P2P GPRS Metering Device Installation Guide

Version 1.9 A

Public

Contents

P2P GPRS Metering Device Installation Guide
Version 1.9
Saved 8.10.2009
Author JYl
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1   Aidon AMR metering device

The purpose of this document is to describe the installation procedure of Aidon AMR 5520, 5530 and 5550 meters, Aidon 5410 GPRS module, and Aidon 5830/5831 Circuit Breaker.

This document contains instructions for the physical installation of the meters, installation of the meter and module to the reading system, and the configuration of the system module.

1.1   Structure of the device

 The metering device consists of the meter, and a communication module. A circuit breaker can be attached as a part of the device.
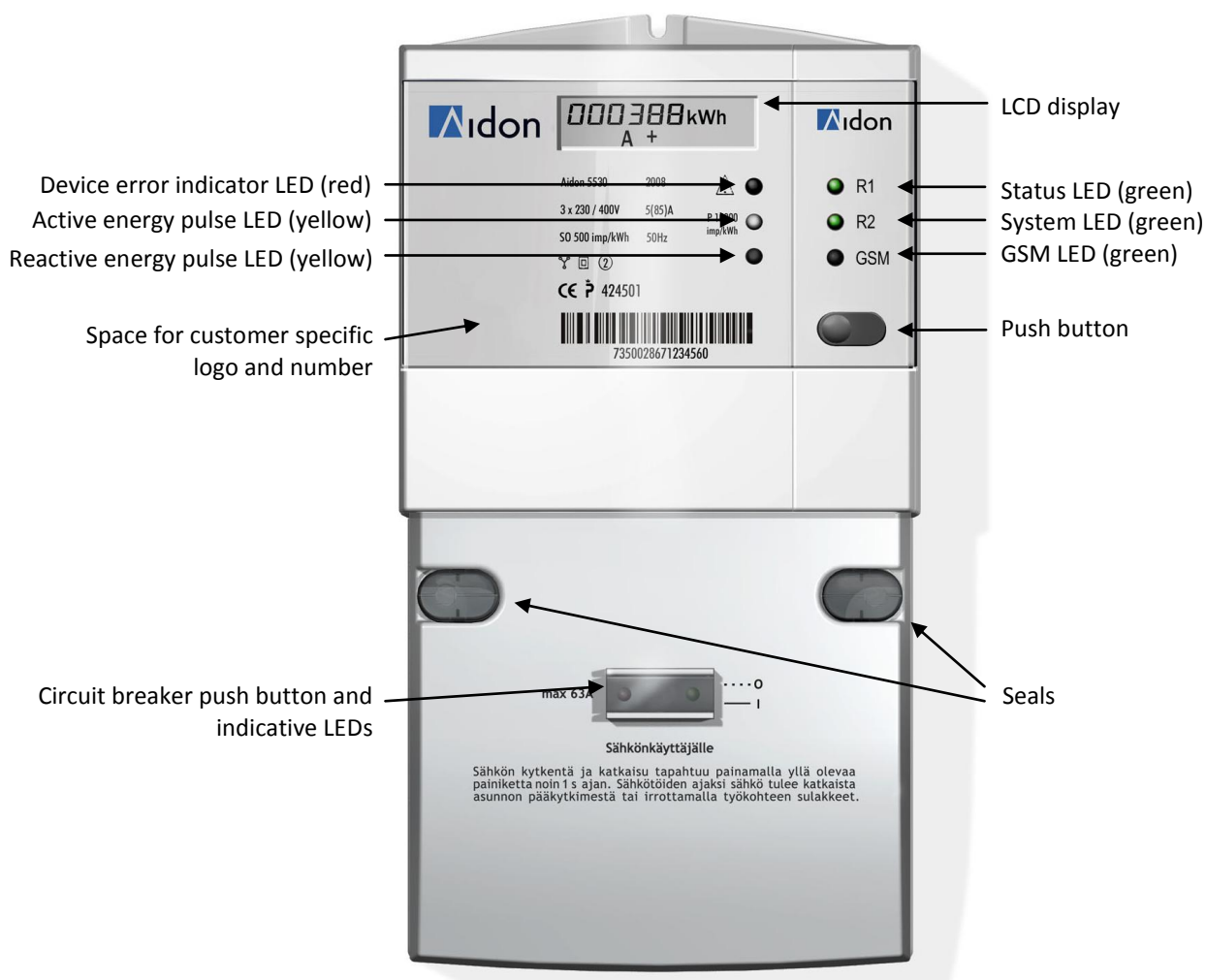
Picture 1: Aidon 5530 metering device equipped with the 5831 Circuit Breaker and 5410 system module.

