if you have ticked the **All load profile values** box in the E600UI (see *E600UI Manual for Installation and Use*). This feature allows you to find each individual load profile value that the meter has recorded.

1) Change from auto scrolling mode to manual scrolling mode by making two short presses on the black push button.

2) Move from one menu item to another by making short presses on the black button. When you find the load profile indication (LP), make a medium press.

3) The first menu level is now displayed. The first menu level shows the load profiles. You can move from one load profile to another by making short presses. When you find the load profile you want to examine more closely, make a medium press.

4) The second menu level is now displayed. The second menu level shows the days of the chosen load profile, starting from the most recent date. Make short presses until you come to the day you want to examine more closely, then make a medium press.

5) The third level shows you the values with status recorded on the chosen day, complete with time stamps (hh:mm) and starting from the first value recorded on that day. Make short presses until you find the value you are looking for.

6) On the third level you can make a medium press any time to return to the second level.

7) Load profile status is shown with value display so that first character in second row contains blinking status code, see *Figure 8*.
Status coding:
Empty = no status
1 = time setting during period or time unreliable
2 = internal error during period
4 = power break during period
Other codes also possible with summing.

Auto Scrolling
↓S   = short press (< 2 sec)

Display test
↓M   = medium press (>2<5 sec)

MENU
LP

P01.00

P02.00

Menu level 1, END

P02.00
23.11.2002

P02.00
22.11.2002

Day level, END

P02.00   01.00(hh.mm)
1234   kW   # = Status

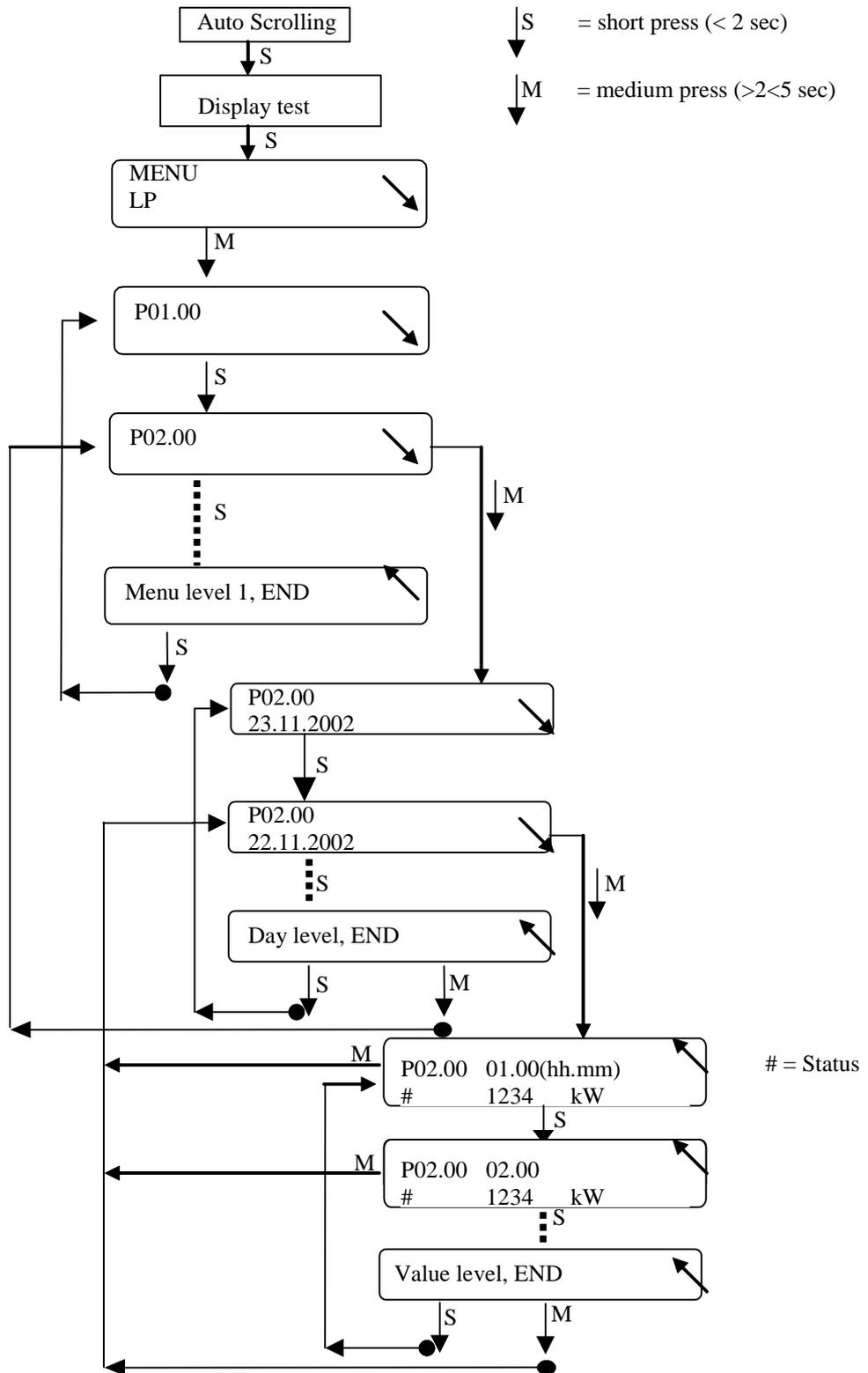P02.00   02.00
1234   kW

Value level, END

Figure 8. An example of manual scrolling: how to browse load profile values

7.1.3 Installation mode

Installation mode is activated automatically instead of auto-scrolling mode in case of errors/alarms.

In case the installation was not ok, the meter shows an error message on the display. The error message submenu describes what went wrong in the installation. See *13.2 Alarm message on display* and *5.4 Checking the installation*.

7.1.4 Set mode

To switch from the auto-scrolling mode to set mode, press first the black push button once (display test shown in LCD), then the red push button once (<u>short</u> press). When the display is on set mode, you can set the time and the date to the meter using the push buttons. See *8. Setting date and time manually*.

The meter will switch automatically back to the auto-scrolling mode after a configurable delay (1min to 2 h) from the last press at the push button.

7.1.5 Test mode

To switch from the auto-scrolling mode to test mode, press first the black push button once (display test shown in LCD), then the black or red push button once (<u>medium</u> press).

When the display is on test mode, you can scroll the manufacturer specified test items on the display using the black push button. Currently the test items are life time cumulative register values (secondary AE+, AE-, RE+, RE-).

To switch form the test mode back to auto-scrolling mode, press with a long press on the black push button.

