System handbook

# Option PME central unit

SINEAX® AM, SINEAX® DM5000, CENTRAX® CU, LINAX® PQ

Operating instructions option PME central unit (2025-07)


GMC INSTRUMENTS

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# Legal information

**Warning notices**

In this document warning notices are used, which you have to observe to ensure personal safety and to prevent damage to property. Depending on the degree of danger the following symbols are used:

If the warning notice is not followed death or severe personal injury **will** result.

If the warning notice is not followed damage to property or severe personal injury **may** result.

If the warning notice is not followed the device **may** be damaged or **may** not fulfill the expected functionality.

**Qualified personnel**

The product described in this document may be handled by personnel only, which is qualified for the respective task. Qualified personnel have the training and experience to identify risks and potential hazards when working with the product. Qualified personnel are also able to understand and follow the given safety and warning notices.

**Intended use**

The product described in this document may be used only for the application specified. The maximum electrical supply data and ambient conditions specified in the technical data section must be adhered. For the perfect and safe operation of the device proper transport and storage as well as professional assembly, installation, handling and maintenance are required.

**Disclaimer of liability**

The content of this document has been reviewed to ensure correctness. Nevertheless, it may contain errors or inconsistencies and we cannot guarantee completeness and correctness. This is especially true for different language versions of this document. This document is regularly reviewed and updated. Necessary corrections will be included in subsequent version and are available via our webpage https://www.camillebauer.com.

**Feedback**

If you detect errors in this document or if there is necessary information missing, please inform us via e-mail to:

customer-support@camillebauer.com

## Contents

# 1. Introduction

## 1.1 Purpose of this document

This document describes the option PME central unit and the associated radio modules to be used with the devices SINEAX® AM, SINEAX® DM5000, CENTRAX® CU or LINAX® PQ. It is intended to be used by:

- Installation personnel and commissioning engineers
- Service and maintenance personnel
- Planners

The functionality, installation and commissioning of the base unit are described in the device manual for the base unit, which can be found on the corresponding product page on our homepage https://camillebauer.com or can be downloaded from the device's website via the menu *Service* | *Device Information* | *Download manual.*

**Scope**

This handbook is valid for all hardware versions of the base units SINEAX® AM, SINEAX® DM5000, CENTRAX® CU or LINAX® PQ with option PME central unit.

**Required knowledge**

A general knowledge in the field of electrical engineering is required. For assembly and installation of the device knowledge of applicable national safety regulations and installation standard is required.

## 1.2 Scope of supply

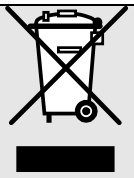
- Measurement device with option PME central unit
- Radio module(s)
- Safety instructions radio module

## 1.3 Further documents

Further documents about this option are available via the respective product site of the base unit on our homepage https://camillebauer.com/ in electronic form:

- Safety instructions radio module
- Data sheet option PME
- Modbus interface Option PME central unit

## 2. Safety notes



Device may only be disposed in a professional manner!

The installation and commissioning should only be carried out by trained personnel.

Check the following points before commissioning:

– that the maximum values for all the connections are not exceeded, see "Technical data" section,

– that the connection wires are not damaged, and that they are not live during wiring,

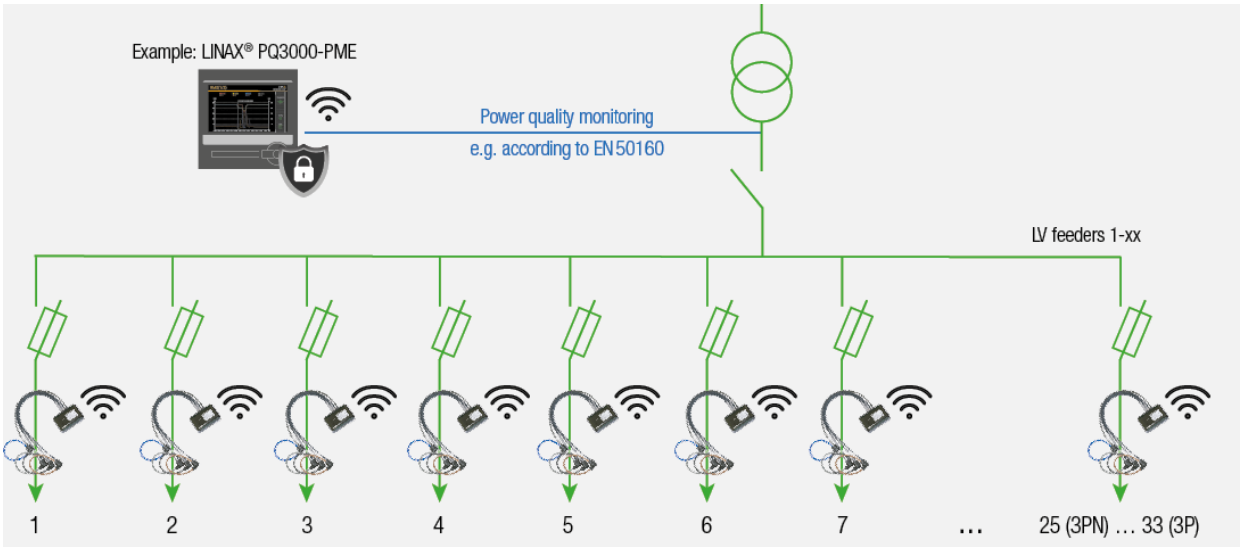
– that the power flow direction and the phase rotation are correct.

The instrument must be taken out of service if safe operation is no longer possible (e.g. visible damage). In this case, the instrument must be returned to the factory or to an authorized service dealer.

Unauthorized repair or alteration of the unit invalidates the warranty.

## 3. Device overview

The PME (Power-Monitor-Energy) option extends the functionality of the respective base unit into an actual energy center by collecting additional information about the distribution of the energy or the consumption of individual loads. This scalable solution makes the temporal power flows transparent and thus creates the basis for comprehensive energy management. It is typically used where the energy is distributed, for example in transformer stations or the supply of industrial plants or building complexes. Radio modules based on Rogowski coils are used as sensors, powered by batteries or via USB-C.



Up to 100 currents, divided between the PME radio modules for 3 or 4 conductors each, can be reliably recorded (AES-128 encryption) without any additional wiring effort. Once a second (default setting), not only the current values are determined from this, but also, thanks to synchronization with the voltage measurement of the base unit, comprehensive performance data and average loads, load profile data and energy meter values are derived, which are also stored as time series in the device.

**Per PME measurement system (3- or 4-wire) additional measurement data are available:**

| MEASURED VALUE GROUP | APPLICATION |
|---|---|
| **INSTANTANEOUS VALUES** | |
| • I (per phase) | » Monitoring the conductors current load |
| • P, Q, Q(H1), S (per phase and total) | » Reactive power compensation |
| • PF und cosφ (per phase and total) | » Checking a given power factor |
| • Temperature (in sensor junction box) | » Ambient temperature in the sensor area |
| • Battery charge level | » Sensor management |
| **HARMONICS** | |
| • THD I and Total Demand Distortion TDD I (per phase) | » Evaluation of the thermal load of equipment |
| • Waveform (100/120 samples per cycle) | » Possible conclusions about the connected consumers |
| **ENERGY BALANCE** | |
| • Energy meters active / reactive energy, import / export | » Preparation of (internal) energy bills |
| • Mean values P, Q, Q(H1), S, PF and cosφ (per phase and total) | » Determination of energy consumption over time (load profile) for energy management or energy efficiency reviews |
| • Mean values I, THD I and TDD I (per phase) | » Monitoring of average conductor load (heating) |

# 4. Connection of radio modules

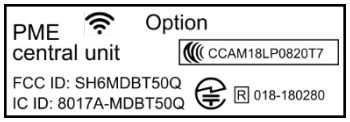
**Ensure under all circumstances that the leads are free of potential when connecting them!**

## 4.1 General safety notes

**Please observe that the data on the nameplate must be adhered to!**

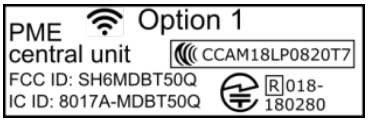
The national provisions have to be observed in the installation and material selection of electric lines, e.g. in Germany VDE 0100 “Erection of power installations with nominal voltages up to 1000 V“!

**PME central unit part of nameplate of possible base units**



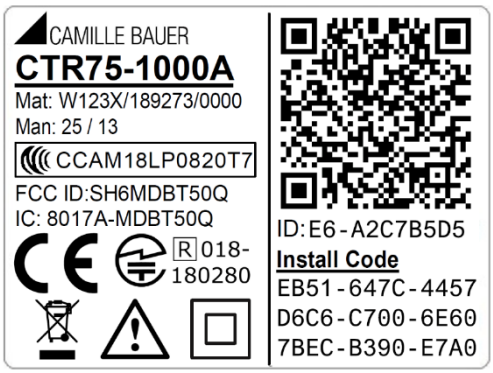

AM1000 / PQ1000


AM2000 / AM300 / PQ3000




DM5000 / PQ5000

**Nameplate of radio module**




| Symbol | Meaning |
|---|---|
| | Device may only be disposed of in a professional manner |
| | Double insulation, device of protection class 2 |
| CE | CE conformity mark. The device fulfills the requirements of the applicable EU directives. |
| | Caution! General hazard point. Read the operating instructions. |
| FCC ID<br>IC | Country specific radio equipment approvals |

## 4.2 PME radio sensor CTR75-1000A

The option PME central unit in the base unit serves monitoring load flows in distribution systems or to consumers using up to 33 PME radio sensors. Synchronously with the voltage of the base unit, radio modules with 3 or 4 current channels each record all data required for the analysis of the energy flows and send them wirelessly to the base unit.

The radio modules require a power supply (batteries or USB-C).

During commissioning, each sensor module has to be linked to the base unit, to be able to assign the measured data uniquely to a measurement point. For that, information given on the nameplate of the modules must be available. It can therefore make sense to link the radio modules to the base unit before mounting them in the plant.

**Commissioning of the radio modules is shown in chapter 5.1.**

**Modules must not be used with an open housing cover.**

The junction box of the radio modules can be fixed directly on a cable using cable ties.

Do not mount the junction box on bare conductors!

**Rogowski coils**

The Rogowski coils of the radio modules are different in color and also marked:

- L1 – Brown
- L2 – Black
- L3 – Gray
- N – Blue (available for 4-wire versions only)

The Rogowski coils are placed directly around the respective conductors. The current direction, which is indicated by an arrow on the measuring head, must be observed.

# 5. Commissioning

The commissioning of the base unit is described in detail in the respective device handbook. You have to check if the connection data of the device match the data of the plant (see nameplate). If so, you can start to put the device into operation by switching on the power supply and the measurement inputs.

