

SHERLOG

Fault Recorder Systems

User Manual

SHERLOG Expert 1.03 Operating Software

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1 SHERLOG Expert operating software

The SHERLOG Expert operating software consists of two parts: **Online** for the operation and management of SHERLOG devices and **Analysis** for the evaluation of records.

1.1 SHERLOG Expert Online for operation

The **Online** part of the software offers many possibilities, ranging from the operation of an individual fault recorder up to the administration of complex fault recorder groups.

The graphical user interface is geared to meet real-world requirements and provides a wide range of functions, including the following:

- Flexible configuration for optimum customisation to measurement tasks with due consideration of the network model
- Fully automatic measurement with
 - Remote data transmission
 - Determination of fault type and fault location
 - Printout or dispatch of fault reports or quality reports
 - Archiving of records in a database
 - Online monitoring
 - Self-monitoring
- Easy-to-use manual functions for data evaluation and report creation
- Remote configuration
- Can be used with several screens (optimum overview, all information can be seen at a glance)

1.2 SHERLOG Expert Analyse for analysis

The **Analyse** part of the software is used for the evaluation of records made by SHERLOG CRX measuring systems.

The software includes a wide range of powerful analysis tools for assessing the recorded data:

- Useful zoom functions and variable scaling
- Simultaneous display, superimposition and synchronization of more than one fault record
- Vector displays
- Harmonic analysis on the basis of full waves or to IEC 61000-4-7 with interharmonics
- Nyquist plot
- Determination of fault location
- Freely configurable absolute and delta measurement cursors
- Formulary and formula editor for the calculation of further power system quantities
- Individual report creation using the clipboard
- Automatic report creation

Power quality analysis to DIN EN 50160 (optional)

If a power quality device licence has been activated, a comprehensive range of evaluation and display functions of continuously recorded network parameters can be carried out, such as the overview of limit value violations or the classification and evaluation of events.

Fault location

The powerful fault locator can characterise faults quickly to support maintenance staff as well as calculating the fault loop and detailing the fault type, fault impedance and fault location.

Mathematical signal analysis

A formula editor can be used to make further mathematical calculations within fault records. The results are added to the fault record as an additional signal.

Data formats

Import and export functions enable data to be exchanged between different systems using standard COMTRADE, CSV and PQDIF file formats.

2 About this document



This user manual describes how to operate and control a SHERLOG CRX fault recorder system and how to evaluate records on a PC with the SHERLOG operating software.

Separate operating instructions describe how to commission, connect, operate and maintain the fault recorder systems.

This user manual is intended for:

- Persons who know how to switch on and off, enable, earth and identify electrical circuits and devices/systems in accordance with the applicable safety standards
- Trained operating personnel in electrical installations

2.1 Other applicable documents

A number of other documents apply in conjunction with this user manual. The manufacturer is not liable for damages resulting from failure to comply with information contained in any of these documents.

All documentation pertaining to the commissioning, configuration of settings, operation and maintenance of a SHERLOG CRX fault recorder system also applies.

Other applicable documents for the user:




- SHERLOG CRX operating instructions

2.2 Validity of the present document


This user manual is valid only for the SHERLOG operating software in conjunction with a SHERLOG CRX fault recorder system.

2.3 Warning marks and symbols

2.3.1 Symbols used in this document

Symbol	Explanation
	DANGER This symbol indicates the presence of an immediate risk associated with electric voltage. If this risk is not avoided, death or serious injury may result.
	CAUTION This symbol indicates the presence of a potential risk associated with improper use. If this risk is not avoided, personal injuries or material damage may result.
	NOTE This symbol highlights notes and information.

2.3.2 Typographical conventions

Symbol	Explanation
	This symbol highlights instructions which require action on the part of the user
1. 2.	Numbered lists are used for actions which must be carried out in the order given
■	This symbol marks the items of a list

3 Software

3.1 Recommended minimum PC requirements

To be able to use the SHERLOG operating software, the computer must fulfil the following minimum requirements:

- Windows 10 (64 Bit) operating system
- Dual-core processor at least 1.8 GHz
- At least 4 GB RAM main memory
- At least 2 GB free hard drive space
- 10/100 Mbit Ethernet interface
- Graphics resolution 1024 x 768
- 19" TFT monitor (widescreen format)

3.2 Installation

The SHERLOG setup CD contains all the components required in order to install the software as well as this manual in PDF format. A PDF Reader (also included) is required in order to open the manual.



Before installing the SHERLOG operating software, it is important to ensure that the Windows operating system is up to date, i.e. that all updates have been installed and that the user is logged on to the PC with administrator rights.



The installation procedure for the SHERLOG operating software starts automatically as soon as the setup CD is inserted in the drive, providing this is permitted by the Windows® system settings.

If the existing installation is to be extended or reconfigured, the installation procedure can be repeated whenever necessary by running the SETUP.EXE file again.

Service packs and software updates included on the CD should only be installed if a message requiring this to be done is displayed during installation.

To install the SHERLOG operating software:

- 1 Close all Windows® applications.
- 2 Insert the SHERLOG setup CD in the drive.
- 3 Installation starts automatically.
- 4 Select the language of the installation programme.
- 5 Follow the instructions displayed on the screen for each installation step and carry out all the steps one after the other.
- 6 Once installation has been completed, restart the PC to activate the settings.

3.3 Start the software



- Click the appropriate entry in the **Programmes** folder of the Windows start menu or the application icon on the desktop

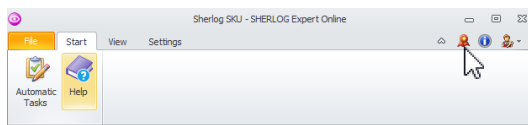
3.4 Licensing



In order to use the software on a permanent basis, the software licence must be unlocked within 30 days of installation.

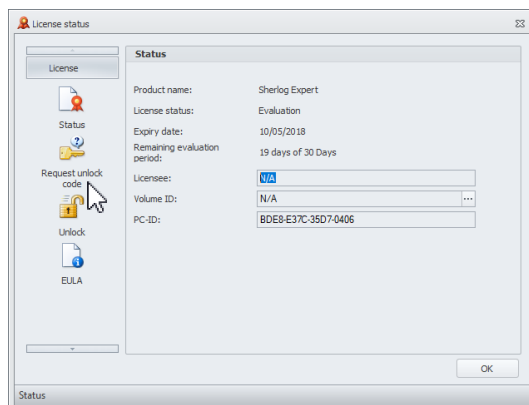
Within the 30 day trial period, it is possible to start the software for test purposes without a licence by clicking the **Start** button.

3.4.1 Display licence status



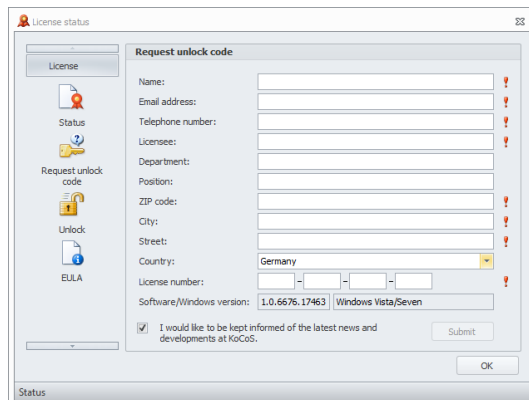
If licence information needs to be quoted, for technical support purposes for example, the relevant information can be found in the **Licence status** window.

3.4.2 Request unlock code



When the programme is started for the first time and every time it is started within the 30 day trial period, the **Status** view is automatically called up, reminding the user to license the software.

- In order to license the application, an unlock code must be obtained from the manufacturer:
- Click the **Request Unlock Code** button



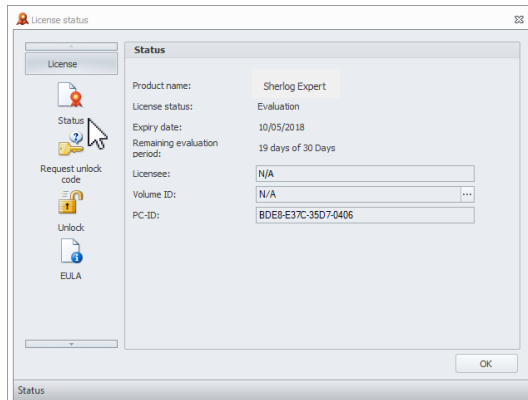
- The **Request Unlock Code** dialogue box is called up
- Enter data in the form

Licence number

- Enter the software licence number
- The licence number can be found on the label of the installation CD.
- Once all the required fields (!) have been filled in, the **Submit** button is displayed.
- Click the **Submit** button
- The request is sent by e-mail



Software licences (licence numbers) always apply to a specific PC! Volume licences for 5 PCs, for example, therefore include 5 licence numbers.



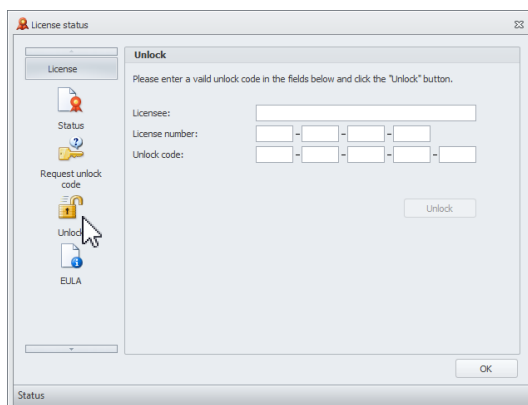
PC-ID

The ID number of the computer on which the software has been installed is required for the generation of the unlock code. The PC-ID is retrieved automatically and entered in the application form.

If no internet connection is available, the request can also be made by telephone using the following number
+49(5631) 9596-0

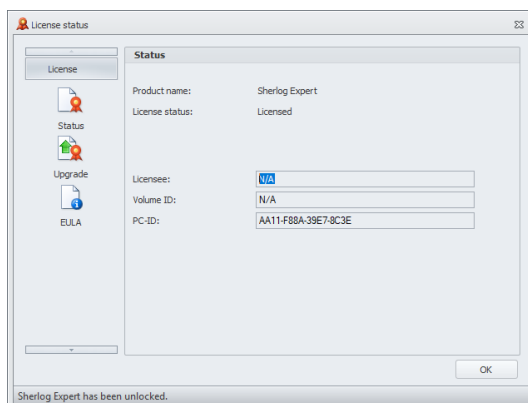
When requesting an unlock code by telephone, the following information must be given: the PC-ID as listed in the **Status** window, the software licence number and other licensee data.

3.4.3 Unlock



KoCoS emails the unlock code to the address entered by the user under **Request Unlock Code**.

- Call up the **Unlock** view
- Enter the data received from KoCoS and click the **Unlock** button



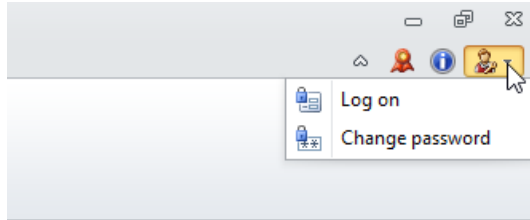
Once the licensing procedure has been successfully completed, the status is displayed as **Licensed**.

- Click the **Start** button

The software is started.

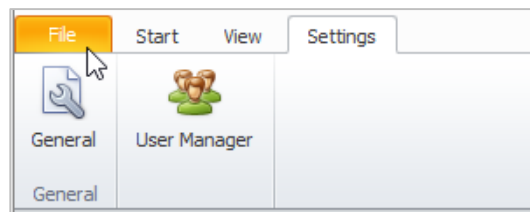
3.5 User Manager

With the **User Manager** new users can be added, existing users can be deleted and user passwords can be defined and changed. By granting different rights or user groups, individual rights can be assigned to any created user.



The status of the user currently logged on is displayed in the title bar.

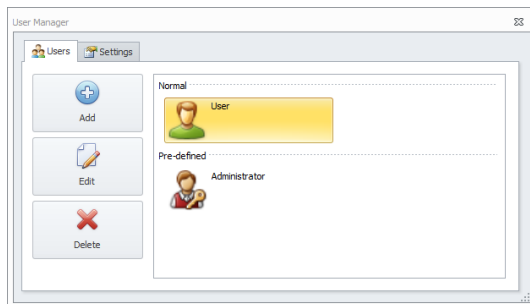
The logon of a user and the change of a password can be made directly via the button.



- On the **Settings** tab, click the **User Manager** button



The User Manager is only accessible for users with the administrator right **Manage accounts**.



The user management is called up.

Users

Add and edit new users with assigning rights.

Groups

Add and edit new groups with assigning rights.

Options

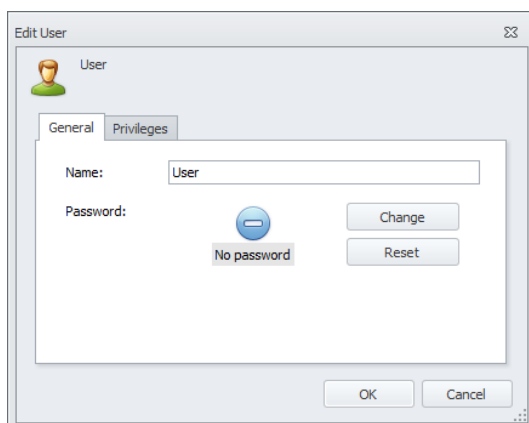
General settings.



The predefined user named **Administrator** cannot be changed or deleted. To prevent unauthorized access, this user account can and should be protected with a secure password.

If the administrator password is lost, the software must be reinstalled!

3.5.1 Add/edit users



- Click the **Add** or **Edit** button in the User manager

The **Edit user** dialogue box is called up.

- Enter/edit the user properties and confirm with **OK**

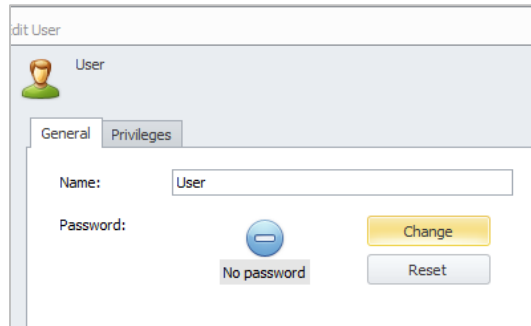
Change password, see below.

Privileges

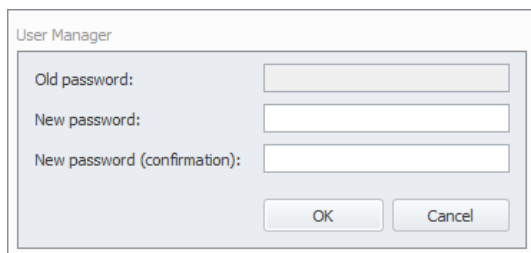
Currently, users can only enable or disable the right to manage user accounts. Users who have this right therefore have administrator rights and can create or delete further users. It is recommended to give this right exclusively to the administrator.

3.5.2 Define/change password

If the dialogue box for changing the password is called up in the **User Manager**, changes can be made for all the users.



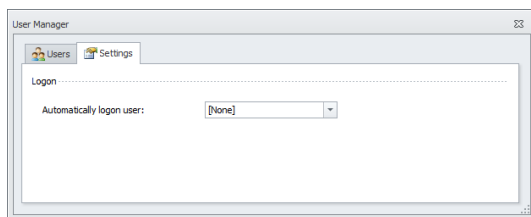
- On the **Configuration** tab, click the **User Manager** button to open the User Manager
- Select user
- Click the **Change** button



A dialogue box for changing the password is called up.

- Enter the old and new passwords and confirm with **OK**

3.5.3 Automatically log on user

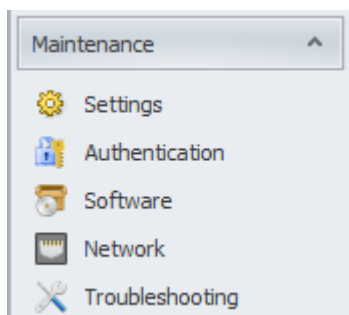


If the software is to be started without a user query, one of the created users can be created as the default user.

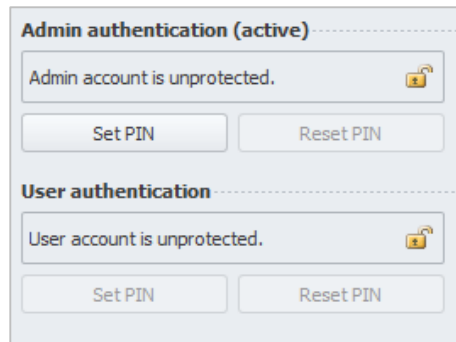
- Under **Settings**, select a user for automatic logon.

3.5.4 Assign device passwords

To prevent unauthorized access to the installed SHERLOG or EPPE devices, passwords for administrator or user access can be stored in the devices. In this case, the SHERLOG Expert operating software requests the entry of the corresponding PIN. The PIN to access the device is automatically stored on the PC for the user currently logged on.



The PIN is assigned using the **Authentication** entry in the device dialogue.



Administrator Authentication:

Full access to all functions including device configuration and deletion of data.

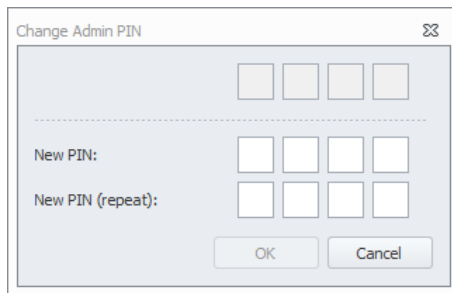
User authentication:

Read-only access to the device status and all measurement values.

- Set PIN

A dialogue box for changing the PIN is called up.

- Enter the old and new PIN and confirm with **OK**



The software automatically stores the PIN on the PC for the user currently logged on.

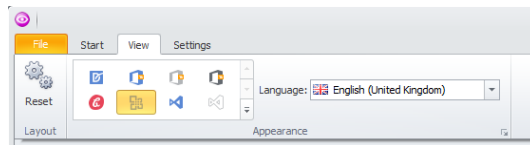


If another user or PC attempts to connect to a protected device, the PIN will be requested. This entry is also only required once per device/user/PC.



The administrator PIN can only be reset with the KoCoS support!

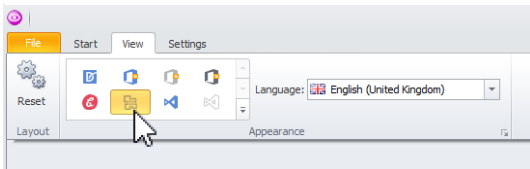
3.6 Customize the user interface



- Call up the **View** tab

Basic settings for the user interface, such as the layout, language and design, can be made here.

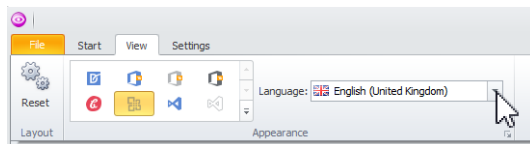
3.6.1 Change the screen design



Various colour schemes are available for the screen background.

- Open the list box and select a colour scheme

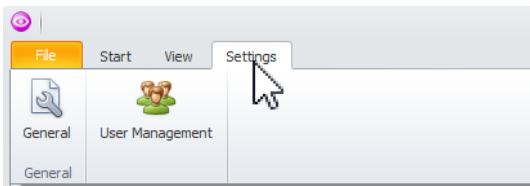
3.6.2 Change the language



Various languages are available for the user interface.

- Open the list box and select a language

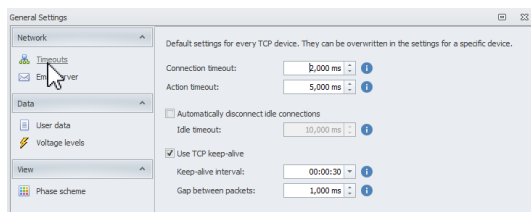
3.7 General settings



- Call up the **Settings** tab

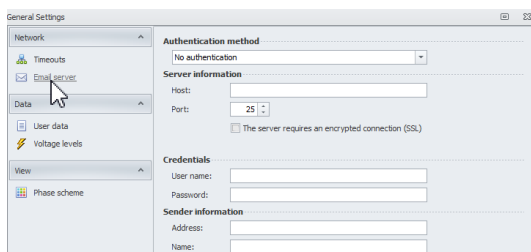
General settings for the configuration of the software can be made under **General**.

3.7.1 Network



Timeouts

Timeouts can be set for some system operations. Use the info button to call up an explanation of the setting.



Email server

To send fault reports by e-mail, an e-mail server must be specified, see under **Automatic Tasks**.

- Enter data for e-mail server

3.7.2 User data

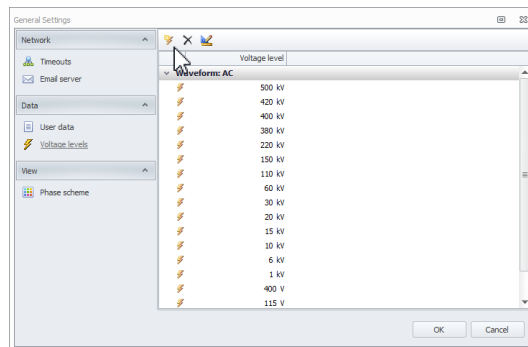


User data

➤ Enter company address and load logo
Graphics in formats jpg, bmp, wmf, gif, ico and png up to a maximum of 2 MB in size can be loaded.

The details are used for the creation of reports, for example.