The meter will switch automatically back to the auto-scrolling mode after a configurable delay (1min to 2 h) from the last press at the push button.

7.2 Active tariffs

The register status menu shows which tariff registers are active. To move to the submenu, make a medium press on the black push button. The submenu shows the ID codes of the active tariff registers.

7.3 Display messages

Some display messages are presented in the following tables.

Table 1. Display messages

Message		Meaning
E600 ID	EDIS ID	
UNIT NUMBER	0.0.0	Unit number
SERIAL NUMBER	C.1.0	Serial number
CURRENT DATE	0.9.2	Current date
CURRENT TIME	0.9.1	Current time
CONF. ID	0.2.0	Configuration ID
CONF. DATE	C.2.1	Configuration date
INPUT STATUS	C.51	Input status
OUTPUT STATUS	C.52	Output status
ACTIVE TARIFF	C.59	Active tariff and register status Submenu shows active tariff register ID's.
MENU TARIFF	C.53 TARIFF	Tariff register menu
MENU LP	C.54 LP	Load profile menu
MENU BP	C.55 BB	Billing Period counter menu
MENU INSTANT. VALUE	C.56 INSTANT. VALUE	Instantaneous values menu
MENU OTHER	C.57 OTHER	Miscellaneous menu
ERR 001	F.1	Error register 1: Application Submenu shows error descriptions in local language
ERR 002	F.2	Error register 2: Core Submenu like above
ERR 003	F.3	Error register 3: Alarms Submenu like above
TRANS. RATIO	0.4.2	Current transformer ratio
INPUT1 CONST	C.60	Input 1 pulse constant
INPUT2 CONST	C.61	Input 2 pulse constant
OUTPUT1 CONST	C.62	Output 1 pulse constant or output type
OUTPUT2 CONST	C.63	Output 2 pulse constant or output type
APPLIC. VER	C.1.1	Application version number
CORE VER	C.1.2	Core version number
BOOTLOAD VER	C.1.3	Bootloader version number
EVENT LOG	C.64	Event log Submenu shows log events in coded form
BREAK LOG	C.65	Long power break log Submenu shows long power breaks in coded form
---END	---END	END tag

Table 2. Display messages – instantaneous values

Message		Meaning
E600 ID	EDIS ID	
A1	21.24	Active power L1
A2	41.24	Active power L2
A3	61.24	Active power L3
A	1.24	Active power sum
R1	23.24	Reactive power L1
R2	43.24	Reactive power L2
R3	63.24	Reactive power L3
R	3.24	Reactive power sum
U1	32.24	Phase voltage L1
U2	52.24	Phase voltage L2
U3	72.24	Phase voltage L3
I1	31.24	Phase current L1
I2	51.24	Phase current L2
I3	71.24	Phase current L3
PF1	33.24	Power factor L1
PF2	53.24	Power factor L2
PF3	73.24	Power factor L3
FRE	14.24	Frequency
AE, SEC	64.1.8	Life-time cum. AE+ (secondary)
AE-, SEC	64.2.8	Life-time cum. AE- (secondary)
RE, SEC	64.3.8	Life-time cum. RE+ (secondary)
RE-, SEC	64.4.8	Life-time cum. RE- (secondary)

ⓘ　In 2-system meters Phase voltage L1 means mains voltage between phase L1 and L2 (U12), and Phase voltage L3 means mains voltage between L3 and L2 (U32).

The following items are not available at all with 2-system meters: active/reactive power for L1/L2/L3, phase voltage/current L2, power factors L1/L2/L3.

8 Setting date and time manually

The consequences of the manual time setting described in the following are identical to those of the *Set time* command in the E600 UI program. See *E600UI Manual for Installation and Use*.

To set the meter's date and time, you need both push buttons. To access the red push button, remove the sliding cover. See chapter *5.2 Sliding cover*.

1) In auto-scrolling mode, make a short press on the black button. Display test appears on the display.

2) Make a short press on the red button. Date and time appear on the display.

3) Make another short press on the red button. The day starts to blink.

4) To change the day, make short presses on the black button until you get the desired day on the display.

5) Accept the day by making a short press on the red button.

6) The month starts to blink. Change the month the same way as you changed the day (see steps 4 and 5). Accept the change by making a short press on the red button. Proceed to the next field.

7) Continue updating the fields as described in steps 4 and 5 until the desired date and time are blinking on the display.

8) Accept the changes by making a short press on the red button.

You can re-update the meter's date and time by pressing the red button again.

9 Ending billing period

To end the meter's billing period, make a short press on the red push button. To access the red button, remove the sliding cover. See chapter *5.2 Sliding cover*.

Billing period ending is indicated with "--- End ---" on the display.

It depends on the configuration, which tariff registers are ended. To prevent extra billing period endings there is also a configurable billing period (BP) ending lock period (0 – 10080 minutes). Refer to *E600UI Manual for Installation and Use*.

> (i) When you end the billing period using the red push button, meter's display must be in auto scrolling mode or manual mode, not in set mode or test mode.

The billing period can also be ended by the internal Real Time Clock (RTC). The RTC setting are done using the UI program. See *E600UI Manual for Installation and Use*.

The third option is to end the billing period using a serial communications channel.

10 Technical details

10.1 Metrological characteristics

Accuracy Class

- Class 1 for active energy (kWh)
- Class 2 for reactive energy (kvarh)

Metrological Requirements

- IEC/EN 62052-11:2003
- IEC/EN 62053-21:2003 (active energy, classes 1 and 2)
- IEC/EN 62053-23:2003 (reactive energy, class 2)

Method of Measurement

- Digital
- 3-system meter for 4 wire networks
- 2-system meter for 3 wire networks

Meter Constant

- CT-connected meters 50 000 imp/kWh
- Direct connected meters 10 000 imp/kWh

Voltage

- U_n=3 x 230/400 V
- U_n=3 x 240/415 V
- U_n=3 x 230 V (2-system meters)
- Measuring range 80 – 115 % U_n

Current

CT-connected meters
- I_n = 5 A, I_n = 5//1 A
- I_{max} = 6 A
- Starting current 0.002 x I_n

Direct connected meters
- I_b = 5 or 10 A
- I_{max} = 100 A
- Starting current 0.005 x I_b

Frequency

- 50 Hz

Power Consumption

- Current circuit per phase 0.05 VA (5 A)
- Voltage circuit per phase < 5.5 VA, 1.5 W

Energy measurement

- +AE (I+IV) kWh
- -AE (II+III) kWh
- +RE (I+II) kvarh
- -RE (III+IV) kvarh
- +Rei (I) kvarh
- +Rec (II) kvarh
- -Rei (III) kvarh
- -Rec (II) kvarh