## 5.1 Linking the PME radio modules to the base unit

For an explicit assignment of the measurement data, the radio modules need to be linked individually to the base unit during commissioning. Doing so, you have to:

1. Supply power to the base unit, that the device website becomes available.
2. Provide power for the radio modules (batteries or USB-C)
   *Hint: Linking is possible even if the module is not powered*
3. Add the radio module to the base unit via QR-Code or manual entry of the Install Code
4. Assign the module to a PME measurement system
5. Assign a name to the measurement system
6. Parametrize the measurement system for the task (system, nominal current, amplification factor(s))
7. Assign the name of the measurement system to the radio module, if desired

Repeat steps 2 to 7 until all radio modules are linked to the base unit.

***Hint**: These steps will be executed immediately, without having the changed configuration to be stored in the device.*

### 5.1.1 Power supply

The radio module CTR75-1000A needs to be powered. This is possible via either batteries or via USB-C (5 VDC).

**Inserting / replacing batteries**

*The batteries must not be inserted / replaced during operation, the radio module must be removed from the system.*

1. Loosen the screws (4x Torx Plus® 10IP) on the bottom of the housing
2. Remove the housing cover. ATTENTION: This cover muster later be reassembled on the same housing bottom.

   *Make sure that you are free of static electricity, so that the electronic is not damaged by static discharge.*

3. Insert batteries in the battery holder or replace the existing batteries. Pay attention to the specified polarity. Always change all batteries at once.

   *Only use **Energizer Ultimate Lithium AA (1,5 V AA / FR6 / L91) batteries**. If other batteries are used, operational reliability and service life could be reduced.*


4. Electronics and housing cover (with the information given on the nameplate) form a unit. The same cover must be placed on the electronics again. Then fix the screws again (maximum torque 1.0 Nm).

The charge status of the batteries can be queried via the service menu **PME current module state**. If the charge level is ≤10 %, all batteries in the corresponding module should be replaced.

| Name | ID | Firmware version | Sensor type | | Last seen | RSSI (⌀) | Link Quality |
|---|---|---|---|---|---|---|---|
| NCS3 | E7-4973E8DD | 1.0 | CTR75-1000A, 3CH | 76 % | 0 s | -54 dBm (-58 dBm) | 100% |
| UT3 | E7-4973E8DE | 1.0 | CTR75-1000A, 3CH | 68 % | 0 s | -63 dBm (-56 dBm) | 100% |

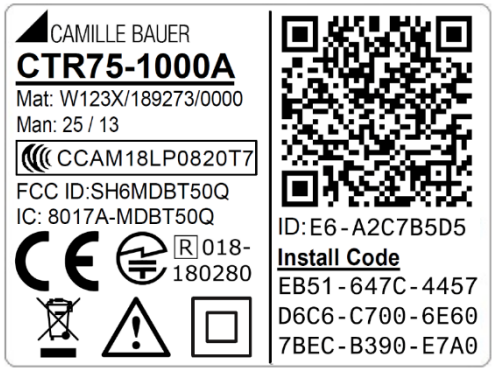
**Powering the module via USB-C (5 VDC)**

As an alternative to battery power, the module can also be supplied via the side USB-C connector. If possible, use a supply with galvanic isolation.

> *The cable for powering via USB-C must not be routed over bare live conductors.*

As soon as the module is powered the LED flashes either red or green.

### 5.1.2 Add a radio module to the base unit

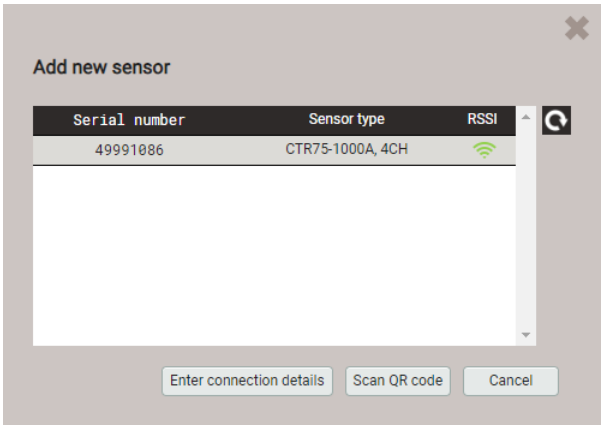



On the right side of the nameplate of the radio module are three pieces of information, which are required for installation:

- **ID**: Identification number of the module, consisting of the module type (E6 or E7) and a unique sequential number (here A2C7B5D5)
- **Install Code**: 32-digit number that is required when linking the module to the base unit and ensures that communication is encrypted.
- **QR-Code**: Scannable version of the Install Code, for a faster installation procedure.

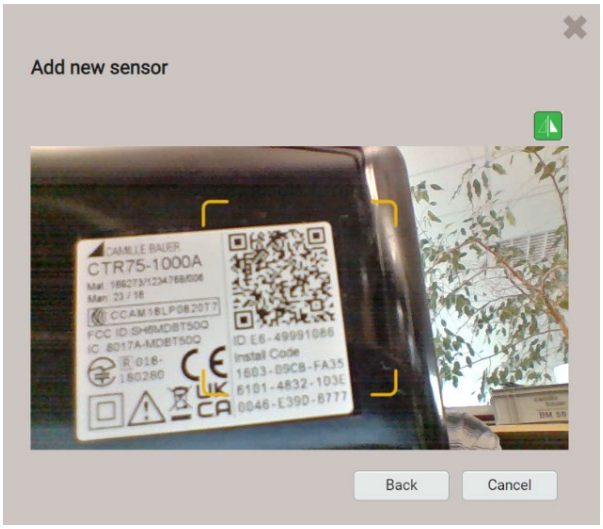
a) Adding a current module to a base unit is done via its website. Select *Add new sensor* in the settings menu of the *PME current modules*. All modules reachable via radio and not assigned to a base unit will be displayed.

***Hint**: Each module can be linked to only one base unit.*



b) If the website is displayed on a device with camera (smart phone, tablet, notebook) or a webcam is connected to the PC, select «Scan QR code», scan the code and proceed to step d).

***Please note the information on using the camera in appendix C.***

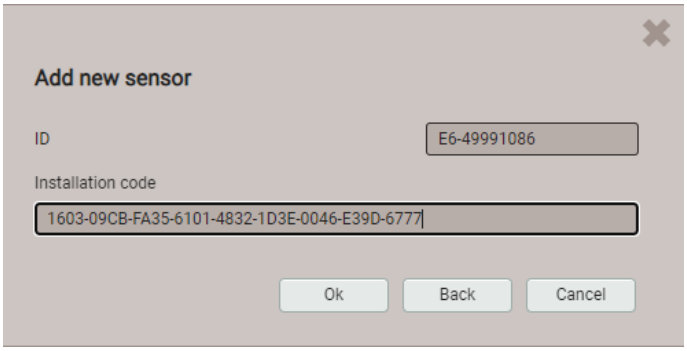



c) If there is no camera available, select

- «Enter connection details» and enter **ID and Install Code**

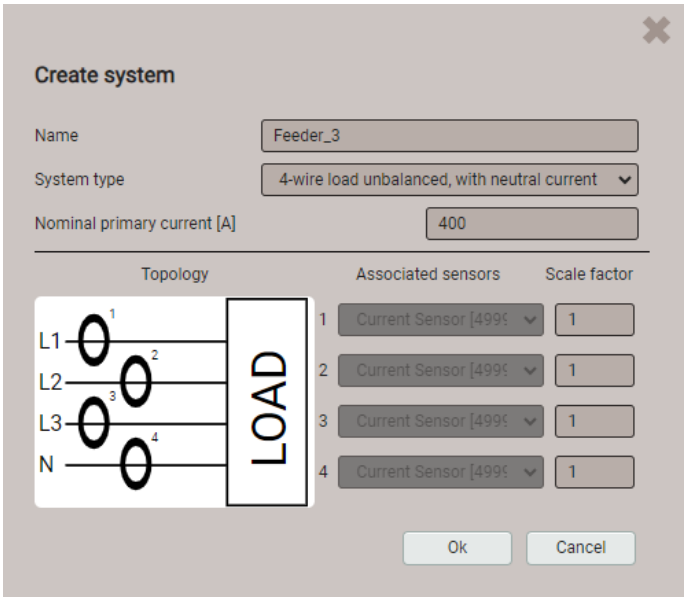
OR

- A device from the list of the not assigned devices and enter the **Install Code**

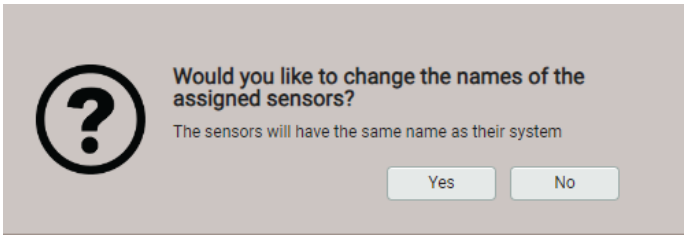



d) The new module must then be assigned to a measurement system. A name can be assigned to the measuring system, the type of connection can be defined and the nominal current can be set. If one or multiple of the sensors only measure a part of the respective total current, this can be corrected with a scale factor, for example by a factor of 2 if only one of 2 parallel conductors is measured.

***A negative amplification factor reverses the current direction, e.g. if a sensor is incorrectly connected.***




e) In the last step the name of the measurement system can also be assigned to the module. This makes it easier to see the module usage within the sensor overview.

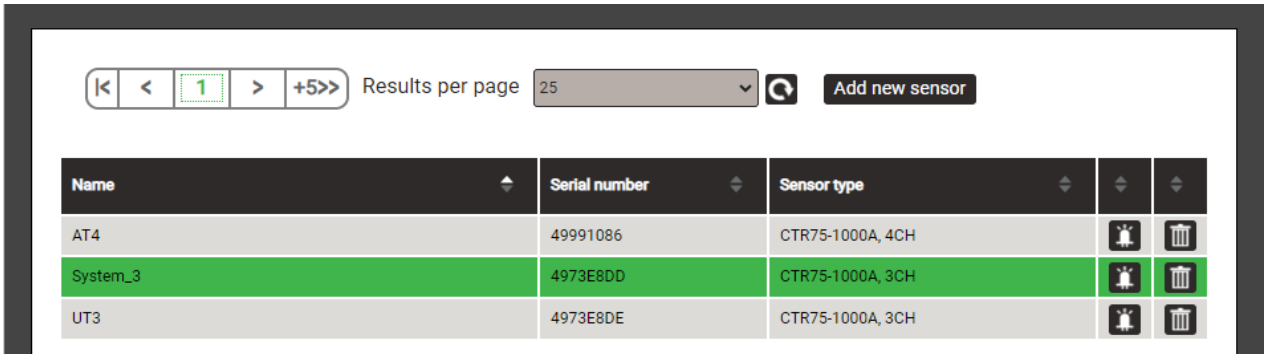


### 5.1.3 Modifying module settings

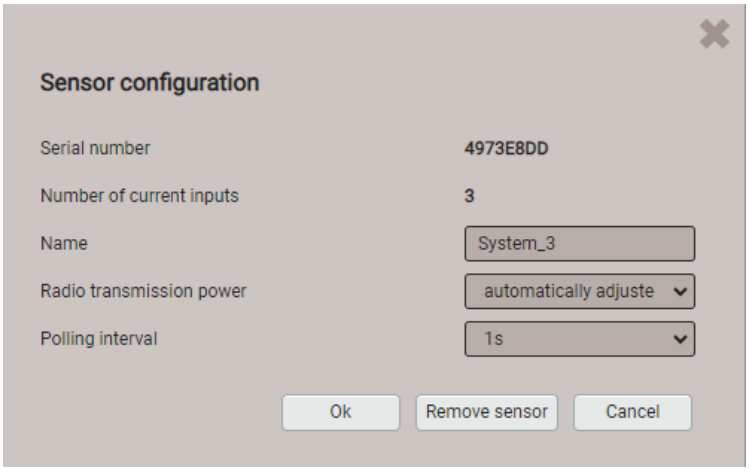
The radio modules use default settings, e.g. a transmission power of 0 dBm (1 mW) or a polling interval of 1 s. If radio modules are mounted at a greater distance from the base unit, it may be necessary to increase the transmission power to ensure reliable radio reception. This then increases the power demand and can reduce the life cycle of the batteries. By extending the polling interval on the other hand the battery load can be reduced.

