SIEMENS

Product Manual

SENTRON

7KM Power Monitoring Device

PAC2200CLP

Edition 12/2022

siemens.com/lowvoltage

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SENTRON

7KM power monitoring device PAC2200CLP

Equipment Manual

12/2022

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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℗ 12/2022 Subject to change

Table of contents

Introduction

1

1.1 Components

The package includes:

- PAC2200CLP power monitoring device
- PAC2200CLP operating instructions
- EC Declaration of Conformity
- DE Declaration of Conformity according to MessEG

Available accessories

- SENTRON powerconfig (https://sie.ag/3x7KffS) software

- SENTRON powermanager (https://sie.ag/3NAGreg) software

1.2 Latest information

Up-to-the-minute information

You can find further support on the Internet (https://support.industry.siemens.com/my/ww/en/requests).

General safety notes

DANGER

Hazardous voltage.
Will cause death, serious personal injury, or equipment damage.

Turn off and lock out all power supplying this equipment before working on this device.

WARNING

Impairment of protection will result from improper use.
Can cause death, serious personal injury, or equipment damage.

The device may be used only for the applications described in the catalog and the associated technical documentation.

Note

These operating instructions do not purport to cover all details or variations in equipment, or to provide for every possible contingency in connection with installation, operation, or maintenance. Should additional information be desired, or should particular problems arise that are not discussed in enough detail in the operating instructions, please contact Technical Support (https://www.siemens.com/support-request) for the information you require.

Safety-related symbols on the device

	Symbol	Meaning
(1)		Risk of electric shock
(2)		Safety alert symbol
(3)		Electrical installation and maintenance by qualified personnel only

1.3 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To keep up to date with all the latest product updates, subscribe to the Siemens Industrial Security RSS Feed at (https://www.siemens.com/industrialsecurity).

1.4 Open Source Software

This product, solution or service ("Product") contains third-party software components. These components are Open Source Software licensed under a license approved by the Open Source Initiative or similar licenses as determined by SIEMENS ("OSS") and/or commercial or freeware software components. With respect to the OSS components, the applicable OSS license conditions prevail over any other terms and conditions covering the Product. The OSS portions of this Product are provided royalty-free and can be used at no charge.

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Siemens AG
Smart Infrastructure
Electrical Products
Technical Support
Postfach 10 09 53
93009 Regensburg
Germany

You will find Technical Support under.

Keyword: Open Source Request (please specify Product name and version, if applicable)

SIEMENS may charge a handling fee of up to 5 EUR to fulfil the request.

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See also

Industry Online Support (https://support.industry.siemens.com/cs/us/en/ps)

www.opensource.org (http://www.opensource.org)

1.5 Advanced training courses

Find out about training courses on offer on the following link.

Training for Industry (https://www.siemens.com/sitrain-lowvoltage)

Here you can choose from:

- Web-based training courses (online, informative, free)
- Classroom training courses (course attendance, comprehensive, subject to fee)

You also have the possibility of compiling your own training portfolio via **Learning paths**.

1.6 Risk of manipulation

Note

Risk of manipulation

Several protective mechanisms can be activated in the device.

In order to reduce the risk of manipulation occurring on the device, it is recommended that the protective mechanisms available in the device are activated:

- Protection against unauthorized operation, to protect the device against unintentional adjustment of parameters.
- Hardware write protection, to effectively prevent changes to the device parameters without physical access to the device.
  If you want to use the device for billing purposes, please refer to the notes at the end of the chapter Parameterizing via the device menu (Page 68).

See also

Parameterization via the device menu (Page 68)

Description

2

2.1 Performance features

The PAC2200CLP is a power monitoring device for measuring the basic electrical variables in low-voltage power distribution. All the measured variables are shown on the PAC2200CLP display. The device is capable of single-phase, two-phase or three-phase measurement and can be used in TN, TT and IT systems.

Please note that the MID approval and the national approval according to PTB A50.7 are valid for use in single-phase and three-phase systems. Single-phase operation is only permitted on L1.

The PAC2200CLP is installed on a standard mounting rail.

Several versions of the PAC2200CLP power monitoring device are available:

- **5 A device:**

  X / 1 A and x / 5 A current transformers can be used for current measuring.

- **65 A device:**

  No current transformers are required for current measuring. The device is connected directly to the low-voltage network. Current of up to 65 A can be measured directly.

The PAC2200CLP power monitoring device features an integrated Ethernet interface.

Thanks to the wide measuring voltage range of the PAC2200CLP, it can be connected directly in the low-voltage network up to a nominal line voltage UL-L of 400 V.

Measurement

- Measurement of all relevant electrical variables in an AC system
- Averaging of all measured values directly on the device in two stages, which are independent of each other and freely configurable (aggregation)
- 4-quadrant measurement for import and export

Counters and average power demand values

- Recording of active, reactive and apparent energy by means of several energy counters
- Calculation and storage of the last demand period average value for active and reactive power for simple software-driven generation of load profiles
- Calculation of average values for active and reactive power of the last completed demand period for import and export
- Time stamp of the current demand period acc. to ISO8601 (local and UTC time)
- MID-certified active energy counter for import and export (Measuring Instruments Directive 2014/32/EU)
- With load profile measurement conforming to statutory calibration regulations and national approval according to PTB-A 50.7
- Integrated 15-minute load profile memory with a storage depth for all billing-relevant data over 2 years
- Daily, monthly and annual consumption of active energy for import and export over 10 years
- Logbook for storing up to 8000 events relevant to statutory calibration regulations according to PTB-A50.7
- Convenient display of load profile and logbook data on the device or via web server in the form of a bar chart
- Download of load profile and logbook data via Modbus TCP or in the form of a csv file via the integrated web server
- Internal device clock with high accuracy and time synchronization function via time server

Display and operator control

- LC display (128 x 64 pixels)
- Four control keys with variable function assignment
- LEDs for Ethernet communication, active energy pulse indicator
- powerconfig
- powermanager
- Web server (HTTP)

Interfaces

- Ethernet
- Digital input
- Digital output

Memory

- Adjusted device parameters are permanently stored in the device memory.
- 2-year storage period for all billing-relevant load profile data
- Logbook for 8000 events relevant to statutory calibration regulations

Time synchronization

When the SNTP server is set and activated, time synchronization takes place automatically immediately after a device reboot.

Security

- Hardware write protection
  If you want to use the device for billing purposes, please refer to the notes at the end of this section.
- Protection against unauthorized operation
- Access protection IP filter
- Modbus TCP port, configurable
- HTTP port, configurable
- Dynamic host configuration protocol (DHCP) included
- Simple Network Time protocol (SNTP) included
- Possible to attach lead seals

Using "Protection against unauthorized operation" and "Hardware write protection", you can protect against write access to the device settings of the PAC2200CLP.

The protection intervenes in case of the following actions:

- Modify parameters in device
- Reset device to factory settings
- Reset password for protection against unauthorized operation

The data can be read without any restrictions.

Note

Use of different terms in the manual and in the device menu.
In the device menu, the term "password protection" is used to refer to protection against unauthorized operation.

Note

Activate hardware write protection

When connecting the power monitoring device to a network, it is recommended that the hardware write protection is activated.

Tariffs

PAC2200CLP supports 2 tariffs for the integrated energy counters (on-peak and off-peak). These tariffs are for information only and are not intended for billing purposes.

Control of tariff switching

Tariff switching can be controlled via the digital input or the communications interfaces.
Time-related switching is only possible using a higher-level system.

The tariff change becomes effective after expiry of the period.

MID-approved

The devices have MID approval and national approval according to PTB-A50.7 for Germany. They are therefore suitable for the measurement and delimitation of power consumption quantities in conformance with statutory metering and calibration regulations according to Renewable Energy Act §62b.

The following actions cannot be performed on the PAC2200CLP:

- Firmware update
- Deletion of the energy counter
- Deletion or reset of load profile data
- Deletion of existing logbook entries

The current transformer ratios set have no effect on the secondary total energy value.
The energy counters may already display a counter value upon delivery as a result of factory device testing.

See also

Commissioning (Page 63)

2.2 Measuring inputs

Current measurement

NOTICE
AC current measurement only The device is not suitable for measuring DC current.

The 5 A device is designed for:

- **Measuring current of 5 A for connecting standard current transformers.** Each current measuring input can take a continuous load of 10 A. A short-time overcurrent up to 100 A with a duration of 1 s is possible.

NOTICE
Directly connecting the current measuring inputs to the low-voltage system can cause irreparable damage to the device. The 5 A device is designed for connection to the low-voltage system via external current transformers. Only connect the current measuring inputs to the low-voltage system via suitable (UL-listed) current transformers.

The 65 A device is designed for:

- **Direct connection to the low-voltage network**.

Voltage measurement

NOTICE
AC voltage measurement only The device is not suitable for measuring DC voltage.

PAC2200CLP is designed for:

- **Direct measurement on the network**.
- **Line supplies with rated voltages up to 230 V / 400 V**. The device is designed for connection to low-voltage networks with rated line voltages of 400 V / 230 V (UL-L/UL-N). In other words, it can be used for measuring voltages up to 277 V line conductor to neutral conductor and 480 V line conductor to line conductor.

Connection types

The device can be used in 2-wire and 4-wire systems (TN, TT and IT systems).

The device does not offer any setting option in the menu. The following connection types are supported by the PAC2200CLP power monitoring device:

Table 2- 1 Connection types provided (connection to L1)

Short code	Connection type
1P2W	1 phase, 2 conductors
3P4W	3 phases, 4 conductors

Note

Use of connection type 1P2W

In order to obtain accurate measured values, phase L1 must be used for single-phase operation (1P2W).

NOTICE

The wrong system connection can destroy the device.

Before connecting PAC2200CLP, it must be ensured that the local power supply conditions match the specifications on the nameplate.

Display of measured variables on the device display and via the web server

The table below shows which measured variables are displayed on the device and via the web server.

A list of the measured values and other parameters which can be read out via the Modbus TCP interface can be found in the appendix in section Modbus TCP (Page 99).

Note

Switchover between the connection types is not offered in the device menu.

Depending on the connection type, certain measured variables have no validity.
For example: measured variables L2 and L3 with the 1P2W connection type.

Note

The device can be used in the IT system. Connection type 3P4W must be selected in this case. If devices are used in the IT system, the validity of the measured values must be considered. Voltage measured values L-N and current I_n are not valid in the IT system (3P3W).

Table 2- 2 Display of measured variables on the device display and via the web server

Measured variable	**Display**	**Web**
Voltage L_{1-N},L_{2-N},L_{3-N}	✓	✓
Voltage L_{12},L_{23},L_{31}	✓	✓
Current L_1,L_2,L_3	✓	✓
Neutral current (calculated)	✓	✓
Apparent power L1,L2,L3, ∑	✓	✓
Active power L1,L2,L3, ∑	✓	✓
Reactive power L1,L2,L3, ∑	✓	✓
Power factor L1,L2,L3, ∑	✓	✓
Line frequency	✓	✓
Active energy tariff T1 import, L1,L2,L3, ∑	✓	✓
Active energy tariff T2 import, L1,L2,L3, ∑	✓	✓
Active energy tariff T1 export, L1,L2,L3, ∑	✓	✓
Active energy tariff T2 export, L1,L2,L3, ∑	✓	✓
Active energy import (MID register) ∑	✓	✓
Active energy export (MID register) ∑	✓	✓
Secondary active energy import (MID register) ∑	✓	✓
Secondary active energy export (MID register) ∑	✓	✓
Reactive energy tariff T1 import, L1,L2,L3, ∑	✓	✓
Reactive energy tariff T2 import, L1,L2,L3, ∑	✓	✓
Reactive energy tariff T1 export, L1,L2,L3, ∑	✓	✓
Reactive energy tariff T2 export, L1,L2,L3, ∑	✓	✓
Apparent energy tariff T1 L1,L2,L3, ∑	✓	✓
Apparent energy tariff T2 L1,L2,L3, ∑	✓	✓
15-minute active energy profile import	✓	✓
15-minute active energy profile export	✓	✓
Daily active energy profile import	✓	✓
Daily active energy profile export	✓	✓
Monthly active energy profile import	✓	✓
Monthly active energy profile export	✓	✓
Annual active energy profile import	✓	✓
Annual active energy profile export	✓	✓

2.3 Functions for delimiting third-party quantities according to §62b Par. 1 of the Renewable Energy Act

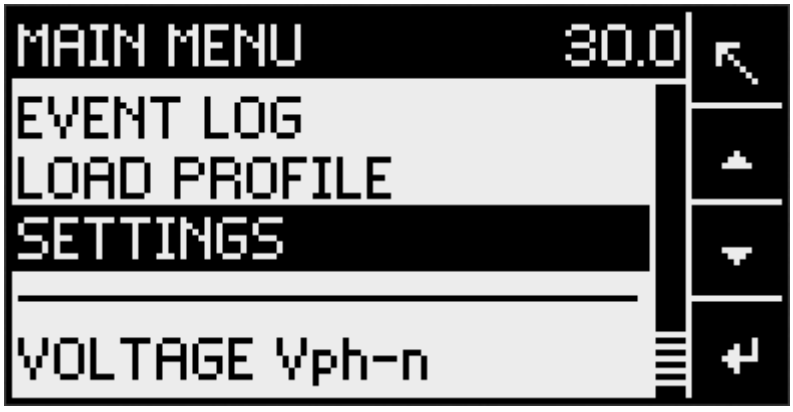
This chapter describes the functions for measurement of levy-relevant electricity quantities in conformance with statutory metering and calibration regulations for the purposes of delimiting third-party quantities according to §62b Par. 1 of the Renewable Energy Act.

2.3.1 Configuring the device time

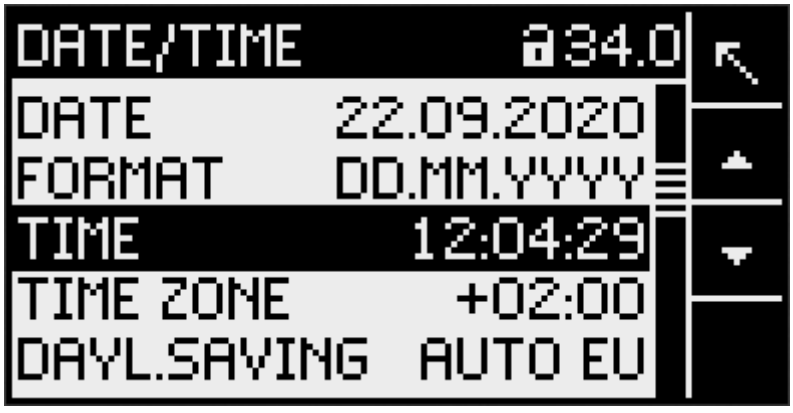
Continuous synchronization of the data and time via an NTP / SNTP server is required in order to generate a load profile in conformance with PTB-A 50.7. The server makes the current time available to all subscribers.
Once the time has been synchronized successfully, the device stores the values which are marked as valid in the load profile. Synchronization must be repeated before the power reserve of the internal device clock expires.

The SNTP server is polled when the device starts up or when the network connector is plugged in (link setup), after which time it is polled continually at variable time intervals. If the server cannot be reached over an extended period, the time is not marked as inaccurate until the power reserve of the internal clock has expired (approx. 3 days).

2.3.1.1 Navigating to main menu, settings, date/time



2.3.1.2 Parameterization



Date: Shows the date currently set in the device.

Format: Format used for display.

Time: Shows the time currently set in the device.

Time zone: This must be set correctly here based on the geographical time zone. It is a prerequisite for correct time synchronization.

Daylight saving: The setting which applies to the place of installation must be entered here.

Option	Description
Auto EU	Usual setting for Europe
Auto US	Usual setting for USA
Off	Time change is deactivated
Table	For specifying custom definitions. Requires the powerconfig configuration software V3.17 or higher, which is available free of charge.

Example of configuration for Germany:

- Time zone: +01:00
- Daylight saving: Auto EU

SNTP:

Option	Description
Active	The device continually polls the configured IP address of the SNTP server to effect synchronization (recommended setting).
BCST client	The device receives the broadcasts of an SNTP server which actively distributes these to all the subscribers in the network. Only broadcasts from the configured IP address are accepted. If the IP address setting remains unchanged at 0.0.0.0, every broadcast is accepted.
Off	Synchronization via SNTP is deactivated.

IP:

IP address of SNTP server. If the address configuration of the device takes place via DHCP, the IP address of the SNTP server is automatically assigned as a rule.

If an IP address was entered manually, this address is used.

SNTP status OK:

The symbol of a filled circle is displayed if the last synchronization was successful. It changes to an empty circle as soon as a synchronization operation fails.

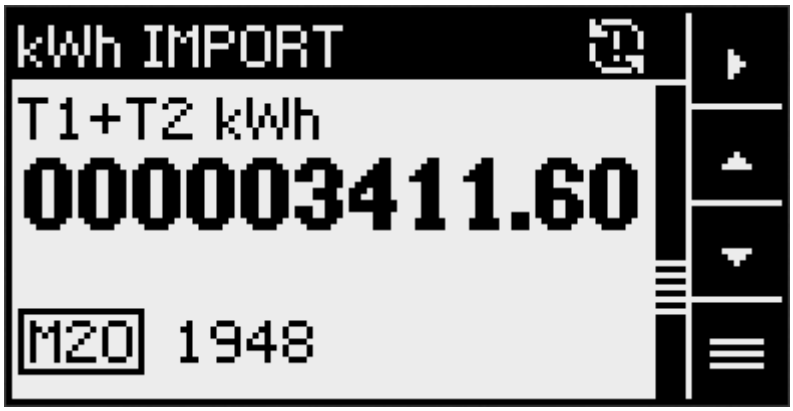
Hotspot text (Page 68)

See also

Parameterization via the device menu (Page 68)

2.3.1.3 Synchronization errors

If the time cannot be synchronized successfully, a flashing warning symbol is displayed on the right in the top bar of the device display:



The warning is displayed immediately after a failed synchronization operation. If the time was previously synchronized successfully, the device continues to run in conformance with PTB-A 50.7 until the power reserve of the internal clock has expired. After expiry, stored values are marked as "invalid" in the load profile memory.

2.3.1.4 Possible time synchronization scenarios

Scenario		Effects
1	Setting of the time within the statutory tolerance of 1% (9 seconds)	If the time is changed by less than 9 seconds, no entry is made in the logbook. The changed time is saved as the new time and the time stamp is adjusted accordingly. The 15-minute load profile values are not marked as invalid.
2	Setting of the time by more than 1% (9 seconds) of the tolerance permitted by statutory regulations	If the date or time is changed by more than 9 seconds, an entry including the date and time is made in the logbook. The changed time or date is saved as the new time or date and the time stamp is adjusted accordingly. The 15-minute load profile values are marked as invalid ("!" on the left in front of the entry).
3	Time in the event of a power failure	As the device is supplied by the measuring voltage, it ceases to operate in this case. However, the internal clock continues to be supplied by a buffer capacitor and the time continues to run internally for 72 hours. No entries are made in the load profile memory or the logbook.
4	Time when power is restored after a power failure	After the device has rebooted, it attempts to synchronize its internal device clock time with the date and time of the SNTP server defined in the settings. An adjustment is only necessary if the device operates beyond the power reserve. The power reserve (72h) restarts after every successful synchronization. **Case 1:** Power failure and restoration take place within one demand period. The flags "short period" (FLAG_QUALITY_SHORT_PERIOD) and "power failure" (FLAG_QUALITY_AUXPOWER_FAIL) are set. The demand period is valid. **Case 2:** Power failure and restoration take place within one demand period. The power reserve of 3 days since the last time synchronization has expired. The device continues the started period. The flags "short period" (FLAG_QUALITY_SHORT_PERIOD), "power failure" (FLAG_QUALITY_AUXPOWER_FAIL) and "time uncertain" (FLAG_QUALITY_TIME_UNSECURE) are set. The demand period is invalid. **Case 3:** Power failure and restoration do not take place within one demand period. The power reserve of 3 days since the last time synchronization has not expired. The device finishes the demand period which started before the power failure. The time stamp originally intended for this period is entered. The flags "short period" (FLAG_QUALITY_SHORT_PERIOD) and "power failure" (FLAG_QUALITY_AUXPOWER_FAIL) are set. The demand period is valid. The flags "short period" (FLAG_QUALITY_SHORT_PERIOD) and "power failure" (FLAG_QUALITY_AUXPOWER_FAIL) are set for the newly started demand period. **Case 4:** Power failure and restoration do not take place within one demand period. The power reserve of 3 days since the last time synchronization has expired. The device finishes the demand period which started before the power failure. The time stamp originally intended for this period is entered. The flags "short period" (FLAG_QUALITY_SHORT_PERIOD), "power failure" (FLAG_QUALITY_AUXPOWER_FAIL) and "time uncertain" (FLAG_QUALITY_TIME_UNSECURE) are set. The demand period is invalid. The flags "short period" (FLAG_QUALITY_SHORT_PERIOD), "power failure" (FLAG_QUALITY_AUXPOWER_FAIL) and "time uncertain" (FLAG_QUALITY_TIME_UNSECURE) are set for the newly started demand period.

2.3.2 Logbook

Important changes which could influence the measurement or the storage of data in the load profile are recorded in this logbook. The reason, time and the OID of the affected demand period are stored for every entry along with the counter readings for import and export at the time of the event.

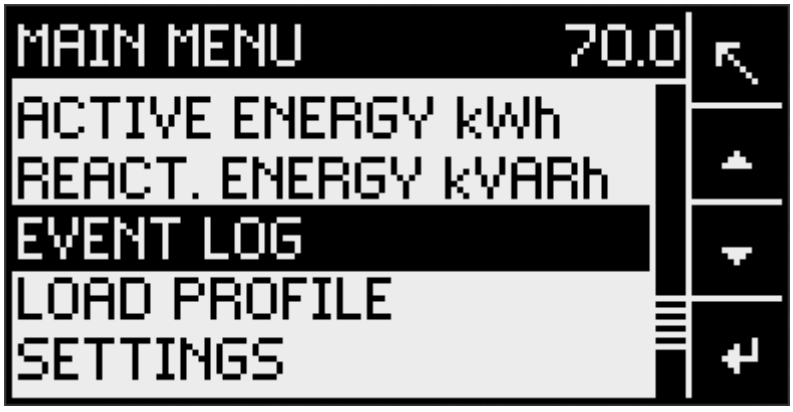
The device can store over 8000 logbook entries. In the unlikely case that all entries have been completely filled, all subsequent measurements are marked as invalid. Since entries cannot be edited or deleted, the device must be replaced.

The logbook can be viewed via the web server and can also be exported in CSV format.

Possible events:

Event	Category	Reason
LOGBOOK FULL	PTB-A 50.7 relevant	The maximum number of logbook entries has been reached. No further settings for the current transformer ratio are possible. Please note that conformance with statutory calibration regulations is no longer upheld in this case, as the time adjustment can no longer be logged. The device must be replaced.
PARAMETER	PTB-A 50.7 relevant	Setting of the current transformer ratio. The setting for the primary or secondary value for current has been changed.
TIME SETTING	PTB-A 50.7 relevant	The time has been set either manually, by software via the Ethernet interface or by means of automatic time synchronization via the SNTP server.
TIME ZONE	Information	Change of the geographical time zone or of the daylight saving setting.
MULTI- SYNC	PTB-A 50.7 relevant	The time has been set several times by less than 9 seconds within one demand period (15 minutes).

2.3.2.1 Navigating to main menu, logbook



2.3.2.2 Examples of logbook entries

Detailed view of "Time zone" entry

Detailed view of "Parameter" entry

2.3.3 Load profile

The consumption values for active energy import (kWh) and active energy export (kWh) are stored in the device at 15-minute intervals, where they are retained for a period of 24 months.

