SICARO Q Manager

Software for Network Quality Recorder SIMEAS Q

Manual

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Notes on Safety

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

Danger

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

Warning

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

Caution

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

Note

is important information about the project, handling the product, or the part of the documentation in question, to which special attention must be paid.

Qualified Personnel

Commissioning and operation of the equipment (module, device) described in this manual must be performed by qualified personnel only. As used in 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 will carry dangerous voltages. Severe injury or damage to property can occur if the appropriate measures are not taken:

- Before making any connections at all, ground the equipment at the PE terminal.
- Hazardous voltages can be present on all switching components connected to the power supply.
- Even after the supply voltage has been disconnected, hazardous voltages can still be present in the equipment (capacitor storage).
- Equipment with current transformer circuits must not be operated while open.
- The limit values indicated in the manual or the operating instructions must not be exceeded; that also applies to testing and commissioning.

Foreword

This manual describes the functions of the **SICARO Q Manager V2.30** software.

This manual is intended SIMEAS Q users.

Scope of validity of this manual

This manual is valid for the **SICARO Q Manager V2.30** software.

This version is suitable for SIMEAS Q devices of the generation 2 working with firmware version 2.20

Standards

The development of the **SICARO Q Manager V2.30** software has been executed according to the principles of ISO 9001:2000.

Further support

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

Hotline

Questions regarding **SICARO Q Manager** and **SIMEAS Q** will be answered by our Hotline in Nuremberg:

Siemens AG
Customer Care Center
Humboldtstr. 59
D-90459 Nuremberg

Telefon +49 (0)180 / 5247000
Fax +49 (0)180 / 5242471
E-Mail ptd.support@siemens.com

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

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Product Overview

1

General information

With the **SICARO Q Manager**, measured data of SIMEAS Q devices can be called, archived and analyzed. For data transmission, the SIMEAS Q devices are connected with the PC.

The archived measured data can be further processed directly with **SICARO PQ**. Additionally, the measured data can be exported for processing with other programs (e.g. Microsoft Excel).

Functional scope

The **SICARO Q Manager** software enables the following functions:

- ❑ Setting up of a graphic system structure with the connected SIMEAS Q devices.

  This system structure simplifies controlling the software during active operation.

- ❑ Parameterizing the measurement settings of each single SIMEAS Q device.

  How a certain measured variable is to be recorded can be determined for each SIMEAS Q device.

- ❑ Remote control of the data acquisition via a PC.

- ❑ Transferring measured data

  In the process of data transmission, the measured data stored in the SIMEAS Q devices are called.

- ❑ Archiving measured data.

  The measured data is stored in an archive. After archiving, the measured data can be analyzed with the SICARO PQ software and reports can be created. The basis for these reports are standards such as EN 50160 and IEC/EN 61000-2-2 for the network quality.

- ❑ Displaying retrieved measured data

  The display of measured data is effected in alphanumeric or graphic form.

- ❑ Automatic, cyclic time setting of all connected devices, to adjust the integrated time module with the PC system time.

- Conversion of stored measured data in a text format (ASCII).

  After the conversion the data can be further processed with a suitable software such as Microsoft Excel.

- Updating device-firmware

Compatibility

With the **SICARO Q Manager V2.30**, you can continue to use existing projects as of version **V2.12**. Data is automatically converted when the old project is opened for the first time. A new archive is generated which contains the existing measured data. The old data is saved.

Setting up the Software

2

Overview

See the following for information on the setup of the **SICARO Q Manager V2.30** software.

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2.1 Software requirements

SICARO Q Manager is a 32-bit-application which is executable under the following operating system:

- Windows XP Professional including Service Pack 2

The **SIMEAS Q PAR** software is required to define the device addresses as well as the connection parameters (baud rate, modem initialization) of the SIMEAS Q devices. It is available on the **SICARO Professional** CD and the **SICARO Basic** CD.

If you use SIMEAS Q devices equipped with a PROFIBUS interface, you must first set up a PROFIBUS communications processor in the PC and configure the PROFIBUS DP network. Subsequently to these two preliminary steps, the **SICARO Q Manager** is able to work with PROFIBUS network and the SIMEAS Q devices connected. The COM PROFIBUS software is required for configuring the PROFIBUS DP network. As a rule, this software is delivered with the DP-5412 runtime software or with the SOFTNET DP runtime software.

You can choose all modems available via the Windows system settings.

2.2 Hardware requirements

System requirements:

The computer must comply with the hardware requirements of the operating sytem used.

- A serial standard interface (COM1,...) is required if SIMEAS Q devices with a RS232 interface (7KG8000-8B.20) or with a RS485 interface (7KG8000-8C.20) are connected directly to the PC, i.e. without using a modem.
- If the connection to the SIMEAS Q devices with RS232 interface (7KG8000-8B.20) or with a RS485 interface (7KG8000-8C.20) is realized via a modem, a dial-up modem (Hayes standard) is required on the PC side. This modem can be implemented as a plug-in board or a desktop unit.
- If the connection to the SIMEAS Q devices is realized via a PROFIBUS network, the PC must be upgraded to become a PROFIBUS master. For this purpose, one of the following Siemens communication processor modules must be installed in the PC together with the corresponding runtime software:

  - CP5412 (A2) with the corresponding DP-5412 runtime software
  - CP5411, 5611 with the corresponding SOFTNET DP runtime software

2.3 Installation of SICARO Q Manager

You install the **SICARO Q Manager** software via a setup program.

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.

Software Functions

3

Overview

This chapter provides an overview of the functional scope of the **SICARO Q Manager** software.

As the following instructions are sequential, you should proceed step by step:

- Create a SICARO Q Manager example project.
- Configure the measurement settings.
- Define the display mode and the way of transmission of measured data in the example project.

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3.1 Requirements

Before you start to work with the **SICARO Q Manager V2.30** software, make sure that the following hardware and software requirements are met:

- For connecting the devices, the corresponding interfaces must be available and configured.
  - **PROFIBUS**
    The CP5412 (A2) communications module or, as an alternative, one of the CP5411, CP5411 (PCMCIA) or CP5611 communications modules including the corresponding driver software (DP5412 or SOFTNET) has been installed and configured. PROFIBUS system is duly configured (see chapter 3). SIMEAS Q devices equipped with a PROFIBUS interface (7KG8000-8A.20) are connected to the PROFIBUS. The devices are in the recording mode (LED “BF” does NOT light up continuously).
  - **RS232/RS485 interface**
    SIMEAS Q devices in the versions with a RS232 interface (7GK8000-8B.20) or with a RS485 interface (7KG8000-8C.20) which are intended for a direct or modem communication are connected to the PC via a serial interface by means of a cable or a RS485 bus system. The connection settings (transfer rate, device address) in the devices have been specified and the devices are in the recording mode (LED “BF” does NOT light up continuously).
  - **RS232/RS485 interface via Modem**
    If the communication to SIMEAS Q devices with a RS232 interface (7GK8000-8B.20) or with a RS485 interface (7KG8000-8C.20) is to be performed via a modem, the modem must be set up and connected via the Windows system controls on the PC side. On the SIMEAS Q side, the modems must be configured to the specific requirements (Hayes modem commands) and connected to the SIMEAS Q devices. As a preliminary step, however, the connection settings (transfer rate, device address, modem initialization string) must have been specified in the SIMEAS Q devices by means of the SIMEAS Q Parameterization software. Also in this case, the devices must be in the recording mode (LED “BF” does NOT light up continuously).
- The **SICARO Q Manager** software has been installed successfully (see Chapter 2).
- Your master PC provides enough storage capacity. The storage capacity required for this purpose depends on the data volume to be recorded. As a rule, 14 bytes are necessary for storing of one measured value.

Note The PROFIBUS tools only required for SIMEAS Q devices with a PROFIBUS interface (7KG8000-8A.20).

3.2 Launch SICARO Q Manager

Launching the program

After a successful setup of **SICARO Q Manager**, start this program as follows:

- Start the program via the Windows start menu:
  Start → Power Quality → SICARO Q Manager → SICARO Q Manager.

  The main window is displayed. First, an empty project named **Untitled** is loaded. You recognize this by:

- the project name **Untitled** in the title bar of the main window and
- the graphic display. Here, only the graphic icon of the master station is displayed as PC.

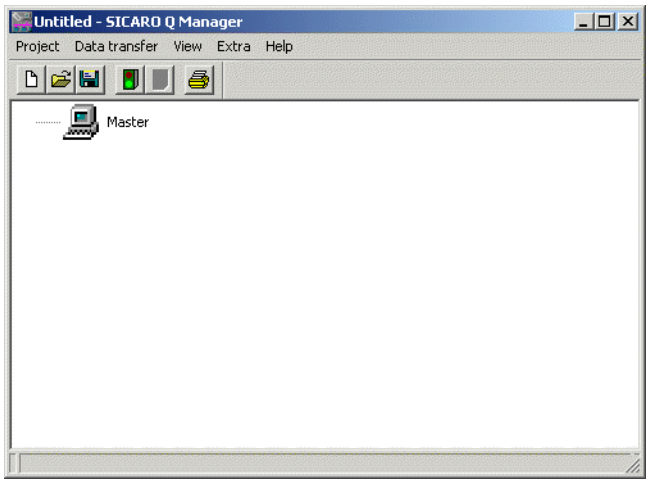


Fig3_01.gif

Figure 3-1 Main window of SICARO Q Manager

3.3 Changing the language

The user interface of the **SICARO Q Manager** software is displayed in the language in which it was set up.

You can change the language at any time by proceeding as follows:

- ❑ Select **Extras** → **Language**.

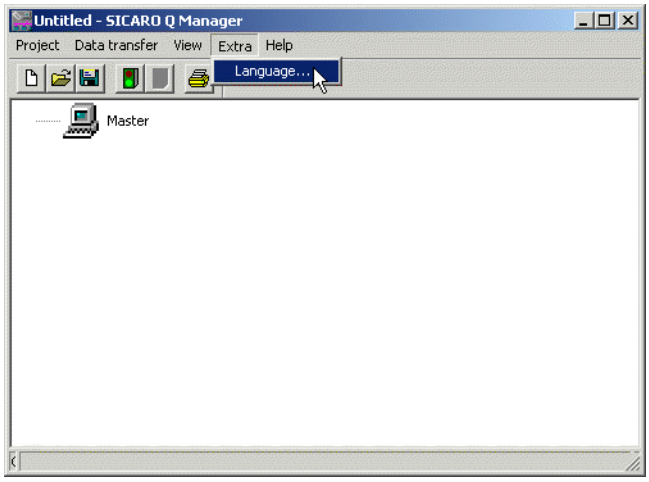


Fig3_02.gif

Figure 3-2 Setting the language

The **Language** dialogue window is displayed.

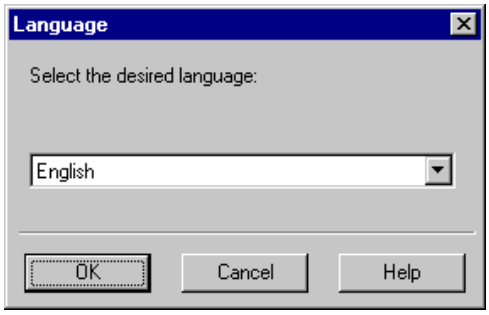


Fig3_03.gif

Figure 3-3 Language selection window

- ❑ Select the desired language **English** from the drop-down list box.
- ❑ Confirm your selection with **OK**.

  Now you have to restart **SICARO Q Manager**.
- ❑ Terminate **SICARO Q Manager** via **Project** → **Close**.
- ❑ Restart **SICARO Q Manager**. After the restart, the **SICARO Q Manager** software displays menu text, dialogue text etc. in the selected language.

3.4 Main window user interface

The user interface of the **SICARO Q Manager** program complies with Windows conventions.

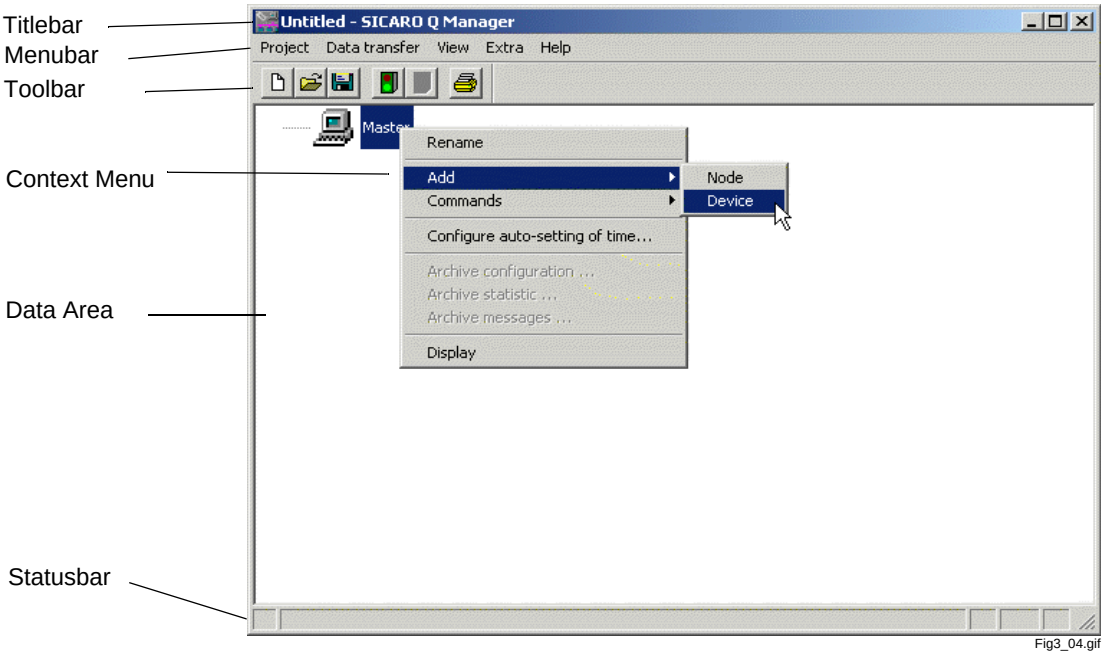


Figure 3-4 User interface of the SICARO Q Manager program

Titlebar The name of the currently loaded SICARO Q Manager project is displayed in the titlebar.

Menubar Access the individual program functions via the menu bar.

Toolbar The icons of the toolbar enable you to execute the mostly required program functions:

- Create new project
- Open project
- Save project
- Start data transfer
- Stop data transfer
- Print project

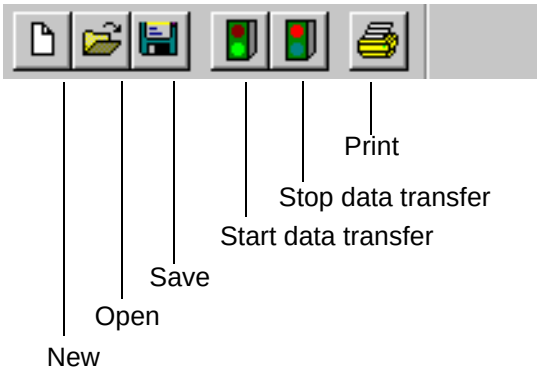


Fig3_05.gif

Figure 3-5 Icons of the toolbar functions

Data area

In the data area of the main window, the project is represented as a tree structure. The data area serves to execute the following functions:

- Creating and editing the system structure of a project.
- Via the system structure
  - you control the data recording.
  - you specify the measurement settings of individual devices, i. e. you determine the recording method of individual measured variables.
  - you open the display window. This window serves to display received measuring data during the data transfer.
  - you call the device status (status of the data recording, memory utilization) as well as the identification data (device address, order number, manufacturing number) of individual SIMEAS Q devices. (Not for SIMEAS Q devices equipped with a 7KG8000-8Ax20 PROFIBUS interface)
  - you specify in the SICARO Q Manager program the connection path for contacting an individual device.

Context menu

Depending on whether you have selected an entry and depending on which one you have selected, you can call up context menus with the right mouse button. The context menu comprises those program functions which are valid for the current selection.

- Select a program function from the context menu by left-clicking it.

Statusbar

Depending on the processing status, the statusbar displays current settings and information:

- Move the cursor on a toolbar or menu item to get information about the selected function displayed in the statusbar.
- In addition to this, the statusbar informs you whether the data transfer is currently in progress.

3.5 Creating and editing a project

During this procedure you build up a graphic system structure depending on the given conditions.

Your overall measuring system consists of several SIMEAS Q devices which are installed in different system sections or subsections. The system structure enables you to display the entire measurement system clearly in a graphic tree structure.

To do this, you can virtually define individual system sections by means of nodes. These system sections can be subdivided via additional nodes. One or several SIMEAS Q devices shall be allocated, i.e. added to each system section. These devices are installed in this system section. The designation of the system sections and of the individual SIMEAS Q devices enables you to easily and quickly select a certain measuring point during the usual data capture and display operation of the SICARO Q Manager software.

After calling the SICARO Q Manager program, the empty project **Untitled** is loaded. This project contains only the master icon to which no devices are allocated.

Creating a new project

If a SICARO Q Manager project is already displayed on your screen, you will have to create a new project **Untitled**:

- ❑ Click on the **Project new** toolbar button.

  Or as an alternative:

- ❑ Open **Project** → **New**.

  The **Untitled** data window is displayed.

Renaming the Master

Assign a unique name to the Master so you can easily identify the project e.g. in SICARO PQ. Proceed as follows:

Right-click the Master and select **Rename** from the context menu.

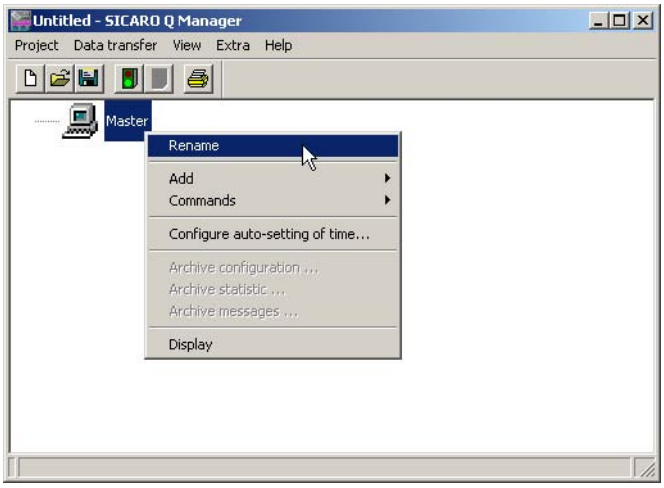


Figure 3-6 Renaming the Master

- ❑ Enter the new name of the Master in the text box.
- ❑ Confirm your entry with the **ENTER** key.

