C13
User Manual

ABB

C13

User Manual

Document ID: 2CMC486004M0201

Revision: D

2020-10-01

Chapter 1: About this Manual

Overview

This chapter describes the conventions used in this manual. It also contains explanations and definitions of terms and definitions that are used in the document.

In this chapter

The following topics are covered in this chapter:

1.1 Conventions Used in this Document

Symbols   This document contains warning, caution, note and tip icons that point out safety related conditions and other important or useful information.

Symbol	Description
	The electrical warning icon indicates the presence of a hazard which could result in electrical shock.
	The caution icon indicates important information or a warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.
	The note icon alerts the reader to important facts and conditions.
	The tip icon gives the reader useful information related to the concept discussed in the text.

Chapter 2: Product Overview

Overview This chapter describes the parts of the meter. It also contains information about the meter type.

In this chapter The following topics are covered in this chapter:

2.1 Meter Parts

Illustration   The parts of the meter are shown in the illustration below:
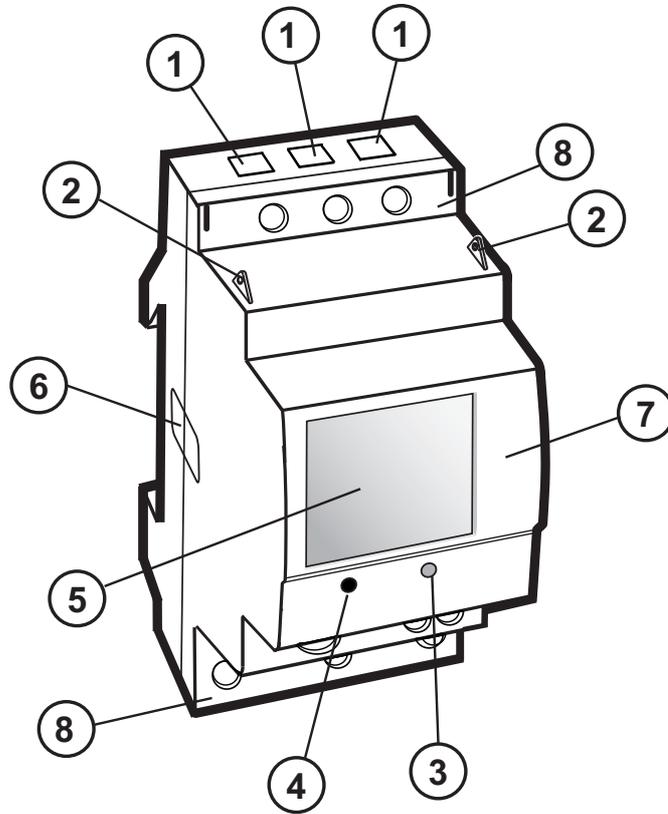
Parts description   The following table describes the parts of the meter:

Item	Description	Comments
1	Terminal for output connections	
2	Sealing points	
3	Push button	For programming and reading metering data
4	LED	Flashes in proportion to the energy measured
5	Display	LCD for meter reading
6	Sealing label	
7	Product data	
8	Terminal block	

2.2   Meter Type

C13 meter   The C13 is a compact meter for 3-phase metering. The meter is direct connected for currents up to max. 40 A.