After this period has elapsed, the oldest value is overwritten by the newest value. If storage in conformance with PTB-A 50.7 is to be upheld, it is absolutely essential that the device clock is able to synchronize the time regularly via an SNTP server within its power reserve.

In addition to the 15-minute values, the PAC2200CLP stores daily, monthly and annual consumption of active energy for import and export over 10 years.

Each value is stored along with additional information about its validity and is marked as invalid if at least one of the following flags is set:

→ FLAG_QUALITY_TIME_UNSECURE (time uncertain, e.g. time changed by more than 9 seconds or power reserve expired)

→ FLAG_QUALITY_UNSECURE (current and/or voltage out of range)

→ FLAG_MULTIPLE_TIMECHANGE (time changed several times, or changes ≥ 1 s)

→ FLAG_CURRENT_TRANSFORMER (current transformer setting changed)

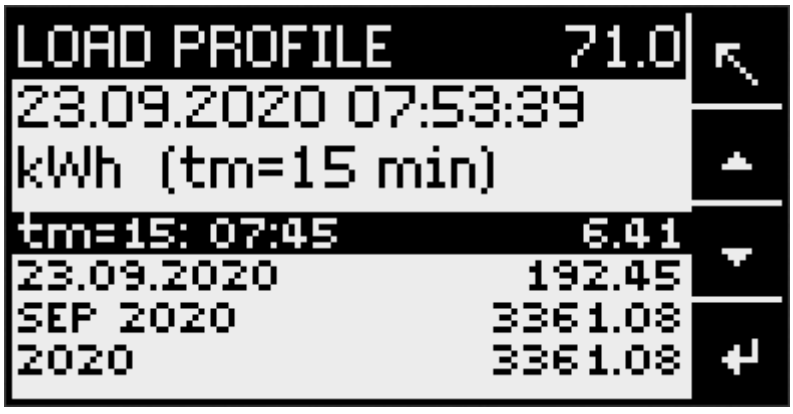
→ FLAG_LOGBOOK_FULL (calibration logbook is full)

The stored load profile can be viewed locally on the display or via the web server. It is also possible to download it in CSV format.

2.3.3.1 Navigating to main menu, load profile

2.3.3.2 Load profile overview

The "Load profile" menu shows the 15-minute load profile in conformance with PTB-A 50.7 as well as the daily, monthly and annual values for information.



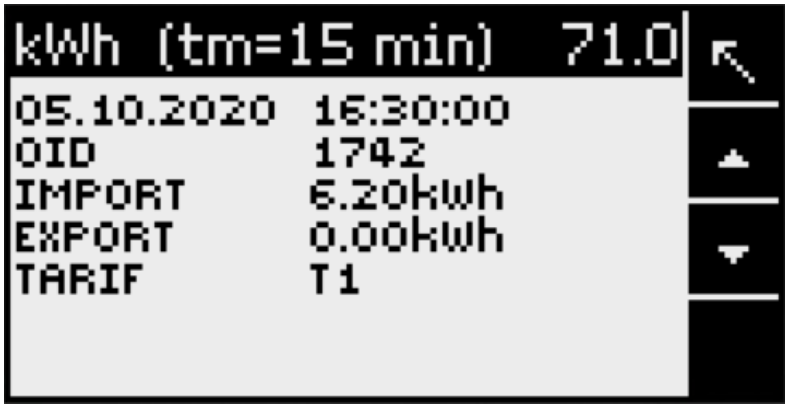
Line	Value	Description
1	6.41 kWh	Energy import of the last completed demand period
2	192.20 kWh	Energy import of current day
3	3360.83 kWh	Energy import of current month
4	3360.83 kWh	Energy import of current year

2.3.3.3 Detailed view of load profile

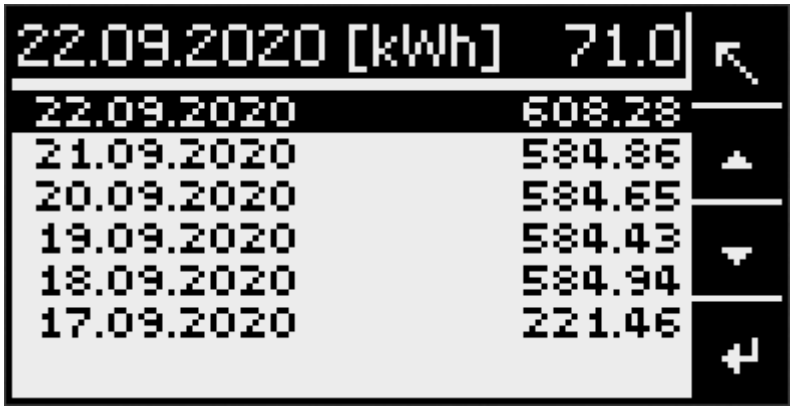
The history can be viewed when a detailed view is selected.

Detailed view line 1 with overview of 15-minute values:

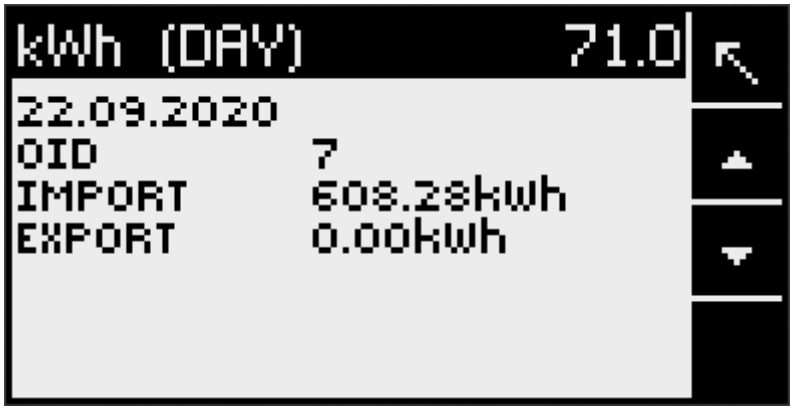
Detailed view of a single entry



Detailed view line 2 with daily values



Detailed view of a single entry



Detailed view line 3 with monthly values

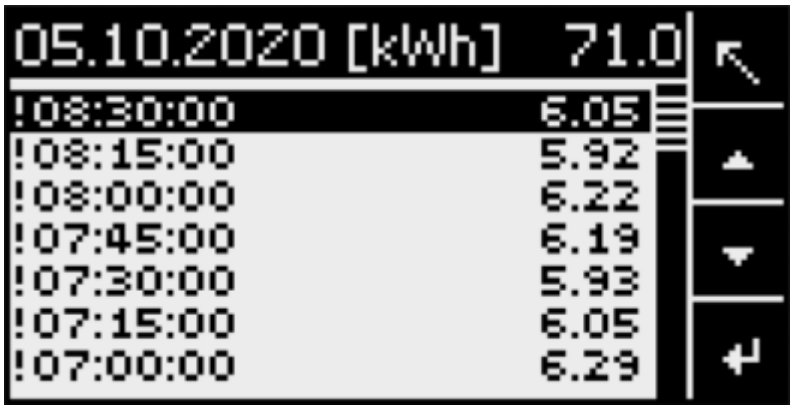
Similar to detailed view of daily values, but with monthly values.

Detailed view line 4 with annual values

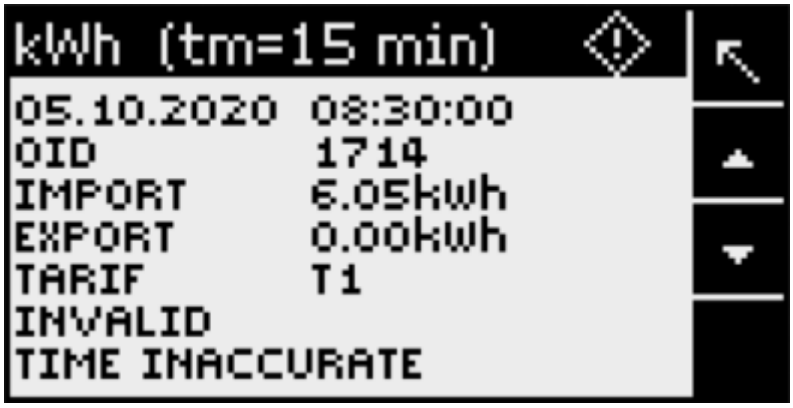
Similar to detailed view of daily values, but with annual values.

2.3.3.4 Display with invalid values

Invalid entries are marked with a "!" in front of the entry.



Details about the reason can be found in the detailed view.



2.4 Averaging measured values

2.4.1 Averaging measured values

Instantaneous values are averaged over defined time periods in order to generate measured value profiles. The average values can be read out and stored for this purpose. This reduces the communication load and the storage requirements on downstream servers.

The PAC2200CLP device features two average value generators, which can be parameterized independently.

The aggregation of the measured values reduces the bus load without the risk of losing information. Average values are calculated contiguously, based on the underlying values.

After expiry of the set time period, the values are updated each time.

- The average values of stage 1 are set to an averaging time of 10 seconds as standard.
- The average values of stage 2 are set to an averaging time of 15 minutes as standard.

The averaging time can be set between three seconds and one year.

These values can only be read out if the communications interfaces are used via Modbus TCP.

The list of available measured values can be found in chapter Modbus measured variables with function code "0x14" (Page 105).

2.4.2 Load profile – energy consumption profile

The PAC2200CLP displays the energy consumption in 15-minute periods, as stipulated in PTB-A50.7. The circular buffer contains enough space for over two years of 15-minute periods. Daily, monthly and annual consumption values are also stored for over 10 years. (See: web browser, powerconfig, Modbus FC0x64)

Each individual period entry contains the following information:

- Time stamp at the end of the completed demand period (UTC) according to PTB-A50.7
- Unique ID
- Real length of period (measurement duration)
- Total active energy for import and export according to PTB-A50.7
- Counter readings of active energy for import and export, separated according to tariff T1 and T2
- Time zone offset to UTC
- Status information about the values from this demand period

In addition to the option of reading out all profiles, the last completed period can also be read out. It is only available during the period that is currently running. (see Modbus map, register 545 onward)

This entry comprises:

- Time stamp at the end of the completed demand period (UTC) according to PTB-A50.7
- Unique ID
- Real length of period (measurement duration)
- Total active energy for import and export according to PTB-A50.7
- Counter readings of active energy for import and export, separated according to tariff T1 and T2
- Counter readings of total active energy for import and export (T1+T2)
- Reactive energy quantity for import and export
- Counter readings of reactive energy for import and export, separated according to tariff T1 and T2
- Status information about the values from this demand period

In addition, cumulated average power demand values for the last stored period are available, e.g. for generating a cumulated load profile (see Modbus map, register 501 onward):

- Cumulated active and reactive power for import and export
- Maximum and minimum active and reactive power measured during the period

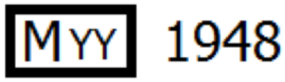
2.4.3 Energy counters

Available energy counters of the PAC2200CLP measuring device (cannot be reset):

			Tariff 1	**Tariff 2**	**Total (T1 + T2)**
Active energy kWh	**Import**	Total	X	X	X (MID)
		L1	X	X	
		L2	X	X	
		L3	X	X	
		Secondary value			X (MID)
	Export	Total	X	X	X (MID)
		L1	X	X	
		L2	X	X	
		L3	X	X	
		Secondary value			X (MID)
Reactive energy kvarh	**Import**	Total	X	X	X
		L1	X	X	
		L2	X	X	
		L3	X	X	
		Secondary value			X
	Export	Total	X	X	X
		L1	X	X	
		L2	X	X	
		L3	X	X	
		Secondary value			X
Apparent energy kVAh		Total	X	X	X
		L1	X	X	
		L2	X	X	
		L3	X	X	
		Secondary value			X

Secondary values: Energy counter which does not take the transformer ratio into account during calculation.

MID: MID registers are indicated in the menu by the MID mark. Marked registers are suitable for billing purposes.



YY Indicates the year when the MID mark was affixed

1948 Identification number of conformity assessment body

2.4.4 History of active energy consumption

Based on selected recordings of energy consumption over time, users can perform a targeted analysis of their energy consumption for the purpose of optimizing their energy usage. The power monitoring devices have a daily energy counter and a monthly energy counter.

- The daily energy counter records the active energy in a ring buffer with a depth of 221 days.
- The monthly energy counter records the active energy in a ring buffer with a depth of 25 months.
- The annual energy counter records the active energy in a ring buffer with a depth of 7 years.

This function is available only in conjunction with communication interfaces. You can find the list of available measuring values in chapters Active energy history with the Modbus function codes 0x14, 0x03 and 0x04 (Page 119) and User-defined Modbus function code 0x64 (Page 126).

2.4.5 Configurable universal counter

The devices provide one configurable counter. The following values can be counted:

- Pulse counting via the digital input for kWh/kvarh
- Status changes at the digital input (rising edge only)
- Status changes at the digital output (rising edge only)

2.5 Digital inputs and outputs

2.5.1 Digital inputs and outputs

The PAC2200CLP features the following inputs/outputs:

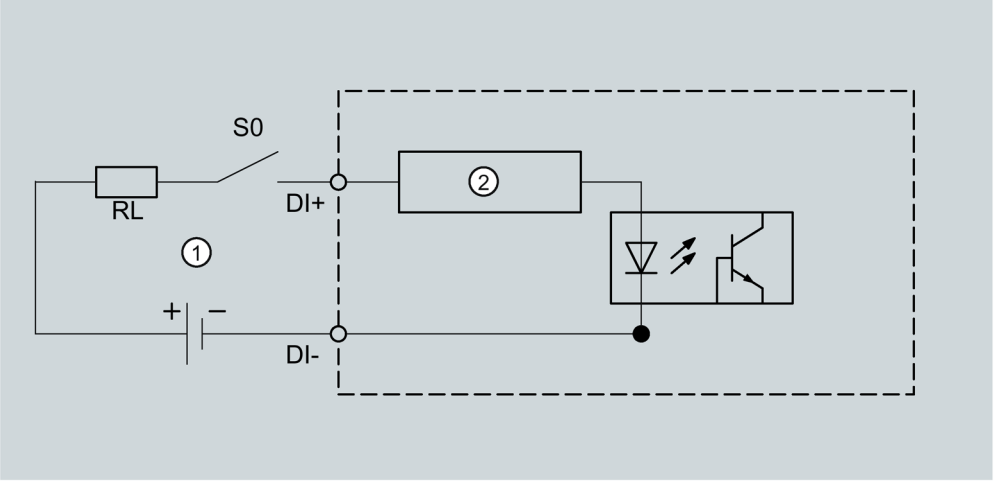
- **1 digital input**
- **1 digital output**

2.5.2 Digital input

The following functions can be assigned to the digital input:

- Status monitoring: Capturing statuses of connected signal encoders
- Tariff switch for two-tariff counters.
- Input for energy pulses (S0 interface)
- Not used

  Digital output is deactivated.
- Backlighting (ON / OFF)



(1) External power supply, max. 30 VDC, typically 24 VDC
(2) Input electronics

Figure 2-1 Block diagram: Digital inputs

2.5.3 Digital output

The following functions can be assigned to the digital output:

- Not used

  Digital output is deactivated.
- Device is ready for operation.

  The digital output is ON.
- Remote control

  Digital output is remotely controlled.

- Direction of rotation

  The digital output is switched on by a counter-clockwise rotating electrical field and remains active while the direction of rotation of the field remains unchanged.

- Energy pulse

  The digital output outputs the parameterized number of pulses per energy unit (e.g. kWh). The specified energy counter is evaluated here.

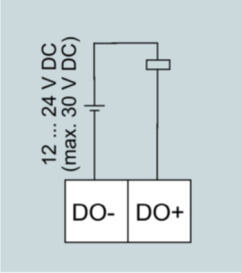


Figure 2-2 Block diagram: Digital outputs

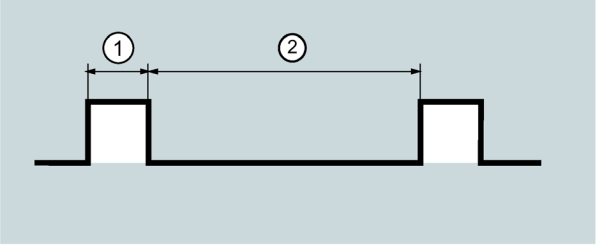
Note

The digital output can be connected as P or N switching.

Wiring

The digital output is passive and implemented exclusively as a switch.

Implementation of the pulse function corresponds to the IEC 62053-31 standard.



(1) Pulse length
(2) Turn-off time

Figure 2-3 Pulse length and turn-off time

- Pulse length:
  Time for which the signal at the digital output is "high". The minimum pulse length is 30 ms and the maximum 500 ms.
- Turn-off time:
  Time for which the signal at the digital output is "low". The turn-off time depends on the measured energy, for example, and can be days or months.
- Minimum turn-off time:
  The minimum turn-off time corresponds to the programmed pulse length. 30 ms is the absolute minimum.

2.6 Communication

2.6.1 Ethernet

Permits communication via the following protocols:

- **Modbus TCP**

The device can be configured via Modbus TCP

- **Web server (HTTP)**

Protocol can be used to read out the measured values via web browser.

- **SNTP**

  The SNTP (Simple Network Time Protocol) is used to automatically synchronize the internal clock with a time server within the network.

  Three function modes are available:

  – No synchronization

  – Date/time synchronization via device request

    The IP address of an NTP server must be configured. Here, the PAC2200CLP automatically requests the current time from the server and resets its internal device clock if necessary.

  – Date/time synchronization via SNTP server broadcast

    The PAC2200CLP receives broadcast time telegrams which are sent from an NTP server. This is practical if the internal clocks of several devices in the same network need to remain synchronized.

If the IP address of the NTP server has been configured, the PAC2200CLP only responds to these telegrams. Furthermore, it can send a request to the server if necessary.

- **DHCP**

Stands for "Dynamic Host Configuration Protocol". Protocol for obtaining network settings from a DHCP server. Network settings are assigned automatically.

Installation 3

3.1 Introduction

⚠ WARNING

The use of damaged devices may result in death, serious injury, or property damage.

Do not install or start up damaged devices.

Installation location

The PAC2200CLP is installed on a TH35 standard mounting rail (acc. to EN 60715) and is designed for installation in permanently installed systems, switchgear cabinets or fuse boxes.

The measuring device can be mounted in any position. The device can be mounted in a horizonal or in a vertical position. For ergonomic reasons, we recommend mounting the device with the user interface in a horizontal position at the user's eye level.

NOTICE

Electrostatic sensitive devices

Electronic modules contain components that can be damaged by electrostatic discharge. These modules can be easily damaged by improper handling.

- You must discharge your body electrostatically immediately before touching an electronic component. To do this, touch a conductive, grounded object, e.g. a bare metal part of a switch cabinet or the water pipe.
- Always hold the component by the plastic enclosure.
- Electronic modules should not be brought into contact with electrically insulating materials such as plastic film, plastic parts, insulating table supports or clothing made of synthetic fibers.
- Always place electrostatic sensitive devices on conductive bases.

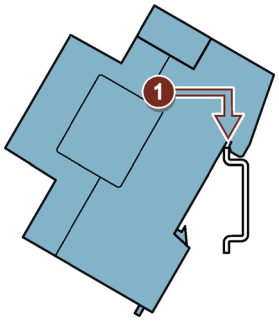
Note

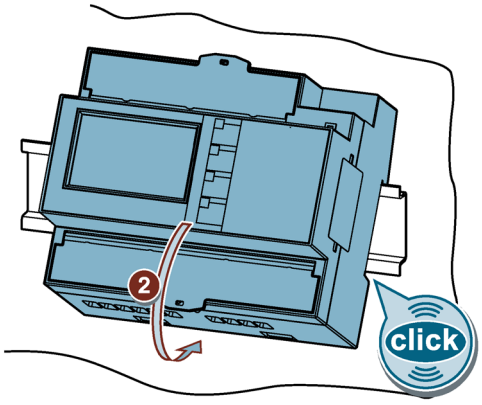
Avoid condensation

Sudden fluctuations in temperature can lead to condensation. Condensation can affect the function of the device. Store the device in the operating room for at least two hours before commencing installation.

3.2 Installation steps

Procedure





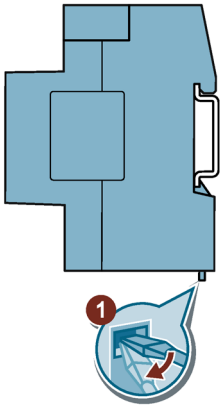
3.3 Removal

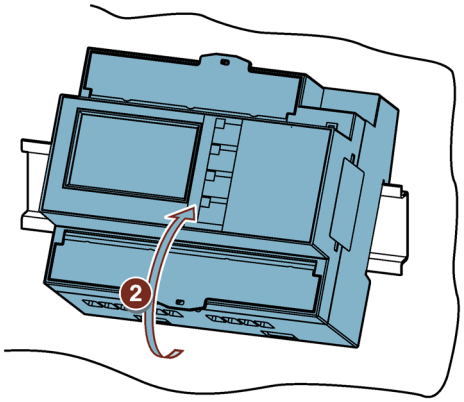
Tools

You require the following tools to uninstall the device:

- Slotted screwdriver

Procedure





Connection

4

4.1 Safety notes

Notes

DANGER

Hazardous voltage

Will cause death, serious personal injury, or equipment damage.

Turn off and lock out all power supplying this equipment before working on this device.

DANGER

Open transformer circuits will result in electric shock and arc flash hazards

Will cause death, serious personal injury, or equipment damage.

For the 5 A device it is only possible to measure the current via external current transformers. The current transformer circuit is not protected by a fuse. Do not open the secondary circuit of the current transformers under load. Short circuit the secondary current terminals of the current transformer before removing this device. The safety information for the current transformers used must be followed.

WARNING

Hazardous voltage
May cause death, serious personal injury, or equipment damage.

- Always open or disconnect circuit from power-distribution system (or server) of building before installing or servicing current transformers.
- The current transformers may not be installed in equipment where they exceed 75% of the wiring space of any cross-sectional area within the equipment.
- Restrict installation of current transformers in an area where it would block ventilation openings.
- Restrict installation of current transformers in an area of breaker arc venting.
- Not suitable for Class 2 wiring methods and not intended for connection to Class 2 equipment.
- Secure current transformers and route conductors so that they do not directly contact live terminals or bus.

⚠ CAUTION

Voltage input conductors may be damaged.

The fuses in the voltage measuring inputs are only used for cable protection. Selection of the fuse depends on the supply cable dimensioning. All commercially available fuses and miniature circuit breakers up to 16 A (C) or 20 A (B) can be used. The relevant applicable regulations must be complied with in selecting the fuse. We recommend 5SY miniature circuit breakers, 3RV motor starter protectors, or 5SB/3NA fuses, depending on the cable requirements and connection conditions.

Voltage input conductors must be protected.

NOTICE

Short-circuit hazard

Take the maximum possible ambient temperature into account when selecting the connecting cables.

The cables must be suitable for operation at a temperature that is 20 °C higher than the maximum ambient temperature.

NOTICE

Device can be irreparably damaged.

When performing an insulation test of the entire installation with AC or DC, the device should be disconnected before starting the test.

Note

Only qualified personnel are allowed to install, commission or service this device.

- Wear the prescribed protective clothing. Observe the general equipment regulations and safety regulations for working with high-voltage installations (e.g. DIN VDE, NFPA 70E, as well as national or international regulations).
- The limits given in the technical data must not be exceeded even during commissioning or testing of the device.
- The secondary connections of intermediate current transformers must be short-circuited at the transformers before the current feeder cables to the device are interrupted.
- Check the polarity and the phase assignment of the instrument transformers.
- Before connecting the device, make sure that the line voltage matches the specifications on the rating plate.
- Before starting up the device, check that all connections have been made correctly.
- Before power is applied to the device for the first time, it must have been located in the operating area for at least two hours in order to reach temperature balance and avoid humidity and condensation.
- Condensation on the device is not permissible during operation.