In order to change the settings of individual modules, a module can be selected in the configuration menu of the PME current modules. In this menu you can also:

- Activate an LED flashing mode to identify the selected module
- Remove modules




In the sensor configuration the desired modifications can then be made:




### 5.1.4 State overview of the modules

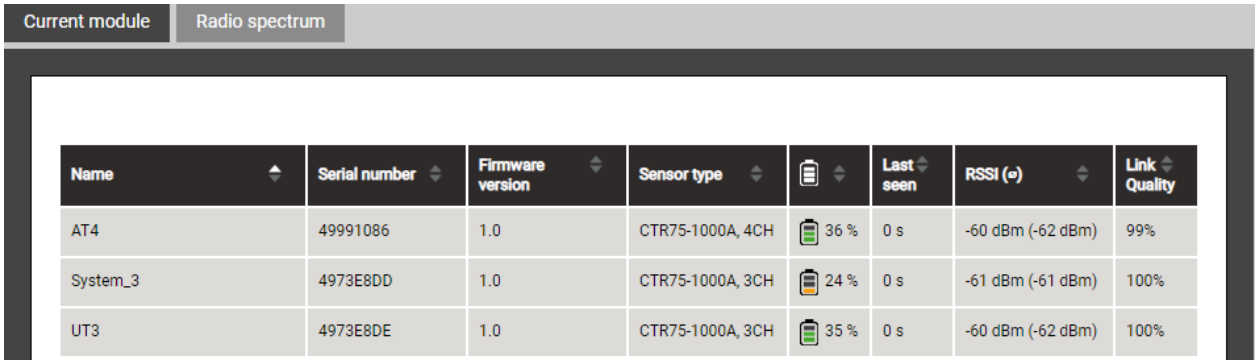
The state LED provides information about the current operating state of the respective module

| Color | State | Meaning |
|---|---|---|
| - | dark | **No power** |
| red | Flashing every 5 s | Radio module **with power**, no measurement system assigned yet, not synchronized |
| green | Flashes every 1 s or 10 s [1)] | Radio module in **measurement mode**, synchronized to base unit |
| orange | Flashes every 1 s for 5 s | **Module identification** via Web-GUI |

[1)] *60 s after synchronization the flashing frequency changes to a 10 s cycle*

Detailed information about the **state of the PME current modules** can be visualized via the service menu:

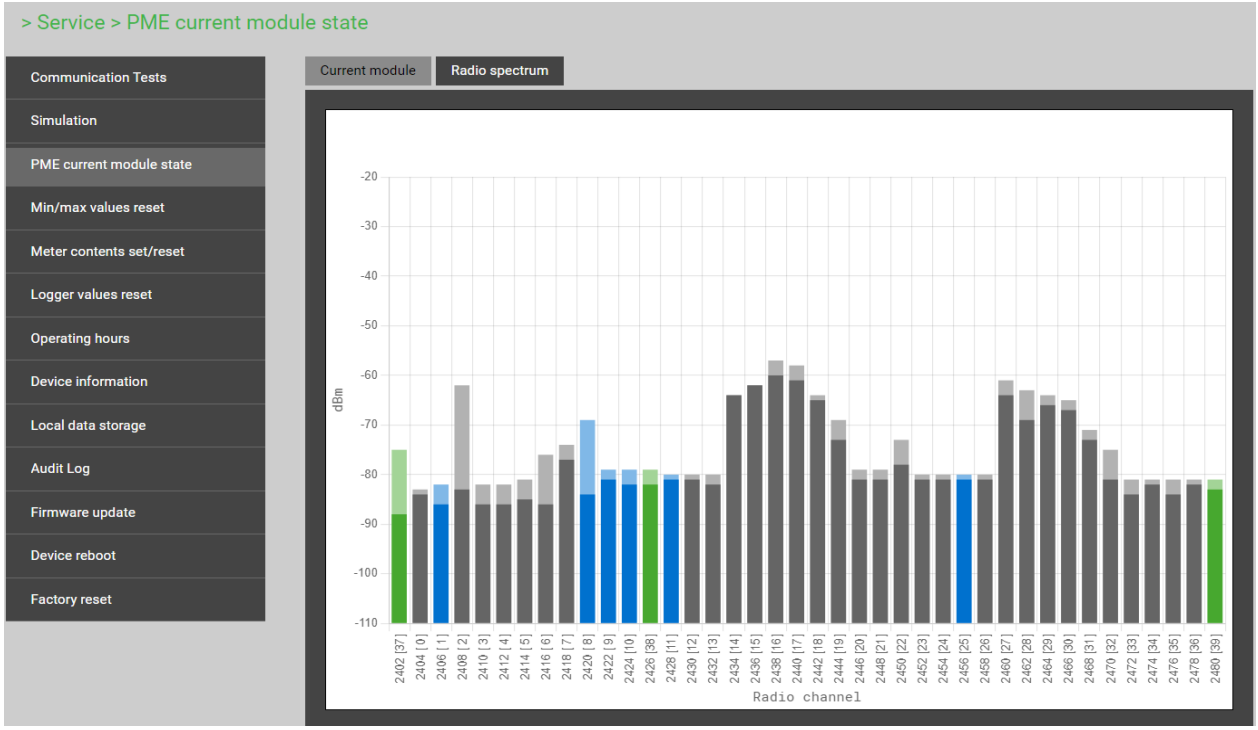
- Name, Serial number, Firmware version and type of the respective module
- Battery state of charge [%]
- Time since last successful communication
- RSSI reception level [dBm] of the last message, average level over the last 5 min in parentheses
- Link Quality: Percentage of successful queries in the last 5 minutes



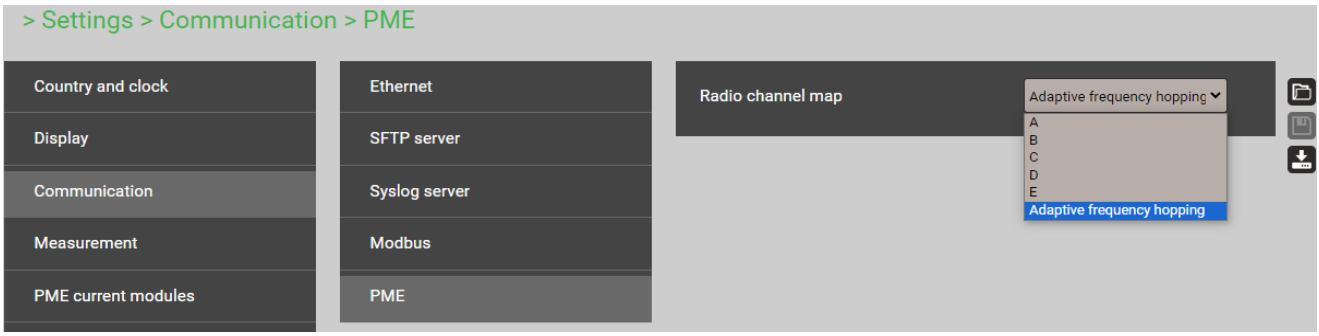

## 5.2 Radio channel selection

Via display of the radio spectrum the data channels used for the communication of the base unit with the radio modules may be visualized.

- Used data channels
- Synchronization channels
- Unused channels




If the Link Quality is lower than expected, you can try to improve the quality by selecting other data channels. This selection can be changed in the communication settings of the base unit.



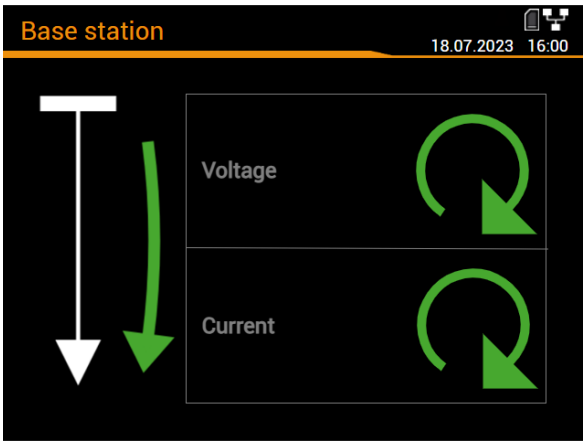

- A: Radio channels 0, 4, 8, 12, 16, 20, 24, 28, 32
- B: Radio channels 1, 5, 9, 13, 17, 21, 25, 29, 33
- C: Radio channels 2, 6, 10, 14, 18, 22, 26, 30, 34
- D: Radio channels 3, 7, 11, 15, 19, 23, 27, 31, 35
- E: Radio channels 0, 6, 11, 13, 19, 20, 26, 33, 36
- Adaptives frequency hopping (default setting): The device automatically searches the channels with the best transmission quality

## 5.3 Installation check

The correct connection of the current and voltage inputs can be checked in two ways.

a) **Sense of rotation check**: Using the sequence of the current and voltage phasors the sense of rotation is determined and compared to the configured one.

Test requirement: Magnitude of all connected voltages at least 5% of nominal, magnitude of all connected currents at least 2% of nominal.




**PQ5000 with option PME**

Menu Instantaneous values | PME measurement systems

In addition, the energy direction is evaluated and displayed, here in green: away from the busbar.