3.7.3 Define voltage levels

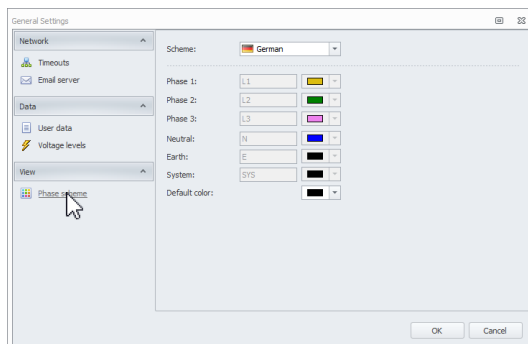


In addition to the location, it is also possible to assign a voltage level to a SHERLOG device. For more information, see under **Set device name, location and connection parameters**.

The voltage levels must be defined beforehand:

- Add, delete or edit voltage levels with the aid of the tool bar

3.7.4 View



Phase scheme

Predefined display profiles can be set via the **Scheme** selection. Select **User defined** to define an individualized display profile.

Signals not defined here are displayed in the standard colour.

3.8 Support

3.8.1 Software version



The technical support department will need to know the version number of the **SHERLOG.EXE** programme file if technical support is required. A window displaying the licence and version numbers of the software is shown in the background when the programme is started and during logon.

To call up the info window:

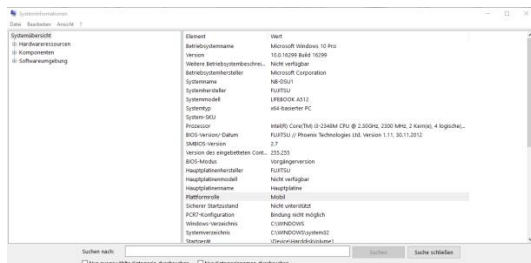
- Call up the **View** tab
- In the **Help** group, click the **Info** button
- The programme info window is called up.

3.8.2 System information



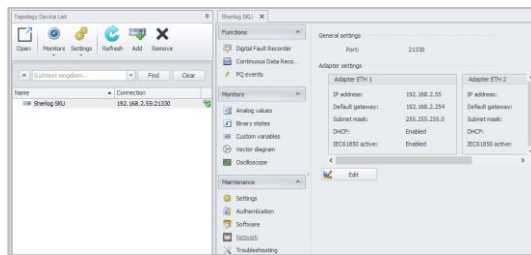
It may be necessary to provide detailed system information when requesting technical support.

- Click the **System info** button



Detailed system information is called up and can be saved as a file.

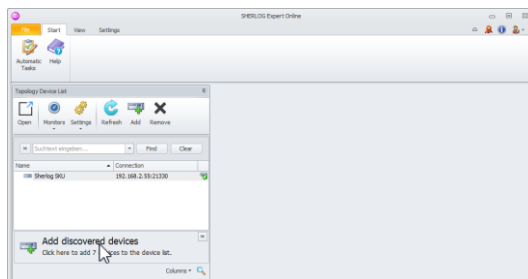
4 Device list



Click **File** to switch between the file menu and the device list.

In the **Topology Device list**, added devices are managed centrally and their topology is displayed.

4.1 Add devices to the device list

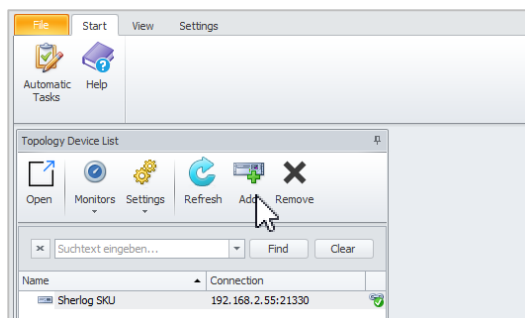


If devices are detected in the connected network which are not in the device list, the **Add Discovered Devices** button is displayed.

➤ Click **Add Discovered Devices**

All devices found are added to the device list.

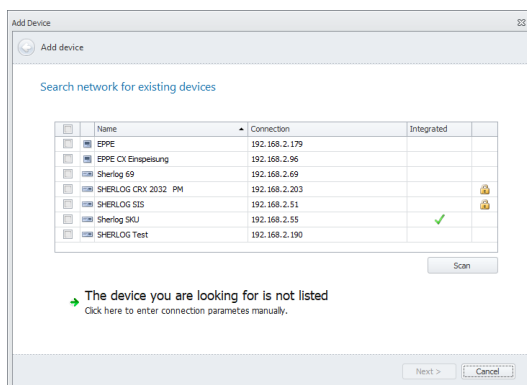
4.1.1 Wizard for the integration of new devices



The wizard can be used to search for individual devices and select them to add.

➤ Click the **Add** button

The wizard for the integration of new devices is started.



A list of all the devices in the network is displayed.

➤ Select a device in the list

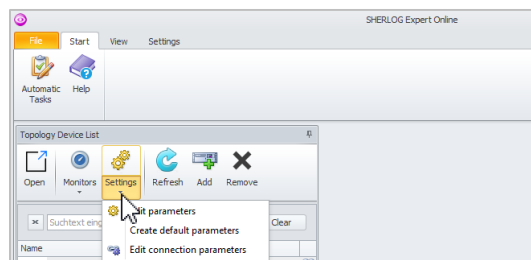
Only one device can be selected at a time.

➤ Confirm with **Next>**

The selected device is integrated.

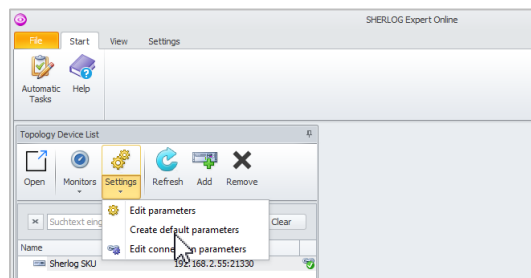
If the desired device is not listed, the connection parameters can be entered manually.

5 Edit device parameters



All settings for the currently selected device can be edited via the device list.

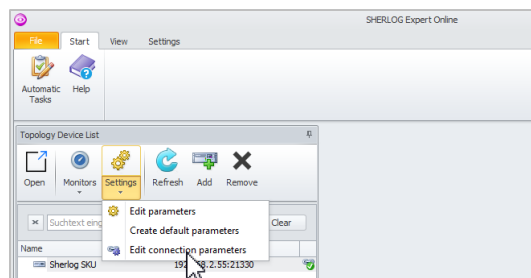
5.1 Reset settings



- Click **Create default parameters**

A parameter set is created based on the factory settings. Confirm with **OK** to reset the selected device to these default parameters.

5.2 Connection parameters



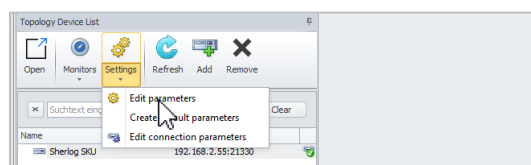
- Click **Edit connection parameters**

The connection settings for the selected device are called up.



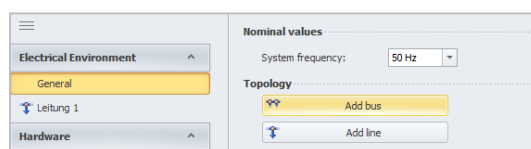
The connection parameters are only changed here in the software. For changes in the device, see **Maintenance**.

5.3 Nominal values, topology and location



- Click Edit parameters

Edit device parameters/General is called up.



Nominal values

- Set the rated frequency of the system

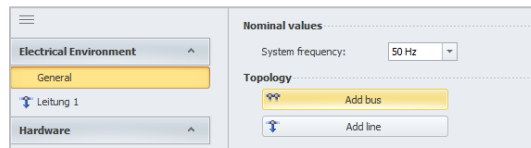
Topology

- Add bus bars and lines as described below

Location

The information on the installation location serves to identify the device. Changes are possible at any time and will be applied to all records saved after the change. Data recorded before the change retains the original information.

5.3.1 Power systems



Power systems such as bus bars or lines can be configured under **Topology**.

Add bus

Bus bars are also to be understood as a synonym for any power systems which contain only voltages. This means that they can also be used for voltage groups of generators or transformers, for example.

Add line

Lines are power systems which can contain both currents and voltages.

If both voltages and currents are assigned to a line, this power system is self-contained.

However, if only currents are assigned to a line, then it can be coupled to a bus bar created previously. Several lines can be connected to one bus bar in this way. This means that SHERLOG is capable of carrying out power or fault location calculations on several lines, for example, although the corresponding voltages (bus bar) are only measured once. See the example of configuration below.

5.3.2 Example of configuration for power systems

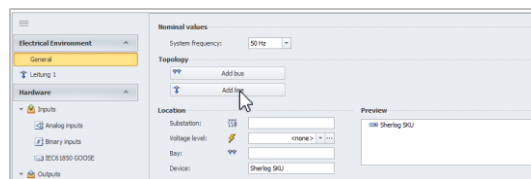
A parameterization is to be created for a 110 kV bus bar and 2 outgoing lines with the following configuration:

110 kV bus bar with 3-phase voltage transformer with open delta winding for measuring the displacement voltage is to be connected to analog inputs 1 to 4.
The transformation ratio of the transformer is 110 kV / 100 V.

Line 1: 3-phase current measurement on a current transformer with a transformation ratio of 400 A / 5 A which is to be connected to SHERLOG high-current inputs with a measuring range up to 200 (200 A). The line is to be coupled to the 110 kV bus bar.

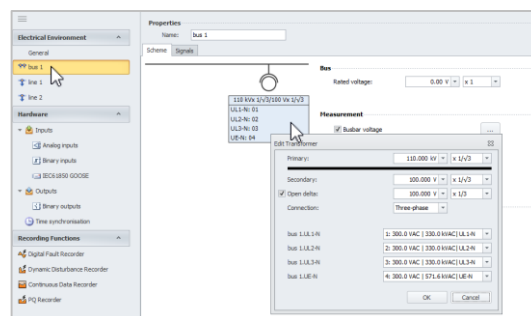
Line 2: 3-phase current measurement with star point current on a current transformer with a transformation ratio of 800 A / 1 A which is to be connected to 200 mV SHERLOG inputs via an external AC/DC current sensor with a shunt of 5 mOhm . Line 2 is also to be coupled to the 110 kV bus bar.

Create power systems



- Add power systems (one new bus bar and two new lines)

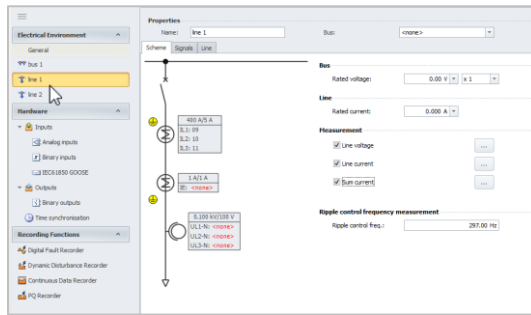
Define bus bar parameters



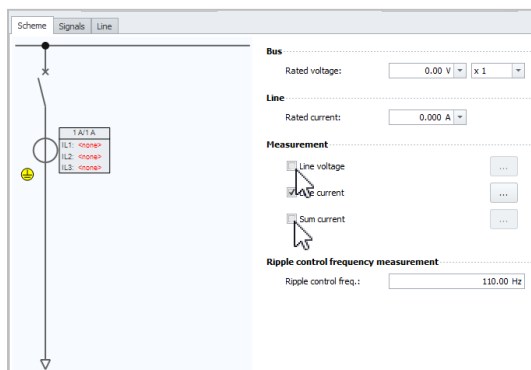
- Click the **New Bus 1** bus bar to open the properties window
- Enter a name for the bus bar
- Click the transformer box to open instrument transformer configuration and measurement channel allocation
- Configure the transformer ratio and measurement channel allocation
- Confirm with **OK**

After opening the transformer configuration again, the internal measuring range of the device and the measuring range of the transformer are displayed in the measurement channel allocation.

Define parameters for line 1 (direct current measurement)

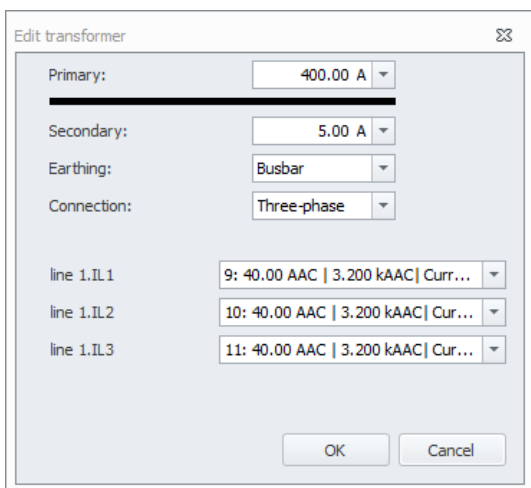


- Click the **Line 1** item to open the properties window
- Enter a name for the line 1



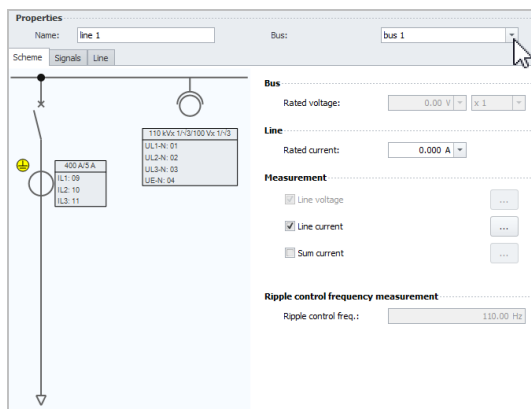
In this example no sum current measurement is to be carried out and the voltage is measured via the bus bar.

- Deactivate line voltage and sum current in the **Measurement** box
- Click the transformer box to open measurement channel allocation and transformation ratio configuration



- Configure the transformer ratio and measurement channel allocation
- Confirm with **OK**

After opening the transformer configuration again, the internal measuring range of the device and the measuring range of the transformer are displayed in the measurement channel allocation.



- Make the bus bar allocation in the properties box

The parameters of the bus bar are added to the diagram

Define parameters for line 2 (current measurement via external sensor)

For line 2, current measurement is to be carried out using an external sensor which converts the current signal to a voltage signal. For this reason it has to be connected to a voltage input of the SHERLOG device. First the sensor must be defined in the analog channel parameters.

When the analog channel parameters are opened, it can be seen that the power systems defined so far have been automatically updated.

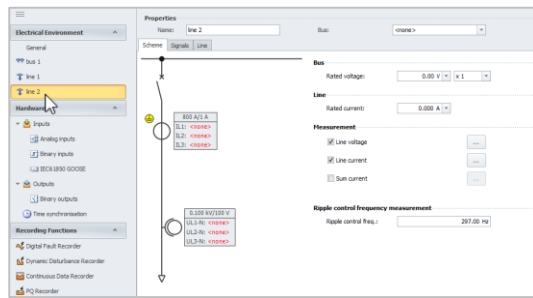
Electrical Environment	#	Color	Range	Component	Signal	DC	Sensor	Ratio	Total Range
General	001		300.0 VAC	bus 1	Voltage L1-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
bus 1	002		300.0 VAC	bus 1	Voltage L2-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
line 1	003		300.0 VAC	bus 1	Voltage L3-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
line 2	004		300.0 VAC	bus 1	Voltage E-N		...	110 kVx 1/√3/100 Vx 1/3	571.6 kVAC
Hardware	005		0.200 VAC		Analog input #05		5.00 mΩ	...	40.00 AAC
Inputs	006		0.200 VAC		Analog input #06		5.00 mΩ	...	40.00 AAC
Analog inputs	007		0.200 VAC		Analog input #07		5.00 mΩ	...	40.00 AAC
Binary inputs	008		0.200 VAC		Analog input #08		5.00 mΩ	...	40.00 AAC
IEC61850 GOOSE	009		40.00 AAC	line 1	Current L1		...	400 A/5 A	3.200 kAAC
Outputs	010		40.00 AAC	line 1	Current L2		...	400 A/5 A	3.200 kAAC
Binary outputs	011		40.00 AAC	line 1	Current L3		...	400 A/5 A	3.200 kAAC
Time synchronisation	012		40.00 AAC		Analog input #12		...	1 A/1 A	40.00 AAC
	013		200.0 AAC		Analog input #13		...	1 A/1 A	200.0 AAC
	014		200.0 AAC		Analog input #14		...	1 A/1 A	200.0 AAC
	015		200.0 AAC		Analog input #15		...	1 A/1 A	200.0 AAC
	016		200.0 AAC		Analog input #16		...	1 A/1 A	200.0 AAC

Define parameters for an external AC/DC current sensor with 5 mOhm shunts

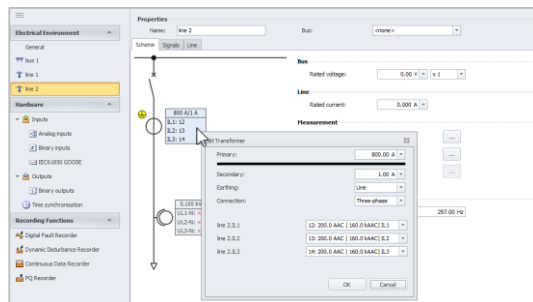
- Open the sensor parameters by clicking the sensor column of the 200 mV analog channel required
- Enter the sensor type and resistance

Once the sensor configuration for the analog input 17 has been completed successfully, the measuring range in the **Total range** column has changed to 40 A. These inputs are now available as current inputs and can be assigned in the signal allocation of the **Line 2** power system.

Electrical Environment	#	Color	Range	Component	Signal	DC	Sensor	Ratio	Total Range
General	001		300.0 VAC	bus 1	Voltage L1-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
bus 1	002		300.0 VAC	bus 1	Voltage L2-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
line 1	003		300.0 VAC	bus 1	Voltage L3-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
line 2	004		300.0 VAC	bus 1	Voltage E-N		...	110 kVx 1/√3/100 Vx 1/3	571.6 kVAC
Hardware	005		0.200 VAC		Analog input #05		5.00 mΩ	...	40.00 AAC
Inputs	006		0.200 VAC		Analog input #06		5.00 mΩ	...	40.00 AAC
Analog inputs	007		0.200 VAC		Analog input #07		5.00 mΩ	...	40.00 AAC
Binary inputs	008		0.200 VAC		Analog input #08		5.00 mΩ	...	40.00 AAC
IEC61850 GOOSE	009		40.00 AAC	line 1	Current L1		...	400 A/5 A	3.200 kAAC
Outputs	010		40.00 AAC	line 1	Current L2		...	400 A/5 A	3.200 kAAC
Binary outputs	011		40.00 AAC	line 1	Current L3		...	400 A/5 A	3.200 kAAC
Time synchronisation	012		40.00 AAC		Analog input #12		...	1 A/1 A	40.00 AAC
	013		200.0 AAC		Analog input #13		...	1 A/1 A	200.0 AAC
	014		200.0 AAC		Analog input #14		...	1 A/1 A	200.0 AAC
	015		200.0 AAC		Analog input #15		...	1 A/1 A	200.0 AAC
	016		200.0 AAC		Analog input #16		...	1 A/1 A	200.0 AAC



➤ Click the **Line 2** entry to open the properties window of the power system



➤ Configure instrument transformer for line current and total current

This completes the configuration.

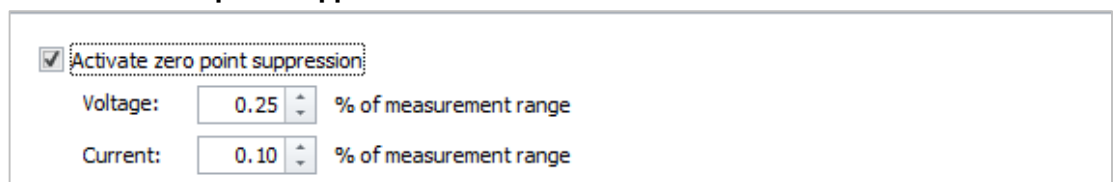
5.3.3 Analog inputs

The names and measuring ranges of the analog channel parameters concerned are added automatically:

#	Color	Range	Component	Signal	DC	Sensor	Ratio	Total Range
001		300.0 VAC	bus 1	Voltage L1-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
002		300.0 VAC	bus 1	Voltage L2-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
003		300.0 VAC	bus 1	Voltage L3-N		...	110 kVx 1/√3/100 Vx ...	330.0 kVAC
004		300.0 VAC	bus 1	Voltage E-N		...	110 kVx 1/√3/100 Vx 1/3	571.6 kVAC
005		0.200 VAC	line 2	Current L1		5.00 mΩ	...	40.00 AAC
006		0.200 VAC	line 2	Current L2		5.00 mΩ	...	40.00 AAC
007		0.200 VAC	line 2	Current L3		5.00 mΩ	...	40.00 AAC
008		0.200 VAC	line 2	Current E		5.00 mΩ	...	40.00 AAC
009		40.00 AAC	line 1	Current L1		...	400 A/S A	3.200 kAAC
010		40.00 AAC	line 1	Current L2		...	400 A/S A	3.200 kAAC
011		40.00 AAC	line 1	Current L3		...	400 A/S A	3.200 kAAC
012		40.00 AAC		Analog input #12		...	1 A/1 A	40.00 AAC
013		200.0 AAC		Analog input #13		...	1 A/1 A	200.0 AAC
014		200.0 AAC		Analog input #14		...	1 A/1 A	200.0 AAC
015		200.0 AAC		Analog input #15		...	1 A/1 A	200.0 AAC
016		200.0 AAC		Analog input #16		...	1 A/1 A	200.0 AAC

The signal names were entered automatically by the software in accordance with the configuration of the electrical environment and can be edited manually as required.

Activate zero point suppression



Zero point suppression can be activated to suppress the display of implausible measurement values (signal noise) when energy systems are switched off. Measurement results smaller than the configured threshold are automatically corrected to zero.