  The new name is displayed.

Saving the project

Save the newly created project. Any following actions (create/delete devices) are thus stored in the archive as messages.

Proceed as follows:

- ❑ Select **Project** → **Save** from the menu bar.
  The **Save as** dialog box is displayed.
- ❑ Select the desired directory.
- ❑ Under **File name**, enter the desired project name.
- ❑ Click **Save**.

Adding a device

To allocate a SIMEAS Q device to a master, proceed as follows:

- ❑ Select the master icon in the main window.
- ❑ Select **Add** → **Device** from the context menu.

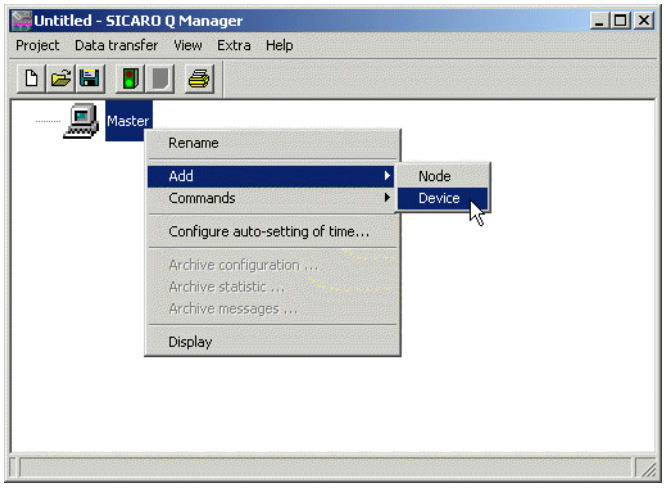


Fig3_06.gif

Figure 3-7 Add device dialogue window

- A SIMEAS Q device icon (with standard designation) is displayed below the master icon. **Device 1** is the standard device name.

  The data window now displays the icon of a SIMEAS Q device allocated to the master.

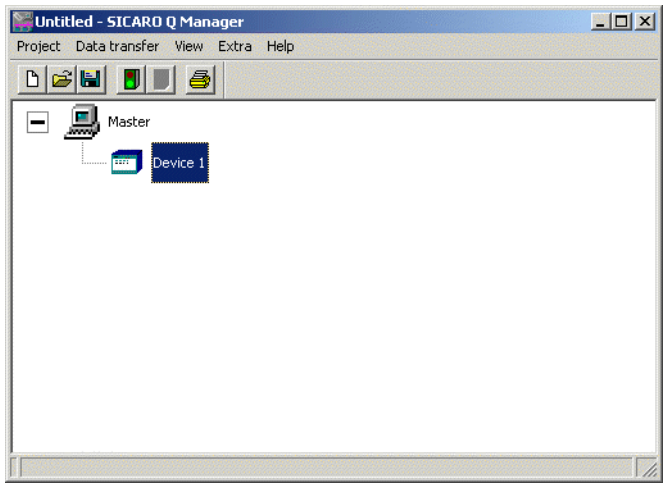


Fig3_07.gif

Figure 3-8 Master with 1 device

Renaming a device

How to rename a device:

- ❑ Select the device which should be renamed.
- ❑ Select **Rename** from the context menu.

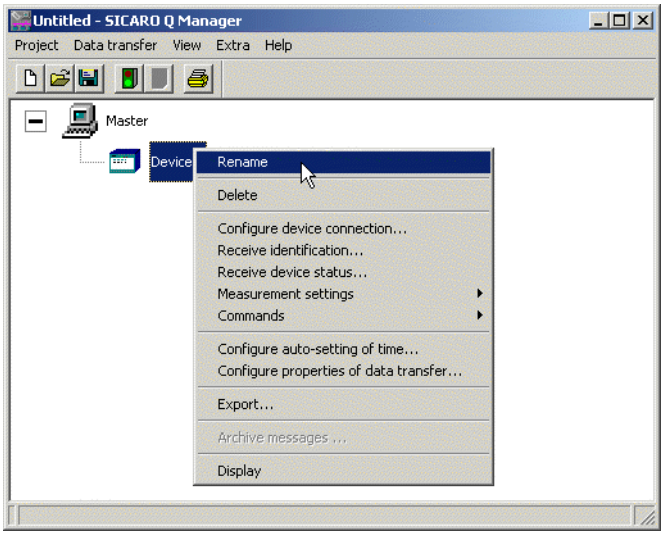


Fig3_13.gif

Figure 3-9 Rename device (according to the same principle already described for the node and the master)

- ❑ Enter the new name for the device into the text box.
- ❑ Confirm your entry with the **ENTER** key.

  The new device name is displayed.

Note:

The same principle is used for renaming nodes.

Adding a node

Structure the project by adding one or several nodes. The node does not influence the functionality.

So fügen Sie dem Projekt einen Knoten hinzu:

- ❑ Select the master icon in the data area.
- ❑ Select **Add** → **Node** in the context menu.

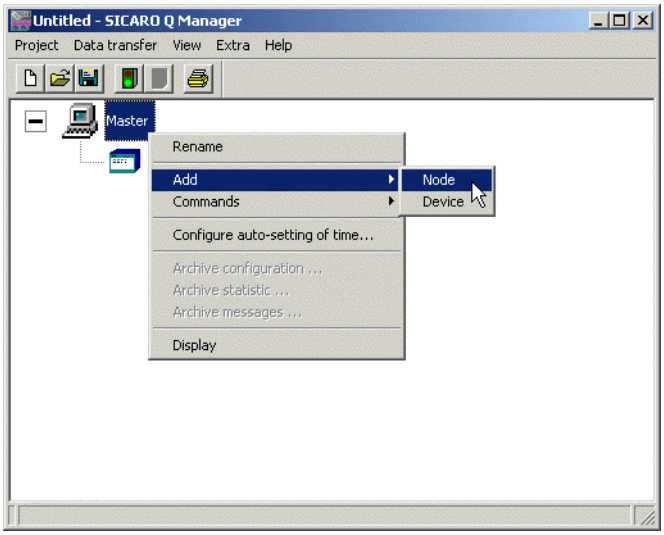


Fig3_08.gif

Figure 3-10 Adding a node from the context menu

A node is now added to the project structure.

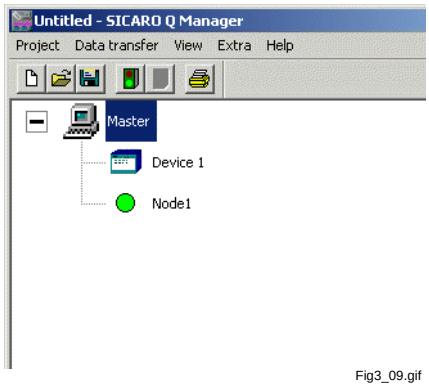


Fig3_09.gif

Figure 3-11 Project structure including the master and “Node 1”

Use the corresponding context menu if you want to add a subnode or a device to an existing node in the project structure.

Removing a device To remove a device, proceed as follows:

- ❑ Click on the device which you want to remove and call the context menu.

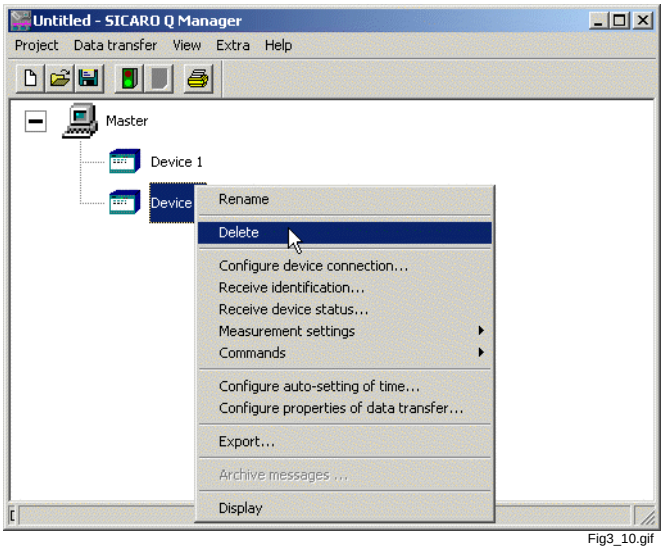


Fig3_10.gif

Figure 3-12 Remove device dialogue window

- ❑ Select **Delete** from the context menu.

  The selected device is deleted from the data window.

Removing a node

In order to remove a node, proceed as follows:

- ❑ Select the node which you want to remove and call the context menu.
- ❑ Select **Delete** from the context menu.

The selected node is removed from the data window.

Note:

The devices allocated to the node are deleted, too.

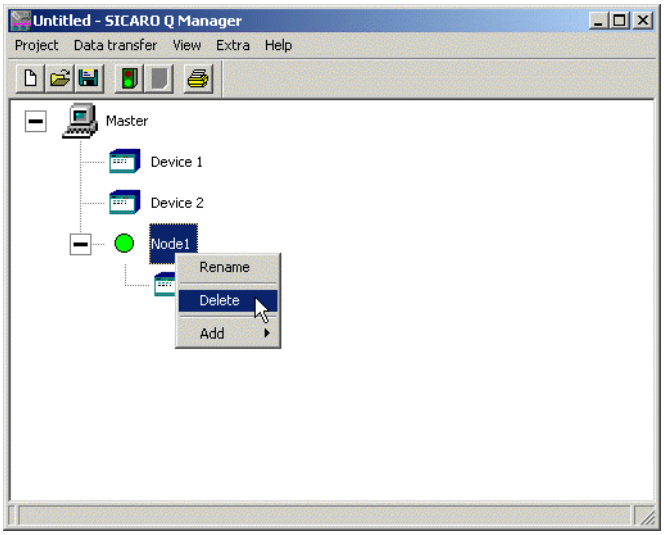


Fig3_11.gif

Figure 3-13 Remove node dialogue window

Saving the project

Save the project to accept the changes.

- ❑ In the toolbar, select the **Save** symbol.

Or:

- ❑ Select **Project** → **Save** from the menu bar.

Exiting the program

To exit the SICARO Q Manager program, proceed as follows:

- ❑ Click **Project** → **Exit**.

The program is exited and you return to the Windows user interface.

Note:

If the changes have not been saved yet, a corresponding message is output when exiting the program.

Opening an existing project

To open an already created project, proceed as follows:

- ❑ Start the **SICARO Q Manager**.
- ❑ Select **Project** → **Open...** from the menu.

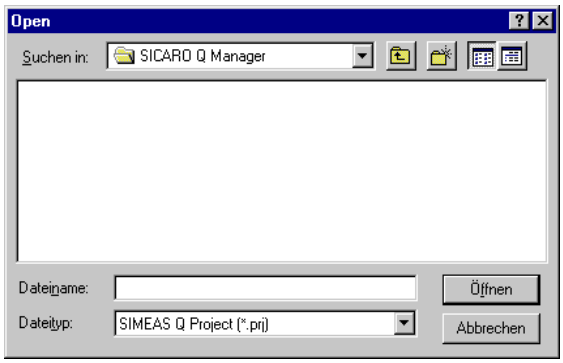


Figure 3-14 Open file dialogue window

Select the desired folder via the file dialog box and then the project file you want to open. Project files have the file attribute *.prj.

- ❑ Open the project by double-clicking the project file.

Or alternatively:

- ❑ Select the project file and click **Open**.
- ❑ The system structure of the selected project is displayed in the data area.

3.6 Specifying the device connections

Important:
The connection settings specified in this context must be identical with the settings of the corresponding device. The connection settings are specified in the device by means of the **SIMEAS Q PAR** software within the framework of commissioning.

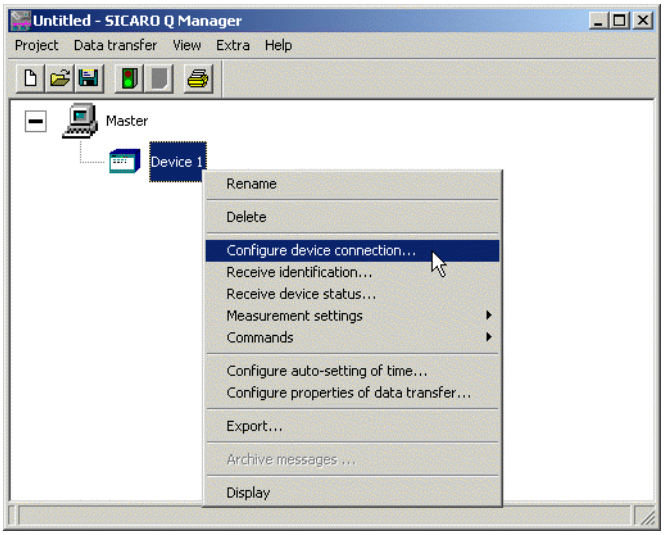


Figure 3-15 Configure device connection

Selecting the device connection

Click on **Configure device connection...** in the context menu of the device. The **Set device connection** dialogue window is displayed.

The displayed window provides the following setting options:

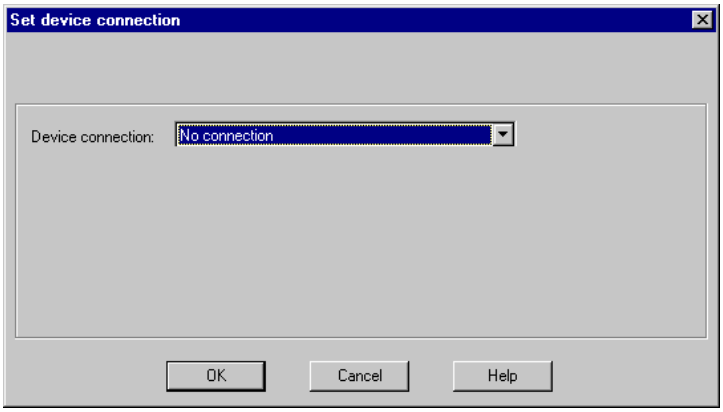


Fig3_16.gif

Figure 3-16 Set device connection dialogue window

Selecting the connection type

The following connection types can be selected from an additional drop-down list box designated **Device connection**:

- **No connection**
- **PROFIBUS DP**
- **Direct connection**
- **Modem connection**

Note:
According to the selected connection type the design of the dialogue window may vary.

Specifying the device address

The **Device** drop-down list box serves to specify the device address by selecting a number from the **Device address** list box (e.g. 2).

Note:
To establish a connection with the device, the specified address has to match with the device address, configured with the SIMEAS Q Parameterization software.

PROFIBUS DP connection type

If you select this connection type, the **Board number** drop-down list box is displayed. This box serves to select the number of the board to which you actually connect the SIMEAS Q device. As a rule, only one communications processor board is installed in a PC. In this case, the board number is 1.

Select your board number and click on **OK**.

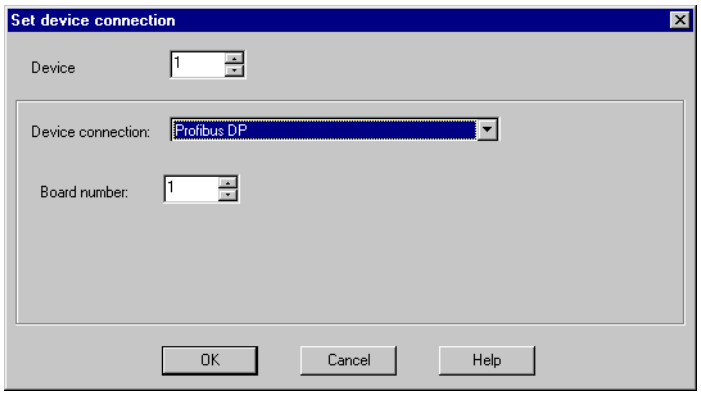


Fig3_17.gif

Figure 3-17 Dialogue window for selecting the desired PC interface- PROFIBUS DP option selected from the drop-down list box

Direct connection

Select this connection type to connect SIMEAS Q devices with RS232 (7KG8000-8B.20) or with a RS485 interface (7KG8000-8C.20) directly to the PC, i.e. without using a modem. The **Interface** drop-down list box is displayed upon clicking this connection type. Specify the COM interface to which this device is connected, e.g. COM2.

The **baud rate** drop-down list box serves to specify the transfer rate (baud rate), e.g. 115.200 bits/sec. In case of long connection lines, it may be possible that this high transfer rate cannot be reached - select a lower rate.

The **RS485 - converter reflecting data** check box is positioned below the **baud rate** drop-down list box. Check this box if the RS232/RS485 adapter used reflects received characters, which is the case for some RS232/RS485 adapters available on the market. The adapter delivered with the RS232/RS485 cable set of the SIMEAS Q Parameterization kit actually is a reflecting adapter. Consequently, you check the box if you use it. However, the box must not be checked for RS232 connections!

IMPORTANT:
The specifications performed in this context must correspond to the specifications of your individual device.

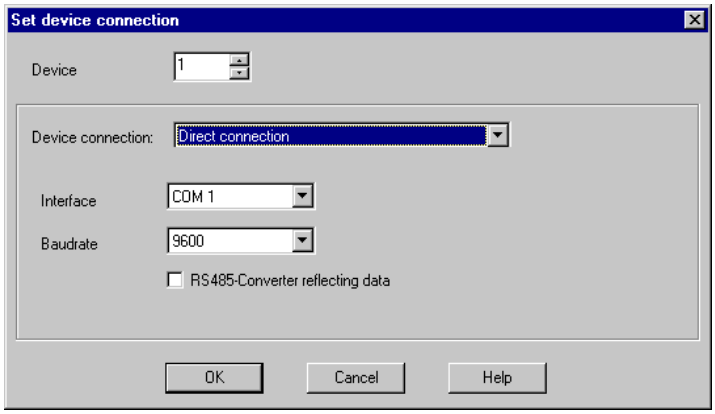


Fig3_18.gif

Figure 3-18 Dialogue window for selecting the desired PC interface - direct connection option selected from the drop-down list box

Modem connection

Select this option if the corresponding SIMEAS Q device is to be connected to the PC via dial-up modems and a telephone network. The SICARO Q Manager software uses modems installed under Windows. For this reason, all modems installed via the **Windows system controls** are available for the SICARO Q Manager.

If you select the modem connection option, a new drop-down list box is displayed. Select the modem to be used with SICARO Q Manager. Click on **Configure modem** to access directly the modem settings of the Windows system controls. If required, you can perform changes here.