Instantaneous measurement

- Total active / reactive power
- Phase active / reactive power
- Phase voltage
- Phase current
- Phase power factor
- Frequency
- Life-time cumulative registers

See *8.2 Measuring different quadrants*

Energy measurement

- +AE (I+IV) kWh
- -AE (II+III) kWh
- +RE (I+II) kvarh
- -RE (III+IV) kvarh
- +Rei (I) kvarh
- +Rec (II) kvarh
- -Rei (III) kvarh
- -Rec (II) kvarh

See *8.2 Measuring different quadrants*

Instantaneous measurement

- Total active / reactive power
- Phase active / reactive power
- Phase voltage
- Phase current
- Phase power factor
- Frequency
- Life-time cumulative registers

Quality measurement

- Voltage breaks
- Over voltage and low voltage
- Over current
- Power factor limits
- No load information
- Voltage profile
- Wrong phase order indication

Time-Of-Use measurement

- 32x1 main TOU/MD registers
- 32x15 background TOU/MD registers
- MD Integration 1, 5, 10, 15, 30 or 60 min

Load profile data recording

- Maximum 8 channels
- Integration period 1, 5, 10, 15, 30, 60 min
- Three (3) data integrity diagnostics bits
- Maximum 38304 values;
  e.g. with 4 channels and 15 minute measurement period, this means 100 days (=38304/4/96).

Event log

- Size 0 – 1024 events
- Date and time, type, and specification

Tariff control

- 40 control functions
- 16 day types

End of billing periods

- 16 register groups

10.2 Technical characteristics

RTC time keeping accuracy
• Crystal • Accuracy 0.5 s / 24 h

RTC reserve running time
• Supercapacitor, 14 days • Lithium battery (option), 10 years • Reserve running accuracy 1 s / 24 h

Operating and storage temperature
• -20… +70 ºC Operating • -40… +70 ºC Storage

Operating and storage humidity
• Annual 0 to 75 %

Communication
• Optical port • Serial communication: RS 232, RS 485 or CS • EN 61107 compatible • DLMS Cosem compatible • External PSTN or GSM modem can be installed direct on the terminal block, see *6 Installation to a metering system*

10.3 Mechanical characteristics

Weight
• 1450 g

Case
• Protection class IP51

Dimensions
• Height 256 mm • Width 180 mm • Depth 92 mm

Display
• LCD display with 16 x 2 characters • Dot matrix characters

Push buttons
• 1 for display readings • 1 for ending the billing period

Nameplates
• Main nameplate for general information • Auxiliary nameplate for application specific information

ai·m ACTIVE INFORMATION MANAGEMENT

10.4 Tests and standards

The E600 meter fulfils the requirements of IEC/EN 62052-11:2003, IEC/EN 62053-21:2003 and IEC/EN 62053-23:2003.

Tests	Standards
• Electrostatic disturbance • RF immunity • Radio interference • Fast transient immunity • Impulse voltage • AC voltage • Spring hammer test • Shock test • Vibration test	• 15 kV air discharge, 8 kV contact • 10 V/m • CISPR 22 • 4 kV • Extended test for 12 kV • 2 kV • 0.2 J ± 0.02 J • 300 m/s^2, 30 g • 9.8 m/s^2, 1 g

11 Connections

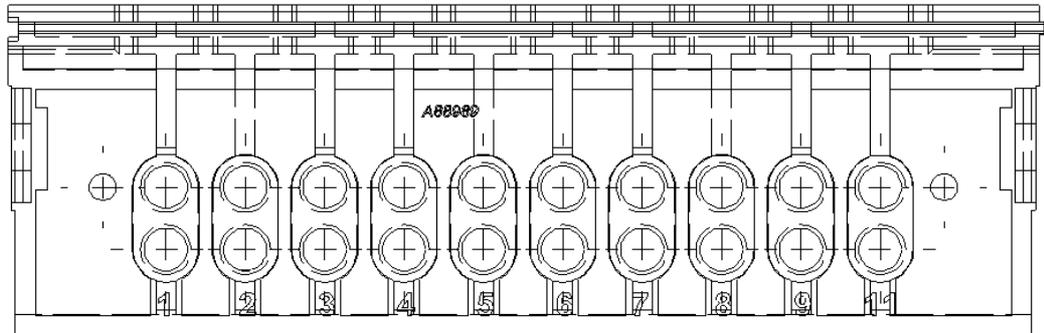## 11.1 Current and voltage connectors

Figure 9. Current and voltage terminals of a current transformer connected meter
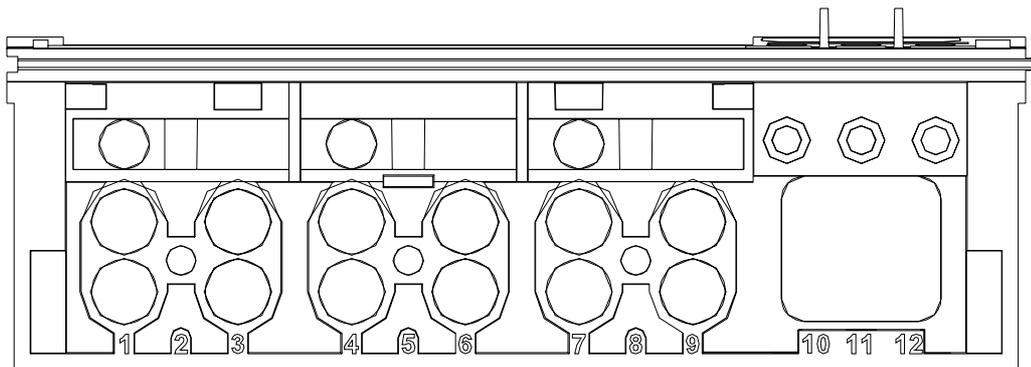

Figure 1. Current and voltage terminals of a direct connected meter.

Current / voltage terminals :		
Terminal	1	Phase 1 current / voltage in
Terminal	3	Phase 1 current out
Terminal	4	Phase 2 current / voltage in
Terminal	6	Phase 2 current out
Terminal	7	Phase 3 current / voltage in
Terminal	9	Phase 3 current out
Terminal	10	Neutral
Terminal	12	Neutral

In direct connected meters the terminals 10 and 12 are galvanically connected together. The hole diameter of the current terminals is 9.7 mm in direct connected meters and 5.6 mm in current transformer connected meters. The dimensions of the current connectors are in accordance with DIN43857.