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1.2   Serial numbering

Serial numbering of Aidon meters is done according to GIAI standard, which is defined by the GS1 organization (http://www.gs1.org). The standard guarantees that each serial number is a unique number. The first 15 digits form a consecutive number, and the last digit is a check sum. Example below:

735002867429017[7]; the check sum is 7
735002867429018[4]; the check sum is 4

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2 Physical installation of the metering device

The meter is designed to fit the M1 grille. The easiest way to install the device is to first attach the meter from the bottom part with two screws, and inserting the top screw last. The wires are peeled so that the part of the wire that goes into the connector has no covering. The wire has to be 20 – 30 mm inside the connector. In case that the wires will not otherwise fit under the terminal cover, the cover plate can be cut from the sides to ease the connection of the cables.

To ensure required tightness, please take notice of the following details:
- The end of the wire must not be twisted; a twisted wire must be straightened.
- After the first tightening, move and pull the wire and tighten again.
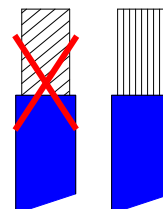
Device	Connectors	Tools
Meter 5520, 5530	Cable ≤25mm ² Connector Ø 8,5mm	Pozidriv 2 3,0 - 3,5 Nm
Meter 5540, 5550	Cable ≤25mm ² Connector Ø 8,5mm	Pozidriv 1 1,5 - 2,0 Nm
System module	Cable ≤2,5mm ² Detachable connector	
Circuit Breaker 5831	Cable ≤25mm ² Connector Ø 8,5mm	Pozidriv 2 3,0 - 3,5 Nm

The system module is located on its position beside the meter. When necessary, the module can be detached. The module is detached by lifting the lower part first and the upper part last. The module is fastened again by positioning the upper part of the module first, and then pressing the lower part on its location. A SIM card has been attached to the GPRS module at the Aidon logistics center.

2.1 Installation environment

The measuring device can be used both indoors and outdoors. The operative temperature range for the meter is -40 – +60 °C, and for the LCD -20 – +55 °C. The metering device is installed to a moisture proof locker. Direct sunlight towards the device has to be avoided.

2.2 Sealing

The sealing can be done by using the Aidon plastic seals or normal wire-seals. Aidon seals are located under the cover plate. The Aidon seals are designed to be used so that the Aidon logo is positioned on the top of the screw. Thus, the seal can be easily fractured with a screwdriver, in case there is a need to detach the cover plate.

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2.3   Device antenna

An external antenna should be always installed to a P2P device for GSM communication. To ensure stable and reliable communication the GSM/GPRS signal strength has to be better than -85dBm ('ooo'…'oooooo' on the device display).
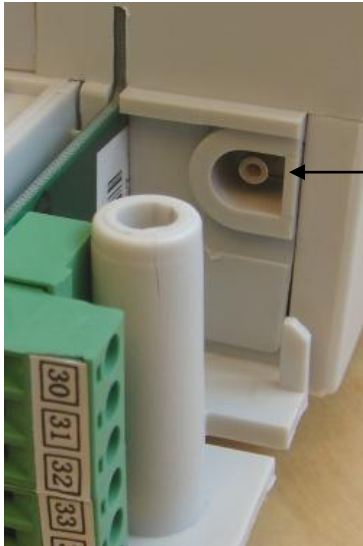
The antenna cable is connected to the SMB connector on the module card.

Picture 2: SMB connector for the antenna

 In case the device is installed to a metal cabinet or other similar to a Faraday cage like space, the antenna has to be brought outside the cabinet. The external antenna should be installed at least 20 cm apart from other antennas and electrical devices.