Product label   The meter type information that is reflected on the product label is shown in the example picture below:
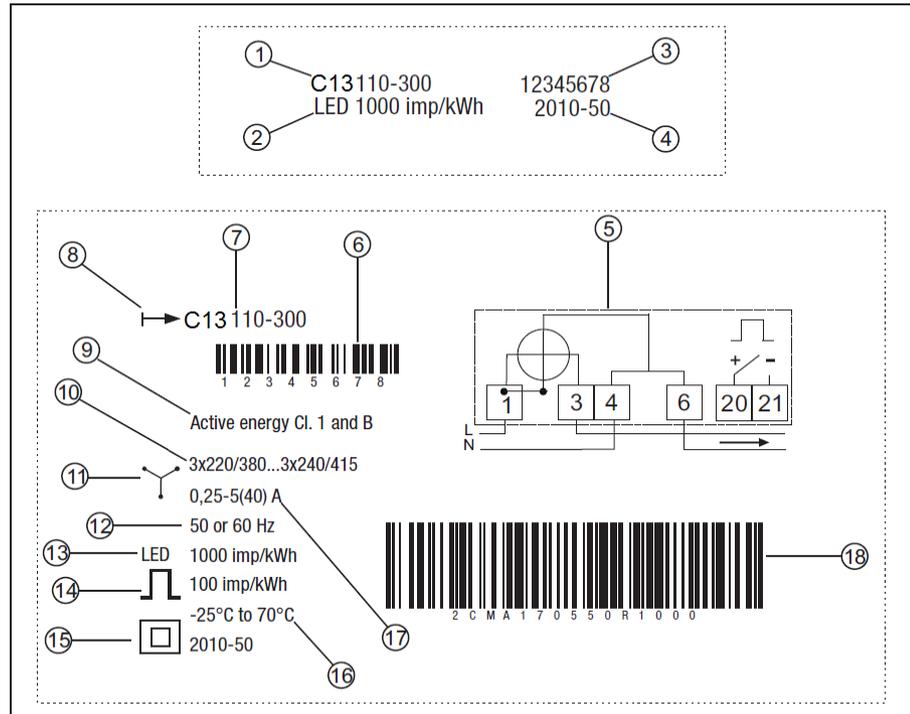
Label information   The information on the type label is explained in the table below:

Item	Description
1	Type designation
2	LED pulse frequency
3	Serial number
4	Manufacturing date (year and week)
5	Wiring diagram
6	Bar code with serial number
7	Type designation
8	Energy import
9	Accuracy (active energy)
10	Nominal voltage
11	3-element metering

Item	Description
12	Frequency
13	LED pulse frequency
14	Pulse frequency
15	Protection class II
16	Operating temperature range
17	Rated current
18	ABB ID

Chapter 3: Installation

Overview

This chapter describes how to mount the C13 meter and how to connect it to an electricity network.

In this chapter

3.1   Mounting the Meter

General   This section describes different ways to mount the C13 meter. For some methods of mounting, additional accessories are needed. For further information about accessories, refer to Main Catalog (2CMC481003C0201).

DIN-rail mounted   The C13 meters are intended to be mounted on a standard (DIN 50022) DIN-rail. If this method of mounting is used no extra accessories are needed and the meter is fastened on the rail by snapping the DIN-rail lock onto the rail.

Wall mounted   The recommended way to mount the meter on a wall is to mount a separate DIN-rail on the wall and then mount the meter on the rail.

Standard DIN-rail   The following picture shows a standard DIN-rail.
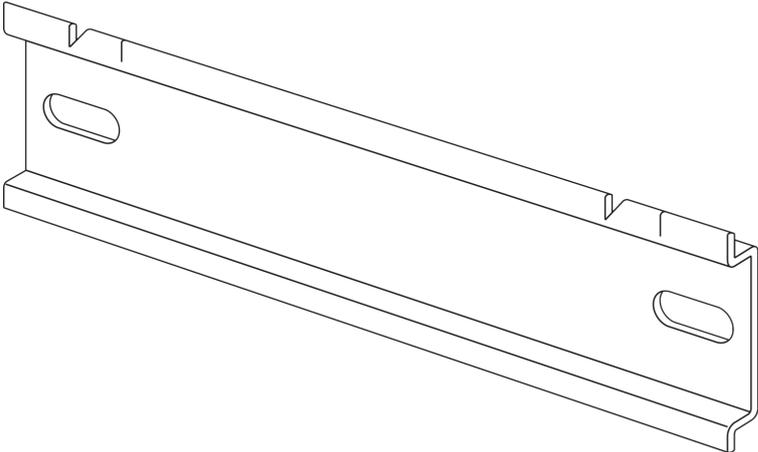
3.2   Environmental Considerations

Ingress protection

To comply with the protection requirements the product must be mounted in protection class **IP 51** enclosures, or better, according to **IEC60259**.