IMPORTANT:

The modem transfer rate specified in the Windows system controls must be identical with the SIMEAS Q transfer rate!

As a last step, enter the desired **Telephone number** into the corresponding box. You can also enter additional control characters such as “,” (1 sec pause during dial-up waiting for exchange line in case of private exchange branches). More detailed information on this subject is provided in the documentation delivered with your individual modem.

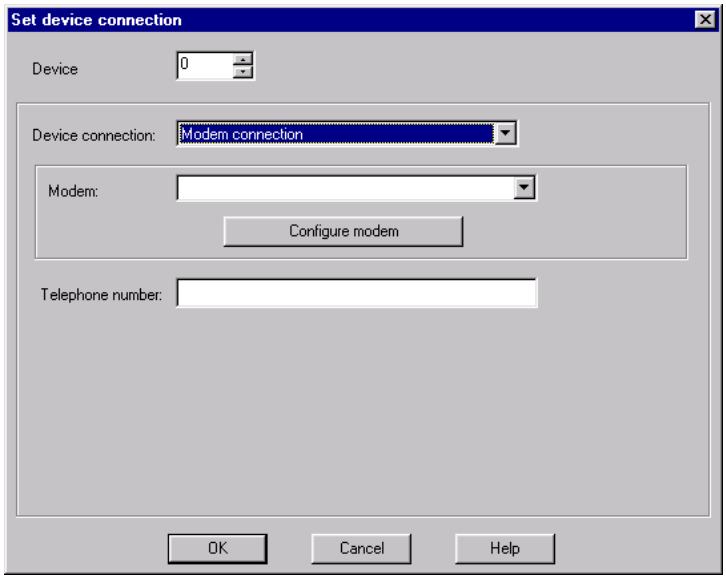


Fig3_19.gif

Figure 3-19 Dialogue window for selecting the desired PC interface - modem connection option selected from the drop-down list box

Note:
As soon as the connection types of all devices existing in the project have been specified, the project must be saved to permanently accept the settings performed.

The system structure graphically represents the device connection type to the left of the device icon. If this is not the case for a certain device icon, this means that the connection settings have not yet been specified and the device in question is not yet ready for communication.

Note:

The connection to the devices can be checked with the **Receive identification** function (see section 3.7).

3.7 Receiving the identification of the SIMEAS Q devices

The **SICARO Q Manager** software allows you to call and display identification data of a connected SIMEAS Q device.

This function is particularly useful as it provides an overview of the features of the connected devices.

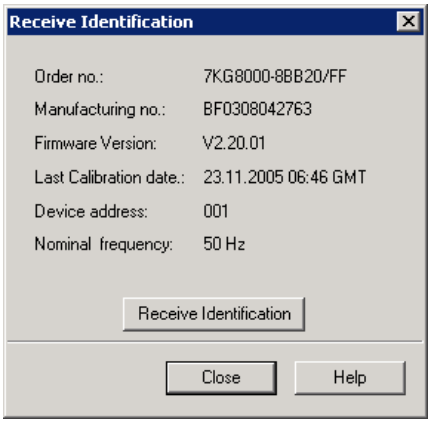


Figure 3-20 Receive identification dialogue box

Procedure

Select **Receive Identification** from the context menu of the corresponding device. The related dialogue box is displayed.

In the dialogue box, click on **Receive Identification** to display the following information on the corresponding device:

- **Order number**
- **Manufacturing number**
- **Firmware version**
- **Latest calibration date**
- **Device address**
- **Network frequency**

Click **Close** to exit the dialogue window

Note:

Receiving the identification is only possible if the connection settings are parameterized correctly.

NOTE:

Be aware of the **Nominal frequency** specified in the SIMEAS Q device. If the calibrated and the specified frequency are not identical, SIMEAS Q will deliver wrong measuring results! Restart the device after each network frequency change (see Chapter 3.9.2).

As soon as you have created a new project and specified the connection types of all devices, this function is available for testing the communication with the individual devices. To do this, execute consecutively the **Receive identification** function for all devices. The overall system is ready for communication if the SICARO Q Manager software is able to display the identification data of each individual device.

NOTE:

The **Receive identification** function is not available for SIMEAS Q devices equipped with PROFIBUS interfaces!

3.8 Receiving the device status of a SIMEAS Q device

Receiving device status

Access this function via the **context menu of the device**. The following window is displayed when selecting this function:

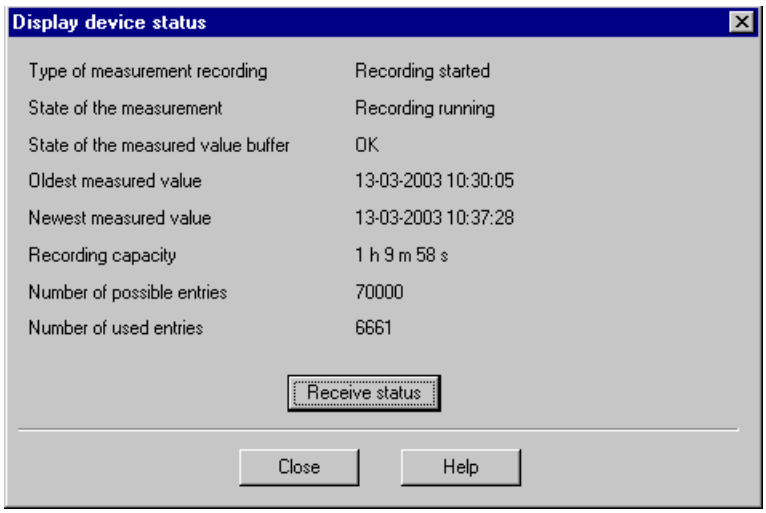


Figure 3-21 Device status dialogue window

This dialogue window serves to retrieve information on the measuring data recording and the memory allocation of the SIMEAS Q device.

Attention:

This function is only available for **RS232 devices (7KG8000-8B.20)** and **RS485 devices (7KG8000-8C.20)**. (For devices equipped with a PROFIBUS interface, this function is displayed in gray, which means that it is deactivated and cannot be executed.

This function is particularly useful for specifying the cycle time of the automatic data transfer (see also Chapter 3.17).

The information is mostly self-explaining. Examples of information displayed via this function:

Type of measurement

- No recording started
- Recording started
- Start recording from...
- Recording over time interval

State of the measurement

- Recording not started
- Recording running
- Recording not running
- Waiting until time condition is fulfilled

State of measured-value buffer

- OK
- Buffer overflow

Recording capacity

Indicates the period for which the storage capacity is still sufficient, i.e. the period before a buffer overflow.

Number of possible entries

- 70,000 measured values
  If the SIMEAS Q device only captures measured variables via the continuous recording option, the overall measuring data memory can be reserved for this purpose. In this case, the storage capacity amounts to 70,000 measured values (value plus time stamp).
- 42000 when the MIN/MAX measured values are on
  When detecting MIN/MAX measured values, 42000 values can be stored.
- During disturbances, additional measured values are detected. Thus, the memory is filled much faster and the values stated above are not valid.

Number of used entries for continuous measurement

The storage capacity remaining for additional measured values can be calculated by comparing the value indicated here with the above-mentioned storage capacity. In this way, the user can easily find out the moment when the data transfer should be activated again. This feature is particularly interesting when the data transfer was interrupted for a certain time.

Note:

The principle objective is to record an uninterrupted measured value chain for longer periods in the PC as this is the only method allowing a correct network quality analysis over a certain period of time.

3.9 Specifying measurement settings

The context menu of the devices provides the following functions at the **Measurement settings** menu item:

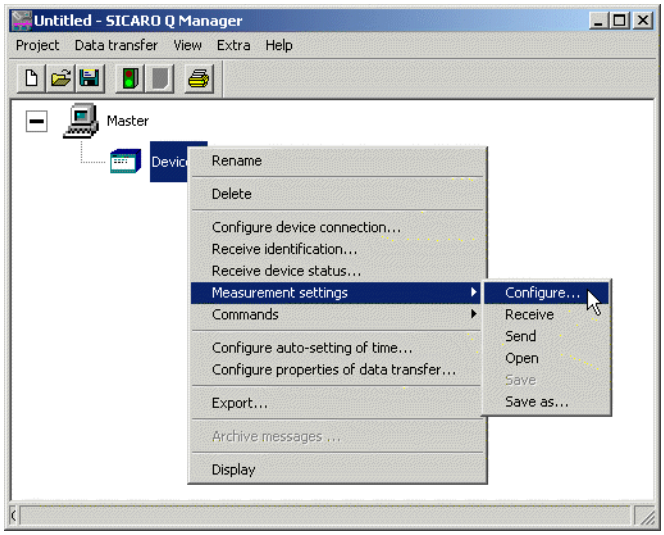


Fig3_22.gif

Figure 3-22 Measurement Settings context menu

Configure

Via this menu item you can access the **Measurement settings** dialogue window for specifying the SIMEAS Q measurement settings. Here you can perform the measurement settings of the selected SIMEAS Q device according to your requirements. Upon calling the **Configure...** function, the dialogue window displays the settings stored in the PC by that time.

These are:

- ❑ after you have opened a project, the measurement settings of the device which were saved together with the project
- ❑ after you have executed the function **Measurement settings** → **Receive**, the settings stored in the SIMEAS Q device by that time
- ❑ after you have executed the function **Measurement settings** → **Open**, the settings which are saved in the settings file (*.SQD) can be selected in this dialogue window.

Receive

Via this function, the current settings in the SIMEAS Q are called by the master.

Send	Via this function, the settings existing in the PC are sent to a device. You have to execute this function to activate new measurement settings. Prerequisite: The measurement has been stopped and the measured data memory deleted.
Open	This function serves to open an individual parameter file. In this way, you can use parameter files created by means of **SIMEAS Q Parameterization** also in the SICARO Q Manager software.
Save	Via this function you save individual settings files in the project.
Save as	This parameter file can be saved under a individual path and file name and can be used for the parameterizing of further devices. That guarantees consistent settings of each SIMEAS Q.

Note:

After you have performed certain measurement settings, you will have to send them to the respective device.

Having executed this procedure for all devices, you will have to save your project again. Only by doing this, it is ensured that the settings in the project and in the devices are identical.

Note this requirement must be met for the SICARO Q Manager software to be able to display the correct measured variables, which were actually captured, in the individual display windows!

3.9.1 Configuring measurement settings (overview)

The dialogue window for the parameterization is divided into two areas:

- ❑ Navigation window (left)
- ❑ Data window (right)

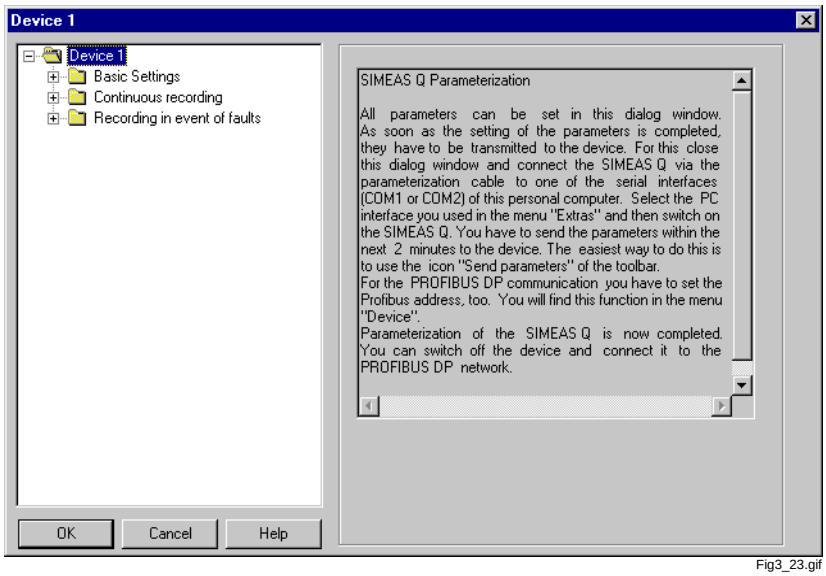


Figure 3-23 Measurement settings dialogue window

Navigation window

The navigation window is structured like the Windows Explorer.

The measurement settings in the navigation window are subdivided into three groups:

- ❑ **Basic settings**
- ❑ **Continuous recording**
- ❑ **Recording in events of faults**

Each group branches further into the level of data sheets.

Data window

In the data window you see the data sheets you have opened via the navigation window.

Data sheets

When creating a new project, the data sheets are pre-allocated with the values of the **Untitled** standard data set. These default measurement settings correspond to the respective average and limit values specified by the EN 50160 standard (features of the voltage in public power supply networks).

- ❑ Open the individual data sheets via the navigation window by selecting a single entry.

Configure the measurement settings by specifying the settings of the data sheets according to your individual requirements.

3.9.2 Specifying basic settings

Before selecting individual measured variables, you must first configure some basic settings.

Basic settings

This can be done in the navigation window at **Basic settings**. The following settings and measured variables belong to the basic settings:

- **Network settings**
  - Nominal frequency of the current supply network (50 or 60 Hz)
  - Network type (single-phase system, 3 wire network - Delta, 4 wire network - Star)
  - Nominal voltage
  - Transformer ratio of the primary voltage/current transformers, if the measured-values are to be captured in primary values (application description)
- **Function of the two relay outputs**
  (binary output 1 or binary output 2)
- **Other settings**
  - Calculation of the Flicker irritability factor in A or P values
  - Specification of the time base for the acquisition of maximum and minimum values
  - Specification of the period of time for recording measured values
  - Selection of the save mode

Network settings

Select **Network settings** in the navigation window (under Basic settings). The dialogue for the determination of these settings is displayed in the data window.

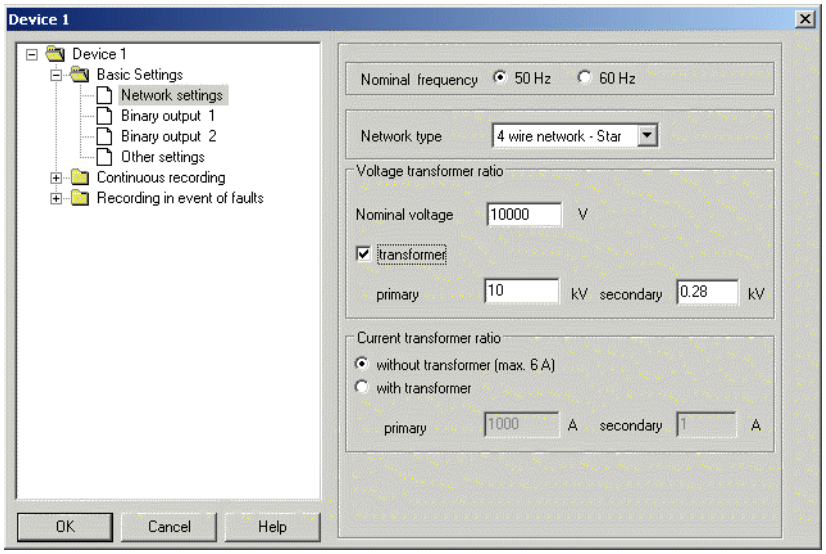


Fig3_24.gif

Figure 3-24 Network settings data sheet

Note:

Exworks SIMEAS Q is set for measurements in a **4 wire network- Star** with **50 Hz** and **230 V (L - N)**.

You can change the network data specified at any time and adapt SIMEAS Q to other networks (measuring areas).

- ❑ Select the option buttons of the network data which characterize your network.
- ❑ 50 Hz or 60 Hz as power 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. If you want to detect the secondary values, deactivate the **Transformer** option. Also for direct voltage measurement, e.g. in the 230 V system, deactivate this option. On the input side, the SIMEAS Q can measure voltages in a range from 0 to 280 V.
  If you deactivated **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 the **Transformer** is activated, the transformer ratio on the primary side can be specified in the range from 0.1 to 1000 kV and on the secondary side in the range from 0 to 280 V.
  Attention: The secondary voltage must always be specified in kV! The entry in the **nominal voltage** field serves as a calculation basis for the evaluation with 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.

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.

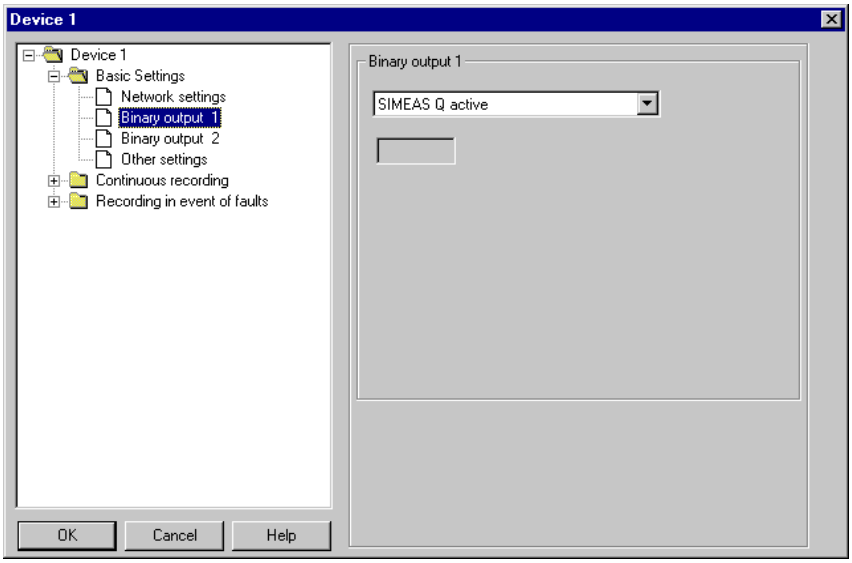


Figure 3-25 Binary output data sheet

Presetting

Binary output 1 is preset on **SIMEAS Q active** and binary output 2 is preset on **Voltage dip**.

In order to alter these settings, proceed as follows:

❑ In the navigation window under basic settings select **Binary output 1** or **Binary output 2**. The corresponding data window is opened and the present setting of the selected binary output is also selected.

Allocate the desired function from the drop-down list box to the binary output. Thereby, the following functions are available:

SIMEAS Q active

With the function SIMEAS Q active you can monitor whether the device is switched on (contact open). If the contact breaks off, the device is either switched off or disturbed.

Active/reactive/ Apparent energy export per pulse (kVA)

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 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 allocate this function to the binary output, the input (open contact) or the output (closed contact) of active power will be displayed.

Threshold value 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 allocate this function to the binary output, a pulse will be released, if a voltage dip occurs at this output.