The screw size is M4. Current terminal screws are combi-screws.

Voltage terminals :		
Terminal	2	Phase in/out
Terminal	5	Phase in/out
Terminal	8	Phase in/out
Terminal	11	Neutral in/out

E600 direct connected meters are equipped with voltage hooks for testing and verification purposes. It is possible to separate the voltage and current circuits from each other for the purpose of verifications by opening the voltage hooks.

11.2 Connection diagrams

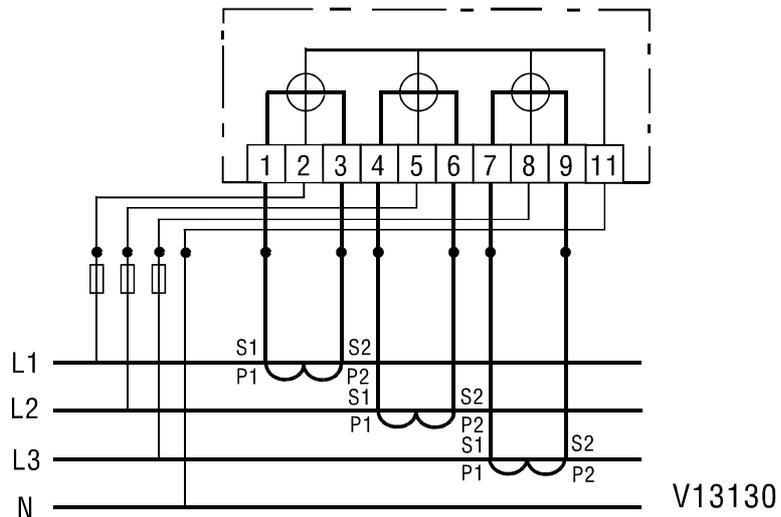Connection diagrams are printed under the meter's terminal cover.
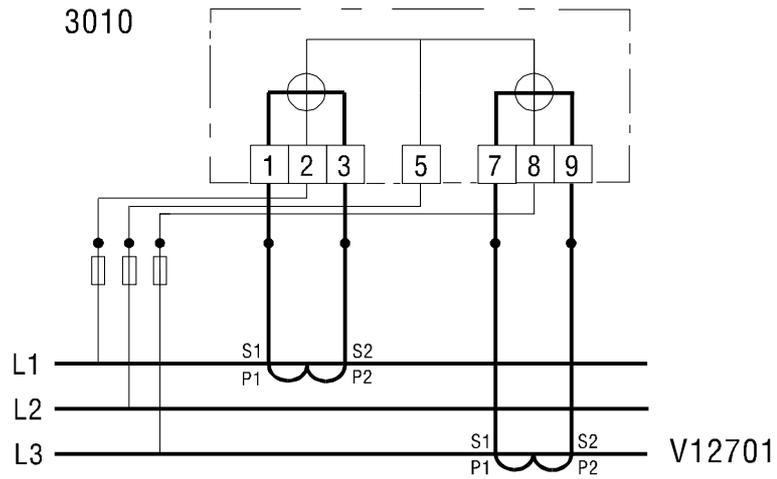

Figure 10. Connections for E600, 3-system V-type meter

Figure 11. Connections for E600, 2-system V-type meter
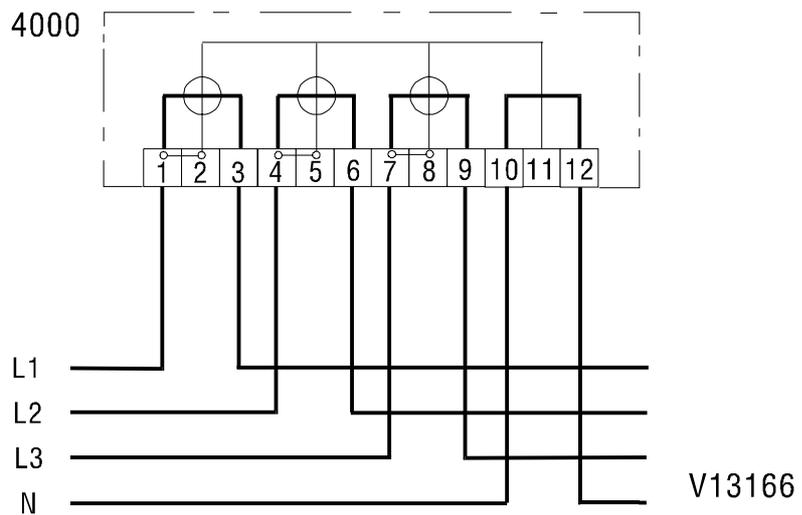

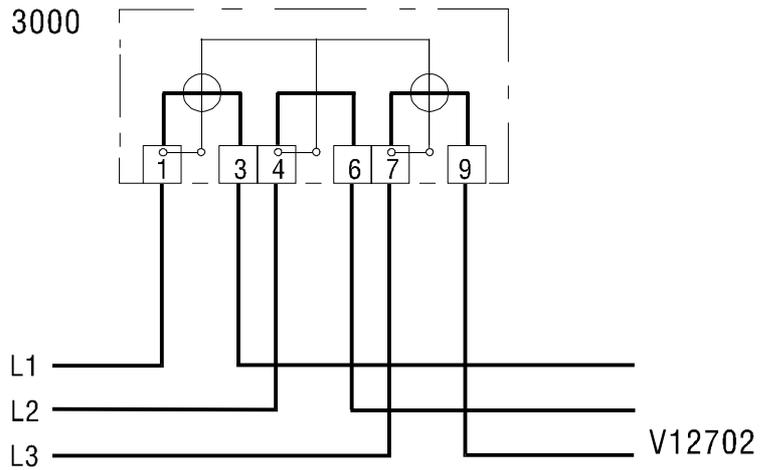**Figure 12. Connections for E600, 3-system direct connected meter**