**Sense of rotation**

Correct sense of rotation

Wrong sense of rotation

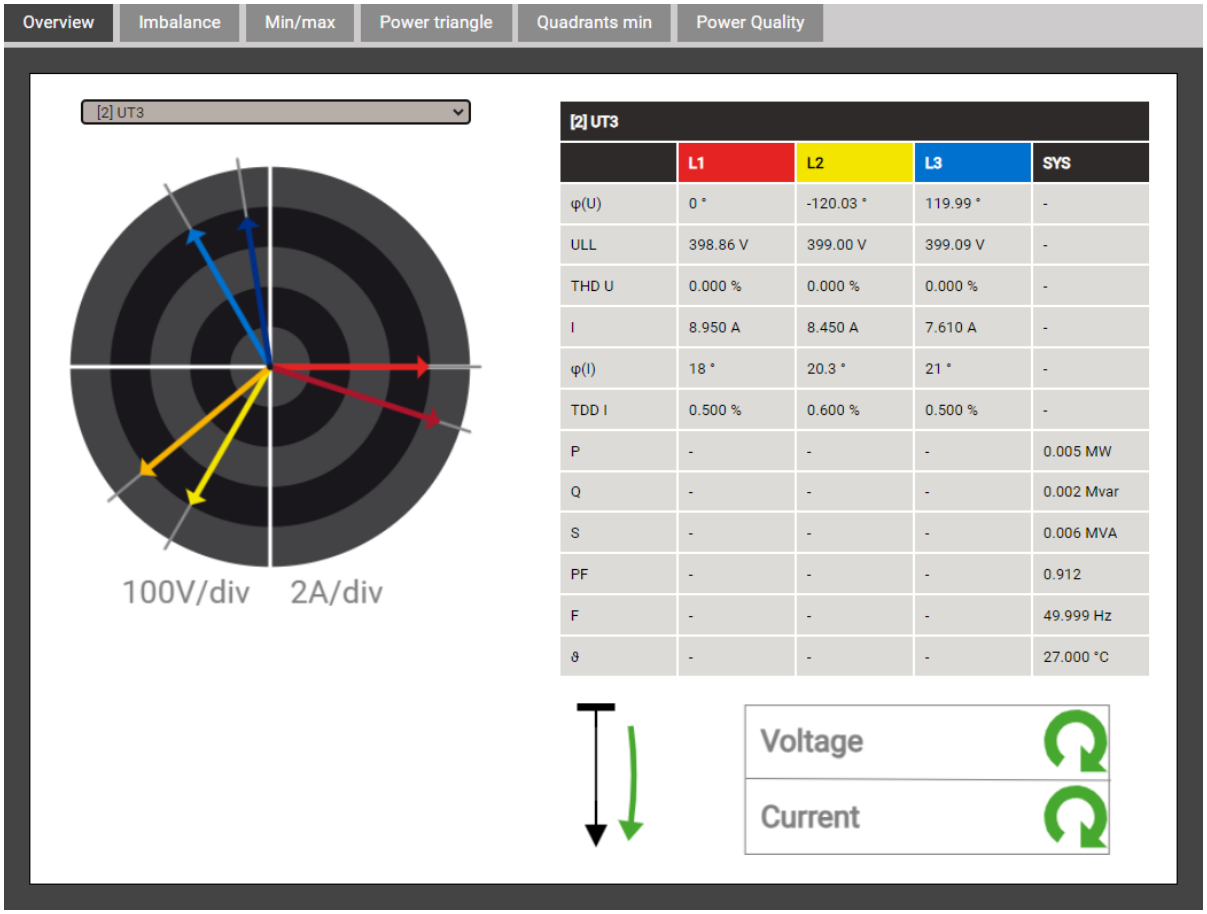
Missing phase or magnitude too small

**Energy direction**

Away from the busbar

Towards the busbar

b) **Installation check for devices with option PME**: Phasor diagram and the visualization of sense of rotation and energy direction are displayed in the same image in the instantaneous values menu of the WEB interface. This information can be displayed not only for the basic device, but also for each individual PME measuring system. The system to be displayed can be selected in the top left drop-down menu.

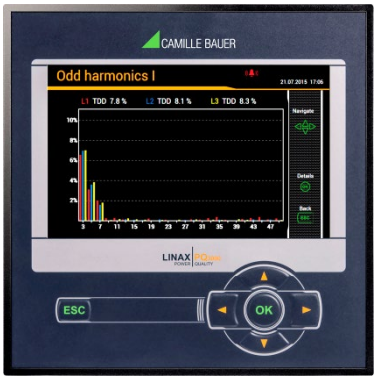



*Instantaneous values display of a PME measurement system*

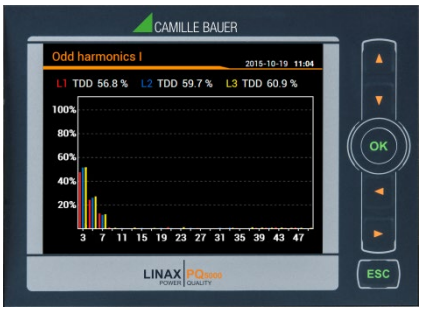
# 6. Operating the device

## 6.1 Operating elements


*PQ1000 /AM1000*




*PQ3000 / AM2000 / AM3000*



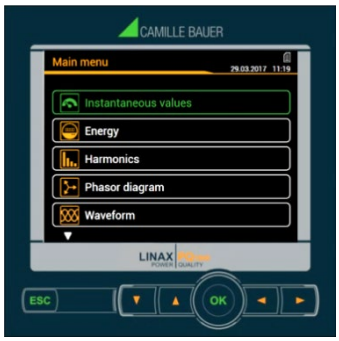

*PQ5000 / DM5000*

The operation of devices with display is performed by means of 6 keys:

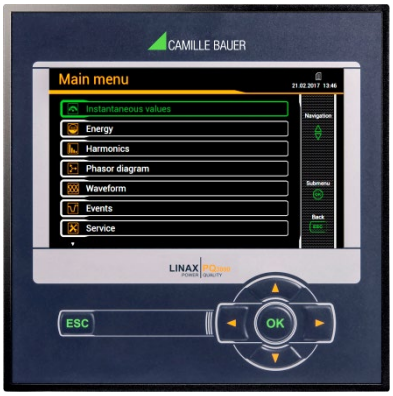
- 4 keys for **navigation** (◄, ▲, ▼, ►) and for the selection of values
- OK for **selection** or confirmation
- ESC for **menu display**, terminate or cancel

The **function** of the operating keys changes in some measurement displays, during parameterization and in service functions. For the PQ3000 the valid functionality of the keys is then shown in a help bar.

## 6.2 Selecting the information to display




*PQ1000*




*PQ3000*


*PQ5000*

For devices with display, information selection is performed via menu. Menu items may contain further sub-menus.

**Displaying the menu**

Press **ESC**. Each time the key is pressed a change to a higher menu level is performed, if present.

**Displaying information**

The menu item chosen using ▲,▼ can be selected using **OK**. Repeat the procedure in possible submenus until the required information is displayed.

**Return to measurement display**

After 2 min. without interaction the menu is automatically closed and the last active measurement display is shown.

## 6.3 Configuration

### 6.3.1 Local configuration at the device

The settings of the optional PME system cannot be viewed or changed locally.

### 6.3.2 Configuration via web browser

All settings for the optional PME system can be made via WEB-GUI.

Deviating from the normal functionality of the settings menu, changes to the PME current modules and PME measuring systems during the linking of the modules to the base unit are immediately applied to the current configuration and do not have to be saved explicitly.

## 6.4 Data recordings of the PME measurement systems

For devices with the option PME central unit, the data logger additionally stores the time-series of mean values and meter readings of the PME measurement systems.

In addition, file-based information of the mean value timeseries may be periodically created using the Data export scheduler. This data may be saved internally and / or send securely to a SFTP server.

| Group | Data type | Request | |
|---|---|---|---|
| Periodic data | • Time-series of mean-values:<br>- Standard quantities (5)<br>- User-specific quantities (12)<br>- Standard quantities of PME measurement systems (33)<br>• Periodic meter readings:<br>- Standard quantities (4)<br>- User-specific quantities (12)<br>- Standard quantities of PME measurement systems (4) | Energy | • Mean value logger<br>• Meter logger |

**Configuration of the periodic data recordings**

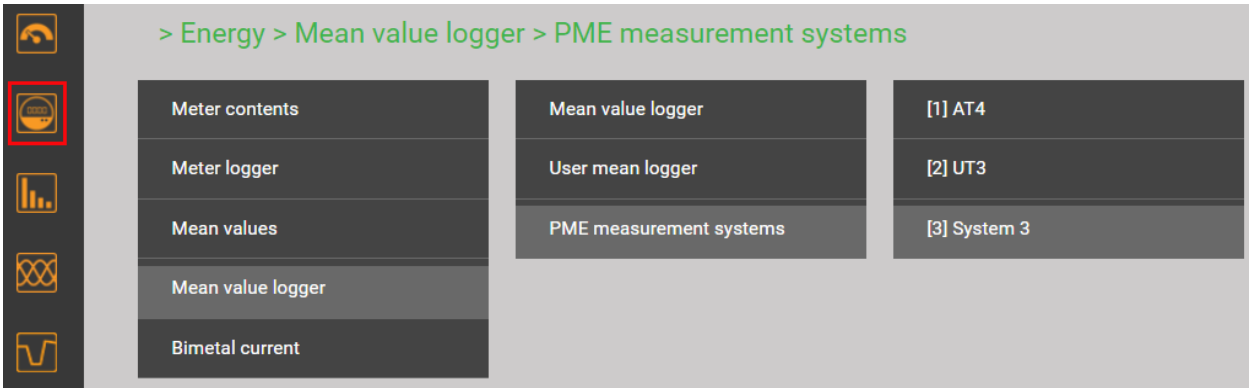
Via the settings menu the user can individually configure:

- The averaging interval of the standard mean-values of the PME measurement systems
- The reading interval of the standard meters of the PME measurement systems

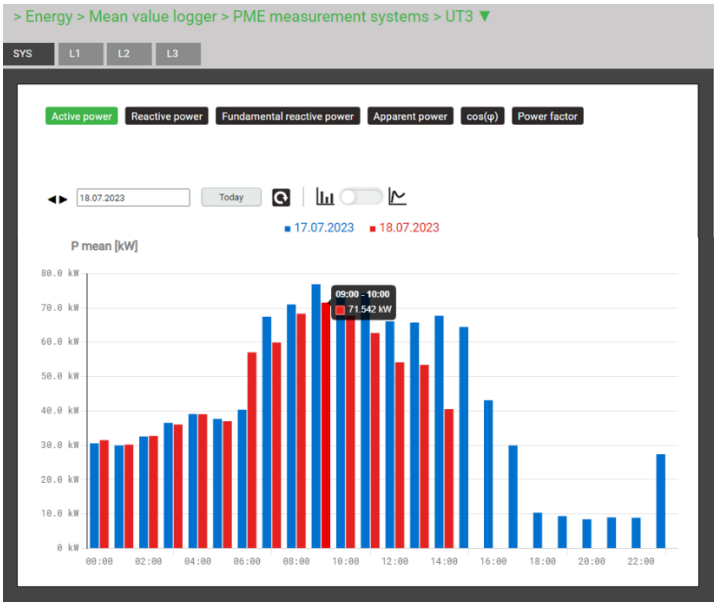
The recording of all mean-values and meters is started automatically on device start. The recording of the mean-values is done when the appropriate averaging interval expires.