A voltage threshold value which was configured during the recording of fault is used as 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.
- Enter a hysteresis as percentage value.
- 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 this function as an alarm indicator.

If the detected measured data are to be evaltuated with SICARO PQ later, the setting in accordance with the standard which is used for the reporting is to be made here.

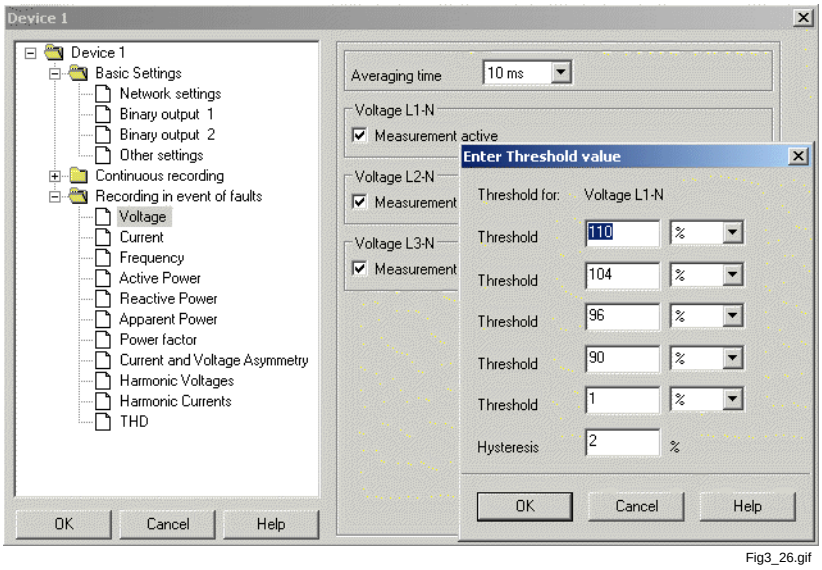


Fig3_26.gif

Figure 3-26 Enter Threshold value window

Other settings

This option makes available all remaining basic settings for the parameterization of SIMEAS Q.

You select the method of calculation for Flicker irritability factors and power calculation as well as the save mode and you define time and duration of the recording as well as the measuring interval for the extreme-value specification during continuous measuring.

Presettings

The preset values are shown in Figure 3-27.

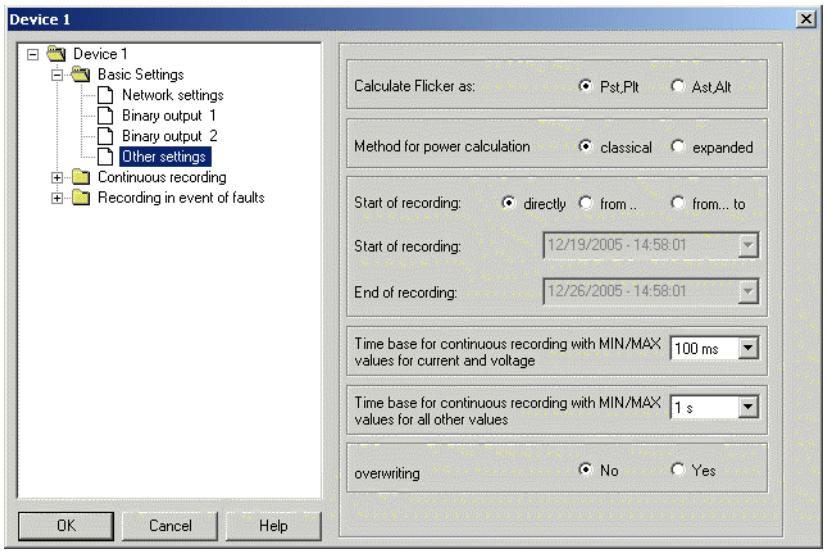


Fig3_27.gif

Figure 3-27 Basic settings - Other settings data sheet

To make changes, proceed as follows:

- Select **Other settings** in the navigation window below **Basic settings**. The data sheet (Figure 3-27) is opened in the data window.
- Execute the necessary settings. In the following, the meaning of the individual possibilities of entering are explained in detail.

Calculate flicker as

Flicker is a measurement of voltage fluctuations of low voltage distribution. The term flicker is defined as a fluctuating visual feeling, caused by a light stimulus whose light density or spectral distribution fluctuates after a while (see IEC 61000-3-3).

Flicker values can be calculated:

- ❑ through the weighting indicators P_{st} and P_{lt}
- ❑ through the weighting indicators A_{st} and A_{lt}.

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

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

A_{st} or A_{lt} is a measure for interference susceptibility.

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

Note:

P-values are used for the flicker calculation in the standard EN 50160. Therefore, these values are preset.

Method of power calculation

You can choose between either the classical method or the expanded method for the calculation of the power in a three-phase system.

- ❑ Choose the **classical** method when you measure in a balanced system, i. e. in a system in which the connected consumers cause a balanced load. Moreover, no harmonic voltages should occur in the system.
  This mode is preset.
- ❑ Choose the **expanded** calculation method when you measure in an unbalanced three-phase system. The harmonics are taken into consideration during the power calculation.

Start/End of recording and period of recording

Determine from when onwards and for which period of time measured data shall be recorded.

- ❑ Choose **directly** in order to be able to start with the recording without delay after the SIMEAS Q device has been connected to the y stem.
- ❑ Choose **from** or **from...to** and enter afterwards the relevant times in order to determine the start of recording and also, if necessary, the period of recording.

Warning:

The specification of the recording period by means of the settings is intended for using the SIMEAS Q with other systems such as programmable logic controllers (PLC). If SIMEAS Q devices are used with SICARO Q Manager, you should always click on **directly**. SICARO Q Manager makes available additional functions which can be executed via the control of the measured-data recording.

Time base

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 SICARO Q Manager. 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 while activating the measured variables) should be an integer multiple of the time base.

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 on a RS485 interface. You must select **No**. 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.

3.9.3 Activating measured variables for continuous measuring

During continuous recording, you determine specific periods for recording (averaging times) each selected measured variable (except flicker). By means of the average time specified, an average value of the individual measured value is determined from the current and voltage values measured at the input. This average value is stored continuously in the memory together with its time stamp.

In addition, you can capture extreme values occurring within a measuring period (time base).

Note:

If the data are to be evaluated with SICARO PQ, the averaging time must be taken from the standard which is to be used for the evaluation in SICARPO PQ.

It is also permissible to set the averaging time to an integer part of the standard averaging time; though, this influences the memory requirements and the processing speed.

Example:
Averaging time in accordance with the standard: 10 minutes → settable averaging time:
10 min, 5 min, 2 min, 1 min, 50 s, 40 s, 30 s, 20 s, 10 s.

Selecting measured variables

In order to select measured variables for continuous recording and to determine the settings, proceed as follows:

- ❑ Double-click **Continuous recording** in the navigation window. A list of all measured variables that can be recorded continuously is displayed.
- ❑ Click on the measured variable to be activated. The data sheet for this variable is displayed in the data window.

The data sheets are structured similarly for the individual variables.

The type and the number of possible measured variables depend on the individual network type (see Basic settings). In this way, you can activate the measurement separately for each phase (if useful) and, in case of power measurement, additionally acquire the sum.

Possible inputs will be explained by means of the harmonics example (see Figure 3-28).

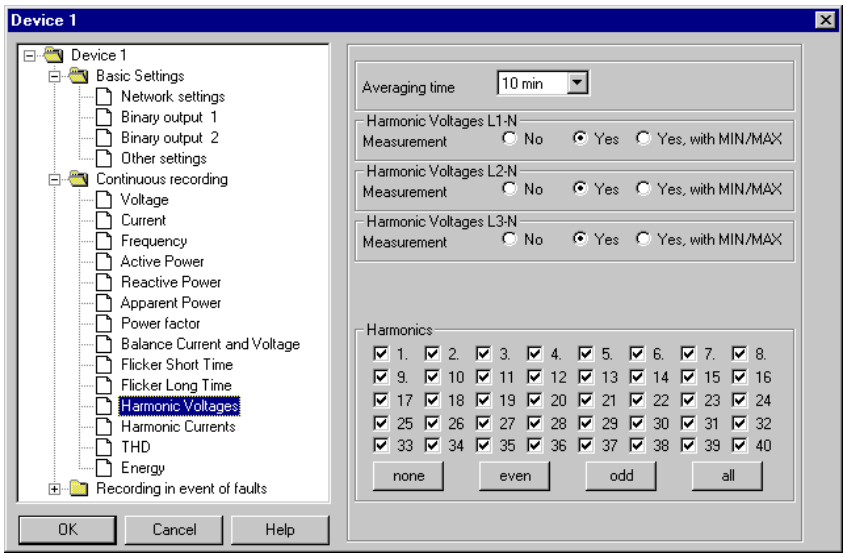


Fig3_28.gif

Figure 3-28 Continuous recording - Harmonic Voltages data sheet

To determine or alter settings for a measured variable, proceed as follows:

❑ Determine the averaging time via the drop-down list box (possible range_ from 1s to 1h). The time refers to all variables activated in **this** data sheet.

Note:

The averaging time should be an integer multiple of the time base. The averaging time in the calculation algorithm of the **Flicker** measured variable is preset and is not parameterized here. The preset averaging times are 10 min. for **Flicker short term** and 120 min. for **Flicker long term**.

❑ Activate the measurement for the desired variable by clicking on **Yes** or **Yes, with MIN/MAX**. By doing the latter you also acquire the extreme values for this variable.

Note:

You have set consistently the period of time for the acquisition of extreme values as time base (see Basic settings) for currents and voltages or for all remaining measured variables.

In the harmonic voltages or harmonic currents screen form, you also determine the harmonics to be measured (up to the 40th harmonic).

- ❑ Select **individual** harmonics (by clicking)

  or

- ❑ Click on one of the lower buttons and select **all** harmonics, all **even**, all **odd** or **none**.

Warning:

If you use one of these buttons you will overwrite the present selection.

3.9.4 Activating measured variables for fault recording

During the event-controlled acquisition of measured data, SIMEAS Q calculates a mean value for a settable averaging time for each selected measured variable. This mean value is compared with threshold values previously specified. Measuring data is recorded if the value exceeds or falls again below these threshold values.

Thereby, time as well as the previous measured value are recorded. In this way, information about when certain measured variables left a nominal range or when they returned to it, is received.

Selecting measured variables

In order to select measured variables for fault recording and to determine the settings, proceed as follows:

- ❑ Double-click **Recording in event of faults**. A list of all variables for fault recording is displayed.
- ❑ Click on the measured variable which is to be activated. The data sheet for this variable is displayed in the data window.

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

Type and amount of the possible measured variables depends on the chosen type of network (see Basic settings). This way, you can activate the recording for each phase (if useful) and acquire in addition the sum during the power measurement.

Possible inputs will be explained with the example of harmonics (see Figure 3-29).

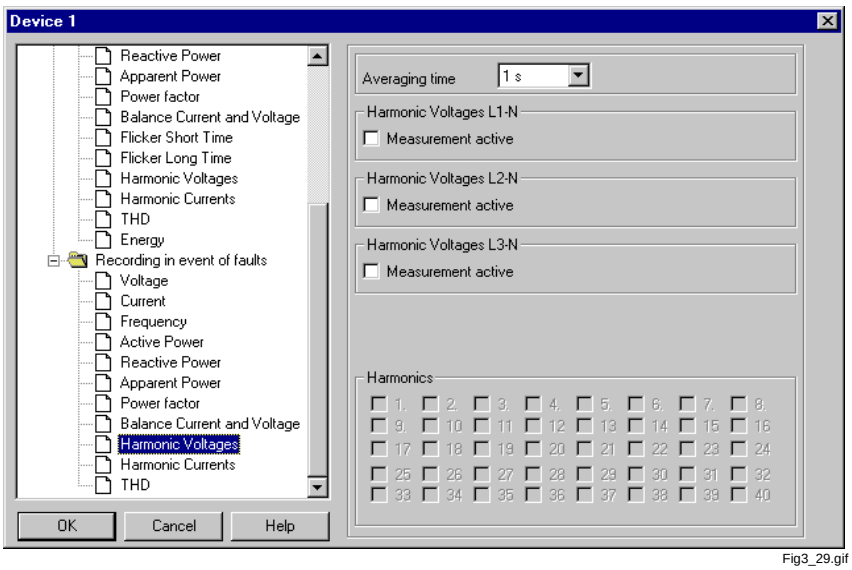


Fig3_29.gif

Figure 3-29 Definition of threshold value for harmonics

In order to determine or alter the settings for a measured variable, proceed as follows:

- ❑ Determine an averaging time via the drop-down list box.
  The chosen time is valid for all variables activated in **this** data sheet.
- ❑ Activate the measurement for the desired variable by clicking on the **Measurement active** check box. The dialogue for the determination of threshold values is displayed (not in the case of harmonics).

  In addition, determine which harmonics are to be measured (up to the 40th harmonic) in the data sheet for harmonic voltages or harmonic currents (see Figure 3-29).
- ❑ Click on the harmonic which is to be changed.

  The **Enter threshold** window is displayed.

Note:

For harmonics, the dialogue for the entering of threshold values is only displayed, when you select the harmonics which are to be measured. You can select threshold values for each individual harmonic.

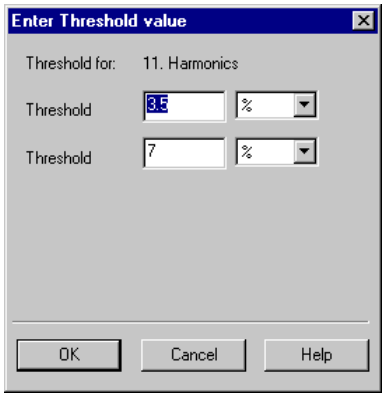


Fig3_30.gif

Figure 3-30 **Enter Threshold value** window

- ❑ Enter the threshold values and the corresponding unit of measurement (selection via the drop-down list box).
- ❑ Confirm with **OK.**

Note:

If you click on a check box again, the measurements of the chosen variables or harmonics will be deactivated. The set threshold values remain preset and are available again during new activation.

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

- ❑ Save the project with **Project** → **Save** to accept the changes.

Important**:**

Only after the project has been stored, the PC recognizes which measured variables it can accept for displaying later! Therefore, this step is **mandatory** and must in no case be forgotten.

3.10 Printing the project data

You can print the measurement settings for your project. Proceed as follows:

- ❑ Click on **Projekt** → **Print**.

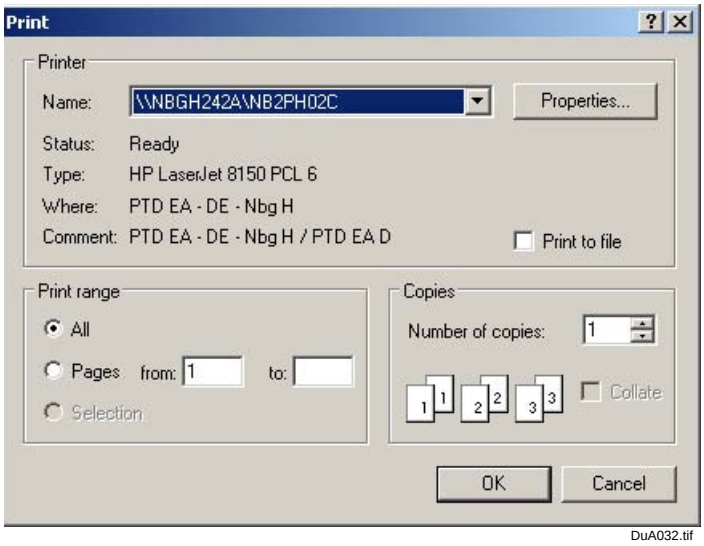


Figure 3-31 Window **Print**

- ❑ Select the desired printer and the corresponding printing parameters.

  After the printing process has started, you will receive a printout of the entire project including all devices and their measurement parameters.

3.11 Specifying the date and time of day in SIMEAS Q devices

Sending date/time of day (Set SIMEAS Q clock)

Access this special function via the **Commands** context menu of the SIMEAS Q device concerned or via the master context menu (PC icon).

The time of day in the SIMEAS Q device should correspond to the actual time of day to ensure that SIMEAS Q provides all measured values captured with a correct time stamp.

In addition to this, the time of day is particularly important for the time-dependent control of the SIMEAS Q measured-data recording.

Specifying the time of day for all SIMEAS Q devices

The **master context menu** serves to specify the time of day for **all** SIMEAS Q devices. With this function, SICARO Q Manager transmits the time of day consecutively to all connected SIMEAS Q devices. By the same time, SICARO Q Manager corrects the time difference caused by the sequential execution of this function. Afterwards, all SIMEAS Q devices connected use the same time of day. As a prerequisite, however, it must be ensured that the communication connection to all devices has been duly established.

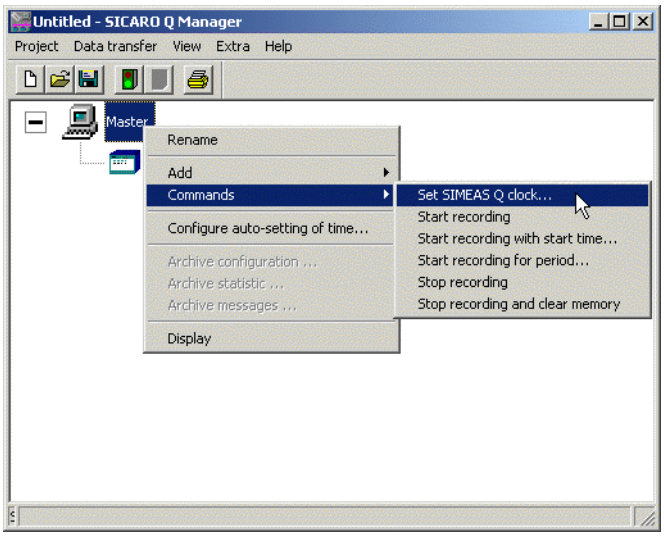


Fig3_33.gif

Figure 3-32 Specifying the date and time of day in SIMEAS Q devices

Specifying the time of day for an individual SIMEAS Q device

To be able to specify the time of day for an individual device, this function is also available via the **context menu of the device concerned**.