Note

Prevent capacitive and inductive interference.

Make sure that all data and signal cables are routed separately from control and power supply cables. In order to avoid the risk of capacitive or inductive interference, these cables must never be routed in parallel.

See also

Applying the measuring voltage (Page 64)

Measuring inputs (Page 17)

4.2 Connections

All terminals are fitted with sealable terminal covers

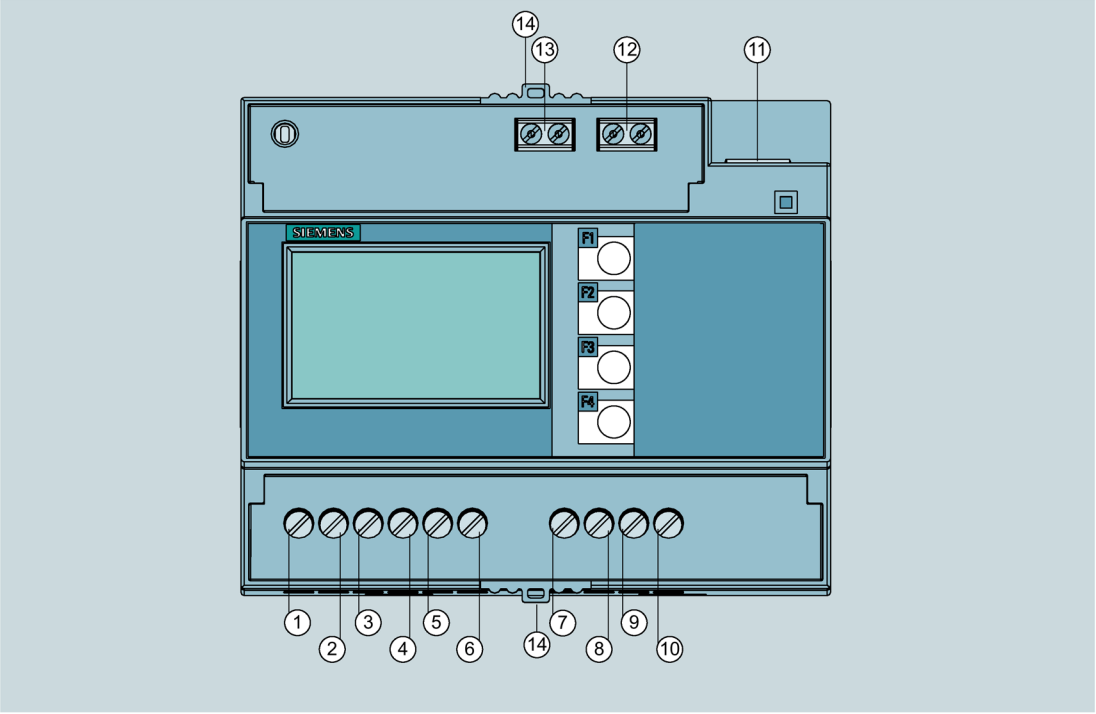


Figure 4-1 PAC2200CLP (5A) connector pin assignments

No.	Connection	Function
(1)	IL1↑k	Current converter connection: I_{L1}, input
(2)	IL1 I↓	Current converter connection: I_{L1}, output
(3)	IL2↑k	Current converter connection: I_{L2}, input
(4)	IL2 I↓	Current converter connection: I_{L2}, output
(5)	IL3↑k	Current converter connection: I_{L3}, input
(6)	IL3 I↓	Current converter connection: I_{L3}, output
(7)	V_1	Voltage connection phase L1
(8)	V_2	Voltage connection phase L2
(9)	V_3	Voltage connection phase L3
(10)	V_N	Neutral conductor
(11)	LAN	Ethernet (optional)
(12)	DI	Digital input
(13)	DO	Digital output
(14)	-	Sealing eyelets for sealing the terminal

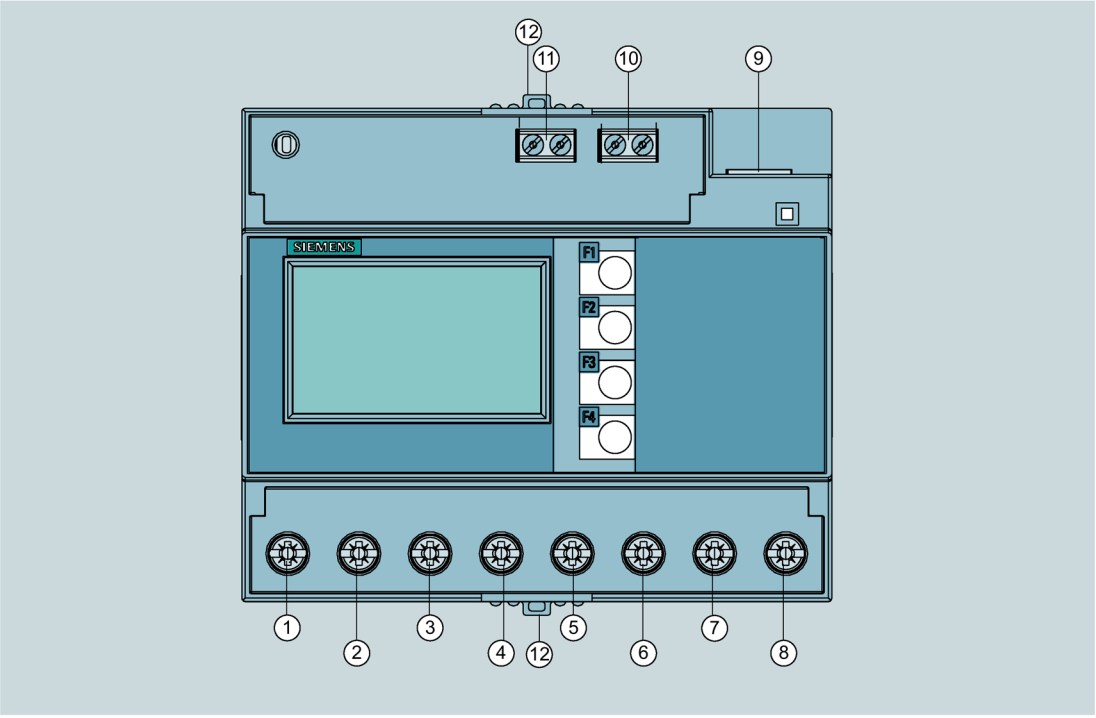


Figure 4-2 PAC2200CLP (65A) connector pin assignments

No.	Connection	Function
(1)	L1 ↑	L1 conductor input
(2)	L1 ↓	L1 conductor output
(3)	L2 ↑	L2 conductor input
(4)	L2 ↓	L2 conductor output
(5)	L3 ↑	L3 conductor input
(6)	L3↓	L3 conductor output
(7)	N↑	N conductor input
(8)	N↓	N conductor output
(9)	LAN	Ethernet
(10)	DI	Digital input
(11)	DO	Digital output
(12)	-	Sealing eyelets for sealing the terminal

4.3 Connection examples

The selection of the connection types in the device can differ according to the device version.

For the 5 A device, it is only possible to measure the current with current transformers.

For the 65 A device, no current transformers may be connected.

All input or output terminals not required for measuring remain free.

Parameterization of the devices is described in section Parameterizing the device (Page 64).

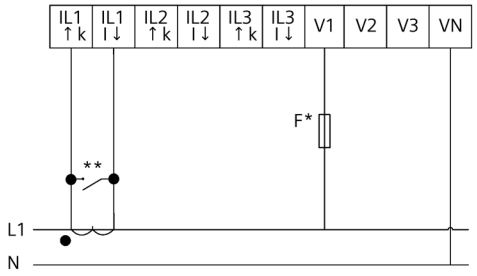
NOTICE
Grounding of current transformers optional The connection of the transformers and thus also the grounding of the transformers on the secondary side must always be carried out according to the applicable regulations. Grounding of the current transformers on the secondary side is not necessary for use in low-voltage switchboards for performing measuring tasks.

Connection examples for the 5 A device

⚠ CAUTION
Protection of the voltage measuring inputs On the 5 A device, the fuses in the voltage measuring inputs are only used for cable protection. Selection of the fuse depends on the supply cable dimensioning. All commercially available fuses and miniature circuit breakers up to 16 A (C) or 20 A (B) can be used. The relevant applicable regulations must be complied with in selecting the fuse. We recommend 5SY miniature circuit breakers, 3RV motor starter protectors, or 5SB/3NA fuses, depending on the cable requirements and connection conditions.

(1) Single-phase measuring, two conductors, unbalanced load, with one current transformer

Connection type 1P2W



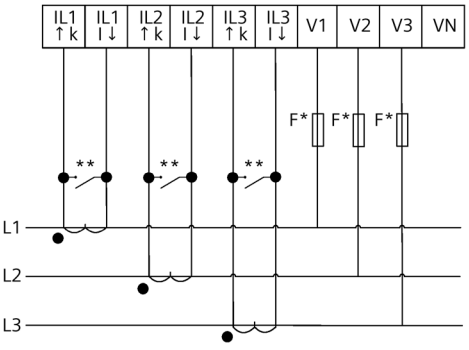
* The fuses are only used for cable protection. All commercially available miniature circuit breakers up to 20 A (B) can be used.

** Install a short-circuit device. Protection against overvoltage when the secondary transformer circuit is open.

Figure 4-3 Connection type 1P2W, with one current transformer

(2) Three-phase measurement, three conductors, unbalanced load, with three current transformers

Connection type 3P4W in the IT system (for validity of measured values, refer to Table 2-3)



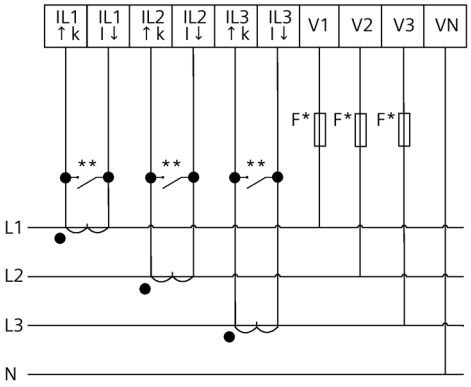
* The fuses are only used for cable protection. All commercially available miniature circuit breakers up to 20 A (B) can be used.

** Install a short-circuit device. Protection against overvoltage when the secondary transformer circuit is open.

Figure 4-4 Connection type 3P4W in the IT system, with three current transformers

(3) Three-phase measuring, four conductors, unbalanced load, with three current transformers

Connection type 3P4W



* The fuses are only used for cable protection. All commercially available miniature circuit breakers up to 20 A (B) can be used.

** Install a short-circuit device. Protection against overvoltage when the secondary transformer circuit is open.

Figure 4-5 Connection type 3P4W

Connection example for the 65 A device

(1) Single-phase measuring, two conductors, unbalanced load

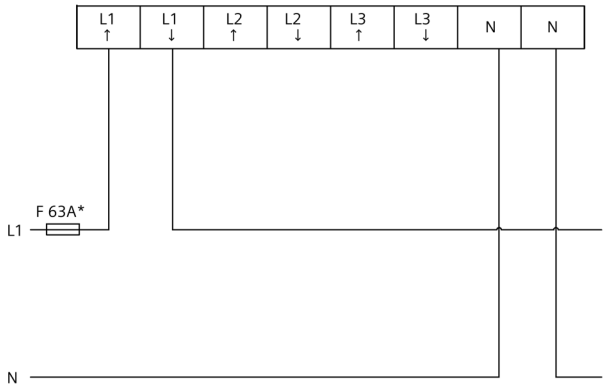
CAUTION

Measuring input protection

On the 65 A device, the fuses in the voltage measuring inputs are only used for cable protection. Selection of the fuse depends on the supply cable dimensioning. All commercially available fuses and miniature circuit breakers up to 63 A can be used. The relevant applicable regulations must be complied with in selecting the fuse.

We recommend 5SY miniature circuit breakers, 3RV motor starter protectors, or 5SB/3NA fuses, depending on the cable requirements and connection conditions.

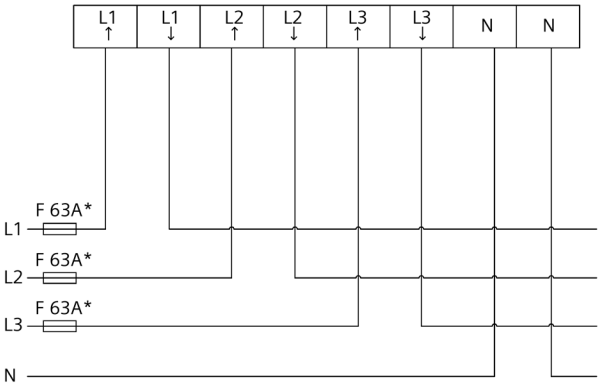
Connection type 1P2W



* The fuses up to 63 A are only used for cable protection.

(2) Three-phase measurement, four conductors, direct connection to the low-voltage network

Connection type 3P4W



* The fuses up to 63 A are only used for cable protection.

Figure 4-6 Direct connection to the low-voltage network.

4.4 Connecting the communication cable

4.4.1 Ethernet communication cable

Always use a shielded cable for the Ethernet data cable.

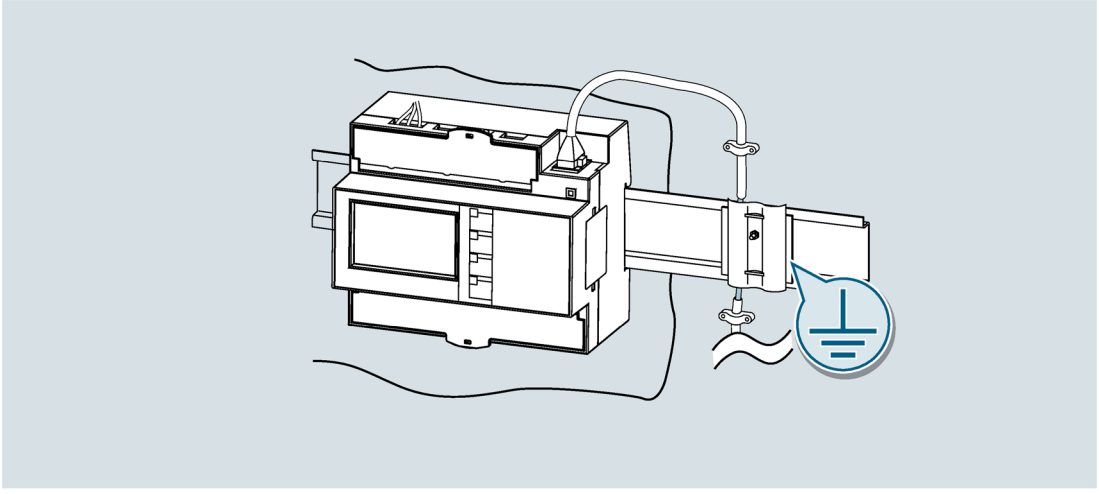
1. Plug the RJ45 cable connector into the RJ45 device socket until the connector engages in the socket.
2. Provide sufficient mechanical strain relief for the Ethernet cable.
3. Ground the cable shield.

4.4.2 Grounding of the Ethernet cable

NOTICE
The upper limit values will be violated if the cable is not grounded Compliance with the technical limit values for noise radiation and noise immunity is only guaranteed if the cable is correctly grounded. The operator of the system is responsible for ensuring compliance with the statutory limit values (CE mark). Make a shield connection as described here.

Implementation

Ground the Ethernet cable in the vicinity of the PAC2200CLP power monitoring device. To do this, expose the foil shield of the cable. Connect the exposed shield to a suitable grounding point on the control cabinet, preferably a shielding bus.



- Be careful not to damage the foil shield of the cable when removing the cable jacket.

  Fasten the exposed shield with a metal cable clamp or alternatively with a hose tie. The clamp must clasp around a large portion of the shield and provide good contact.
- To allow good contact, a tin-plated or galvanically stabilized surface is ideal. With a galvanized surface, the contact should be achieved using suitable screws. A painted surface at the contact point is not suitable.

NOTICE
Loss of contact if the shield connection is incorrectly used for strain relief If the shield connection is used for strain relief, the grounding contact can deteriorate or be completely lost. Do not use the contact point on the cable shield for strain relief.

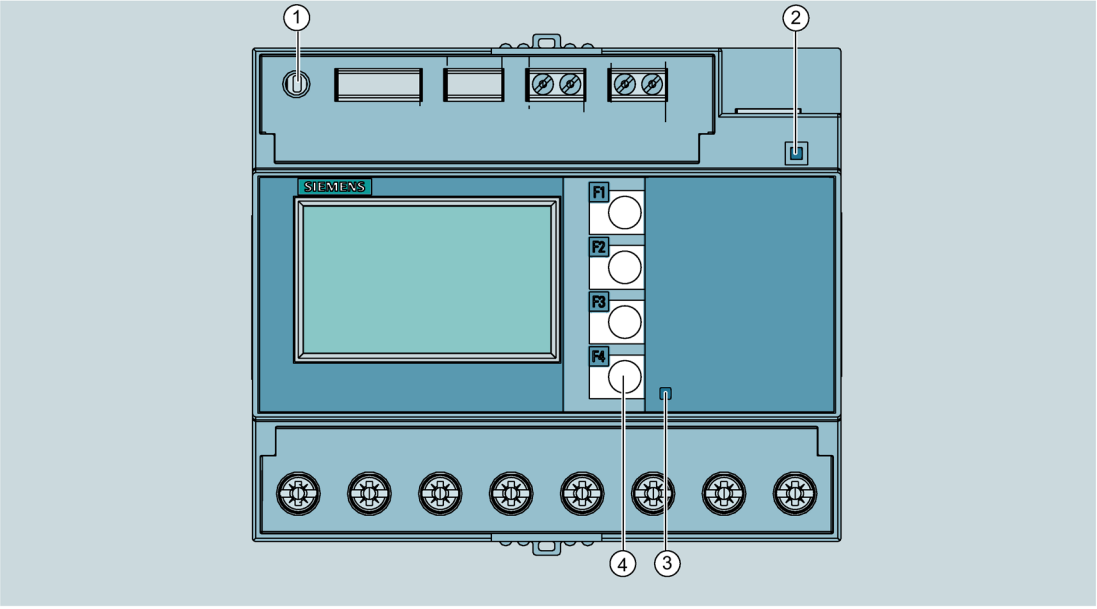
Operation

5

5.1 Device interface

5.1.1 Displays and operator controls

The front of the PAC2200CLP device features the following displays and operator controls:



① Software pushbutton

② LED for Ethernet: Link / Activity

- LED is illuminated: Data connection available
- LED flashes: Data is being transferred
- LED is off: No data connection available

③ Active energy pulse indicator

- 5 A device: 5000 pulses/kWh
- 65 A device: 500 pulses/kWh

④ Control keys

Figure 5-1 Device interface

5.1.2 SW button

Devices connected to a network are to be protected against unauthorized remote access and possible manipulation.

The physical access of the user to the device is confirmed with the SW button.

In the following cases, the user is prompted to press the button:

- when activating/deactivating the passwords via SENTRON powerconfig
- when activating / deactivating the hardware write protection

5.1.3 Control keys

The device can be operated by means of four keys. The keys are assigned different functions that depend on the menu level used.

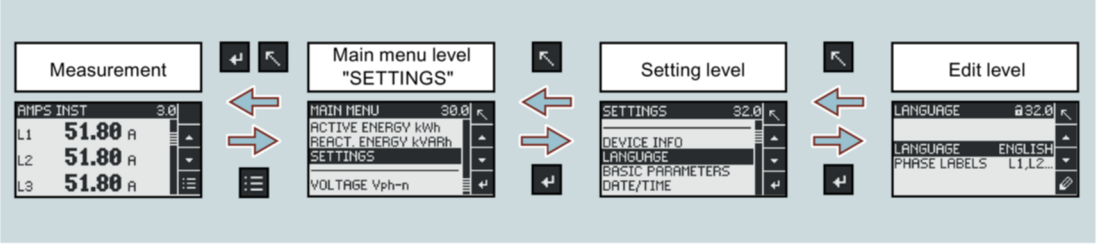
Keys	Possible assignment	Meaning
		No function
		Scroll between extended measured values
		Cancel the last action carried out
		Scroll up
		Increment selection
		Scroll down
		Select the editing location
		Decrement selection
		Main menu level
		ON/OFF
		Edit selection
		Confirm selection

5.2 Menu navigation

The menu-based navigation is intuitive and self-explanatory. Only the basic structure of the menu-based navigation will be explained for this reason. To simplify the overview, menu screenshots are not included in the manual. The description and function of the individual parameters can be found in chapter Device parameterization (Page 64).

The device menu can be subdivided into four menu levels:

- Measured value level
- Main menu level
- Setting level
- Editing level



Depending on the device version and firmware status, the availability of the measured values may vary in the measured value and main menu levels. The parameter selection options at the setting and editing levels also depend on the device version and firmware status.

5.2.1 Measured value level

By default, the device is at the measured value level.

At the measured value level, the available measured values can be read off. (All possible measured values are listed in table 2-2 on pages 15-16. The selection of measured values depends on the device version and connection type)

Using the keys ▲ and ▼ you can scroll through the measured values.

When measured values are selected, additional information can be called up with the ▶ key.

The ☰ key returns the device to the "Main menu level".

5.2.2 Main menu level

In this menu level, all available measured variables are listed without measured values. Additionally, the main menu level has a

"SETTINGS"

menu option for configuration of the device.

The ↖ key returns the device to the measured value menu level.

Using the keys ▲ and ▼ you can scroll through the measured variables.

The ↵ key confirms the required selection and takes the device to the measured value level.

In the "SETTINGS" menu option, the device is set to the "Setting level" by actuating the ↵ key.

5.2.3 Setting level

At the setting level, the device can be configured. All settable parameters are listed at this menu level.

The ↖ key returns the device to the main menu level.

Using the keys ▲ and ▼ you can scroll through the setting parameters.

The ↵ key confirms the required selection and takes the device to the editing level.

5.2.4 Editing level

At the editing level it is possible to modify the device parameters.

The ↖ key returns the device to the setting level.

The required value can be adjusted using the ✎ key.

The required value is entered using the ▲ and ▼ keys.

The input is confirmed with the ↵ key.

Each input must be confirmed with the ↵ key, otherwise the change that has been made is not accepted by the device.

5.3 Supporting software

The power monitoring system from the SENTRON portfolio allows you to introduce energy management according to the ISO 50001 and ISO 50003 standards and permanently reduce energy costs. In addition to cost savings through optimized consumption, you ensure increased resilience with the monitoring of power supply systems and network quality in infrastructure and industrial plants.

You can find more information on the internet (https://sie.ag/3OfwCSA).

5.3.1 powermanager

Energy data of the PAC2200CLP power monitoring device can be measured, monitored, evaluated, displayed and archived using the powermanager energy management software.

powermanager provides the following functions:

- Tree view of the customer's system (project tree)
- Measured value display with pre-defined user views
- Alarm management
- Demand curve
- Reporting, different report types (e.g. cost center report)
- Load monitoring of reaction plans
- Power peak analysis (available as of powermanager V3.0 SP1)
- Support of distributed plants (systems)
- Archiving system
- User administration

5.3.2 powerconfig

The powerconfig software is the combined commissioning and service tool for communication-capable metering devices and circuit breakers from the SENTRON family.

