SIMEAS Q
Par V2.30

Configuration software

Manual

Edition: 11.01.2006

E50417-H1076-C265-A2

SIEMENS

Notes on Safety

This manual does not constitute a complete catalogue of all safety measures required for operating the respective equipment (module, device), since special operating conditions may require additional measures. However, it does contain notes which must be adhered to for your own personal safety and for avoiding property damage. These notes are highlighted with a warning triangle and different keywords indicating different degrees of danger:

Warning

means that death, severe injury or substantial property damage may occur if the appropriate safety measures are not taken.

Caution

means that minor injury or property damage may occur if the appropriate safety measures are not taken.

Qualified Personnel

Commissioning and operation of the equipment (module, device) described in this manual must be performed by qualified personnel only. In the sense of the safety notes contained in this manual, qualified personnel are those persons who are authorized to commission, release, ground and tag devices, systems and electrical circuits in accordance with safety standards.

Use as Prescribed

The equipment (device, module) must not be used for any other purposes than those described in the Catalog and the technical description. If it is used together with third-party devices and components, these must be recommended or approved by Siemens.

Correct and safe operation of the product requires adequate transportation, storage, installation and mounting as well as appropriate use and maintenance.

During operation of electrical equipment, it is unavoidable that certain parts of this equipment are carrying dangerous current. Severe injury or property damage may occur if the appropriate measures are omitted:

- Before making any connections at all, ground the equipment at the PE terminal.
- Hazardous voltages may be present on all switching components connected to the power supply.
- Even after the supply voltage has been disconnected, hazardous voltages may still be present in the equipment (capacitor storage).
- Equipment with current transformer circuits may not be operated while open.

The limit values indicated in the manual or the operating instructions must not be exceeded; this also applies to testing and commissioning.

Disclaimer of liability
Although we have carefully checked the contents of this publication for conformity with the hardware and software described, we cannot guarantee complete conformity since erorrs cannot be excluded. The information provided in this manual is checked at regular intervals and any corrections which might become necessary are included in the next releases. Any suggestions for improvement are welcome.

The contents of this manual is subject to change without prior notice.
Document version: 2.30.01

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Foreword

This manual describes the functions of the **SIMEAS Q** device and the **SIMEAS Q Par V2.30** software. The manual is intended for users of SIMEAS Q.

Scope of validity of the manual

This manual is valid for **SIMEAS Q Par V2.30** and higher.

This version is suitable for SIMEAS Q devices of the generation 2 working with firmware version 2.30.

Standards

SIMEAS Q was developed in compliance with the ISO 9001 standards.

Further support

For general information and questions regarding licences please contact your local Siemens sales partner.

Hotline

Questions regarding **SIMEAS Q Par V2.30** and **SIMEAS Q** will be answered by our Hotline in Nuremberg:

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Downloadarea

Information concerning Power Quality products as well as firmware and software downloads are available at our Internet download area:

www.powerquality.de or

www.simeas.com

Contents

Product Overview 1

General information

SIMEAS Q Par V2.30 is a software for the configuration of SIMEAS Q according to your requirements. Depending on the used communication protocol (RS232, RS485 and PROFIBUS DP) the software enables the configuration and preparation of the SIMEAS Q for operation.

Functionality

The software SIMEAS Q Parameterization enables the following functions:

- Definition of the device address
- Definition of the communication parameter, e.g. transfer rate setting
- Calibration of the device
- Update the device address
- Parameterizing of measurement setting of SIMEAS Q

Setting up the Software

2

Overview

See the following for information on the setup of the **SIMEAS Q Par V2.30** software.

Contents

2.1 Software requirements

SIMEAS Q Par V2.30 is a 32-bit-application which is executable under the following operating systems:

- Windows XP Professional incl. Service Pack 2

2.2 Hardware requirements

The **SIMEAS Q Par V2.30** software can be installed on all IBM-compatible computers that fulfil the following minimum requirements:

- The computer must comply with the hardware requirements of the operating sytem used.
- Free serial interface

Note:

For the transmission of the parameter a special communication cable is necessary. Please use the cable which is in the scope of supply of configuration package.

2.3 Installation

You can install the **SIMEAS Q Par V2.30** software using a setup program. The software is neither protected by a dongle nor do you have to enter a registration number.

Note:

You require administrator rights for installing the software.

Installation of the software

Proceed as follows:

❑ Insert the installation CD into your CD-ROM drive. The installation process is started.

Note:

If the installation process is not started automatically, proceed as follows:

- Click **Start** → **Run**.
- Enter **X:\SETUP.EXE**, with **X** designating the letter of your CD-ROM drive.
- Click **OK**.

❑ Follow the installation instructions.

3 Getting Started

Overview

This chapter **Getting Started** describes how to install the parameterization software including starting up the device. Changes to the default parameters are only described if they are necessary to adapt the device to the existing system environment. A detailed description of the various functions and parameters is given in Chapter 4 of this manual.

The sequence of operations described is not mandatory, but is intended to help you become familiar with parameterization of the SIMEAS Q.

Contents

3.1 Starting SIMEAS Q Par V2.30

3.1.1 Calling up and terminating the program

Call-up

After you have successfully installed **SIMEAS Q Par**, you can run the program as follows:

- ❑ Double-click on the program icon on the Windows desktop. The main window of the program is opened.

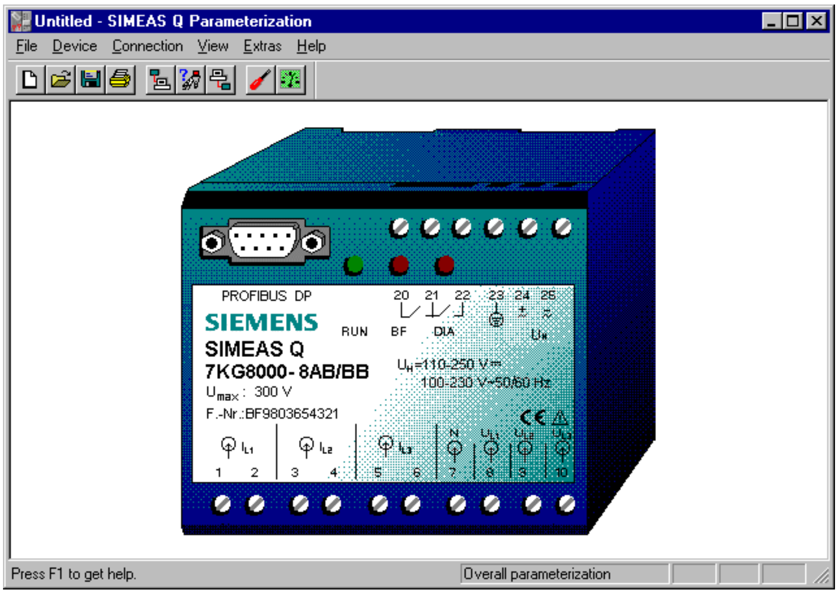

Image3_01.giff

Fig. 3-1 Main window of **SIMEAS Q Par**

After you have started the program, the default data set is loaded in accordance with standard EN 50160. This data set is displayed as **Untitled** in the titlebar and is taken as a basis for creating parameter data sets.

Exiting

This is how to exit the program.

- ❑ Select menu item **File** → **Exit**. The program is terminated and you return to the Windows desktop.

Note:

If you have made changes to the data set currently loaded, a reminder is displayed which you must confirm.

3.1.2 User interface

The user interface of the **SIMEAS Q Par** software complies with Windows conventions. It is subdivided into the following parts:

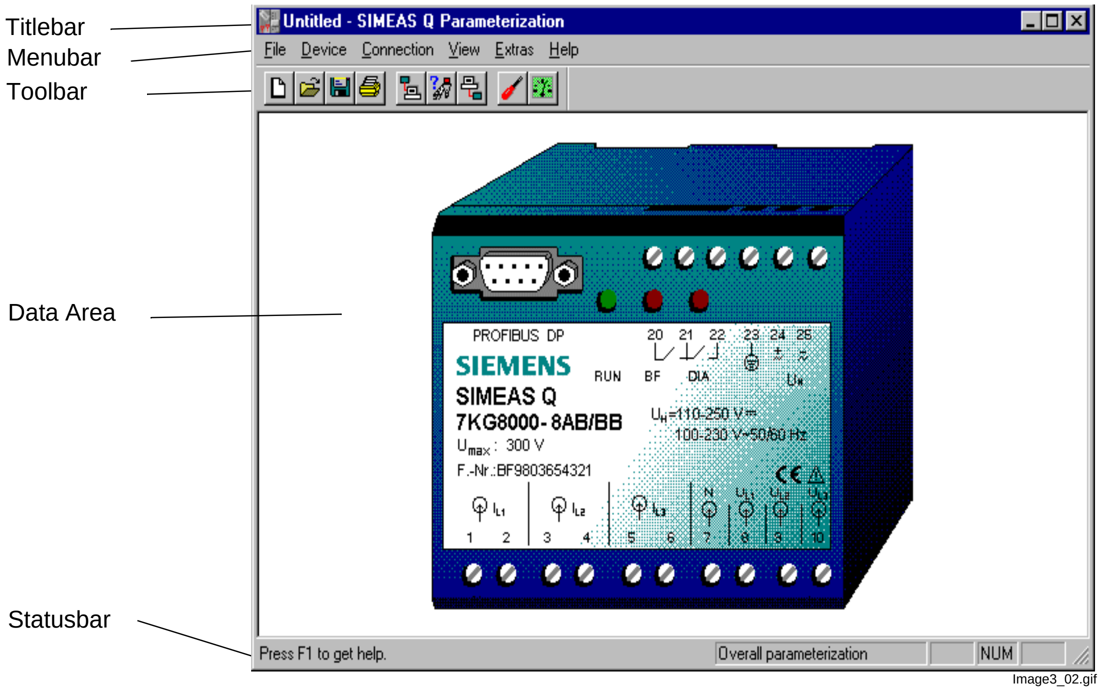

Fig. 3-2 User interface of the **SIMEAS Q Par**

Titlebar

In the titlebar, the parameterization file currently loaded and the name of the software are always displayed. After you have started the program, they will be:

Untitled - SIMEAS Q Par V2.30

Menubar

The user interface is subdivided into six main menus which each contain menu items for related functions.

Toolbar

The toolbar contains icons for frequently required functions. Each icon is associated with a function which is called up when you click on the icon.

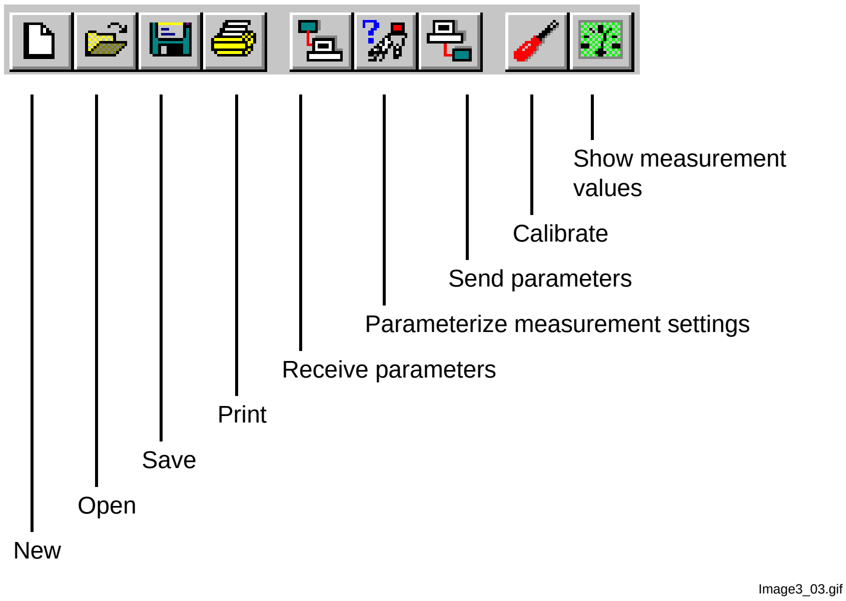

Fig. 3-3 Icons of the functions on the toolbar

Data area

In the data area, the dialog boxes of the program are displayed.

Statusbar

The statusbar shows short explanations of each function.

3.1.3 Main menus

This section gives brief explanations of the function groups in each main menu to provide you with an overview of the user interface. A reference to the relevant section is given for functions that require a detailed description.

File menu

This contains functions for managing files. The names and functions of the menu items comply with Windows conventions.

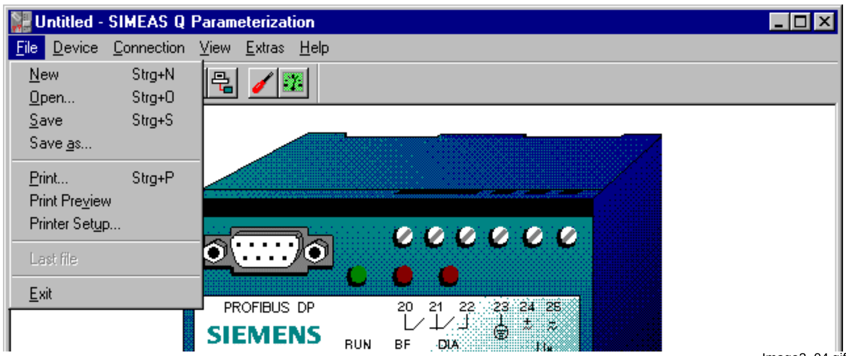

Image3_04.gif

Fig. 3-4 Functions of the File menu

Device menu

Contains functions referring to parameterization of the SIMEAS Q.

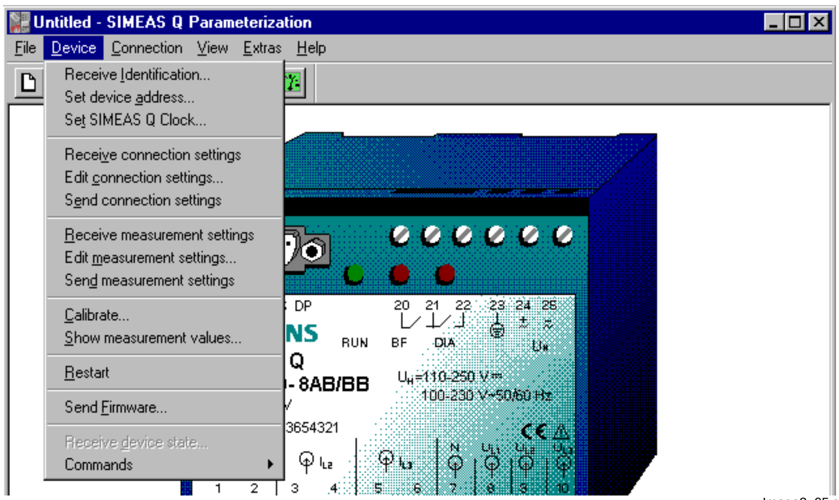

Image3_05.gif

Fig. 3-5 Functions of the Device menu

Connection menu

Includes functions resp. menus for configuration of the device connection.

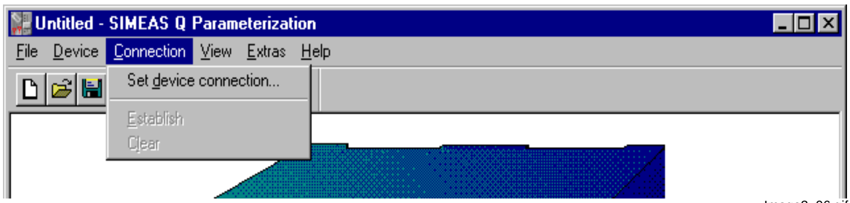

Image3_06.gif

Fig. 3-6 Functions of the Connection menu

View menu

Contains functions that change the appearance of the software on the screen. You can have the icon and/or the statusbar displayed or hidden.