5.3.4 Binary inputs

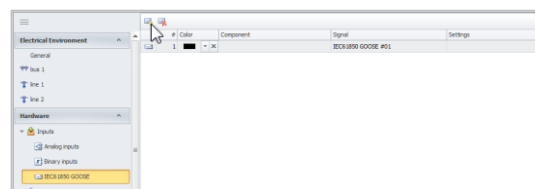
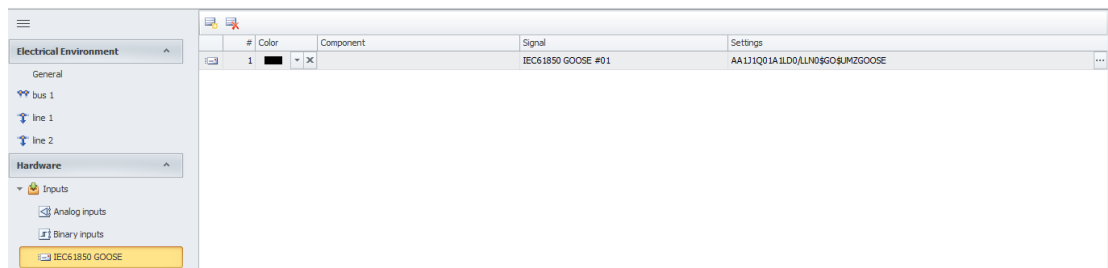
The configuration of the binary inputs includes switching channels on and off, the signal colour for the record as well as entering the desired names.

Channels which are switched off are not recorded.

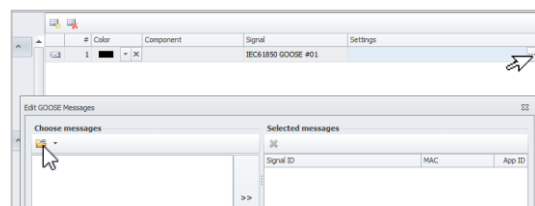
#	Color	Component	Signal	Debounce time
001	Black		Binary input #01	0 ms
002	Black		Binary input #02	0 ms
003	Black		Binary input #03	0 ms
004	Black		Binary input #04	0 ms
005	Black		Binary input #05	0 ms
006	Black		Binary input #06	0 ms
007	Black		Binary input #07	0 ms
008	Black		Binary input #08	0 ms
009	Black		Binary input #09	0 ms
010	Black		Binary input #10	0 ms
011	Black		Binary input #11	0 ms
012	Black		Binary input #12	0 ms
013	Black		Binary input #13	0 ms

5.3.5 IEC61850 GOOSE

Virtual binary inputs can be created for recording GOOSE messages via the network connection.



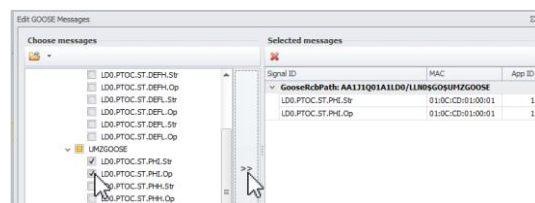
➤ Add virtual signal



➤ Click the button
➤ Select configuration file



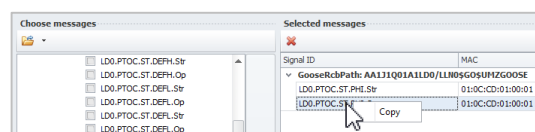
Files in the cid, scd and icd formats are supported.



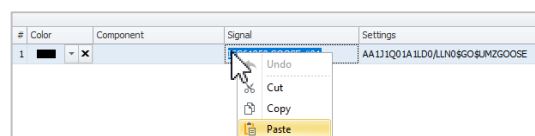
➤ Select messages and confirm with >> after **Selected messages**



If several messages are selected, they are accepted with the logical operator OR.

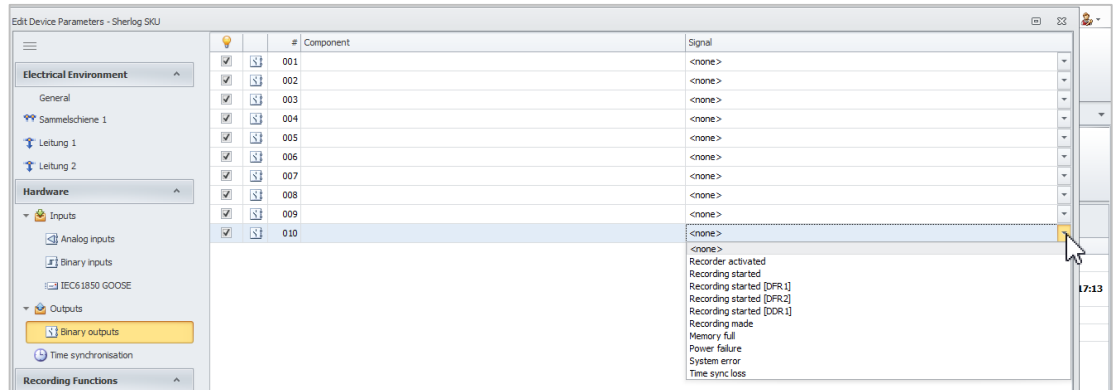


If the name from the configuration file is to be used as the signal name, it can be copied via the clipboard.



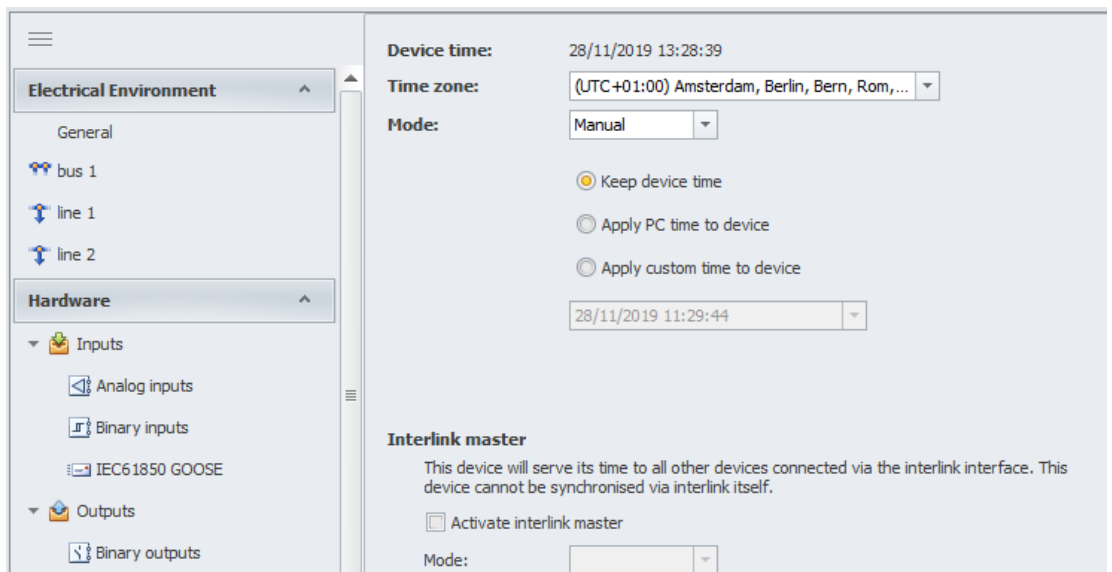
5.3.6 Binary outputs

Fixed functions only can be allocated to the binary inputs using the picklist in the **Signal** column:



5.3.7 Time synchronization

The time synchronization can be set in the operating software or alternatively on the device display. For more information, see the **SHERLOG CRX Operating Instructions**.

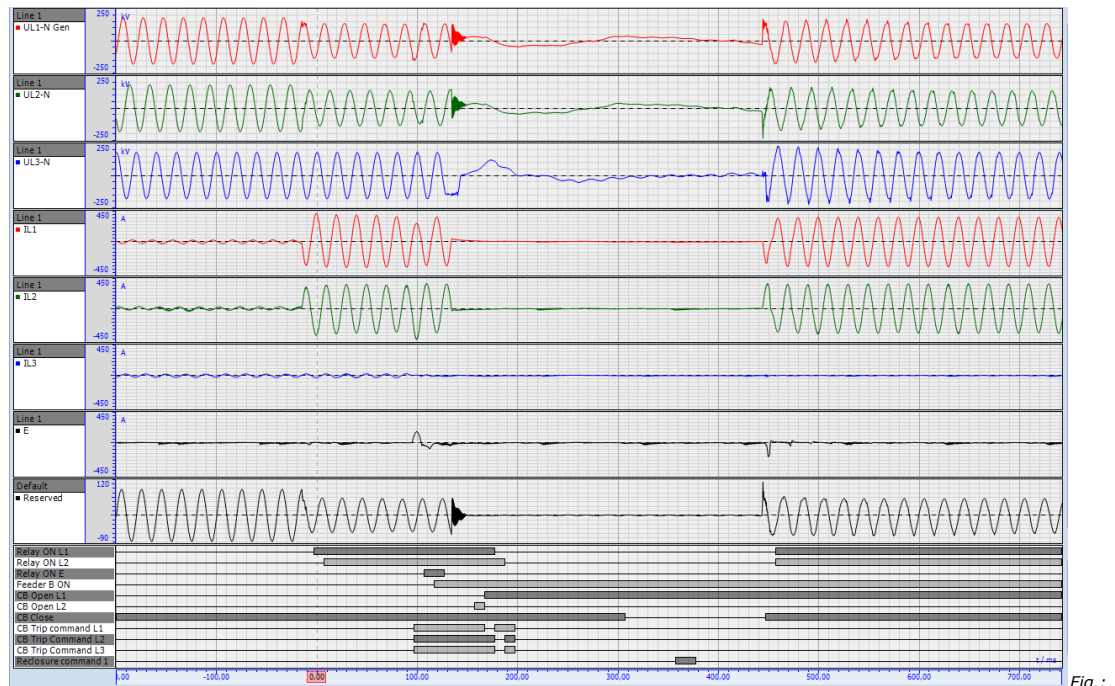


5.3.8 Define digital fault recorder parameters

The digital fault recorder makes high-resolution recordings of power system faults.

The transient fault record generally contains all the signals which are connected to the analog and binary inputs and shows the fault characteristic with additional pre-fault and post-fault periods.

The time resolution of the analog inputs can be set between 250 Hz and 30 kHz. Binary inputs are always recorded with 10 kHz and therefore have a fixed time resolution of 100 microseconds (0.1 ms).



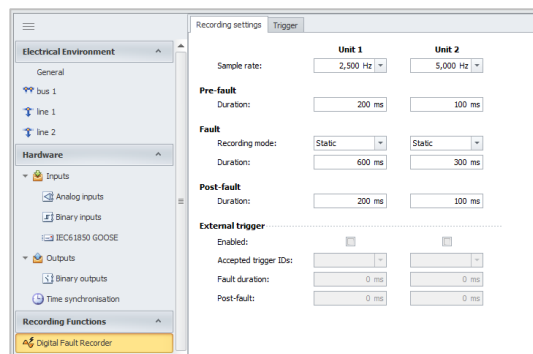
Example of a record

SHERLOG contains two discrete digital fault recorder units.

Sampling rate, recording duration and trigger conditions can be assigned to each unit separately.

Both units can also generate simultaneous or overlapping recordings.

Sampling rate and recording duration



- Call up the **Digital fault recorder** view
- Make the settings on the **Recording settings** tab

Sample rate:

The sampling frequency for analog inputs can be chosen between 250 Hz and 30 kHz.

Pre-fault/Duration:

Recording duration before fault occurrence

Fault/Recording mode static:

The recording duration is the defined **Maximum duration** whatever the actual fault duration. Subsequent faults which are detected during this time do not prolong recording.

Fault/Recording mode dynamic:

The recording duration is controlled by the actual length of the event which triggers recording but is limited by the **Maximum duration**. Subsequent faults which are detected during this time do not prolong recording.

Post-fault/Duration:

Recording duration which is added to the fault recording duration. Subsequent faults which are detected during this time prolong recording by provoking a restart of the fault recording duration. The maximum number of permissible subsequent triggers is set in the trigger parameters.

External trigger

The settings under **External trigger** are used to define the way this SHERLOG device is to behave in response to external cross-triggers which can be initiated by other SHERLOG devices. The cross-trigger information is exchanged between the participating SHERLOG devices via the KoCoS-Interlink interface.

Define trigger parameters

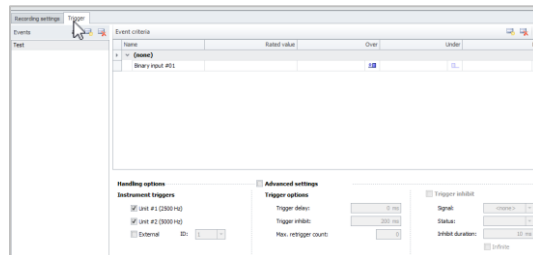


Fig.: Empty trigger dialogue box

Up to 14 trigger events can be defined on the **Trigger** tab for the purpose of triggering fault records automatically.

Up to 16 event criteria can be assigned to any one trigger event.

In addition, certain Handling options are possible for each trigger event.

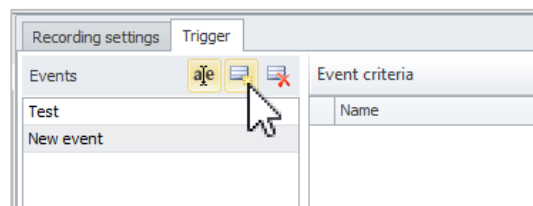


Fig.: Create trigger events

➤ Create a trigger event by clicking the **Add** button

Events can be renamed using the **F2** function key or the a|e button.

Handling options

Handling options	Advanced settings	Trigger inhibit
Instrument triggers <input checked="" type="checkbox"/> Unit #1 (2500 Hz) <input type="checkbox"/> Unit #2 (5000 Hz) <input type="checkbox"/> External ID: 1	Trigger options Trigger delay: 0 ms Trigger inhibit: 200 ms Max. retrigger count: 0	Signal: <none> Status: Inhibit duration: 10 ms <input type="checkbox"/> Infinite

Instrument triggers

Unit #1 and Unit #2:

The check boxes are used to define which fault recorder units are to be started (triggered) by this event.

External:

- The **External** check box is used to define whether this even is also to be passed on as a cross-trigger to other SHERLOG devices via the KoCoS-Interlink interface.
- The ID is used to identify the cross-trigger information. In the external trigger configuration of the other SHERLOG devices it is possible to specify which IDs the devices react to. This allows the implementation of selective cross-triggers.

Handling options	Advanced settings	Trigger inhibit
Instrument triggers <input checked="" type="checkbox"/> Unit #1 (2500 Hz) <input type="checkbox"/> Unit #2 (5000 Hz) <input type="checkbox"/> External ID: 1	Trigger options Trigger delay: 0 ms Trigger inhibit: 200 ms Max. retrigger count: 0	Signal: <none> Status: Inhibit duration: 10 ms <input type="checkbox"/> Infinite

Trigger options

Trigger delay:

Defines the time period which must elapse before a limit value violation triggers a recording.

A delay can be useful for some measurement tasks, in order to suppress starting currents, for example. Usually no delay is entered for fault recorder applications (0 ms) as all limit violations are supposed to trigger a recording without delay in this case.

Trigger inhibit:

An inhibit time can be defined for a trigger if repeated recording is not required when the same events occur several times in succession.

Triggering is suppressed when the same limit value violation occurs repeatedly in succession within the inhibit time. An inhibit time can be used to prevent intermitting triggers in this way.

Max. triggers:

If a subsequent fault occurs within the post-fault period of a fault record, the record in progress is prolonged. The maximum number of triggers specifies how often recording may be prolonged. If the maximum number has been reached and another subsequent fault occurs, the record in progress is finished and a new record is started.

Trigger inhibit:

By configuring a trigger inhibit, it is possible to use a binary input to prevent a recording being triggered in response to this event.

An example of an application is the suppression of the record of planned switch-ons or transitions.

The duration of the trigger inhibit can be limited by entering an **Inhibit duration**. If the **Infinite** check box is activated, the trigger inhibit remains valid for the entire time during which the chosen status persists.

Add event criteria

In order for trigger events to be able to become active, appropriate criteria must be assigned to them. All the criteria within an event are linked by the "or" operator. This means that events become active as soon as one or more criteria are violated.

Up to 16 criteria can be assigned to any one event.

- Click the **Add** button to add an event criterion

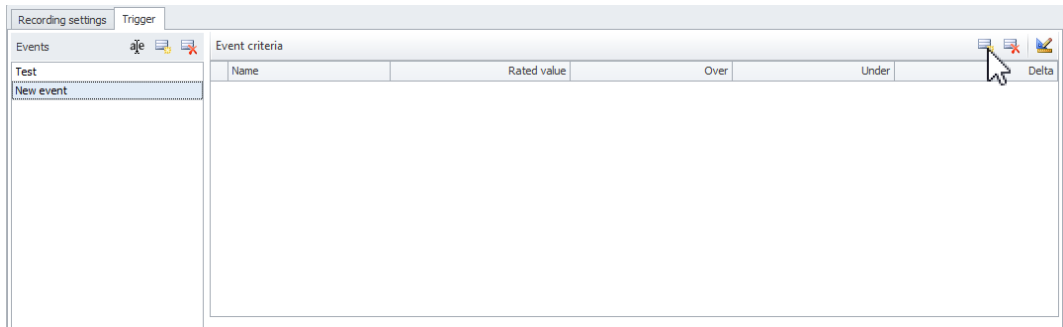


Fig.: Add criteria to a selected event

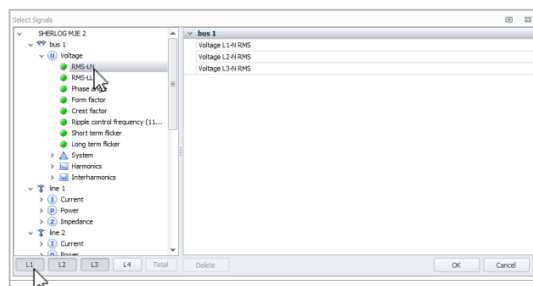


Fig.: Selection of the event criteria

A signals browser is opened. Analog and binary channels which have been assigned to a power system during the configuration of the electrical environment are listed under the name of that power system.

Analog and binary channels which have not been assigned to a power system are available for selection under **Analog signals** and **Binary signals**.

- Select a criterion and add it by clicking the button for the appropriate phase reference

Once the criteria have been selected, the limit values to be monitored can be selected and then set by clicking the **Edit criterion** button or by clicking the limit values and icons directly.

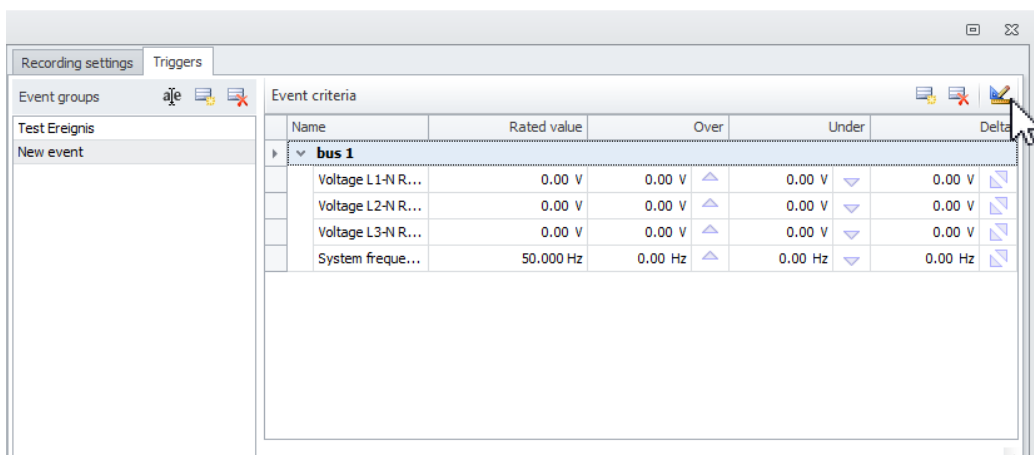


Fig. Event list with assigned criteria

Overtriggers, undertriggers or delta (change) triggers can be set either as absolute quantities or in percent in relation to the rated value.

It is important to note that all limit values refer to primary quantities.

Fig.: Example for 110 kV bus bar

Example: Trigger on the phase-phase voltages of a 110 kV bus bar

Because the voltage levels given and the data of voltage transformers usually refer to phase-phase voltages, but the fault recorder usually measures the phase conductor against the star point or the earth, the factor $\sqrt{3}$ must be used when setting the trigger thresholds.

So the correct rated value of a 110 kV voltage level is $110 \text{ kV} / 1.73 = 53508 \text{ V}$.

When setting the trigger threshold in percent it is important to note that 100% always refers to the rated value given. So an overvoltage of 10% should be entered as 110%.

5.3.9 Define dynamic disturbance recorder parameters

Unlike the digital fault recorder, the dynamic disturbance recorder does not record the signal shape, but records values which are calculated from the signals, such as amplitude, phase angle, frequency, unbalance, etc..

The time resolution can be set anywhere between 1 Hz and 120 Hz. Binary inputs are always recorded with 10 kHz and therefore have a fixed time resolution of 100 microseconds (0.1 ms).

Dynamic (RMS) fault records consist of a pre-fault period and a post-fault period which is started with a trigger event.

Sampling rate and recording duration

Fig.: Dynamic disturbance recorder/Recording settings

Sample rate:

The sampling rate (calculation interval) can be chosen between 1 Hz and 120 Hz.

Pre-fault:

Recording duration before fault occurrence. Duration of the pre-fault period max. 30 seconds.

Post-fault:

Recording duration starting with fault occurrence. Duration of the post-fault period max. 1800 seconds (30 minutes).