The PC-based tool facilitates parameterization of the devices, resulting in substantial time savings, particularly when several devices have to be set up. Power monitoring devices from the 7KM PAC series can be parameterized and operated via various communication interfaces using powerconfig and measured values can be documented and monitored.

powerconfig provides the following functions:

- Parameterization, documentation, operation and monitoring in one software
- User-friendly documentation of measured values and settings
- Clear presentation of the available parameters including validity testing of the inputs
- Display of the available device statuses and measured values in standardized views
- Project-oriented storage of device data
- Consistent operation and usability
- Support of the various communication interfaces (Modbus RTU, Modbus TCP, PROFIBUS, PROFINET)
- Updating of device firmware and loading of language packs (device-dependent)
- Download of the load profile data and the logbook of PAC2200CLP in the form of a .csv file

Note

You launch the Online Help in powerconfig by pressing the *F1* key.

5.3.3 Web server

The device can be read out with a PC/notebook via a website using the web server integrated in the device. Communication takes place via MODBUS HTTP protocol.

The web server provides the following functions:

- Device information such as serial number, firmware status etc.
- View and evaluation of the measured values
- Clear overview of daily, monthly and annual energy values
- Display of the load profile for active energy for import and export
- Option to download load profile data and the logbook in the form of a csv file

Start web server:

1. Connect the device to the PC or network via the Ethernet interface.
2. Make sure that the PAC2200CLP device and the configuration computer are in the same subnet.
3. Enter the IP address of the device in the browser.

HTTP-Port: 80 (default setting)

Note

The web server can be deactivated with the HTTP Port: 0 setting.

5.3.4 Advanced training courses

Find out about training courses on offer on the following link.

Training for Industry (https://www.sitrain-learning.siemens.com/DE/en/rw73138/Low-Voltage-Power-Distribution)

Here you can choose from:

- Web-based training courses (online, informative, free)
- Classroom training courses (course attendance, comprehensive, subject to fee)
- Online training courses (via Teams or Adobe Connect, comprehensive, subject to fee)

  The popular online training courses offer you several advantages:

  – No travel expenses
  – Time savings
  – No traveling

You also have the possibility of compiling your own training portfolio via **Learning paths**.

5.4 Protection against manipulation

5.4.1 Introduction

The PAC2200CLP is equipped with a range of mechanisms to protect against deliberate and inadvertent device manipulation:

- Protection against unauthorized operation
- Hardware write protection
- IP filter
- Configurable Modbus TCP port

The closed padlock symbol in the display title indicates whether "protection against unauthorized operation" or "hardware write protection" is activated.

The device is protected against write access.

The device is not protected against write access.

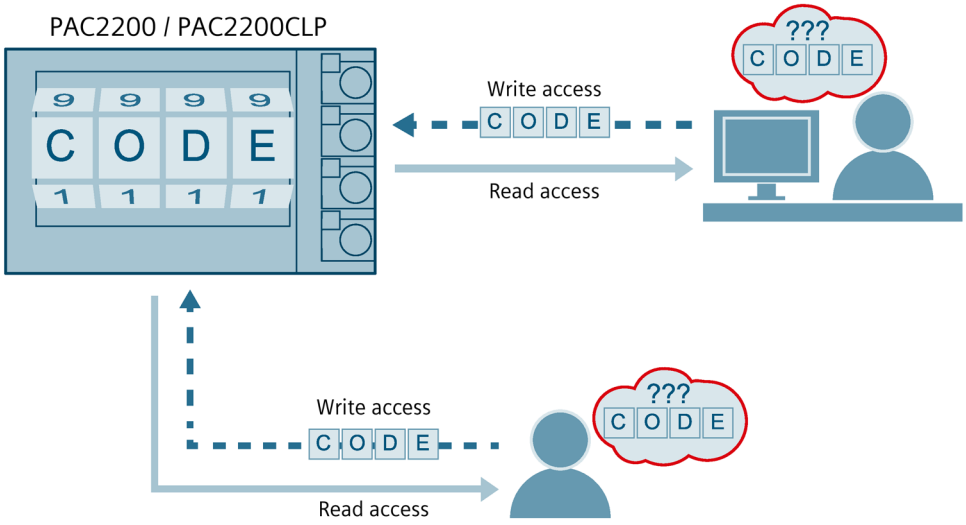
5.4.2 Protection against unauthorized operation

Protection against unauthorized operation prevents write access via the device interface and the

communications interfaces, in particular:

- Changing of device settings, including password.
- Changing and deletion of values/parameters.
- Deletion of data and memory content.
- Setting and resetting of counts.
- Resetting to factory settings.

Reading out of measured values and memory content is still possible when protection against unauthorized operation is active.



As soon as the password has been entered in the device once, it is not requested again as long as the "SETTINGS" menu level remains active.

The password policy is a four-digit number from 0000 to 9999. (Default password: 0000)

Note

Use of different terms in the manual and in the device menu.
In the device menu, the term "password protection" is used to refer to protection against unauthorized operation.

If no user-specific password has been assigned, the default password must be entered when protection against unauthorized operation is switched on. The currently valid password becomes visible on the display when protection against unauthorized operation is switched off. The password remains saved and becomes effective again the next time protection against unauthorized operation is switched on.

Note

Before switching on protection against unauthorized operation, make sure that you and the group of authorized users are all in possession of the password.

If password protection is switched on, you need the password for all changes to the device settings. You also require the password to call the "PASSWORD" dialog box again in order to switch off access protection or to change the password.

Note

If you have forgotten the password, please contact Technical Support. You will receive a new password from them.

5.4.3 Hardware write protection

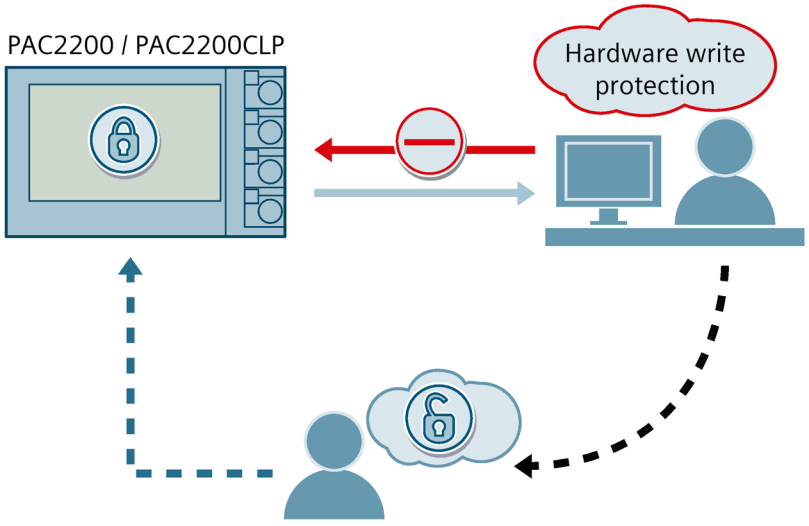
The hardware write protection prevents write access to the device, both via the communication interface and on the display.

In order to gain write access, the hardware write protection must be deactivated directly on the device.

The hardware write protection cannot be deactivated via a communication interface.

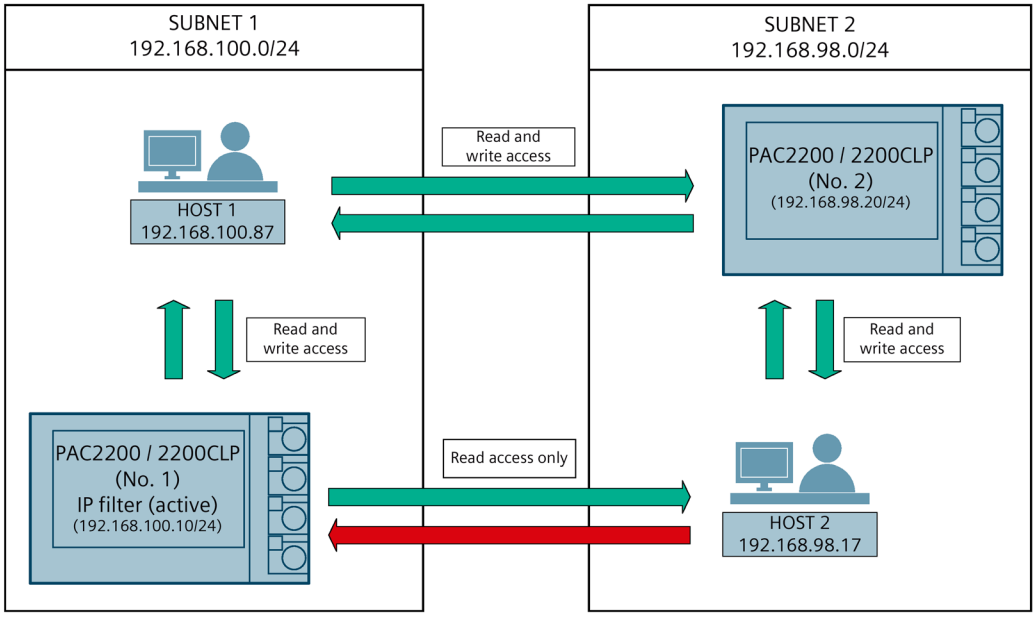
To activate or deactivate the hardware write protection, the user is prompted to press the SW button on the device. The request to do so appears on the display for 15 minutes.

If the SW button has not been pressed once 15 minutes have expired, the change is not applied and the request message on the device display disappears.



5.4.4 IP filter (subnet firewall protection)

The IP filter, also called subnet firewall protection, is a configurable protection on the device. If the protection is activated, write requests are only accepted if the user is in the same subnet.



5.4.5 Modbus TCP port, configurable

Ports are communication channels which make it possible to access a Modbus-capable device via a network.

Standard IP ports like port 502 are often tested by port scanners. If an open port is discovered by an attacker, the device can be attacked via this port.

The PAC2200CLP device allows the Modbus TCP ports to be configured manually. Switching from standard port 502 to a user-defined port makes it more difficult to scan for open ports.

5.4.6 Housing seal and sealing

Seal label:

The seal label protects the device from unauthorized access and possible manipulation inside the device.

The device has two seal labels. The seal is multilayered. After removing or damaging the sticker, the word "Void" remains on the device housing.

Note

Expiration of the warranty claim due to damage or removal of the seal label

If the seal label is damaged or removed, the warranty becomes invalid.

The device is not certified for billing purposes.

Seal:

The device has two sealing eyelets for sealing the terminals.
The sealing of the connections prevents the manipulation of connections and thus also possible energy theft.

Commissioning

6

6.1 Overview

Prerequisites

- The device has been installed.
- The device has been connected in accordance with the possible connection methods.

Steps for starting up the device

1. Apply the measuring voltage
2. Parameterize the device
3. Check measured values

NOTICE
Check the connections Incorrect connection can result in malfunctions and failure of the device. Before starting up the PAC2200CLP, check that all the connections have been made correctly.

NOTICE
Disconnect device prior to insulation test When performing an insulation test of the entire installation with AC or DC, the device should be disconnected before starting the test.

6.2 Applying voltage

The device is supplied with power via the voltage it measures.

Please consult the technical data or the type plate for the type and level of the possible supply voltage.

See chapter Connections (Page 42).

⚠ WARNING

Do not apply voltage in excess of the rated voltage limit
Can cause death, serious personal injury, or equipment damage.

The maximum voltage listed in the technical data and on the rating plate must not be exceeded.

6.3 Parameterizing the device

6.3.1 Parameterizing with powerconfig

You can download the powerconfig configuration software from the Industry Online Support Website ((https://support.industry.siemens.com/cs/ww/en/view/63452759) herunterladen.).

Information and notes on how to use powerconfig can be found in the Online Help of the configuration software or by contacting Technical Support.

You launch the Online Help in powerconfig by pressing the "F1" key.

Before you can configure the PAC2200CLP power monitoring device, the measuring voltages must be connected and communication with the device must be set up.

Establishing a connection to PAC2200CLP

Proceed as follows to establish a connection to the PAC2200CLP device:

1. Connect the PAC2200CLP device to the PC or network.
2. If you have connected the device via the Ethernet, make sure that the device and the configuration computer are in the same subnet.
3. Open the powerconfig configuration software.
4. On the toolbar, click on the "Search for accessible devices" key or alternatively press the "F11" key. The "Search for accessible devices" window is displayed.
5. Click the "Ethernet" tab in the "Search for accessible devices" window:

   The "Ethernet" view appears.

   – Select the Ethernet interface from the selection list.
   – Click on the "Start search" button.
   – Select the desired device.
   – If necessary, adapt the communication settings.
   – To do this, switch the edit mode to "Unlocked". Carry out the required settings in the menu options "IP address", "Network mask", "Gateway" etc. Click on the button "Load changes to configuration parameters into device(s)".

6. All devices found are shown in the "Result" window.
7. Select the desired device and click on the "Create devices" button.

   The selected device is added.
8. In menu item "Views", select the sub-menu "Parameters".

   The "Parameter" window is displayed.
9. In the "Properties" window, click on the "Load to PC" button.

   The configuration is loaded from the device to the PC.

Parameterizing the device

The parameters are entered and changed in offline mode.

To switch between online and offline mode, click "Activate online view" in the "Options" menu or press the "F12" key.

Set the required basic parameters.

Note the description of the parameters in section Parameterizing via the device menu (Page 68).

Make use of the Online Help in powerconfig.

In order to load the parameters to the device, proceed as follows:

1. Integrate the device in powerconfig.
2. In menu item "Views", select the sub-menu "Parameters" or alternatively press the "Ctrl" and "Pos1" buttons simultaneously.

   The "Parameter" window is displayed.
3. In the "Parameters" window, click on the "Load to PC" button.

   The set parameters are loaded to the device.
4. Check the device parameters and adjust them if necessary. The parameters can only be changed in offline mode.

   More detailed information on parameterization can be found in the powerconfig Online Help or in section Parameterizing via the device menu (Page 68).
5. In the "Parameters" window, click on the "Load to device" button.

   The set parameters are loaded to the device.

"Security" parameter

Activate security with powerconfig:

1. In menu item "Views", select the sub-menu "Security".

   The "Security" window is displayed.
2. In the menu item "Options", select "Activate online view".

   The "Security" window is refreshed. The following degrees of protection can be activated/deactivated

   – Password protection
   – Hardware write-protection
   – Subnet firewall protection (IP filter)

"Password protection" parameter

When using password information, write access is possible by means of the "powerconfig" software.

The password is only required when the "Password protection" parameter is activated.

As soon as the password has been entered once for the device, it is not requested again. The set password can be deleted from the memory in menu item "Password management".

Two different password types are available:

- Device password: Valid for one device only
- Global password: Valid for multiple devices

  (A global password simultaneously unlocks multiple devices in which the “Global password” has been defined).

ON: Write access is password protected by means of communication.

OFF: Password protection deactivated

(default setting: OFF)

Password policy: Four-digit number between 0000-9999

(default setting 0000)

Activation or deactivation of the password protection must be confirmed on the device. The request message "PRESS SW" appears on the display for 15 minutes. By pressing the SW button on the device during this phase, the protection function is activated or deactivated.

If the button has not been pressed once 15 minutes have expired, the changes are not applied and the request message on the device disappears.

If the password is entered incorrectly, this action can only be repeated after a short delay.

Every repeated incorrect password entry results in an extension of the delay period between entry possibilities.

Note

If you have forgotten the password, please contact Technical Support. You will receive a new password from them.

"Hardware write-protection" parameter

No write access is possible, even if password information is used. In order to gain write access, the hardware write protection must be deactivated.

ON: Hardware write protection is activated.

OFF: Hardware write protection is deactivated

Activation or deactivation of the password protection must be confirmed on the device. Request message "PRESS SW" appears on the display for 15 minutes. By pressing the SW button on the device during this phase, the protection function is activated or deactivated.

If the button has not been pressed once 15 minutes have expired, the changes are not applied and the request message on the device disappears.

"Access protection IP filter" parameter

The IP filter is a configurable access protection. If activated, Modbus TCP write commands are only accepted if the remote station is located in the same subnet.

Note

It is recommended to activate the hardware write protection on the device.

If you want to use the device for billing purposes, please refer to the notes at the end of the section Parameterizing via the device menu (Page 68).

6.3.2 Parameterization via the device menu

The PAC2200CLP device can be parameterized via the "Settings" menu option. See section Menu-based navigation (Page 53).

"Language" parameter

The language of menu-based navigation and of the measured value displays can be set in the "Language" menu item.

Selection	Range	Factory setting
Language	English, German	English
Phase designation	• L1, L2, L3 • a, b, c	L1, L2, L3

"Basic settings" parameter

Not available for 65 A devices.

"Current input" parameter

The "Current input" parameter specifies the values for the current input.

When measuring via current transformer, the device must know the current conversion ratio.

For this purpose, the primary and secondary current must be specified in the fields "PRIMARY CURRENT" and "SECONDARY CURRENT".

Selection	Range	Factory setting
PRIMARY CURRENT	Freely adjustable. Range: 1 A ... 10000 A	50 A
SECONDARY CURRENT	Range: 1 A, 5 A	5 A
DISPLAY RANGE	Freely adjustable. Range: 1 A ... 10000 A	50 A
I(n) display	Display of current in neutral conductor (calculated) **No:** • Neutral current is displayed in menu item 3.0 **Yes:** • Neutral current is not displayed	**Yes**

You can configure the resolution of the current display in the "DISPLAY RANGE" menu item. The setting has no impact on the measurement accuracy of the device. The recommended setting is the current that is usually flowing in the system. If the usual current is 50 A, set the display range to 50 A. In this case, the current is displayed with one decimal place.

"Write protection" parameter

The "Write protection" parameter is described later in this section.

"Date/Time" parameter

The date and time can be set by using the "Date/time" option in the "Settings" menu.

Selection	Range	Factory setting
DATE	Current date The date format is defined in the FORMAT field.	–
FORMAT	DD.MM.YYYY (day – month – year) MM/DD/YY (month – day – year) YYYY-MM-DD (year – month – day)	DD.MM.YYYY
TIME	HH:MM:SS	
TIME ZONE	Time zone, refers to coordinated universal time (UTC) –12:00 ... +14:00, in 30-minute intervals Examples: • "–06:00" corresponds to UTC-6 • "+01:00" corresponds to UTC+1	00:00
DAYL.SAVING	Automatic change of time from standard time to daylight saving time and from daylight saving time to standard time. • **OFF:** Time change is switched off • **Auto EU:** Time change within the European Union, changeover to daylight saving time: The internal clock is put forward from 1 a.m. UTC to 2 a.m. UTC on the last Sunday in March. Changeover to standard time: The internal clock is put back from 2 a.m. UTC to 1 a.m. UTC on the last Sunday in October. • **Auto US:** Time change within the USA, changeover to daylight saving time: The internal clock is put forward from 2 a.m. local time to 3 a.m. on the second Sunday in March. Changeover to standard time: The internal clock is put back from 2 a.m. local time to 1 a.m. on the first Sunday in November. • **Table:** Time change can be individually parameterized. The parameters can be set in the software.	OFF
SNTP	Protocol is used for transmitting and synchronizing the time. • **OFF:** SNTP function not active • **ACTIVE:** The device automatically requests the time from the NTP server. • **BCST client:** The device receives time telegrams which are sent from an NTP server.	OFF

Selection	Range	Factory setting
IP (only when SNTP is activated)	If an SNTP IP address is configured, only data from this IP address is accepted.	0.0.0.0
SNTP STATUS OK (only when SNTP is activated)	• **ACTIVE:** SNTP server is available • **NOT ACTIVE:** SNTP server is unavailable	–

"Integrated I/O" parameter

"Digital input" parameter

The following functions can be assigned to the "Digital input" parameter:

- Tariff switching for two-tariff, active energy, and reactive energy counters.

Selection	Range	Factory setting
ACTION	• **NONE:** Input is deactivated. • **PULSE INPUT:** Counting of input pulses • **HT/LT SWITCHING**: Switching between tariffs. Low tariff if input active. • **DISPLAY:** Backlighting. Backlighting ON, if input is active.	NONE
UNIT	The "UNIT" property is only visible if "PULSE INPUT" is set for the "ACTION". Countable unit with pulse counting: • Active energy (kWh) • Reactive energy (kvarh)	—
PULSES PER UNIT	The "PULSES PER UNIT" property is only visible if "PULSE INPUT" is set for the "ACTION". Range: 1 to 4000	1
PRO (input pulse divider)*	The "PULSES PER UNIT" property is only visible if "PULSE INPUT" is set for the "ACTION". Range: 1; 10; 100; 1000	1

)* Formula:

$$\frac{\text{Pulses per unit}}{\text{Pulse divider x unit}} = \text{Pulse value}$$

Example:

Pulses per unit: 50

Pulse divider: 100

Unit: kWh

$$\frac{50}{100\ \text{kWh}} = 0.5\ \text{pulses per kWh} \quad = 500\ \text{pulses per MWh}$$

"Digital output" parameter

The following functions can be assigned to the "Digital output" parameter:

- Energy pulse output; can be programmed for active or reactive energy pulses
- Indication of the direction of rotation
- Operating state display of the device
- Switching output for remote control via the Modbus interface

Selection	Range	Factory setting
ACTION	• **OFF:** Output is deactivated. • **DEVICE ON:** Output signals that the device is switched on. • **REMOTE CONTROL**: Output is controlled by remote access. • **DIRECTION OF ROTATION:** Output is switched on by an electric counter-clockwise rotating field and remains active for as long as the field is rotating in this direction. • **PULSE:** Digital output signals the number of pulses set for each energy unit (e.g. kWh). The energy counter specified in the "COUNTER SOURCE" field is evaluated here.	OFF
PULSES PER UNIT	The "PULSES PER UNIT" property is only visible if "PULSE INPUT" is set for the "ACTION". Range: 1 to 4000	1
PRO (Output pulse divider)	The "PULSES PER UNIT" property is only visible if "PULSE INPUT" is set for the "ACTION". Range: 1; 10; 100; 1000	1
UNIT	Selects the type of cumulative power and the import value that triggers the pulse when that value is reached. • Counter Import Active Energy (kWh) • Counter Export Active Energy (kWh) • Counter Import Reactive Energy (kvarh) • Counter Export Reactive Energy (kvarh)	Counter Import Active Energy (kWh)
PULSE LENGTH	The "Output pulse divider" property is only visible if "Energy pulse" is set for the "USAGE TYPE". Length of energy pulses. Range: 30 ms to 500 ms	100 ms

"Communication" parameter

The number of available communications interfaces can vary depending on the version of the device.

"MODBUS TCP" parameter

Selection	Range	Factory setting
MAC	MAC address. Read only.	–
DHCP	(Dynamic Host Configuration Protocol) • OFF • ON If the DHCP is activated, network configurations are automatically assigned. This enables automatic integration of devices in an existing network. If the DHCP is activated, network configurations cannot be adjusted manually.	ON
IP	IP address: 000.000.000.000 Manual setting of the IP address is only possible when DHCP is deactivated.	–
SN (subnet mask)	Subnet address: 000.000.000.000 Manual setting of the subnet is only possible when DHCP is deactivated	–
LIMIT (gateway)	Gateway address: 000.000.000.000 If data exchange with an IP address which is not in the home subnet is required, the data can be transmitted via a gateway. Gateway interconnects different networks. Manual setting of the gateway is only possible when DHCP is deactivated.	–
PORT	Modbus port: 0 to 65534	502
IP FILTER	• OFF: IP filter deactivated • ON: Write access is rejected if the remote station is in another subnet. The IP filter, also called subnet firewall protection, is a configurable protection on the device. If the protection is activated, write requests are only accepted if the user is in the same subnet.	OFF
HTTP PORT (web server)	Manual setting of the HTTP port (web server): 0 to 65534 With the HTTP port 0 setting, the web server is deactivated.	80

"Display" parameter

Selection	Range	Factory setting
CONTRAST	The display contrast can be adjusted in steps. Range: 1 - 10	5
BRIGHTNESS	The intensity of the backlighting can be adjusted in steps. Range: 0 - 3	3
BACKL.DIMMED	The dim setting of the display can be adjusted in steps. Range: 0 - 3	3
DIM AFTER	On expiry of the set period, the backlighting is dimmed to the set intensity. Range: 0 - 99	3
TEST INDICATOR	Display test indicator. For testing the functional capability of the display.	–

"Extended" parameter

"Password" parameter

Selection	Range	Factory setting
DISPLAY	• OFF: Password deactivated • ON: Write access is password protected using keys on display	OFF
COMMUNICATION	• OFF: Password deactivated • ON: Write access is password protected by means of communication	OFF
PASSWORD	Password policy four-digit number. Value range: 0000 to 9999	0000

Write access to the device settings can be prevented by means of a password.