Figure 13. Connections for E600, 2-system direct connected meter

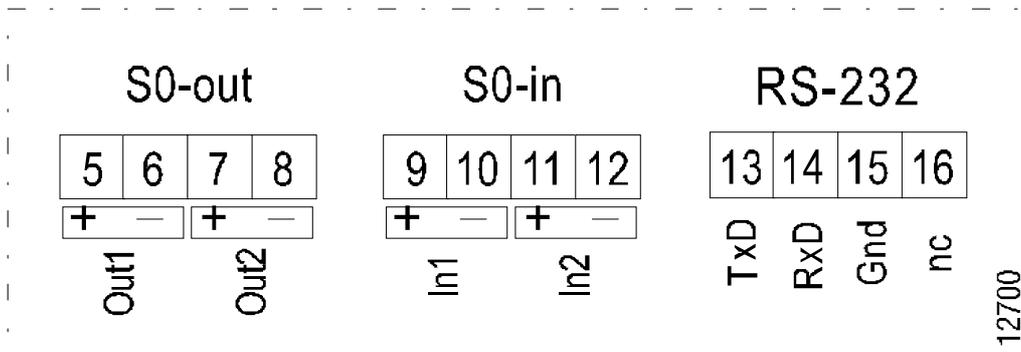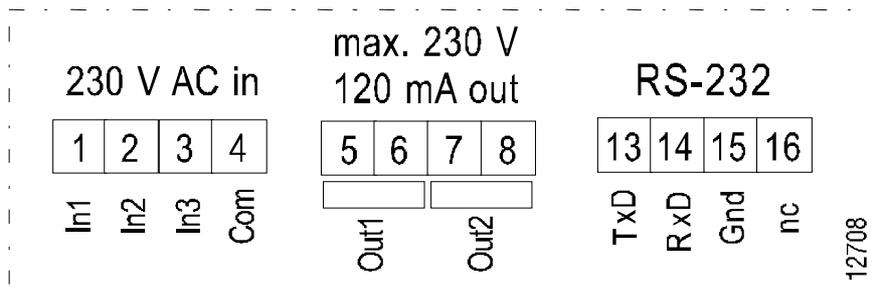**Figure 14. Connections for i2p2rs232 option**

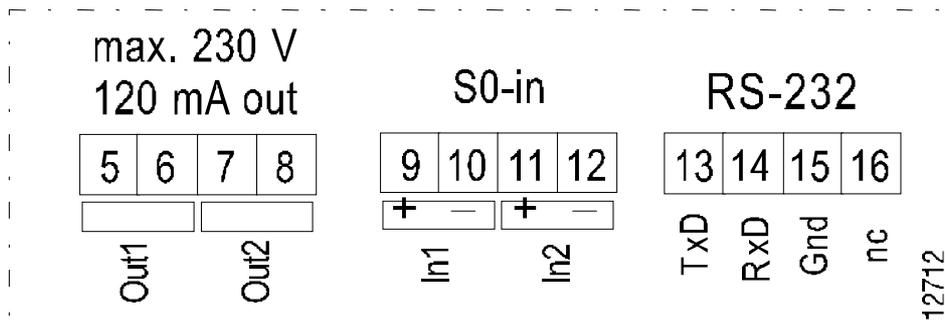**Figure 15. Connections for I3P2rs232 option**
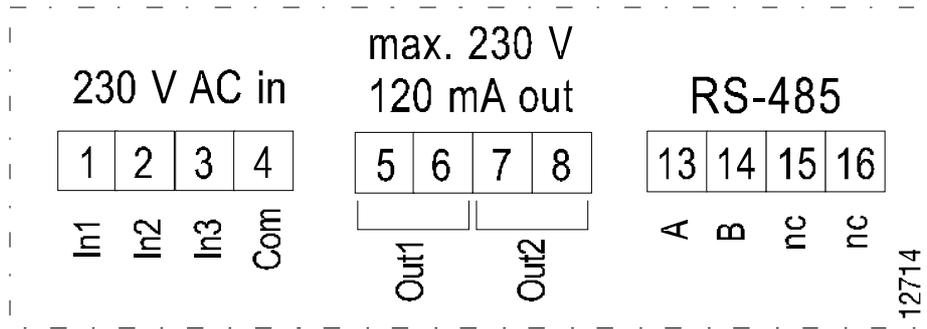
Figure 16. Connections for i2P2rs232 option

Figure 17. Connections for I3P2rs485 option

Note!

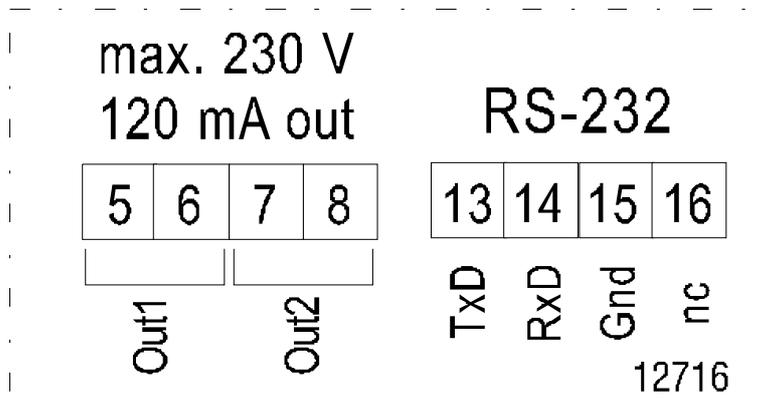**Use only one phase voltage (L1, L2 or L3) for all high voltage (230V) inputs (1, 2 and 3).**
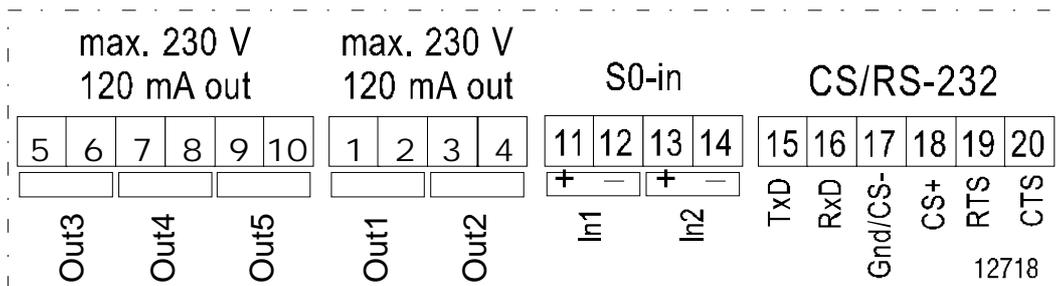

Figure 18. Connections for P2rs232 option
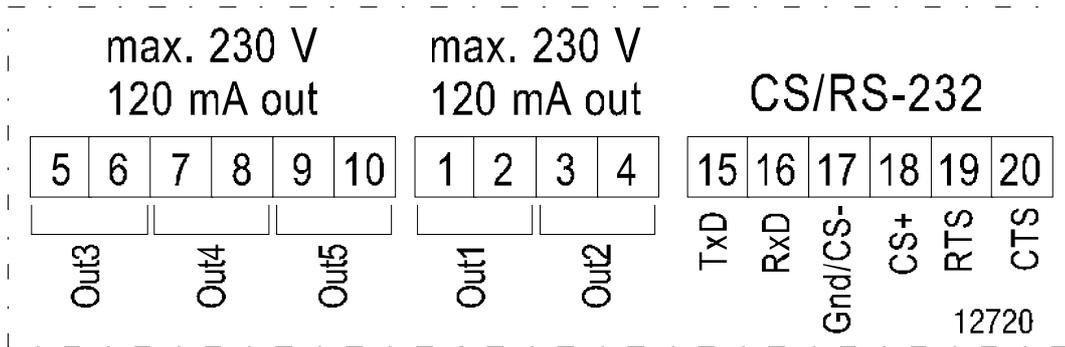