Mechanical environment

In accordance with the Measuring Directive **(2014/32/EU)**, the product complies with **M1**, which means that it can be operated in "...locations with vibration and shocks of low significance, e.g. for instruments fastened to light suporting structures subject to negligible vibrations and shocks transmitted from local blasting or pile-driving activities, slamming doors, etc."

Electromagnetic environment

In accordance with the Measuring Directive **(2014/32/EU)**, the product complies with **E2**, which means that it can be operated "...in locations with electro magnetic disturbances corresponding to those likely to be found in other industrial buildings."

Climatic environment

In order to work properly the product should not be operated outside the specified temperature range of -25°C – +70°C.

In order to work properly the product should not exposed to humidity exceeding the specified 75% yearly average, 95% on 30 days/year.

3.3   Installing the Meter

Warning – Electrical equipment should only be installed, accessed, serviced and maintained by qualified electrical personnel.

Working with high voltage is potentially lethal. Persons subjected to high voltage may suffer cardiac arrest, burn injuries, or other severe injuries. To avoid such injuries, make sure to disconnect the power supply before you start the installation.

Warning – For safety reasons it is recommended that the equipment is installed in a way that makes it impossible to reach or touch the terminal blocks by accident.

The best way to make a safe installation is to install the unit in an enclosure. Further, access to the equipment should be limited through use of lock and key, controlled by qualified electrical personnel.

Warning – The meters must always be protected by fuses on the incoming side.

In order to allow for maintenance of transformer rated meters, it is recommended that there should be a short circuiting device installed near the meter.

Installation requirements

To comply with the protection requirements the meter must be mounted in protection class IP 51 enclosures, or better, according to IEC 60259.

Meters with wireless communication should not be installed closer than 20 cm from people.

Install the meter

Follow the steps in the table below to install the meter:

Step	Action
1	Switch off the mains power.
2	Place the meter on the DIN-rail and make sure it snaps onto it.
3	Strip the cable insulation to the length that is indicated on the meter.
4	Connect the cables according to the wiring diagram that is printed on the meter and tighten the screws (0.8 Nm).
5	Install the circuit protection (max 40 A).
6	Connect the output to an external power supply (max 5–40 V). See the wiring diagram printed on the meter.
7	Turn on the mains power.

Verify the installation

The C13 meter has a red LED next to the push button on the front of the meter that flashes proportionally to the active energy. The LED has a fixed pulse frequency of 1000 imp/kWh and can be used to test and verify the installation. If the LED flashes when the mains power is turned on, the installation was successful.

3.3.1 Wiring Diagrams

4-wire connection The following diagram shows a 4-wire connection of a direct connected 3-phase meter:
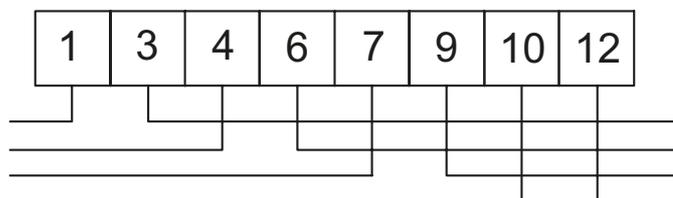
3.3.1.1 Outputs

Fixed, 1 output

Installation
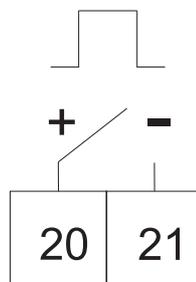
Chapter 4: User Interface

Overview

This chapter gives an overview of the display and of the functions of the button on the meter.