**Displaying the chronology of the mean values**

The chronology of the mean values of the PME measurement systems is available via the menu **Energy:**

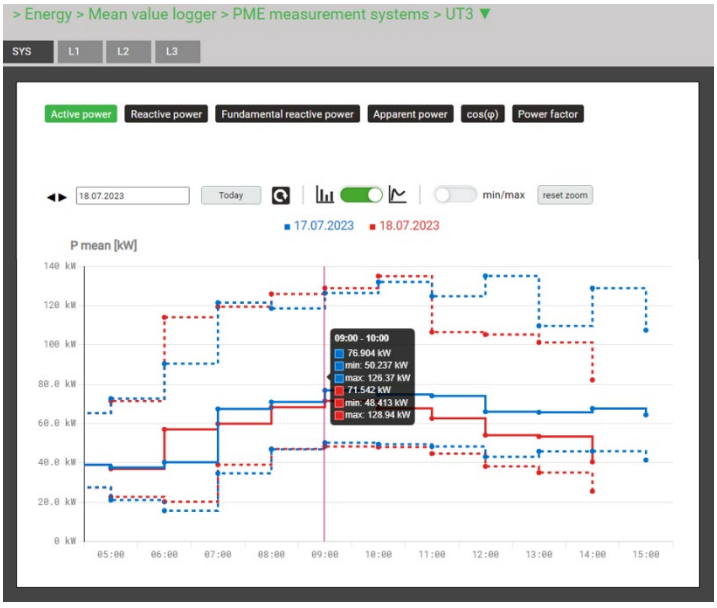



*Selection of the mean value logger of a PME measurement system*




The mean-value to be displayed can be selected via the corresponding registers. Daily profiles are displayed, together with the values from the previous day.

The values for the individual averaging intervals can be read off with the help of a «fly-over» display.




As an alternative a line display can be selected, in which also the display of minimum and maximum values can be activated. This way the fluctuation of the measurements can be seen best.

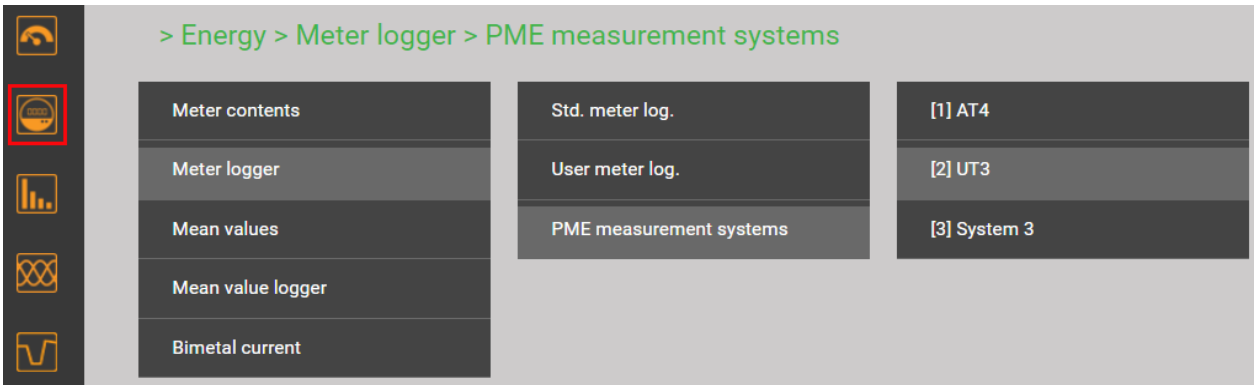
This type of display also allows zooming into the time range of interest. The individual measured values are shown as points. Using the «fly-over» feature detailed data can be displayed:

- Time interval
- Mean value of the interval
- Minimum RMS value within the interval
- Maximum RMS value within the interval

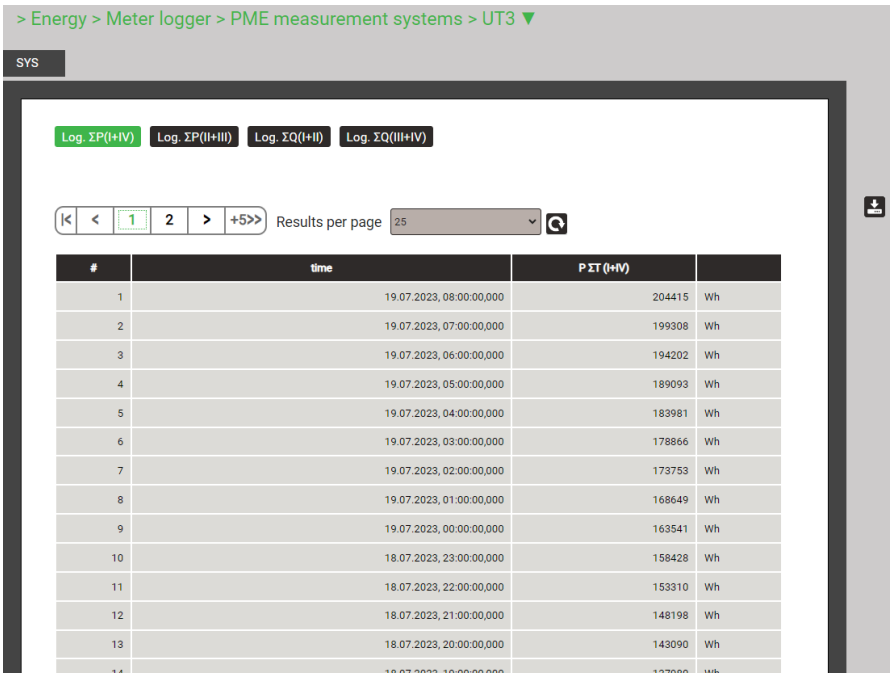
### Displaying the chronology of meter contents

The chronology of the meter readings is available via the menu **Energy**.

From the difference of two successive meter readings the energy consumption for the dedicated time range can be determined.




*Selection of the meter logger of a PME measurement system*

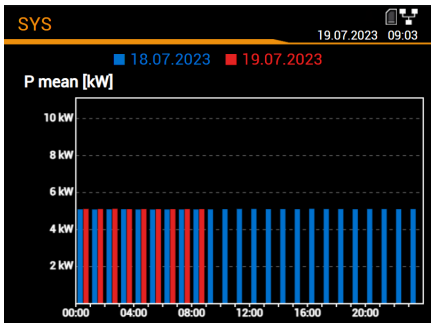



*Meter content readings in table form*

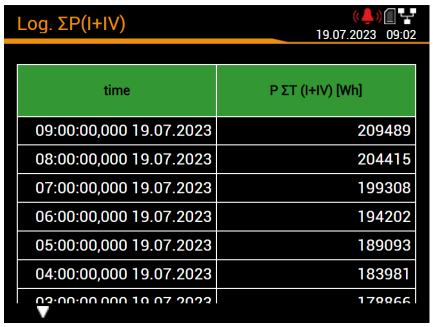
### Displaying data locally

The selection works in principle in the same way as with the WEB-GUI. There are the following differences:

- The individual measured quantities are arranged in a display matrix and can be selected via navigation.
- The number of displayable meter readings is limited to 25
- The time range of the mean values is limited to the present day or the present week. There is no possibility for navigation. In addition, hourly mean-values will be shown, independently of the real averaging time.




*Mean values for the present day*




*Meter readings*

### Manual data export of meter readings as CSV file


Via  the time range of the data to export can be selected. A CSV (Comma separated value) file will be generated. For creation the CSV settings of the data exporter are applied. This can be imported as a text file to Excel.

The same file contains data for all meter quantities.

## 6.5 Measurement information in file format

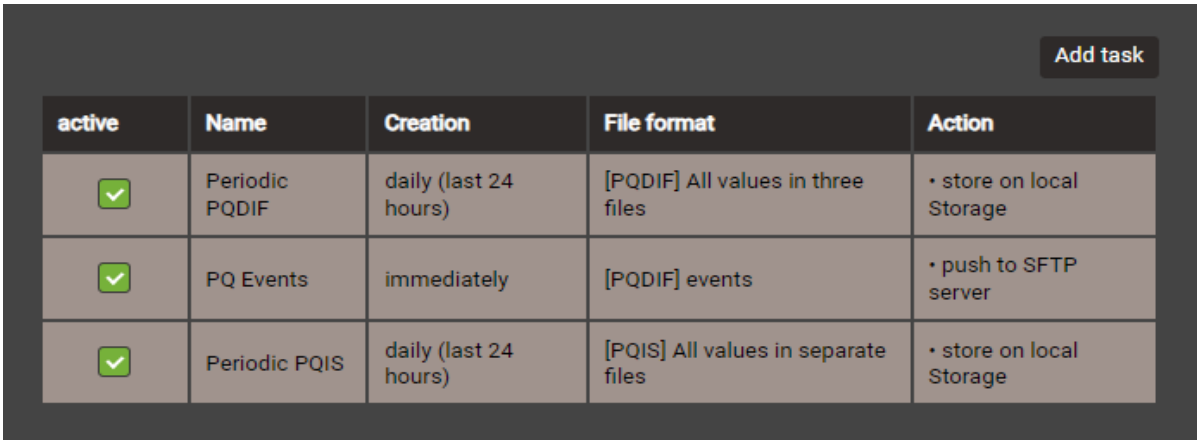
Using the data export scheduler, measurement information may be provided also in file format. Such files can then:

- periodically or event-driven being sent to a SFTP server
- locally stored in the device and downloaded via webpage

The management and setup of tasks for providing files is done via the item *Data export* | *Data export scheduler* in the settings menu.

### 6.5.1 Predefined tasks

If the base unit is a PQ device, the data export scheduler contains three predefined tasks for providing measurement data in PQDIF or CSV file format. For better readability all tasks are activated in the below image. In the factory settings only the task “Periodic PQDIF” is active.




The user may activate, deactivate and modify these tasks, but cannot delete them. Local storage and for PQDIF files also “push to SFTP” server are possible actions to be defined.