In this picture, the metering device is installed to the metal cabinet. The antenna is installed outside the cabinet.

Picture 3: Metal cabinet and an external antenna.

See attachment "LP900 antenna mounting instructions" for more detailed instructions for the antenna installation.

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3   Installation of the device to the reading system

Controlled by the core meter

All segments
GOOD
xxxV L1
xxxV L2
xxxV L3

1.

Controlled by the system module

INSTALLATION STATE

RUN
SIGNAL
oooooo

2.

INST 1   3.

INST 2   4.

INST 3   5.

INST 4 / *Time*   6.

Controlled by the system module

NORMAL STATE

RUN
Normal display

7.

Installation and registration to the system
Power up the meter

1. When the meter in connected to the electricity, the display first shows all of the segments, then the text 'Good', and then the voltage level of each phase.

GSM signal strength

2. The text 'Run' is shown, as the system module now controls the display. Next text 'Signal' is shown. Then the GSM signal strength is shown with dots ("oo"…"oooooo"). The signal strength is accepted with a push button press.

   • A sufficient GSM signal strength two dots, "oo".

SMS configuration

3. When the display shows the text 'INST 1', the module is ready to receive an SMS configuration message. If the SMS is not sent, the installation can be continued from Step 5 by a push button press.

4. When the display shows the text 'INST 2', the module has received and accepted the SMS configuration message. If necessary, it is possible to send a new SMS now, e.g. to repair an erroneous configuration. In this step it is also possible to read the meters configuration. Move on to the next step by pressing the push button.

Registering the device to the reading system and setting the system time

5. When the display shows the text 'INST 3', the module is sending a registration message to the reading system. The reading system sends a reply message for the device with system time and date.

6. When the display shows the text 'INST 4' and system time in turns, the module has successfully sent the registration message for the reading system and received the system time and date. The installation is accepted with a push button press. The metering device is now ready for use.

In case the communication with the reading system fails, the display shows the texts 'INST 4', error code, and 'no cloc'. See examples in chapter 2.6.

Normal state

7. The module starts again and begins the normal operation.

By pressing the push button for more than 3 seconds, the module boots up and the installation is not accepted. The installation starts again from Step 2.

The installation process can be restarted at any time by pressing the push button for more than 3 seconds.

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Controlled by the system module

INSTALLATION STATE

| RUN |
| SIGNAL | 1. |
| oooooo |

👉 ⬤

| INST 1 | 2. |
| INST 2 | 3. |

👉 ⬤

| INST 3 | 4. |

👉 ⬤

| INST 4 | 5. |
| No cloc |

👉 ⬤

Controlled by the system module

NORMAL STATE

| RUN |
| *Normal display* |

Installation without registering the device to the reading system

It is possible to install a device in such a way that it is not registered to the reading system in installation.

GSM signal strength

1. The text 'run' is shown, as the system module now controls the display. Next the GSM signal strength is shown with dots ("oo"…"oooooo"). The signal strength is accepted with a push button press.

   - "oo" is a sufficient GSM signal strength.

SMS configuration

2. When the display shows the text 'INST 1' the module is ready to receive an SMS configuration message. If the SMS is not sent, the installation can be continued from Step 4 by a push button press.

3. When the display shows the text 'INST 2', the module has received and accepted the SMS configuration message. If necessary, it is possible to send a new SMS now, e.g. to repair an erroneous configuration. In this step it is also possible to read the meters configuration. Move on to the next step by pressing the push button.

4. When the display shows the text 'INST 3', the module is sending a registration message to the reading system. Abort the device's installation to the reading system with a push button press.

5. The display now shows the texts 'INST 4' and 'no cloc' in turns. The installation is accepted with a push button press. The metering device is now ready for use.

By pressing the push button for more than 3 seconds, the module boots up and the installation is not accepted. The installation starts again from Step 1.

The installation process can be restarted at any time by pressing the push button for more than 3 seconds.