Figure 19. Connections for i2P5CS/rs232

max. 230 V
120 mA out

5	6	7	8	9	10

Out3   Out4   Out5

max. 230 V
120 mA out

1	2	3	4

Out1   Out2

CS/RS-232

15	16	17	18	19	20

TxD   RxD   Gnd/CS-   CS+   RTS   CTS

12720

Figure 20. Connections for P5CS/rs232

230 V AC in

1	2	3	4

In1   In2   In3   Com

max. 230 V
120 mA out

5	6	7	8

Out1   Out2

S0-in

9	10	11	12

+ − In1   + − In2

RS-232

13	14	15	16

TxD   RxD   GnD   nc

12722
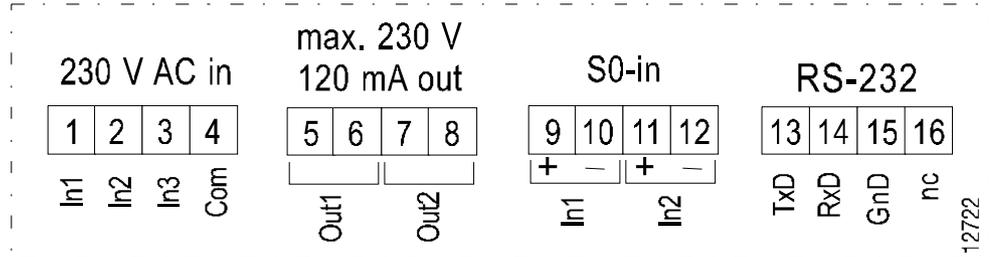
Figure 21. Connections for I3i2P2rs232

S0-in

9	10	11	12

+ − In1   + − In2

RS-232

13	14	15	16

TxD   RxD   Gnd   nc

12710
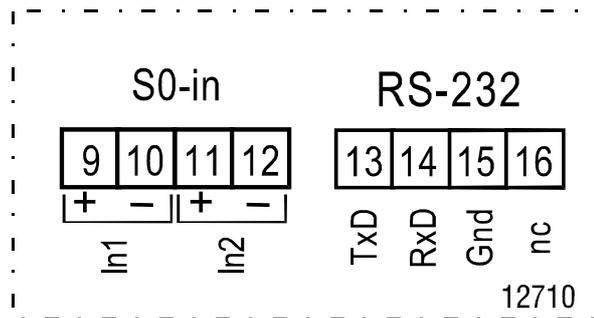
Figure 22. Connections for i2rs232

230 V AC in

1	2	3	4

In1   In2   In3   Com

max. 230 V
120 mA out

5	6	7	8

Out1   Out2

S0-in

9	10	11	12

+ − In1   + − In2

RS-485

13	14	15	16

A   B   nc   nc

12704
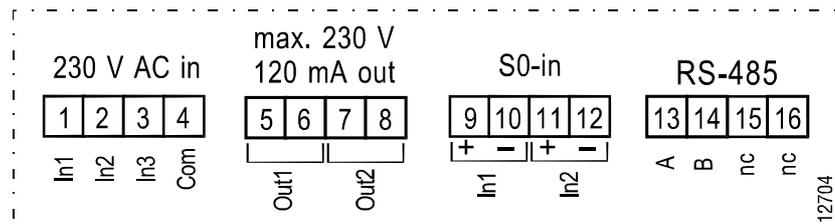
Figure 23. Connections for I3i2P2rs485

max. 230 V
120 mA out

5	6	7	8	9	10

Out3   Out4   Out5

max. 230 V
120 mA out

1	2	3	4	11	12

Out1   Out2   Out6

S0-in

13	14	15	16

+ − In1   + − In2

RS-232

17	18	19	20	21	22

TxD   RxD   Gnd   nc   RTS   CTS

12725

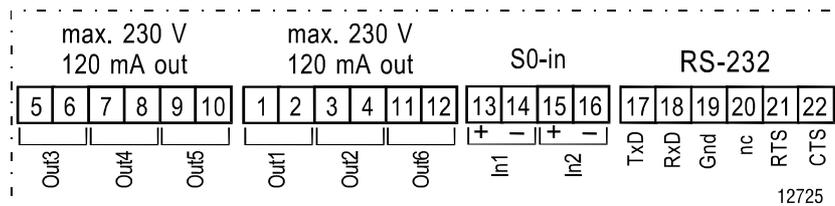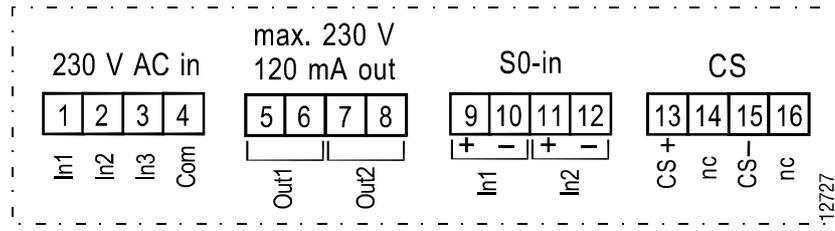**Figure 24. Connections for i2P6rs232**