In this chapter

The following topics are covered in this chapter:

4.1 Display and buttons

Display

The display consists of icons, digits and letters. The measured value/menu options are displayed with large letters. The measured unit is displayed on the bottom-right side of the display, and the status icons are displayed at the upper part of the display, see figure below.
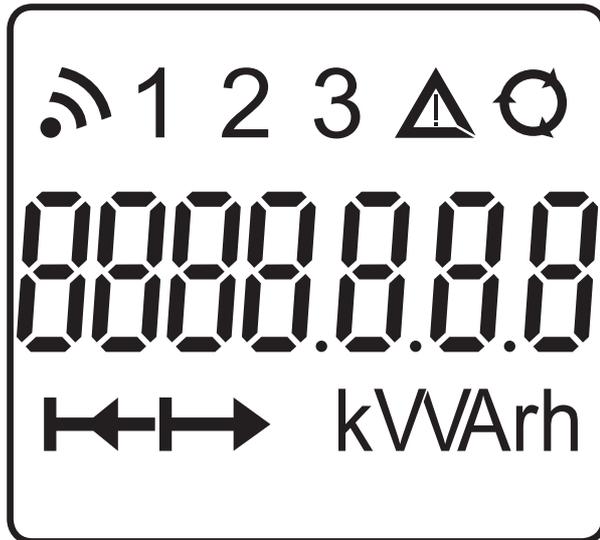
Status Icons

The status icons are shown in the table below.

Icon	Indication	Comment
⚠	Active error	When a error has been detected, the icon will be lit on the display. When no error has been detected, the icon will be turned off.
↻	Metering in progress.	When a load is connected to the meter, the icon will flash to indicate metering. When no load is connected, the icon will be turned off.

Button

The meter has one push button which is located below the display. A short press on the button (less than 1 sec) will step through the menu/submenu. A long press (more than 1 sec) followed by a release of the button will open the set menu or select an item in the menu.

4.2   Menu Structure

Overview   This section will give an introduction to the menu structure.

Menu structure   The menu structure of the meter can be viewed in the following figure

View menu → Set menu ┌→ Select function   Set alarm

- Active energy   Alarm power

- Active energy   Alarm voltage, L1   Alarm level
  max resolution - Output ←   on
              - Exit   Alarm voltage, L2
                                                        Alarm on
- Active power,   Alarm voltage, L3   delay
  total
                         Alarm current, L1
- Active power, L1   Alarm level
                         Alarm current, L2   off
- Active power, L2
                         Alarm current, L3   Alarm off
- Active power, L3   delay
                         Alarm power factor
- Voltage, L1   Save

- Voltage, L2   ── Pulse output

- Voltage, L3

- Current, L1   ── Out on

- Current, L2   Exit

- Current, L2   ── Out off

- Power factor

- Output state   ── Exit

- Version

- CrC

- Error

Navigation   To navigate in the menu, use the short press to navigate between the different
                      menu items, and the long press to select a menu item. When performing settings,
                      the short press is used to change the value of a specific setting, and the long press
                      is used to toggle between different digits.

View menu   In the view menu, the following choices can be made.

Choice in menu	Output on display	No. of digits	No. of decimals	Unit	Min. value	Max. value
Active energy	<numerical value> kWh	7	0	kWh	0	9999999

Choice in menu	Output on display	No. of digits	No. of decimals	Unit	Min. value	Max. value
Active energy max resolution	\<numerical value\> Wh	6	3	Wh	0	999.999
Active power Total	\<numerical value\> W	5	0	W	0	99999
Active power Phase 1	\<numerical value\> W	5	0	W	0	99999
Active power Phase 2	\<numerical value\> W	5	0	W	0	99999
Active power Phase 3	\<numerical value\> W	5	0	W	0	99999
Voltage Phase 1	\<numerical value\> V	3	0	V	0	999
Voltage Phase 2	\<numerical value\> V	3	0	V	0	999
Voltage Phase 3	\<numerical value\> V	3	0	V	0	999
Current Phase 1	\<numerical value\> A	3	1	A	0	99.9
Current Phase 2	\<numerical value\> A	3	1	A	0	99.9
Current Phase 3	\<numerical value\> A	3	1	A	0	99.9
Power factor	\<numerical value\>	4	3	N/A	0	1
Output state						
- Alarm on, or	AL On	N/A	N/A	N/A	N/A	N/A
- Alarm off, or	AL OFF	N/A	N/A	N/A	N/A	N/A
- Output on, or	OUtOn	N/A	N/A	N/A	N/A	N/A
- Output off, or	OUtOFF	N/A	N/A	N/A	N/A	N/A
- Pulse out	PULOUt	N/A	N/A	N/A	N/A	N/A
Firmware version Part 1	N/A	3	N/A	N/A	1	255
Firmware version Part 2	N/A	3	N/A	N/A	0	255
Firmware version Part 3	N/A	3	N/A	N/A	0	255