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3.1 Detecting errors in installation state
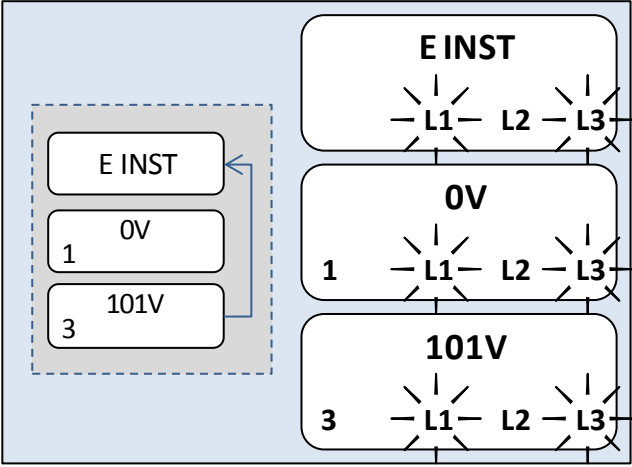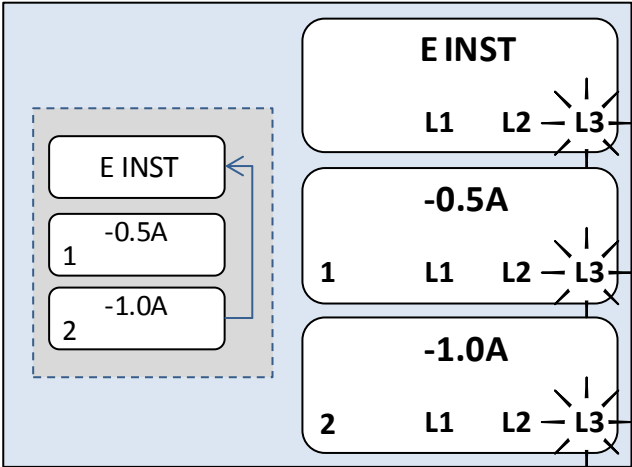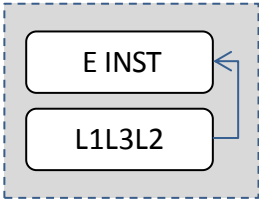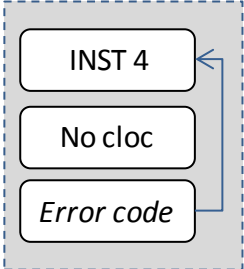
<table>
<tr><td>

Controlled by the core meter

All segments
Exx
xxxV L1
xxxV L2
xxxV L3

1.

Controlled by the system module

INSTALLATION STATE

RUN
E99

2.

</td><td>

Hardware fault

The core meter has detected a severe hardware error, e.g. memory fault.

1. In power up, core meter first shows all segments, and then the text 'Exx' (where the xx is the error code). After this the meter shows the voltage level of each phase.

    o The red HW error LED lights up on the meter.

2. The system module shows the text E99 on the meter's display. The installation should be discontinued and the device changed.

</td></tr>
</table>

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Controlled by the core meter

All segments		All segments
Exx		GOOD
xxxV L1	OR	xxxV L1
xxxV L2		xxxV L2
xxxV L3		xxxV L3

1.

Controlled by the system module

INSTALLATION STATE

RUN

E INST	**2.**
xxxV 1[2][3]	**3.**
L1L3L2	**4.**
-xxxA 1[2][3]	**5.**

👉 ⬤

| SIGNAL | **6.** |

…

Installation related errors

In case there are errors detected in the installation state:

1. In power up, core meter first shows all segments, and then the text 'Exx' (where the xx is the error code, see troubleshooting guide). After this the meter shows the voltage level of each phase.
   OR
   Alternatively, first all of the segments are shown, then the text 'Good', and then the voltage level of each phase.

The following messages are on the display, until the installation is accepted with a push button press:

2. 'E INST'

3. In case a phase is missing (<80% of 230V), it is indicated by a blinking 'Lx' text (where the x is the phase number), and measured voltage levels.

4. In case a rotation error is detected, the text 'L1L3L2' is displayed.

5. In case there are phase(s), which indicate produced energy instead of consumed, those phases and the measured negative current levels are displayed.