External trigger:

The settings under **External trigger** are used to define the way the SHERLOG device is to behave in response to external cross-triggers which can be initiated by other SHERLOG devices. The cross-trigger information is exchanged between the participating SHERLOG devices via the KoCoS-Interlink interface.

Select the signals to be recorded and define the trigger parameters

On the **Signals and triggers** tab the **Add** button can be used to select the measurement values which are to be recorded and enter the appropriate trigger criteria. For more information, see under the heading **Add event criteria** in the chapter titled **Define digital fault recorder parameters**. A total of 32 signals can be added for triggering and recording.

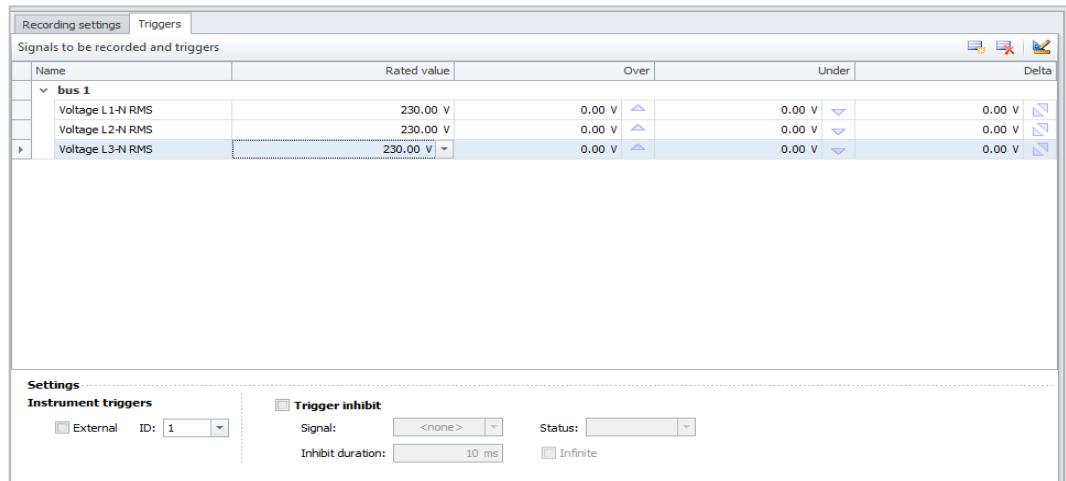
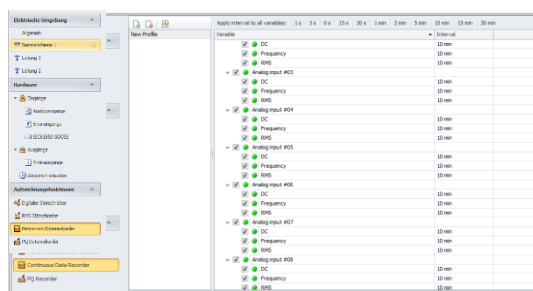


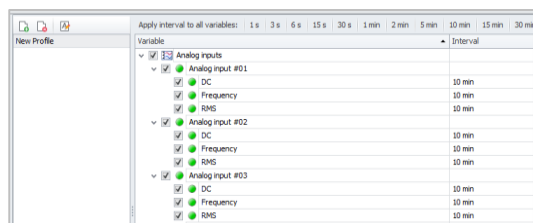
Fig.: Dynamic disturbance recorder/Triggers

5.3.10 Define continuous data recorder (PQ) parameters





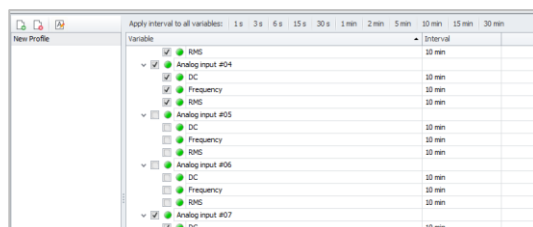
Cyclical recordings of RMS values of voltage and current characteristics and power values can be configured under **Continuous data recorder** when the PQ device licence is activated.

If a measurement is to be carried out in accordance with a standard (standard EN50160), an automatic configuration can be carried out under **PQ data recorder**, see below.



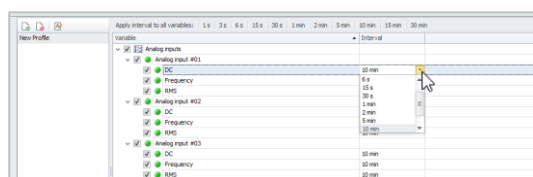
Which variables are to be recorded is defined in profiles. Several different profiles can be created and recorded in parallel.

- Use  to create a new profile
- Use  to edit the profile name



In each profile, any variable can be selected for recording by activating the corresponding check box.

If the check box at the top node (line or busbar) of the variable selection is activated, all variables are selected.



Except for the variables **Ripple control frequency**, **Short-term flicker** and **Long-term flicker**, the recording intervals for all variables can be set independently of one another.

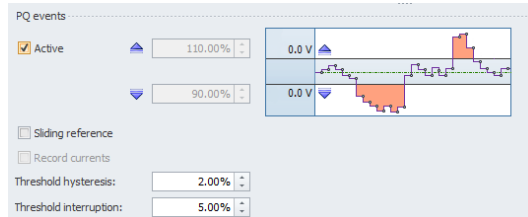
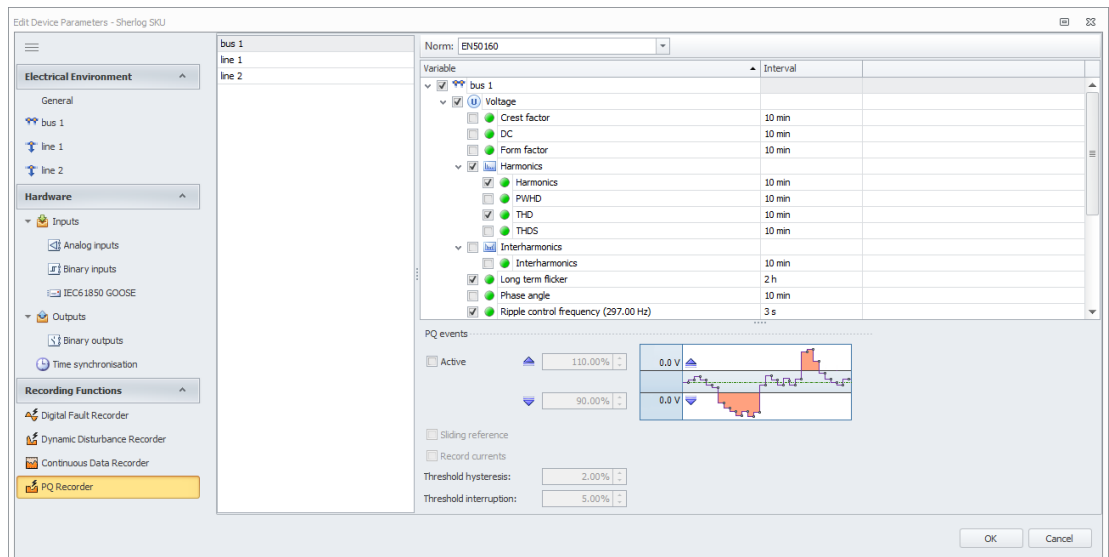
In the title bar, it is also possible to apply an interval to all variables.

5.3.11 Define PQ data recorder parameters

(PQ device licence must be activated)

As with the continuous data recorder, the variables to be recorded are selected using profiles.

With the PQ data recorder, however, automatic configuration in accordance with standards such as EN 50160 is always fundamental. In addition to the automatically configured variables, any variables can be added manually by activating the check boxes. However, it is not possible to delete automatically configured variables.



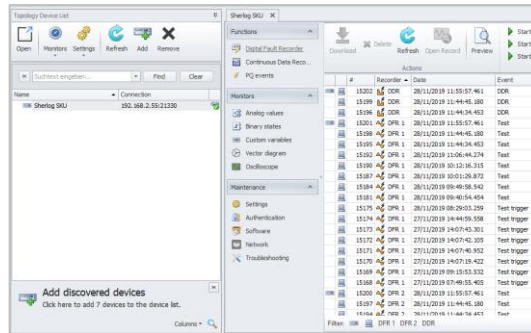
Additionally, trigger criteria (threshold values) for the event-driven recording can be configured:

- Select the **Active** check box to activate the event trigger

Minimum and maximum trigger values can be configured as percentage values with reference to the rated value for the relevant voltage (line 1 or 2).

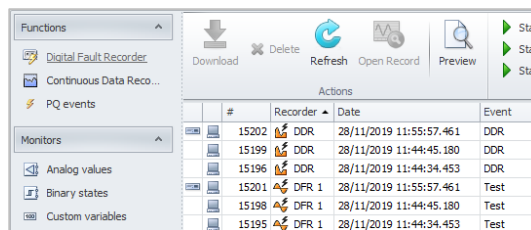
6 Device dialogue window

The device dialogue window is the central control element for all actions which are directly related to the operation of the connected fault recorders. The device dialogue window provides an overview of all records of the device. All functions and monitors can be called up directly in the device dialogue window, network and fault status can be displayed.



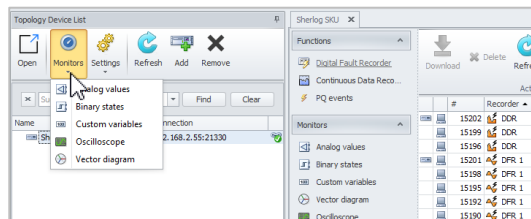
- Click a device in the device list
The device dialogue window is opened.

Device dialogue windows for several devices can be opened simultaneously and the windows can be positioned, docked and grouped on the screen as required. For more information, see the chapter titled **Analyse** under **Customize the user interface**.



Under **Functions** and **Monitors**, various views for the device dialogue window can be called up. They are described below.

When a device dialogue window is opened, the **Digital fault recorder** function is displayed automatically.



Independently of the device dialogue window, the monitors can also be called up via the **Monitors** selection.

Several monitors can be opened simultaneously here and the windows can be positioned, docked and grouped on the screen as required. For more information, see the chapter titled **Analyse** under **Customize the user interface**.

7 Functions

Under **Functions** the records of the individual fault recorder functions can be called up.

7.1 Digital fault recorder

#	Recorder	Date	Event	Criterion	Sample rate	Duration
15202	DDR	28/11/2019 11:55:57.461	DDR	<Binary input #1>	50 Hz	10.00 s
15199	DDR	28/11/2019 11:44:45.180	DDR	<Binary input #1>	50 Hz	10.00 s
15196	DDR	28/11/2019 11:44:34.453	DDR	<Binary input #1>	50 Hz	10.00 s
15201	DFR 1	28/11/2019 11:55:57.461	Test	<Binary input #1>	2,500 Hz	0.99 s
15198	DFR 1	28/11/2019 11:44:45.180	Test	<Binary input #1>	2,500 Hz	0.99 s
15195	DFR 1	28/11/2019 11:44:34.453	Test	<Binary input #1>	2,500 Hz	0.99 s
15192	DFR 1	28/11/2019 10:12:16.315	Test	<Binary input #1>	2,500 Hz	0.99 s
15187	DFR 1	28/11/2019 10:01:29.872	Test	<Binary input #1>	2,500 Hz	0.99 s
15184	DFR 1	28/11/2019 09:40:34.494	Test	<Binary input #1>	2,500 Hz	0.99 s
15175	DFR 1	28/11/2019 08:29:03.259	Test trigger	Test trigger	1,000 Hz	0.26 s
15174	DFR 1	27/11/2019 14:07:42.105	Test trigger	Test trigger	1,000 Hz	0.26 s
15173	DFR 1	27/11/2019 14:07:42.105	Test trigger	Test trigger	1,000 Hz	0.26 s
15172	DFR 1	27/11/2019 14:07:42.105	Test trigger	Test trigger	1,000 Hz	0.26 s
15170	DFR 1	27/11/2019 14:07:42.105	Test trigger	Test trigger	1,000 Hz	0.26 s

In the **Digital fault recorder** view, all the records currently saved in the memory of the fault recorder or in the database are displayed in a table of contents.

- DFR1: Transient fault recorder 1
- DFR2: Transient fault recorder 2
- DDR: Dynamic disturbance recorder

Records can be displayed, transferred to the PC and deleted; test recordings can be generated.

#	Recorder	Date	Event	Criterion	Sample rate	Duration
15202	DDR	28/11/2019 11:55:57.461	DDR	<Binary input #1>	50 Hz	10.00 s
15199	DDR	28/11/2019 11:44:45.180	DDR	<Binary input #1>	50 Hz	10.00 s
15196	DDR	28/11/2019 11:44:34.453	DDR	<Binary input #1>	50 Hz	10.00 s
15201	DFR 1	28/11/2019 11:55:57.461	Test	<Binary input #1>	2,500 Hz	0.99 s
15198	DFR 1	28/11/2019 11:44:45.180	Test	<Binary input #1>	2,500 Hz	0.99 s
15195	DFR 1	28/11/2019 11:44:34.453	Test	<Binary input #1>	2,500 Hz	0.99 s

The symbols in the first two columns of the table of contents indicate whether the record is saved on the device or has already been transferred to the operating PC and saved in the record database.

- Column 3: Consecutive record number
- Recorder: Recorder which generated the record (DFR1, DFR2 or DDR).
- Date: Trigger date and time of the record.
- Event: Name of the trigger event as defined under Handling options.
- Criterion: Trigger criterion with indication of type: over, under or change (d/dt).
- Sample rate: Sampling rate with which the record was generated.
- Duration: Duration of the whole record including the pre-fault, fault and post-fault periods.

7.1.1 Filter records

#	Reco	Date	Event	Criterion
15202	DDR	28/11/2019 11:55:57.461	DDR	<Binary input #1>
15199	DDR	28/11/2019 11:44:45.180	DDR	<Binary input #1>
15196	DDR	28/11/2019 11:44:34.453	DDR	<Binary input #1>
15201	DFR 1	28/11/2019 11:55:57.461	Test	<Binary input #1>
15198	DFR 1	28/11/2019 11:44:45.180	Test	<Binary input #1>
15195	DFR 1	28/11/2019 11:44:34.453	Test	<Binary input #1>
15192	DFR 1	28/11/2019 10:12:16.315	Test	<Binary input #1>
15190	DFR 1	27/11/2019 14:07:42.105	Test trigger	<Binary input #1>
15187	DFR 1	27/11/2019 14:07:42.105	Test trigger	<Binary input #1>
15184	DFR 1	27/11/2019 14:07:42.105	Test trigger	<Binary input #1>
15181	DFR 1	27/11/2019 14:07:42.105	Test trigger	<Binary input #1>
15175	DFR 1	28/11/2019 08:29:03.259	Test trigger	Test trigger
15174	DFR 1	27/11/2019 14:07:42.105	Test trigger	Test trigger
15173	DFR 1	27/11/2019 14:07:42.105	Test trigger	Test trigger
15172	DFR 1	27/11/2019 14:07:42.105	Test trigger	Test trigger

If there are a large number of records in the device, it can be helpful to filter display on the basis of specific criteria.

- Click the filter icon in the header of the relevant column
- Select a filter criterion

Filter: [DFR 1] [DFR 2] [DDR]

Start in device

In the footer it is also possible to filter by storage location and recorder.

7.1.2 Sort records

The default setting is for the latest records to be added at the top of the list (sorted by date in ascending order).

Click a column to change the sorting order. Each click switches the order between ascending and descending.

7.1.3 Group records

Right-click the column heading to open a context menu which lists further display functions for selection.

This makes it possible to group the display by different recording functions or events, for example.

7.1.4 Download records

Records can be transferred manually from the device to the database on the operating PC.

- Select the records required (use the shift or CTRL key for multiple selection)
- Start transfer by clicking the **Download** button

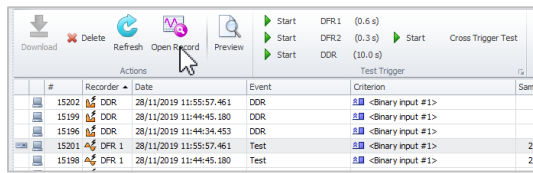
Double-click the desired record to download it and open it directly for analysis, see under **SHERLOG Expert Analyse**.

Records which have been downloaded are added to the database and are marked accordingly.



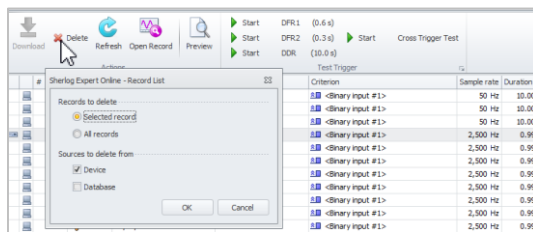
Double-click the desired record to download it and open it directly for analysis, see under **SHERLOG Expert Analyse**.

7.1.5 Open records



- Select the record required (use the shift or CTRL key for multiple selection)
- Click **Open record**
- The record is downloaded automatically. **SHERLOG Expert Analyse** is opened, the selected records are displayed, see under **SHERLOG Expert Analyse**.

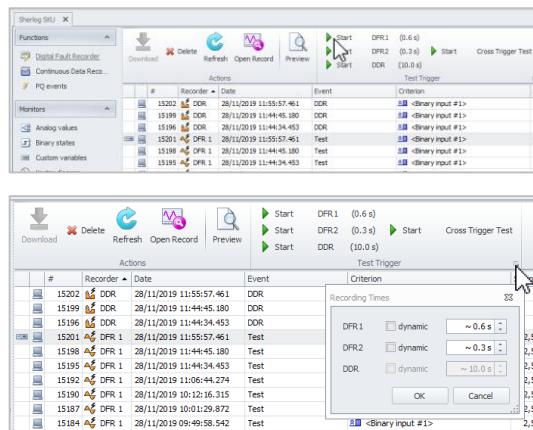
7.1.6 Delete records



Records can be deleted from the device and/or the PC database either individually or all together.

- Click **Delete**
- Select which records are to be deleted
- Confirm with **OK**

7.1.7 Trigger test recordings via the software



For certain measurement tasks or for the purpose of testing functionality, the two transient fault recorders DFR1 and DFR2 can be triggered manually.

- Click the arrow icon to open the test trigger configuration window
- Set record duration
- Click **Start** to activate test trigger



Alternatively test triggers can be activated directly using the display of the SHERLOG device. For more information, see the **SHERLOG CRX operating instructions**.

7.2 Continuous data recorder

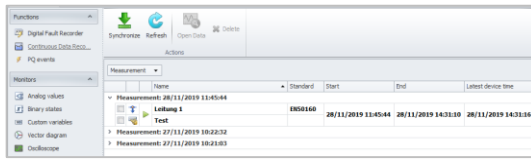
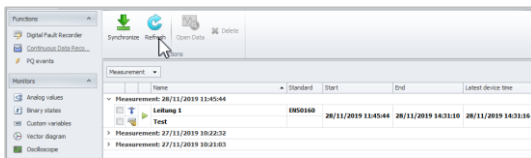
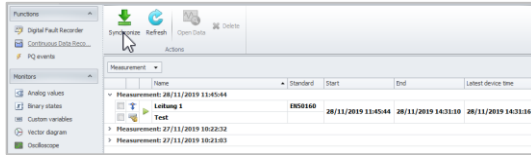


Fig.: Device dialogue, **Continuous data recorder** view

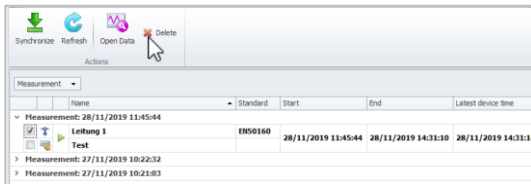
In the **Continuous data recorder** view, the measurement data saved in the measuring device can be displayed, deleted, called up and transferred to the PC. A communication connection between PC and measuring device must be activated before these functions can be used.

Active records are marked with the ► symbol.

Using the **Synchronize** function, cyclical measurement data can be transferred from the measuring device to the PC. Cyclical measurement data which has already been transferred is marked with the current date in green.

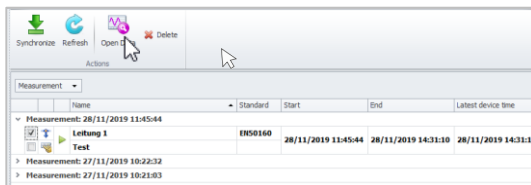


Using the **Refresh** function, already transferred measurement data can be updated.



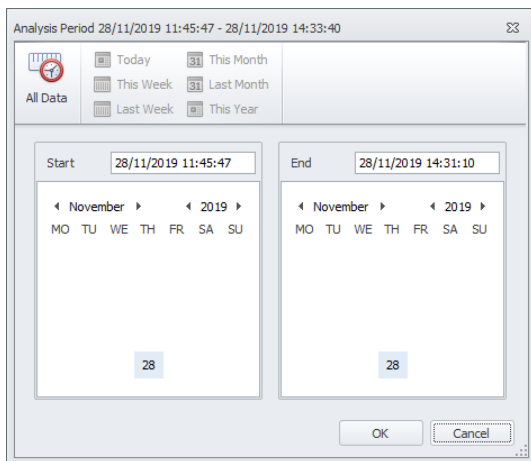
Using the **Delete** function, data which is not required in the device can be deleted.

7.2.1 Open long-term records



Click the **Open data** button to open the analysis software with the measurement data which has already been transferred to the PC.

A window opens automatically in which the analysis period to be displayed can be entered.



As well as opening all recorded data, it is also possible to merely open a selected analysis period.