Choice in menu	Output on display	No. of digits	No. of decimals	Unit	Min. value	Max. value
CRC Part 1	N/A	4	N/A	N/A	0000	FFFF
CRC Part 2	N/A	4	N/A	N/A	0000	FFFF
Error	Er <numerical value>	4	N/A	N/A	N/A	N/A

Set menu

The set menu is used to set different options in the meter. The set menu is reached by using the long press when located in the view menu. The following choices are available in the set menu, see table below.

Choice in menu	Output on display
Output	SEt OUt
Exit	EH it

Set alarm menu

When choosing Exit, the menu will return to the view menu. When choosing Output, the following choices will be available.

Choice in menu	Output on display	Explanation
Alarm power	AL P VV	By choosing this option, the alarm will be set with regards to the measured power.
Alarm voltage	AL U L1 V	By choosing this option, the alarm will be set with regards to the measured voltage on Phase 1.
Alarm voltage	AL U L2 V	By choosing this option, the alarm will be set with regards to the measured voltage on Phase 2.
Alarm voltage	AL U L3 V	By choosing this option, the alarm will be set with regards to the measured voltage on Phase 3.
Alarm current	AL C L1 A	By choosing this option, the alarm will be set with regards to the measured current on Phase 1.
Alarm current	AL C L2 A	By choosing this option, the alarm will be set with regards to the measured current on Phase 2.
Alarm current	AL C L3 A	By choosing this option, the alarm will be set with regards to the measured current on Phase 3.

Choice in menu	Output on display	Explanation
Alarm power factor	AL PF	By choosing this option, the alarm will be set regarding to the measured power factor.
Pulse output	PULOUt	By choosing this option, the pulse output function will be activated.
Out on	OUtOn	By choosing this option, the output will be set to static on.
Out off	OUtOFF	By choosing this option, the output will be set to static off.
Exit	EHit	Go back to the set menu.

When either Alarm power, Alarm voltage, Alarm current or Alarm factor has been chosen, the following choices will be available.

Choice	Output on display	Unit	Explanation
Alarm level on	AL On	W/V/A/-	When the measured value passes the set value, the alarm will be triggered.
Alarm on delay	dEL On	seconds	When the measured value passes the set value and remains for the set time, the alarm will be triggered.
Alarm level off	AL OFF	W/V/A/-	When the measured value passes the set value, the alarm will be cleared.
Alarm off delay	dEL OFF	seconds	When the measured value passes the set value and remains for the set time, the alarm will be cleared.
Save	SAUE	N/A	This option saves the alarm settings.
Exit	EHit	N/A	Go back to the set menu without saving. Use this option to view the current alarm settings.

Chapter 5: Meter Settings

Overview

This chapter describes how to configure the functions of the meter, including alarm settings.

In this chapter

The following topics are covered in this chapter:

5.1   Setting the Output

About the output   The C13 meter has one output which can be used for three different purposes. When one of the three options has been chosen for the output, the remaining two options are automatically disabled.

- Alarm monitoring
  The output is used for monitoring if an alarm has been triggered or not.
- Static level
  The output is set as static, either as static on or static off.
- Pulse output
  The output is set as a pulse output.

Output state   The Output state in the main menu indicates what function is activated. See table below for the different functions that can be activated

Activated function	Output on display	Comment
Alarm on	AL On	The alarm is set and has been triggered.The pulse output exit is deactivated.
Alarm off	AL OFF	The alarm is set but has not been triggered. The pulse output exit is deactivated.
Output on	OUtOn	There is always a continous signal on the output.
Output off	OUtOFF	The output is closed for all traffic, both inbound and outbound.
Pulse out	PULOUt	The output is activated with a frequency based on measured energy. The alarm function is deactivated.