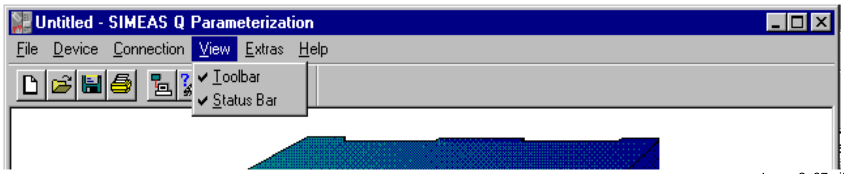

Image3_07.gif

Fig. 3-7 Functions of the View menu

Extras menu

Includes language settings as well as functions that concern the system settings.

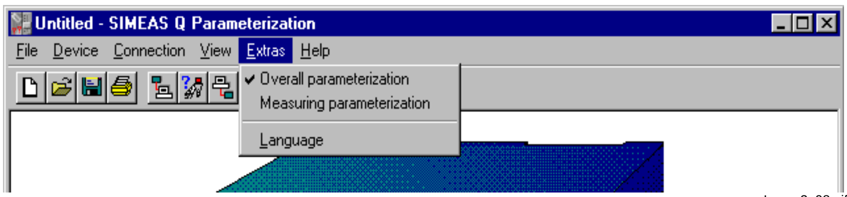

Image3_08.gif

Fig. 3-8 Functions of the Extras menu

Help menu

Contains help topics and information about the software version.

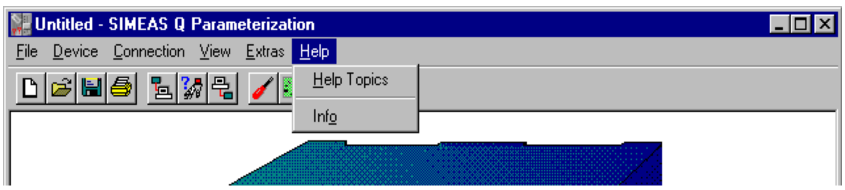

Image3_09.gif

Fig. 3-9 Functions of the Help menu

3.1.4 Selecting the language of the user interface

At present, it is possible to switch the user interface of the program between four languages, German, English, French, and Spanish. The new user interface language is always automatically stored permanently until you change the language again, i.e. the other storage functions of the program do not have any effect on it.

Note:

The default setting for the user interface language is German.

This is how you change the user interface language:

- Select the menu item **Extras** → **Language**. The Language dialogue box is opened.
- Open the dropdown list and click on English. The selected language is placed in the dropdown list box.

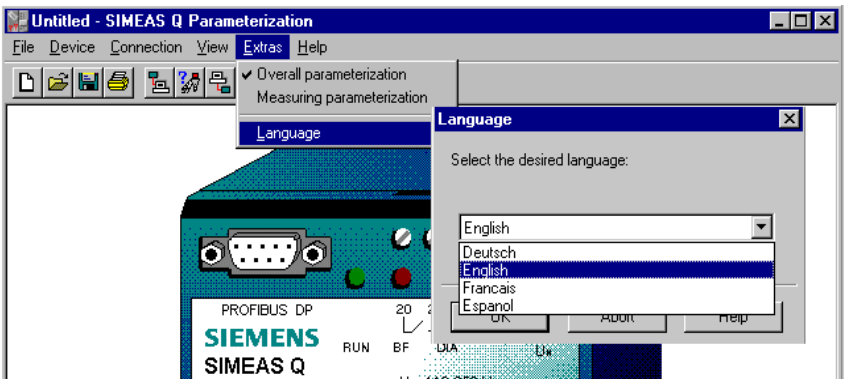

Image3_10.gif

Fig. 3-10 Setting the language

- Confirm with **OK**. An information box indicates that the newly selected language will only be activated the **next** time you run the program.
- Confirm with **OK** and exit the program.

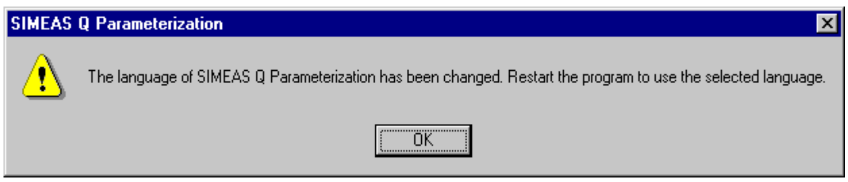

Image3_11.gif

Fig. 3-11 Message box

3.1.5 Operating with File menu

Creating a new parameter file

After launching the software **SIMEAS Q Par** a standard parameter set will uploaded. The name of this standard set is **Untitled** and will represented in the titlebar.

- To create a new parameter file, select menu **File** → **New** or **click on** the **New** icon in the toolbar.

Image3_12.gif

Fig. 3-12 Creating a new parameter file

Opening a already saved parameter file

- To open a already saved parameter file, select the menu **File** → **Open...** or click on the symbol **Open** in the toolbar of the software.

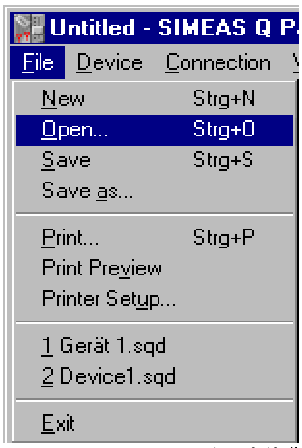

Image3_13.gif

Fig. 3-13 Opening a parameter file

- Afterwards the dialogue box **Open** opens, **Select** the parameter file to be opened and confirm your choice with **Open.**

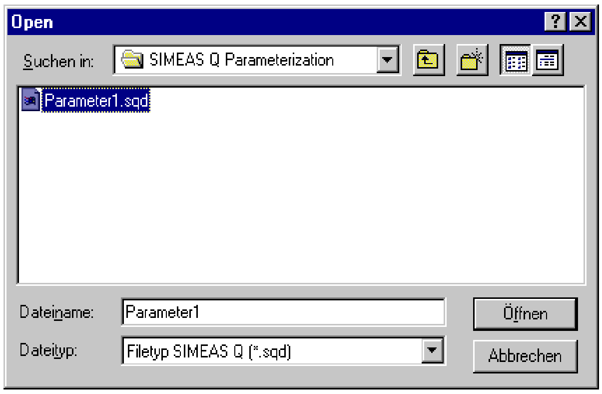

Image3_14.gif

Fig. 3-14 Selecting and opening a parameter file

Note:

The Parameter files are saved as files with the extension **.*sqd**. With the SIMEAS Q Parameterization software only files of this format can be read.

Saving the parameter file

- To save a parameter file and to reuse it, e.g., for other SIMEAS Q devices you select the menu item **File** → **Save** or click on the **Save** icon in the toolbar.

Image3_15.gif

Fig. 3-15 Saving the parameter file

- To save a parameter file under a new name select the menu **File** → **Save as.**

Fig. 3-16 Save As menu

Select the file name and the directory in which you want to save the parameter file.

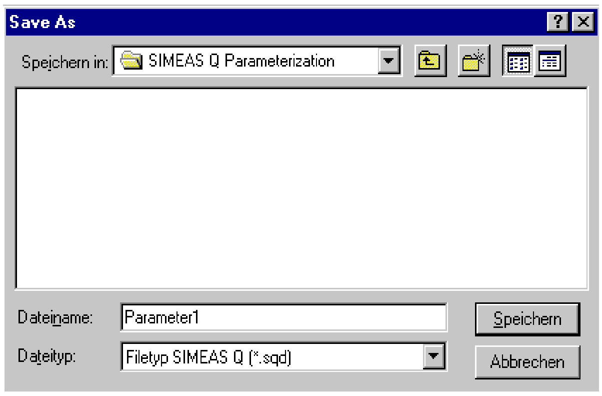

Fig. 3-17 Dialog box Save As

Printer Setup

- Under the menu **File** → **Printer Setup** you can select an installed printer with which you can print out the device settings.

Print Preview

- With the menu **File** → **Print Preview** you can open the print preview including the device settings.

Print

- With the menu item **File** → **Print** you can print out the current loaded device settings with a connected printer.

3.2 Connecting the SIMEAS Q and PC

To establish a connection to a SIMEAS Q, for transmission of the measurement settings the SIMEAS Q has to be connected to a PC. For that, you require the specific connecting cable included in the scope of supply of the parameterization package. It consists of:

- 2 cables
- Gender changer
- RS232 - 485 converter
- 5V power supply unit

Assembling the connecting cable

The connecting cable is assembled as shown in the drawing in Fig. 3-18.

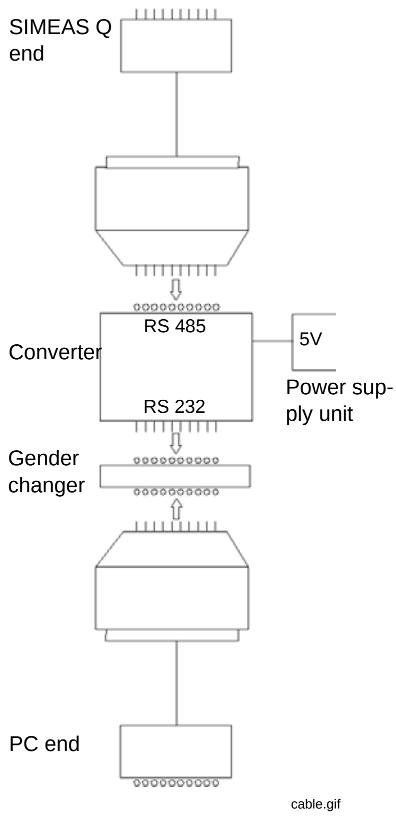

Fig. 3-18 Structure of the connecting cable

Connecting the connecting cable

Caution:

Do not connect the wrong 9-way SubD connectors! The RS485 end must be connected to the SIMEAS Q and the RS232 end with the PC!

- ❑ Check the connection. If you have connected the connecting cable the wrong way round, no parameterization data will be transmitted.
- ❑ Connect the 5 V power supply unit to a 220 V power source.

3.3 Setting up the parameterization interface on the PC

In this section, you will set the serial interface via which you will load the parameter data set into the SIMEAS Q. Proceed as follows:

- Select menu **Connection** → **Set device connection**. The **Set device connection** dialog box will open.
- Select from the dropdown list the entry **Direct connection from the overall parameterization**.
- Afterwards select the interface on which you have connected the device.
- Choose the option: **RS485-Converter reflecting data**, if you use a reflecting converter.

Note:

If you use the standard converter included in the parameterization packet, this function must be active.

- Confirm your settings with **OK**.

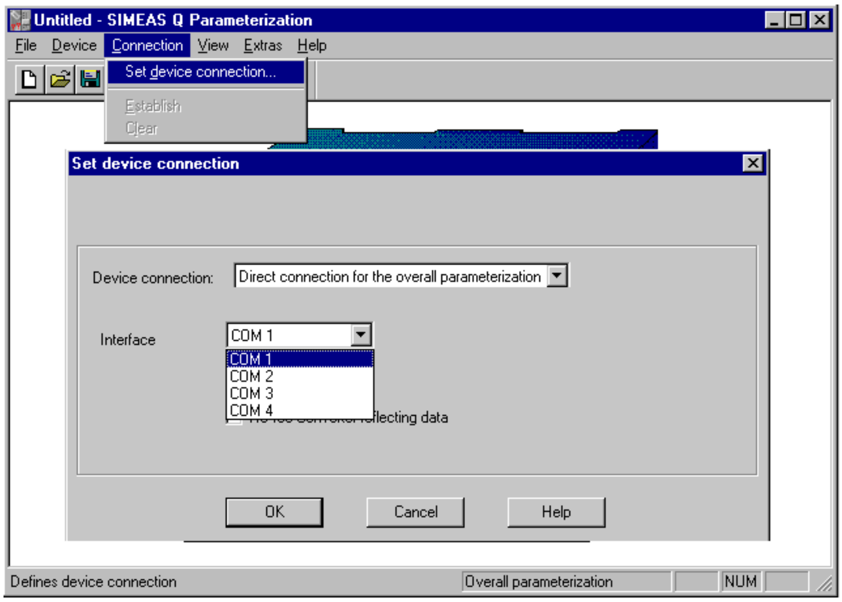

Image3_19.gif

Fig. 3-19 Setting up the parameterization interface

3.4 Selecting the parameterization mode

After Power On, SIMEAS Q remains in parameterization mode for 2 minutes. After that, it automatically switches to recording mode and remains in recording mode.

The following applies:

- If **a** parameterization telegram is received within the first 2 minutes, the SIMEAS Q remains in parameterization mode. To switch to recording mode, you have to switch off the SIMEAS Q and switch it on again. After 2 minutes, it will then switch to recording mode.
- If **no** parameterization telegram is received within the 2 minutes, SIMEAS Q switches to recording mode and remains in recording mode. To switch back to parameterization mode, you must switch off the SIMEAS Q and switch it on again. It is then in parameterization mode for 2 minutes.

Procedure

To set the SIMEAS Q device into the parameterization mode select the function **Receive Identification**. This function will be described in the following.

3.5 Receive Identification

After you have connected the PC with the SIEMAS Q and also configured the communication you can try to communicate with the device for the first time.

Note:

To receive the identification the device must be connected to a power supply and turned on.

- ❑ Select menu item **Device** → **Receive Identification** within the next 2 minutes. The **Receive identification** communication box is opened.

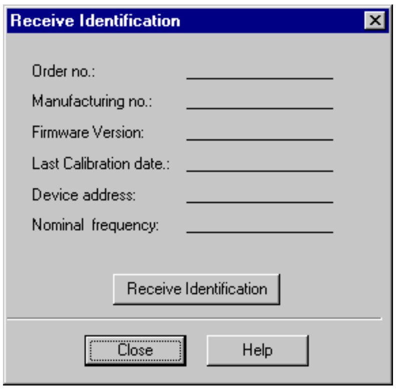

Image3_20.gif

Fig. 3-20 Receive identification communication box (1)

- ❑ Click on the **Receive identification** button. A parameterization telegram is sent.

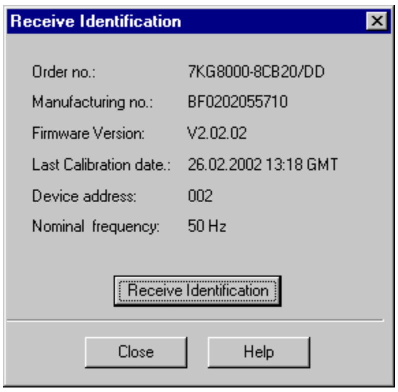

Image3_21.gif

Fig. 3-21 Receive identification communication box (2)

- ❑ Click on the **Close** button to return to the main window.

Note:

By calling up this function the device will switch in parameterization mode. It remains in this mode as long as a new start happens.

3.6 Setting the device address

To identify the SIMEAS Q in the communication network a unique device address has to be assigned.

Note:

Please mind that you do not use a device address twice in your communication network.

- Select menu item **Device** → **Set device address**. The **Set device address** dialogue box is opened.