6. After the error is accepted with a push button press, the device continues to work in normal state.

3.2   Accepting the installation in case of an error

The installation can be accepted, even though there are errors detected in installation state. The device waits until the faulty installation is repaired or accepted with a push button press.

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3.3 Error situation examples

E INST L1 — L2 — L3 E INST 0V 1 101V 3 **0V** 1 — L1 — L2 — L3 **101V** 3 — L1 — L2 — L3	**Low voltage detected in two phases** The following information is shown in turns: • E INST • 0V (i.e. zero volts detected in phase one) • 101V (i.e. 101 volts detected in phase three) A missing phase (<80% of 230V) is indicated in all display views (L1/L2/L3), including the installation view and views during the normal usage. Note, that even if the voltage level is restored back to normal, the display rotates as in the beginning. For an example, if the voltage level in phase three raises back to 230V, the 'L3' flag stops blinking, but the voltage level is still shown for the phase 3.
E INST L1 L2 — L3 E INST -0.5A 1 -1.0A 2 **-0.5A** 1 L1 L2 — L3 **-1.0A** 2 L1 L2 — L3	**Reversed current** One or more phases indicate that energy is produced instead of consumed.
E INST L1L3L2	**Phase rotation error** Phases are not connected in the correct order L1-L2-L3. Note that in boot up, the display shows the text 'E05'.
INST 4 No cloc *Error code*	**No connection to reading system** In case, the module cannot establish a connection to the reading system in the installation state, the display shows the following texts in turns: 'INST 4', 'no cloc', and an error code. The installation can be either accepted, or started again with a long push button press.

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4   Error codes

E01   Watchdog activated
E02   Eeprom fault
E03   Metering circuit fault
E04   Corrupted data storage
E05   Rotation error

E260   The module fails to send a registration message to the reading system. It is likely that there is a problem with the GPRS connection. Restart the module by pressing the push button for 3 seconds, after which the signal strength is shown on the display again. Restart the installation procedure.

E12405   The module can establish a GPRS connection but does not get a reply from the reading system. Contact the system administrator. Make sure, that the device information can be found from the reading system. If necessary, report the metering point and the device information to the administrator. Restart the module by pressing the push button for 3 seconds, after which the signal strength is shown on the display. Restart the installation procedure.

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5 Configuration of Aidon 5410 module in installation state

The Aidon 5410 module has several configurable settings, which can be modified in the installation state if necessary. This chapter provides examples of the most common configuration messages, and descriptions of all the configurable parameters.

The configuration messages can be sent via a cell phone, in text message format (SMS). In addition to configuring new settings, the meters current settings can be read, and changed if necessary with a new configuration message. The text messages can be sent also with the Aidon SMS configuration tool.

5.1 Format of the configuration message

Upper and lower case letters (A to Z), numbers (0 to 9) and punctuation marks (, - . /) can be used in the settings. The message may be up to 160 characters long. Each line of the SMS has to end in a semicolon (;) and a line break, **excluding the last line**.

When sending the configuration message without the Aidon SMS configuration tool, note that on the first line, there always has to be a Meter ID. If the Meter ID is not on the first line, the device does not save the settings, or send an acknowledgement message.

Meter ID is used to identify the device in the reading system. Starting from serial number 7350028673768820 the Meter ID is formed by the eight (8) last digits of the serial number. Until the serial number 735002867373408, the Meter ID is formed by two zeros (00) and six (6) last digits of the serial number (for example 00373408).

5.2 Acknowledgement message sent by the module

After receiving a configuration message, the module replies with an acknowledgement message. This can be used to verify whether the settings were saved to the module successfully. If the saving of the sent configuration fails, an error code is included in the acknowledgement message, which can be used to examine the format and the content of the message.

The status codes in the module's acknowledgement message are described in the following table:

OK	The meter has received a configuration message, and the settings are saved successfully.
EINV	There is an error in the configuration message's settings. Please check the message format.
EML	Missing PIN code. Add a PIN code to the settings, and try to send the message again.
EPL	The meter's write protection is on and the configuration could not be saved. Please contact Aidon support.
EHW	The configuration could not be saved due to a hardware error. Please contact Aidon support.