Set output to pulse output   To set the pulse output to be available for pulse measuring, perform the following steps when located in the view menu.

Step	Action	Comment
1	When located in the view menu, use the long press to get to the set menu.	-
2	Use the long press to get to the selection of functions menu.	-
3	Toggle through the menu to get to the Pulse out choice. Use the long press to choose Pulse out (PULOUt on the display).	The Pulse out choice in the selection of function menu is displayed as: PULOUt

Disable output   The output can also be disabled by performing the following steps when located in the view menu.

Step	Action	Comment
1	When located in the view menu, use the long press to get to the set menu	-
2	Use the long press to get to the selection of function menu.	-
3	Toggle through the menu to get to the Output off choice (*OutOFF* on the display). Use the long press to choose the Output off.	The Output off choice in the view menu is displayed as: *OutOFF*

Activate output   To activate the output, perform the following steps when located in the view menu.

Step	Action	Comment
1	When located in the view menu, use the long press to get to the set menu.	-
2	Use the long press to get to the selection of function menu.	-
3	Toggle through the menu to get to the Output on choice (*OutOn* on the display). Use the long press to choose the Output on.	The Output on choice in the view menu is displayed as: *OutOn*

5.2 Setting the Alarm

About the alarm   The alarm function gives the user the possibility to set an alarm that will trigger when a defined limit is reached by the measured value. See table for more information.

Choice in menu	Unit	Output on display	Range
Alarm power	W	AL P W	0–99999 W
Alarm voltage Phase 1	V	AL U L1 V	0–299 V
Alarm voltage Phase 2	V	AL U L2 V	0–299 V
Alarm voltage Phase 3	V	AL U L3 V	0–299 V
Alarm current Phase 1	A	AL C L1 A	0–40.00 A
Alarm current Phase 2	A	AL C L2 A	0–40.00 A
Alarm current Phase 3	A	AL C L3 A	0–40.00 A
Alarm power factor	-	AL PF	0–0.999

If the value is set above the max range, the meter will automatically set the value to the max value allowed by the range.

Example: Alarm current is set to 100.0 A by the user, but the max value is 40.0 A, so the meter will use the max value, in this case 40.0 A.

If an alarm has been set, the output state will indicate if the alarm is triggered (AL On) or not (AL OFF). The magnitude of the set alarm is also displayed in the output state.

Set alarm   To set an alarm, perform the following steps when located in the view menu.

Step	Action	Comment
1	Use the long press to get to the set menu	-
2	Use the long press to get to the selection of function menu	-
3	Toggle through the menu to choose what magnitude to set. Choose one of the following: Alarm power (W), Alarm voltage (V), Alarm current (A) and Alarm factor (no magnitude).	Use the long press to choose.
4	Set the alarm value that the measured value must pass in order for the alarm to trigger (Alarm level on).	Use the short press to change the value of the digit, and the long press to step through the different digits.

Step	Action	Comment
5	Set the time frame that the measured value must pass the set alarm value in order for the alarm to trigger (Alarm on delay).	Use the short press to change the value of the digit, and the long press to step through the different digits.
6	Set the alarm value that the measured value must pass in order for the alarm to be cleared (Alarm level off).	Use the short press to change the value of the digit, and the long press to step through the different digits.
7	Set the time frame that the measured value must pass the set alarm value in order for the alarm to be cleared (Alarm off delay).	Use the short press to change the value of the digit, and the long press to step through the different digits.
8	To save the alarm settings and enable the alarm function, use the long press when located in the save-menu (5RUE on the display). After performing this setting, the alarm is set.	If not choosing the option save, the settings will not be saved and the previously saved setting will be used instead. The alarm will not be activated.

Read alarm The Output option in the View menu shows whether a programmed alarm has been triggered or not. A triggered alarm displays as AL On, and an alarm that has not been triggered displays as AL OFF.