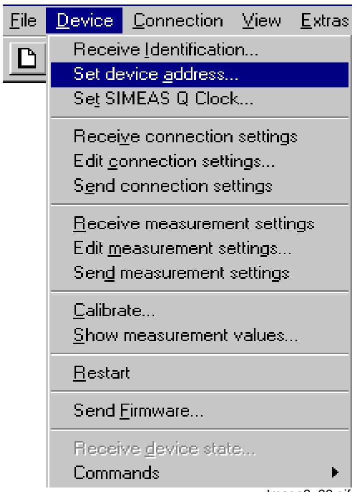

Image3_22.gif

Fig. 3-22 Set device address menu

- Enter the address which you would like to assign to the device.

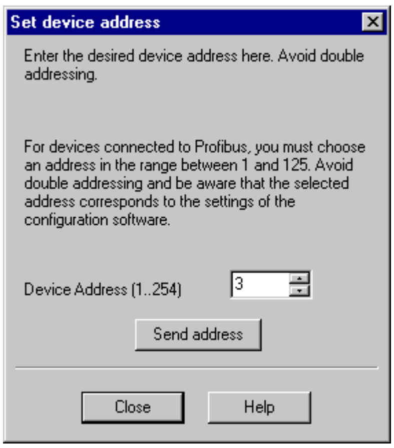

Image3_23.gif

Fig. 3-23 Set device address

Note:

If you would like to operate the SIMEAS Q in a PROFIBUS DP system please ask the PROFIBUS system administrator which address you should use for the device.

- Click on the **Send address** button.
- Close the window with **Close**. You have now transferred the PROFIBUS address to the device.

3.7 Synchronizing the SIMEAS Q

To synchronize the SIMEAS Q, set the date and time to your system time.

- Select menu item **Device** → **Set SIMEAS Q clock**. The **Set SIMEAS Q clock** dialogue box opens.
- Click on the **Send PC time** button. Your PC sends its time data to the SIMEAS Q and synchronizes its own internal clock with the PC time.
- Click on the **Close** button to return to the main window.

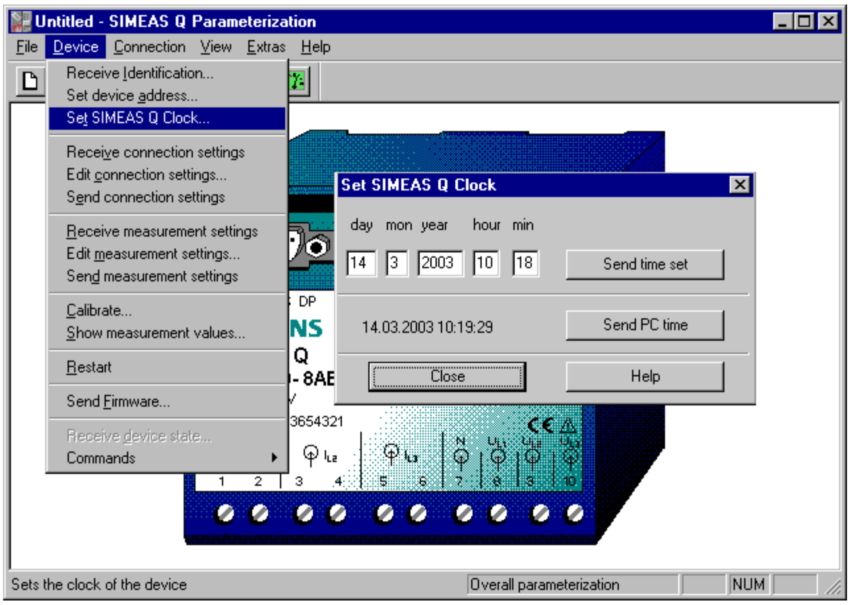

Image3_24.gif

Fig. 3-24 Set SIMEAS Q Clock communication box

3.8 Receive, edit and send connection settings

Configure connection settings

To transfer measured values from the device to your evaluation-PC the connection settings have to be configured first.

Receive connection settings

To edit the current device settings you have to transmit them from the device in the following way:

Select the menu **Device** → **Receive connection settings**

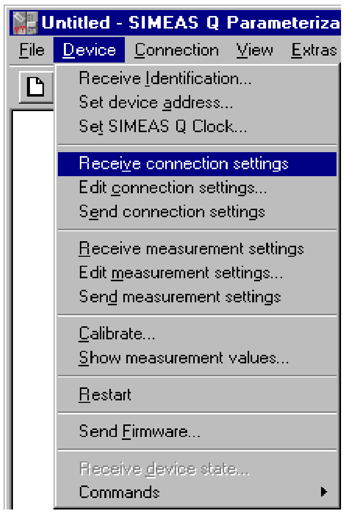

Image3_25.gif

Fig. 3-25 Receive connection settings menu

- ❑ Afterwards the connection parameters will be transmitted from the device to your PC.
- ❑ After the successful transmission of the settings the following message appears.

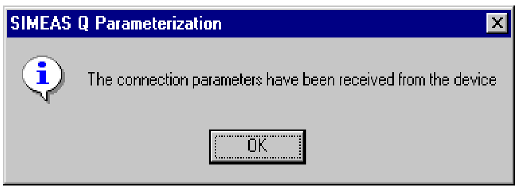

Image3_26.gif

Fig. 3-26 Connection parameters transferred

Edit connection settings

To edit the connection settings please proceed as follows:

- ❑ Select the menu **Device** → **Edit connection settings**

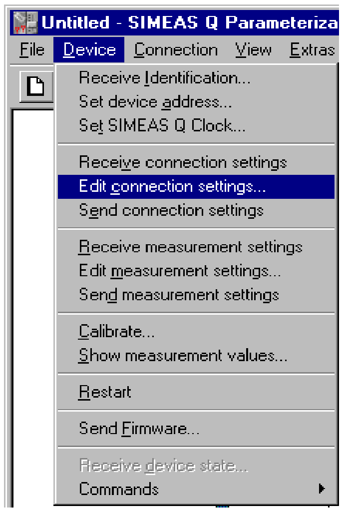

Image3_27.gif

Fig. 3-27 Edit connection settings menu

❑ Afterwards the following dialog window a opens:

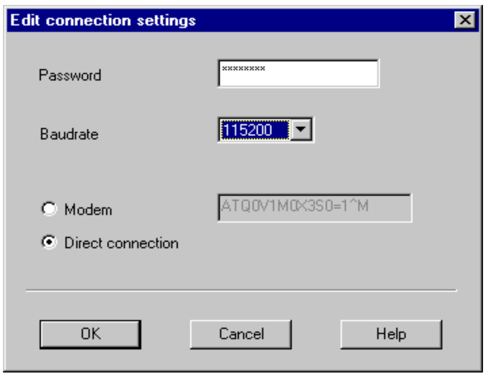

Image3_28.gif

Fig. 3-28 Edit connection settings

- **Password**
  we recommend to keep the pre-setting.
- **Baudrate**
  Select the transfer rate e.g. 115.200 Bit/sec.

Note:

If you use long distance communication cable a high transfer rate might not work. In this case select a lower transfer rate.

- **Connection type**
  Depending how you want to connect the SIMEAS Q with you evaluation-PC, you have the possibility to select 2 different types of connection. Either you use a Modem or direct connection for communication.

Modem
Select this type of connection if you want to communicate with the SIMEAS Q via a modem. We recommend to use the init string: **ATQ0V1M0X3S0=1^M**.

Note:

A communication via a modem is only possible for SIMEAS Q with RS232 (7KG8000-8B*20) or RS485 (7KG8000-8C*20) interface.

Direct connection
Select this type of connection if you want to communicate with the SIMESA Q via a direct connection.

- ❑ Confirm your selection with **OK**.

Send connection settings

To transmit the connection settings to the device proceed as follows:

- ❑ Select the menu **Device** → **Send connection settings**. Afterwards the settings will be transmitted to the device.

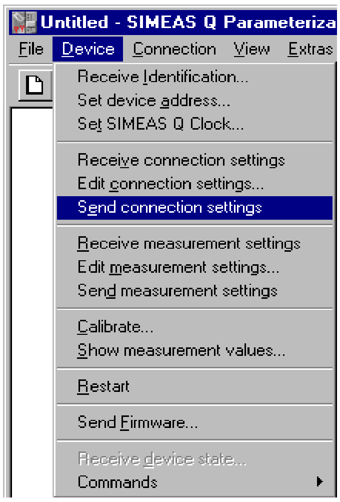

Image3_29.gif

Fig. 3-29 Send connection settings menu

- ❑ After successful transmission confirm the message with **OK**.

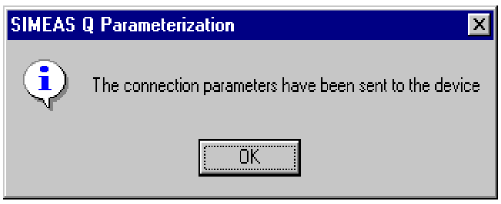

Image3_30.gif

Fig. 3-30 Connection parameters transferred

3.8.1 Function test

The function test shows whether your SIMEAS Q is functional and whether it has been calibrated properly. Proceed as follows:

- Connect the current and voltage source, preferably with the nominal values of your measuring range, to the inputs of your SIMEAS Q.
- Select menu item **Device** → **Show measurement values**. The **Show measurement values** dialog box opens and the measurement values are displayed.

Caution:

Assuming the SIMEAS Q is correctly calibrated, the current and voltage values displayed must match the input values applied. A variation of ± 0.1% from the end value of the measuring range, i.e. ± 0.28 V for voltages and ± 0.006 A for currents is permissible.

If the values applied and the values displayed do not match taking the permissible tolerance into account, you should recalibrate the device (see Chapter 5.1).

- Click on the **Close** button to terminate display of the measurement values.

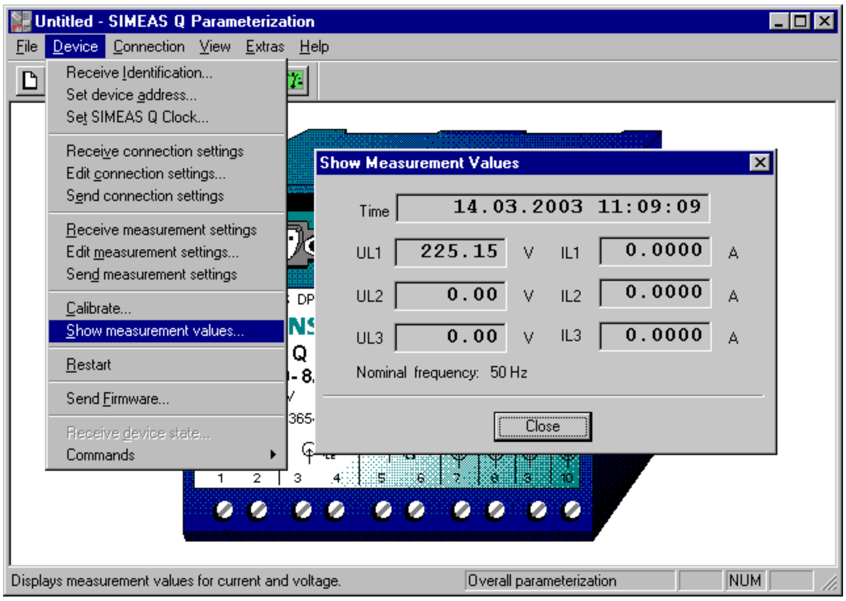

Image3_31.gif

Fig. 3-31 Show measurement value communication box

3.8.2 Restart

After you have configured all parameters, the SIMEAS Q has to be brought into operation mode. To do this 2 options are available.

1. By selecting the menu **Device** → **Restart** the device will be brought into operation mode. This function takes at least up to 2 minutes and will be indicated with a status information.

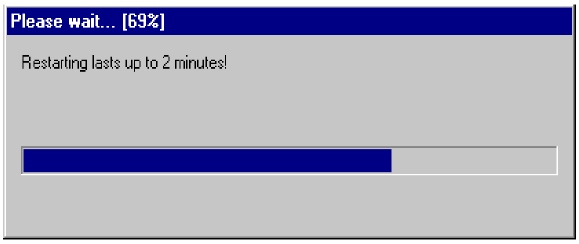

Image3_32.gif

Fig. 3-32 Communication window Show measurement value

2. The second possibility is to disconnect the device for a couple of seconds form the auxiliary power supply.

After 2 minutes the device changes into operation mode.

Note:

The device is in operation mode, only when the left green LED is on.

Parameterization 4

Overview

This chapter **Parameterization** describes how to parameterize the measurement settings from defining the network properties to transferring the completed parameter set to SIMEAS Q.

The selected sequence is useful, but not obligatory. It is possible to switch between any input windows. The measured quantities that you can select are provided by **SIMEAS Q Par** depending on the type of network set. Therefore always define the type of network first before starting to parameterize the measured quantities.

Contents

4.1 Parameterizing measurement settings (overview)

SIMEAS Q records measured quantities either continuously or depending on events, measured value violations with time stamp. With continuous measurement, the extreme values of each measured quantity can be stored within a defined period. Both recording modes are available at the same time. All measured quantities are acquired simultaneously in parallel.

The device is parameterized before use using the **SIMEAS Q Par** software. During parameterization, you select all the required measured quantities and define the recording mode for each measured quantity. You can perform up to 200 measurements at the same time with SIMEAS Q.

Continuous recording

With continuous recording, you can define measuring periods (averaging times) for the selected measurement variables. Within such a period, a mean value is determined for the measured quantity from the acquired value. The mean value and the time information about the end of the measuring period is stored in the memory.

Recording of faults

The recording of faults is mainly used to record voltage dips or overvoltages. Measured data are only recorded if the average value of a variable has violated one or more upper or lower limits (threshold values). The mean value between two limit value violations and the time it occurred are also stored.

Calculation of the measured data

During measuring and recording operation, the device calculates the RMS value over a sine half wave (half period) for each activated voltage and current channel. The required variables are calculated from the scan values according to the parameterization.

Note:

You will find the basis for calculating the individual values in Appendix A.

Possible measured quantities

With SIMEAS Q, you can store and read up to 200 different measured values. Compared with conventional network quality recorders that can be read out via PROFIBUS, this is a considerable improvement.

You can acquire, monitor, or calculate the following variables:

- RMS values of the phase-to-phase voltages
- RMS values of the phase-to-phase currents
- Line frequency
- Active, reactive, apparent power and power factor per phase and for the entire system
- Balance factor of the currents and voltages
- Flicker interference factors for short term and long term per phase
- Harmonic voltages and currents per phase up to the 40th harmonic
- Total harmonic distortion THD per phase
- Active work (input and output), reactive work (capacitive and inductive) and apparent work of the entire system.

Calling up data sheets

The measurement settings are input via data sheets. These contain all the relevant measurement quantities for the selected measurement settings. Opening these data sheets is described in Chapter 4.2.

4.2 Entering measurement settings

4.2.1 Calling up data sheets

Measurement settings are entered on data sheets. Data sheets contain all the parameters relevant to the selected measurement settings.

- Select menu item **Device** → **Edit measurement settings**. The **Parameterize measurement settings** box is opened.

It is divided into two areas:

- The navigation window (left)
- The data window (right).