Figure 25. Connections for I3i2P
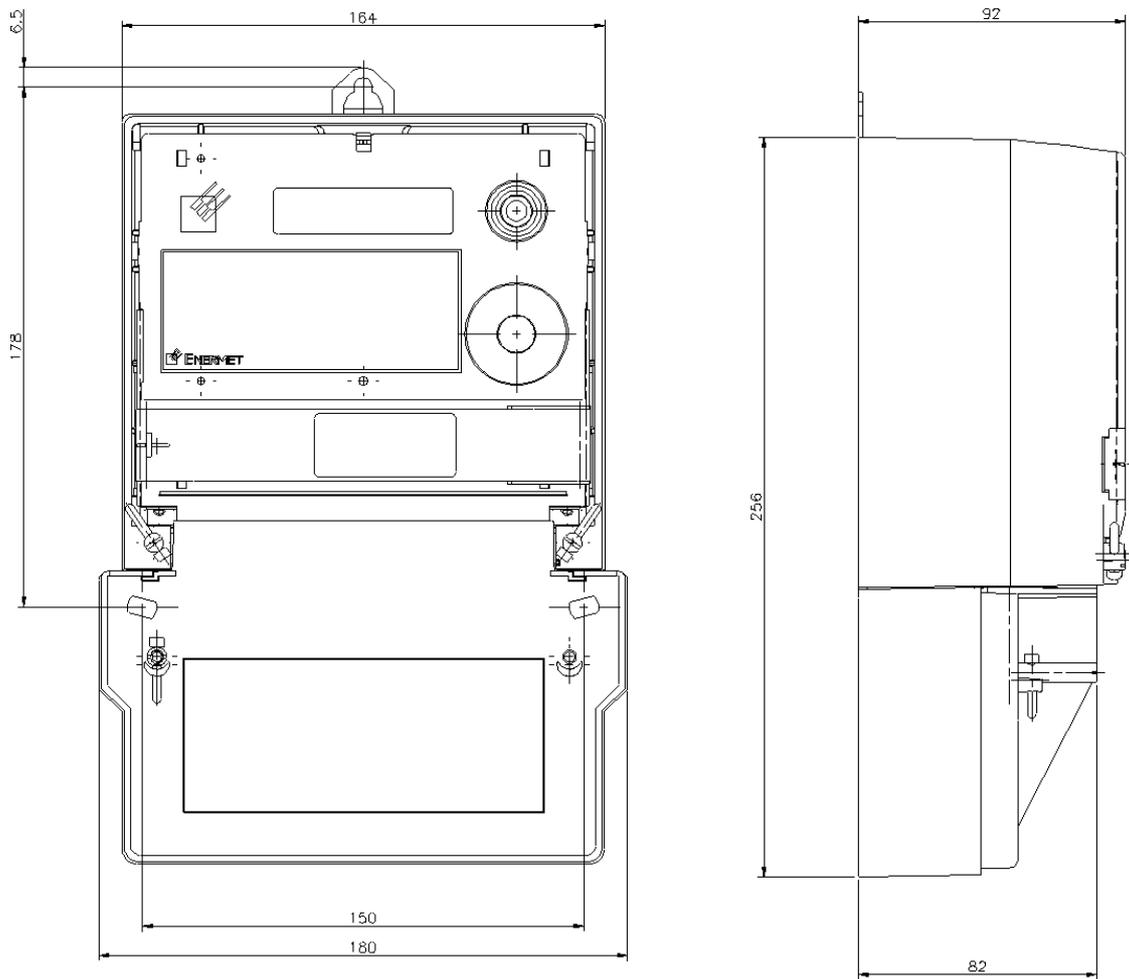
12 Dimensions
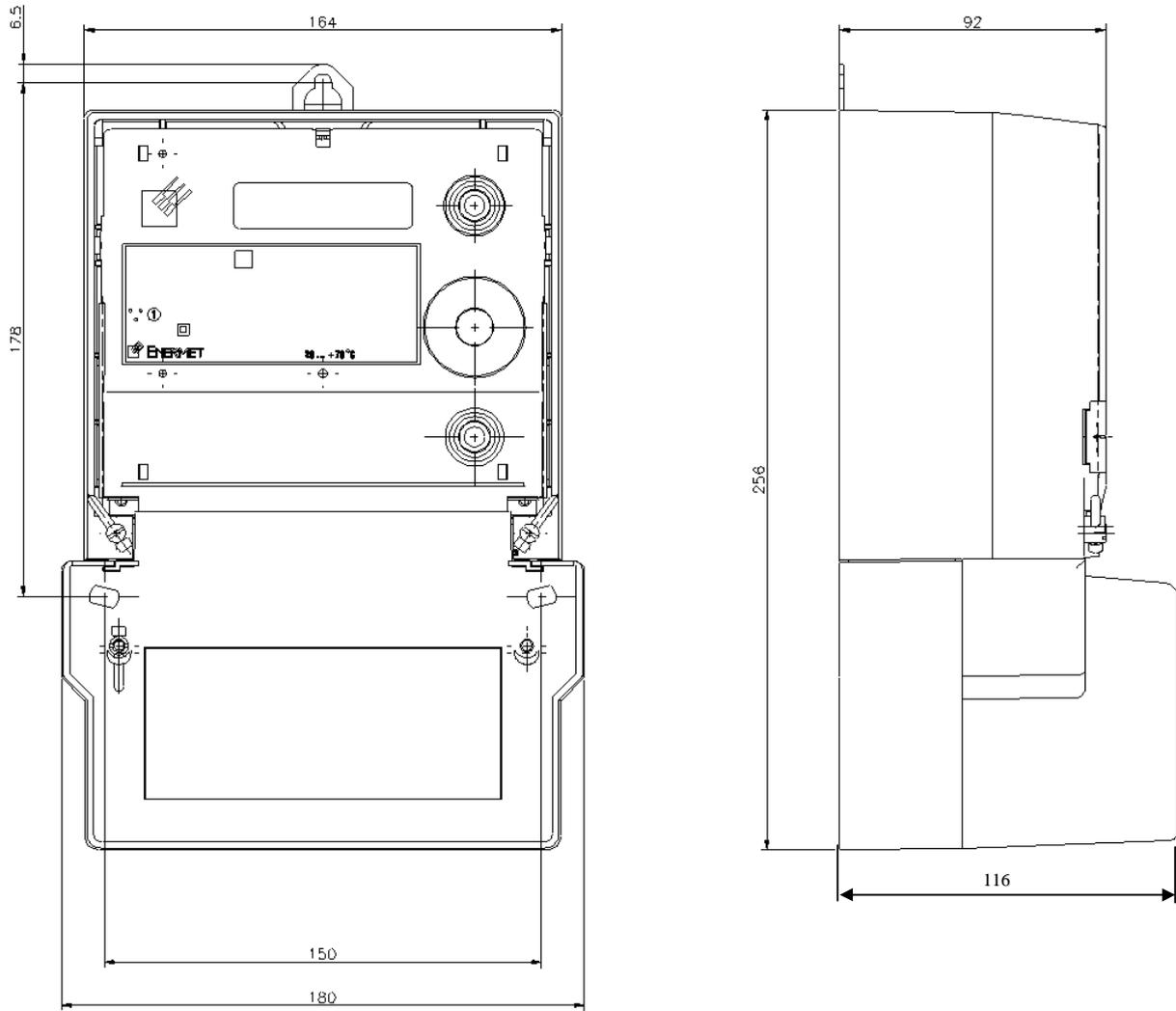

Figure 22. Dimensions of the E600 meter

Figure 23. Dimensions with the M100-G modem

13 Troubleshooting

13.1 Phase indication symbol is blinking

Phase symbols L1, L2 and L3 indicate electricity network's phase voltages. Phase symbols are shown with current date and time display item. The symbols are turned on when the corresponding phase voltages exist. The phase symbols also indicate various error situations, which are presented in Table 3.