In case the module does not send an acknowledgement message, please check the following details: The format of the SMS, Meter ID, and the phone number to which the message was sent. If all of the details above were correct, make sure that text message sending is allowed for the SIM card.

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5.3 Device installation, metering point setting

During installation, the most common SMS sent to a device, is used to define a metering point to which the device is installed. The 5410 module uses the message to establish a connection to the reading system to which the device is connected. The module sends a registration message for the reading system, by which the device is linked to a metering point in the reading system.

The format of the configuration message containing a metering point ID:

Device installation, metering point setting	
SMS format: <Meter ID> ; MP=<Metering point ID>	Example: 73768820; MP=73400007 Example: 00373408; MP=73400007
Acknowledgement message sent by the module	
SMS format: <Meter ID> <Status code>	Example: 73768820 OK

5.4 Device installation, repair message

In case the device has already successfully accepted a configuration message, a PIN code has to be included to the repair message in addition with the meter and metering point IDs. The PIN code is four zeros (0000). In case the PIN code is not added to the message, an **EML** error code will be included in the acknowledgement message sent by the meter.

The format of the repair message when setting the metering point ID again:

Device installation, repair message	
SMS format: <Meter ID>; MP=<Metering point ID>; PIN= <Pin code>	Example: 73768820; MP=73400007; PIN=0000
Acknowledgement message sent by the module	
SMS format: <Meter ID> <Status code>	Example: 73768820 OK

Note! The device's configuration cannot be changed with a configuration message after the meter has been on for two weeks, or one week after it has received a configuration message.

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5.5 Setting the current transformer ratio

The metering devices' current transformer ratio is 1/1 by default. If necessary the 5550 device's CT ratio can be changed during the installation with a configuration message (SMS).

The format of the configuration message is described in the following table:

Metering device installation, setting the current transformer ratio	
SMS format: <Meter ID>; MP=<Metering point ID>; CT=<Primary ratio/Secondary ratio>	Example: 73768820; MP=73400007; CT=100/5
The acknowledgement message sent by the module	
SMS format: <Meter ID> <Status code>	Example: 73768820 OK

5.6 Reading the module's configuration

A message to read the module's configuration	
SMS format: <Meter ID>; PIN= <Pin code>; READ	Example: 73768820; PIN=0000; READ
A reply message from the module	
SMS format: <Meter ID>; MP=<Metering point ID>; CT=<Primary ratio/Secondary ratio>; SIP= <Server IP address:Port>; APN= <GPRS access point name>	Example: 73768820; MP=73400007; CT=1/1; SIP=194.111.45.226:1000; APN=Internet

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5.7 All of the module's configurable settings

The following table describes all of the settings, which can be defined in a configuration message during the installation. The meter ID is mandatory. The other parameters can be defined if necessary. The existing setting will be preserved for the parameters which are not defined in the message.

Setting	Format	Restrictions	Mandatory
Meter ID	<Eight last digits of Meter ID> **or** <00 + six last digits of Meter ID> See chapter 5.1 for information.	Max 8 digits	Yes
Metering point ID	MP=<Metering point ID>	Max 40 characters	No
Current transformer ratio	CT=<Primary ratio/Secondary ratio>	Digits from 1 – 65535	No
Access point	APN=<apn>	--	No
Server IP and Port	SIP=<ip address:port>	Has to be in format x.x.x.x:xxxx	No
PIN code	PIN=<Pin code>	4 digits	No
No acknowledgement	NOACK	No acknowledgement message	No
Read configuration	READ	Configuration message has to include meter ID, PIN code and READ command.	No

The following table describes the configuration message format in general:

Device installation, all the parameters listed	
SMS format: <Meter ID>; MP=<Metering point ID>; CT=<Primary ratio/Secondary ratio>; SIP= <Server IP address>:<Port>; APN= <GPRS access point name>; PIN=<PIN>; NOACK; READ	Examples of messages: 73768820; MP=73400007; CT=100/5 73768820; SIP=194.111.45.226:1000; APN=internet 73768820; PIN=0000; READ
Acknowledgement message sent by the module	
SMS format: <Meter ID> <Status code>	Example: 73768820 OK