7.3 PQ Events

(PQ device licence must be activated)

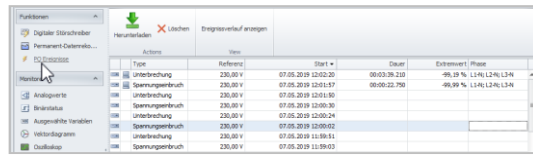
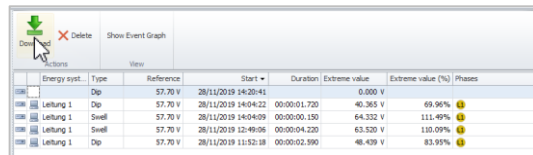
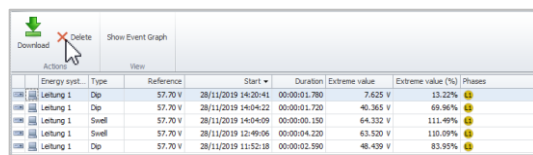


Fig.: Device dialog window, PQ Events view

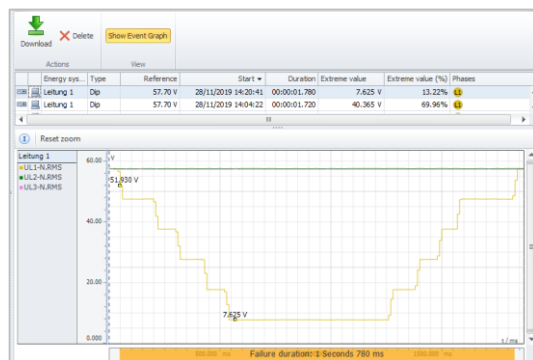
In the **PQ Events** view, the time period when events occurred is displayed. The events can be deleted, called up or transferred to the PC. A communication connection between PC and measuring device must be activated before these functions can be used.



Using the **Download** function, the events can be transferred from the measuring device to the PC. Events which have already been transferred are displayed with information on duration, extreme value and phases.



Using the **Delete** function, data which is not required in the device can be deleted.

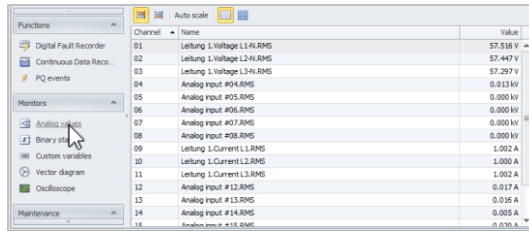


In the **Show event graph** view, the event characteristic is displayed graphically.

8 Monitors

The monitors allow different views of the input signals.

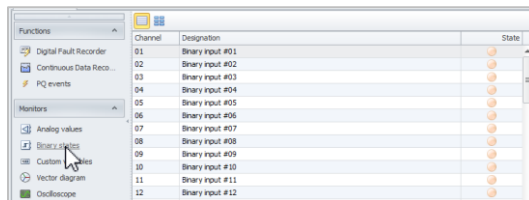
8.1 Analog values



In the **Analog values** view, the measurement values of all analog inputs are displayed.

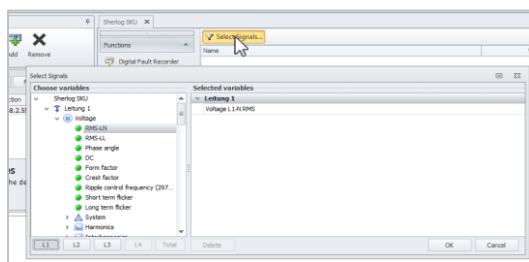
As the user can switch between primary and secondary values in this display, it is particularly suitable for checking the configured transformer ratios during commissioning.

8.2 Binary states



In the **Analog values** view, the states of all binary inputs are displayed.

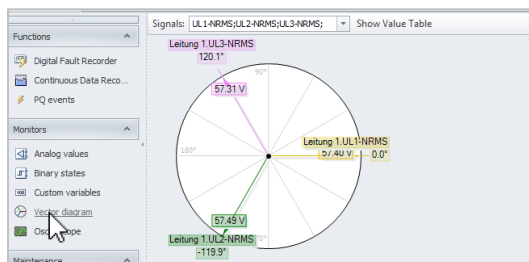
8.3 Selected variables



The live values of the selected signals are displayed.

- Click **Select signals**
- The signals browser is called up
- Select desired signals

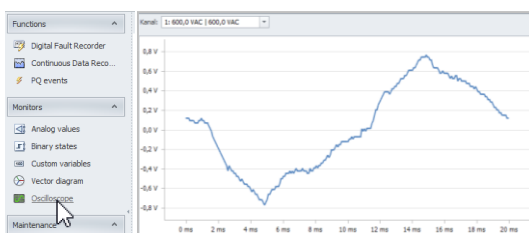
8.4 Vector Diagram



The live values of the selected signals are displayed in a vector diagram.

The **Show value table** button can also be used to show a value table for magnitude and angle.

8.5 Oscilloscope



The live values of the selected channel are displayed as an oscillogram.

9 Maintenance

9.1 Change the SHERLOG CRX IP address

The IP connection parameters can either be set on-site using the display of the SHERLOG device or remotely via the software.

If the IP connection parameters of a SHERLOG which has already been registered in the software are changed via the device display, this change must also be made in the software, so that the device can be accessed again in the software.

Example: SHERLOG IP address has been changed on the device

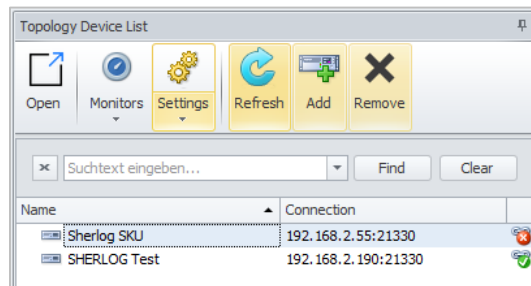



Fig.: Device list displays communication fault

A SHERLOG CRX with the IP address 192.168.2.136 was added to the device list of the software. Later the SHERLOG IP address was changed on the display of the SHERLOG device. As a result, the device cannot be accessed via the software.

The icon  for a communication fault is displayed in the device list.

9.1.1 Update connection parameters in the software

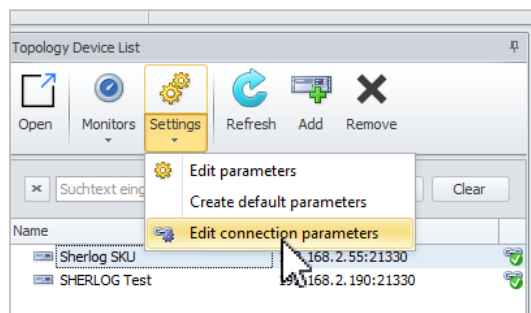


Fig.: Settings/Edit connection parameters

- Select the device concerned in the device list
- Click **Settings/Edit connection parameters**

The connection parameters for the selected device are called up.

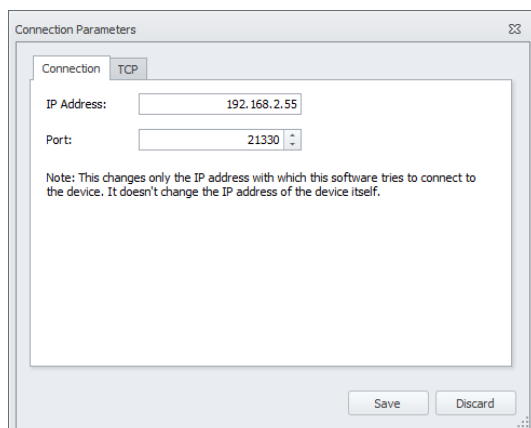


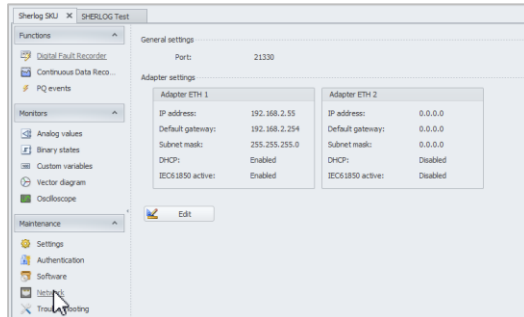
Fig.: Connection parameters

- Set and save the correct device IP parameters in the **Connection parameters** dialogue

9.1.2 IP connection settings via remote access using the software

The IP connection settings of SHERLOG devices can be edited in the software via remote access if the data connection is functioning correctly.

- Double-click the device concerned to open the device dialogue window
- Switch to the **Maintenance/Network** view



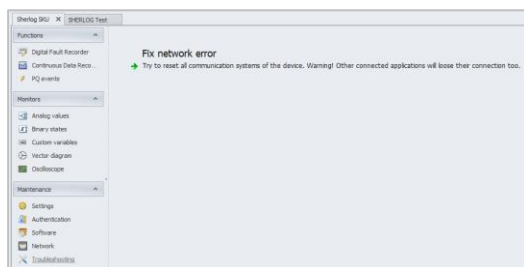
- Enter the changes
- Activate the changes by clicking the **Apply** button



This method changes the IP connection settings of the SHERLOG devices as well as the corresponding settings in the software of the PC in use.

If the access to the changed SHERLOG device is to be configured for further PCs, the IP address must be changed manually on these PCs. For more information, see under **Update connection parameters in the software**.

9.1.3 Troubleshooting



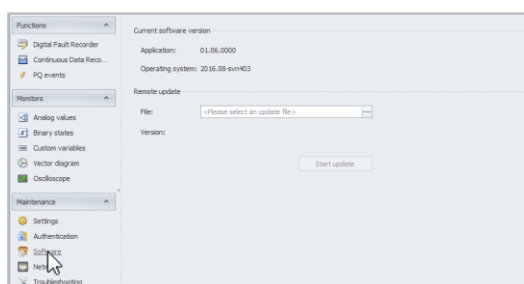
In case of disturbances in the communication of the device, all connections can be reset by clicking **Fix network error**.



CAUTION

Other connected applications will lose their connection too!

9.1.1 Software



Menu item for remote update of the device software. The currently installed device version is displayed and update files can be selected and loaded into the device.

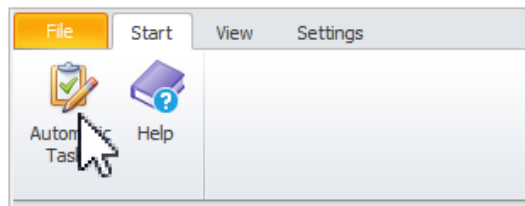


During the update procedure the device is unreachable, which is indicated in the device list by a red X at connection status.

A progress bar is displayed in the software which runs through the entire update procedure. This can take a few minutes.

10 Automatic tasks

Automatic tasks can be used to carry out functions automatically.



- Switch to the **Start** tab
- Select the desired device
- Click the **Automatic tasks** button

Fig.: Start/Automatic tasks

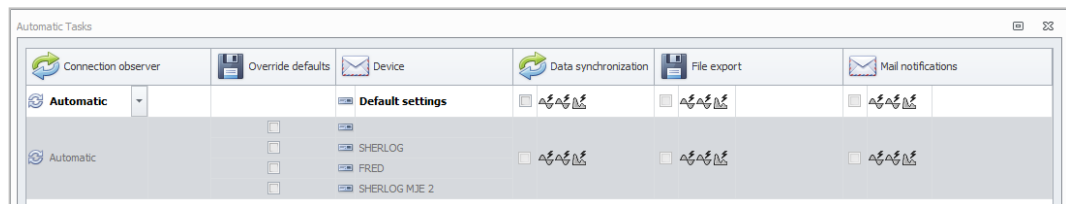
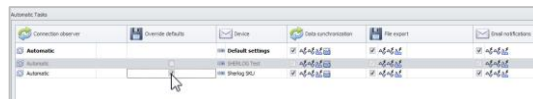


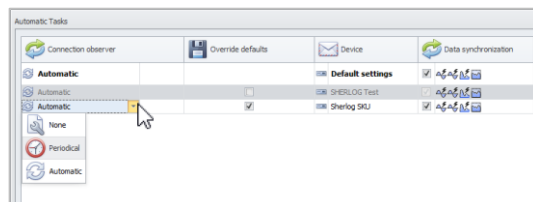
Fig.: Automatic tasks

10.1 Override defaults



In the top line, the default settings are made which are applied to all devices for which the check box under **Override defaults** is not activated. By activating the check box, settings deviating from the standard can be made for individual devices.

10.2 Connection observer

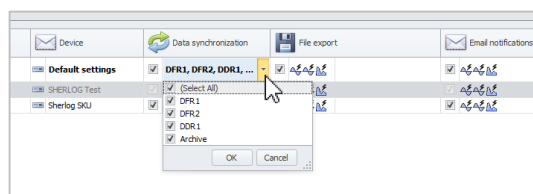


Automatic tasks can be carried out automatically as soon as a record is available on the device or periodically in adjustable time intervals.

This includes monitoring the connection between the device and the PC. The status of the connection is displayed in the device list.

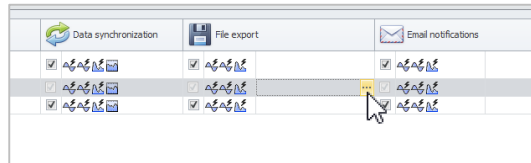
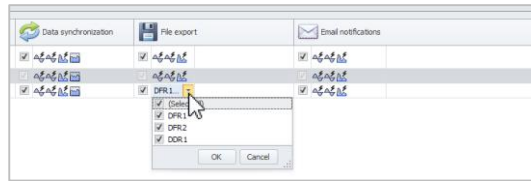
10.3 Data synchronization

In order to create reports and to analyse recorded data, the data must be transferred to the common record database. The transfer can be automated with data synchronization.



- Adjust default settings or activate the check box in the **Override defaults** column and only adjust the desired device
- Open the list box and define for which fault recorder the task is to be carried out

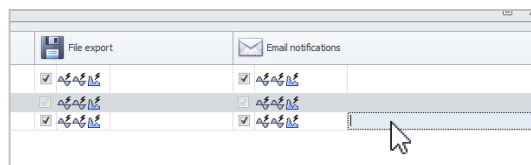
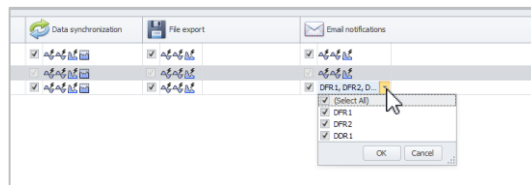
10.4 File export



After an automatic data transfer, the data can also be automatically exported to any directory.

- Adjust default settings or activate the check box in the **Override defaults** column and only adjust the desired device
- Open the list box and define for which fault recorder the task is to be carried out
- Specify the directory to which the data is to be exported

10.5 E-mail notification

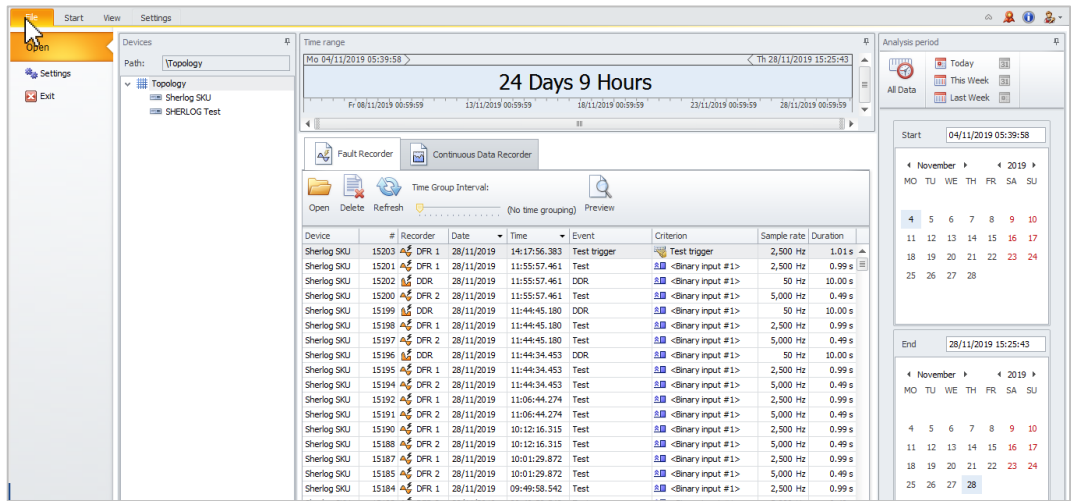


After automatic report creation, the report can also be sent automatically by e-mail.

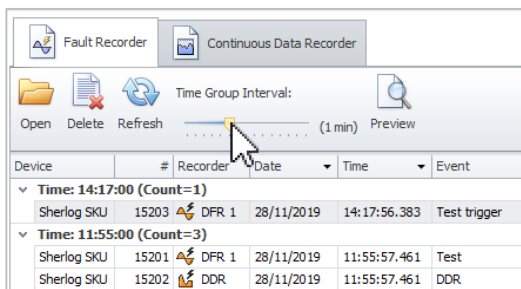
- Adjust default settings or activate the check box in the **Override defaults** column and only adjust the desired device
- Open the list box and define for which fault recorder the task is to be carried out
- Specify the e-mail address to which the report is to be sent

11 File menu

On the **File** tab, it is possible to call up all records saved in the database regardless of the connection to a device.



11.1 Time group interval

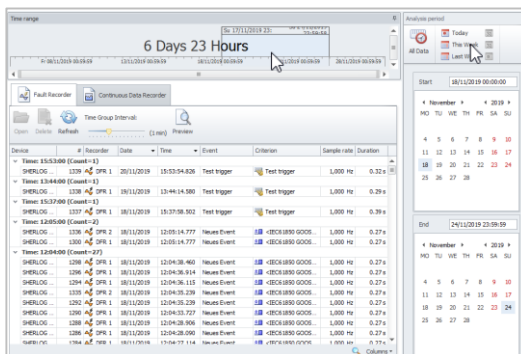


In the header a time interval for grouping the records can be set.

Use the slider to set the time interval

Records which are in the same time interval are grouped.

11.2 Analysis period



Records can be filtered via a time window. The range for the setting depends on the data of the records.

- Define time window by clicking on **Today / This week / Last week**
- or
- Enter times for start and end of time window or click in calendar
- or
- Use the slider in the display to set the time window

Only the records within the time window are displayed.

12 SHERLOG Expert Analyse

The SHERLOG analysis software is used for the evaluation of recordings made by SHERLOG CRX fault recorders.

The software contains a comprehensive range of powerful analysis tools for the assessment of recorded data:

- Useful zoom functions and variable scaling
- Simultaneous display, superimposition and synchronization of more than one fault record
- Vector displays
- Harmonic analysis on the basis of full waves or to IEC 61000-4-7 with interharmonics
- Automatic PQ evaluation in accordance with EN 50160 for measurement data from devices with PQ device licence
- Nyquist plot
- Determination of fault location
- Freely configurable absolute and delta measurement cursors
- Formulary and formula editor for the calculation of further power system quantities
- Individual report creation using the clipboard
- Automatic report creation

Fault location

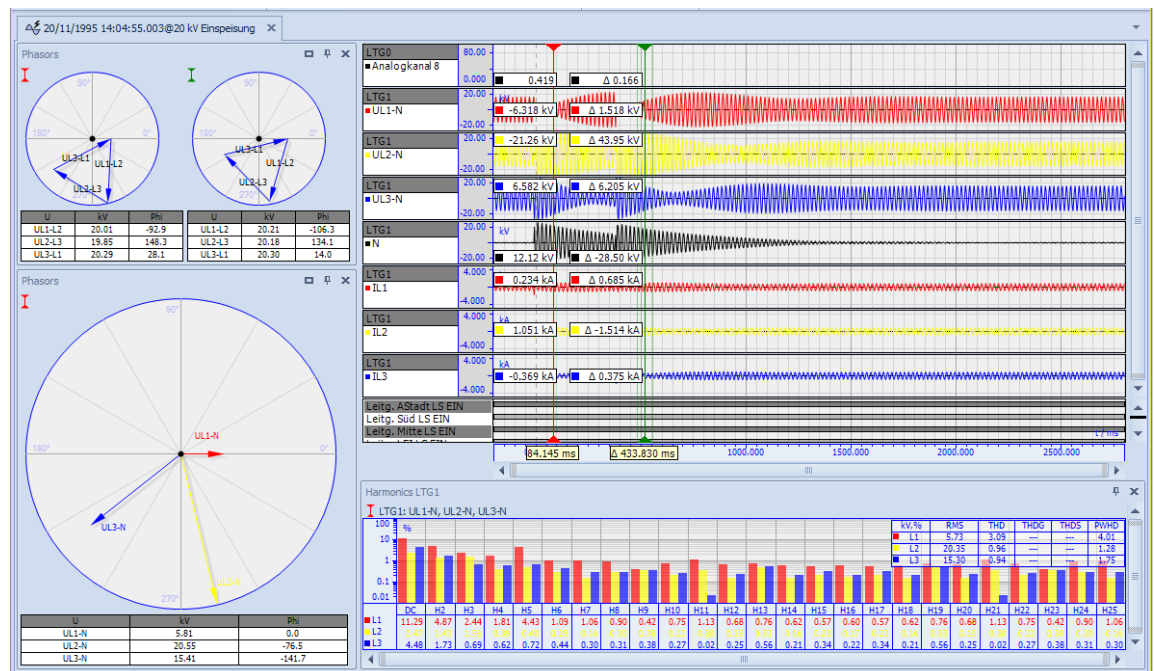
The fault locator can characterise faults quickly as well as calculating the fault loop and detailing the fault type, fault impedance and fault location.

Mathematical signal analysis

A formula editor can be used to make further mathematical calculations within fault records. The results are added to the fault record as an additional signal.

Data formats

Import and export functions enable data to be exchanged between different systems using standard COMTRADE, CSV, PQDIF or Nequal file formats.