After the password has been entered once for the device, it is not requested again while the device is still at the "Settings" level.

Password protection prevents the following actions:

- Changing of device settings, including password
- Changing and deletion of values
- Deletion of data and memory content
- Resetting to factory settings

Reading out of measured values and memory content is possible without restriction when password protection is active.

"Reset" parameter

Selection	Range	Factory setting
FACTORY SETTINGS	All the device settings, with the exception of the communication parameters, are reset to the as-delivered condition. No data relevant to statutory calibration regulations (e.g. register values for active energy, load profile values and logbook entries) is deleted. • OFF: Not active • ON: Active	OFF
COMMUNICATION PARAMETERS	All communication settings are reset to the as-delivered condition. • OFF: Not active • ON: Active	OFF
Confirmation of the reset	Confirmation of the reset	0000

Note

The reset must be confirmed by pressing "Execute...". The device reset is not performed otherwise.

"Write protection" parameter

Selection	Range	Factory setting
WRITE PROTECTION	• OFF: Not active • ON: Active	OFF
PRESS SW	The physical access of the user to the device is confirmed with the SW button. When activating or deactivating the write protection, the request "PRESS SW" appears on the display. If the SW button has not been pressed once 15 minutes have expired, the changes are not applied and the request message on the device display disappears.	–
DISPLAY	Write protection prevents write access via the device interface. • OFF: Write protection not active • ON: Write protection active	OFF
DATE/TIME	The date and time are protected by the write protection function. • OFF: Write protection not active • ON: Write protection active	OFF
PASSWORD	The password is protected by the write protection function. • OFF: Write protection not active • ON: Write protection active	OFF
COMMUNICATION	Write protection prevents write access via the communications interface. • OFF: Write protection not active • ON: Write protection active	OFF

The hardware write protection prevents write access to the device, both via the communications interface and on the display.

In order to gain write access, the hardware write protection must be deactivated directly on the device.

The hardware write protection cannot be deactivated via a communications interface. The user must press the SW button directly on the device to activate or deactivate the hardware write protection function.

Note

After the PAC2200CLP has started up, check that it is functioning correctly.

If you are capturing data for billing purposes, the hardware write protection must be activated and the terminal cover must be sealed. See section Connections (Page 42).

It must also be ensured that the device is not storing any invalid data. In this respect, it is important that the time synchronization is functioning correctly, for example.

Also check that the device is functioning correctly at regular intervals to safeguard against potential difficulties.

Service and maintenance

7

7.1 Cleaning

Clean the device as required. Use a dry cloth for this.

NOTICE
Damage may result from use of detergents.
Detergents can damage the device. Do not use detergents.

⚠ DANGER
Hazardous voltage. **Will cause death, serious personal injury, or equipment damage.**
Turn off and lock out all power supplying this equipment before working on this device.

7.2 Calibration

The device requires no maintenance.

The device has been calibrated by the manufacturer before shipping. Recalibration is not required provided the environmental conditions are maintained.

7.3 Troubleshooting guide

Remedies for the resolution of faults

Fault	Remedies
Device is not working	• Check power supply • Check fuse
Voltage or current measured values are not displayed	• Check fuse • Check the configuration (see Parameterizing the device (Page 64))
Voltage values are not plausible	• Check the voltage taps at the different phases to determine whether or not voltage is present
Current values are not plausible	• Check the settings and the wiring of the current transformer (if present) and correct if necessary
No communication	• Check the network cable connection • Check whether the green "LAN" LED is lit • Check the communication settings (incorrect IP address, incorrect subnet, incorrect Modbus TCP port or gateway?) • Check firewall, if present (possibly preventing communication to the Modbus ports)
Power values are incorrect, although voltage and current are correctly applied	• Check voltages and currents of the phases (not properly connected to one another) • Check the polarity of the current transformer, if present For devices with a current transformer connection: Incorrect phase assignment between voltage and current connections: – Check voltages and currents of the phases (not properly connected to one another) and correct if necessary. – The voltage tap for connection of measuring voltage UL1 must be performed at the same phase as the installation of the current transformer that is connected to the IL1 terminals. The same applies to voltage tap UL2 and the current transformer at IL2, as well as voltage tap UL3 and the current transformer at IL3. – Check the current flow direction of the primary current transformers and the wiring of the secondary connections (k,l) of the current transformers and replace if necessary. See chapter Connection examples (Page 44).
Fault indication in the display menu: "MID VOID"	• The device is defective and cannot be repaired. • The device may no longer be used for billing.

If the device fault cannot be remedied by the measures given above, the device is probably defective.

More help can be found on the Internet.

Technical Assistance (https://www.siemens.com/support-request)

If the device is defective, please proceed as follows:

- See chapter Warranty (Page 81) if the device has become defective within the warranty period.
- If the device has become defective outside the warranty period, then the device must be disposed of in accordance with local disposal regulations.

7.4 Warranty

Procedure

Note

Loss of warranty

Opening the device invalidates the Siemens warranty. Only the manufacturer is permitted to carry out repairs to the devices. Return faulty or damaged devices to Siemens for repair or replacement.

If the device is faulty or damaged, proceed as follows (only during the warranty period):

1. Uninstall the device; refer to section Removal (Page 38).
2. Pack the device in a suitable manner to prevent it from being damaged during transport.
3. Return the device to Siemens. You can obtain the address from:
   - Your Siemens sales partner
   - Technical Assistance

Note

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment, or contractual relationship. All Siemens obligations derive from the respective sales contract, which also contains the complete and exclusive warranty agreement. These contractual warranty requirements are neither extended nor restricted by the implementation of this Operating Manual.

See also

Latest information (Page 8)

Disposal of waste electronic equipment

Waste electronic equipment must not be disposed of as unsorted municipal waste, e.g. household waste. When disposing of waste electronic equipment, the current local national/international regulations must be observed.

Technical specifications

8

8.1 Technical specifications

Device configuration

- 1 optically isolated digital input
- 1 optically isolated digital output
- 1 Ethernet interface for connection to and configuring on the PC or network

Measurement

Only for connection to AC voltage systems

Measuring method	
For voltage measurement	True root-mean-square measurement (TRMS)
For current measurement	True root-mean-square measurement (TRMS)

Measured value acquisition	
Energy	Contiguous (zero blind measuring)
Current, voltage	Contiguous (zero blind measuring)
Waveform	Sinusoidal or distorted
Frequency of the relative fundamental	50 Hz
Pulse display LED (5 A device)	5000 pulses/kWh
Pulse display LED (65 A device)	500 pulses/kWh

Measuring inputs for voltage (5 A/65 A devices)

Measuring inputs	
Voltage $U_{n\ (L\text{-}N\ /\ L\text{-}L)}$	230 V / 400 V AC, 50 Hz
Max. measurable voltage	
Voltage L-N	230 V 3AC (+20%)
Voltage L-L	400 V 3AC (+20%)
Min. measurable voltage	
Voltage L-N	100 V 3AC (-80%)
Voltage L-L	173 V 3AC (-80%)
Zero point suppression level	
Voltage L-N	7 V
Voltage L-L	10 V
Impulse withstand voltage	6.5 kV (1.2 / 50 µs)
Measuring category	CAT III (acc. to IEC 61010-2-030)
Input resistance (L-N)	1 MΩ

Measuring inputs for current (5 A device)

Only for connection to AC power systems via external current transformers (5 A device)

Measuring inputs	
Rated current In I_e	1 A / 5 A
Max. permissible continuous current	10 A
Current impulse overload capability	100 A for 1 s
Zero point suppression level	10 mA / 45 mA
Measuring range	1 ... 120%
Apparent power consumption	
Measuring range 1 A / per phase	4 mVA
Measuring range 5 A / per phase	0.115 VA

Measuring inputs for current (65 A device)

For direct connection to the AC power system.

Measuring inputs	
Reference current Iref (acc. to EN 50470-1)	10 A
Max. input current Imax	65 A
Current impulse overload capability	1990 A for 10 ms
Measuring range	0.5 ... 65 A

Power supply (5 A and 65 A devices)

Power supply	
Design of the power supply	Wide range AC power supply (supply from measuring voltage L1, L2 or L3)
Operating range	100 V - 230 V +/- 20%
Power consumption	5 VA
Overvoltage category	OVC III

Measuring accuracy

Applied standards:

- IEC 61557-12
- IEC 62053-21
- IEC 62053-23
- EN 50470-3:

Measured variable	**Accuracy class (5 A device)**	**Accuracy class (65 A device)**
Voltage	Class 0.5 (IEC 61557-12)	Class 0.5 (IEC 61557-12)
Current	Class 0.5 (IEC 61557-12)	Class 0.5 (IEC 61557-12)
Neutral conductor current (calculated)	Class 0.5 (IEC 61557-12)	Class 0.5 (IEC 61557-12)
Apparent power	Class 1 (IEC 61557-12)	Class 1 (IEC 61557-12)
Active power	Class 1 (IEC 61557-12)	Class 1 (IEC 61557-12)
Reactive power	Class 1 (IEC 61557-12)	Class 1 (IEC 61557-12)
Total apparent power	Class 1 (IEC 61557-12)	Class 1 (IEC 61557-12)
Total active power	Class 1 (IEC 61557-12)	Class 1 (IEC 61557-12)
Total reactive power	Class 2 (IEC 61557-12)	Class 2 (IEC 61557-12)
Total power factor	Class 0.5 (IEC 61557-12)	Class 0.5 (IEC 61557-12)
Line frequency	Class 0.05 (IEC 61557-12)	Class 0.05 (IEC 61557-12)
Total active energy	Class 1 (IEC 61557-12) (IEC 62053-21)	Class 1 (IEC 61557-12) (IEC 62053-21)
Total reactive energy	Class 2 (IEC 61557-12) (IEC 62053-23)	Class 2 (IEC 61557-12) (IEC 62053-23)
Total active energy	Class C (EN 50470-3)	Class B (EN 50470-3)

Note:

With the PAC2200CLP 5 A device, the measuring accuracy depends on the quality of the external current transformers used.

Digital input

Digital input		
Number		1
Type		Passive
Input voltage		
	Rated value	24 V DC
	Maximum input voltage	30 V DC
Input current		
	"1" signal detection	2.5 ... 10 mA
	"0" signal detection	≤0.5 mA

Digital output

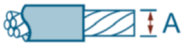
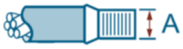
Digital output		
Number		1
Type		Passive
Design/function		Switching output or pulse output
Rated voltage		0 ... 30 V DC, typical 24 V DC (SELV or PELV supply)
Output current		
	For signal "1"	Depends on the load and the external power supply
	Continuous load	≤50 mA (thermal overload protection)
	Transient overload	≤130 mA for 100 ms
	For signal "0"	≤0.2 mA
Internal resistance		30 Ω
Overvoltage category		OVC I
Pulse output function		
	Standard for pulse emitter	Signal characteristics in accordance with IEC 62053-31
	Adjustable pulse duration	30 ... 500 ms
	Min. settable time frame	10 ms
Max. switching frequency		17 Hz
Short-circuit protection		Yes

Communication

Ethernet interface (optional)	
Protocols	Modbus TCP; web server (HTTP); SNTP; DHCP
Ethernet connection	RJ-45
Data rate	10 / 100 Mbps

Connection elements

The specified conductor cross-sections describe the capacity of the connection terminals. When selecting the conduction cross-sections, always pay attention to the possible current load and ensure adequate cable protection.

Current, power supply	**5 A device**	**65 A device**
Conductor cross-section for copper cable (Cu)		
Rigid 	0.2 ... 6.0 mm² [AWG 24 ... 10]	0.75 ... 35 mm² [AWG 19 ... 2]
Flexible 	0.2 ... 4.0 mm² [AWG 24 ... 12]	1 ... 35 mm² [AWG 18 ... 2]
Flexible with end sleeve, without plastic sleeve 	0.2 ... 4.0 mm² [AWG 24 ...12]	0.75 ... 25 mm² [AWG 19 ... 4]
Flexible with end sleeve and plastic sleeve 	0.25 ... 4.0 mm² [AWG 24 ... 12]	0.75 ... 25 mm² [AWG 19 ... 4]
2-wire, same cross-section		
Rigid 	0.2 ... 1.5 mm² [AWG 24 ... 16]	0.75 ... 10 mm² [AWG 19 ... 8]
Flexible 	0.2 ... 1.5 mm² [AWG 24 ... 16]	1 ... 4mm² [AWG 18 ... 12]
Flexible with end sleeve, without plastic sleeve 	0.25 ... 0.75 mm² [AWG 24 ... 19]	0.75 ... 4 mm² [AWG 19 ... 12]
Flexible with TWIN end sleeve and plastic sleeve 	0.5 ... 2.5 mm² [AWG 20 ... 14]	0.75 ... 4 mm² [AWG 19 ... 12]
Tightening torque	0.5 ... 0.6 Nm [4.4 ... 5.3 lb-in]	3 Nm [26.6 lb-in]
Conductor cross-section for copper cable (Cu) for UL market	AWG 10 ... 4 Solid or stranded with ferrules	
Conductor cross-section for copper cable (Cu) for CSA market	AWG 8 ... 4 Compact stranded	

Communication ports	
Conductor cross-section for copper cable (Cu)	
Rigid 	0.14 ... 1.5 mm² [AWG 26 ... 16]
Flexible 	0.14 ... 1.5 mm² [AWG 26 ... 16]
Flexible with end sleeve, without plastic sleeve 	0.25 ... 1.0 mm² [AWG 24 ... 18]
Flexible with end sleeve and plastic sleeve 	0.25 ... 1.5 mm² [AWG 24 ... 16]
2-wire, same cross-section	
Rigid 	0.14 ... 0.75 mm² [AWG 26 ... 19]
Flexible 	0.14 ... 0.75 mm² [AWG 26 ... 19]
Flexible with end sleeve, without plastic sleeve 	0.25 ... 0.5 mm² [AWG 24 ... 20]
Flexible with TWIN end sleeve and plastic sleeve 	0.5 ... 1.0 mm² [AWG 20 ... 18]
Tightening torque	0.5 ... 0.6 Nm [4.4 ... 5.3 lb-in]

Dimensions and weights

Dimensions and weights	
Type of fixing	DIN-rail mounting TH35 to EN 60715
Construction type	6TE
Housing dimensions W x H x D	108 mm x 97 mm x 71 mm [4.2 in x 3.8 in x 2.8 in]
Weight	
5 A device without packaging	310 g
5 A device with packaging	375 g
65 A device without packaging	415 g
65 A device with packaging	480 g

Degree of protection and protection class

Degree of protection and protection class	
Protection class	Safety class II
Degree of protection according to IEC 60529	
Front area	IP40
Termination area	IP20
If higher degree of protection requirements are placed on the application engineering, the customer must take suitable measures. This includes installation in a protective enclosure with degree of protection IP51 and higher	

Ambient conditions

Operation is only permissible in a control cabinet or fuse box inside an enclosed dry room.

Ambient conditions	
Temperature range	
Ambient temperature while in operation	-40 °C ... +70 °C (HW dependence, see device)
Ambient temperature during transportation and storage	-40 °C ... +70 °C
Relative humidity (annual average value)	< 75 % RH
Installation altitude above sea level	max. 2000 m above sea level
Device mounting position	Any
Degree of pollution	2
Environmental tests	according to EN 60068-2-27 EN 60068-2-6 EN 60068-3-3

Electromagnetic environment in accordance with MID directive (2014/32/EU)

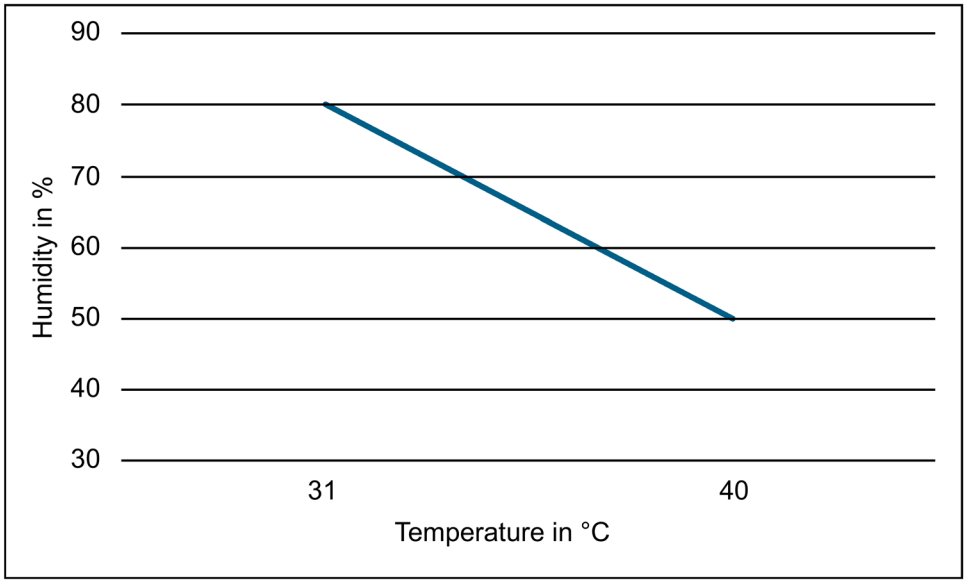
- Class E2

Mechanical environment in accordance with MID directive (2014/32/EU)

- Class M1

Relative humidity in relation to ambient temperature

The maximum relative humidity is 80 % at temperatures up to 31 °C, decreasing linearly down to 50 % relative humidity at 40 °C.



Approvals

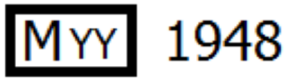
The PAC2200CLP conforms to the regulations of the European directives.

- **CE conformity**

  CE

  Applied directives and standards can be found in the EU Declaration of Conformity (https://support.industry.siemens.com/cs/ww/en/ps/7KM2200-2EA00-1JB1/cert).

- **MID conformity (optional)**

  DE MTP 17 B 008 MI-003

  Only devices with the following MLFB numbers have MID approval:

  7KM2200-2EA00-1JB1

  7KM2200-2EA40-1JB1

  As per the Measuring Instruments Directive (MID), Annex 1, Point 10, the following displays and the functions that cause them are within the MID application range and therefore formed part of the conformity assessment procedures according to MID, Annex II, Module B.

Energy for the overall measured values formed from all the existing measuring systems, OBIS code	Short code Energy	Phase angle range of the offset between current and voltage	Revision
Positive active, 1.8.0 T1 + T2 kWh secondary side (menu item kWh IMPORT 11.10)	+A	> 270° to < 90°	0
Positive active, 1.8.0 T1 + T2 kWh primary side (menu item kWh IMPORT 11.8)	+A	> 270° to < 90°	1
Negative active, 2.8.0 T1 + T2 kWh primary side (menu item kWh EXPORT 11.9)	-A	> 90° to < 270°	1
Negative active, 2.8.0 T1 + T2 kWh secondary side (menu item kWh EXPORT 11.11)	-A	> 90° to < 270°	1

Not included in the application range are in particular:

- Outputs with the exception of the test LED
- Data interfaces (Ethernet) as well as digital inputs and outputs
- Apparent energy
- Reactive energy
- Instantaneous values (voltage, current, apparent power, active power, reactive power, power factors, frequency, totals)
- Switching between tariffs
- Password protection and hardware write protection
- Reset function
- Load profile values (daily, monthly, annual values)
- Calculation of average values for active and reactive power of the last completed demand period for import and export

Functions in conformance with statutory calibration regulations according to PTB-A 50.7:

- Logbook
- Load profile (energy feeds, 15-minute values, import and export)
- Date/time
- Transformer factor settings

- Applied directives and standards can be found in the EU Declaration of Conformity (https://support.industry.siemens.com/cs/ww/en/ps/7KM2200-2EA00-1JB1/cert).

  You can download the relevant certificates from the Siemens Support website (https://support.industry.siemens.com/cs/ww/en/ps).

- **DE Declaration of Conformity**
  DE MTP 20 B 003 M National approval of the load profile according to PTB-A50.7.

- **Notes on proper metering**
  Requirements for the user as per § 23 of the German Metering and Calibration Act (MessEV)
  Under the Metering and Calibration Act, parties constituting users of a metering device as per the statutory calibration regulations must perform metering and must handle metering devices such that proper metering is guaranteed.

- Users as per the statutory calibration regulations with consideration of the ruling of market roles by the Metering Point Operation Act include:

  - Metering device users:
    Metering device users are the metering point operators as per the Metering Point Operation Act.
  - Measured value users:
    Measured value users are parties who perform metering and who transmit measured values onto authorized third parties as per the Metering Point Operation Act, as well as those who are responsible for the billing of network utilization and energy supply.

  It is the task of the metering device users to make it possible for the measured value users to familiarize themselves with the requirements described below.

- **Transparency of use**

  The measured value user must provide transparency for the electricity customers for whom the devices are used by clarifying how the energy and power values which are being billed have been obtained. "Providing transparency" means furnishing information which will allow the electricity customers to understand how the billed items in the electricity invoice have been calculated. The displays on the devices used for them in conformance with statutory calibration regulations will be used for assistance here. It is particularly important that the following information is provided:

  – Which of the values displayed on the devices are actually allowed to be used for billing purposes?

  – Values which are not displayed cannot be used for billing purposes and displayed values which are the results of functions that are not relevant to statutory calibration regulations are purely informative in character and cannot be used for billing purposes either.

  Furthermore, the metering devices must be used such that the electricity customers are also able to read the measurement results relevant to billing and the error messages.

- **Transparency of tariffs**

  There are no tariffs.

- **Error messages / time adjustments**

  – Error messages
  The device function errors which the counters described here are able to diagnose and display are described in the product description. If one or more events constituting "error messages relevant to statutory calibration regulations" occur, use in conformance with statutory calibration regulations is no longer guaranteed and the stored measurement results must be regarded as unreliable. The devices must be removed, repaired if necessary and calibrated if they are to continue to be used for billing purposes.

  – Time adjustment
  In the case of counters with an internal clock that can be remotely controlled, technical measures must be provided to ensure that displays in conformance with statutory calibration regulations are provided on the counter to verify that the clock adjustment which influences proper metering and billing has taken place during a billing period. This can be achieved as follows with the counters described here: A command to adjust the counter clock via one of the existing interfaces always results in an entry in the calibration logbook. The current registration period at the time of the clock adjustment is marked as invalid. The registration period which started when the time was adjusted ends at the next whole-numbered multiple of the registration period length (at time xx:15, 30, 45 or 00) based on the newly set counter time.