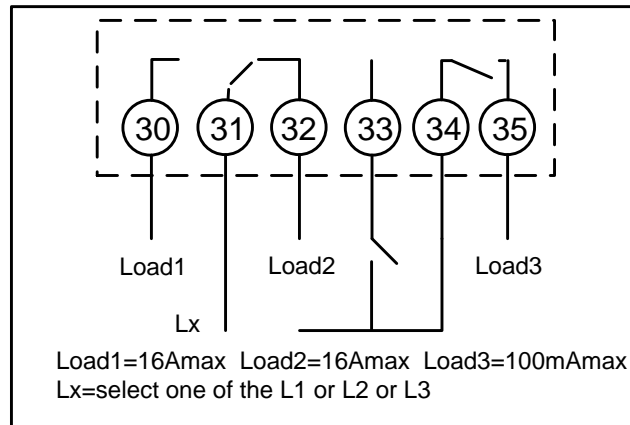Note that each line of the SMS has to end in a semicolon (;) and a line break, excluding the last line.

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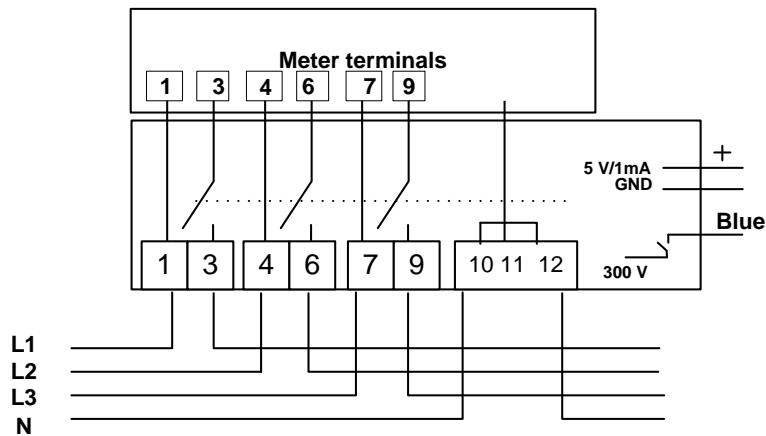Version 1.9
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Appendix A: Connection diagrams

3-phase metering device connection diagrams

5520

5530

5540

5550

P2P GPRS Metering Device Installation Guide
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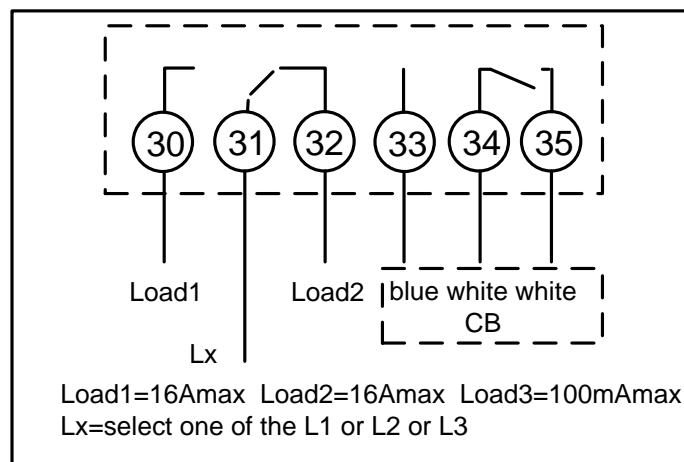Copyright © 2009-2010 Aidon Ltd.