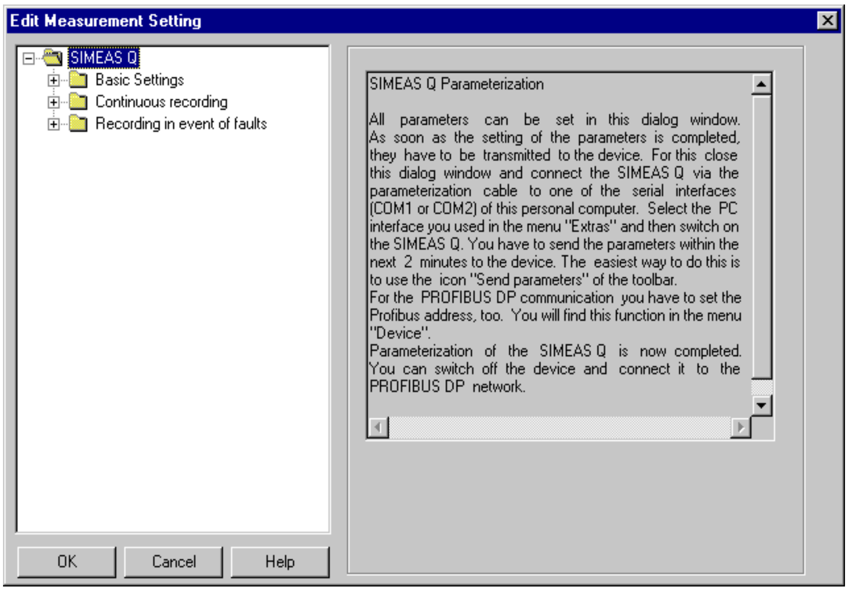

Image4_01.gif

Fig. 4-1 Navigation and data windows of the Parameterize measurement settings function

Navigation window

The navigation window contains a hierarchical structure like the Windows directory structure. This makes the menu structure of the program clearer and enables you to navigate through the various data sheets of the measurement settings quickly.

The measurement settings are divided into three groups:

- **Basic settings**
- **Continuous recording**
- **Recording in the event of faults**

Each group branches further into the level of the data sheets. These levels are first hidden. You can make them visible or invisible as follows:

- ❑ **Double-click** on the **plus sign** in front of the name of the group. The hidden level becomes visible and the plus sign turns into a minus sign.
- ❑ **Double-click** on the **minus sign** in front of the name of the group. The visible level becomes invisible and the minus sign turns into a plus sign.

Data group

At first, the data window shows an explanatory text about the group which is marked. Only when you have opened a data sheet are the parameters for the measurement settings in question displayed. Data sheets are marked by a circle symbol in front of the name.

This is how to open a data sheet:

- ❑ Click **once** on the icon or the name of the data sheet in the navigation window. The data sheet is displayed in the data window.

Data sheets

The data sheets are preset to the values of the default data set **Untitled**. These preset measurement settings correspond to the mean values of the value ranges recommended in the EN 50160 standard.

Note:

The measurement settings of the default data set are listed in Appendix B.

4.3 Defining basic settings

Before you select and parameterize measured quantities, you must set the parameter set to the network to be measured and define the measurement conditions and calculation methods.

Measured quantities

You can set these under **Basic settings** in the navigation window. The basic settings include the following parameters and measured quantities:

- **Network settings**
  - Nominal frequency of the power supply network (50 or 60 Hz)
  - Network type (single-phase system, three-wire network, four-wire network)
  - Nominal voltage
  - Transformer ratio of the primary transformer, if necessary (*/1/ SIMEAS Q, Operating Instructions*)
- **Function of the two relay outputs**
  (binary output 1 or binary output 2)
- **Other settings**
  - Calculation of the flicker interference factor in A or P values
  - Definition of the time base for acquiring max and min values
  - Definition of the period for recording measured values
  - Selection of the storage mode

4.3.1 Network settings

If you select **Network settings** in the navigation window (under Basic settings), the dialog for defining these parameters is opened in the data window.

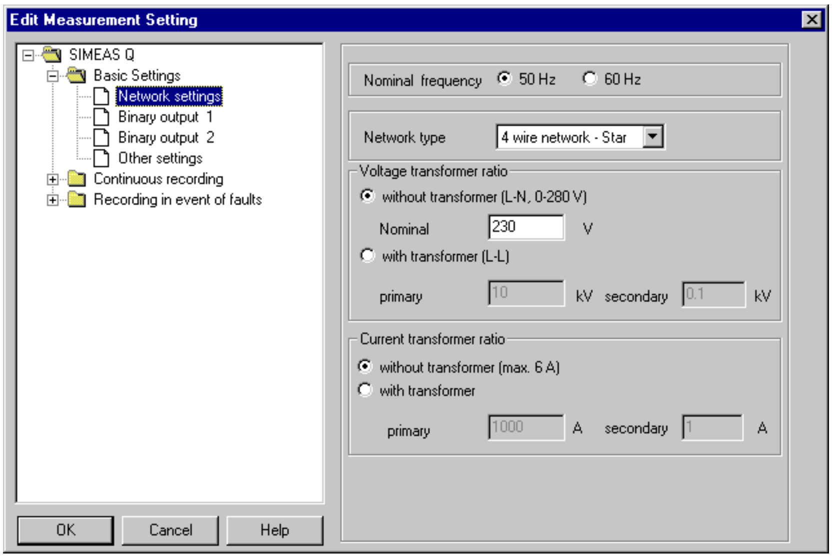

Image4_02.gif

Fig. 4-2 Dialog box for setting the network parameters

Note:

The SIMEAS Q is preset for measurements in a **four-wire network** with **50 Hz** and **230 V (LP - N)**.

You can change the defined network data at any time to adapt SIMEAS Q flexibly to other networks (measurement environments).

- ❑ Select the radio buttons of the network data that define your network.
- ❑ 50 Hz or 60 Hz as the nominal frequency

Warning:

Restart your SIMEAS Q device after each change of the network frequency setting.

SIMEAS Q uses different scanning frequencies for 50 and 60 Hz. To obtain precise measuring results, the SIMEAS Q should be calibrated at the network frequency used later during the measurement.

The **Receive identification** function displays the network frequency to which the measured-value capturing is being synchronized.

- ❑ Single-phase system, 3 wire network - Delta, 4 wire network - Star as network type

- The SIMEAS Q device can capture measured values either as primary or as secondary values. The measured variables are usually scanned at a voltage transformer. Specify the transformer ratio to be able to capture primary values. To capture secondary values, select the **Without transformer** option. This option must also be selected for the direct voltage measurement, e.g. in the 230 V network. On the input side, the SIMEAS Q can measure voltages in a range from 0 to 280 V.
  If you have selected **Without transformer**, you must additionally specify the nominal voltage. The maximum value which can be specified is 280 V. At any rate, you must indicate phase-ground voltages. For a direct measurement in the 230 V network, the nominal voltage is 230 V. For a measurement with voltage transformers, the nominal voltage is in most cases 100/root 3 (57.74V) or 110/root 3 (63.5 V).
  If you select the **With transformer** option, the transformer ratio on the primary side can be indicated in a range from 0.1 to 1000 kV and on the secondary side in a range from 0 to 280 V.
  Attention: The secondary voltage must always be specified in kV!
  The entry the field **Nominal** voltage is used as calculation basis for SICARO PQ.
- Like for the voltages, the SIMEAS Q device is also able to capture currents in primary or secondary values. The transformer ratio of the current transformer must be specified accordingly.
  On the input side, SIMEAS Q can measure currents in a range from 0 to 6 A. If the **Without transformer** option is selected, SIMEAS Q captures measured values in this range.
  On the primary side, the transformer ratio can be indicated in a range from 1 to 100,000 A whereas on the secondary side, it can be indicated in a range from 0 to 6 A. The secondary transformer output usually is 1 or 5 A.

4.3.2 Binary outputs

SIMEAS Q is equipped with two binary outputs implemented by means of optocoupler relays. The switching information available in this way can be used with other devices such as recorders, horns, sensing elements or pulse recorders.

You can allocate predefined functions to the binary outputs independently of each other.

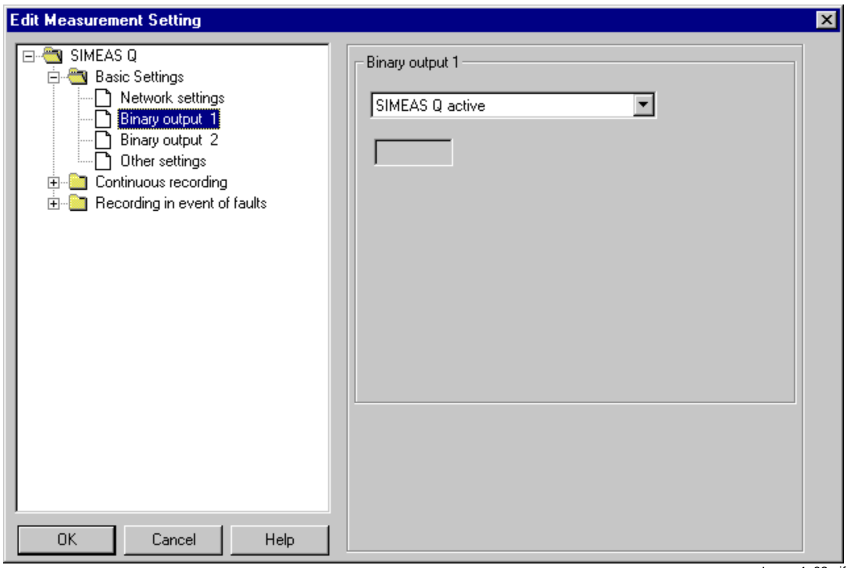

Image4_03.gif

Fig. 4-3 Binary output data sheet

Default setting

The default is **SIMEAS Q active** for binary output 1 and **Voltage dip** for binary output 2.

To change these settings, proceed as follows:

- ❑ Select **Binary output 1** or **Binary output 2** under Basic settings in the navigation window. The corresponding data window is opened and the current setting of the selected binary output is marked.

Assign the required function to the binary output from the dropdown list box. The following functions are available:

SIMEAS Q active

With the SIMEAS Q active function, you can monitor whether the device is switched on (contact open). If the contact drops out, the device is switched off or defective.

Active work
Reactive work
Apparent work

If you allocate one of these functions to the binary output, the SIMEAS Q device always releases a short pulse as soon as the energy value specified in the input box has been reached and thus captured by SIMEAS Q.

- In the input box, specify the energy value which must be reached to release a pulse. This function is suitable for energy counting.

Active power input / output

If you assign this function to the binary output, the input (contact is open) or the output (contact is closed) of active power is displayed.

Threshold cos φ

If you allocate this function to the binary output, the power factor cos φ will be monitored.

- Determine a threshold value for the factor. If this factor falls below, the contact will close and therefore trigger off an impulse.
  You can use this function as alarm indicator.

Voltage dip

If you assign this function to the binary output, a pulse is triggered on a voltage dip at this output.

A voltage threshold parameterized during fault value measurement is used as the threshold value.

You configure this threshold value as follows:

- In the navigation window click on **Voltage** which is located below **Recording in the event of faults**. The data window is displayed. Depending on the type of network, you can select up to three phase voltages.
- Activate the desired phase voltage. The window **Enter Threshold** is displayed.
- Determine the necessary thresholds. Hereby, at least one has to be below the nominal voltage.
- Confirm with **OK**.

Out of the maximum of five configurable threshold values for the voltage, the highest below the nominal voltage is the threshold value for the voltage dip. This function is only available if the **Recording in event of faults for voltage** option has been activated (see above).

You can use the function as a warning.

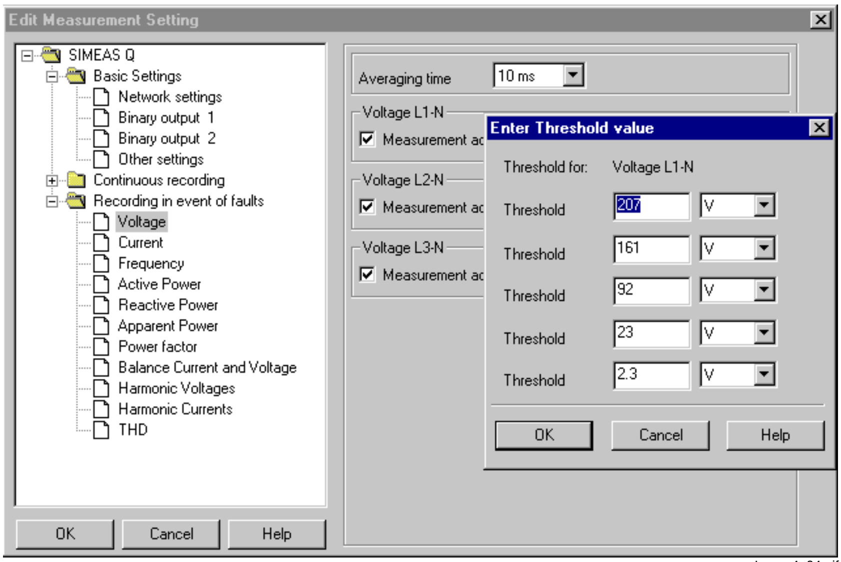

Fig. 4-4 Enter Threshold value window

4.3.3 Other settings

Under this item, you can define all the other basic settings for parameterizing the SIMEAS Q.

You select the methods for calculating the flicker interference factors and power and the storage mode and define the time and duration of recording as well as the measurement interval for extreme value calculation during continuous measurement.

Default settings

The default values are shown in Fig. 4-5.

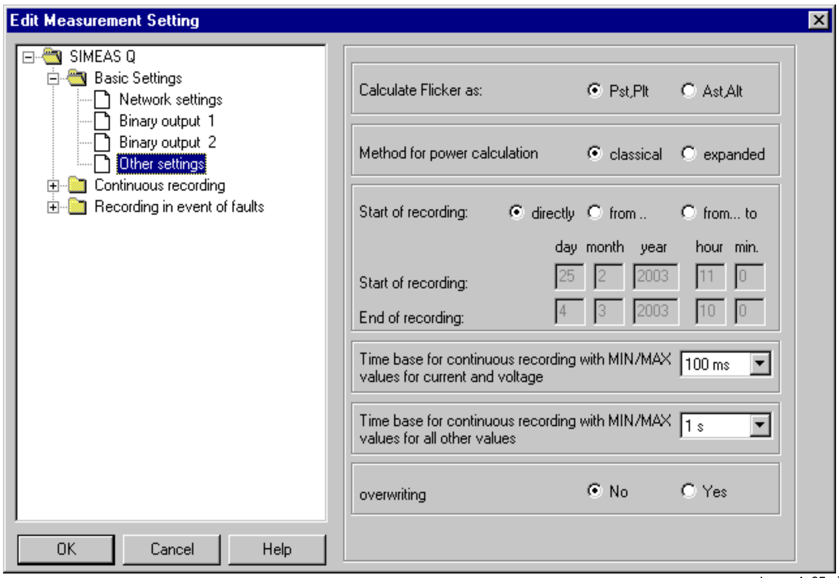

Image4_05.gif

Fig. 4-5 Basic settings - Other settings data sheet

To make changes, proceed as follows:

- ❑ Select **Other settings** under Basic settings in the navigation window. The data sheet (Fig. 4-5) is opened in the data window.
- ❑ Make the necessary settings. In the following, the meaning of the individual input options is explained in detail.

Flicker

Flicker is a measurement of voltage fluctuations in the low voltage distribution. The term flicker is defined as fluctuating visual perception caused by a light stimulus whose luminance or spectral distribution fluctuates over time (see IEC 61000-3-3).

Flicker values can be calculated:

- by the evaluation indicators P_{st} and P_{lt}
- by the evaluation indicators A_{st} and A_{lt}.

(The abbreviations stand for **short term** and **long term**).

P_{st} or P_{lt} is a measure of the interference effect.

A_{st} or A_{lt} is a measure of the interference sensitivity.

- Select P_{st}, P_{lt} or A_{st}, A_{lt} as the method of calculation.

Note:

Because P values are used to calculate the flicker in the EN 50160 standard, these values are preset.