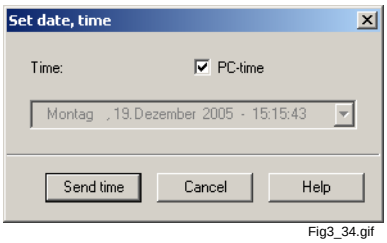


Fig3_34.gif

Figure 3-33 Dialogue window for sending time information

3.12 Controlling measured data recording

3.12.1 Requirements

- The SICARO Q Manager software is set up and the system structure has been built up.
- The connection settings to the individual devices have been set correctly and the connection can be established without problems.
- All SIMEAS Q devices are set for the respective measuring tasks.
- The system structure and individual measurement settings of the SIMEAS Q devices are saved as a project.
- The overall communication with all devices can be established without problems and the individual devices are in the recording mode (2 minutes after power ON or restart).

3.12.2 SIMEAS Q commands

Via the commands

- **Start recording**
- **Start recording with start time...**
- **Start recording for period**
- **Stop recording**
- **Stop recording and clear memory**

you can control the measured data recording in the SIMEAS Q devices. You will find the commands in the context menu of the master and the individual SIMEAS Q devices.

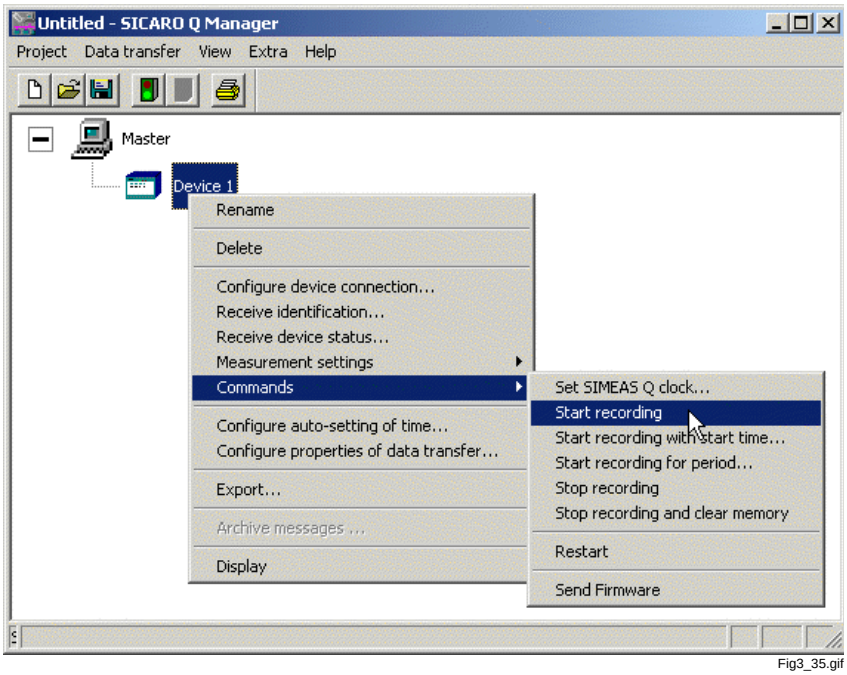


Fig3_35.gif

Figure 3-34 Start recording window

Via the context menu of the master, the commands are sent to all devices, which means that measured data records can be started and ended synchronously for all devices.

Via the context menu **Commands** of an individual device, you control the recording of this particular SIMEAS Q device.

The commands are:

- **Start recording**

Via this command, the recording is started immediately.

- **Start recording with start time...**

Here, you can determine the start of the recording by stating a certain time. After the command has been selected, the following dialogue box is displayed:

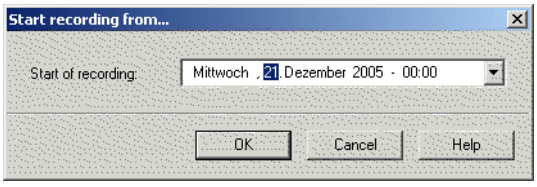


Fig3_36.gif

Figure 3-35 Start recording from time... window

Enter here the desired starting time. Make sure that you enter a time in the future and that time, month etc. given, are correct.

Confirm the execution of the command with **OK**.

If the command can not be carried out, an error message will be displayed.

- **Start recording for period...**

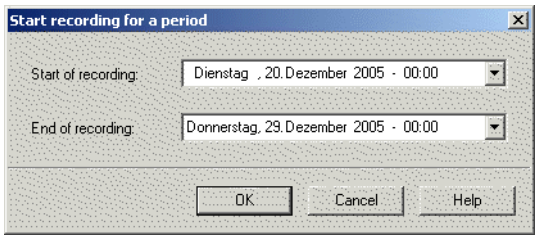


Figure 3-36 Start recording in a period dialogue window

Proceed as described above for the **Start recording for period...** option, but determine the start of recording as well as the end of recording.

Note:

The starting of the recording of SIMEAS Q is only possible, if

- the recording is **not** already in progress
- the measured data memory is empty.

For this reason, you should execute the **Stop recording and clear memory** command before each start.

- **Stop recording**

Stops the recording immediately.

If the recording has already stopped before, an error message is displayed.

- **Stop recording and clear memory**

Stops the recording immediately and deletes data which is perhaps still existent.

This function initiates a memory reset. A new recording can only be started when this command has been carried out.

Note:

Via the measurement settings **Basic settings/Other settings** you can also control the recording of measured data. If you want to control the recording via commands, you will have to select immediately the setting **Start of recording** from the settings.

3.13 SIMEAS Q restart - special function

Restart

Access this special function via the **Commands** context menu of the SIMEAS Q device concerned.

This function serves to initiate a restart of the individual SIMEAS Q device.

This function is not required for normal operation. However, it may be a particularly useful tool for laboratory tests.

A restart actually means to switch a SIMEAS Q device OFF and ON again. Consequently, the SIMEAS Q device does not record any measuring data and does not react on commands or enquiries for a period of two minutes after the execution of this command. During this time, the device is in its start-up phase during which it can only be contacted via the **SIMEAS Q PAR** software.

After this period of two minutes, the device switches to normal operation and starts recording measuring data according to the measuring settings specified within the framework of parameterization. From now on, it also uses the connection parameters specified and can also be contacted via the **SICARO Q Manager** software.

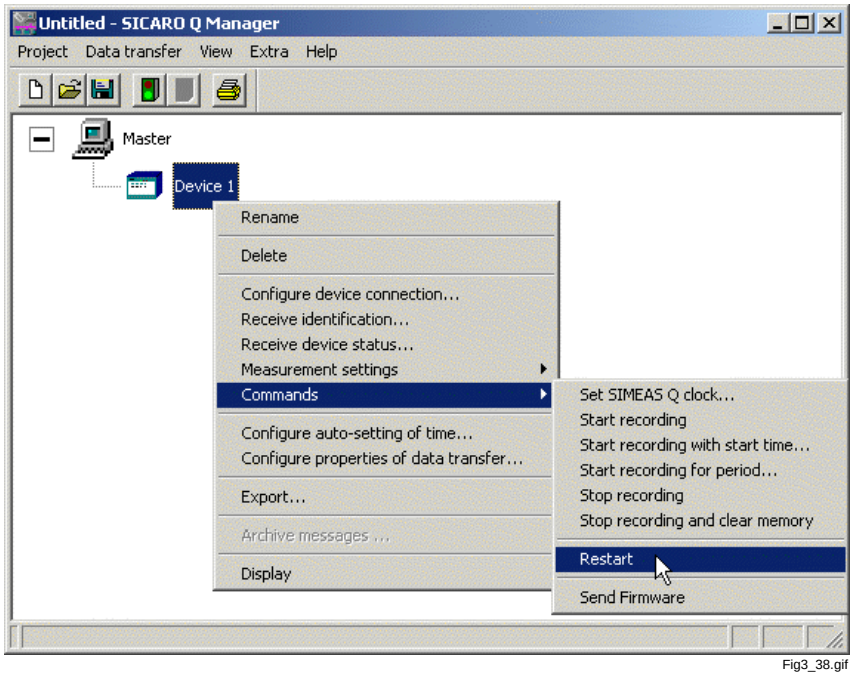


Fig3_38.gif

Figure 3-37 Restart SIMEAS Q

3.14 Firmware update

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 also possible to upload a new firmware via the SICARO Q Manager.

Attention:

Uploading a new firmware the measured data memory in the device will be deleted

To update the device firmware please proceed as follows:

- ❑ Select via the Context menu of the corresponding device the command **Commands** → **Send Firmware**.

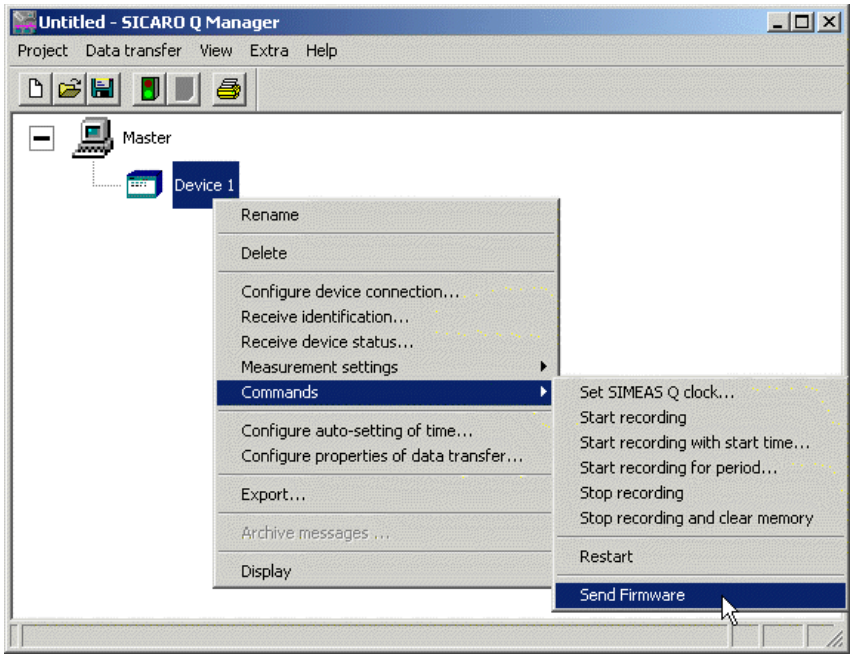


Fig3_39.gif

Figure 3-38 Send Firmware

- ❑ Afterwards the windows Send Firmware will open.
- ❑ Select the Firmware you want to send to the SIMEAS Q by clicking the **Select...** button

Fig3_40.gif

Figure 3-39 Send Firmware dialogue window

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.

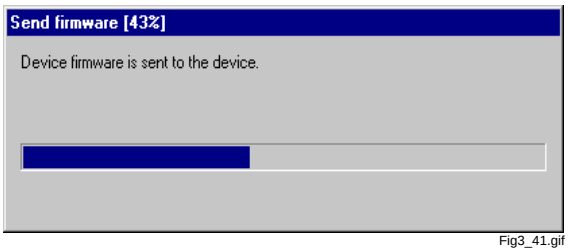


Fig3_41.gif

Figure 3-40 Status announcement of the Firmware Update

Note:

The duration of the firmware update process strongly depends on selected transfer rate and can be between 30 seconds and 5 minutes.

- ❑ The end of the firmware update will be signalized with a message. Confirm the message with **OK**.

Fig3_42.gif

Figure 3-41 Message end of firmware update

❑ Close the dialogue window Send Firmware.

Note:

After successful transmission of the firmware the device will restart automatically and switch into the measurement mode (only the left green LED is on) 2 minutes later.

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

3.15 Time setting

The SICARO Q Manager offers you the possibility to set the time of the integrated clock module of all connected SIMEAS Q devices automatically. That guarantees that all connected SIMEAS Q have the same time base.

Note:

The automatic time setting only works when the data transfer has already started.

For the configuration of the time-set function two different possibilities are provided.

Cyclic time setting via the master

That enables a parallel setting for all connected SIMEAS Q. Furthermore it is possible to select whether a separate communication should be built up for the time set or the time set should be carried out in course of the data transfer of measured values.

Note:

This settings will be taken over for all connected SIMEAS Q.

Please proceed as follows:

- ❑ Select the master with the left mouse button.
- ❑ Press the right mouse button and select the function **Configure auto-setting of time ...**

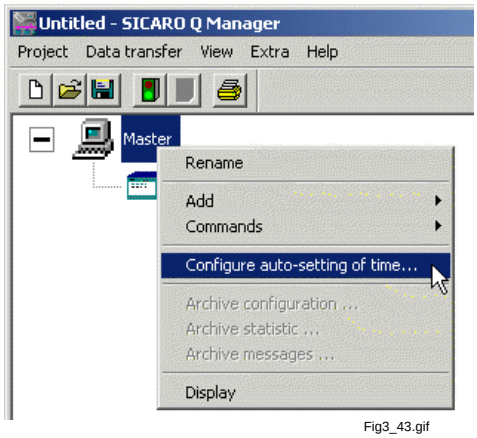


Figure 3-42 Configure auto-setting of time

The dialogue window **Configure automatic send time** will open.

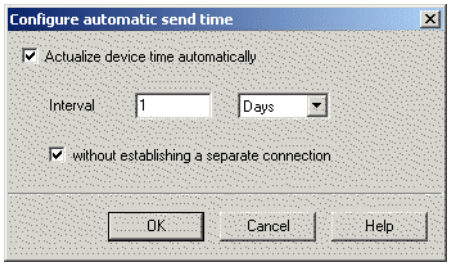


Fig3_44.gif

Figure 3-43 Configure automatic send time dialogue window

- ❑ Select the function **Actualize device time automatically** if you want to set the time automatically.
- ❑ Select the desired period time
  - ❑ minute
  - ❑ hour
  - ❑ day
  - ❑ week

  We recommend the setting **1 days**.
- ❑ Select whether a separate communication should be built up for the time setting or not.

Note:

Due to the telephone costs we recommend to use this function. In this case a time set will be carried out in course of the data transfer of measured values.

- ❑ Confirm your choice with **OK**. Afterwards your settings will be taken over for all connected devices.

  To select different settings for each device please proceed as follows.

Cyclic time setting for device

With it, it is possible to meet individual settings for connected SIMEAS Q.

Proceed as follows:

- ❑ Select the device you want to configure.
- ❑ Press the right mouse button and select the function **Configure auto-setting of time ...**

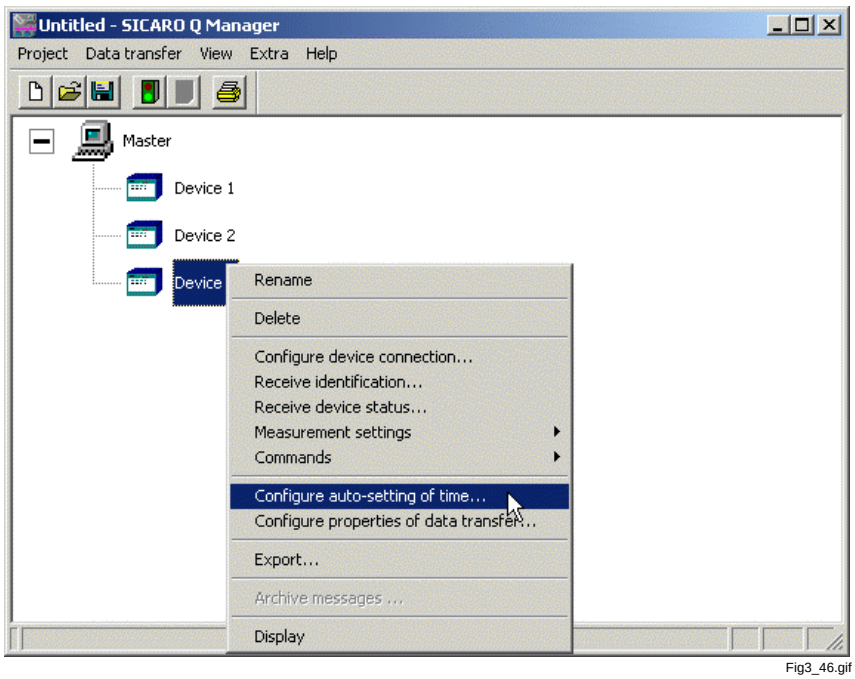


Fig3_46.gif

Figure 3-44 Configure automatic setting of time

The dialogue window Configure automatic time setting will open.

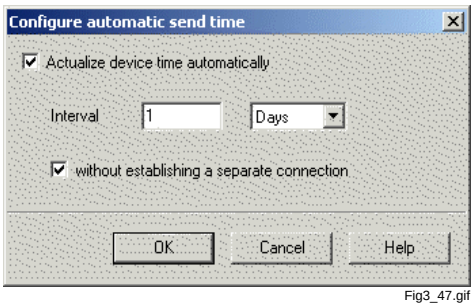


Fig3_47.gif

Figure 3-45 Configure automatic setting of time dialogue window

- ❑ Select the function **Actualise device time automatically** if you want to set the time automatically.
- ❑ Select the desired period time.
  - ❑ minute
  - ❑ hour

- day
- week

❑ Select whether a separate communication should be built up for the time setting or not.

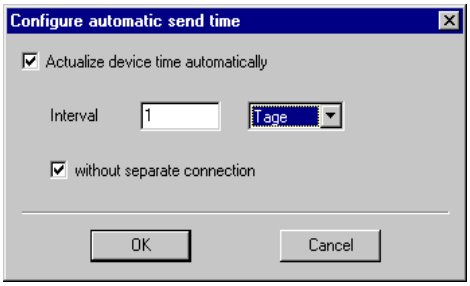


Fig3_48.gif

Figure 3-46 Example of time setting via device

Note:

Due to the telephone costs we recommend to use this function. In this case a time set will be carried out in course of the data transfer of measured values.

❑ Confirm your choice with **OK**. Afterwards your settings will be taken over for all connected devices.

3.16 Archiving of measured data

Overview

SICARO Q Manager allows you to archive measured data from the SIMEAS Q devices.

The used archive has the following features:

- Measured data can be archived either **continuously** or in **cyclic storage mode**.
- The program provides quick access to the measured data in the archive.
- The archive can be stored both on the local hard disk and on a network computer. A permanent connection to the network computer is required, otherwise archiving is automatically terminated.
  We do not recommend using a USB stick.
- The user can view the archive occupancy.
- Relevant parameters for the measurement (e.g. thresholds) can equally be archived.
- Operational indications and status messages of SICARO Q Manager can be saved.
- SICARO PQ can directly access the archive. For more information, see the SICARO PQ documentation.
- OSCOP P can access the archive. For more information, see the OSCOP P documentation.

Note:

When opening a SIMEAS Q Manager project version 2.1x, the data of all measured value files (*.sqv) will be converted after a safety prompt. The conversion can take some time depending on the size of the measured value files.