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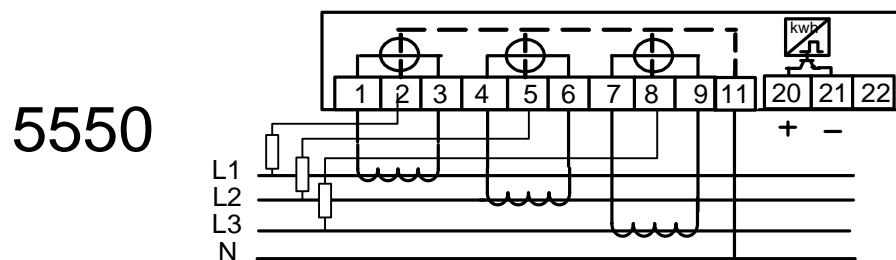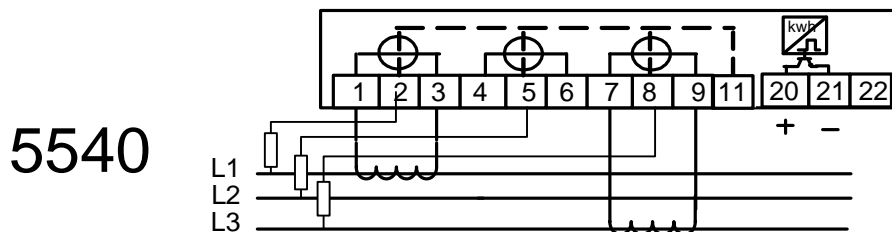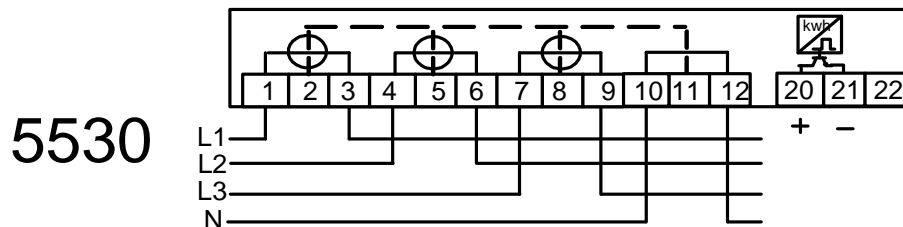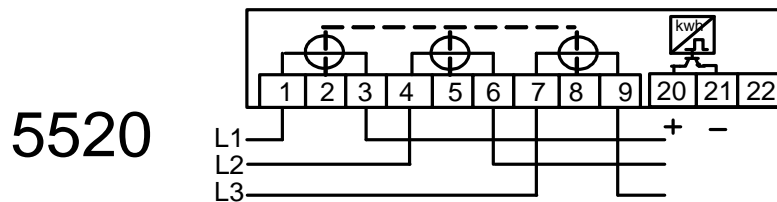
5410 System Module connection diagram

Load1   Load2   Load3

Lx

Load1=16Amax Load2=16Amax Load3=100mAmax
Lx=select one of the L1 or L2 or L3

5831 Circuit Breaker connection diagram

Meter terminals

1   3   4   6   7   9

5 V/1mA   +
GND

Blue

1 3 4 6 7 9 10 11 12   300 V

L1
L2
L3
N

5410 System module and 5831 Circuit Breaker connection diagram

Load1   Load2   blue white white
                          CB
Lx

Load1=16Amax Load2=16Amax Load3=100mAmax
Lx=select one of the L1 or L2 or L3

Appendix B: Circuit Breaker's LEDs

	The green LED is on. The power is on.	
	The green LED is blinking. Device is enabled, and the power is off. The electricity can be connected by pressing the Circuit Breaker push button.	
	The Circuit Breaker is not powered. • The main switch is off • Blown main fuse • Power cut	
	The red LED is blinking. Device is disabled, and the power is off. Electricity can be reconnected only by the controlling device.	
	The red LED is on, and the green LED is blinking. Device error detected. The power is off.	
	Both of the LEDs are on. Device error detected. The power is on.	
	The red LED is on. Device error detected. The power is disconnected (disabled state).	

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Appendix C: Customer displays

The following table contains examples of different customer display sequences. The sequences are configurable, and therefore may differ between customers.

5530 1-tariff	5530 2-tariff	5550
A+ → Time → Date (loop)	T1 → T2 → Active tariff → Time → Date (loop)	A+ → R+ → R- → T1 → T2 → Active tariff → Time → Date (loop)

5530 1-tariff

Long push button press
> 5 sec

SIGNAL → ooo

GSM signal strength:
Max: oooooo
Min: o
No signal: -