- **Use of the communications interfaces**

  The communications interfaces of the counters are not in conformance with statutory calibration regulations. Measured values of the counters to be approved here which are read out over these interfaces can only be used for billing purposes insofar as, in accordance with Annex 2, Paragraph 8.1 of the Metering and Calibration Act, they

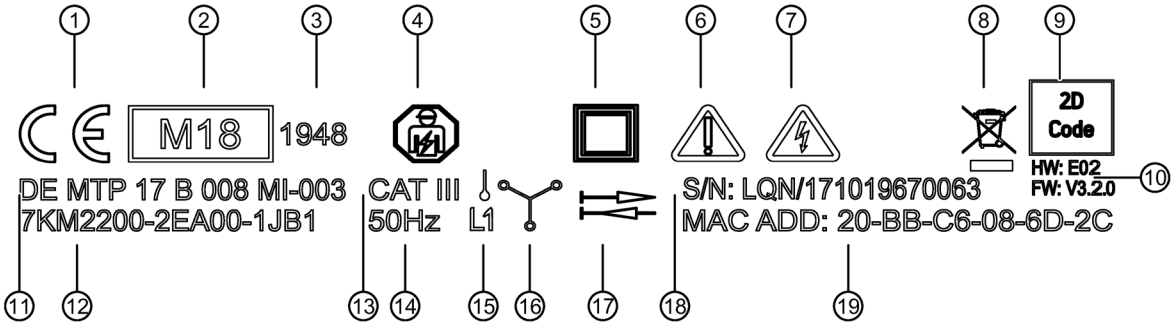
constitute an unchanged repetition of the measurement results shown on the display of the counters to be approved here.

- **Logbook function**

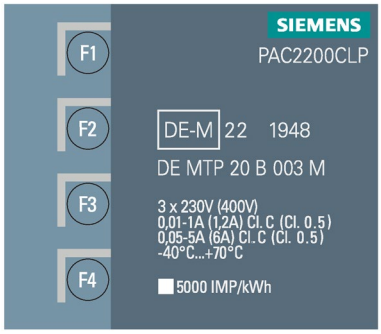
  The counters described here always feature a calibration logbook which can only be deleted if the access protection provided by the manufacturer is impaired.

8.2 Labeling

Labels on the housing of the PAC2200CLP



① CE mark
② MID mark with the year it was affixed
③ Number of the notified body
④ Electrical installation and maintenance by qualified personnel only
⑤ Protective insulation - device of class II
⑥ General warning symbol
⑦ Risk of electric shock
⑧ The device must not be disposed of with general domestic waste.
⑨ 2D code (serial number of the device)
⑩ Hardware and firmware version
⑪ Registration number
⑫ Article number
⑬ Overvoltage category CAT III for current and voltage inputs
⑭ Frequency
⑮ Network type (1P2W)
⑯ Network type (3P4W)
⑰ Bidirectional counter
⑱ Serial number of the device
LQN/xxzzzzzzzzzz xx= year of manufacture
⑲ MAC address



(1) DE-M - Metrology symbol for national approval in Germany (DE = Germany; M = Metrology)
22 = year of manufacture, in this example 2022: The year shown after the metrology mark is the year in which the mark was affixed (see Metering and Calibration Act §14 (4))
1948 = Notified body (CSA Group Bayern GmbH)

Dimension drawings

9

9.1 Dimensional drawings

Frame dimensions

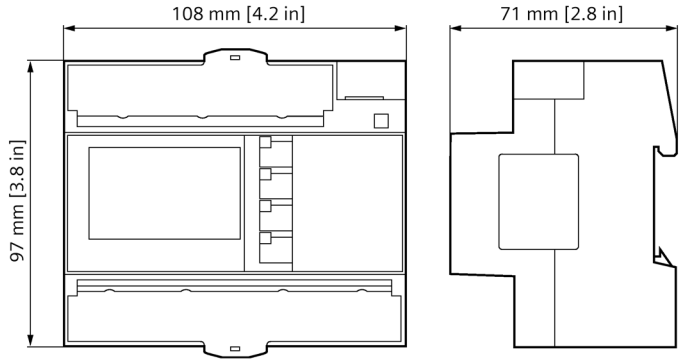


Figure 9-1 Frame dimensions

Appendix A

A.1 Modbus TCP

Detailed information about Modbus can be found at the Modbus Website (http://www.modbus.org)

A.1.1 Function codes

Function codes control the data exchange. In doing so, a function code tells the slave which action it is to take.

If an error occurs, the most significant bit (MSB) is set in the FC byte of the response frame.

Supported Modbus function codes

Table A- 1 Supported Modbus function codes

FC	Function in accordance with Modbus specification
0x01	Read Coils
0x02	Read Discrete Inputs
0x03	Read Holding Registers
0x04	Read Input Registers
0x05	Write Single Coil
0x06	Write Single Register
0x0F	Write Multiple Coils
0x10	Write Multiple Registers
0x2B	Read Device Identification
0x14	Read File Record (for average values)
0x64	Siemens specific Function Code

A.1.2 Modbus exception codes

Overview

Table A- 2 Modbus exception codes

Exception codes	Name	Meaning	Remedy
01	Illegal Function	Illegal function: • The function code in the request is not a permissible action for the slave. • The slave is in a status in which it cannot process a request of this type. This is the case, for example, if it has not yet been configured and is requested to return register values.	Check which function codes are supported.
02	Illegal Data Address	Illegal data address This address is not permissible for the slave. This is the case, for example, if the combination of start offset and transfer length is invalid.	Check the offset and the number of registers.
03	Illegal Data Value	Illegal data value: The request contains a data value that is not permissible for the slave. This indicates an error in the remaining structure of a complex request, e.g. an incorrect data length.	Check that the specified offset and the specified data length in the command are correct.
04	Slave Device Failure	Error in processing the data: An indefinite error occurred when the slave attempted to execute the requested action.	Check that the specified offset and the specified data length are correct.
F0	Write Protection ON	The action has been rejected because the write protection is set.	Deactivate write protection.

A.1.3 Modbus measured variables with the function codes 0x03 and 0x04

Addressing the measured variables

You can use the Modbus function codes 0x03 and 0x04 on all the measured variables listed below.

Note

Error in the case of inconsistent access to measured values

Please ensure the start offset of the register is correct when making **read accesses**.

Please ensure the start offset and the number of registers are correct when making **write accesses**.

Example: If a value consists of two registers, a read command applied in the second register will generate an error code. The PAC2200CLP will also output an error code if a write operation ends in the middle of a multi-register value.

Table A- 3 Available measured variables

Abbr. in the "Access" column	Abbreviation
R	Read access
W	Write access
RW	Read and write access

Offset	Number of registers	Name	Format	Unit	Value range	Access
1	2	Voltage V_{L1-N}	Float	V	-	R
3	2	Voltage V_{L2-N}	Float	V	-	R
5	2	Voltage V_{L3-N}	Float	V	-	R
7	2	Voltage V_{L1-L2}	Float	V	-	R
9	2	Voltage V_{L2-L3}	Float	V	-	R
11	2	Voltage V_{L3-L1}	Float	V	-	R
13	2	Current L1	Float	A	-	R
15	2	Current L2	Float	A	-	R
17	2	Current L3	Float	A	-	R
19	2	Apparent power L1	Float	VA	-	R
21	2	Apparent power L2	Float	VA	-	R
23	2	Apparent power L3	Float	VA	-	R
25	2	Active power L1	Float	W	-	R
27	2	Active power L2	Float	W	-	R
29	2	Active power L3	Float	W	-	R
31	2	Reactive power L1	Float	var	-	R
33	2	Reactive power L2	Float	var	-	R
35	2	Reactive power L3	Float	var	-	R

Offset	Number of registers	Name	Format	Unit	Value range	Access
37	2	Power factor L1	Float	-	0 ... 1	R
39	2	Power factor L2	Float	-	0 ... 1	R
41	2	Power factor L3	Float	-	0 ... 1	R
55	2	Frequency	Float	Hz	45 ... 65	R
57	2	Average voltage V_{L-N}	Float	V	-	R
59	2	Average voltage V_{L-L}	Float	V	-	R
61	2	Average current	Float	A	-	R
63	2	Total apparent power	Float	VA	-	R
65	2	Total active power	Float	W	-	R
67	2	Total reactive power	Float	var	-	R
69	2	Total power factor	Float	-	-	R
71	2	Neutral current (calculated)	Float	A	-	R
205	2	Device diagnostics and device status	Unsigned long	-	Byte 0 system status	R
207	2	Status of the digital outputs	Unsigned long	-	Byte Bit 0 = Output 0	R
209	2	Status of the digital inputs	Unsigned long	-	Byte 3 Bit 0 = Input 0	R
211	2	Active tariff	Unsigned long	-	0 = Tariff 1 1 = Tariff 2	R
215	2	Universal counter	Unsigned long	-	0 ... 999999999	RW
217	2	Relevant parameter changes counter	Unsigned long	-	-	R
219	2	Counter all parameter changes	Unsigned long	-	-	R
231	2	Configurable energy counter	Float	kWh, kvarh	-	R
265	2	Daily profile counter	Unsigned long	-	-	R
267	2	Monthly profile counter	Unsigned long	-	-	R
269	2	Annual profile counter	Unsigned long	-	-	R
501	2	Cumulated average active power import	Float	W	-	R
503	2	Cumulated average reactive power import	Float	var	-	R
505	2	Cumulated average active power export	Float	W	-	R
507	2	Cumulated average reactive power export	Float	var	-	R
509	2	Maximum active power reading during the period	Float	W	-	R
511	2	Minimum active power reading during the period	Float	W	-	R
513	2	Maximum reactive power reading during the period	Float	var	-	R
515	2	Minimum reactive power reading during the period	Float	var	-	R
517	2	Length of the current demand period	Unsigned long	s	-	R
519	2	Time since start of the active demand period	Unsigned long	s	-	R

Offset	Number of registers	Name	Format	Unit	Value range	Access
545	2	Time stamp for the current period (UTC)	unix_ts	-	-	R
547	2	OID current period (unique period ID)	Unsigned long	-	-	R
549	2	Active energy import current period	Float	Wh	-	R
551	2	Reactive energy import current period	Float	varh	-	R
553	2	Active energy export current period	Float	Wh	-	R
555	2	Reactive energy export current period	Float	varh	-	R
557	2	Length of demand period (measurement duration)	Unsigned long	ms	-	R
559	2	Status information	Unsigned long		BYTE 0 0x00 TARIFF 1 BYTE 0 0x01 TARIFF 2 Bit 23: Measuring input out of range Bit 22: Power failure Bit 21: Time inaccurate Bit 16: Short period Bit 18: Multi-synchronization Bit 12: New event in logbook Bit 6: Reactive power type VAR1 Bit 0: Period is invalid	R
561	4	Active energy import current period T1	Double	Wh	-	R
565	4	Active energy import current period T2	Double	Wh	-	R
569	4	Reactive energy import current period T1	Double	varh	-	R
573	4	Reactive energy import current period T2	Double	varh	-	R
577	4	Active energy export current period T1	Double	Wh	-	R
581	4	Active energy export current period T2	Double	Wh	-	R
585	4	Reactive energy export current period T1	Double	varh	-	R
589	4	Reactive energy export current period T2	Double	varh	-	R
593	4	Active energy import current period T1+T2	Double	Wh	-	R
597	4	Active energy export current period T1+T2	Double	Wh	-	R
799	2	Date/time (UTC)	unix_ts	-	-	RW
801	4	Active energy import tariff 1	Double	Wh	Overflow 1.0e+12	R
805	4	Active energy import tariff 2	Double	Wh	Overflow 1.0e+12	R
809	4	Active energy export tariff 1	Double	Wh	Overflow 1.0e+12	R
813	4	Active energy export tariff 2	Double	Wh	Overflow 1.0e+12	R
817	4	Reactive energy import tariff 1	Double	varh	Overflow 1.0e+12	R

Offset	Number of registers	Name	Format	Unit	Value range	Access
821	4	Reactive energy import tariff 2	Double	varh	Overflow 1.0e+12	R
825	4	Reactive energy export tariff 1	Double	varh	Overflow 1.0e+12	R
829	4	Reactive energy export tariff 2	Double	varh	Overflow 1.0e+12	R
833	4	Apparent energy tariff 1	Double	VAh	Overflow 1.0e+12	R
837	4	Apparent energy tariff 2	Double	VAh	Overflow 1.0e+12	R
841	4	L1 active energy import tariff 1	Double	Wh	Overflow 1.0e+12	R
845	4	L1 active energy import tariff 2	Double	Wh	Overflow 1.0e+12	R
849	4	L1 active energy export tariff 1	Double	Wh	Overflow 1.0e+12	R
853	4	L1 active energy export tariff 2	Double	Wh	Overflow 1.0e+12	R
857	4	L1 reactive energy import tariff 1	Double	varh	Overflow 1.0e+12	R
861	4	L1 reactive energy import tariff 2	Double	varh	Overflow 1.0e+12	R
865	4	L1 reactive energy export tariff 1	Double	varh	Overflow 1.0e+12	R
869	4	L1 reactive energy export tariff 2	Double	varh	Overflow 1.0e+12	R
873	4	L1 apparent energy tariff 1	Double	VAh	Overflow 1.0e+12	R
877	4	L1 apparent energy tariff 2	Double	VAh	Overflow 1.0e+12	R
881	4	L2 active energy import tariff 1	Double	Wh	Overflow 1.0e+12	R
885	4	L2 active energy import tariff 2	Double	Wh	Overflow 1.0e+12	R
889	4	L2 active energy export tariff 1	Double	Wh	Overflow 1.0e+12	R
893	4	L2 active energy export tariff 2	Double	Wh	Overflow 1.0e+12	R
897	4	L2 reactive energy import tariff 1	Double	varh	Overflow 1.0e+12	R
901	4	L2 reactive energy import tariff 2	Double	varh	Overflow 1.0e+12	R
905	4	L2 reactive energy export tariff 1	Double	varh	Overflow 1.0e+12	R
909	4	L2 reactive energy export tariff 2	Double	varh	Overflow 1.0e+12	R
913	4	L2 apparent energy tariff 1	Double	VAh	Overflow 1.0e+12	R
917	4	L2 apparent energy tariff 2	Double	VAh	Overflow 1.0e+12	R
921	4	L3 active energy import tariff 1	Double	Wh	Overflow 1.0e+12	R
925	4	L3 active energy import tariff 2	Double	Wh	Overflow 1.0e+12	R
929	4	L3 active energy export tariff 1	Double	Wh	Overflow 1.0e+12	R
933	4	L3 active energy export tariff 2	Double	Wh	Overflow 1.0e+12	R
937	4	L3 reactive energy import tariff 1	Double	varh	Overflow 1.0e+12	R
941	4	L3 reactive energy import tariff 2	Double	varh	Overflow 1.0e+12	R
945	4	L3 reactive energy export tariff 1	Double	varh	Overflow 1.0e+12	R
949	4	L3 reactive energy export tariff 2	Double	varh	Overflow 1.0e+12	R
953	4	L3 apparent energy tariff 1	Double	VAh	Overflow 1.0e+12	R
957	4	L3 apparent energy tariff 2	Double	VAh	Overflow 1.0e+12	R
961	4	Secondary total active energy import (MID register)	Double	Wh	Overflow 1.0e+12	R
965	4	Secondary total active energy export (MID register)	Double	Wh	Overflow 1.0e+12	R
969	4	Total active energy import (MID register)	Double	Wh	Overflow 1.0e+12	R
973	4	Total active energy export (MID register)	Double	Wh	Overflow 1.0e+12	R

A.1.4 Modbus measured variables with function codes 0x14, 0x03 and 0x04

Addressing the measured variables

The measured variables listed below can be read out via Modbus function code 0x14 "Read File Record".

Stage 1 (File Number 1), default setting 10 s,

Stage 2 (File Number 2), default setting 15 min.

The values are also mirrored in the address space of function codes "0x03" and "0x04", see column "Address FC0x03 FC0x04".

Note

Error in the case of inconsistent access to measured values

Please ensure the start offset of the register is correct when making **read accesses**.

Please ensure the start offset and the number of registers are correct when making **write accesses**.

Example: If a value consists of two registers, a read command applied in the second register will generate an error code. The PAC2200CLP will also output an error code if a write operation ends in the middle of a multi-register value.

Abbr. in the "Access" column	Abbreviations
R	Read access
W	Write access
RW	Read and write access

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Number of registers	Name	Format	Unit	Value range	Access
1	1	30001	2	Time stamp	unix_ts	-		R
1	3	30003	2	Flags	uint32_t	-	0= UNFLAGGED 1= FLAGGED	R
1	5	30005	2	Voltage L1 - N	Float	V		R
1	7	30007	2	Voltage L2 - N	Float	V		R
1	9	30009	2	Voltage L3 - N	Float	V		R
1	11	30011	2	Voltage L1 - L2	Float	V		R
1	13	30013	2	Voltage L2 - L3	Float	V		R
1	15	30015	2	Voltage L3 - L1	Float	V		R
1	17	30017	2	Current L1	Float	A		R
1	19	30019	2	Current L2	Float	A		R
1	21	30021	2	Current L3	Float	A		R
1	23	30023	2	Apparent power L1	Float	VA		R
1	25	30025	2	Apparent power L2	Float	VA		R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Number of registers	Name	Format	Unit	Value range	Access
1	27	30027	2	Apparent power L3	Float	VA		R
1	29	30029	2	Active power L1	Float	W		R
1	31	30031	2	Active power L2	Float	W		R
1	33	30033	2	Active power L3	Float	W		R
1	35	30035	2	Reactive power L1	Float	var		R
1	37	30037	2	Reactive power L2	Float	var		R
1	39	30039	2	Reactive power L3	Float	var		R
1	41	30041	2	Power factor L1	Float	-		R
1	43	30043	2	Power factor L2	Float	-		R
1	45	30045	2	Power factor L3	Float	-		R
1	47	30047	2	Frequency	Float	Hz		R
1	49	30049	2	Average voltage L - N	Float	V		R
1	51	30051	2	Average voltage L - L	Float	V		R
1	53	30053	2	Average current	Float	A		R
1	55	30055	2	Total apparent power	Float	VA		R
1	57	30057	2	Total active power	Float	W		R
1	59	30059	2	Total reactive power	Float	var		R
1	61	30061	2	Total power factor	Float	-		R
1	63	30063	2	Neutral current I_N	Float	A	-	R
1	257	30257	2	Time stamp	unix_ts	-		R
1	259	30259	2	Flags	uint32_t	-	0= UNFLAGGED 1= FLAGGED	R
1	261	30261	2	Maximum voltage L1 - N	Float	V		R
1	263	30263	2	Maximum voltage L2 - N	Float	V		R
1	265	30265	2	Maximum voltage L3 - N	Float	V		R
1	267	30267	2	Maximum voltage L1 - L2	Float	V	R	R
1	269	30269	2	Maximum voltage L2 - L3	Float	V	R	R
1	271	30271	2	Maximum voltage L3 - L1	Float	V	R	R
1	273	30273	2	Maximum current L1	Float	A	R	R
1	275	30275	2	Maximum current L2	Float	A	R	R
1	277	30277	2	Maximum current L3	Float	A	R	R
1	279	30279	2	Maximum apparent power L1	Float	VA	R	R
1	281	30281	2	Maximum apparent power L2	Float	VA	R	R
1	283	30283	2	Maximum apparent power L3	Float	VA	R	R
1	285	30285	2	Maximum active power L1	Float	W	R	R
1	287	30287	2	Maximum active power L2	Float	W	R	R
1	289	30289	2	Maximum active power L3	Float	W	R	R
1	291	30291	2	Maximum reactive power L1	Float	var	R	R
1	293	30293	2	Maximum reactive power L2	Float	var	R	R
1	295	30295	2	Maximum reactive power L3	Float	var	R	R
1	297	30297	2	Maximum power factor L1	Float	-	R	R
1	299	30299	2	Maximum power factor L2	Float	-	R	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Number of registers	Name	Format	Unit	Value range	Access
1	301	30301	2	Maximum power factor L3	Float	-	R	R
1	303	30303	2	Maximum frequency	Float	Hz	R	R
1	305	30305	2	Maximum average voltage L - N	Float	V	R	R
1	307	30307	2	Maximum average voltage L - L	Float	V	R	R
1	309	30309	2	Maximum average current	Float	A	R	R
1	311	30311	2	Maximum total apparent power	Float	VA	R	R
1	313	30313	2	Maximum total active power	Float	W	R	R
1	315	30315	2	Maximum total reactive power	Float	var	R	R
1	317	30317	2	Maximum total power factor	Float	-	R	R
1	319	30319	2	Maximum neutral current I_N	Float	A	-	R
1	513	30513	2	Time stamp	unix_ts	-		R
1	515	30515	2	Flags	uint32_t	-	0= UNFLAGGED 1= FLAGGED	R
1	517	30517	2	Minimum voltage L1 - N	Float	V	R	R
1	519	30519	2	Minimum voltage L2 - N	Float	V	R	R
1	521	30521	2	Minimum voltage L3 - N	Float	V	R	R
1	523	30523	2	Minimum voltage L1 - L2	Float	V	R	R
1	525	30525	2	Minimum voltage L2 - L3	Float	V	R	R
1	527	30527	2	Minimum voltage L3 - L1	Float	V	R	R
1	529	30529	2	Minimum current L1	Float	A	R	R
1	531	30531	2	Minimum current L2	Float	A	R	R
1	533	30533	2	Minimum current L3	Float	A	R	R
1	535	30535	2	Minimum apparent power L1	Float	VA	R	R
1	537	30537	2	Minimum apparent power L2	Float	VA	R	R
1	539	30539	2	Minimum apparent power L3	Float	VA	R	R
1	541	30541	2	Minimum active power L1	Float	W	R	R
1	543	30534	2	Minimum active power L2	Float	W	R	R
1	545	30545	2	Minimum active power L3	Float	W	R	R
1	547	30547	2	Minimum reactive power L1	Float	var	R	R
1	549	30549	2	Minimum reactive power L2	Float	var	R	R
1	551	30551	2	Minimum reactive power L3	Float	var	R	R
1	553	30553	2	Minimum power factor L1	Float	-	R	R
1	555	30555	2	Minimum power factor L2	Float	-	R	R
1	557	30557	2	Minimum power factor L3	Float	-	R	R
1	559	30559	2	Minimum frequency	Float	Hz	R	R
1	561	30561	2	Minimum average voltage L - N	Float	V	R	R
1	563	30563	2	Minimum average voltage L - L	Float	V	R	R
1	565	30565	2	Minimum average current	Float	A	R	R
1	567	30567	2	Minimum total apparent power	Float	VA	R	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Number of registers	Name	Format	Unit	Value range	Access
1	569	30569	2	Minimum total active power	Float	W	R	R
1	571	30571	2	Minimum total reactive power	Float	var	R	R
1	573	30573	2	Minimum total power factor	Float	-	R	R
1	575	30575	2	Minimum neutral current I_N	Float	A	-	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Number of registers	Name	Format	Unit	Value range	Access
2	1	31001	2	Time stamp	unix_ts	-		R
2	3	31003	2	Flags	uint32_t	-	0= UNFLAGGED 1= FLAGGED	R
2	5	31005	2	Voltage L1 - N	Float	V		R
2	7	31007	2	Voltage L2 - N	Float	V		R
2	9	31009	2	Voltage L3 - N	Float	V		R
2	11	31011	2	Voltage L1 - L2	Float	V		R
2	13	31013	2	Voltage L2 - L3	Float	V		R
2	15	31015	2	Voltage L3 - L1	Float	V		R
2	17	31017	2	Current L1	Float	A		R
2	19	31019	2	Current L2	Float	A		R
2	21	31021	2	Current L3	Float	A		R
2	23	31023	2	Apparent power L1	Float	VA		R
2	25	31025	2	Apparent power L2	Float	VA		R
2	27	31027	2	Apparent power L3	Float	VA		R
2	29	31029	2	Active power L1	Float	W		R
2	31	31031	2	Active power L2	Float	W		R
2	33	31033	2	Active power L3	Float	W		R
2	35	31035	2	Reactive power L1	Float	var		R
2	37	31037	2	Reactive power L2	Float	var		R
2	39	31039	2	Reactive power L3	Float	var		R
2	41	31041	2	Power factor L1	Float	-		R
2	43	31043	2	Power factor L2	Float	-		R
2	45	31045	2	Power factor L3	Float	-		R
2	47	31047	2	Frequency	Float	Hz		R
2	49	31049	2	Average voltage L - N	Float	V		R
2	51	31051	2	Average voltage L - L	Float	V		R
2	53	31053	2	Average current	Float	A		R
2	55	31055	2	Total apparent power	Float	VA		R
2	57	31057	2	Total active power	Float	W		R
2	59	31059	2	Total reactive power	Float	var		R
2	61	31061	2	Total power factor	Float	-		R
2	63	31063	2	Neutral current I_N	Float	A		R
2	257	31257	2	Time stamp	unix_ts	-		R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Number of registers	Name	Format	Unit	Value range	Access
2	259	31259	2	Flags	uint32_t	-	0= UNFLAGGED 1= FLAGGED	R
2	261	31261	2	Maximum voltage L1 - N	Float	V		R
2	263	31263	2	Maximum voltage L2 - N	Float	V		R
2	265	31265	2	Maximum voltage L3 - N	Float	V		R
2	267	31267	2	Maximum voltage L1 - L2	Float	V	R	R
2	269	31269	2	Maximum voltage L2 - L3	Float	V	R	R
2	271	31271	2	Maximum voltage L3 - L1	Float	V	R	R
2	273	31273	2	Maximum current L1	Float	A	R	R
2	275	31275	2	Maximum current L2	Float	A	R	R
2	277	31277	2	Maximum current L3	Float	A	R	R
2	279	31279	2	Maximum apparent power L1	Float	VA	R	R
2	281	31281	2	Maximum apparent power L2	Float	VA	R	R
2	283	31283	2	Maximum apparent power L3	Float	VA	R	R
2	285	31285	2	Maximum active power L1	Float	W	R	R
2	287	31287	2	Maximum active power L2	Float	W	R	R
2	289	31289	2	Maximum active power L3	Float	W	R	R
2	291	31291	2	Maximum reactive power L1	Float	var	R	R
2	293	31293	2	Maximum reactive power L2	Float	var	R	R
2	295	31295	2	Maximum reactive power L3	Float	var	R	R
2	297	31297	2	Maximum power factor L1	Float	-	R	R
2	299	31299	2	Maximum power factor L2	Float	-	R	R
2	301	31301	2	Maximum power factor L3	Float	-	R	R
2	303	31303	2	Maximum frequency	Float	Hz	R	R
2	305	31305	2	Maximum average voltage L - N	Float	V	R	R
2	307	31307	2	Maximum average voltage L - L	Float	V	R	R
2	309	31309	2	Maximum average current	Float	A	R	R
2	311	31311	2	Maximum total apparent power	Float	VA	R	R
2	313	31313	2	Maximum total active power	Float	W	R	R
2	315	31315	2	Maximum total reactive power	Float	var	R	R
2	317	31317	2	Maximum total power factor	Float	-	R	R
2	319	31319	2	Maximum neutral current I_N	Float	A	-	R
2	513	31513	2	Time stamp	unix_ts	-		R
2	515	31515	2	Flags	uint32_t	-	0= UNFLAGGED 1= FLAGGED	R
2	517	31517	2	Minimum voltage L1 - N	Float	V	R	R
2	519	31519	2	Minimum voltage L2 - N	Float	V	R	R
2	521	31521	2	Minimum voltage L3 - N	Float	V	R	R
2	523	31523	2	Minimum voltage L1 - L2	Float	V	R	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Number of registers	Name	Format	Unit	Value range	Access
2	525	31525	2	Minimum voltage L2 - L3	Float	V	R	R
2	527	31527	2	Minimum voltage L3 - L1	Float	V	R	R
2	529	31529	2	Minimum current L1	Float	A	R	R
2	531	31531	2	Minimum current L2	Float	A	R	R
2	533	31533	2	Minimum current L3	Float	A	R	R
2	535	31535	2	Minimum apparent power L1	Float	VA	R	R
2	537	31537	2	Minimum apparent power L2	Float	VA	R	R
2	539	31539	2	Minimum apparent power L3	Float	VA	R	R
2	541	31541	2	Minimum active power L1	Float	W	R	R
2	543	31534	2	Minimum active power L2	Float	W	R	R
2	545	31545	2	Minimum active power L3	Float	W	R	R
2	547	31547	2	Minimum reactive power L1	Float	var	R	R
2	549	31549	2	Minimum reactive power L2	Float	var	R	R
2	551	31551	2	Minimum reactive power L3	Float	var	R	R
2	553	31553	2	Minimum power factor L1	Float	-	R	R
2	555	31555	2	Minimum power factor L2	Float	-	R	R
2	557	31557	2	Minimum power factor L3	Float	-	R	R
2	559	31559	2	Minimum frequency	Float	Hz	R	R
2	561	31561	2	Minimum average voltage L - N	Float	V	R	R
2	563	31563	2	Minimum average voltage L - L	Float	V	R	R
2	565	31565	2	Minimum average current	Float	A	R	R
2	567	31567	2	Minimum total apparent power	Float	VA	R	R
2	569	31569	2	Minimum total active power	Float	W	R	R
2	571	31571	2	Minimum total reactive power	Float	var	R	R
2	573	31573	2	Minimum total power factor	Float	-	R	R
2	575	31575	2	Minimum neutral current I_N	Float	A	-	R