The old files are stored in a backup folder. The name of the backup folder is assigned automatically.

Note:

If the SIMEAS Q Manager cannot access the archive (e.g. in case of an interrupted network connection), the data transmission is interrupted. The data transmission has to be restarted when the connection is reestablished.

Continuous archive

Unlike the **cyclic storage archive**, the **continuous archive** contains all data starting from the moment the system was taken into service. It requires, however, a sufficiently large memory medium.

You can split the archive into archive parts and divide them among several memory media such as local hard disks or hard disks in the Ethernet network.

You assign a size to each archive part. You can choose one of the following options:

- Assign a fixed size (e.g. 200 MB) to the archive part. There must be enough free space on the memory medium.
- The archive part may occupy the entire memory space of the storage medium minus a safety tolerance (e.g. 100 MB). If the hard disk has a capacity of 1000 MB, there are 900 MB remaining for the archive part.

If the archive consists of several archive parts, the measured data are located in the active archive part. By default, SICARO Q Manager marks the archive part that was created first as the active archive.

When the first archive part is full, SICARO Q Manager automatically activates the next archive part. The ascending archive part number is relevant in this context.

Note:

All the data contained in the archive part is always cleared before an archive part is activated.

Archive in the cyclic storage mode

In order to activate an archive in the cyclic storage mode, you have to configure the archive as follows:

Create several archive parts (at least 2). You can specify any path for saving the archive parts, a folder on a local hard disk or a network directory. Generally, all folders available in Windows Explorer can be selected. Activate the cyclic storage mode in the archive properties.

Assign a size limitation to each archive part. Set the same maximum memory size for each archive part.

The following rule of thumb holds for switching between the archive parts: the archive part with the next higher number is activated (counting from the presently active archive part). If there is no higher number, the archive part with the smallest number is activated. Before activating an archive part, all data in it are deleted.

Example:

In the example shown here, the cyclic storage archive should be able to hold at least 200 MB of data in 5 archive parts. You should do the following calculation to determine the required memory space:

When switching between the archive parts, the archive part to be activated next is always cleared. Therefore, the data have to be stored in 4 archive parts (5 - 1). Therefore, each archive part must have a size of 50 MB (200 MB / 4).

The memory space required must hence have a size of 250 MB (5 x 50 MB). In this example, the memory space must be larger than the data volume by 25%.

You can reduce this percentage by increasing the number of archive parts.

Example:

The cyclic storage archive should be able to hold at least 200 MB of data in 11 archive parts.

The data should be stored in 10 archive parts (11 - 1). Therefore, each archive part must have a size of 20 MB (200 MB / 10).

The memory space required must hence have a size of 220 MB (11 x 20 MB). In this case, the memory space must be larger than the data volume only by 10%.

Note:

You should always save the project before accessing the archive (e.g. to archive configuration). The archive structure is only updated after the project has been saved.

The archive parts of a device must a minimum size of 10 MB. For two or more devices the minimum size of the archive parts will increase.

3.16.1 Archive configuration

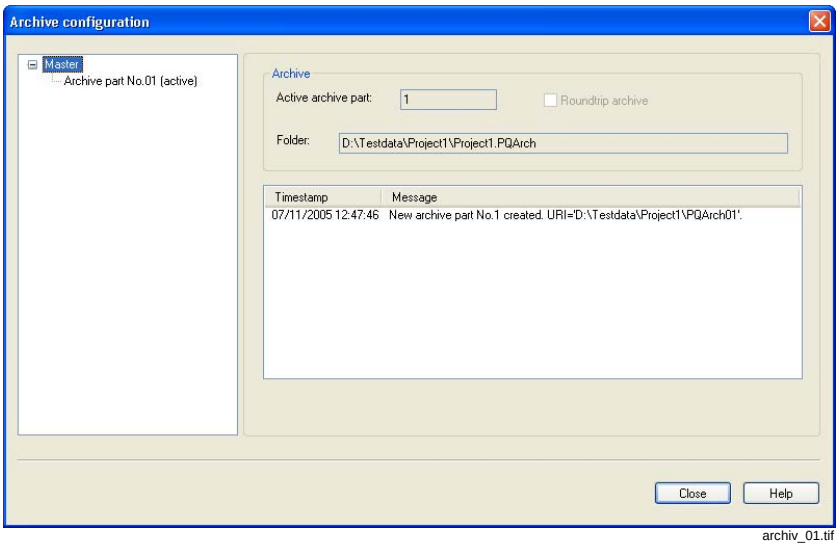
Creating a new archive

When saving a new project, an empty archive consisting of an archive part is generated automatically. Additional archive parts can be added to the archive.

Archive configuration

How to configure the archive:

- In the **SICARO Q Manager** select the **Project** → **Archive configuration** menu item. The **Archive configuration** window is opened.
- Select the entry **Master** in the left half of the window.



archiv_01.tif

Fig. 3-47 Archive configuration window, Master

Create new archive part

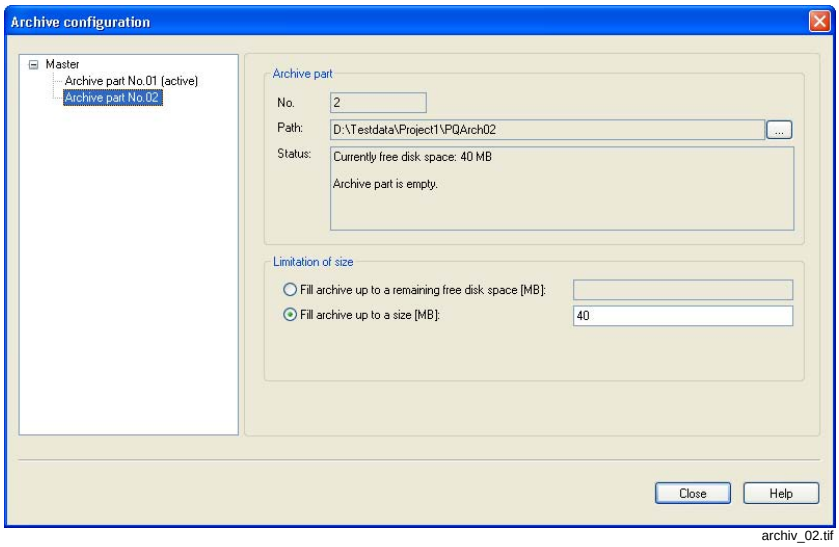
- Right-click the entry **Master** and select **Create new archive part** from the context menu. The **Create archive folder** window opens.

Note:

The cyclic storage mode requires at least a second archive part whereas the continuous archive needs only a single archive part.

- Specify the folder where you want to save the archive part. The project directory is predefined.

- Confirm by clicking **Save**. The new archive part is displayed.
- Activate **cyclic storage archive** to work in the cyclic storage mode.
- Select an archive part in the left half of the window.



archiv_02.tif

Fig. 3-48 Archive configuration window, archive part

The **Path** field indicates the location where the archive part is saved. Click on the **…** button to the right of the field **Path** to change the path where the archive part is saved (the data are moved to the new location).

The **Status** field shows the available memory space. It also shows whether the archive part contains data and whether it is active**.**

- Select the type of **Limitation of size** and enter the size.

Note:

If you use the option **Fill archive up to remaining free disk space**, it is not reasonable to create two archive parts on **one** memory medium.

Delete archive part

Before deleting the archive part, you have to delete the data in the archive. The **active** archive part can not be deleted/cleared.

- Right-click the archive part you wish to delete.
- Select the **Delete data** menu item.
- Confirm the safety prompt with yes. The content of the archive part is deleted.
- Select the **Delete archive part** menu item. The archive part is deleted.

3.16.2 View archive statistic

Overview

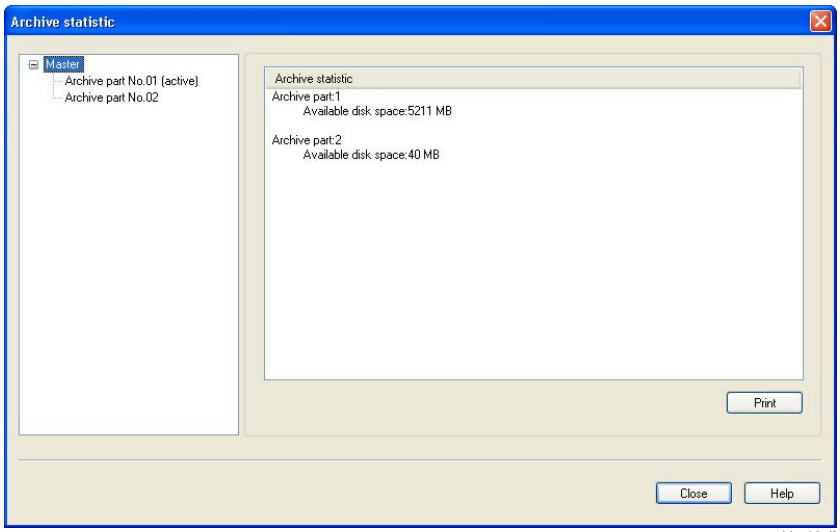
In the window **Archive statistic** you see:

- The available and the occupied memory of the archive parts.
- The time when the archive is expected to be full.
- The period for which data are available.

You can also print the archive statistic.

View archive statistic

- In the **SICARO Q Manager** select the **Project** → **Archive statistic** menu item. The window **Archive statistic** opens.
- Select the entry **Master** in the left half of the window.

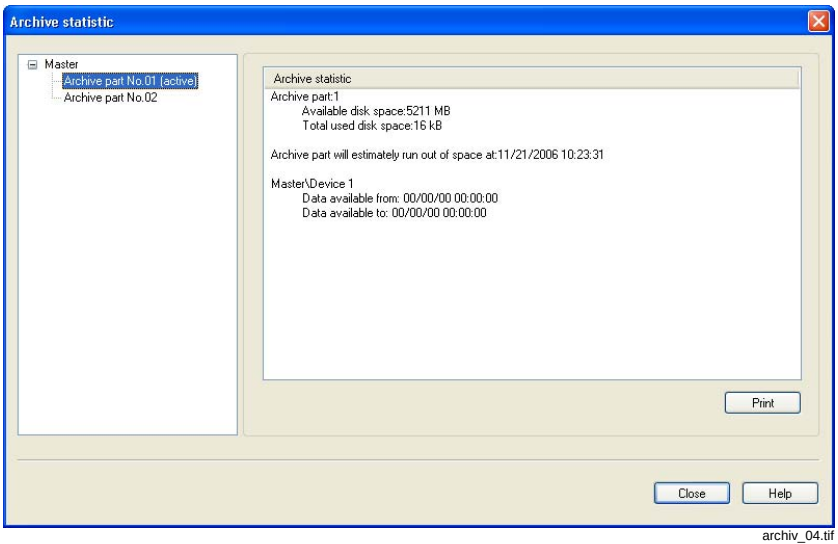


archiv_03.tif

Fig. 3-49 Archive statistic window

The right half of the window shows the available memory of the archive parts.

- Select an archive part in the left half of the window. The statistic of the archive part is displayed.



archiv_04.tif

Fig. 3-50 Archive statistic window, archive part

Printing archive statistic

- Click the **Print** button to print the displayed statistic.

3.16.3 Archive messages

Overview

In addition to the measured data, messages (operational and status messages) occurred during operation of SICARO Q Manager can also be stored in the archive.

The following messages are archived:

- A status message when the time is set in the device.
- A status message is set to 1 the moment data are first read out of the device.
- A status message is set to 0 the moment reading the data has been finished.
- An operational message when an archive part is created.
- An operational message when an archive part is activated.
- An operational message when an archive part is emptied.
- An operational message when an archive part is moved.
- An operational message when the recording is stopped and the memory is cleared.

The operational messages are displayed in the dialog upon device selection provided they are relevant for the device.

The status messages are displayed in the dialog upon selection of the corresponding element under the device provided they are relevant for the device.

Operational message that refer not to a device but to an archive are displayed in the dialog upon selection of the **Archive status** element.

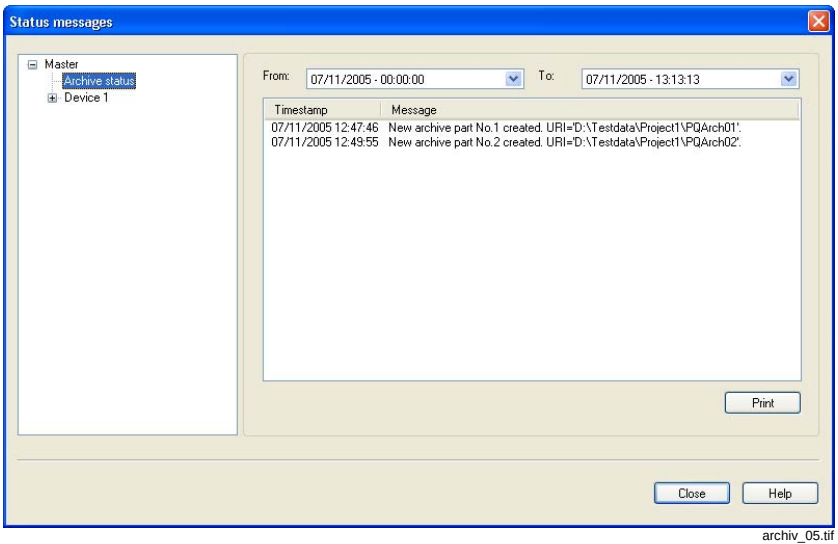
The filter for the message display is set to the current day by default. But the filter can be set to any time period. You can also print the presently displayed messages.

Viewing messages

- In the **SICARO Q Manager** select the **Project** → **Archive messages** menu item. The **Status messages** window is opened.

The currently available memory space for the archive parts is displayed for the **Master** (as in the Archive statistic window).

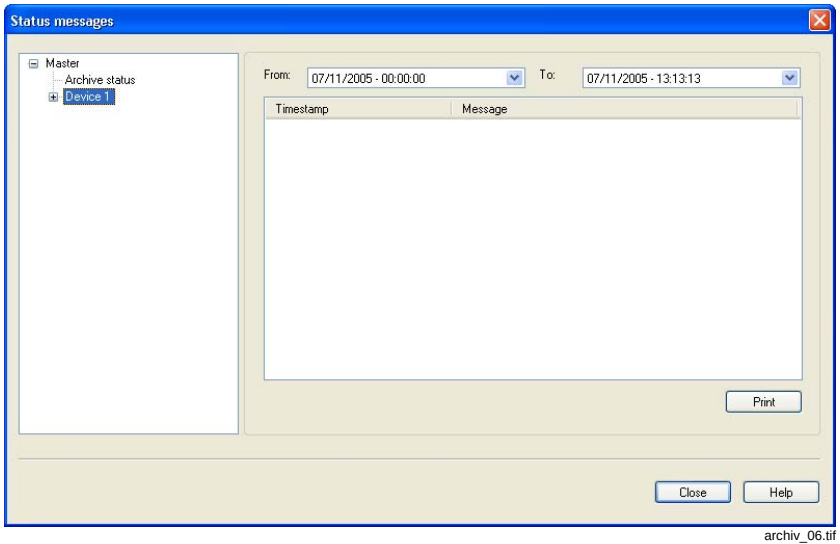
- Select **Archive status** in the left half of the window.



archiv_05.tif

Fig. 3-51 Status messages, archive status

- Define the period of time for which you wish to view the status messages. The messages are listed with their time stamp and they can be printed via the **Print** button.
- Select a **device** or a **node** in the left half of the window.



archiv_06.tif

Fig. 3-52 Status messages, device

- Define the period of time for which you wish to view the status messages. The messages relating to device or node are listed with their time stamp and they can be printed via the **Print** button.

3.17 Setting the cycle times for the data transfer

Configure properties for data transfer

Access this function via the **context menu of the device**. The following window is displayed when selecting this function:

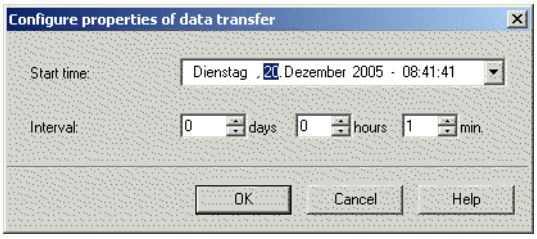


Fig3_49.gif

Figure 3-53 Data transfer cycle dialogue window

Start time

This box serves to enter the date and the time of day of the cycle start.

Interval

The three drop-down list boxes serve to specify in minutes, hours and days the time interval in which the data are to be called from the SIMEAS Q device.

Example:

Cycle start 1.9.00 18:00:00

Cycle time: 3 hours

Measuring data is called at the following times:

1. 1.9.00 18:00:00

2. 1.9.00 21:00:00

3. 2.9.00 00:00:00

4. 2.9.00 03:00:00

etc., until the data transfer is finished.

ATTENTION:

Be aware to specify the cycle to ensure that the data is called before the SIMEAS Q device enters into a buffer overflow. Use the **Device status** function to obtain information on the maximum duration of the cycle time.

3.18 Displaying measured data

Besides the transferring and saving of measured data, displaying them is an important function of the software SICARO Q Manager.

The display of measured data is also possible via a different window, the display-element window. The display-element window can be shown for the master or for each connected and configured SIMEAS Q device. In order to show the display-element window, click with the right mouse button on the graphic system structure of the main window on the device whose measured data you want to look at. The context menu from which you have to select the **Display** menu item is displayed.

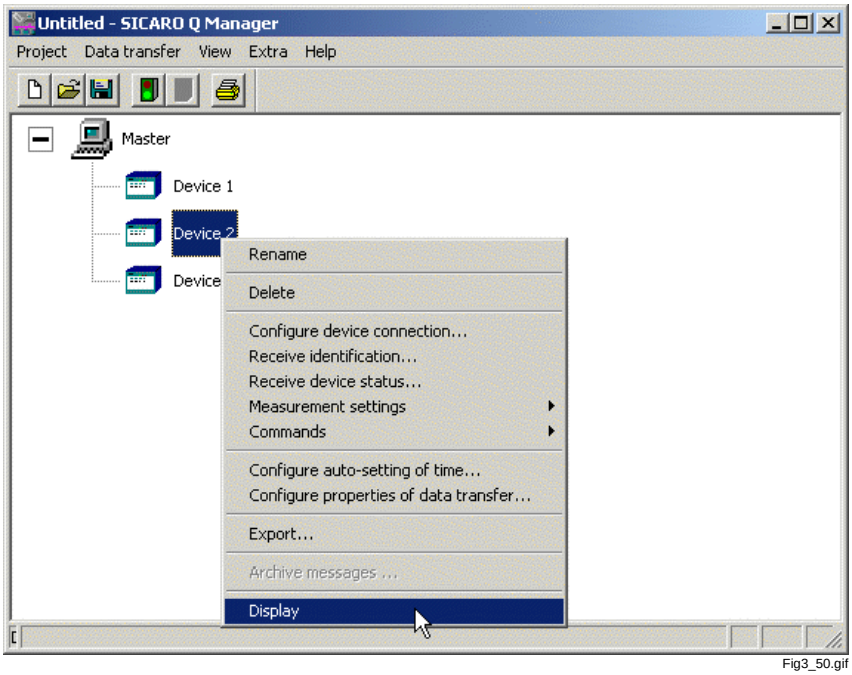


Fig3_50.gif

Figure 3-54 Displaying measured data

Prerequisites:

- ❑ The graphic system structure has been built up (Chapter 3.5)
- ❑ The connection to the individual devices has been set correctly and is ready for operation.
- ❑ The individual SIMEAS Q devices have been set for the intended measuring task.
- ❑ The project was saved.