Power calculation

For calculation of the power in a three-phase network, you can chose between the classic and the expanded method.

- Select the **classic** method if you want to measure in a balanced network, i.e. in a network in which the connected loads are balanced. Moreover, no harmonics must occur in the network.
  This mode is preset.
- Select the **expanded** calculation method if you want to measure in an unbalanced three-phase system. Harmonics are taken into account in the power calculation.

Start and duration of recording

Define from what time and for what period you want to record measurement data.

- Select **directly** to start recording immediately after you have connected SIMEAS Q to the system.
- Select **from** or **from ... to** and enter the appropriate times to define the start of recording and, if necessary, the duration of recording.

Caution:

Before measuring, check whether the system time of your SIMEAS Q has been set correctly. If necessary, correct it (see Chapter 2).

Base time

For the continuous measuring with extreme values (MIN and MAX), specify here a time base for the extreme value capture. Within the framework of the extreme value capture, SIMEAS Q stores the average value together with the highest and lowest measuring value occurring in a measuring period (averaging time). Example:

Averaging time 1 min; basic averaging time 1 sec. With the beginning of each minute, SIMEAS Q starts capturing the 1-minute average value. Basic average values are calculated each second (basic averaging time) for this purpose. After the measuring period (averaging time), the 1-minute average value is calculated from 60 basic average values. The maximum (MAX) and the minimum (MIN) basic average value are determined additionally. The value triple consists of a minimum, a maximum and an average value, is saved after each measuring period and can be called via the SIMEAS Q Par V2.30. The capture of the next value triple for the next minute starts.

The described procedure is identical for each measured variable enabling the capture of extreme values by means of SIMEAS Q.

You can define different time bases for:

- Currents and voltages
- all other measured values.

Note:

The averaging time (parameterized by activating the measured quantities) must be an integer multiple of the time bases.

Save mode (Overwriting)

This setting serves to specify if the SIMEAS Q functions as a recorder or as a sensor for measured variables.

Overwriting mode not activated

If you select **No**, SIMEAS Q works as a measured-value recorder. This setting must be selected if data shall not be called continuously from the SIMEAS Q devices but in very short periods.

Note:

For SIMEAS Q devices with a RS232 interface and with a RS485 interface, this is the case due to the transfer technique. Consequently, you must select **No** for these device types. In this way, all values of a measured variable to be measured are stored in the memory. These values are deleted in the memory to release storage capacity only by the time when values (measured value inc. time stamp) are called by the PC.

Advantage

Measured values which have not yet been called by the PC are intermediately stored in the SIMEAS Q device. Depending on the average time specified, SIMEAS Q has in this case stored several measured values of a measured variable (measured-value chain). This procedure ensures that no measuring data is lost as long as the capacity of the measured value memory is sufficient.

Disadvantage

As soon as the capacity of the measured-value memory is exhausted, SIMEAS Q is unable to save new measured data until storage capacity is released again by means of a master station call. Consequently, measured data is lost if the data inquiry does not run for a longer period of time or if the scan cycle specified is too long.

Overwriting mode activated

With the **Yes** option, SIMEAS Q functions like a sensor. The recording of measured-value chains relating to a measured variable is not of primary importance in this context. However, this setting is only useful for SIMEAS Q devices equipped with a PROFIBUS interface. Due to the high transfer rates enabled in this way, current measured values can be called from SIMEAS Q in particularly short time intervals of fractions of seconds. By means of programmable control systems, these values can, for example, be used for control tasks.

With the **Yes** option, each stored measured value of a measured variable is updated by a newly detected measured value, i.e. the former value is overwritten. Consequently, SIMEAS Q does not store a measured-value chain in its memory in this case. There is always only one measured value per parameter available in the memory.

Advantage

A buffer overflow cannot occur.

Disadvantage

To record a measured-value chain, it must be ensured that the master calls the measured value before this value is updated. If the master station does not call the value in the prescribed time, this value is overwritten and the former value is lost, i.e. the measured-value chain becomes incomplete also in case of very short interruptions of the communication between the master and SIMEAS Q.

4.4 Activating measured quantities with cont. measurement

For continuous recording, you define specific measuring periods (averaging times) for each selected measured quantity (except flicker). Using the averaging time set, a mean value of the measured quantity is determined for the acquired current and voltage values and continuously stored in the memory with a time stamp.

In addition, you can acquire the extreme values that occur within a measuring period (averaging time) (time base; see Page 43) and define the orders of harmonics that you want to acquire.

Note:

If you want to evaluate the data with SICARO PQ, you have to use the averaging time defined in the standard to be used for the evaluation.

It is also allowed to use an integral part of the standard averaging time. This affects the memory usage and the operating speed.

Example:
Averaging time according to Standard 10 minutes →
allowed averaging time
10 min, 5 min, 2 min, 1 min, 50 s, 40 s, 30 s, 20 s, 10 s.

Selecting measured quantities

To select measured quantities for continuous measurement and to define the settings, proceed as follows:

- ❑ Double-click on **Continuous recording** in the navigation window. A list of all measured quantities that can be acquired continuously is displayed.

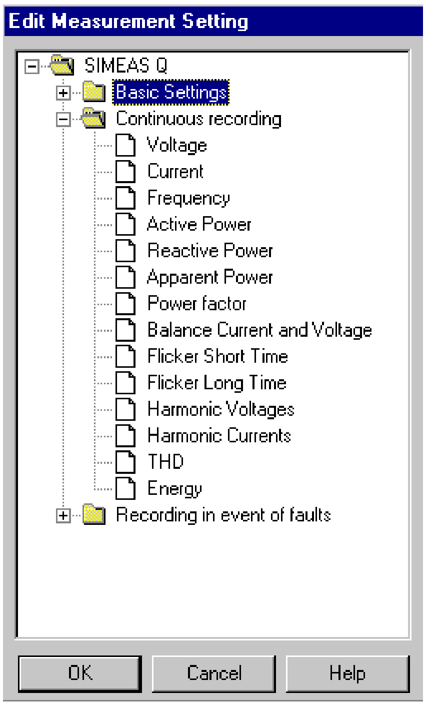

Image4_06.gif

Fig. 4-6 Settable measured quantities for continuous recording

- ❑ Click on the measured quantity to be activated. The data sheet for this quantity is displayed in the data window.

The data sheets for the individual quantities have a similar structure.

The type and number of possible measured quantities depends on the selected network type (Basic settings). You can activate measurement individually for each phase (if required) and also acquire the sum for power measurements.

Let us take an example of a harmonic to explain the inputs (see Fig. 4-7).

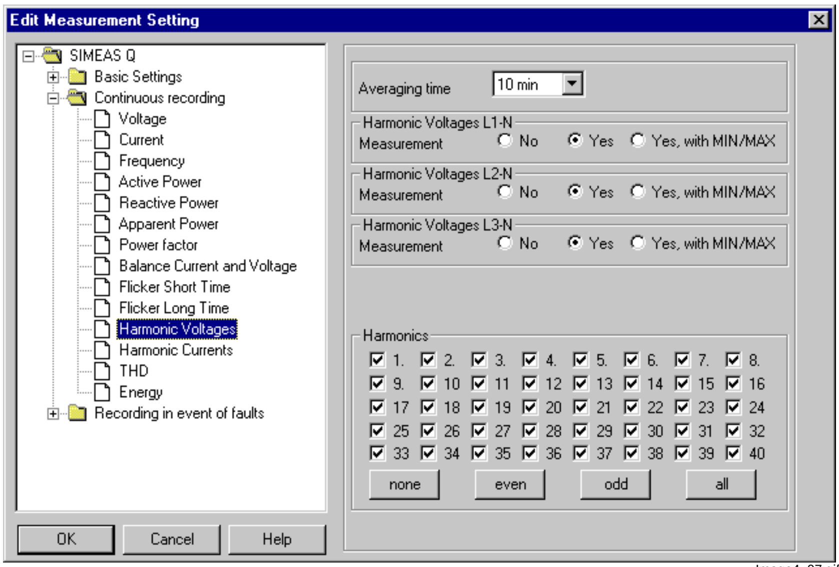

Image4_07.gif

Fig. 4-7 Data window for harmonic voltage for continuous recording

To define or change settings for a measured value, proceed as follows:

- Define the averaging time using the dropdown list box (possible range 1s - 1h). The time applies to all quantities activated in **this** data sheet.

Note:

The averaging time must be an integer multiple of the time base. For the measured quantity **Flicker**, the averaging time must be specified in the calculation algorithm and is not parameterized here. The default averaging time for **Flicker short-term** is 10 min, for Flicker long-term 120 min.

- You activate measurement for the required quantity by clicking on **Yes** or **Yes with MIN/MAX**. In the latter case, the extreme values of this quantity are also acquired.

Note:

You have defined the period for extreme value acquisition as the time base (for Basic settings) for currents and voltages or for all other measured quantities in a standard way.

In the section for harmonic voltage or harmonic current, you can define which harmonics you want measured (up to the 40th order harmonic).

- Select the **individual** harmonics (by clicking on them)

  or

- Click on one of the lower buttons to select **all**, all **even**, all **odd** or no (**none**) harmonics.

Caution:

If you click one of these buttons, the previous selection is over written.

4.5 Activating measured quantities for fault value measurement

With the event-controlled acquisition of measured data, SIMEAS Q calculates an average value over a settable averaging time for each selected measured quantity. This average value is compared with set threshold values. If values exceed these thresholds and then return to normal, measured data is recorded.

The time and the average measured value so far are recorded. In this way, you obtain information about when certain measured quantities move out of a nominal range and when they return to it.

You can also define the orders of harmonics to be acquired (up to the 40th order harmonic).

Selecting measured quantities

To select measured quantities for measurement in the event of a fault and to define the settings, proceed as follows:

- ❑ Double-click on **Recording in the event of fault** in the navigation window. A list of all quantities for fault value acquisition is displayed:

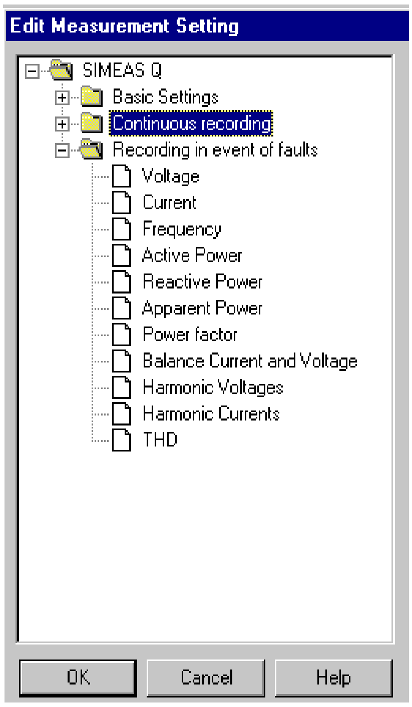

Image4_08.gif

Fig. 4-8 Settable measured quantities for measurement in the event of a fault

- ❑ Click on the measured quantity to be activated. The data sheet for this quantity is displayed in the data window.

The data sheets for the individual quantities have a similar structure.

The type and number of possible measured quantities depends on the selected network type (Basic settings). You can activate measurement individually for each phase (if required) and also acquire the sum for power measurements.

Let us take an example of a harmonic to explain the inputs (see Fig. 4-9).

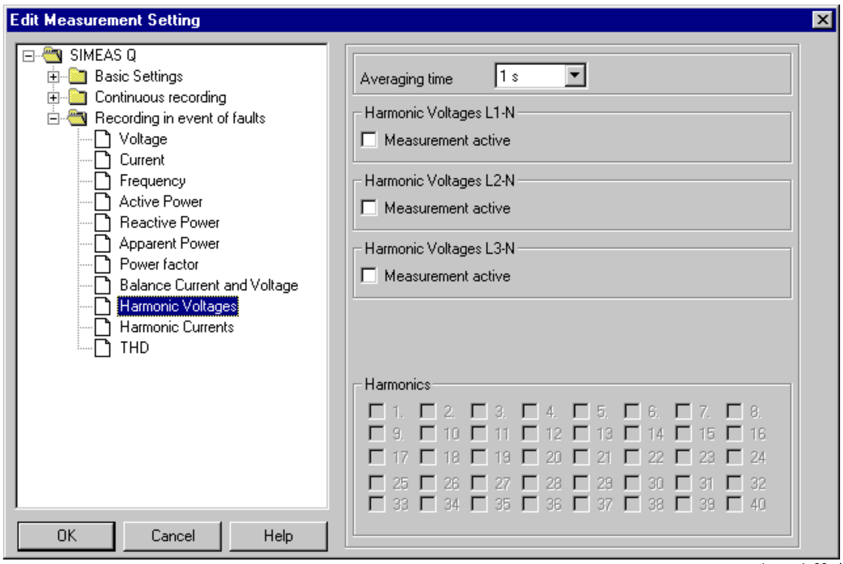

Image4_09.gif

Fig. 4-9 Data window for harmonic voltage for continuous recording

To define or change settings for a measured value, proceed as follows:

- ❑ Define the averaging time using the dropdown list box.
  The selected time applies to all quantities activated in **this** data sheet.
- ❑ You activate measurement of the required quantity by clicking on the check box **Measurement active**. The dialog for defining the threshold values is displayed (except for harmonics).

  In the data sheet for harmonic voltage or harmonic current (see Fig. 4-9), you can also define which order harmonics you want measured (up to the 40th harmonic).
- ❑ Click on the harmonic to be measured.

  The **Enter threshold** window is displayed.

Note:

For harmonics, the dialog box for entering the threshold values is only displayed if you select the harmonic to be measured. You can define individual threshold values for each harmonic.

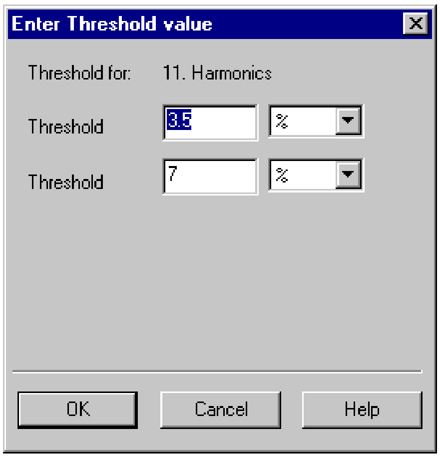

Image4_10.gif

Fig. 4-10 Entering threshold values

- Enter the threshold values and the associated unit (select via dropdown list box).
- Confirm with **OK**.

Note:

If you click on a check box again, the measurements for the selected quantities and harmonics are deactivated. The set threshold values remain set and are available when activated again.

The number of possible threshold values is not the same for all measured quantities.

4.6 Transferring parameters

After you have completed parameterization of the SIMEAS Q, you must save the parameter set you created (see Chapter 3). After that, transfer the parameters to the SIMEAS Q.

Sending parameters

Please proceed as follows:

- Click on **Send measurement settings** in the **Device** menu. The parameter set is sent to the SIMEAS Q.