**Periodic PQIS**

If this task is activated, the device periodically creates, at the end of each day, CSV files with all information about the power quality, possibly occurred events during the day and the determined load profiles per Current Module. These files can be downloaded compressed in a ZIP file for a selectable time period. They are structured and formatted in a way that they can be read directly into the PQIS® software and evaluated there. The following files are generated:

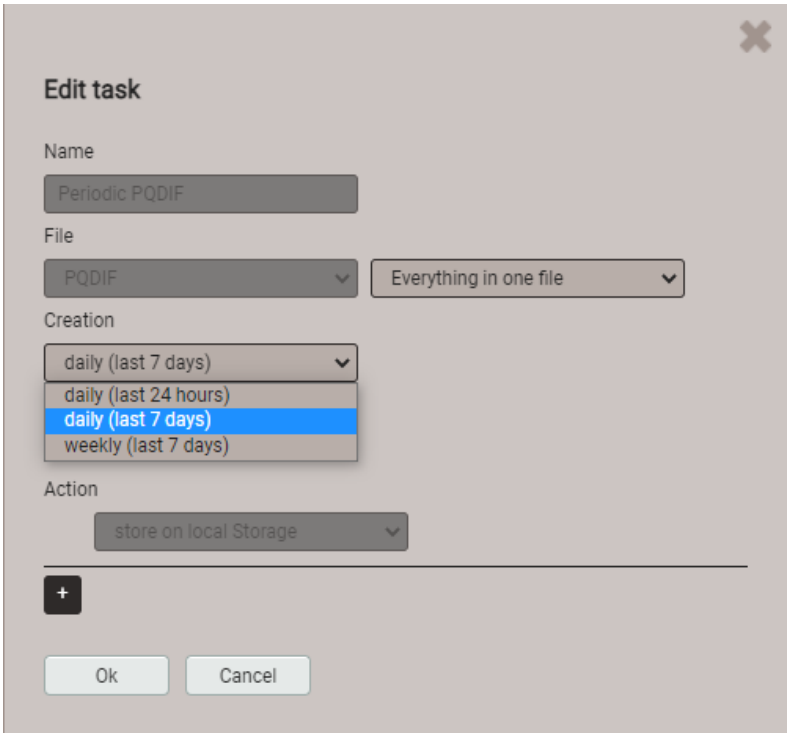
- 10 minutes mean-values for PQ assessment
- 2 hours flicker values for PQ assessment
- 10 minutes mean-values of each current module for PQ statistic
- Mean-values (configurable interval) of power quantities of each current module for load profile analysis
- PQ event list
- Data for each PQ event:
  - Half-cycle values of voltages
  - Half-cycle values of each current module (for PQ5000MOBCLM only)
  - Waveform (samples) of voltages
- Signalling voltage event list
- Half-cycle voltages for all signalling voltage events

**PQ Events**

If this task is activated, a PQDIF file with event data is created as soon as a PQ event has ended. Typically, this file is then sent to an SFTP server.

**Periodic PQDIF**
If this task is activated, the device periodically creates shortly after midnight PQDIF files and saves the file or files in a hierarchical time structure (year, month, day).

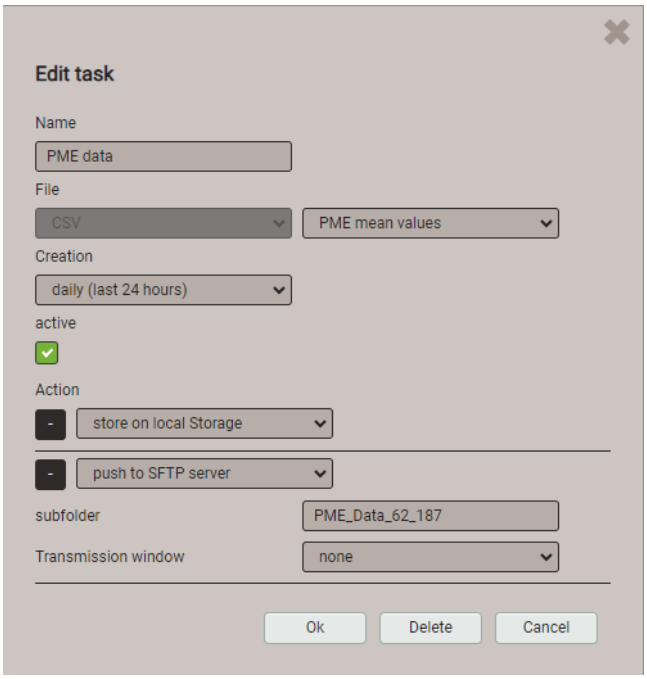
By selecting a predefined task, the associated settings can be adapted. justed by selecting the entry. For example, for the task *Periodic PQDIF* you may choose whether the information should be stored in one file or in up to three files (statistics, histograms, events). The time range can be either one day or seven days, and generation can be daily or weekly.




### 6.5.2 Creating periodic file data

In addition to the predefined tasks, new tasks can be setup for creating CSV files with mean-values information at regular intervals. These files may then be stored locally and / or pushed to a SFTP server.

By selecting “Add task” new schedules can be set-up. An example is shown below:

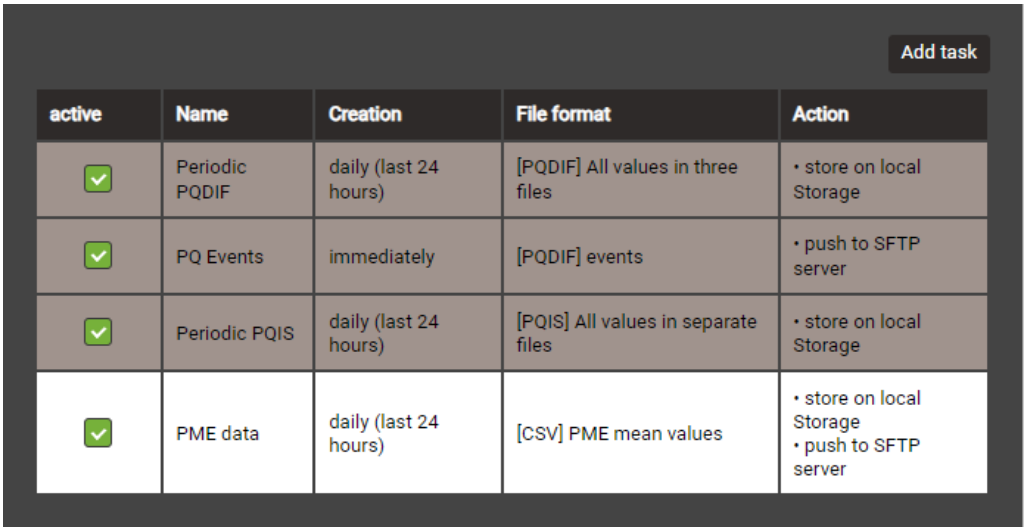



The task “PME data” generates daily files with the mean-values of all PME measurement systems. A separate file is created for each measurement system.

The files will be both stored locally and pushed to the subfolder „PME_Data_62_187“of a SFTP server. The settings of the SFTP server to be used can be defined via Communication | SFTP in the Settings menu.

With the transmission window, a random transmission of the file(s) to the SFTP server within the selected time window could be provoked. The transmission window can be up to 6 hours. Here it is deactivated to force an immediate transfer.

The task list then shows four active tasks. Predefined tasks are marked gray to highlight that they can be deactivated but not removed. On the other hand, at any time the newly created task “PME_data” can be fully modified, deactivated or deleted.

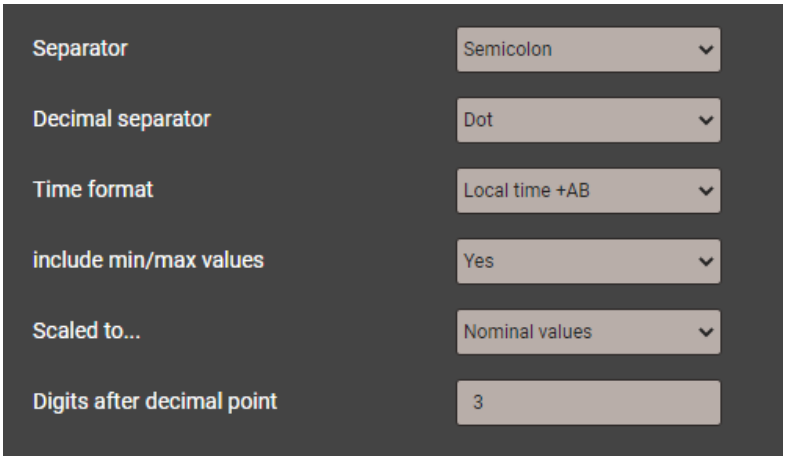



| active | Name | Creation | File format | Action |
|---|---|---|---|---|
| ☑ | Periodic PQDIF | daily (last 24 hours) | [PQDIF] All values in three files | • store on local Storage |
| ☑ | PQ Events | immediately | [PQDIF] events | • push to SFTP server |
| ☑ | Periodic PQIS | daily (last 24 hours) | [PQIS] All values in separate files | • store on local Storage |
| ☑ | PME data | daily (last 24 hours) | [CSV] PME mean values | • store on local Storage<br>• push to SFTP server |

Via the settings of the local display only the activation / deactivation of the tasks is supported.

### CSV settings

CSV files are intended for transmitting statistics of mean values. You may adjust the below parameters to adapt the file format and the content of the created files to your requirements.



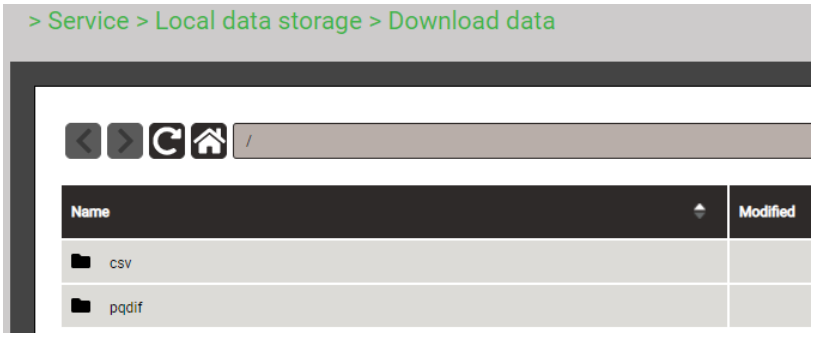

- The **Separator** separates the individual entries on a text line for later display in table form.
- The **Decimal separator** defines how numbers or measured values are written to the file. The decimal separator must correspond to the country-specific number format of the operating system so that the CSV file can be opened directly in Excel without an import process. Common separators are periods (123.45) or commas (123.45).
- **Time format** defines the time format to be written. With the “local time + AB” time format, the double entries between 2 and 3 AM are supplemented with the letters A and B when switching back from daylight saving time.
- **Include min/max values** defines whether mean values with / without minimum and maximum values are written to the CSV file.
- **Scaled to** specifies whether the numerical value is based on the basic unit (e.g. 1087.65W) or on the units specified according to the nominal values (e.g. 1.0876kW), which are also used in the web interface.
- **Digits after decimal point** defines the number of digits after the decimal separator with which the numbers are written to the file.

### 6.5.3 Accessing file information via webpage

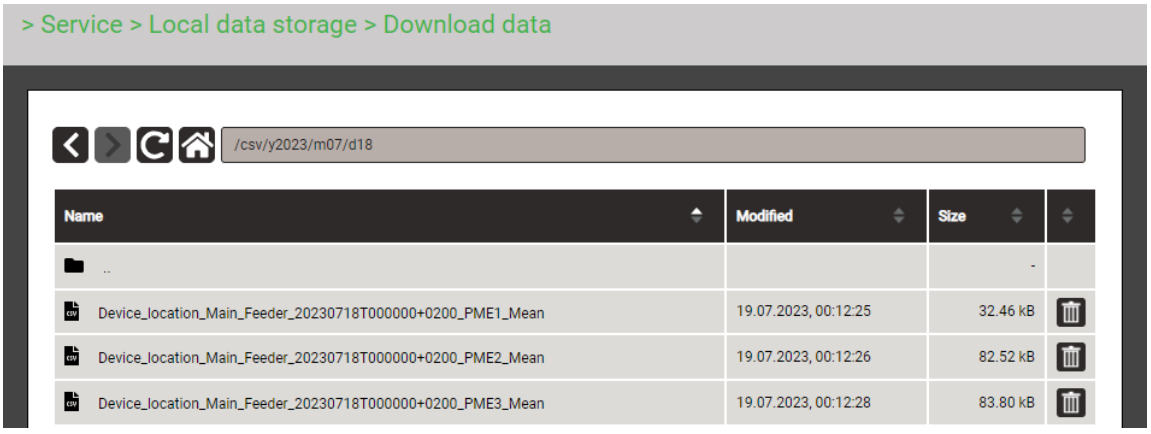
You can access files stored in the device using the service menu **Local data storage | Download data**. Depending on the tasks defined in the data export scheduler the available file structure may be different:

- **csv**: container for all CSV files to be stored locally
- **pqdif**: container for all PQDIF files (for LINAX PQ only) to be stored locally

The existing structure is displayed in a new tab.