A.1.5 Structure - Digital input status and digital output status with the function codes 0x03 and 0x04

The following are available via Modbus:

- "Status of the digital input"
- "Status of the digital output"

Input status and output status of the PAC2200CLP

Table A- 4 Structure - Status of the digital inputs and outputs, Modbus offset 207 and 209

Name	Length	Status	Byte	Bit	Bit mask	Access
Status: Digital output	32 bits	DO	3	0	0x00000001	R
Status: Digital input	32 bits	DI	3	0	0x00000001	R

A.1.6 Structure - Device diagnostics and device status with the function codes 0x03 and 0x04

Structure

Table A- 5 Modbus offset 205, register 2: Structure device status and device diagnostics

Byte	Bit	Device status	Type	Bit mask	Value range	Access
0	1	Device configuration menu is active	Status	0x02000000	0 = not active 1 = active	R
0	2	Voltage out of range	Status	0x04000000		R
0	3	Current out of range	Status	0x08000000		R
0	4	Device time inaccurate	Status	0x10000000		R
0	5	Update status is active	Status	0x20000000		R
0	6	Hardware write protection is active	Status	0x40000000		R
0	7	Modbus communication is write-protected	Status	0x80000000		R
1	1	Maximum pulse rate exceeded	Status	0x00020000		R
1	5	Logbook full	Status	0x00200000		R
1	6	SNTP not synchronizing	Status	0x00400000		R
1	7	Wait for user interaction	Status	0x00800000		R
2	0	Relevant parameter changes[1)]	Stored	0x00000100		RW
2	2	Maximum pulse rate was exceeded[1)]	Stored	0x00000400		RW
2	3	Restart of the device[1)]	Stored	0x00000800		RW

[1)] Only these device states must be acknowledged.

A.1.7 Modbus diagnostics and status information parameters with function codes 0x01, 0x02, 0x05 and 0x0F

Status parameters

You can use the Modbus function code 0x02 on all the status parameters listed below.

The status information (access: R) und diagnostic information (access: RW) listed below can be read with the help of Modbus function codes 0x01 and 0x02.

The diagnostic information (access: RW) can be changed with the help of Modbus function codes 0x05 and 0x0F.

Table A- 6 Status parameters

Offset	Number of registers	Name	Format	Value range	Access
108	1	Relevant parameter changes[1)]	Bit	0 = not active 1 = active	RW
110	1	Maximum pulse rate was exceeded[1)]	Bit		RW
111	1	Restart of the device[1)]	Bit		RW
112	0	Resetting of energy counter by user	Bit		RW
117	1	Maximum pulse rate exceeded	Bit		R
121	1	Logbook full	Bit		R
122	1	SNTP not synchronizing	Bit		R
123	1	Wait for user interaction	Bit		R
125	1	Device configuration menu is active	Bit		R
126	1	Voltage out of range	Bit		R
127	1	Current out of range	Bit		R
128	1	Device time inaccurate	Bit		R
129	1	Update status is active	Bit		R
130	1	Hardware write protection is active	Bit		R
131	1	Modbus communication is write-protected	Bit		R
200	1	Digital input 0	Bit		R
300	1	Digital output 0	Bit		R

1) Only these device states must be acknowledged.

A.1.8 Modbus settings with the function codes 0x03, 0x04 and 0x10

Addressing the settings

You can use the Modbus function codes 0x03 and 0x04 for read accesses and 0x10 for write accesses on all the settings parameters listed below.

Table A- 7 Settings parameters

Offset	Number of registers	Name	Unit	Format	Value range		Access
49999	2	Rated current display range	A	unsigned long	1 - 10000 A		RW
50001	2	Connection type	-	unsigned long	0	3P4W	RW
50011	2	Primary current	A	unsigned long	1 ... 10000 A (5 A device)		RW
					65 A (65 A device)		R
50013	2	Secondary current	A	unsigned long	1 A, 5 A (5 A device)		RW
					65 A (65 A device)		R

Table A- 8 Settings parameter for the digital input

Offset	Number of registers	Name	Unit	Format	Value range		Access
50025	2	Digital input "Action"	-	unsigned long	0 =	Status only	RW
					1 =	Pulse input	
					2 =	High tariff / low tariff switching	
					4 =	Display of back-lighting	
50029	2	"Pulse input" mode	kWh	unsigned long	0 =	kWh	RW
					1 =	kvarh	
50031	2	Pulses per pulse unit	-	unsigned long	1 ... 4000		RW
50239	2	Pulse unit	kWh	unsigned long	0 =	1 kWh / kvarh	RW
					1 =	10 kWh / kvarh	
					2 =	100 kWh / kvarh	
					3 =	1000 kWh / kvarh	

Table A- 9 Settings parameter for the digital output

Offset	Number of registers	Name	Unit	Format	Value range		Access
50033	2	Switching function assignment to a vector group	-	unsigned long	0 ... 99		RW
50035	2	Digital output "Action"	-	unsigned long	0 =	Off	RW
					1 =	Device ON	
					2 =	Switching output	
					3 =	Direction of rotation	
					5 =	Energy pulse	
50041	2	"Energy pulse" mode	-	unsigned long	0 =	Import kWh	RW
					1 =	Export kWh	
					2 =	Import kVARh	
					3 =	Export kVARh	
50043	2	Pulses per pulse unit	-	unsigned long	1 ... 4000		RW
50045	2	Pulse length	ms	unsigned long	30 ... 500		RW
50147	2	Timeout digital output	s	unsigned long	0 = AUS 0.1 ... 18000 = Output is reset after expiry of the time, provided there is no operator input.		RW
50237	2	Pulse unit	kWh	unsigned long	0 =	1 kWh / kvarh	RW
					1 =	10 kWh / kvarh	
					2 =	100 kWh / kvarh	
					3 =	1000 kWh / kvarh	

A.1.9 Modbus communication parameters with the function codes 0x03, 0x04 and 0x10

Addressing the communication parameters

Table A- 10 Communication parameters

Offset	Number of registers	Name	Unit	Format	Applicable Modbus function codes	Value range	Access
62991	2	DHCP ON/OFF	-	unsigned long	• 0x03 • 0x04 • 0x10	0 = DHCP OFF 1 = DHCP ON	RW
62993	2	SNTP server IP address	-	unsigned long	• 0x03 • 0x04 • 0x10	0 ... FFFFFFFFh	RW
62995	2	SNTP client mode	-	unsigned long	• 0x03 • 0x04 • 0x10	0 = SNTP client OFF 1 = SNTP active client 2 = SNTP broadcast client	RW
62997	2	Subnet firewall ON/OFF	-	unsigned long	• 0x03 • 0x04 • 0x10	-	RW
62999	2	Modbus TCP port	-	unsigned long	• 0x03 • 0x04 • 0x10	0 = Modbus OFF 1 ... 0xFFFF = port number (502 = default)	RW
63001	2	IP address	-	unsigned long	• 0x03 • 0x04 • 0x10	0 ... FFFFFFFFh	RW
63003	2	Subnet mask	-	unsigned long	• 0x03 • 0x04 • 0x10	0 ... FFFFFFFFh	RW
63005	2	Gateway	-	unsigned long	• 0x03 • 0x04 • 0x10	0 ... FFFFFFFFh	RW
63007	2	Bootloader version	-	unsigned long	• 0x03 • 0x04	char, uchar, uchar, uchar	R
63009	2	Password protection ON/OFF	-	unsigned long	• 0x03 • 0x04	0; 1	R

Offset	Number of registers	Name	Unit	Format	Applicable Modbus function codes	Value range		Access
64001	27	IM0 data	-	IM0STRUCT	• 0x03 • 0x04	-		R
64028	89	IM1 – IM4 data	-	IM14STRUCT	• 0x03 • 0x04 • 0x10	-		RW
65290	2	Hardware write protection ON/OFF (requires pressing of "SW" key on device)	-	unsigned long	• 0x10	0 = 1 =	ON OFF	RW

A.1.10 Modbus device information with the function codes 0x03, 0x04 and 0x10

Addressing the device information parameters

You access the following device information parameters block-by-block only, e.g. read from Offset 64001 27 register.

Note

Error in the case of inconsistent access to I&M values

Please ensure the start offset and the number of registers are correct when making **read accesses** and **write accesses**. Always read or write the entire block.

Please ensure the start offset and the number of registers are correct when making **write accesses**.

If a value consists of several registers, a read command applied in the second register, for example, will generate an error code. The PAC2200CLP will also output an error code if, for example, a write operation ends in the middle of a multi-register value.

Table A- 11 I&M 0 parameters with the function codes 0x03 and 0x04

Offset	Total registers	Number of registers per parameter	Name	Format	Value range	Access
Start offset 64001	**27**	[1]	Manufacturer's ID	unsigned short	42*)	R
[64002]		[10]	Order No.	Char 20	ASCII	R
[64012]		[8]	Serial number	Char 16	ASCII	R
[64020]		[1]	Hardware version	unsigned short	0 ... 65535	R
[64021]		[2]	Firmware version	1 char, 3 unsigned char	V 0.0.0 ... V 255.255.255	R
[64023]		[1]	Counter for changes	unsigned short	1 ... 65535	R
[64024]		[1]	Profile ID	unsigned short	3A00 ... F6FF	R
[64025]		[1]	Specific Profile ID	unsigned short	-	R
[64026]		[1]	Version of the I&M data	2 unsigned char	0.0 ... 255.255	R
[64027]		[1]	Supported I&M data	unsigned short	00 ... FF	R
*) 42 stands for Siemens AG						

Table A- 12 I&M 1-4 parameters with the function codes 0x03, 0x04 and 0x10

Offset	Total registers	Number of registers per parameter	Name	Format	Value range	Access
Start offset 64028	**89**	[16]	Plant identifier	Char 32	ASCII	RW
[64044]		[11]	Location identifier	Char 22	ASCII	RW
[64055]		[8]	Installation date	Char 16	ASCII	RW
[64063]		[27]	Comment	Char 54	ASCII	RW
[64090]		[27]	Signature	Char 54	-	RW

A.1.11 Modbus command parameters

Addressing the command parameters

You can apply the Modbus function code 0x06 to the command parameters.

Table A- 13 Command parameters

Offset	Number of registers	Name	Unit	Format	Value range		Access
60006	1	Switching tariff	-	unsigned short	0 =	Main tariff	W
					1 =	Secondary tariff	
60007	1	Acknowledge the diagnostics bits[3] (cf. stored bits in unsigned long beginning offset 205)	-	unsigned short	0 ... ffffh		W
60008	1	Switching outputs (if parameterized)	-	unsigned short	0ffh ... 1ffh		W
					Byte 0 = 0	Digital output 0.0	
					Byte 1 = 0	OFF	
					Byte 1 = 1	ON	
60009	1	Switching command for vector group	-	unsigned short	High 0 ... 99, Low 0 ... 1 High byte group assignment Low byte 1 = ON, 0 = OFF		W
3) The Modbus Master must acknowledge these diagnostics bits.							

A.1.12 Modbus standard device identification with the function code 0x2B

Addressing the Modbus standard device identification

You can use Modbus function code 0x2B on these device identification parameters.

Table A- 14 Parameter for Modbus standard device identification

Object ID	Name	Format	Access
OID 0	Manufacturer	String	R
OID 1	Manufacturer device name	String	R
OID 2	Firmware version / bootloader version	String	R

A.1.13 Active energy history with the Modbus function codes 0x14, 0x03 and 0x04

The active energy counters listed below can be read out via Modbus function code 0x14 "Read File Record".

- The daily energy counter (file number 90) records the active energy for each day of the preceding two months.
- The monthly energy counter (file number 91) records the active energy for each month of the preceding two years.

The values are also mirrored in the address space of function codes "0x03" and "0x04", see column "Address FC0x03 FC0x04".

Note

Modbus queries for "Work portion Tariff 1" or "Work portion Tariff 2" must always be performed as a whole in a package (TS, Work portion T1, Work portion T2) with the start address at TS (e.g. 32003, 32009, 32015).