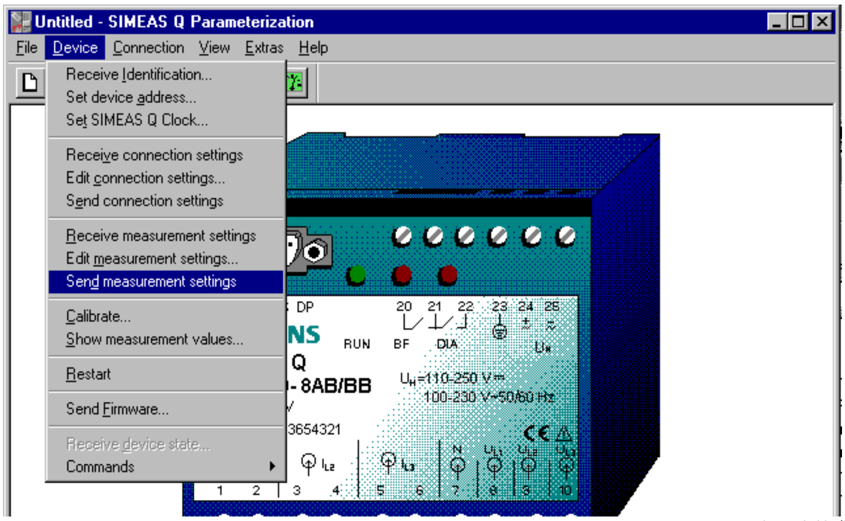

Image4_11.gif

Fig. 4-11 Sending parameters

After that, you can disconnect the device from the power supply and install it where it is to be used. After connecting the power supply again, the device switches to operating mode after two minutes and starts making the parameterized measurements at the defined time.

Note:

After you have completed the parameterization, you must save the parameterization data. See Chapter 3.

Receiving parameters

Moreover, you can load and modify the current parameter set into your parameterization software if the SIMEAS Q is already in operation. Please proceed as follows:

- ❑ Make sure that the connected SIMEAS Q is in parameterization mode. If this is not the case, disconnect the device briefly from the network and switch it on again.
- ❑ Send a command within the next two minutes (e.g. with menu item **Device** → **Read identification**). The device is switched to parameterization mode permanently.
- ❑ Select the command **Receive measurement settings** in menu item **Device**. The parameter set of the connected SIMEAS Q is read out and transferred.
- ❑ Now make the necessary changes. After that, you can store the data and transfer them to the SIMEAS Q again to update the parameter set.

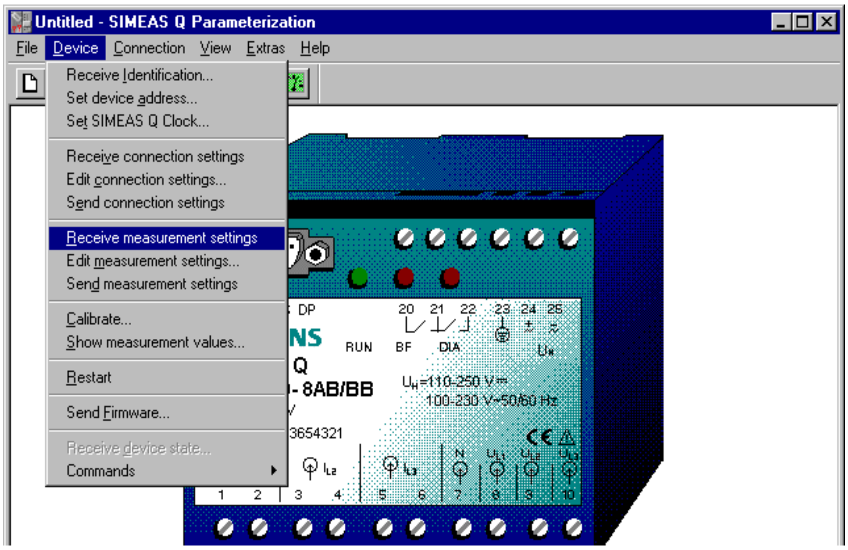

Image4_12.gif

Fig. 4-12 Receive measurement settings

4.7 Mounting the device

You have now prepared and parameterized your SIMEAS Q. Disconnect the device from the power supply and from the parameterization computer.

Snap the SIMEAS Q onto a mounting rail.

- Apply the measuring voltages and currents.
- Plug in the connecting cable to the communication processor.
- Connect the power supplies and switch them on. SIMEAS Q is ready for measurement and will start recording at the parameterized time.

Special Functions 5

Overview

The following part ''Special Functions'' provides information concerning calibration and updating the firmware.

Contents

5.1 Calibration

The calibration function is used for optimum setting of the SIMEAS Q to the measuring range. SIMEAS Q has been calibrated at 170 V and 3.6 A in the factory. These values are approximately in the middle of the measuring range of $100/\sqrt{3}$ to $230V$ and 1 to $5A$.

Note:

To keep the measuring accuracy of the SIMEAS Q constant, it is enough to calibrate the device every 2 years. You can query the time of last calibration and the calibrated nominal frequency with the function **Receive identification**.

If you have an **OMICRON CMS 156** or a similar calibration device, you can calibrate the SIMEAS Q yourself. Otherwise, contact your Siemens sales representative.

Caution:

The calibration voltage must be in the range 50 to 280 V, the calibration current in the range 1 to 6 A and the nominal frequency has to be 50 or 60 Hz.

Make sure that the nominal frequency is correct. If the calibrated frequency does not match the frequency of the network to be monitored, the measured values will not be correct.

Calibration procedure

You must observe the sequence of the operating steps described below. Incorrect calibration causes incorrect measurement results.

- ❑ Connect the reference voltages and currents of the calibration device with the measurement inputs of the SIMEAS Q.
- ❑ Connect the SIMEAS Q to the parameterization PC (see Chapter 3.2) and start **SIMEAS Q Par V2.30** (see Chapter 3.1).
- ❑ Switch on SIMEAS Q and send a parameterization telegram (see Chapter 3.4).
- ❑ Start the **Calibration** function.

5.1.1 Performing calibration

- ❑ Select the menu item **Device** → **Calibrate**. The **Calibrate** dialog box is opened.

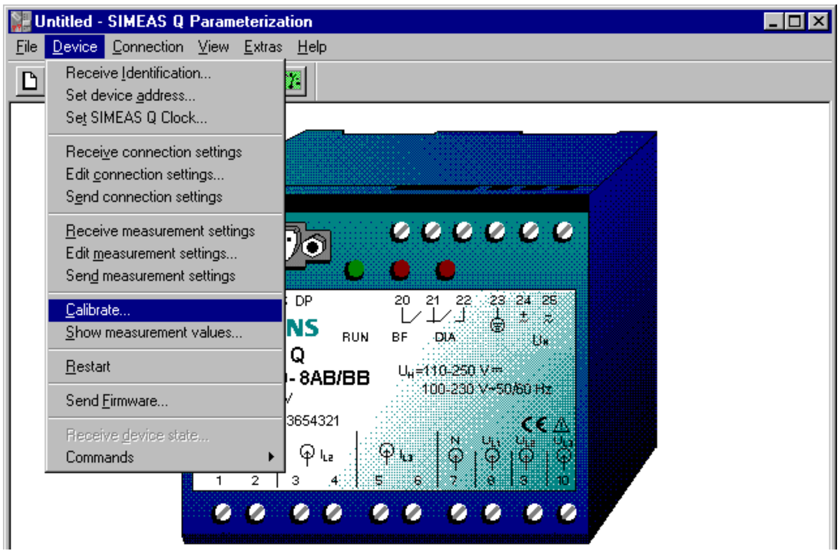

Image5_01.gif

Fig. 5-1 Calibrating the SIMEAS Q dialog box

- ❑ Enter the setpoints in accordance with the reference quantities of the calibration device applied, e.g. 170 V and 3.6 A.

Caution:

Check the nominal frequency set on the calibration device. It must match that displayed in the **Calibrate** dialog box.

- ❑ Click on the **Calibrate** button to start calibration. An offset calibration and an amplitude calibration are performed. SIMEAS Q Parameterization guides you step by step.
- ❑ Follow the instructions in the popup windows and confirm each one with **OK**.

Image5_02.gif

Fig. 5-2 Offset calibration

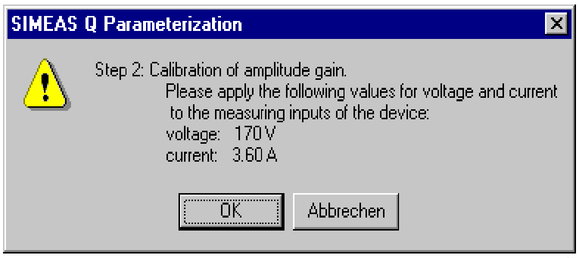

Image5_03.gif

Fig. 5-3 Amplitude calibration

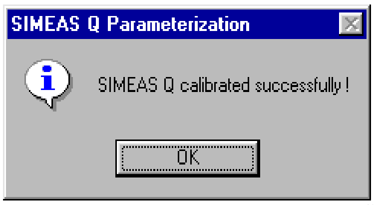

Image5_04.gif

Fig. 5-4 Status message about calibration

- ❑ Return to the main window with **Close**.

Note:

After calibration, SIMEAS Q reboots and is not addressable for approx. two minutes.

- ❑ Disconnect the SIMEAS Q from the calibration device.

5.2 Updating the firmware

The SIMEAS Q comes with the current firmware from our factory. To activate new functions or to remove possible errors in the firmware, it is possible to upload a new firmware with the software SIMEAS Q Parameterization.

Attention:

By uploading a new firmware the data memory in the device will be deleted. Read the parameter file about the **SIMEAS Q Par** software so that data are not lost.

To update the device firmware please proceed as follows:

- ❑ Select the menu item **Extras** → **Send firmware**.

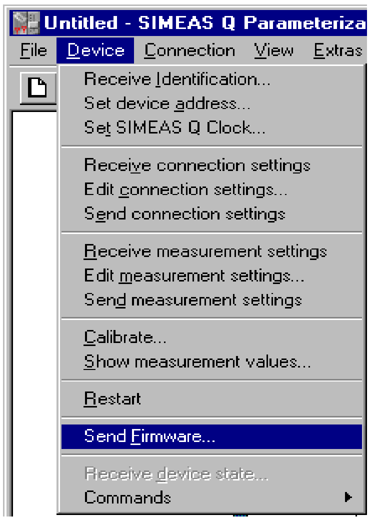

Image5_05.gif

Fig. 5-5 Calling up the Send firmware function

- ❑ The **Send firmware** dialog box is opened.
- ❑ Using the **Select** button, select your diskette drive, mark the firmware file, and confirm with **Open**. The file is placed in the dialog field. After the installation of SIMEAS Q PAR you will find the the current device firmware in **...\Siemens\SIMEAS_Q_Par\Utilities\Firmware**.

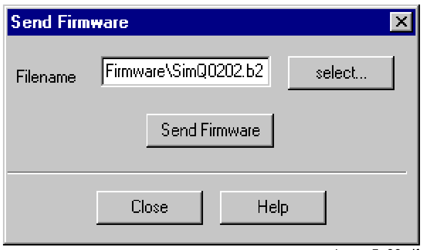

Image5_06.gif

Fig. 5-6 Send firmware dialogue box

Attention:

Pleas take care, that the selected file has the extension ***.B2**. Do not use any other type of files for an upgrade, otherwise the processor could be destroyed.

In case of any doubt please contact our hotline or visit our internet download area www.powerquality.de to get the latest firmware version.

- After you have selected the firmware file, send the new firmware by clicking the button **Send Firmware** to the SIMEAS Q.
- Afterwards a windows will open, showing you the current status of the data transmission.

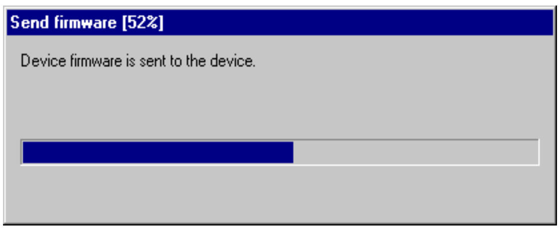

Image5_07.gif

Fig. 5-7 Send firmware dialogue box

Note:

Due to the transfer rate of 9600 Baud the upgrade of the firmware ca take up to 6 minute.

- The end of the upgrade will be indicated with a message. Confirm the message with **OK**.

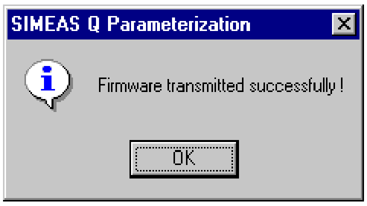

Image5_08.gif

Fig. 5-8 Send firmware dialogue box

Note:

Please note the information of the read-me file concerning the firmware.

6 Quick Reference

In this part the necessary steps for configuration and commissioning of a SIMEAS Q are listed.

- Starting SIMEAS Q Par. Chapter 3.1
- Connecting the SIMEAS Q and PC. Chapter 3.2
- Setting up the parameterization interface on the PC. Chapter 3.3
- Plug-in the auxiliary power supply of SIMEAS Q
- Activate configuration mode resp. Receive identification. Chapter 3.4
- Setting the device address. Chapter 3.6
- Synchronizing the SIMEAS Q. Chapter 3.7
- Edit connection settings. Chapter 3.8
- Configure measurements settings. Chapter 4
- Installation and commissioning of SIMEAS Q. Chapter 4.7

Formulas and Algorithms

A

Overview

Appendix A contains the formulas and algorithms that are used to calculate the RMS values and the derived measured quantities.

Contents

A.1 Requirements

The measurement algorithms given below refer to measurements in a **50Hz system**. For **60Hz systems**, the formulas must be adapted accordingly.

For measured quantities that are acquired and calculated both during continuous measurement and measurement in the event of a fault, the formulas and algorithms are identical. Measured quantities that are only relevant to one of the two measuring modes are marked accordingly.

A.2 Current and voltage

SIMEAS Q digitizes the currents and voltages applied with a sampling rate of 6,400 Hz in 50Hz networks and 7,680 Hz in 60Hz networks and calculates the RMS values from them over half a period.

Voltage and current values consist of an AC and a DC part. In electrical supply systems, the DC component is usually zero and therefore does not need to be taken into account.

By definition, the RMS value is the quantity of energy that is converted in a purely resistive load.

For voltage and current, the RMS values are calculated as follows:

$$U_{AC} = \sqrt{\left(\frac{1}{N}\sum_{j=1}^{N} u_j^2\right)} \qquad I_{AC} = \sqrt{\left(\frac{1}{N}\sum_{j=1}^{N} i_j^2\right)}$$

where

U, I RMS values
u, i Measured values for voltage and current
N Number of measured values for 16 periods (here: N = 128 * 16).

A.3 Nominal frequency

The frequency is always determined at input $\mathbf{V_{P1}}$ of the SIMEAS Q. The signal is digitized with sampling frequency $\mathbf{f_{sample}}$, where:

$$f_{sample} = 128 \cdot f_{nom}$$

An internal frequency counter measures the sampling rate, i.e. the internal quartz oscillator determines the accuracy and resolution of the frequency measurement.

A.4 Power

The power is always calculated for all three phases. Connection of the wattmeter is invariable and is defined as follows:

Wattmeter	Measured quantities	Explanation
W1	$P1 \cdot I_{P1}$	Phase P1 and current of phase P1
W2	$P2 \cdot I_{P2}$	Phase P2 and current of phase P2
W3	$P3 \cdot I_{P3}$	Phase P3 and current of phase P3

In the case of measurement in a three-wire network, the phase-to-phase voltages $V_{P1 - P2}$ and $V_{P2 - P3}$ and the currents I_{P1} and I_{P3} are connected to the inputs of the SIMEAS Q in a two-wattmeter circuit. Because the voltage $V_{P3 - P1}$ and the current I_{P2} cannot be acquired, no measured quantities based on them (e.g. harmonic on voltage $V_{P3 - P1}$) can be acquired. Therefore, only the values for the complete system can be acquired for the powers.

The device can calculate the power either by the classic or by the expanded calculation method. The choice of method depends on the conditions in the measuring system.