The files of the PME measurement systems are stored in a hierarchical time structure (year, month, day) in the **csv** folder. By navigating to the date and selecting a file, it can be easily downloaded.




### 6.5.4 Periodical sending to a SFTP Server

If in the data export scheduler the sending to an SFTP server has been selected as action, the appropriate files will be sent periodically to the SFTP server defined in the settings of the communication. This is described in the device handbook of the base unit.

# 7. Service, maintenance and disposal

## 7.1 Batteries

The PME radio modules may contain batteries. These may be exchanged by the user, see chapter 5.1.1.

## 7.2 Disposal

The product and the radio modules must be disposed in compliance with local regulations. This particularly applies to the built-in batteries.

# 8. Technical data

## Current module CTR75-1000A

| | |
|---|---|
| Number of channels | 3 or 4 |
| Max. number of modules | 25...33 (≤100 currents per PME central unit) |
| Frequency range | 10 Hz up to 100 kHz |
| Max. rated current $I_N$ | 1000 A [1)] |
| Max. measurable current | 1,2 x $I_N$ |
| Starting current | 2 A (fundamental component) |

*[1)] The measurement range will be automatically set based on the rated value selected for the associated measurement system*

| | |
|---|---|
| Sampling rate | 6 kHz |
| Polling interval | configurable 1…20 s, default 1 s |
| Transmission power | configurable -12…8dBm, default 0 dBm |
| Range | 10 m at transmission power 0 dBm |

### Power supply

| | |
|---|---|
| Sources | 4 x batteries 1,5 V AA / FR6 /L91 or USB-C (5 V DC) |
| Batteries | Energizer Ultimate Lithium AA (not in scope of supply) |
| Battery life time | appr. 10 years, at transmission power 0 dBm |

### Measurement uncertainty

*Reference conditions: Ambient 23°C±1K, sinusoidal input signals, Rogowski current measurement with centered conductors and no external field*

Note: If the conductor is not centered, the additional error can be up to ±2.5% of the measured value

| | |
|---|---|
| Current | ±0,5 % (IEC 60688) |
| Active / reactive energy | Class 3.0 typical (IEC 62053) |

### Radio communication

| | |
|---|---|
| Frequency | 2,4 GHz |
| Security | Advanced Encryption Standard AES-128 |
| Number of PME systems | Up to 5 at the same location |

### Mechanical properties

| | |
|---|---|
| Conductor diameter | ≤75 mm |
| Sensor cable | Ø 6 mm |
| Connection cable length | 0.5 m |

### Ambient conditions, general information

| | |
|---|---|
| Operating temperature | –10 up to 15 up to 30 up to +55 °C |
| Storage temperature | –25 up to +70 °C |
| Temperature influence | 0.5 x measurement uncertainty (typical) per 10 K |
| Long term drift | 0.5 x measurement uncertainty per year |
| Relative humidity | < 95% no condensation |
| Altitude | ≤ 2000 m max. |

Device to be used indoor only!!

### Safety

The current inputs are galvanically isolated from each other.

| | |
|---|---|
| Protection | IP42 (junction box), if mounted as shown<br>IP67 (Rogowski coils) |
| Pollution degree | 2 |
| Measurement category | 1000 V CAT III, 600 V CAT IV |

# Annex

# A Description of measured quantities of the PME measurement systems

## Used abbreviations

2LN 3-wire load in a split phase system (system with 2 phases and center tap), with neutral current measurement
3L 3-phase load, unbalanced load
4L 4-wire load, unbalanced load, without neutral current measurement
4LN 4-wire load, unbalanced load, with neutral current measurement

## A1 Basic measurements

The acquisition of the currents by means of the radio modules is synchronized to the voltages of the base unit. This synchronous acquisition allows to calculate derived quantities such as power, load factor or meters.

| Measurement | 2LN | 3L | 4L | 4LN |
|---|---|---|---|---|
| Current I1 | √ | √ | √ | √ |
| Current I2 | √ | √ | √ | √ |
| Current I3 | √ | √ | √ | √ |
| Neutral current $I_N$ | √ | | √[1)] | √ |
| Active power P | √ | √ | √ | √ |
| Active power P1 | √ | | √ | √ |
| Active power P2 | √ | | √ | √ |
| Active power P3 | | | √ | √ |
| Total reactive power Q | √ | √ | √ | √ |
| Total reactive power Q1 | √ | | √ | √ |
| Total reactive power Q2 | √ | | √ | √ |
| Total reactive power Q3 | | | √ | √ |
| Fundamental reactive power Q(H1) | √ | √ | √ | √ |
| Fundamental reactive power Q1(H1) | √ | | √ | √ |
| Fundamental reactive power Q2(H1) | √ | | √ | √ |
| Fundamental reactive power Q3(H1) | | | √ | √ |
| Apparent power S | √ | √ | √ | √ |
| Apparent power S1 | √ | | √ | √ |
| Apparent power S2 | √ | | √ | √ |
| Apparent power S3 | | | √ | √ |
| Power factor PF | √ | √ | √ | √ |
| Power factor PF1 | √ | | √ | √ |
| Power factor PF2 | √ | | √ | √ |
| Power factor PF3 | | | √ | √ |
| cosφ (H1) | √ | √ | √ | √ |
| cosφ (H1) L1 | √ | | √ | √ |
| cosφ (H1) L2 | √ | | √ | √ |
| cosφ (H1) L3 | | | √ | √ |
| Angle φ between U1 and I1 | √ | √ | √ | √ |
| Angle φ between U2 and I2 | √ | √ | √ | √ |
| Angle φ between U3 and I3 | | √ | √ | √ |

[1)] *Calculated, that the sum of all currents is zero*

## A2 Harmonic analysis

| Measurement | 2LN | 3L | 4L | 4LN |
|---|---|---|---|---|
| THD Current I1 | √ | √ | √ | √ |
| THD Current I2 | √ | √ | √ | √ |
| THD Current I3 | | √ | √ | √ |
| THD Current IN | √ | | | √ |
| TDD Current I1 | √ | √ | √ | √ |
| TDD Current I2 | √ | √ | √ | √ |
| TDD Current I3 | | √ | √ | √ |
| TDD Current IN | √ | | | √ |

**TDD (Total Demand Distortion)**

The complete harmonic content of the currents is calculated as THD (Total Harmonic Distortion) and TDD (Total Demand Distortion). Whilst THD is scaled to the actual fundamental current, TDD is related to the nominal current and can estimate the influence of the current harmonics on the overall system better.

## A3 Mean-values with fluctuation range

The interval time can be selected in the range from 1 minute to two hours. The internal clock is used to synchronize the averaging intervals.

The maximum and minimum RMS values are also determined for the interval

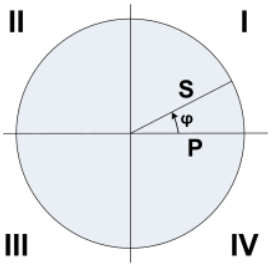
| Measurement | AVG | min | max | 2LN | 3L | 4L | 4LN |
|---|---|---|---|---|---|---|---|
| Current I1 | • | • | • | √ | √ | √ | √ |
| Current I2 | • | • | • | √ | √ | √ | √ |
| Current I3 | • | • | • | √ | √ | √ | √ |
| Neutral current $I_N$ | • | • | • | √ | | √[1)] | √ |
| THD Current I1 | • | • | • | √ | √ | √ | √ |
| THD Current I2 | • | • | • | √ | √ | √ | √ |
| THD Current I3 | • | • | • | | √ | √ | √ |
| THD Current IN | • | • | • | √ | | | √ |
| TDD Current I1 | • | • | • | √ | √ | √ | √ |
| TDD Current I2 | • | • | • | √ | √ | √ | √ |
| TDD Current I3 | • | • | • | | √ | √ | √ |
| TDD Current IN | • | • | • | √ | | | √ |
| Active power P | • | • | • | √ | √ | √ | √ |
| Active power P1 | • | • | • | √ | | √ | √ |
| Active power P2 | • | • | • | √ | | √ | √ |
| Active power P3 | • | • | • | | | √ | √ |
| Total reactive power Q | • | • | • | √ | √ | √ | √ |
| Total reactive power Q1 | • | • | • | √ | | √ | √ |
| Total reactive power Q2 | • | • | • | √ | | √ | √ |
| Total reactive power Q3 | • | • | • | | | √ | √ |
| Fundamental reactive power Q(H1) | • | • | • | √ | √ | √ | √ |
| Fundamental reactive power Q1(H1) | • | • | • | √ | | √ | √ |
| Fundamental reactive power Q2(H1) | • | • | • | √ | | √ | √ |
| Fundamental reactive power Q3(H1) | • | • | • | | | √ | √ |
| Apparent power S | • | • | • | √ | √ | √ | √ |
| Apparent power S1 | • | • | • | √ | | √ | √ |
| Apparent power S2 | • | • | • | √ | | √ | √ |
| Apparent power S3 | • | • | • | | | √ | √ |
| Power factor PF | • | • | • | √ | √ | √ | √ |
| Power factor PF1 | • | • | • | √ | | √ | √ |
| Power factor PF2 | • | • | • | √ | | √ | √ |
| Power factor PF3 | • | • | • | | | √ | √ |
| cosφ (H1) | • | • | • | √ | √ | √ | √ |
| cosφ (H1) L1 | • | • | • | √ | | √ | √ |
| cosφ (H1) L2 | • | • | • | √ | | √ | √ |
| cosφ (H1) L3 | • | • | • | | | √ | √ |

[1)] *Based on a calculated neutral current*

## A4 Meters

The subsequent energy meter contents are provided for each PME measurement system.

| Measured quantity |
|---|
| Active energy I+IV |
| Active energy II+III |
| Reactive energy I+II |
| Reactive energy III+IV |




**Programmable meter resolution**

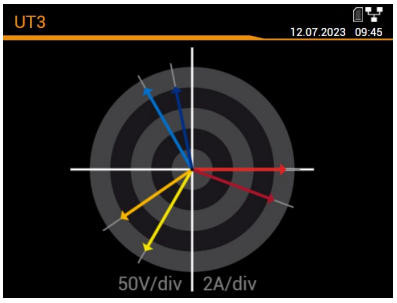
For all meters the resolution (displayed unit) can be selected almost freely. This way, applications with short measurement times, e.g. energy consumption of a working day or shift, can be realized. The smaller the basic unit is selected, the faster the meter overflow is reached.