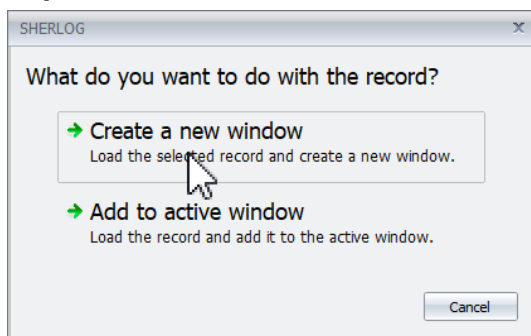
12.1 Open records

The analysis software is started by opening a record in SHERLOG Expert Online.

12.1.1 Open several records

Several records can be opened one after the other.

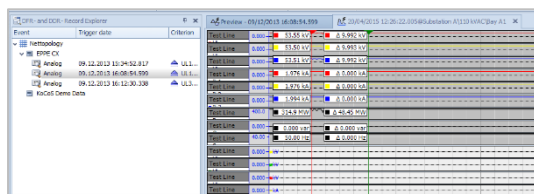
In a separate analysis window



If a record is already open when another record is opened, the user can choose whether the records are to be displayed separately or whether they are to be superimposed.

➤ Click **Create a new window**

The record is opened in a separate analysis window.

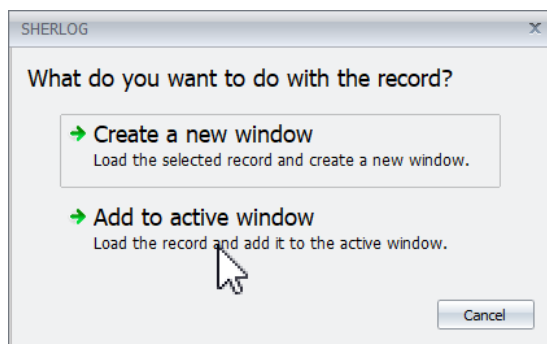


The newly opened record is added as a further tab in the analysis window.

Click the tabs to switch between records.

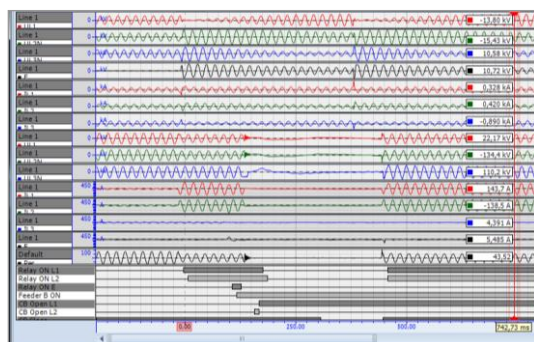
Each record can be grabbed with the mouse, removed from the current view and dragged to another screen, for example, once it has been accessed via the corresponding tab.

Superimpose records



➤ Click **Add to active window**

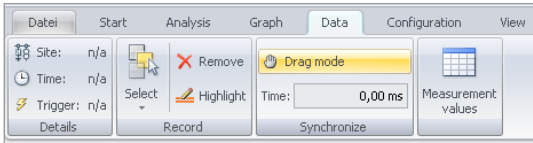
The record to be opened is superimposed with the currently displayed record.



Superimposition causes the individual records to be consolidated to form a new record which can be saved as a new event by clicking **Save as** on the **File** tab.

Synchronize superimposed records

Records which overlap in time are synchronized automatically on the basis of the trigger time points.

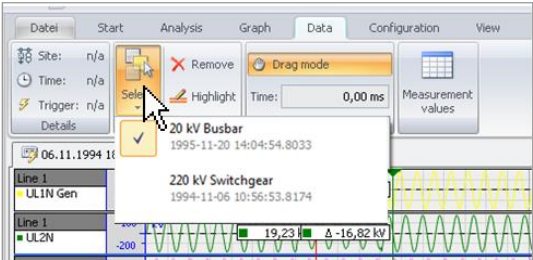


Manual synchronization

When the **Drag mode** button is activated, the records can be moved in relation to one another with the mouse.

Alternatively, a time correction can be entered. The records are displaced by the amount of time entered here.

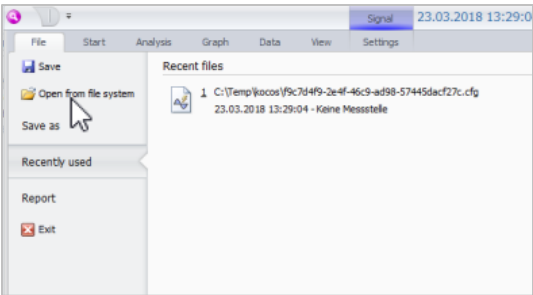
Highlight or remove superimposed records



Especially if individual signals have been moved around in consolidated records, it can be useful to highlight all the channels of a specific record for identification purposes.

In order to do so, a record can be selected by clicking the **Select** button on the **Data** tab. The **Highlight** and **Remove** buttons affect the selected record only.

12.1.2 Open from file system



SHERLOG event records (*.Evt) or records available in COMTRADE format can be opened from any storage location.

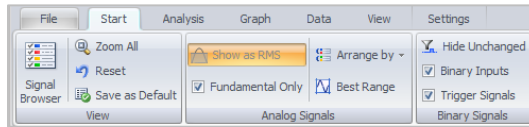
- Click the **Open from file system** button

A file browser is opened for selecting the record.

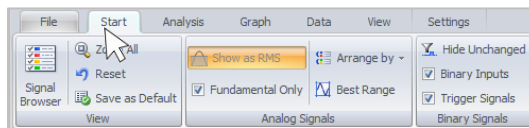
12.2 User interface

Basic knowledge of the Windows® operating system is a prerequisite for working with the software. Typical Windows® functions are not dealt with in this user manual.

12.2.1 Ribbon

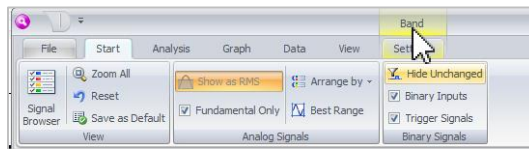


Task-oriented tabs are arranged in the ribbon.



Task-oriented tabs

The tabs are used to call up thematically organized groups of commands which are displayed on the ribbon.



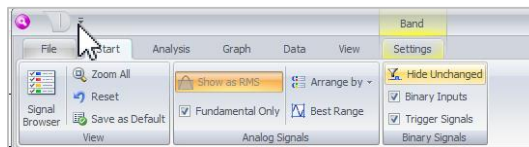
Contextual tabs

In addition to the core tabs which are always displayed, some tabs are only available when the user selects a function which requires special options for its execution.

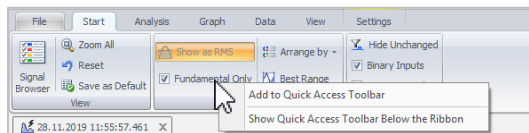


The functions and commands of individual tabs are described in the context of their use in the following chapters of this user manual.

Quick access toolbar



The quick access toolbar is always in the foreground (active). Users can customize this toolbar by adding favourite commands for quick access.



Add commands to the quick access toolbar

- Select the desired command by clicking it with the right-hand mouse button

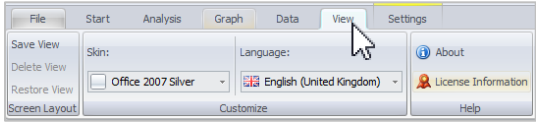
A dialogue box for customizing the quick access toolbar is called up.

- Choose **Add to Quick Access Toolbar**

The command is displayed as an icon on the quick access toolbar and can be called up from there.

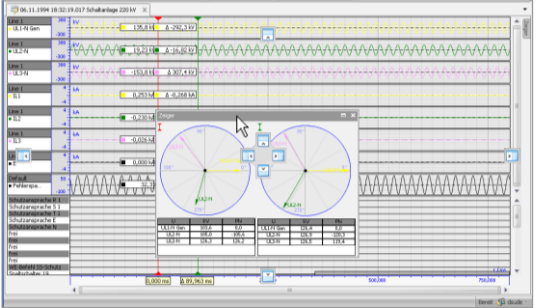
To remove commands from the quick access toolbar, use the right-hand mouse button to call up the remove command.

12.2.2 Customize the user interface



Settings for the screen design and the language are made on the **View** tab. For more information, see above under **Software**.

Position additional windows



Using the mouse, the position and size of tools such as signal lists or the windows of analysis functions can also be changed manually.

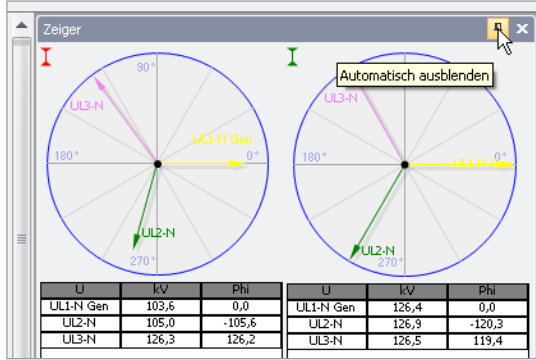
The position can also be changed automatically with the docker function:

- Click the title bar of the docker window and drag it while keeping the left-hand mouse button pressed

A number of arrow icons are displayed for positioning.

- Drag the window to one of these arrow icons and then release the mouse button
- The docker window is positioned automatically.

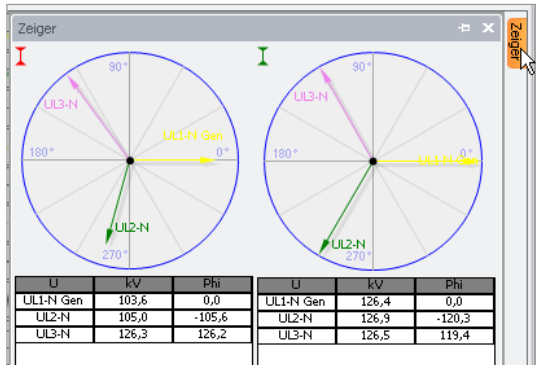
Automatically hide additional windows



Additional windows can be hidden and or shown using the buttons at the edge of the monitor:

- Click the **Auto hide** button

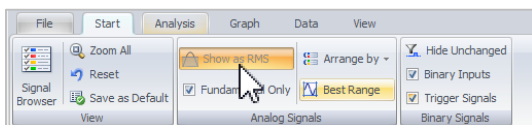
The window is hidden and a button for showing the window is automatically positioned at the edge of the monitor.



- Point to the button with the mouse pointer
- The window is shown.

12.3 Display options for fault records

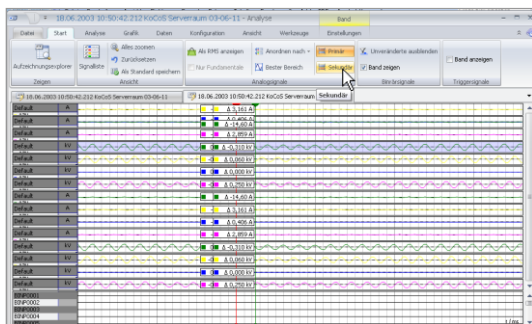
12.3.1 RMS display



➤ Click the **Show as RMS** button

The signal characteristics are displayed as RMS values with optimised scaling.

12.3.2 Display primary or secondary values



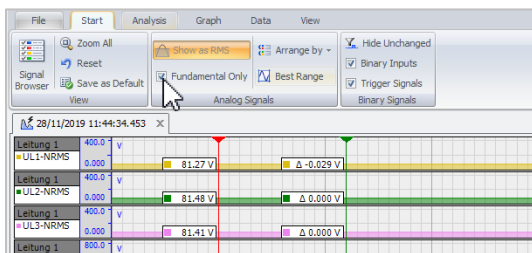
➤ Click the **Primary** button

The primary values are displayed at the measurement cursors. Primary values allow for the transformer ratios configured for sensors and transformers.

➤ Click the **Secondary** button

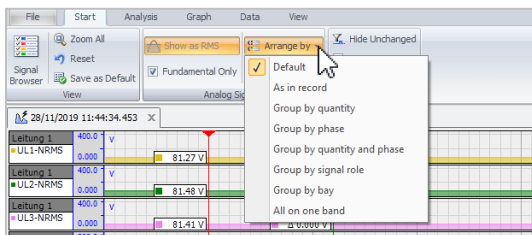
The secondary values are displayed at the measurement cursors. Secondary values refer to the measurement signal at the input terminals of SHERLOG.

12.3.3 Fundamentals only



This view shows only the amplitude of the fundamental wave (50/60/16.7 Hz component). Harmonic components are hidden.

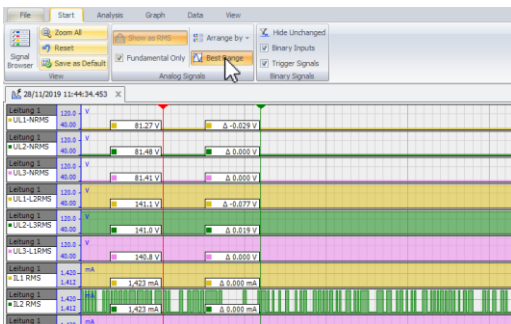
12.3.4 Arrange by



The individual signal characteristics (bands) are re-sorted and/or grouped according to the selection.

Note: Only the current view is rearranged. The channels in the record file are not rearranged.

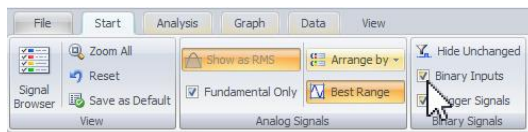
12.3.5 Best range display



➤ Click the **Best range** button

The scaling factor for the display of signal characteristics is automatically set to achieve an optimised display with maximum resolution.

12.3.6 Show and hide binary channels



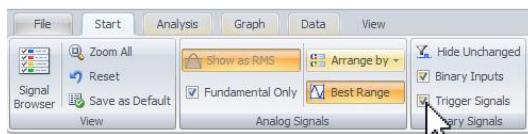
The display of the binary channel signals can be shown or hidden.

- In the **Binary signals** group, select the **Show band** check box

The binary signals are displayed.

Activate the **Hide unchanged** button to display only those binary channels for which at least one change of state is registered during recording.

12.3.7 Show and hide trigger information



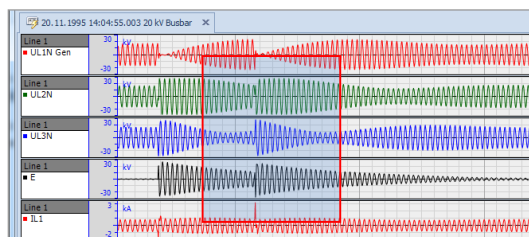
In the **Trigger signals** band, the type and duration of all the limit value violations which occurred during recording are displayed. This shows when and for how long which limit value was violated within the record.

The display of the extended trigger information by means of binary signal display can be shown or hidden.

- In the **Trigger signals** group, select the **Show band** check box

12.4 Zoom functions

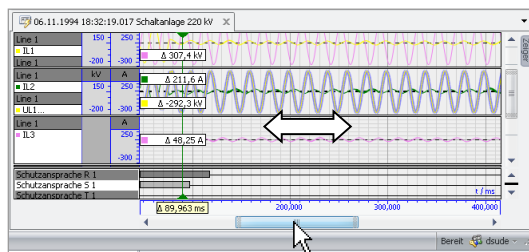
12.4.1 Window zoom



- Use SHIFT + left-hand mouse button to drag open a zoom window around the area to be displayed

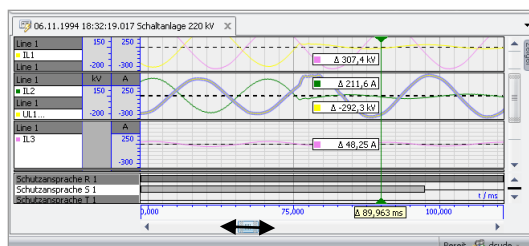
The selected area is zoomed to the maximum display size.

12.4.2 Smart bars



- Use the left-hand mouse button to move the sliders on the horizontal and vertical scroll bar.

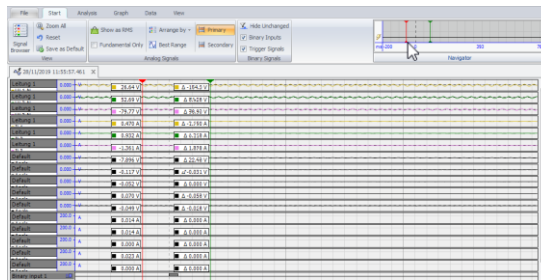
The zoomed area of the image is moved.



- Position the mouse pointer on the ends of the slider which are marked in grey

The mouse pointer takes on the form of a double-headed arrow and the left-hand mouse button can be used to operate the zoom

12.4.3 Bird view (navigator)



The ribbon features a navigation window which provides an overview of the entire length of the record and the current cursor positions.

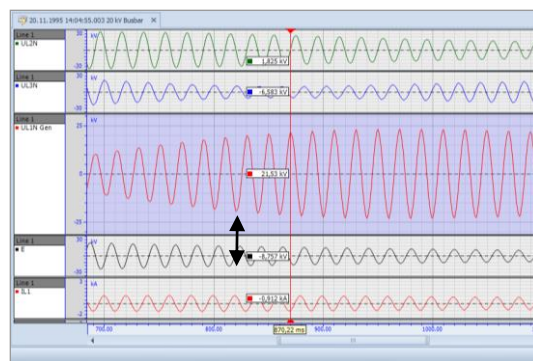


The navigation window is hidden if the window is not wide enough to display the groups of commands and the navigation window!

The (zoomed) time range currently visible in the analysis window is shown with a grey background in the navigation window. Via the grey area, the view can be moved and its size modified (zoomed) with the left-hand mouse button.

The navigator can also be used to move the position of the measurement cursors.

12.4.4 Amplitude zoom of individual signal bands

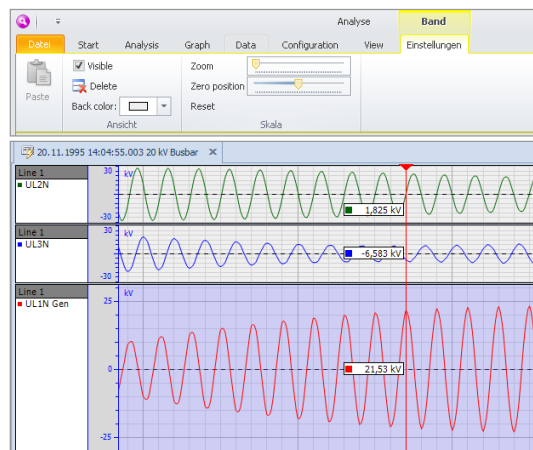


Using the mouse, the individual signal bands can be selected or moved and their amplitude magnified.

- Position the mouse pointer at the bottom edge of a band.

The mouse pointer takes on the form of a double-headed arrow and the signal band can be zoomed as required.

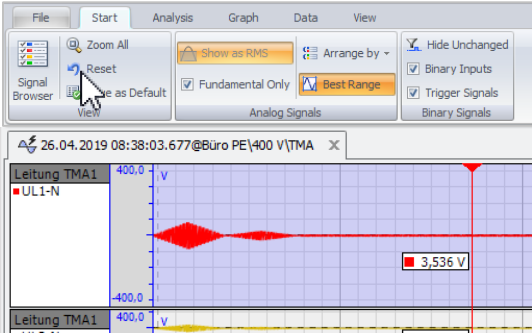
12.4.5 Edit the scaling factor and the offset of individual signals



Individual signals can be zoomed in on and moved within the band.

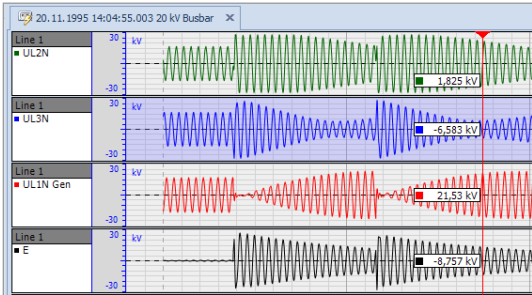
- Select a band
- The **Band** tab is displayed in the quick access toolbar
- Click the **Band** tab
- The tab for editing bands is displayed
- Use the **Zoom** slider to set the scale of the amplitude within the band
- Use the **Zero position** slider to set the offset of the signal within the band

12.4.6 Undo zoom functions

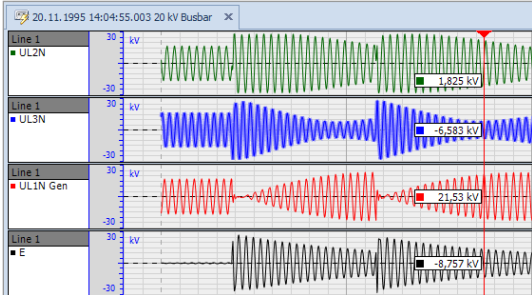


- On the **Start** tab, click the **Reset** button
- The zoom functions carried out since the last time the view was saved are undone.

12.4.7 Move signals with the mouse



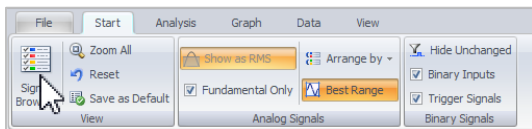
- Change the order of the signals**
- Select a band
 - Keep the left-hand mouse button pressed and move the band to the required position
- When the band is moved, the insertion location is shown in blue.