A.4.1 Classic calculation

Here you will find the classic calculation explained generally and using the example of a three-wire system.

The measured quantities $\mathbf{V_n}$ and I_n are the RMS values of the fundamental and the harmonics that the system determines using a fast-Fourier analysis.

The calculated quantities apparent power **S** and reactive power **Q** refer exclusively to the fundamental, because the definitions of these quantities are only valid for the fundamental.

General explanation

Active power

$$P = \frac{1}{N}\sum_{j=1}^{N} u_j \cdot i_j$$

where

u, i Measured values for voltage and current
N Number of measured values, here: N = 128 * 16.

Apparent power

$$S = U_{AC} \cdot I_{AC}$$

Reactive power

$$Q = \sqrt{S^2 - P^2}$$

Note:

The sign of the reactive power **Q** is defined by the phase angle between the fundamentals of the voltage and current. If the value is < 0, Q is also < 0.

Power factor

$$PF = \frac{P}{S}$$

Polyphase systems

To be able to calculate the power in a three-wire system by the **classic method**, the following conditions must be fulfilled:

- Voltage balance
- Load balance
- No harmonics.

It is possible to apply either the 2-wattmeter method or the 3-wattmeter method for the calculation.

2-wattmeter method

For the 2-wattmeter method, the following relations apply:

Total active power

$$P_{total} = P_{W1} + P_{W2}$$

Total apparent power

$$S_{total} = \frac{\sqrt{3}}{2} \cdot (U_{P1-P3} \cdot I_{W1} + U_{P2-P3} \cdot I_{W2})$$

Total reactive power

$$Q_{total} = \sqrt{S_{total}^2 - P_{total}^2}$$

Note:

The sign of the total reactive power $\mathbf{Q_{total}}$ is always zero, because the positive sequence component in the 3-wire system is not calculated.

Power factor

$$PF = \frac{P_{total}}{S_{total}}$$

3-wattmeter method

With calculation using the 3-wattmeter method in a 4-wire system, you obtain:

Total active power

$$P_{total} = P_{W1} + P_{W2} + P_{W3}$$

Total apparent power

$$S_{total} = \sqrt{(U_{P1} + U_{P2} + U_{P3})^2} \cdot \sqrt{(I_{P1} + I_{P2} + I_{P3})^2}$$

Total reactive power

$$Q_{total} = \sqrt{S_{total}^2 - P_{total}^2}$$

Note:

The sign of the total reactive power $\mathbf{Q_{total}}$ is the same as the sign of the angle difference between the angles of the positive sequence components of the voltage and current (see also Unbalanced systems, Seite 74).

Power factor

$$PF = \frac{P_{total}}{S_{total}}$$

A.4.2 Expanded calculation

The expanded calculation method is used for power calculation in unbalanced networks.

Unbalanced three-phase systems can be described as 2 symmetrical systems with different directions of rotation:

- Positive phase-sequence system
- Negative phase-sequence system.

The expanded calculation method is described below using one phase and 3-wire systems. After that, the unbalance is calculated in a 3-wire system.

Balanced system

With the expanded method, the device calculates the characteristic values of the positive sequence system for apparent power, reactive power and phase displacement.

The power calculation for **one phase** only takes account of the fundamental which is indicated in the formulas by the index **n = 1**.

Active power

$$P = \frac{1}{128}\sum_{j=1}^{128} u_j \cdot i_j$$

Apparent power

$$S_{n=1} = U_{n=1} \cdot I_{n=1}$$

Reactive power

$$Q_{n=1} = (U_{n=1} \cdot I_{n=1}) \cdot \sin\varphi_{n=1}$$

Power factor

$$PF = \cos\varphi$$

Phase displacement

$$\varphi_{n=1} = \varphi_{u_{n=1}} - \varphi_{i_{n=1}}$$

In **3-phase systems**, the device calculates the active power from the sum of the individual measurement results of the wattmeters connected:

- **2-wattmeter method**
  Sum of the 2 single-phase measurements. The calculation is equivalent to the 2-wattmeter method of the classic calculation (see Page A-71).
- **3-wattmeter method**
  Sum of 3 single-phase measurements.

Active power

$$P_{total} = P_{W1} + P_{W2} + P_{W3}$$

Apparent power

$$S_{total} = 3 \cdot U_{pos} \cdot I_{pos}$$

Reactive power

$$Q_{total} = S_{total} \cdot \sin(\varphi_{pos,\,U} - \varphi_{pos,\,I})$$

Power factor

$$PF_{total} = \cos(\varphi_{pos,\,U} - \varphi_{pos,\,I})$$

where:

pos = positive sequence component of the 3-wire system.

Unbalanced system Unbalance is calculated only in 4-wire systems for the voltages and currents of the 3 phases. They are defined as the ratio of the balanced subsystems **Negative sequence system** (SubIndex: neg) to the **Positive sequence system** (SubIndex: pos) multiplied by the factor 100%.

Voltage

$$U_{sym_u} = \left|\frac{U_{neg}}{U_{pos}}\right| \cdot 100$$

Current

$$I_{sym_u} = \left|\frac{I_{neg}}{I_{pos}}\right| \cdot 100$$

Positive sequence system:

Voltage

$$\begin{bmatrix} U_\alpha \\ U_\beta \\ U_\gamma \end{bmatrix} = \left(\frac{1}{3} \cdot \begin{bmatrix} 1 & e^{j\frac{2\pi}{3}} & e^{j\frac{4\pi}{3}} \\ 1 & e^{j\frac{4\pi}{3}} & e^{j\frac{2\pi}{3}} \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} \underline{U_{P1}} \\ \underline{U_{P2}} \\ \underline{U_{P3}} \end{bmatrix} \right) = \left\{ \frac{1}{3} \cdot \begin{bmatrix} 1 & e^{j \cdot 120°} & e^{j \cdot 240°} \\ 1 & e^{j \cdot 240°} & e^{j \cdot 120°} \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} \underline{U_{P1}} \\ \underline{U_{P2}} \\ \underline{U_{P3}} \end{bmatrix} \right\}$$

From this, the following relation is derived for $\mathbf{U}_\alpha$:

$$\begin{aligned} U_\alpha &= \frac{1}{3} \cdot [U_{P1} \cdot e^{j0°} \cdot e^{j0°} + U_{P2} \cdot e^{-j120°} \cdot e^{j120°} + U_{P3} \cdot e^{-j240°} \cdot e^{j240°}] \\ &= \frac{1}{3} \cdot [U_{P1} \cdot e^{j0°} + U_{P2} \cdot e^{j0°} + U_{P3} \cdot e^{j0°}] \\ &= \frac{1}{3} \cdot [U_{P1} \cdot (\cos(0°) + j\sin(0°)) + U_{P2} \cdot (\cos(0°) + j\sin(0°)) + U_{P3} \cdot (\cos(0°) + j\sin(0°)) \\ &= \frac{1}{3} \cdot [U_{P1} + U_{P2} + U_{P3}] \end{aligned}$$

Current

Taking the phase angle φ_{UI} into account, the current values of the positive sequence system are calculated in a similar way to the voltage values:

$$\begin{bmatrix} I_\alpha \\ I_\beta \\ I_\gamma \end{bmatrix} = \frac{1}{3} \cdot \begin{bmatrix} 1 & e^{j\frac{2\pi}{3}} & e^{j\frac{4\pi}{3}} \\ 1 & e^{j\frac{4\pi}{3}} & e^{j\frac{2\pi}{3}} \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} \underline{I_{P1}} \\ \underline{I_{P2}} \\ \underline{I_{P3}} \end{bmatrix} = \frac{1}{3} \cdot \begin{bmatrix} 1 & e^{j \cdot 120°} & e^{j \cdot 240°} \\ 1 & e^{j \cdot 240°} & e^{j \cdot 120°} \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} \underline{I_{P1}} \\ \underline{I_{P2}} \\ \underline{I_{P3}} \end{bmatrix}$$

From this, the following relation is derived for I_α:

$$\begin{aligned} I_\alpha &= \frac{1}{3} \cdot [I_{P1} \cdot e^{j(0° \pm \varphi)} \cdot e^{j0°} + I_{P2} \cdot e^{-j(120° \pm \varphi)} \cdot e^{j120°} + I_{P3} \cdot e^{-j(240° \pm \varphi)} \cdot e^{j240°}] \\ &= \frac{1}{3} \cdot [I_{P1} \cdot e^{j(0° \pm \varphi) + j0°} + I_{P2} \cdot e^{-j(120° \pm \varphi) + j120°} + I_{P3} \cdot e^{-j(240° \pm \varphi) + j240°}] \\ &= \frac{1}{3} \cdot [I_{P1} \cdot (\cos(0° \pm \varphi + 0°) + j\sin(0° \pm \varphi + 0°)) \\ &+ I_{P2} \cdot (\cos(-120° \pm \varphi + 120°) + j\sin(-120° \pm \varphi + 120°)) \\ &+ I_{P3} \cdot (\cos(-240° \pm \varphi + 240°) + j\sin(-240° \pm \varphi + 240°))] \\ &= \frac{1}{3} \cdot [I_{P1} \cdot (\cos(\pm\varphi) + j\sin(\pm\varphi)) + I_{P2} \cdot (\cos(\pm\varphi) + j\sin(\pm\varphi)) + I_{P3} \cdot (\cos(\pm\varphi) + j\sin(\pm\varphi)) \end{aligned}$$

Negative sequence system:

Voltage

$$\begin{bmatrix} U_\alpha \\ U_\beta \\ U_\gamma \end{bmatrix} = \frac{1}{3} \cdot \begin{bmatrix} 1 & e^{j\frac{2\pi}{3}} & e^{j\frac{4\pi}{3}} \\ 1 & e^{j\frac{4\pi}{3}} & e^{j\frac{2\pi}{3}} \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} \underline{U_{P1}} \\ \underline{U_{P2}} \\ \underline{U_{P3}} \end{bmatrix} = \frac{1}{3} \cdot \begin{bmatrix} 1 & e^{j \cdot 120°} & e^{j \cdot 240°} \\ 1 & e^{j \cdot 240°} & e^{j \cdot 120°} \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} \underline{U_{P1}} \\ \underline{U_{P2}} \\ \underline{U_{P3}} \end{bmatrix}$$

From this, the following relation is derived for $\mathbf{U}_\beta$:

$$U_\beta = \frac{1}{3} \cdot [U_{P1} \cdot e^{j0^o} \cdot e^{j0^o} + U_{P2} \cdot e^{-j120^o} \cdot e^{j240^o} + U_{P3} \cdot e^{-j240^o} \cdot e^{j120^o}]$$

Current

$$\begin{bmatrix} I\alpha \\ I_\beta \\ I_\gamma \end{bmatrix} = \frac{1}{3} \cdot \begin{bmatrix} 1 & e^{j\frac{2\pi}{3}} & e^{j\frac{4\pi}{3}} \\ 1 & e^{j\frac{4\pi}{3}} & e^{j\frac{2\pi}{3}} \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} \underline{I_{P1}} \\ \underline{I_{P2}} \\ \underline{I_{P3}} \end{bmatrix} = \frac{1}{3} \cdot \begin{bmatrix} 1 & e^{j \cdot 120°} & e^{j \cdot 240°} \\ 1 & e^{j \cdot 240°} & e^{j \cdot 120°} \\ 1 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} \underline{I_{P1}} \\ \underline{I_{P2}} \\ \underline{I_{P3}} \end{bmatrix}$$

From this, the following relation is derived for I_β:

$$\begin{aligned} I_\beta &= \frac{1}{3} \cdot [I_{P1} \cdot e^{j(0° \pm \varphi)} \cdot e^{j0°} + I_{P2} \cdot e^{j(120° \pm \varphi)} \cdot e^{j240°} + I_{P3} \cdot e^{j(240° \pm \varphi)} \cdot e^{j120°}] \\ &= \frac{1}{3} \cdot [I_{P1} \cdot e^{j((0° \pm \varphi) + 0°)} + I_{P2} \cdot e^{(-j)(120° \pm \varphi) + j120°} + I_{P3} \cdot e^{(-j)(240° \pm \varphi) + j240°}] \\ &= \frac{1}{3} \cdot [I_{P1} \cdot (\cos(0° \pm \varphi + 0°) + j\sin(0° \pm \varphi + 0°)) \\ &\quad + I_{P2} \cdot (\cos(-120° \pm \varphi + 240°) + j\sin(-120° \pm \varphi + 240°)) \\ &\quad + I_{P3} \cdot (\cos(-240° \pm \varphi + 120°) + j\sin(-240° \pm \varphi + 120°))] \\ &= \frac{1}{3} \cdot [I_{P1} \cdot (\cos(-120° \pm \varphi) + j\sin(-120° \pm \varphi)) + I_{P2} \cdot (\cos(-120° \pm \varphi) + j\sin(-120° \pm \varphi)) \\ &\quad + I_{P3} \cdot (\cos(-120° \pm \varphi) + j\sin(-120° \pm \varphi))] \end{aligned}$$

A.5 Flicker

Flicker is a measure of voltage fluctuations in the low voltage distribution.

In calculating the **Flicker** parameter, you obtain evaluation indicators that indicate the effects of the flicker:

- P_{st} and P_{lt} are a measure of the interference effect
- A_{st} and A_{lt} are a measure of the interference sensitivity.

The abbreviation **st** stands for short term, **lt** for long term.

Caution:

For flicker calculations, you do not have to define averaging times, because the calculation algorithm for the parameter Flicker defines that P_{st} or A_{st} is calculated every 10 minutes and P_{lt} or A_{lt} every 120 minutes.

Short-term:

$$P_{st} = \sqrt{(0.0314 \cdot P_{0.1} + 0.0525 \cdot P_{1s} + 0.0657 \cdot P_{3s} + 0.28 \cdot P_{10s} + 0.08 \cdot P_{50s})}$$

and

$$A_{st} = P_{st}^3$$

Long-term:

$$P_{lt} = \sqrt[3]{\left(\sum_{j=1}^{12} \frac{P_{st_j}^3}{12}\right)}$$

and

$$A_{lt} = P^3_{lt}$$

Note:

The flicker calculation is based on the 250 V lamp model.

A.6 Harmonics of the voltages and currents

SIMEAS Q measures the harmonics up to the 40th order.

The harmonic components are determined by a fast-Fourier analysis of the sampled signals (according to IEC 1000-4-7). The amplitude of the fundamental and the harmonics up to the 40th order are calculated for each current and voltage input. The number of harmonics is defined user-specifically during parameterization. For voltages, the device determines the amplitude values as a ratio to the fundamental as a percentage because of the nominal voltage value. The harmonic currents are measured directly in amperes.

THD

The THD factor (Total Harmonic Distortion) is the RMS value of all harmonics divided by the RMS value of the fundamental of the voltage.

Voltage

$$THD = \frac{0.01}{U_1}\sqrt{\sum_{n=2}^{40} U_n^2}$$

where

n Order of the harmonic

U RMS value of the voltage

A.7 Energy (only for continuous recording)

Electrical energy is defined as the power over a certain period. SIMEAS Q uses the set averaging time here.

Caution:

To obtain the correct sign in the following calculations, SIMEAS Q must be connected in phase and with the correct direction of power flow.