Chapter 6: Technical Description

Overview

This chapter describes the technical functions of the C13 meter.

In this chapter

The following topics are covered in this chapter:

6.1   Energy Values

General

The energy values are stored in energy registers. The different energy registers can be divided into:

- Registers containing active energy.

The energy values can be read directly on the display by using the button on the meter.

Presentation of register values

In direct connected meters the energy is usually displayed with a fixed unit and number of decimals (normally kWh, with no decimals).

In case the energy is displayed with fixed units and number of decimals the energy will "roll over" to zeros when the energy is increment ed if all nines are displayed. The meter can however contain more digits internally, which can be read out via communication if the meter is equipped with a communication interface.

6.2 Instrumentation

Instrumentation functions

The following table shows the complete instrumentation functions of the C13 meter.

Instrumentation	C13
Active power L1	X
Active power L2	X
Active power L3	X
Voltage L1 - N	X
Voltage L2 - N	X
Voltage L3 - N	X
Current L1	X
Current L2	X
Current L3	X
Power factor, Total	X

Accuracy

All instrumentation data accuracy is defined within the voltage range -20% – +15% of the stated nominal voltage and within the current range 5% of the base current to the maximum current.

6.3 Outputs

About outputs

The C13 meter has one output which can be used for three different purposes. When one of the three options has been choosen for the output, the remaining two options are automatically disabled.

- Alarm monitoring
  The output is used for monitoring if an alarm has been triggered or not.
- Static level
  The output is set as static, either as static on or static off.
- Pulse output
  The output is set as a pulse output.

On the pulse output the meter sends out a specified number of pulses (pulse frequency) per kilowatt hour (kilovar for reactive pulse outputs). The amount of pulses sent out are in proportion to the energy flowed through the meter.

The meter has a pulse output frequency of 1000 imp/kWh and the pulse width is 100 ms.

6.4   Alarm

General

The purpose of the alarm function is to enable monitoring of quantities in the meter. Monitoring can be set to high or low level detection. High level detection gives an alarm when the level of a quantity goes above the set level. Low level detection gives an alarm when the value goes below the set level.

Quantities

Depending on the meter type all or a subset of the following quantities can be monitored:

- Active power
- Power factor
- Current L
- Voltage L-N

Functional description

When the value of the monitored quantity passes the activation level, and remains there for a period of time equal or longer than the specified time delay, the alarm is activated. In the same way, the alarm is deactivated when the value passes the deactivation level and remains there for a time equal to or longer than the specified time delay.

If the activation level is higher than the deactivation level, the alarm is activated when the value of the monitored quantity is higher than the activation level.

If the activation level is lower than the deactivation level, the alarm is activated when the vale of the monitored quantity is lower than the activation level.

32

Chapter 7: Technical data

Overview

This chapter contains the technical specifications and the physical dimensions of the meter.

In this chapter

The following topics are covered in this chapter:

7.1 Technical Specifications

Specifications for C13 direct connected meter

Voltage/current inputs	
Nominal voltage	3x230/400 VAC
Voltage range	3x220–240 VAC (-20% – +15%)
Power dissipation voltage circuits	1.5 VA (0.6 W) total
Power dissipation current circuits	0.04 VA (0.04 W) per phase at 230 VAC and I_b
Base current I_b	5 A
Reference current I_{ref}	5 A
Transitional current I_{tr}	0.5 A
Maximum current I_{max}	40 A
Minimum current I_{min}	0.25 A
Starting current I_{st}	< 20 mA
Terminal wire area	0.5–10 mm^2
Recommended tightening torque	0.8 Nm
General data	
Frequency	50 or 60 Hz ± 5%
Accuracy	1% (Cl. 1, Cl. B)
Display of energy	7-digit LCD
Mechanical	
Material	Polycarbonate in transparent front glass. Glass reinforced polycarbonate in bottom case and upper case. Polycarbonate in terminal cover.
Weight	190 g
Environmental	
Operating temperature	-25°C – +70°C
Storage temperature	-25°C – +85°C
Humidity	75% yearly average, 95% on 30 days/year.
Resistance to fire and heat	Terminal 960°C, cover 650°C (IEC 60695-2-1)
Pulse output	
Current	2–100 mA
Voltage	5–40 VDC
Pulse output frequency	1000 imp/kWh
Pulse length	100 ms
Terminal wire area	0.5–6 mm^2
Recommended tightening torque	0.8 Nm
Pulse indicator(LED)	
Pulse frequency	1000 imp/kWh
Pulse length	40 ms
EMC compatibility	