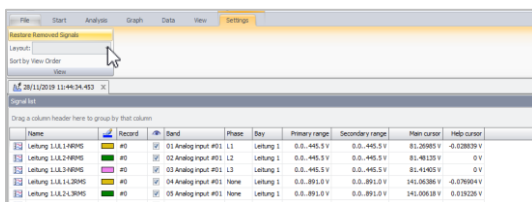
- Superimpose signals**
- To superimpose signals, several signals can be displayed in one band.
- Select a signal
 - Keep the left-hand mouse button pressed and move the signal into another band
- The target band is highlighted during the movement.

- Separate superimposed signals**
- During the movement, position the mouse pointer between two bands so that neither of the bands is highlighted.
- The selected signal is added as a new band.

12.5 Signal browser



➤ On the **Start** tab, click the **Signal browser** button.

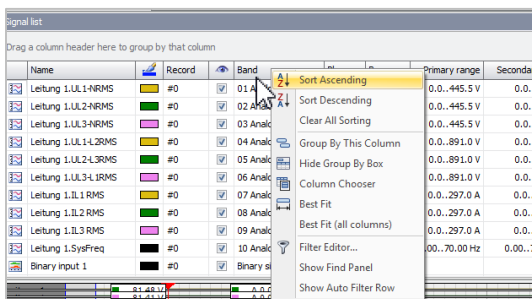


The signal browser is called up.

The signal browser shows all the analog and binary channels of the record as well as their measuring ranges or states at the cursor positions.

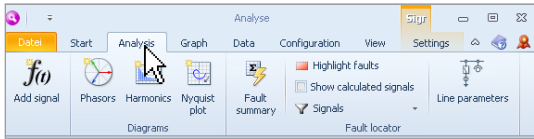
User-defined views

Two user-defined views can be saved and called up in the **View** group.



When one of these user-defined views is called up, a right-click on the column heading opens a context menu in which the view can be defined.

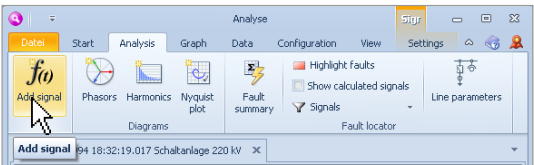
12.6 Analysis functions



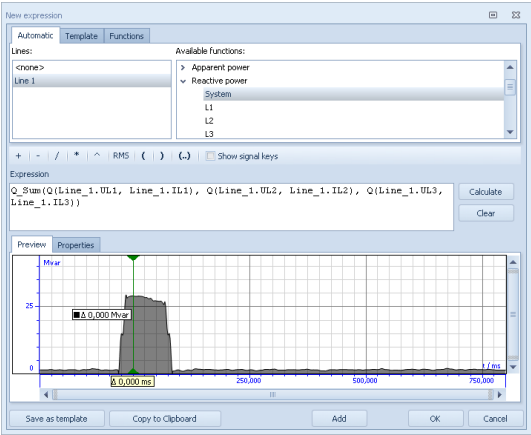
All the analysis functions can be called up from the **Analysis** tab

12.6.1 Use mathematical calculations to add signals

A formula editor can be used to make further mathematical calculations within fault records. The results can be added to the fault record as an additional signal.



➤ On the **Analysis** tab, click the **Add signal** button

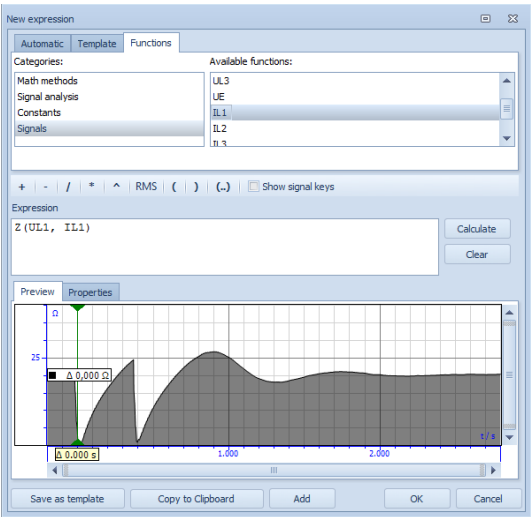


The **New expression** window is called up **Automatic**

This tab makes available those calculations which automatically result from the signal types and phase allocations of the channels in the record which is open at the time. For example, if the phase reference between current and voltage channels is defined in the record, the calculation formulae for power which can be derived from the phase reference are offered directly.

Template

Using the **Save as template** button, individual formulae can be saved in the template for later use.

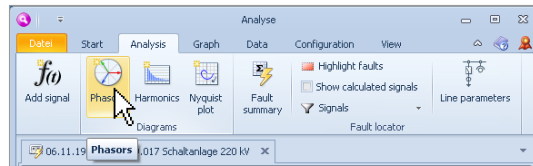


Functions

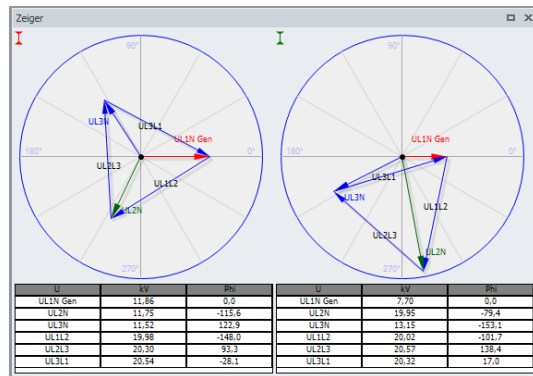
Users themselves can define all kinds of virtual channels with the aid of the functions provided. Access is given to mathematical functions, formulae for signal analysis (unbalance, frequency, harmonics etc), constants and all the channels in the record which is currently open.

12.6.2 Vector analysis

Power systems which exist in the record (e.g. a line or a bus bar) can be displayed with their value and phase angle in the form of a vector diagram. Any number of vector diagrams can be opened; the view can be set individually for each one.



➤ On the **Analysis** tab, click the **Phasor** button.

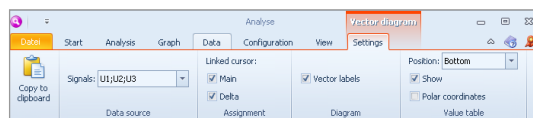


The vector diagram is called up.

In addition to the graphical display, the signals displayed in the vector diagram can also be displayed numerically in table form.

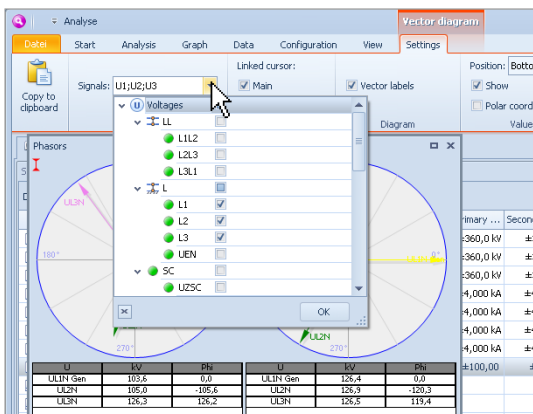
The vector diagram displays the values corresponding to the current position of the main and/or help cursor.

The reference quantity in the diagram is always the voltage of phase 1 with the phase angle 0°. The direction of rotation is to the left (mathematically positive) so that a phasor at 90° has a 90° lead on voltage UL1.



The functions available for the vector diagram are displayed in the ribbon.

If more than one vector diagram is open, the functions are applied to the diagram which is currently selected.



The signals to be displayed can be selected in the **Data source** group.

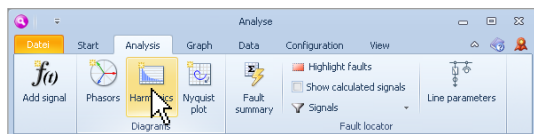
The cursor for which a vector diagram is to be shown can be specified in the **Assignment** group.

The vector labels can be shown/hidden in the **Diagram** group.

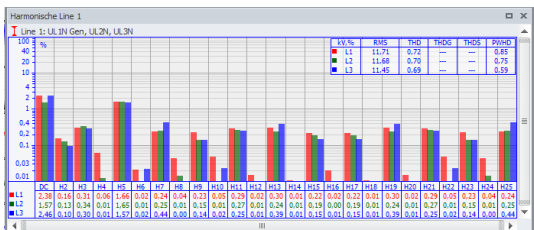
The table view can be edited in the **Value table** group.

12.6.3 Harmonic analysis

Harmonics can be displayed in a bar chart for analysis. Any number of bar charts can be opened; the view can be set individually for each one.



➤ On the **Analysis** tab, click the **Harmonics** button



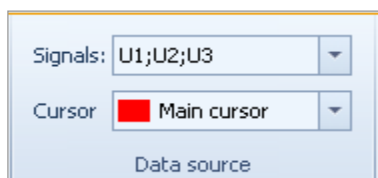
The bar chart for the analysis of harmonics is displayed.

The measurement value of each of the harmonics can be displayed numerically beneath the chart.



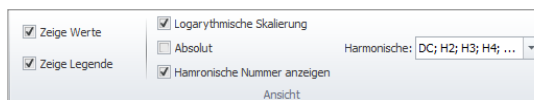
The functions available for harmonic analysis are displayed in the ribbon.

If more than one bar chart is open, the functions are applied to the chart which is currently selected.

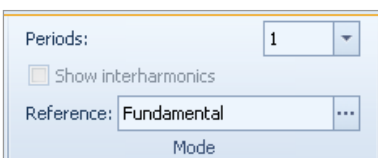


The signals to be displayed can be selected in the **Data source** group.

It is also possible to specify which of the cursors is to be used for the analysis.



The chart view can be edited in the **View** group and the user can select the harmonics to be displayed. Which harmonics are available depends on the sampling rate of the record which is to be analysed.

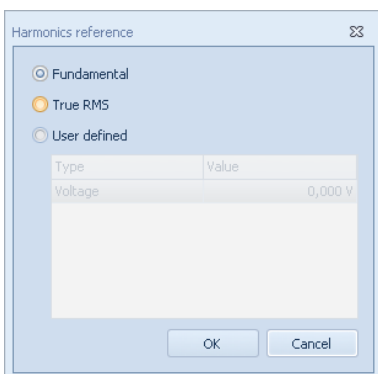


Mode

Periods:

It is possible to define the number of periods used for the calculation of the harmonics. The calculation window is arranged symmetrically around the selected measurement cursor.

If the calculation is carried out across a number of periods, it is possible to show the resulting interharmonic signals.



Reference:

The following options can be chosen as the reference for the calculation of harmonics:

Fundamental:

RMS value of the system frequency component.

Whole signal:

RMS value of the whole signal: TrueRMS.

User-defined value:

Freely configurable value, e.g. for the calculation of harmonics with reference to defined rated values (Total Demand Distortion).

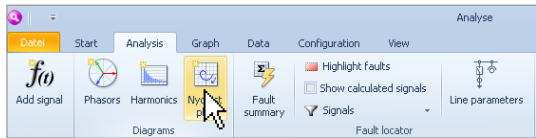
kV,%	RMS	THD	THDG	THDS	PWHD
L1	103,5	1,04	---	---	1,67
L2	104,9	1,17	---	---	2,50
L3	126,3	1,26	---	---	1,02

In addition to the RMS value of the whole signal (**RMS**) and the total harmonic distortion (**THD**), the **Legend** displays the following quantities in accordance with IEC 61000-4-7.

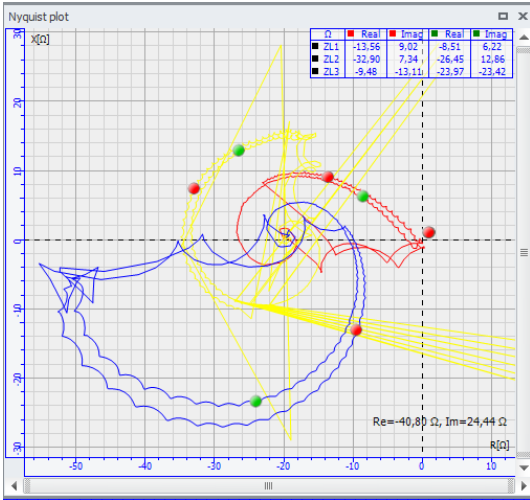
- THDG** --> Group distortion
- THDS** --> Subgroup distortion
- PWHD** --> Partially weighted distortion

12.6.4 Nyquist plots

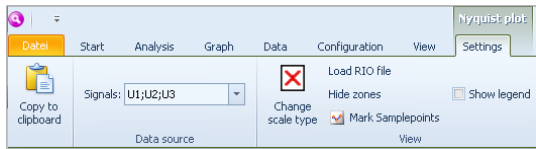
Recorded signals can be displayed in a Nyquist plot.



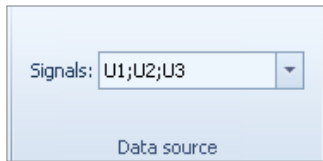
➤ On the **Analysis** tab, click the **Nyquist plot** button



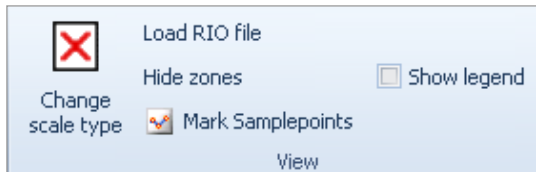
The Nyquist plot is displayed. The current cursor positions are shown as coloured points in the Nyquist plot.



The functions available for the Nyquist plot are displayed in the ribbon. If more than one Nyquist plot is open, the functions are applied to the diagram which is currently selected.



The signals to be displayed can be selected in the **Data source** group.



The plot view can be edited in the **View** group. It is also possible to import the operating characteristic of protection devices using the RIO format. This allows the actual relay characteristic to be superimposed on and compared with the fault impedance.

12.6.5 Fault location

The method implemented for fault location is based on the fact that the imaginary part of the impedance (reactance) of an electrical high-voltage line is proportional to the length of the line and independent of the arc resistance. This means that if the abovementioned line parameters are known, the fault location can be inferred from the characteristic of the fault current and voltage (conductance method).

To ensure that sudden, large variations in the load are not identified as faults, the starting threshold for the fault locator can be defined individually for the phase and neutral currents using overcurrent factors.

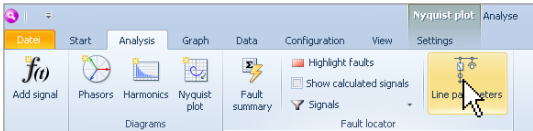
Set line parameters

For SHERLOG CRX measuring systems

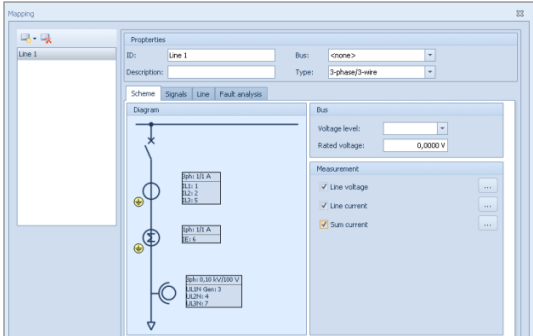
The parameters which are required for fault location, such as line impedances, capacities, coupling to parallel lines, starting thresholds etc are set in the device configuration (Electrical environment) of SHERLOG CRX and automatically belong to every fault record. However, the analysis software also offers the options of entering or editing line parameters subsequently during analysis. This is necessary when, for example, fault location is to be carried out for consolidated fault records made by various different SHERLOG CRX devices.

For individual records

If a record from an external device such as a protection relay is available as a COMTRADE file and is to be analysed, the line parameters can be entered in the analysis software.

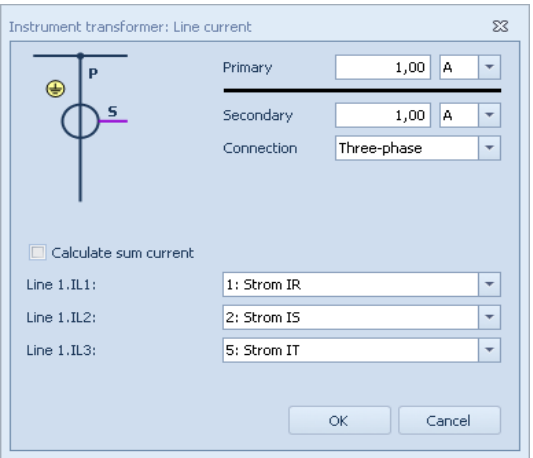


On the Analysis tab, click the Line parameters button

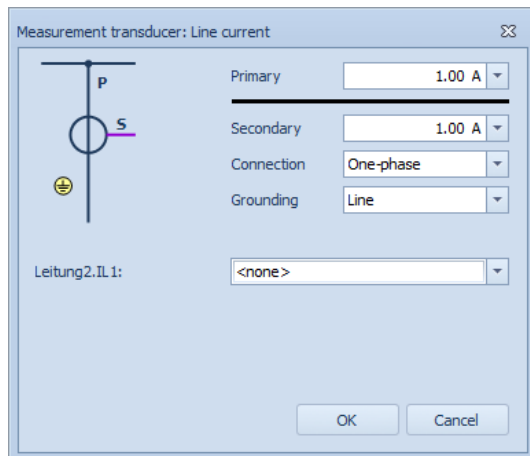


A window is opened with the line diagram identified from the record. In the case of imported COMTRADE records, automatic assignment is not always possible, depending on the execution, and bus bars and/or lines must be added manually using the buttons

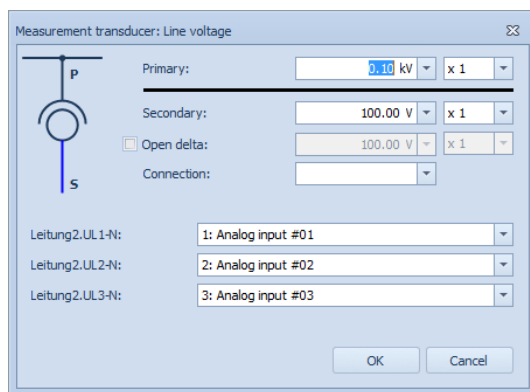
Click the info boxes next to the icons for current and voltage transformers to open the window for setting the channel allocation and the transformer ratios



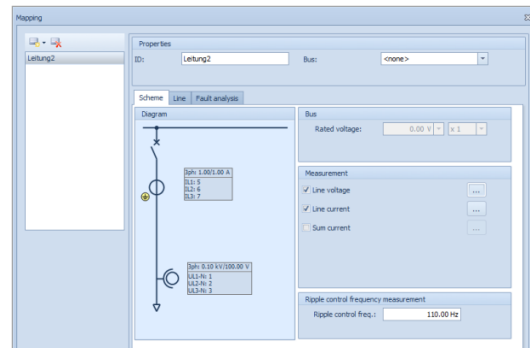
Setting for a current transformer with channel allocation



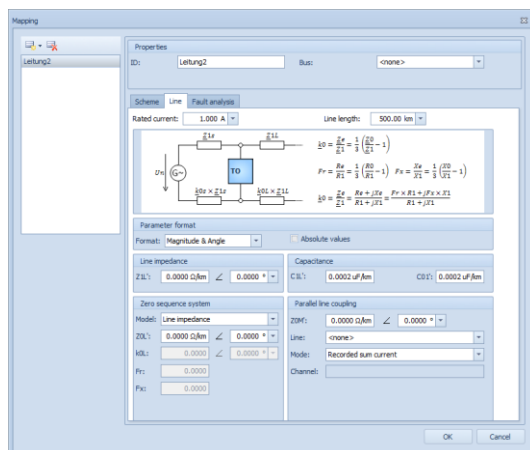
Setting for a summation current transformer with channel allocation



Setting for a voltage transformer with channel allocation



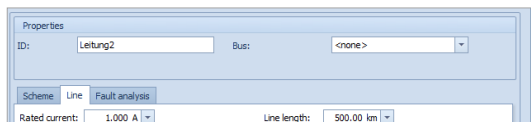
Once the line diagram has been fully configured, the appropriate line parameters can be assigned on the **Line** tab.



Set line parameters for a power system

- Switch to the **Line** tab
- Enter the rated current and the line length
- Choose the entry format

Z1L: positive-sequence impedance, essential.
 Z0L: zero-sequence impedance, essential.
 C1L: line capacity, optional.
 Z0M: Required for parallel lines.



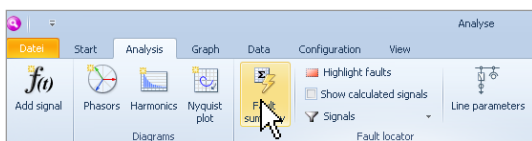
Enter starting threshold for fault location

- Switch to the **Fault analysis** tab

The starting thresholds for the phase-phase and neutral currents are set as factors in relation to the rated current entered in the line parameters. If the resulting overcurrent is reached within a fault record, fault location is automatically carried out for the time range concerned.

Carry out fault location

Fault location is automatically carried out for every record which is open using the configured line parameters. Different display functions are available for the graphical and numerical evaluation. These are described in detail below:

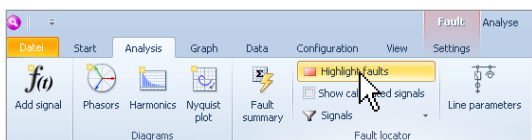


Fault summary

- On the **Analysis** tab, click the **Fault summary** button.