Table 3. Error situations in phase indication

Phase indication	Meaning	Action
One phase symbol is blinking	Phase voltage is too high or too low	Check the operation of the electricity network and meter connections.
All phase symbols are blinking.	Wrong voltage phase order	Check the operation of the electricity network and meter connections.

13.2 Alarm message on display

An alarm message begins with the text Err and number sequence 001, 002, or 003. The number sequence tells in which section the error is detected:

- Err 001: application error

- Err 002: meter core error

- Err 003: measurement alarm (control of electricity network)

This number sequence is shown on the upper row of the display. An eight digit hexadecimal number is displayed on the lower row. To move to the submenu, make a medium press on the black push button. The submenu shows plain text error message(s) equivalent to the hexadecimal error code.

Tables 4 – 6 show the hexadecimal error codes as well as the equivalent, plain text error message texts. If several errors are detected at a time, the error code is the sum of individual error codes. The tables also describe the meaning of the error messages. In addition, some advice is given about what to do if an error message appears on the LCD.

The meter enters the detected changes and failures to its internal event log (for example, power failures). Use the E600UI to define the type and number of events entered and saved in the log, and to read the event log. You can also view the logs on the LCD in coded form.

Table 4. Err 001: Application error codes and messages

Application error	Error code on LCD	Error message on LCD	Meaning
Bit number	Hex		
4	0008	WATCHDOG	Watchdog has caused a reset
6	0020	TIME ERROR	Error in real time, e.g. duration of a power break has exceeded the guaranteed backup time of the real time clock or an attempt to adjust time over limits. In this situation the time may be erroneous.
9	0100	MEM ERROR CODE	Checksum error in code memory
11	0400	MEM ERROR EEPROM	Checksum error in non-volatile memory (EEPROM)
14	2000	HARDWARE ERROR	Application hardware error
16	8000	OUTPUT OVERFLOW	Pulse output overflow or underflow
17	10000	CORE MEM WRITE	Memory error between application and core
18	20000	CORE CONF WRITE	Memory error between application and core

In case of real time error (bit number 6, code 0020), update the unit's time or if that does not solve the problem, deliver the meter to Enermet for maintenance.

In case any other of the error messages presented in the Table 4 appear on the display, deliver the meter to Enermet for maintenance.

Table 5. Err 002: Meter core error codes and messages

Meter core error	Error code on LCD	Error message on LCD	Meaning
Bit number	Hex		
1	0001	EEPROM RESET	Non-volatile memory (EEPROM) was initialised.
2	0002	MEM ERROR EEPROM	Checksum error in non-volatile memory (EEPROM)
3	0004	MEM ERROR RAM	Checksum error in volatile memory (RAM)
4	0008	MEM ERROR CODE	Checksum error in code memory
5	0010	ADC ERROR	A/D-converter operation fault

In case of an ADC error, check the operation of the electricity network and the meter's connections. One reason for ADC error can be that voltage or current exceeds the AD-converter's range. If voltages and currents are OK, but ADC error still appears, deliver the meter to Enermet for maintenance.

In case any other of the error messages presented in the Table 5 appear on the display, deliver the meter to Enermet for maintenance.

Table 6. Err 003: Measurement alarm codes and messages

Measurement alarm	Error code on LCD	Error message on LCD	Meaning
Bit number	**Hex**		
1	0001	MSSING VOLT. L1	No phase voltage (phase L1 missing)
2	0002	MSSING VOLT. L2	No phase voltage (phase L2 missing)
3	0004	MSSING VOLT. L3	No phase voltage (phase L3 missing)
4	0008	LOW VOLTAGE L1	Low phase voltage (phase L1)
5	0010	LOW VOLTAGE L2	Low phase voltage (phase L2)
6	0020	LOW VOLTAGE L3	Low phase voltage (phase L3)
7	0040	HIGH VOLTAGE L1	High phase voltage (phase L1)
8	0080	HIGH VOLTAGE L2	High phase voltage (phase L2)
9	0100	HIGH VOLTAGE L3	High phase voltage (phase L3)
10	0200	VOLTAGE SEQUENCE	Wrong voltage phase order
12	0800	HIGH CURRENT L1	High phase current (phase L1)
13	1000	HIGH CURRENT L2	High phase current (phase L2)
14	2000	HIGH CURRENT L3	High phase current (phase L3)
15	4000	POWER FACTOR L1	Power factor out of range (phase L1)
16	8000	POWER FACTOR L2	Power factor out of range (phase L2)
17	10000	POWER FACTOR L3	Power factor out of range (phase L3)
			See more explanation below
18	20000	NO LOAD	No load

In case any of the error messages presented in the Table 6 appear on the display, check the operation of the electricity network and the meter's connections.

Power factor errors:
Typically a power factor error means that current wires are connected in a wrong way.

Power factor range causing alarm with 1-direction (import only) meter is for example –1.0…0.8 (you can configure the limits for export and for import using the E600UI). Thus a negative power factor causes alarm. Power factor range causing alarm with 2-direction (import and export of energy) must be configured to for example -0.8…0.8, otherwise export measurement causes false alarm. A 2-direction meter cannot detect wrong current flow automatically. You must check manually that all the power factors L1/L2/L3 are positive or negative.

ⓘ   In 2-system meters the following alarms are not used at all: No/low/high voltage L2, high current L2, wrong voltage phase order, power factor L1/L2/L3.

14 About this document

14.1 Revision History

Version	Date	Description
v. 3.10	March 17, 2005	Added chapter *About This Document*. Updates in several chapters: *2.3, 10.1, 11.2*. Updated Note-style.
v. 3.01	May 9, 2005	*2.3 I/O options*
v. 3.10	September 13, 2005	Updated the standards.

14.2 Typographical Conventions

The following typographical conventions are used throughout this document:

Font	Description
Courier	Font for file paths and code examples.
Bold	Font style used for menu items and buttons in user interface.
Italics	Font style for new terminology and for references to other documents or other parts within this document. For instance, for more information on the PDA features, please see *chapter 3*.
(i)	Symbol for additional information, hints and other important notifications.