Impulse voltage test	6 kV 1.2/50µs (IEC 60060-1)
Surge voltage test	4 kV 1.2/50µs (IEC 61000-4-5)
Fast transient burst test	4 kV (IEC 61000-4-4)
Immunity to electromagnetic HF-fields	80 MHz – 2 GHz at 10 V/m (IEC61000-4-3)
Immunity to conducted disturbance	150kHz – 80MHz (IEC 61000-4-6)
Immunity to electromagnetic disturbances	2–150 kHz for kWh-meters
Radio frequency emission	EN 55022, class B (CISPR22)
Electrostatic discharge	15 kV (IEC 61000-4-2)
Standards	IEC 62052-11, IEC 62053-21 class 1, GB/T 17215.211-2006, GB/T 17215.321-2008 class 1 & 2, GB 4208-2008, EN 50470-1, EN 50470-3 category B

7.2 Physical Dimensions

C13   The following drawing shows the physical dimensions of the C13 meter
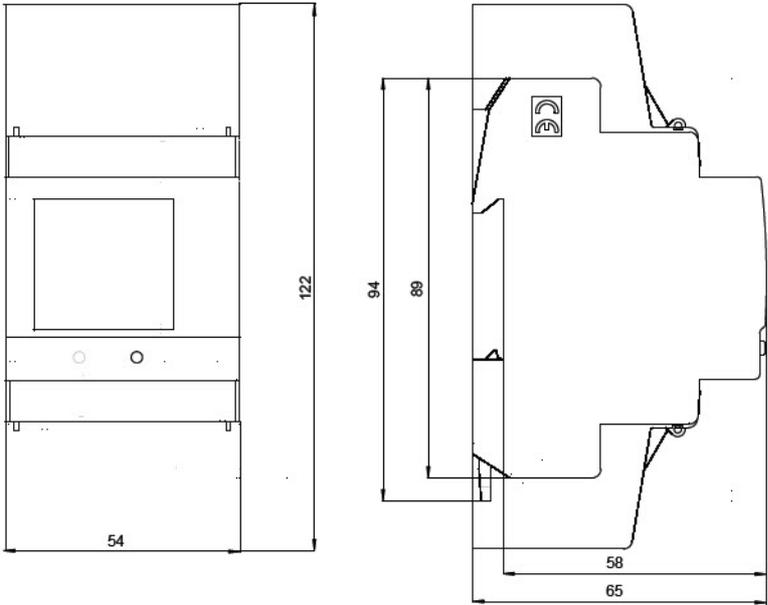
Chapter 8: Troubleshooting

Overview

This chapter describes the error codes and the warnings that can be received from the meter.

In this chapter

The following topics are covered in this chapter:

Troubleshooting

8.1 Error Codes and Warnings

Error codes

Error code	Description
Er0041	Program CRC error
Er0042	Persistent storage CRC error
Er0051	Vref is not vdd/2
Er0052	Temperature sensor error

Warnings

Warning	Description
Er1007	Negative power
Er1008	Frequency outside meter specification

Chapter 9: Service & Maintenance

Overview

This chapter contains information about service and maintenance of the product.

In this chapter

The following topics are covered in this chapter:

9.1   Service and Maintenance

Service

This product contains no parts that can be repaired or exchanged. A broken meter must be replaced.

Cleaning

If the meter needs to be cleaned, use a lightly moistened cloth with a mild detergent to wipe it.

! **Caution –** Be careful that no liquid gets into the meter since it can ruin the equipment.