*Meter scaling can be set for each PME measurement system individually.*

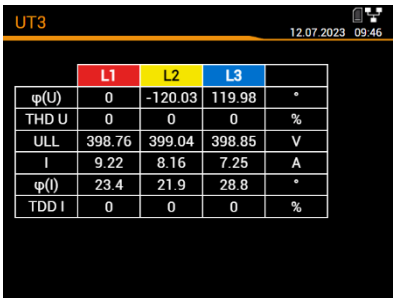
# B Display matrix PME measurement systems

Instantaneous values

**(CTR1)** ▶ **(CTR 2)** ▶ **(CTR 3) . . . .** ▶ **(CTR 25...33)**

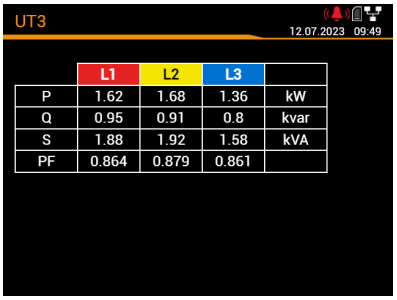



PHASOR_PME



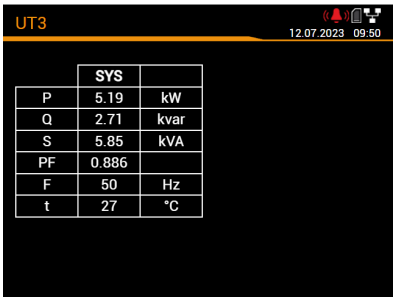

| | L1 | L2 | L3 | |
|---|---|---|---|---|
| φ(U) | 0 | -120.03 | 119.98 | ° |
| THD U | 0 | 0 | 0 | % |
| ULL | 398.76 | 399.04 | 398.85 | V |
| I | 9.22 | 8.16 | 7.25 | A |
| φ(I) | 23.4 | 21.9 | 28.8 | ° |
| TDD I | 0 | 0 | 0 | % |

INST_UI



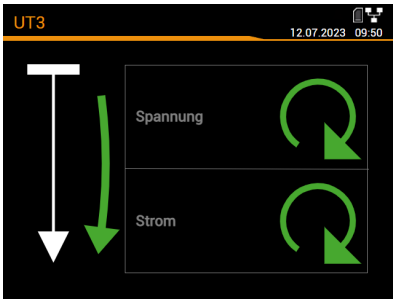

| | L1 | L2 | L3 | |
|---|---|---|---|---|
| P | 1.62 | 1.68 | 1.36 | kW |
| Q | 0.95 | 0.91 | 0.8 | kvar |
| S | 1.88 | 1.92 | 1.58 | kVA |
| PF | 0.864 | 0.879 | 0.861 | |

INST_PQS




| | SYS | |
|---|---|---|
| P | 5.19 | kW |
| Q | 2.71 | kvar |
| S | 5.85 | kVA |
| PF | 0.886 | |
| F | 50 | Hz |
| t | 27 | °C |

INST_SYS

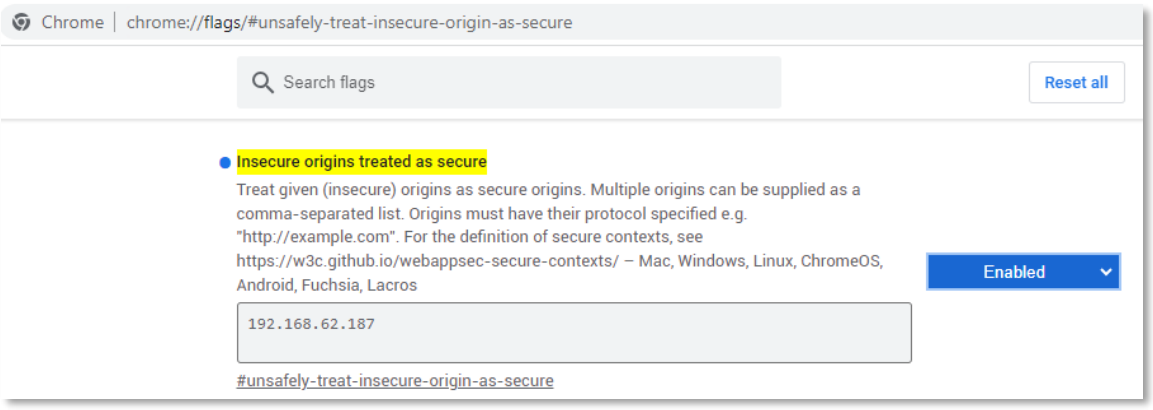



PHASE_SEQ

# C Using a camera

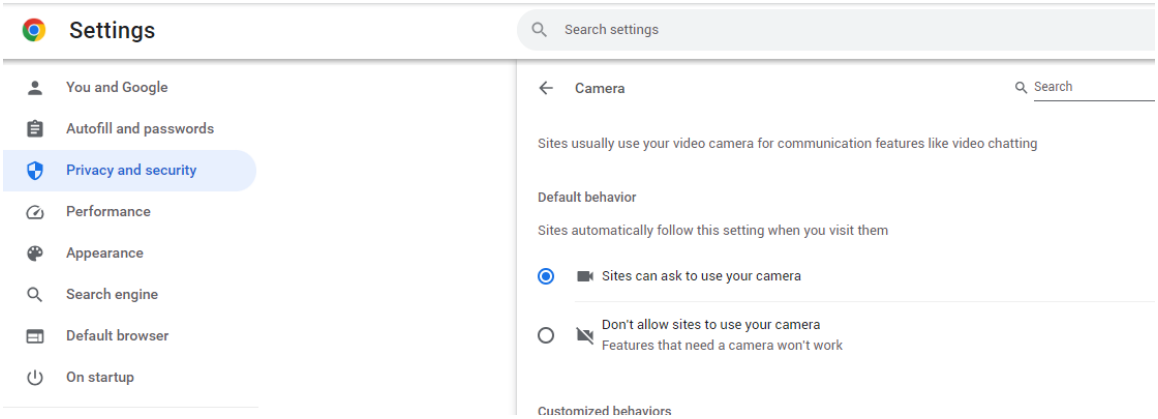
In order to be able to use the camera to scan the QR code on a website, the following points must be observed:

- The website must use secure HTTPS communication. Note: Enabling web security using HTTPS is described in the device manual for the basic device.
  **OR**
- Alternatively, the (insecure) website of the device can be defined as a secure source

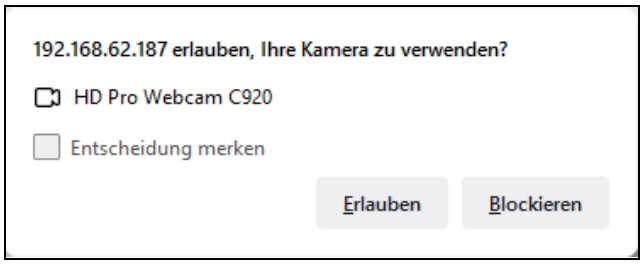



*Flag settings in Chrome browser*

- The use of the camera by websites must be activated in the browser settings in the privacy and security section

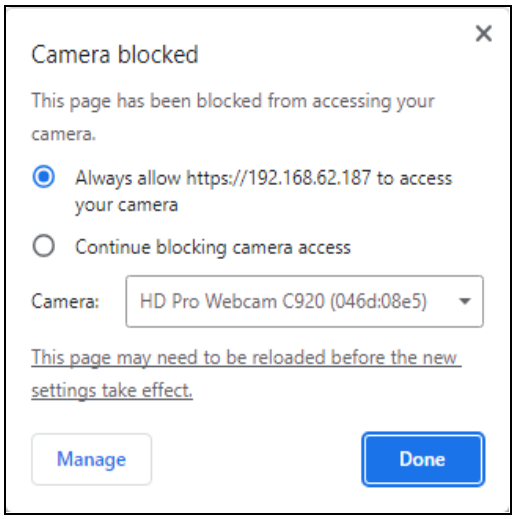


- Depending on the browser, a permission may be required before activating the camera.




*Browser: Firefox*

- Permission to use the camera via a website can be revoked at any time. If several cameras are connected, the camera to be used can be selected




*Browser: Chrome*

# D Typical range

**Use case 1**

- Industrial Environment
- Central unit and sensors in the same room
- Radio channel configuration: Adaptive frequency hopping

| Transmission power | Distance | Link quality achieved |
|---|---|---|
| 0 dBm | 5m | > 87% |
| | 10m | > 61% |
| | 15m | > 50% |
| | 20m | > 40% |
| | 25m | > 33% |
| +4 dBm | 5m | > 93% |
| | 10m | > 85% |
| | 15m | > 74% |
| | 20m | > 70% |
| | 25m | > 65% |
| +8 dBm | 5m | > 95% |
| | 10m | > 89% |
| | 15m | > 80% |
| | 20m | > 75% |
| | 25m | > 70% |

**Use case 2**

- Industrial Environment
- Central unit in steel cabinet, 2mm grounded; sensors outside
- Radio channel configuration: Adaptive frequency hopping

| Transmission power | Distance | Link quality achieved |
|---|---|---|
| 0 dBm | 5m | > 80% |
| | 10m | > 28% |
| | 15m | 0…8% |
| | 20m | 0…3% |
| +4 dBm | 5m | > 92% |
| | 10m | > 55% |
| | 15m | > 60% |
| | 20m | 0…24% |
| +8 dBm | 5m | > 95% |
| | 10m | > 86% |
| | 15m | > 66% |
| | 20m | 0…28% |

# E Radio compliance

**FCC / IC statement**

Contains
FCC ID:SH6MDBT50Q
IC: 8017A-MDBT50Q

This device complies with part 15 of the **FCC** rules and **Industry Canada** license-exempt RSS Standard(s). Operation is subject to the following two conditions.

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

*Le présent appareil est conforme à la partie 15 des règles de la **FCC** et aux CNR d'**Industrie Canada** applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :*

*(1) l'appareil ne doit pas produire de brouillage*

*(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si lebrouillage est susceptible d'en compromettre le fonctionnement."*

**Further approvals**

| | |
|---|---|
| R 018-180280 | TELEC Certificate (Japan) |
| CCAM18LP0820T7 | NCC Certificate (Taiwan) |
| CMIIT ID: 2018DJ5128 | SRRC Certificate (China) |
| R-C-ryt-MDBT50Q | KC Certificate (South Korea) |
| E2/2018/50088-02 | CE (EU) & RCM (Australia & New Zealand) |

Camille Bauer Metrawatt AG is not responsible for any radio television interference caused by unauthorized modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Camille Bauer Metrawatt AG. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user

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