Active energy E_P

Input

To calculate the active energy in the input direction, the device integrates the positive active power values over the set averaging time.

$$E_{P-input} = \sum P_{total,pos}$$

where:

$$P_{total,pos} = \begin{cases} 0 & \wedge \quad P_{total} \le 0 \\ P_{total} & \wedge \quad P_{total} > 0 \end{cases}$$

Output

To calculate the active energy in the output direction, the device integrates the negative active power values over the set averaging time.

$$E_{P-output} = \sum P_{total,neg}$$

where:

$$P_{total,neg} = \begin{cases} 0 & \wedge \quad P_{total} > 0 \\ -P_{total} & \wedge \quad P_{total} \le 0 \end{cases}$$

Reactive energy E_Q

Capacitive

To calculate the capacitive reactive energy, the positive reactive power values are integrated over the set averaging time; for inductive reactive energy, the negative reactive power values.

$$E_{Q-Cap} = \sum Q_{total,pos}$$

where:

$$Q_{total,pos} = \begin{cases} 0 & \wedge \quad Q_{total} \leq 0 \\ Q_{total} & \wedge \quad Q_{total} > 0 \end{cases}$$

Inductive

To calculate the inductive reactive energy, the negative reactive power values are integrated over the set averaging time.

$$E_{Q-Ind} = \sum Q_{total,neg}$$

where:

$$Q_{total,neg} = \begin{cases} 0 & \wedge \quad Q_{total} > 0 \\ -Q_{total} & \wedge \quad Q_{total} \leq 0 \end{cases}$$

Apparent energy E_S

To calculate the apparent energy output, SIMEAS Q integrates the apparent power values over the set averaging time.

$$E_S = \sum S_{total}$$

Standard Parameter File

B

Overview

The **SIMEAS Q Par** software is supplied with a standard parameter data set. The default values are the mean values of the value ranges recommended in the EN 50160 standard.

The standard parameter data set is loaded every time the parameterization software is restarted. It is named Untitled and is displayed in the titlebar.

Contents

B.1 Basic settings

General	PC interface	COM1
	PROFIBUS address	0
	Language	German
Network parameters	Network type	Four-wire network
	Nominal frequency	50 Hz
	Voltage transformer	No
	Nominal voltage	230 V
	Current transformer	No
Binary outputs	Binary output 1	
	Output	SIMEAS Q active
	Binary output 2	
	Output	Voltage dip
Basic settings	Calculate flicker values as	P_{st}, P_{lt}
	Method of power calculation	classic
	Recording	directly
	Storage mode	not overwriting
	Time base for continuous measurement with MIN/MAX values	
	for voltage and current	100 ms
	for other quantities	1 s

B.2 Measurement settings for continuous measurement

Voltage V	Averaging time	10 min
	P1	On
	P2	On
	P3	On
Current I	Averaging time	10 min
	P1	Off
	P2	Off
	P3	Off
Frequency f	Averaging time	10 min
	Frequency	Off
Active power P	Averaging time	10 min
	P1	Off
	P2	Off
	P3	Off
	Total	Off
Reactive power Q	Averaging time	10 min
	L1	Off
	L2	Off
	L3	Off
	Total	Off
Apparent power S	Averaging time	10 min
	P1	Off
	P2	Off
	P3	Off
	Total	Off

Power factor PF	Averaging time	10 min
	P1	Off
	P2	Off
	P3	Off
	Total	Off
Balance current and voltage	Averaging time	10 min
	Balance voltage	On
	Balance current	Off
Flicker short-term	P1	On
	P2	On
	P3	On
Flicker long-term	P1	On
	P2	On
	P3	On
Harmonic voltage	Averaging time	10 min
	P1	On
	P2	On
	P3	On
	Harmonic	1st to 40th
Harmonic current	Averaging time	10 min
	P1	Off
	P2	Off
	P3	Off
THD	Averaging time	10 min
	P1	On
	P2	On
	P3	On

Energy E	Averaging time	15 min
	Active energy input $E_{P\ input}$	Off
	Active energy output $E_{P\ output}$	Off
	Reactive energy inductive $E_{Q\ ind}$	Off
	Reactive energy capacitive $E_{Q\ cap}$	Off
	Apparent energy E_S	Off

B.3 Measurement settings for fault value measurement

Voltage V	Averaging time	10 ms
	P1	On
	Threshold 1	207 V (90% of V_{Nom})
	Threshold 2	161 V (60% of V_{Nom})
	Threshold 3	92 V (40% of V_{Nom})
	Threshold 4	23 V (10% of V_{Nom})
	Threshold 5	2.3 V (1% of V_{Nom})
	P2	On
	Threshold 1	207 V (90% of V_{Nom})
	Threshold 2	161 V (60% of V_{Nom})
	Threshold 3	92 V (40% of V_{Nom})
	Threshold 4	23 V (10% of V_{Nom})
	Threshold 5	2.3 V (1% of V_{Nom})
	P3	On
	Threshold 1	207 V (90% of V_{Nom})
	Threshold 2	161 V (60% of V_{Nom})
	Threshold 3	92 V (40% of V_{Nom})
	Threshold 4	23 V (10% of V_{Nom})
	Threshold 5	2.3 V (1% of V_{Nom})
Current I	Averaging time	10 ms
	P1	Off
	P2	Off
	P3	Off
Frequency f	Averaging time	10 s
	P1	On
	Threshold 1	50.5 Hz
	Threshold 2	49.5 Hz
Active power P	Averaging time	1 s
	P1	Off
	P2	Off
	P3	Off
	Total	Off
	Thresholds	All = 0

Reactive power Q	Averaging time	1 s
	P1	Off
	P2	Off
	P3	Off
	Total	Off
	Thresholds	All = 0
Apparent power S	Averaging time	1 s
	P1	Off
	P2	Off
	P3	Off
	Total	Off
	Thresholds	All = 0
Power factor PF	Averaging time	1 s
	P1 Threshold 1 Threshold 2	Off 0.9 0.8
	P2 Threshold 1 Threshold 2	Off 0.9 0.8
	P3 Threshold 1 Threshold 2	Off 0.9 0.8
	Total Threshold 1 Threshold 2	Off 0.9 0.8
Balance current and voltage	Averaging time	1 s
	Balance voltage Threshold 1 Threshold 2 Threshold 3 Threshold 4 Threshold 5	On 2% 0% 0% 0% 0%
	Balance current	Off

Harmonic voltage	Averaging time	1 s
	P1	Off
	P2	Off
	P3	Off
	2nd to 25th harmonic Threshold 1 Threshold 2	 according to EN 50160 Threshold 1 · 2
Harmonic current	Averaging time	1 s
	P1	Off
	P2	Off
	P3	Off
THD	Averaging time	10 min
	P1 Threshold 1 Threshold 2	On 8% 0%
	P2 Threshold 1 Threshold 2	On 8% 0%
	P3 Threshold 1 Threshold 2	On 8% 0%

B.4 Printing out the standard parameter data set

You can print out the standard parameters.

Proceed as follows:

- Start the **SIMEAS Q Parameterization** software. The main window is opened and the standard parameters are loaded automatically.
- Select the menu item **File** → **Print**. The Windows print menu is opened. The usual Windows functions can be executed.
- Click on the **OK** button to start printing.

B.5 Viewing the standard parameter data set

To view the standard parameter data set, proceed as follows:

- Start the **SIMEAS Q Parameterization** software. The main window is opened. The standard parameters are loaded automatically.
- Select menu item **File** → **Print preview**. You can see the first page of loaded parameters.
- Click on the **Enlarge** button to read the parameters, and with the **Next** button you can scroll to the next page.
- With the **Print** button, you can print out the parameters.
- Click on the **Close** button to exit the print preview.

Averaging Times, Time Bases, Threshold Values

C

Overview

To acquire energy values, defined periods are required. If you want system messages to be derived from energy values, the corresponding threshold values must be defined. SIMEAS Q Par uses the terms averaging time, time base, and threshold value.

In this appendix, the terms are uniquely defined and value ranges are listed in a table for the individual parameters of the various recording modes.

Contents

C.1 Term definitions

Averaging time

The averaging time defines the period over which the arithmetic mean is calculated from the acquired measured values.

Depending on the recording mode, SIMEAS Q processes this mean value in different ways:

- ❑ During continuous measurement, the mean value is stored together with the time stamp **End of measuring period**.
- ❑ For measurement in the event of a fault, SIMEAS Q compares the mean value with one or more thresholds. The device only stores if at least one upper or lower threshold has been exceeded.

Time base

The time base is only required for continuous recording. It is the period over which a measured value is formed from the digitized analog value. A largest and a smallest value is filtered out of these measured values to determine the extreme values of a measured quantity within the averaging time.
The time base must be an integer part of the averaging time.

Threshold value

Threshold values are user-specifically parameterized limit values for acquisition in the event of a fault. The system requires at least one threshold value for each measured quantity. A measured quantity is only acquired if at least one upper or lower threshold value is exceeded.

C.2 Averaging times and time bases (continuous recording)

If you parameterize SIMEAS Q for continuous recording of measured values, you can select different averaging times for the measured quantities. The system requires the time bases to acquire extreme values.

Table C-1 Averaging times and time bases with reference to the measured quantity for continuous recording

<table>
<tr><th>Measured value</th><th>Averaging times</th><th>Time bases for extreme value acquisition</th></tr>
<tr><td>RMS values phase-ground voltages or phase-phase voltages</td><td rowspan="8">1, 2, 5, 6, 10, 15, 30 s
1, 2, 5, 6, 10, 15, 30, 60 min</td><td rowspan="2">for 50Hz nominal frequency
20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 500 ms,
1, 2, 5, 6, 10, 15, 30 s
1 min
for 60Hz nominal frequency
16, 33, 50, 66, 83, 100, 116, 133, 150, 166, 183, 200, 500 ms,
1, 2, 5, 6, 10, 15, 30 s,
1 min</td></tr>
<tr><td>RMS value phase currents</td></tr>
<tr><td>Nominal frequency</td><td rowspan="8">1, 2, 5, 6, 10, 15, 30 s
1 min</td></tr>
<tr><td>Active power
(per phase and total)</td></tr>
<tr><td>Reactive power
(per phase and total)</td></tr>
<tr><td>Apparent power
(per phase and total)</td></tr>
<tr><td>Power factor
(per phase and total)</td></tr>
<tr><td>Balance current and voltage</td></tr>
<tr><td>Flicker interference factor short-term</td><td>10 min</td></tr>
<tr><td>Flicker interference factor long-term</td><td>120 min</td></tr>
</table>

Table C-1 Averaging times and time bases with reference to the measured quantity for continuous recording

Measured value	**Averaging times**	**Time bases for extreme value acquisition**
1st to 40th harmonic voltage per phase	1, 2, 5, 6, 10, 15, 30 s 1, 2, 5, 6, 10, 15, 30, 60 min	1, 2, 5, 6, 10, 15, 30 s 1 min
1st to 40th harmonic current per phase		
Total harmonic distortion THD per phase		
Active energy - input Active energy - output Reactive energy - inductive Reactive energy - capacitive Apparent energy	1, 2, 5, 6, 10, 15, 30, 60 min	

C.3 Averaging times and thresholds (fault value measurement)

The averaging times for measurements in the event of a fault are determined independently of the averaging times for continuous recording. In addition, at least one threshold value must be defined for each measured quantity.

Table C-2 Averaging times and threshold values for recording in the event of a fault

Measured value	Averaging times	Number of thresholds
RMS values phase-ground voltages or phase-phase voltages	**for 50Hz nominal frequency** 10, 20, 50, 100, 500 ms, 1, 2, 5, 6, 10, 15, 30 s, 1, 2, 5, 6, 10, 15, 30, 60 min **for 60Hz nominal frequency** 8, 16, 33, 50, 66, 83, 100, 116, 133, 150, 166, 183, 200, 500 ms, 1, 2, 5, 6, 10, 15, 30 s, 1, 2, 5, 6, 10, 15, 30, 60 min	5
RMS value phase currents		
Nominal frequency	1, 2, 5, 6, 10, 15, 30 s 1, 2, 5, 6, 10, 15, 30, 60 min	2
Active power (per phase and total)		
Reactive power (per phase and total)		
Apparent power (per phase and total)		
Power factor (per phase and total)		
Balance current and voltage		5

Table C-2 Averaging times and threshold values for recording in the event of a fault

Measured value	**Averaging times**	**Number of thres-holds**
1st to 40th harmonic voltage per phase	1, 2, 5, 6, 10, 15, 30 s 1, 2, 5, 6, 10, 15, 30, 60 min	2 per harmonic
1st to 40th harmonic current per phase		
Total harmonic distortion THD per phase		2

References

/1/ *SIMEAS Q, Application Description*
C53000-B874-C204-5

/2/ *SIMEAS Q Parameterization, Manual*
E50417-H1076-C265-A1

/3/ *SIMEAS Q Manager, Manual*
E50417-H1076-C111-A3

Glossary

A_{st}, A_{lt} — A measure of interference sensitivity (st = short term; lt = long term)

Averaging time — The averaging time is a multiple of the → time base. Extreme values are calculated over the averaging time.

Balanced system — Polyphase network in which all phases are loaded evenly with loads

Binary outputs — Output of binary signals (high and low) to switch relays.

Byte — Unit of information consisting of 8 bits (octet).

Checkbox — Are used to activate and deactivate functions. More then one checkbox in a group can be active at the same time.

Classic method — Algorithm for calculating power in a → balanced system without taking the harmonics into account.

Continuous recording — Continuous recording of the measured quantities in a user-specifically defined time base.

Converter — Adapter for connecting different standardized interfaces.

cos φ — Power factor

Data window — Window for entering data.

Expanded method — Algorithm for calculating power in an → unbalanced system taking the harmonics into account.

Fault value recording — Only measured values that exceed user-defined → threshold values are stored. They are stored with a timestamp.

Flicker — Measure of voltage fluctuations in the low-voltage distribution.

FT	Abbreviation of file transfer
Gender Changer	An adapter allowing connection of two connectors with the same gender.
GSD file	Geräte-Spezifische Datei = device-specific file
Master	Higher-level device that monitors and controls lower-level devices (→ slaves).
Navigation window	Forms the program structure of the measurement settings. By clicking or double-clicking on the structure icons you can "navigate" between the various parameter groups and dialog boxes.
Negative sequence component	Polyphase system in which the phases P1, P2, and P3 are offset counterclockwise by 120°.
Parameter numbers	→ PNU. Part of the unique designation of the measured quantities. The identifier consists of the PNU and → subindex.
PNU	→ Parameter numbers
Positive sequence component	Polyphase system in which the phases P1, P2, and P3 are offset clockwise by 120°.
P_{st}, P_{lt}	A measure of interference effect (st = short term; lt = long term).
Radio button	Are used to activate and deactivate functions. Only one radio button in a group can be active at any one time.
SIMEAS Q	**SI**emens **MEAS**uring **Q**uality Network quality recorder
SIMEAS Q parameterization	Parameterization software for SIMEAS Q.
Slave	Lower-level device that is monitored and controlled by a higher-level device (→ master).
sql file	Extension for parameter files
Standard parameter set	Parameter data set preset in the factory in the SIMEAS Q and in SIMEAS Q parameterization.

SU	Daylight-saving/standard time switchover
subindex	Part of the unique designation of the measured quantities. The identifier consists of the → PNU and subindex.
THD	Total harmonic distortion
Threshold value	Limit value that triggers and action, e.g. status message, warning, shut-down, etc. For a measured quantity, it is possible to define several threshold values that trigger classified actions.
Time base	Time in which a mean value is formed from the sampling values. These mean values are used to calculate extreme values over the → averaging time.
Time information	Date and time of an event.
Time stamp	→ Time information
Unbalanced system	Polyphase network in which not all phases are loaded evenly with loads.
Validity	The validity bit indicates the status **valid** or **invalid**.

Index

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