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Length	Name	Format	Access
90	1	32001	2	Error state	Bool	R
90	3	32003	2	TS actual period	UNIX_TS (UTC)	R
90	5	32005	2	Work portion today Tariff 1	Float	R
90	7	32007	2	Work portion today Tariff 2	Float	R
90	9	32009	2	TS of day – 1	UNIX_TS (UTC)	R
90	11	32011	2	Work portion Tariff 1	Float	R
90	13	32013	2	Work portion Tariff 2	Float	R
90	15	32015	2	TS of day – 2	UNIX_TS (UTC)	R
90	17	32017	2	Work portion Tariff 1	Float	R
90	19	32019	2	Work portion Tariff 2	Float	R
90	21	32021	2	TS of day – 3	UNIX_TS (UTC)	R
90	23	32023	2	Work portion Tariff 1	Float	R
90	25	32025	2	Work portion Tariff 2	Float	R
90	27	32027	2	TS of day – 4	UNIX_TS (UTC)	R
90	29	32029	2	Work portion Tariff 1	Float	R
90	31	32031	2	Work portion Tariff 2	Float	R
90	33	32033	2	TS of day – 5	UNIX_TS (UTC)	R
90	35	32035	2	Work portion Tariff 1	Float	R
90	37	32037	2	Work portion Tariff 2	Float	R
90	39	32039	2	TS of day – 6	UNIX_TS (UTC)	R
90	41	32041	2	Work portion Tariff 1	Float	R
90	43	32043	2	Work portion Tariff 2	Float	R
90	45	32045	2	TS of day – 7	UNIX_TS (UTC)	R
90	47	32047	2	Work portion Tariff 1	Float	R
90	49	32049	2	Work portion Tariff 2	Float	R
90	51	32051	2	TS of day – 8	UNIX_TS (UTC)	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Length	Name	Format	Access
90	53	32053	2	Work portion Tariff 1	Float	R
90	55	32055	2	Work portion Tariff 2	Float	R
90	57	32057	2	TS of day – 9	UNIX_TS (UTC)	R
90	59	32059	2	Work portion Tariff 1	Float	R
90	61	32061	2	Work portion Tariff 2	Float	R
90	63	32063	2	TS of day – 10	UNIX_TS (UTC)	R
90	65	32065	2	Work portion Tariff 1	Float	R
90	67	32067	2	Work portion Tariff 2	Float	R
90	69	32069	2	TS of day – 11	UNIX_TS (UTC)	R
90	71	32071	2	Work portion Tariff 1	Float	R
90	73	32073	2	Work portion Tariff 2	Float	R
90	75	32075	2	TS of day – 12	UNIX_TS (UTC)	R
90	77	32077	2	Work portion Tariff 1	Float	R
90	79	32079	2	Work portion Tariff 2	Float	R
90	81	32081	2	TS of day – 13	UNIX_TS (UTC)	R
90	83	32083	2	Work portion Tariff 1	Float	R
90	85	32085	2	Work portion Tariff 2	Float	R
90	87	32087	2	TS of day – 14	UNIX_TS (UTC)	R
90	89	32089	2	Work portion Tariff 1	Float	R
90	91	32091	2	Work portion Tariff 2	Float	R
90	93	32093	2	TS of day – 15	UNIX_TS (UTC)	R
90	95	32095	2	Work portion Tariff 1	Float	R
90	97	32097	2	Work portion Tariff 2	Float	R
90	99	32099	2	TS of day – 16	UNIX_TS (UTC)	R
90	101	32101	2	Work portion Tariff 1	Float	R
90	103	32103	2	Work portion Tariff 2	Float	R
90	105	32105	2	TS of day – 17	UNIX_TS (UTC)	R
90	107	32107	2	Work portion Tariff 1	Float	R
90	109	32109	2	Work portion Tariff 2	Float	R
90	111	32111	2	TS of day – 18	UNIX_TS (UTC)	R
90	113	32113	2	Work portion Tariff 1	Float	R
90	115	32115	2	Work portion Tariff 2	Float	R
90	117	32117	2	TS of day – 19	UNIX_TS (UTC)	R
90	119	32119	2	Work portion Tariff 1	Float	R
90	121	32121	2	Work portion Tariff 2	Float	R
90	123	32123	2	TS of day – 20	UNIX_TS (UTC)	R
90	125	32125	2	Work portion Tariff 1	Float	R
90	127	32127	2	Work portion Tariff 2	Float	R
90	129	32129	2	TS of day – 21	UNIX_TS (UTC)	R
90	131	32131	2	Work portion Tariff 1	Float	R
90	133	32133	2	Work portion Tariff 2	Float	R
90	135	32135	2	TS of day – 22	UNIX_TS (UTC)	R
90	137	32137	2	Work portion Tariff 1	Float	R
90	139	32139	2	Work portion Tariff 2	Float	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Length	Name	Format	Access
90	141	32141	2	TS of day – 23	UNIX_TS (UTC)	R
90	143	32143	2	Work portion Tariff 1	Float	R
90	145	32145	2	Work portion Tariff 2	Float	R
90	147	32147	2	TS of day – 24	UNIX_TS (UTC)	R
90	149	32149	2	Work portion Tariff 1	Float	R
90	151	32151	2	Work portion Tariff 2	Float	R
90	153	32153	2	TS of day – 25	UNIX_TS (UTC)	R
90	155	32155	2	Work portion Tariff 1	Float	R
90	157	32157	2	Work portion Tariff 2	Float	R
90	159	32159	2	TS of day – 26	UNIX_TS (UTC)	R
90	161	32161	2	Work portion Tariff 1	Float	R
90	163	32163	2	Work portion Tariff 2	Float	R
90	165	32165	2	TS of day – 27	UNIX_TS (UTC)	R
90	167	32167	2	Work portion Tariff 1	Float	R
90	169	32169	2	Work portion Tariff 2	Float	R
90	171	32171	2	TS of day – 28	UNIX_TS (UTC)	R
90	173	32173	2	Work portion Tariff 1	Float	R
90	175	32175	2	Work portion Tariff 2	Float	R
90	177	32177	2	TS of day – 29	UNIX_TS (UTC)	R
90	179	32179	2	Work portion Tariff 1	Float	R
90	181	32181	2	Work portion Tariff 2	Float	R
90	183	32183	2	TS of day – 30	UNIX_TS (UTC)	R
90	185	32185	2	Work portion Tariff 1	Float	R
90	187	32187	2	Work portion Tariff 2	Float	R
90	189	32189	2	TS of day – 31	UNIX_TS (UTC)	R
90	191	32191	2	Work portion Tariff 1	Float	R
90	193	32193	2	Work portion Tariff 2	Float	R
90	195	32195	2	TS of day – 32	UNIX_TS (UTC)	R
90	197	32197	2	Work portion Tariff 1	Float	R
90	199	32199	2	Work portion Tariff 2	Float	R
90	201	32201	2	TS of day – 33	UNIX_TS (UTC)	R
90	203	32203	2	Work portion Tariff 1	Float	R
90	205	32205	2	Work portion Tariff 2	Float	R
90	207	32207	2	TS of day – 34	UNIX_TS (UTC)	R
90	209	32209	2	Work portion Tariff 1	Float	R
90	211	32211	2	Work portion Tariff 2	Float	R
90	213	32213	2	TS of day – 35	UNIX_TS (UTC)	R
90	215	32215	2	Work portion Tariff 1	Float	R
90	217	32217	2	Work portion Tariff 2	Float	R
90	219	32219	2	TS of day – 36	UNIX_TS (UTC)	R
90	221	32221	2	Work portion Tariff 1	Float	R
90	223	32223	2	Work portion Tariff 2	Float	R
90	225	32225	2	TS of day – 37	UNIX_TS (UTC)	R
90	227	32227	2	Work portion Tariff 1	Float	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Length	Name	Format	Access
90	229	32229	2	Work portion Tariff 2	Float	R
90	231	32231	2	TS of day – 38	UNIX_TS (UTC)	R
90	233	32233	2	Work portion Tariff 1	Float	R
90	235	32235	2	Work portion Tariff 2	Float	R
90	237	32237	2	TS of day – 39	UNIX_TS (UTC)	R
90	239	32239	2	Work portion Tariff 1	Float	R
90	241	32241	2	Work portion Tariff 2	Float	R
90	243	32243	2	TS of day – 40	UNIX_TS (UTC)	R
90	245	32245	2	Work portion Tariff 1	Float	R
90	247	32247	2	Work portion Tariff 2	Float	R
90	249	32249	2	TS of day – 41	UNIX_TS (UTC)	R
90	251	32251	2	Work portion Tariff 1	Float	R
90	253	32253	2	Work portion Tariff 2	Float	R
90	255	32255	2	TS of day – 42	UNIX_TS (UTC)	R
90	257	32257	2	Work portion Tariff 1	Float	R
90	259	32259	2	Work portion Tariff 2	Float	R
90	261	32261	2	TS of day – 43	UNIX_TS (UTC)	R
90	263	32263	2	Work portion Tariff 1	Float	R
90	265	32265	2	Work portion Tariff 2	Float	R
90	267	32267	2	TS of day – 44	UNIX_TS (UTC)	R
90	269	32269	2	Work portion Tariff 1	Float	R
90	271	32271	2	Work portion Tariff 2	Float	R
90	273	32273	2	TS of day – 45	UNIX_TS (UTC)	R
90	275	32275	2	Work portion Tariff 1	Float	R
90	277	32277	2	Work portion Tariff 2	Float	R
90	279	32279	2	TS of day – 46	UNIX_TS (UTC)	R
90	281	32281	2	Work portion Tariff 1	Float	R
90	283	32283	2	Work portion Tariff 2	Float	R
90	285	32285	2	TS of day – 47	UNIX_TS (UTC)	R
90	287	32287	2	Work portion Tariff 1	Float	R
90	289	32289	2	Work portion Tariff 2	Float	R
90	291	32291	2	TS of day – 48	UNIX_TS (UTC)	R
90	293	32293	2	Work portion Tariff 1	Float	R
90	295	32295	2	Work portion Tariff 2	Float	R
90	297	32297	2	TS of day – 49	UNIX_TS (UTC)	R
90	299	32299	2	Work portion Tariff 1	Float	R
90	301	32301	2	Work portion Tariff 2	Float	R
90	303	32303	2	TS of day – 50	UNIX_TS (UTC)	R
90	305	32305	2	Work portion Tariff 1	Float	R
90	307	32307	2	Work portion Tariff 2	Float	R
90	309	32309	2	TS of day – 51	UNIX_TS (UTC)	R
90	311	32311	2	Work portion Tariff 1	Float	R
90	313	32313	2	Work portion Tariff 2	Float	R
90	315	32315	2	TS of day – 52	UNIX_TS (UTC)	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Length	Name	Format	Access
90	317	32317	2	Work portion Tariff 1	Float	R
90	319	32319	2	Work portion Tariff 2	Float	R
90	321	32321	2	TS of day – 53	UNIX_TS (UTC)	R
90	323	32323	2	Work portion Tariff 1	Float	R
90	325	32325	2	Work portion Tariff 2	Float	R
90	327	32327	2	TS of day – 54	UNIX_TS (UTC)	R
90	329	32329	2	Work portion Tariff 1	Float	R
90	331	32331	2	Work portion Tariff 2	Float	R
90	333	32333	2	TS of day – 55	UNIX_TS (UTC)	R
90	335	32335	2	Work portion Tariff 1	Float	R
90	337	32337	2	Work portion Tariff 2	Float	R
90	339	32339	2	TS of day – 56	UNIX_TS (UTC)	R
90	341	32341	2	Work portion Tariff 1	Float	R
90	343	32343	2	Work portion Tariff 2	Float	R
90	345	32345	2	TS of day – 57	UNIX_TS (UTC)	R
90	347	32347	2	Work portion Tariff 1	Float	R
90	349	32349	2	Work portion Tariff 2	Float	R
90	351	32351	2	TS of day – 58	UNIX_TS (UTC)	R
90	353	32353	2	Work portion Tariff 1	Float	R
90	355	32355	2	Work portion Tariff 2	Float	R
90	357	32357	2	TS of day – 59	UNIX_TS (UTC)	R
90	359	32359	2	Work portion Tariff 1	Float	R
90	361	32361	2	Work portion Tariff 2	Float	R
90	363	32363	2	TS of day – 60	UNIX_TS (UTC)	R
90	365	32365	2	Work portion Tariff 1	Float	R
90	367	32367	2	Work portion Tariff 2	Float	R
90	369	32369	2	TS of day – 61	UNIX_TS (UTC)	R
90	371	32371	2	Work portion Tariff 1	Float	R
90	373	32373	2	Work portion Tariff 2	Float	R
90	375	32375	2	TS of day – 62	UNIX_TS (UTC)	R
90	377	32377	2	Work portion Tariff 1	Float	R
90	379	32379	2	Work portion Tariff 2	Float	R
90	381	32381	2	TS of day – 63	UNIX_TS (UTC)	R
90	383	32383	2	Work portion Tariff 1	Float	R
90	385	32385	2	Work portion Tariff 2	Float	R
90	387	32387	2	TS of day – 64	UNIX_TS (UTC)	R
90	389	32389	2	Work portion Tariff 1	Float	R
90	391	32391	2	Work portion Tariff 2	Float	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Length	Name	Format	Ac-cess
91	1	32401	2	Error state	Bool	R
91	3	32403	2	TS actual period	UNIX_TS (UTC)	R
91	5	32405	2	Work portion this month Tariff 1	Float	R
91	7	32407	2	Work portion this month Tariff 2	Float	R
91	9	32409	2	TS of month – 1	UNIX_TS (UTC)	R
91	11	32411	2	Work portion Tariff 1	Float	R
91	13	32413	2	Work portion Tariff 2	Float	R
91	15	32415	2	TS of month – 2	UNIX_TS (UTC)	R
91	17	32417	2	Work portion Tariff 1	Float	R
91	19	32419	2	Work portion Tariff 2	Float	R
91	21	32421	2	TS of month – 3	UNIX_TS (UTC)	R
91	23	32423	2	Work portion Tariff 1	Float	R
91	25	32425	2	Work portion Tariff 2	Float	R
91	27	32427	2	TS of month – 4	UNIX_TS (UTC)	R
91	29	32429	2	Work portion Tariff 1	Float	R
91	31	32431	2	Work portion Tariff 2	Float	R
91	33	32433	2	TS of month – 5	UNIX_TS (UTC)	R
91	35	32435	2	Work portion Tariff 1	Float	R
91	37	32437	2	Work portion Tariff 2	Float	R
91	39	32439	2	TS of month – 6	UNIX_TS (UTC)	R
91	41	32441	2	Work portion Tariff 1	Float	R
91	43	32443	2	Work portion Tariff 2	Float	R
91	45	32445	2	TS of month – 7	UNIX_TS (UTC)	R
91	47	32447	2	Work portion Tariff 1	Float	R
91	49	32449	2	Work portion Tariff 2	Float	R
91	51	32451	2	TS of month – 8	UNIX_TS (UTC)	R
91	53	32453	2	Work portion Tariff 1	Float	R
91	55	32455	2	Work portion Tariff 2	Float	R
91	57	32457	2	TS of month – 9	UNIX_TS (UTC)	R
91	59	32459	2	Work portion Tariff 1	Float	R
91	61	32461	2	Work portion Tariff 2	Float	R
91	63	32463	2	TS of month – 10	UNIX_TS (UTC)	R
91	65	32465	2	Work portion Tariff 1	Float	R
91	67	32467	2	Work portion Tariff 2	Float	R
91	69	32469	2	TS of month – 11	UNIX_TS (UTC)	R
91	71	32471	2	Work portion Tariff 1	Float	R
91	73	32473	2	Work portion Tariff 2	Float	R
91	75	32475	2	TS of month – 12	UNIX_TS (UTC)	R
91	77	32477	2	Work portion Tariff 1	Float	R
91	79	32479	2	Work portion Tariff 2	Float	R
91	81	32481	2	TS of month – 13	UNIX_TS (UTC)	R
91	83	32483	2	Work portion Tariff 1	Float	R
91	85	32485	2	Work portion Tariff 2	Float	R

File (FC0x14)	Offset address	Address FC0x03 FC0x04	Length	Name	Format	Access
91	87	32487	2	TS of month – 14	UNIX_TS (UTC)	R
91	89	32489	2	Work portion Tariff 1	Float	R
91	91	32491	2	Work portion Tariff 2	Float	R
91	93	32493	2	TS of month – 15	UNIX_TS (UTC)	R
91	95	32495	2	Work portion Tariff 1	Float	R
91	97	32497	2	Work portion Tariff 2	Float	R
91	99	32499	2	TS of month – 16	UNIX_TS (UTC)	R
91	101	32501	2	Work portion Tariff 1	Float	R
91	103	32503	2	Work portion Tariff 2	Float	R
91	105	32505	2	TS of month – 17	UNIX_TS (UTC)	R
91	107	32507	2	Work portion Tariff 1	Float	R
91	109	32509	2	Work portion Tariff 2	Float	R
91	111	32511	2	TS of month – 18	UNIX_TS (UTC)	R
91	113	32513	2	Work portion Tariff 1	Float	R
91	115	32515	2	Work portion Tariff 2	Float	R
91	117	32517	2	TS of month – 19	UNIX_TS (UTC)	R
91	119	32519	2	Work portion Tariff 1	Float	R
91	121	32521	2	Work portion Tariff 2	Float	R
91	123	32523	2	TS of month – 20	UNIX_TS (UTC)	R
91	125	32525	2	Work portion Tariff 1	Float	R
91	127	32527	2	Work portion Tariff 2	Float	R
91	129	32529	2	TS of month – 21	UNIX_TS (UTC)	R
91	131	32531	2	Work portion Tariff 1	Float	R
91	133	32533	2	Work portion Tariff 2	Float	R
91	135	32535	2	TS of month – 22	UNIX_TS (UTC)	R
91	137	32537	2	Work portion Tariff 1	Float	R
91	139	32539	2	Work portion Tariff 2	Float	R
91	141	32541	2	TS of month – 23	UNIX_TS (UTC)	R
91	143	32543	2	Work portion Tariff 1	Float	R
91	145	32545	2	Work portion Tariff 2	Float	R
91	147	32547	2	TS of month – 24	UNIX_TS (UTC)	R
91	149	32549	2	Work portion Tariff 1	Float	R
91	151	32551	2	Work portion Tariff 2	Float	R

A.1.14 User-defined Modbus function code 0x64

Function code 0x64 was defined in order to make it possible to read historical data, such as the load profile or events stored in a logbook, out of a PAC device via Modbus.

Structure of request frame

7 bytes	1 byte	1 byte	1 byte	5 bytes
MBAP Header	Function code 0x64	Data Log Identifier	Data Identifier	Advanced Data Identifiers

The "data log identifier" is defined system-wide for all PAC devices. The data memory which is to be read out of the PAC device can be selected using this identifier. The "data identifier" and the "advanced data identifier" determine which data from the selected data memory are sent in the response data records.

Definition "Data Log Identifier"

Description	Number
Load profile memory	0x00
Daily profile memory	0x04
Monthly profile memory	0x05
Annual profile memory	0x06
Logbook (event memory)	0x01

Definition "Data Identifier"

The "data identifier" determines which collection of measured values (or events) are sent in the data records of the response frame.

Measuring channel 1: Active energy or active power import

Measuring channel 2: Active energy or active power export

Description	Number	Can be used on " Data Log Identifier"
All events	0x00	0x01
Measuring channels 1 und 2 (average values and cumulated values)	0x60	0x00
Measuring channel 1 (average values and cumulated values)	0x61	0x00
Measuring channel 2 (average values and cumulated values)	0x62	0x00
Measuring channels 1 und 2 (average values)	0x63	0x00
Measuring channel 1 (average values)	0x64	0x00
Measuring channel 2 (average values)	0x65	0x00
Measuring channels 1 und 2 (cumulated values)	0x66	0x00
Measuring channel 1 (cumulated values)	0x67	0x00
Measuring channel 2 (cumulated values)	0x68	0x00
Measuring channels 1 and 2 (energy quantity)	0x69	0x00, 0x04, 0x05, 0x06
Measuring channel 1 (energy quantity)	0x6A	0x00, 0x04, 0x05, 0x06
Measuring channel 2 (energy quantity)	0x6B	0x00, 0x04, 0x05, 0x06

Description	Number	Can be used on " Data Log Identifier"
Measuring channels 1 and 2 (energy quantity), in addition 4 counter readings (import T1, import T2, export T1, export T2)	0x6C	0x00, 0x04, 0x05, 0x06
Measuring channels 1 and 2 (energy quantity), in addition 2 counter readings (total import T1+T2, total export T1+T2)	0x6D	0x00, 0x04, 0x05, 0x06
4 counter readings (import T1 and T2, export T1 and T2)	0x70	0x00, 0x04, 0x05, 0x06
2 counter readings (import T1, export T1)	0x71	0x00, 0x04, 0x05, 0x06
2 counter readings (import T2, export T2)	0x72	0x00, 0x04, 0x05, 0x06

Definition "Advanced Data Identifier"

The "advanced data identifier" has a length of 5 bytes. It consists of an object ID (4 bytes, format "unsigned long" big endian) and the number (1 byte) of data records required in the response frame.

Every data record of a historical data memory in the PAC device can be addressed by this object ID (OID) which is unique in the device. A special entry (or a number of entries which are inserted in the frame one after the other) can be read.

The highest OID in existence is available for every data memory in associated Modbus registers (see table "Data memory and associated Modbus registers").

If OID 0x00000000 is requested, the PMD returns the oldest valid OID with the associated data record. If a non-existent OID (other than 0) is requested, the PAC device returns the Modbus exception code 0x04. A syntax error in the Modbus frame also results in a Modbus exception response.

Data memory und associated Modbus registers

Description "Data Log Identifier"	Modbus register of the highest OID in existence	Data format	Length
Load profile memory	0x00E4	Unsigned long	2 registers
Daily profile memory	0x010A	Unsigned long	2 registers
Monthly profile memory	0x010C	Unsigned long	2 registers
Annual profile memory	0x010E	Unsigned long	2 registers
Logbook (event memory)	0x00E0	Unsigned long	2 registers

Reading out the profile data memory (load profile, daily profile, monthly profile, annual profile)

Each of the profile data memories contains 2 measuring channels:

- Measuring channel 1: Active energy or active power import
- Measuring channel 2: Active energy or active power export

A special feature of the load profile memory (demand period duration of 15 minutes) is that these channels are also available as

- Arithmetic average power demand values (W)
- Cumulated average power demand values (W) and/or as
- Energy portions (Wh)

Each of these values can be converted to any of the others using the demand period duration and the real measurement duration which is also available.

Any entry in the profile data memory can be marked as a data variable ("information flag bytes") by the device. This information helps the user to identify occurrences during the demand periods.

Description of the "information flag bytes":

FLAG_TARIFF_T1	0x00xxxxxx
FLAG_TARIFF_T2	0x01xxxxxx
FLAG_TARIFF_UNKNOWN	0xFFxxxxxx
FLAG_QUALITY_UNSECURE	0x00800000
FLAG_QUALITY_AUXPOWER_FAIL	0x00400000
FLAG_QUALITY_PERIOD_TO_SHORT	0x00010000
FLAG_QUALITY_TIME_UNSECURE	0x00200000
FLAG_MULTIPLE_TIMECHANGE	0x00040000
FLAG_CURRENT_TRANSFORMER	0x00080000
FLAG_LOGENTRY	0x00001000
FLAG_LOGBOOK_FULL	0x00002000
FLAG_Q1	0x00000040
FLAG_BAD_QUALITY_MARKER	0x00000001

Reading out the logbook (event memory)

In a similar way to profile data records, event data records can be read out using "data log identifier" (0x01), "data identifier" (0x00) and "advanced data identifier" (OID and number of data records).

Different data record types exist for event entries:

Event type	Description
1	Change to current transformer setting
2	Time set
3	Time set several times within one period
4	Reserved
5	Change of time zone setting
6	Reserved
7	Reserved

Examples

A number of Modbus frames are provided here to indicate the readout of various data logs in the device using the function code 0x64.

Example of request frame

7 bytes	1 byte	1 byte	1 byte	5 bytes
MBAP Header	Function code 0x64	Data log identifier (Tagesprofilspeicher)	Data identifier (all channels energy)	Advanced data identifiers (4 byte OID and 1 byte number of records.)
0x0000 0x0000 0x0009 0x01	0x64	0x04	0x6D	0x00002CE2 0x02

Example of response frame

Bytes in hex	Description		
00 00 00 00 00 64 01	MBAP Header		
64	Modbus user defined function code		
61	payload length in bytes (starting with the following byte to the end, excluding CRC)		
04	Data log identifier -> day profile memory		
6D	Data identifier -> channels 1 + 2 (active energy) and Readings of energy counters T1+T2		
00 00 2C E2	Set the read pointer to OID 0x00002CE2 to the of the day profile memory		
02	Number of records inserted in this telegram (may be smaller than requested)		
2D	Length of first record in bytes (including this byte)		
	0x2D data bytes of 1st record with OID 0x00002CE2		
5E 84 CF 98	timestamp act.period	unix time UTC	4 byte
00 00 0E 10	Timezone offset in s	signed long	4 byte
00 00 2C E2	OID act. Period (unique period entry identification index)	unsigned long	4 byte
41 90 D1 A4	Active energy Import act. Period in Wh	float	4 byte
00 00 00 00	Active energy Export act. Period in Wh	float	4 byte
41 41 B4 EB 44 67 2E 00	Active energy counter reading Import T1+T2 act. Period in Wh	double	8 byte
00 00 00 00 00 00 00 00	Active energy counter reading Export T1+T2 act. Period in Wh	double	8 byte
00 00 07 7E	Real load profile period length act. Period in ms	unsigned long	4 byte
00 01 00 40	Information flag bytes act. period	Bitfield	4 byte
2D	Length of 2nd record in a row starting with OID 0x2CE3 in bytes (including this byte)		
	0x2D data bytes of record 0x02 with OID 0x2CE3		
5E 84 D3 1C	timestamp act.period	unix time UTC	4 byte
00 00 0E 10	Timezone offset in s	signed long	4 byte
00 00 2C E3	OID act. Period (unique period entry identification index)	unsigned long	4 byte
41 90 D1 A5	Active energy Import act. Period in Wh	float	4 byte
00 00 00 00	Active energy Export act. Period in Wh	float	4 byte
41 41 B4 F4 51 81 7A 00	Active energy counter reading Import T1+T2 act. Period in Wh	double	8 byte
00 00 00 00 00 00 00 00	Active energy counter reading Export T1+T2 act. Period in Wh	double	8 byte
00 00 07 7E	Real load profile period length act. Period in milliseconds	unsigned long	4 byte
00 01 00 40	Information flag bytes act. period	Bitfield	4 byte

Example of readout of the logbook (event memory), request frame

7 bytes	1 byte	1 byte	1 byte	5 bytes
MBAP Header	Function code 0x64	Data log identifier (event memory)	Data identifier (all events)	Advanced data identifiers (4 byte OID and 1 byte number of records.)
0x0000 0x0000 0x0009 0x01	0x64	0x01	0x00	0x00000000 0x04

Example of readout of the logbook (event memory), response frame

Bytes in hex	Description
00 00 00 00 00 EE 01	MBAP Header
64	Modbus user defined function code
EB	payload length in bytes (starting with the following byte to the end, excluding CRC)
01	Data log identifier -> event memory
00	Data identifier -> all events
0x00000000	Set the read pointer to first OID of the event memory
04	Number of records inserted in this telegram (may be smaller than requested)
39	Length of first record in bytes (including this byte)
62 7F 5B D7	Date in UTC
00 00 0E 10	Timezone offset in s
00 00 00 01	OID of Logbook record
00 00 00 02	Corresponding period OID
00 00 00 01	Type of record (1=current transformer settings change)
00 00 00 64	Primary transformer setting
00 00 00 05	Secondary transformer setting
FF FF FF FF	Reserved
41 47 E3 CC 9E 65 69 00	Energy counter value import (T1+T2) at logging time
00 00 00 00 00 00 00 00	Energy counter value export (T1+T2) at logging time
00 00 00 01	Logbook Version
56 03 02 00	Firmware version
39	Length of 2nd record in bytes (including this byte)
62 88 A9 27	Date in UTC
00 00 0E 10	Timezone offset in s
00 00 00 02	OID of Logbook record
00 00 02 A7	Corresponding period OID
00 00 00 01	Type of record (1=current transformer change, 2=time change, 3=multiple time change)
00 00 03 84	Primary transformer setting
00 00 00 05	Secondary transformer setting
FF FF FF FF	Reserved
41 60 A8 48 70 51 30 40	Energy counter value import(T1+T2) at logging time
00 00 00 00 00 00 00 00	Energy counter value export (T1+T2) at logging time
00 00 00 01	Logbook Version
56 03 02 00	Firmware version
39	Length of 3rd record in bytes (including this byte)

Bytes in hex	Description
62 88 A9 47	Date in UTC
00 00 0E 10	Timezone offset in s
00 00 00 03	OID of Logbook record
00 00 02 A7	Corresponding period OID
00 00 00 01	Type of record (1=current transformer change)
00 00 00 32	Primary transformer setting
00 00 00 05	Secondary transformer setting
FF FF FF FF	Reserved
41 60 A9 8E 90 6B 96 40	Energy counter value import (T1+T2) at logging time
00 00 00 00 00 00 00 00	Energy counter value export (T1+T2) at logging time
00 00 00 01	Logbook Version
56 03 02 00	Firmware version
39	Length of 4th record in bytes (including this byte)
5E C6 44 1E	Date in UTC
00 00 0E 10	Timezone offset in s
00 00 00 04	OID of Logbook record
00 00 02 A9	Corresponding period OID
00 00 00 03	Type of record (3=multiple time change)
FF FF FF FF	Reserved
FF FF FF FF	Reserved
5E C6 44 20	Date before time change in UTC (in case of Type 5 → time of timezone Parameter change)
41 60 AA 9D 40 51 24 C0	Energy counter value import (T1+T2) at logging time
00 00 00 00 00 00 00 00	Energy counter value export (T1+T2) at logging time
00 00 00 01	Logbook Version
56 03 02 00	Firmware version

See also

Commissioning (Page 63)

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