Warning:

Make sure that the measurement settings parameterized in SIMEAS Q and the measurement settings known to the project, are the same. To be on the safe side, you should pick up the settings of each SIMEAS Q device via the function **Measurement settings** → **Receive** before you save the project.

Only this prerequisite ensures that the software displays the measured data provided by the SIMEAS Q device.

The display shows only measured data which was acquired by the SIMEAS Q via **Continuous recording**. Displayed is always the measured value of a measured variable, which was acquired last by the SIMEAS Q device and retrieved by the software. Here, measured variables of all connected SIMEAS Q devices can be shown in the display-element window of the master. This gives you, for example, an overview of the power consumption at all measuring points at which SIMEAS Q devices are installed. In the display-element window of each device, only the measured variables of this particular device are shown.

You display measured values depending on the respective measured variable with the following display elements:

- the standard display element (moving-coil instrument)
  for current, voltage, active energy, reactive energy, apparent energy, power factor, symmetry, flicker and harmonic distortion factor THD

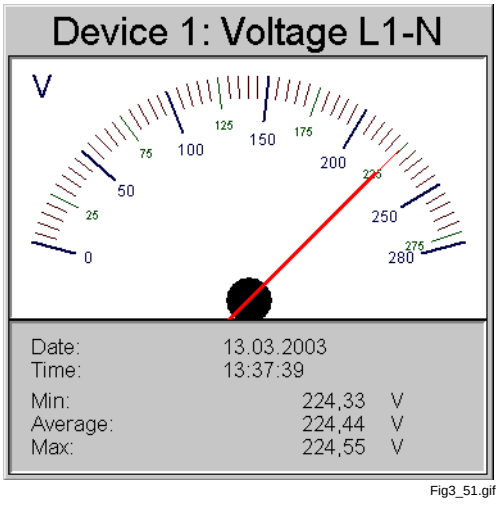


Figure 3-55 Moving-coil instrument

- the bar diagram with logarithmic Y-axis-scaling for harmonic voltage and current

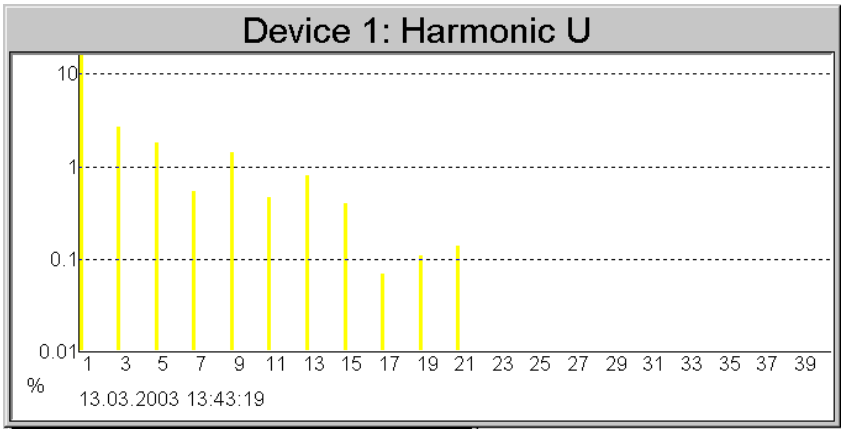


Figure 3-56 Bar diagram

- ❑ the display element for energy values

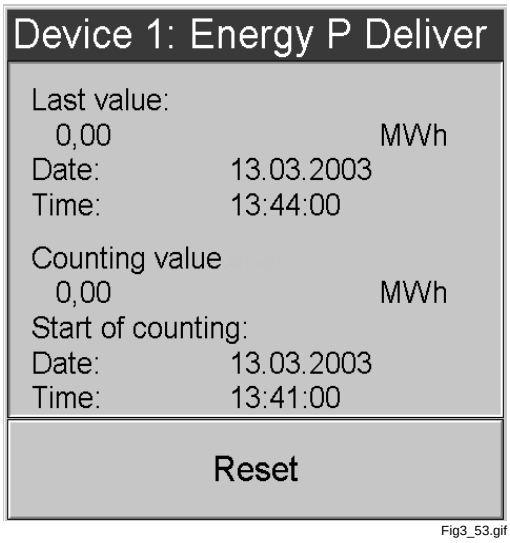


Figure 3-57 Device element for energy

The following describes the adding, positioning, setting etc. of a display element in a display-element window.

Calling the display

To be able to read all parameterized measured values, you have to display them visually. SICARO Q Manager has functions which allow the setup of individual display-element windows for each SIMEAS Q device and the master.

To set up your display-element window, proceed as follows:

- ❑ Select the symbol of device 1 in the system structure, e.g. Project_1.
- ❑ Select **Display** from the context menu.

The displayed sheet is still empty.

Create display element

For each measurement that you want to display visually, you have to create a display element.

- ❑ Click with the right mouse button on the empty display window.

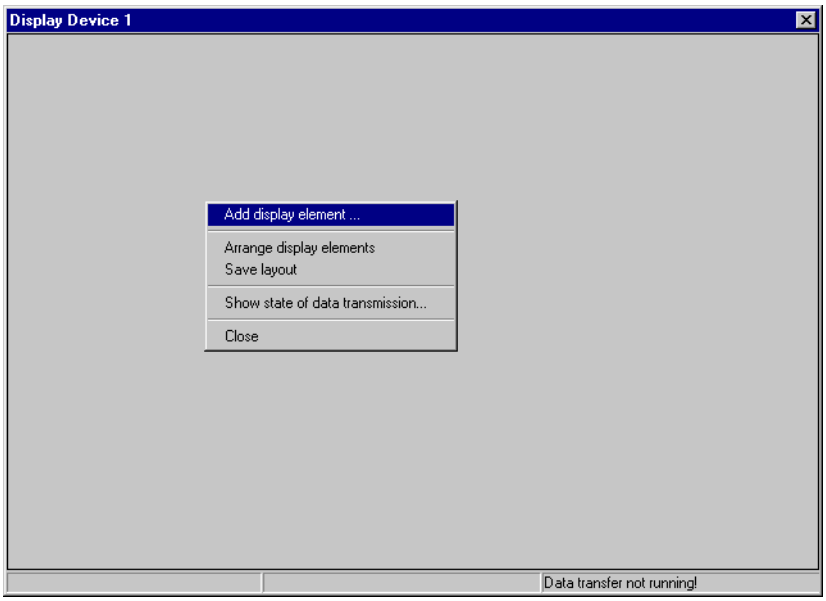


Fig3_54.gif

Figure 3-58 Empty display sheet

- ❑ Select **Add display element** from the context menu.

Select measured variable

The **Select devices** dialogue window is displayed.

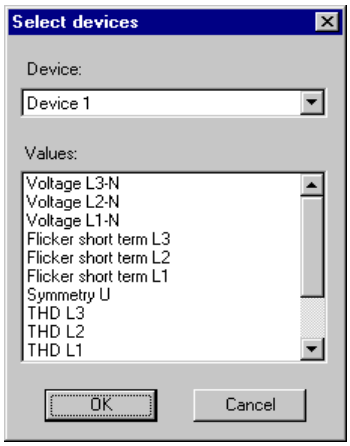


Figure 3-59 Measured variable dialogue window

All devices whose settings you have entered in the data sheets are listed in the menu above.

- ❑ To specify the display element window of the master, select the SIMEAS Q device whose measured variable you want to display from the **Device** drop-down list box.

  All parameterized measured variables for device 1 are now listed in the dialogue window.

- ❑ Select **Voltage L1-N** from the **Values** drop-down list box.

- ❑ Confirm all entries with **OK**.

  Now you see the first display element in the display window.

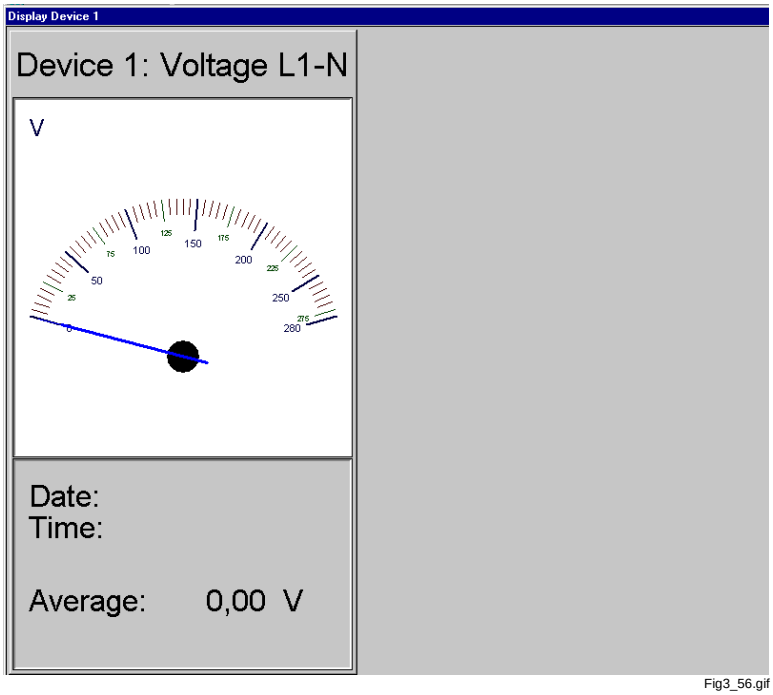


Figure 3-60 Display for Device 1

Add display element

In order to add further display elements for device 1, proceed as follows:

- ❑ Call the context menu.
- ❑ Select **Add display element**.

  The new display element now covers the first one.

Note:

When you add a new display element, it will cover the previous ones. Therefore they have to be arranged in the display-element window.

Arrange display elements

This is how you arrange several display elements in your display window:

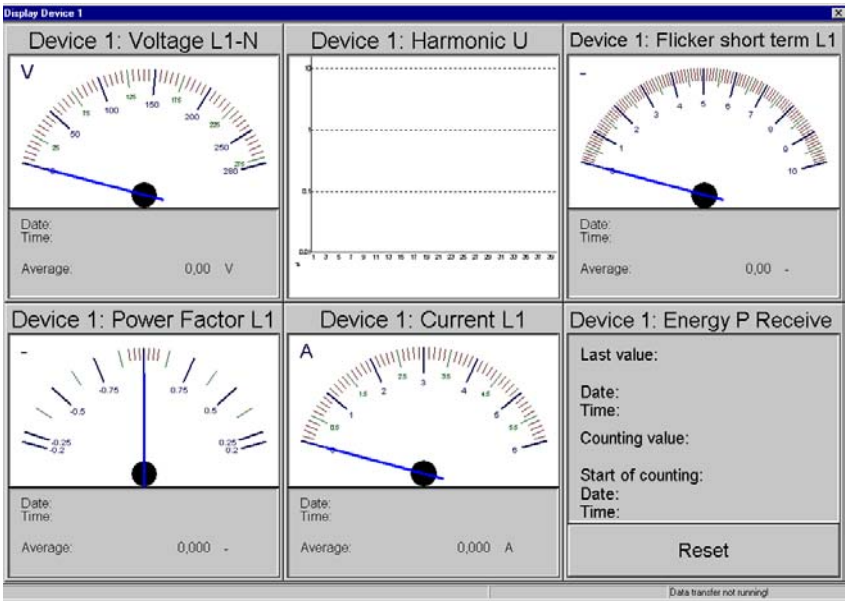


Fig3_57.gif

Figure 3-61 Display elements not arranged

- ❑ Call the context menu.
- ❑ Select **Arrange display elements**.

  All display elements are arranged in the display window. You can also move individual elements:

- ❑ Select the display element that you want to move.

  The display element changes its color in the titlebar. It becomes darker.

- ❑ Click on the active display element and move it across the screen.

Modifying size of display element

This is how you alter height and width of the display element:

- ❑ Move the cursor across the boundary lines of the display element.

  The cursor changes its image: you see a double-sided arrow.
- ❑ Click on the boundary line, keep the key pressed and pull the line with the mouse into the desired direction.

Deleting display element

You can delete any display element from the display element file

- ❑ Select the display element that you want to delete and call the context menu.
- ❑ Select **Delete display element**.

  You will see that the selected display element is deleted from the display-element window.

Saving layout

In order to keep the arrangement of the display elements, save the layout:

- ❑ Call the context menu of the display-element window.
- ❑ Select **Save layout**.

Changing display element properties

In order to alter the measuring range for a display setting, proceed as follows:

- ❑ Select the display element whose measuring range you want to alter and call the context menu.
- ❑ Select **Properties** from the context menu.

  The **Properties** dialogue window is displayed.

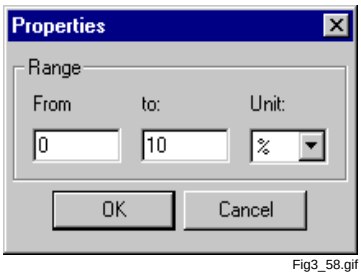


Figure 3-62 **Properties** dialogue window

- ❑ Enter the measuring range **From/To** and select from the list the corresponding **Unit**.
- ❑ Confirm your entries with **OK**.

  You will see that the measuring range of the altered display element shows the new settings.

3.19 Starting the data transfer

The following prerequisites must be met to be able to start the data transfer:

- The connection to the devices have been parameterized and can be established.
- The archive has been configured.
- The measuring settings of all SIMEAS Q devices have been specified.
- The project was stored with the current measuring settings of the individual SIMEAS Q devices.
- In addition to this, the measured-data recording in the individual SIMEAS Q devices should be activated via commands or via the device settings.

In contrast to the measured-data recording, the start and the end of the data transfer are always activated simultaneously for all devices of the master system:

- Click on the **Start data transfer** icon.

  or

- Select **Data transfer** → **Start** from the menu bar.

  The project is stored automatically and the archive is checked.

  The data transmission is started.

An example:

The following measurements have been activated in the SIMEAS Q device:

Continuous measurement:

- Voltage UL1, UL2 and UL3
  Averaging time 10 min
- Harmonic voltage measured on UL1
  Harmonics measured: 3., 5., 7., 9., 11., 13., 15., 17., 19.
  Averaging time 10 min
- Flicker irritability factor on UL2, UL3 with 10 min fix averaging time
- Frequency averaging time 10 min
- THD on UL1, UL2 and UL3
  Averaging time 10 min
- Voltage asymmetry
  Averaging time 10 min

These are 20 values with an averaging time of 10 minutes. The SIMEAS Q device memory has a capacity of 70,000 measuring data. For the above-mentioned example, 70,000/20 = 3,500 measuring periods can be compensated. For a 10 min averaging time per measuring period, this corresponds to a period of 35,000 min (= about 21 days).

The continuous measurement is most important for the calculation for the compensation time. Measured variables captured in case of a fault hardly cause a data recording under normal operating conditions. For the calculation of the compensation period, such measuring data can be taken into account with a security factor.

3.20 Stopping the data transfer

You can interrupt the data transfer between the SIMEAS Q devices and the master PC at any time.

- ❑ Stop the data transfer by clicking the **Stop data transfer** button.

  As an alternative:

- ❑ Select **Data transfer** → **Stop** from the menu bar.

  The data transfer stop is confirmed by a message displayed in a separate window.

3.21 Exporting data

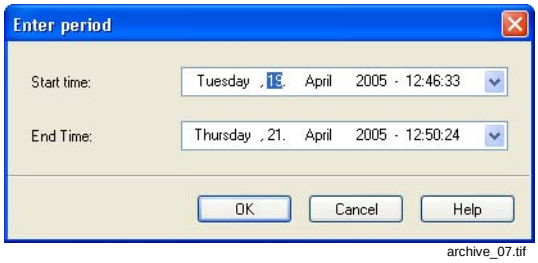
To process recorded measured data with an external program (e.g. Microsoft Excel), the data have to be exported as an ASCII file.

Exporting data

Before exporting recorded measured data, the data transfer between **SIMEAS Q** and Master PC has to be finished.

Measured data can be exported as follows:

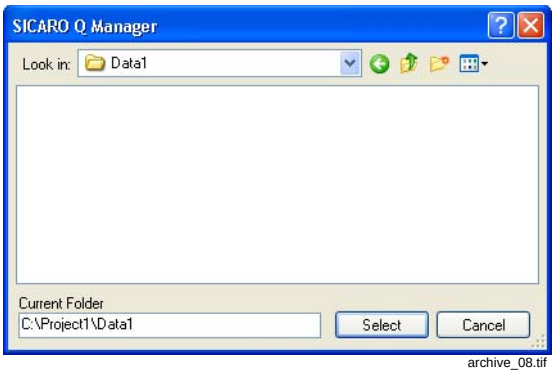
- In the **SICARO Q Manager**, right-click the device whose measured data you want to export.
- Select **Export** in the context menu. The **Enter time** window opens.



archive_07.tif

Fig. 3-63 Enter time period

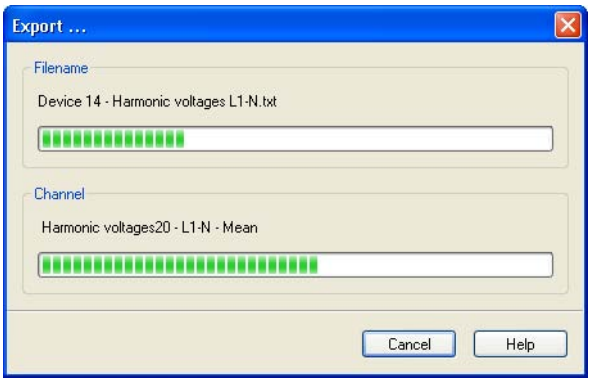
- Enter the time period for which you want to export data.
- Click **OK**. A window opens where you can select a folder.



archive_08.tif

Fig. 3-64 File export window

- Enter the path.
- Click **Select**. The export is started and its progress displayed.



archive_09.tif

Fig. 3-65 Export, progress indicator

The data are saved to the indicated folder in several **.txt files**. The name of the .txt files indicates to which device and to which measured quantity the data belong.

Display file

The exported measured data can be listed by means of a table calculation program, preferably Excel.

- ❑ Open the Excel program.
- ❑ Open via **File** → **Open** the exported SICARO Q Manager file.
  - ❑ Select from **Search in** the catalogue **DATA1**.
  - ❑ Select **Text files (..., *.txt,...)** from the **File type** drop-down list box.
  - ❑ Select the measured-value file, e.g. **Device 1 - Harmonic U L1.txt**.

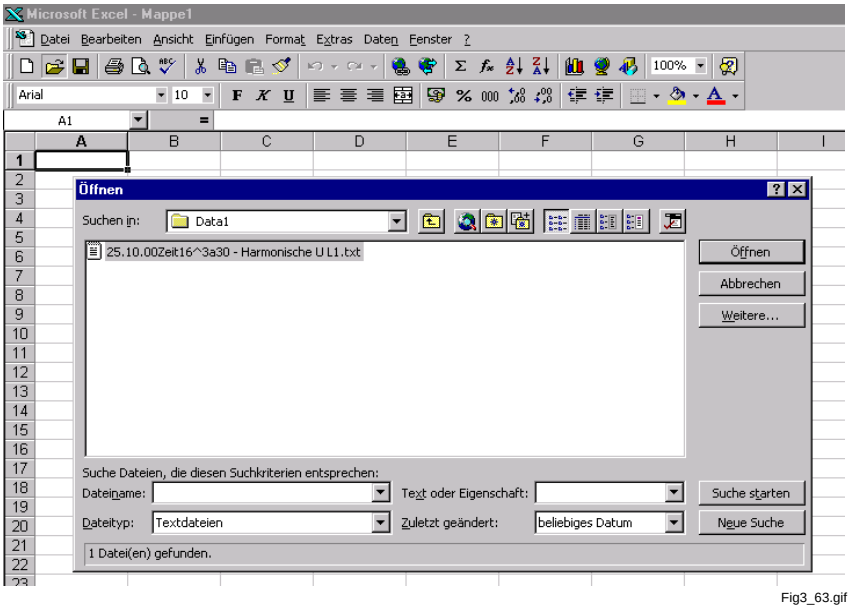


Figure 3-66 Open the measurement file in **Excel**

- ❑ Perform your inputs and then click the **Open** button.

The **Text Import Wizard** window is displayed.

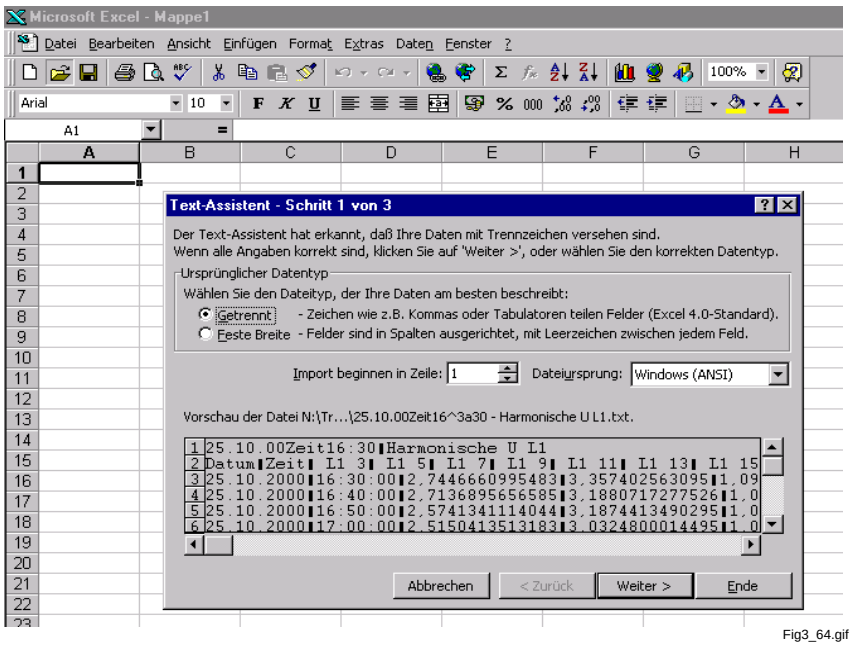


Fig3_64.gif

Figure 3-67 Excel Text Import Wizard, Step 1

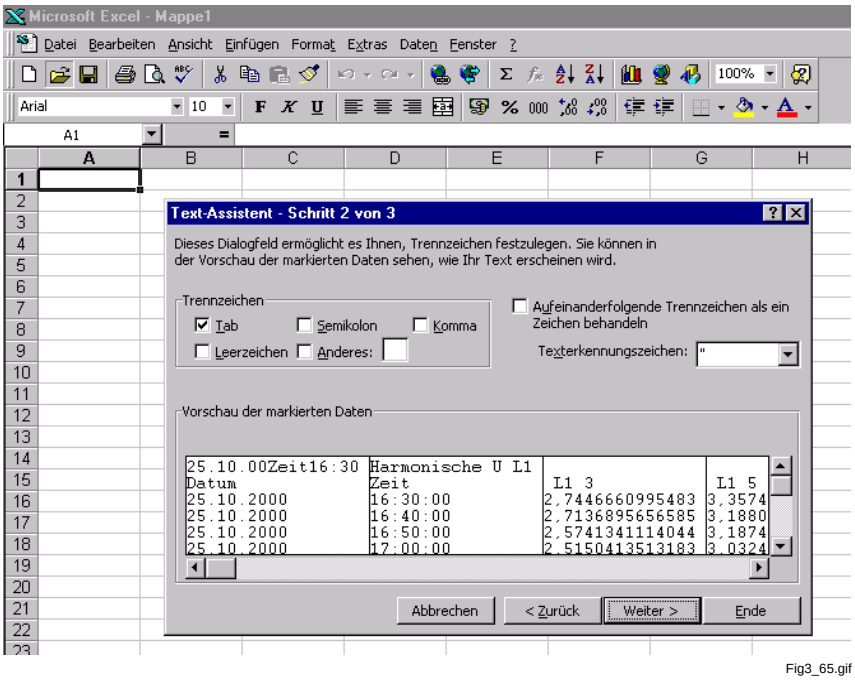


Fig3_65.gif

Figure 3-68 Excel Text Import Wizard, Step 2

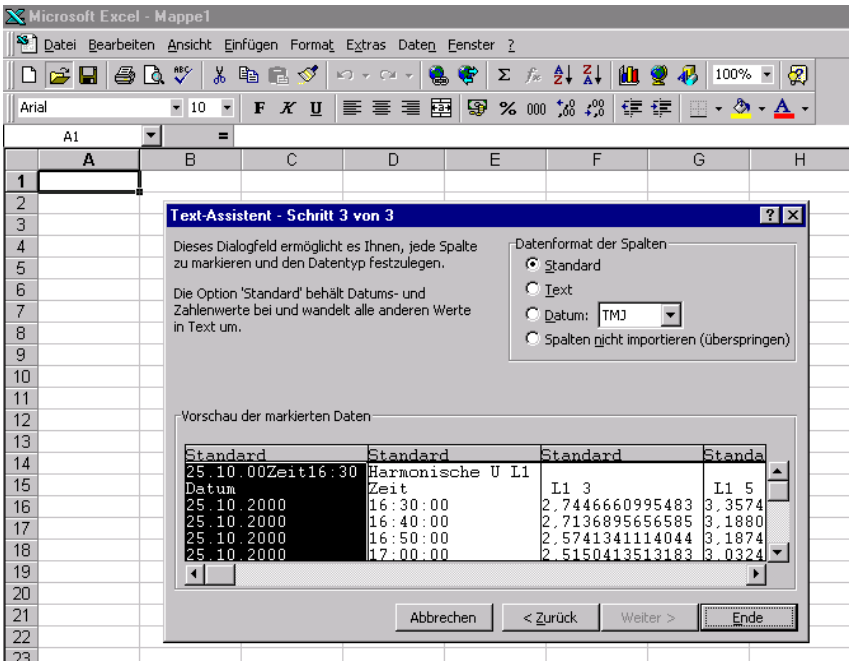


Fig3_66.gif

Figure 3-69 Excel Text Import Wizard, Step 3

- ❑ Click the **Finish** button.

  The **Device 1_UL3_cont**. file is displayed **as table**.

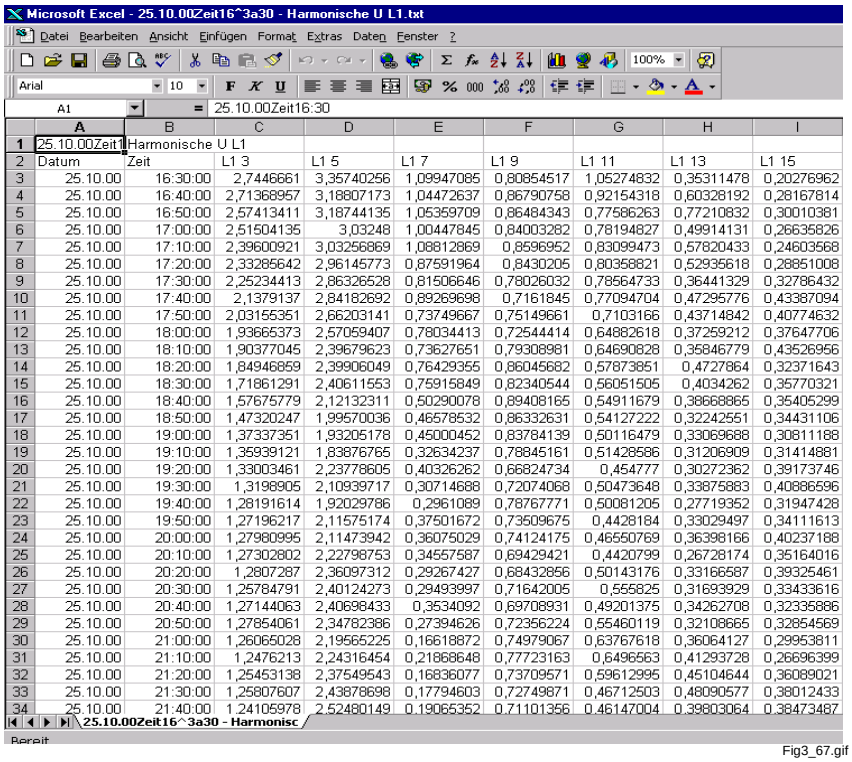


Fig3_67.gif

Figure 3-70 File Device 1_UL3_cont

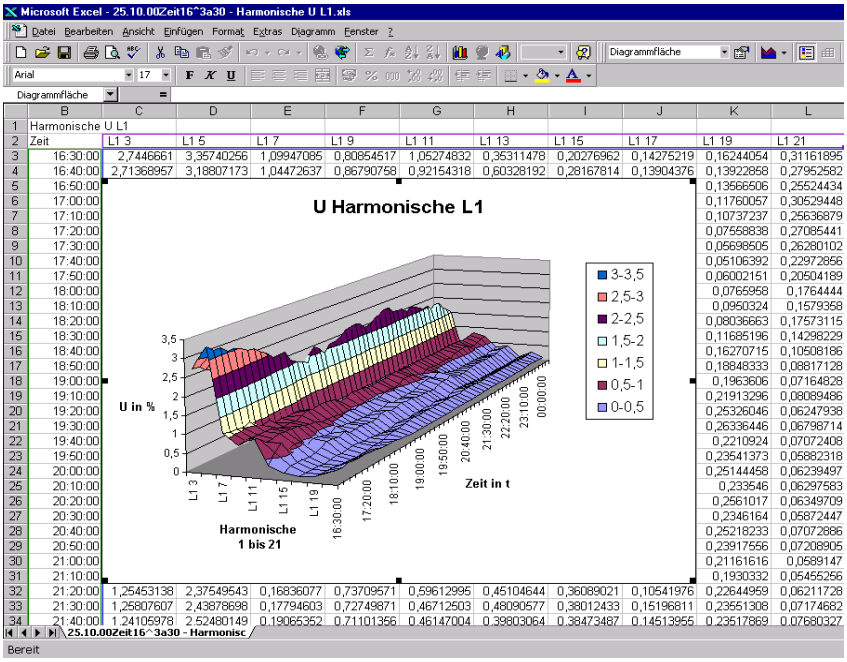


Fig3_68.gif

Figure 3-71 SIMEAS Q data in daily response graph

Quick reference

4

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

- ❑ Connect the SIMEAS Q with the configuration-PC.
- ❑ Define the device address with the configuration software SIMEAS Q PAR. See Manual SIMEAS Q Parameterization.
- ❑ Define the parameters of the connection with the configuration software SIMEAS Q PAR. See Manual SIMEAS Q Parameterization.
- ❑ Install the device.
- ❑ Connect the device with your evaluation-PC.
- ❑ Starting SICARO Q Manager (see Chapter 3.2)
- ❑ Archive configuration (see Chapter 3.16)
- ❑ Creating the project (see Chapter 3.5)
- ❑ Specifying the device connections (see Chapter 3.6)
- ❑ Specifying measurement settings (see Chapter 3.9)
- ❑ Configure automatic time-setting (see Chapter 3.15)
- ❑ Setting the cycle times for the data transfer (see Chapter 3.17)
- ❑ Displaying measured data (see Chapter 3.18)
- ❑ Starting the data transfer (see Chapter 3.19)

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

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A.1 Requirements

The measurement algorithms given below refer to measurements in a **50 Hz system**. For **60 Hz 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 50 Hz networks and 7,680 Hz in 60 Hz 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 **V_{P1}** of the SIMEAS Q. The signal is digitized with sampling frequency **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 $\mathbf{I_n}$ 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, Page A-94).

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-91).
- **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 $\mathbf{U}_\alpha$:

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

Current

Taking the phase angle $\varphi_{\mathbf{UI}}$ 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:

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

Negative sequence system:

Voltage

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

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

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

From this, the following relation is derived for I_β:

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

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 61000-4-7). 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:

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

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:

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

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.

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

Averaging Times, Time Bases, Threshold Values

B

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 Parameterization 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.

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B.3	Averaging times and thresholds (fault value measurement)	113

B.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.

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.

B.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 B-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
RMS values phase-ground voltages or phase-phase voltages	1, 2, 5, 6, 10, 15, 30 s 1, 2, 5, 6, 10, 15, 30, 60 min	**for 50 Hz 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 60 Hz 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
RMS value phase currents		
Nominal frequency		1, 2, 5, 6, 10, 15, 30 s 1 min
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		
Flicker interference factor short-term	10 min	
Flicker interference factor long-term	120 min	

Table B-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	

B.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 B-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 50 Hz 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 60 Hz 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 B-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, Operating Instuctions*
E50417-K1074-C321

/2/ *SIMEAS Q PAR, Manual*
E50417-H1076-C265

/3/ *SICARO Q Manager, Manual*
E50417-H1076-C111

/4/ *SIMEAS Q, Manual*
E50417-H1076-C072

/5/ *SICARO PQ, Application Description*
E50417-H1076-C119

Glossary

Averaging time	The averaging time is a multiple of the → Time base. Over the period of the averaging time extreme values are formed.
Balanced net	Polyphase system, in which all phases are stressed equally with consumers.
Time base	Period of time during which an mean value is formed from the sampled values. These mean values are used for the forming of extreme values during the period of the → Averaging time. The averaging time should be an integer multiple of the time base.
Binary outputs	Output of binary signals (high and low) for the switching of relays.
Byte	Information unit consisting of 8 bits.
Classical method	Algorithm for the power calculation in a → Balanced net, not taking the harmonics into consideration.
Continuous recording	Continuous recording of measured variables in a time base which is to be determined specifically by the user.
Converter	Adapter for the connection of various standard interfaces.
Expanded method	Algorithm for the power calculation in an → Unbalanced net, taking the harmonics into consideration.
Fault recording	Only measured variables which exceed the → Threshold values specified by the user, are saved with time stamp.
Flicker	Measure for voltage fluctuations in the low voltage distribution.
FT	**F**ile **T**ransfer
GSD file	**G**eräte **S**pezifische **D**atei (Device-specific-file)

Master	Higher-level device which monitors and controls sub-devices (→ slave).
Navigation window	Displays the program structure of the measurement settings. Through single clicks or double clicks on the structure icons, you can **navigate** between the various parameter sets and dialog windows.
Negative-sequence system	Polyphase system in which the phases L1, L2 and L3 are each by 120° out of phase counterclockwise.
Positive-sequence system	Polyphase system, in which the phases L1, L2 and L3 are each by 120° out of phase clockwise.
P_{st}, P_{lt}	Measure for the interference effect (**s**hort **t**erm; **l**ong **t**erm) of voltage fluctuations.
SD file	Extension of the parameter files
SICARO Q Manager V2.30	Software product **SICARO Q Manager V2.30** for SIMEAS Q
SIMEAS Q	**SI**emens **MEA**suring **S**ystems **Q**uality Network Quality Recorder
SIMEAS Q Parameterization	Parameterization software for SIMEAS Q
Slave	Sub-device which is monitored and controlled by a higher-level device (→ Master).
Standard parameter set	Ex-works preset parameter file set in SIMEAS Q and in the SIMEAS Q parameterization.
SU	Reversing of summer time and winter time
THD	Total harmonic distortion
Threshold	Limiting value which triggers off an event, e.g. status signal, warning, disconnection etc. Several threshold values which trigger off classified events, can be determined for each measured variable.
Time information	Date and time of an event

Time stamp → Time information

Unbalanced net Polyphase system in which not all phases are stressed equally with consumers.

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Yes, with MIN/MAX 45

To

Siemens AG

PTD EA D SC22

Postbox 4806

D-90026 Nuremberg

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Remarks/Suggestions

Your remarks and suggestions will help us to enhance the usability of our documentation. Please fill in this questionnaire and mail or fax it back to Siemens (fax number +49-911-433-8518).

Title of the Manual:	SICARO Q Manager
Order No. of the Manual:	E50417-H1076-C111-A4

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