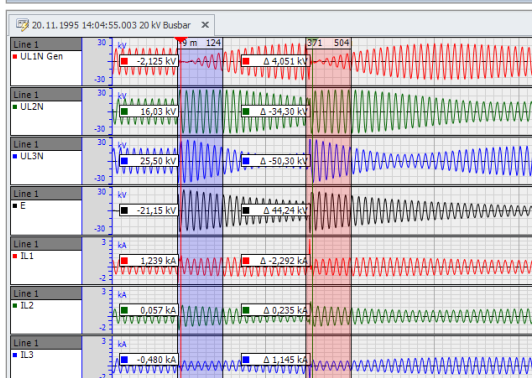
Type	Location	Duration		
L1L2	477,93 km	98,8 ms		
Fault				
Type	L1L2			
Location	477,93 km			
Duration	98,8 ms			
Fault impedance				
Z	502,4 Ω			
Phi	72,0 °			
R	155,0 Ω			
X	477,9 Ω			
Phase values				
	L1	L2	L3	E
U	105,7	111,9	126,8	kV
I	184,85	166,62	17,83	1,50 A
I Max	194,22	174,84	22,91	4,19 A

A window is displayed with detailed information on every fault identified in the record, including the fault type, fault impedance and distance-to-fault.



Highlight faults

- Click the **Highlight faults** button



Colour is used to highlight those areas in which faults have been identified and for which the data for the **Fault details** has been calculated.

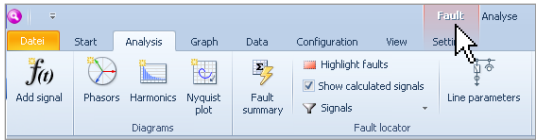


Show calculated signals

- Select the **Show calculated signals** check box

This function supplements the fault record with mathematical signals calculated automatically within the scope of fault analysis.

The values to be displayed can be selected on the **Fault/Settings** tab. See below for more information.

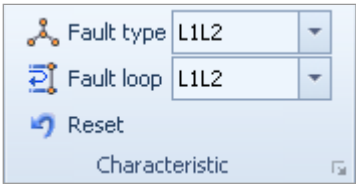


Fault/Settings tab

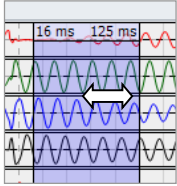
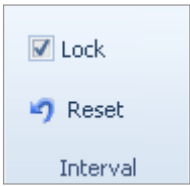
- Call up the **Fault** tab
- The functions for fault analysis are displayed in the ribbon.



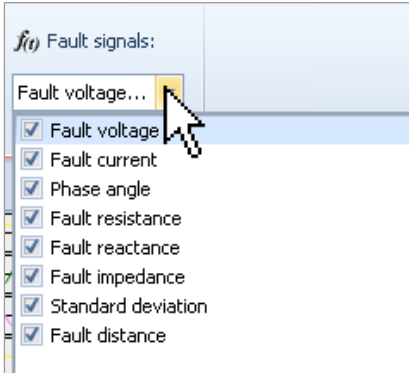
The distance-to-fault and the fault duration of the fault area selected in the record are displayed in the **Details** group.



The **Fault type** and **Fault loop** parameters used for fault location are displayed in the **Characteristic** group. They can be edited manually if required.



When the **Lock** check box in the **Interval** group is cleared, the time range for the calculation of the fault location can be edited manually. To do so, use the mouse to move the left-hand or right-hand edge of the time range which is marked in colour. Afterwards the fault data is automatically recalculated and displayed.

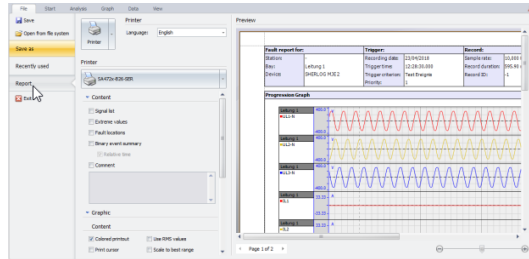


In the **View** group, the user can select which mathematical channels of the record are to be displayed when the **Show calculated signals** button is clicked.

12.7 Create fault reports

12.7.1 SHERLOG report function

The SHERLOG report function can be used to create fault reports and print them out directly or save them as a file.



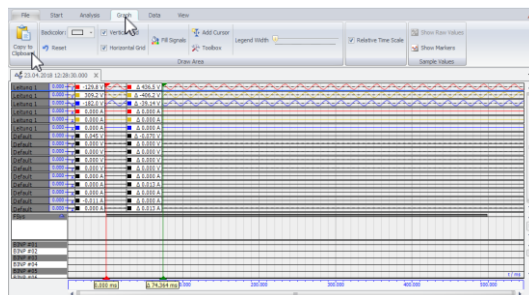
- On the **File** tab, click **Report**
- A window for setting the report parameters, such as language, output (printer or file), content, formatting etc. is called up.

The preview window is automatically updated after every change.

- Start report output by clicking the **Printer/File** button

12.7.2 Create customized reports

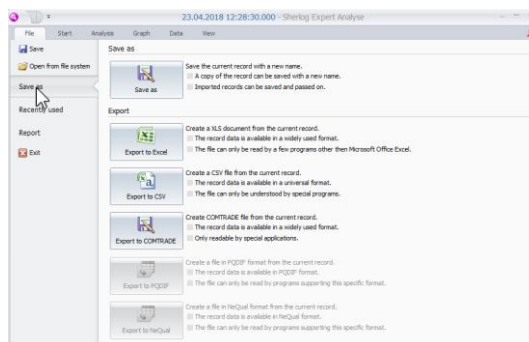
For the creation of customized reports, all graphs and tables of results can be copied to other Windows applications as vector graphics using the Windows clipboard.



Copy graphs with the Windows clipboard:

- Switch to the **Graph** tab
- Click the window which is to be copied
- Click the **Copy to clipboard** button

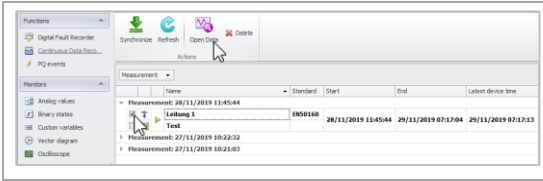
12.8 Data export and import



All export and import functions can be accessed in the **File** menu under **Save as**.

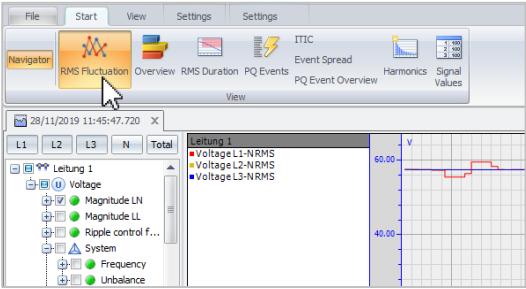
12.9 Analysis of long-term records and events

(PQ device licence must be activated)

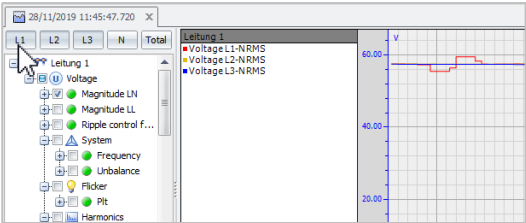


➤ Open long-term record in SHERLOG Expert Online, see above

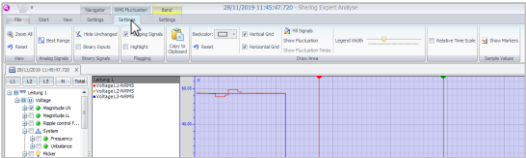
12.9.1 RMS fluctuations



➤ Click the **RMS Fluctuation** tab



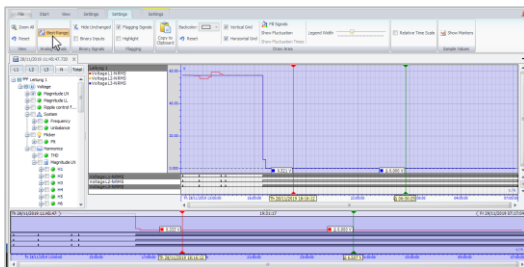
A selection tree in which the signals to be displayed can be activated or deactivated is displayed. The tree structure makes it possible to select which phases of the signal are to be displayed in the characteristic.



➤ Under **RMS Fluctuation**, click the **Settings** tab

The settings which can be made are described below.

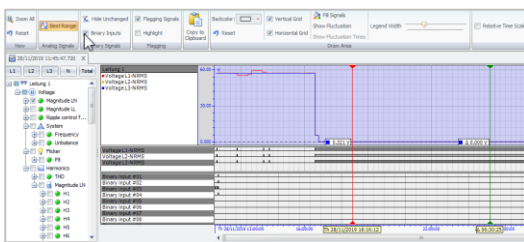
12.9.2 Best range display



➤ Click the **Best range** button

The scaling factor for the display of signal characteristics is automatically set to achieve an optimised display with maximum resolution.

12.9.3 Show and hide binary channels



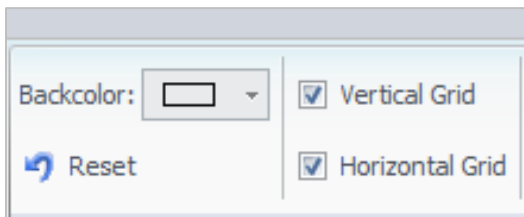
The display of the binary channel signals can be shown or hidden.

➤ In the **Binary signals** group, select the **Binary inputs** check box

The binary signals are displayed.

Activate the **Hide unchanged** button to display only those binary channels for which at least one change of state is registered during recording.

12.9.4 Draw area

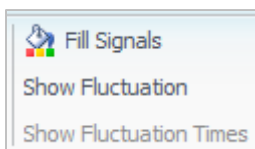


Background colour

The background colour of the draw area can be changed or reset to the default setting.

Grid

Additionally, a vertical and/or horizontal grid can be shown or hidden.

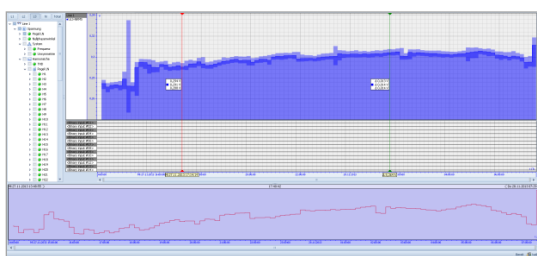


Fill signals

The periodic RMS value characteristic is displayed in colour beneath the signal characteristic, providing a better overview especially with single-phase signals.

Show Fluctuation

In addition to the mean value of the configured interval (e.g. 10 min.), the minimum and maximum value which occurred within the interval are displayed.

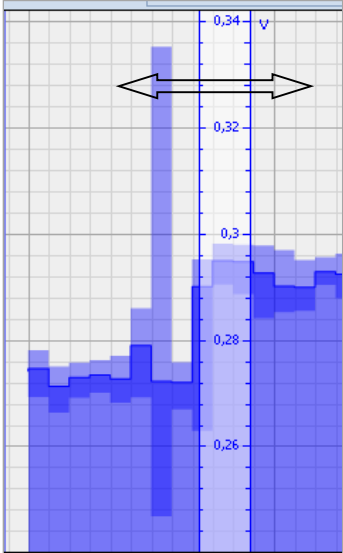


Show Fluctuation Times

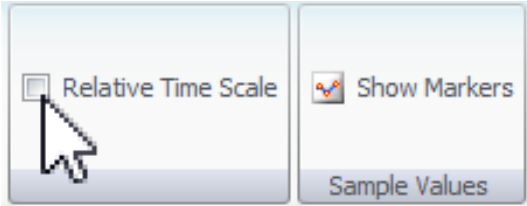
Additionally, the times are displayed when the minimum and maximum value occurred.



Legend width
The legend width on the y axis can be varied freely with the slider.
The axis labels can be moved freely by keeping the mouse button pressed.

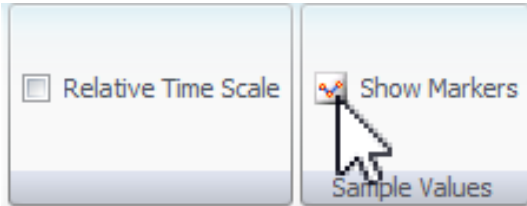


12.9.5 Time scale

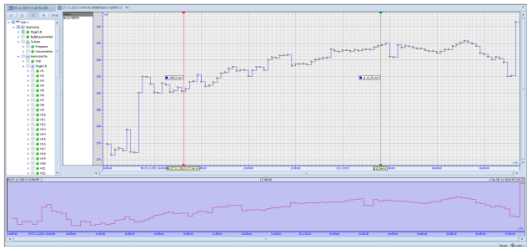


The time scale can be switched to a relative display.

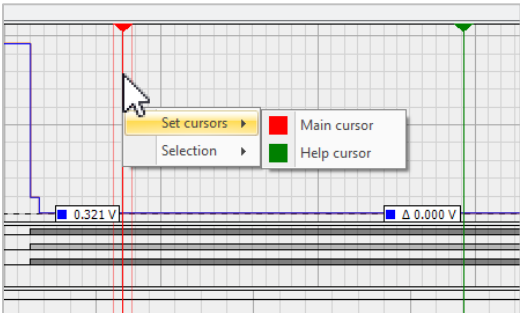
12.9.6 Sample values



The sample values are displayed in the signal characteristic.

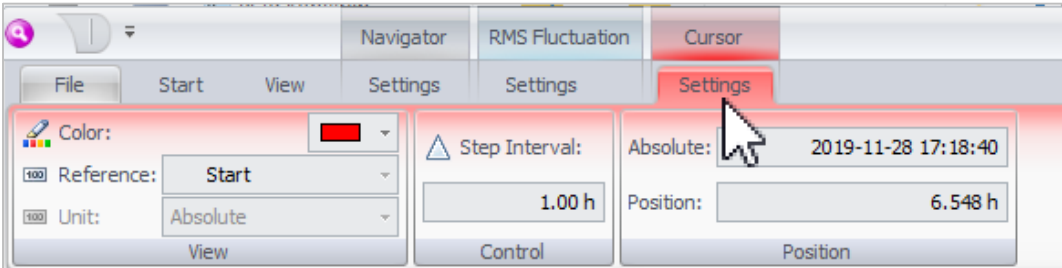


12.9.7 Cursors

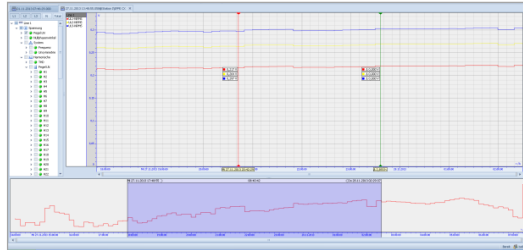
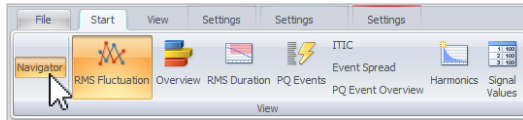


A main and a delta cursor can be used for analysing the measurement values. Using the context menu (right-hand mouse button), cursors can be added.

If a cursor is selected, settings regarding colour, reference and interval etc. can be made on the **Cursor** tab.



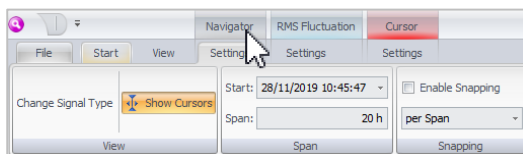
12.9.8 Navigator



Using the ribbon, a navigator function can be activated and configured. The function features a navigation window which provides an overview of the entire length of the record and the current cursor positions.

The (zoomed) time range currently visible in the analysis window is shown with a blue background in the navigation window. Via the blue area, the view can be moved and its size modified (zoomed) with the left-hand mouse button. The navigator can also be used to move the position of the measurement cursors.

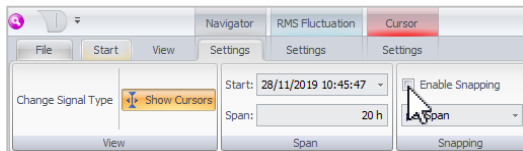
As an individual window element, the navigator can be freely docked to other windows.



The following settings can be made on the **Navigator** tab:

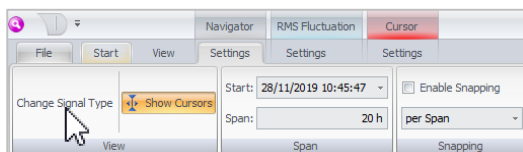
Span

The span to be displayed can be set manually in the navigator or by entering the time here.



Snapping

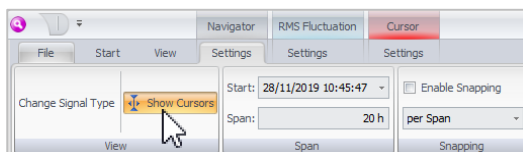
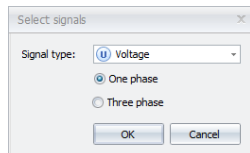
If snapping is activated, the span to be evaluated can only be selected within a fixed interval. If snapping is deactivated, the span can be set freely.



Change signal type

For displaying signals in the navigator, various signal types can be set.

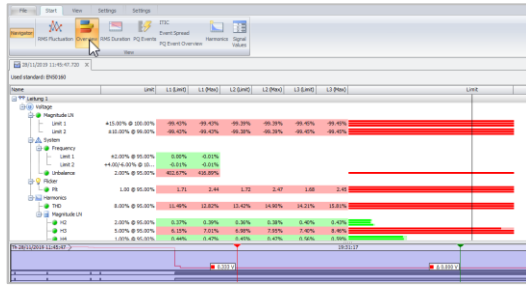
Meta data contain information on time synchronisation, the occurrence of fault records or events.



Show cursors

Using this button, the cursors can be shown or hidden.

12.9.9 Limit value overview



➤ Click the **Overview** button

An overview of the statistical evaluation of the cyclical measurement data is displayed in bar graph or table form.

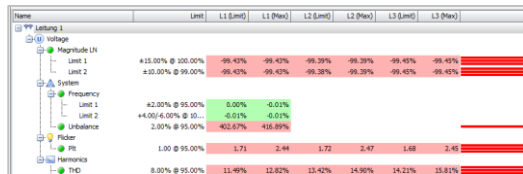
The colours of the bars in the graphical representation have the following significance:

- Green: the evaluated quality characteristic conforms to the selected standard (e.g. EN50160)
- Yellow: the specified frequency limit value (e.g. 99%) of the quality characteristic conforms to EN50160, but the maximum value is greater than the limit value.
- Red: the evaluated quality characteristic does not conform to EN50160 as the specified frequency limit value is exceeded.



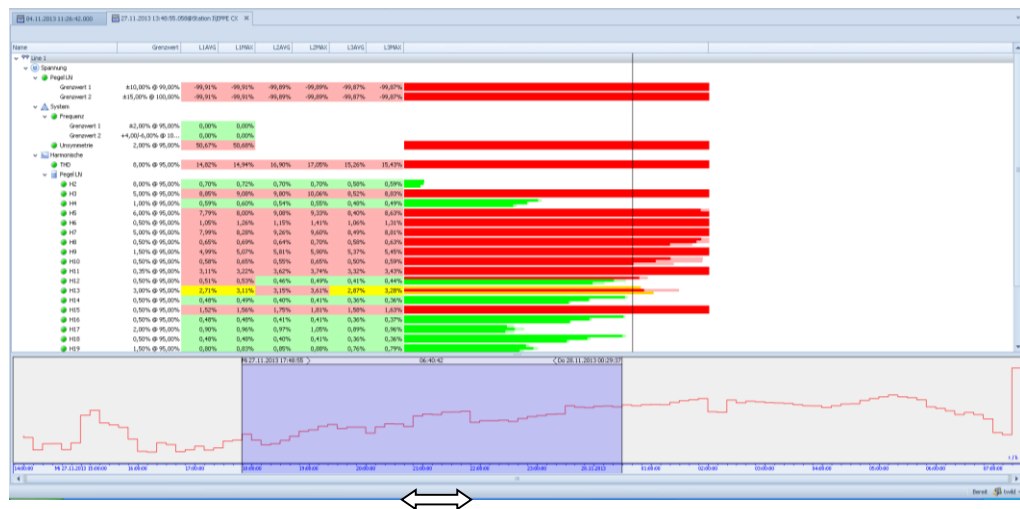
The non-transparent part of the bar displays the relevant frequency limit value in accordance with the integrated standard, e.g. EN 50160 (e.g. 99% of the measurement values which must not exceed a specific limit value).

The slightly transparent part of the bar displays the maximum value which occurred within the selected time period.

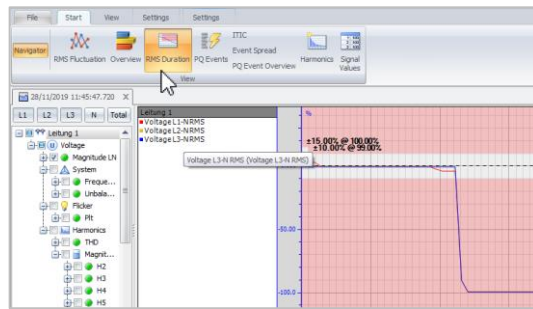


The tabular summary gives an overview of the limit values which are to be complied according to the standard used (e.g. EN 50160) and the values which actually occurred.

- Limit value: Limit value which is to be complied according to the standard used.
 $\pm 10\% @ 99\%$ means that 99% of all measurement values must not exceed or fall below a limit of $\pm 10\%$ in relation to the rated value.
- L1 AVG: Measured mean value which is to be complied according to the frequency limit value (e.g. 99%) of the norm concerned.
- L1 Limit: Maximum value which is recorded independently of the evaluation in accordance with the selected norm and which occurred within the selected time period.
- If an interval was defined for the display or was set by using the navigator, only this interval is evaluated. If the interval is changed, the evaluation is adjusted directly.



12.9.10 RMS duration



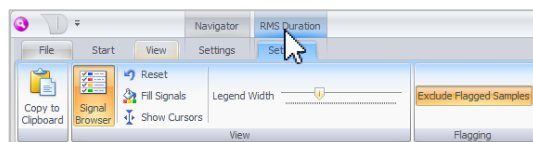
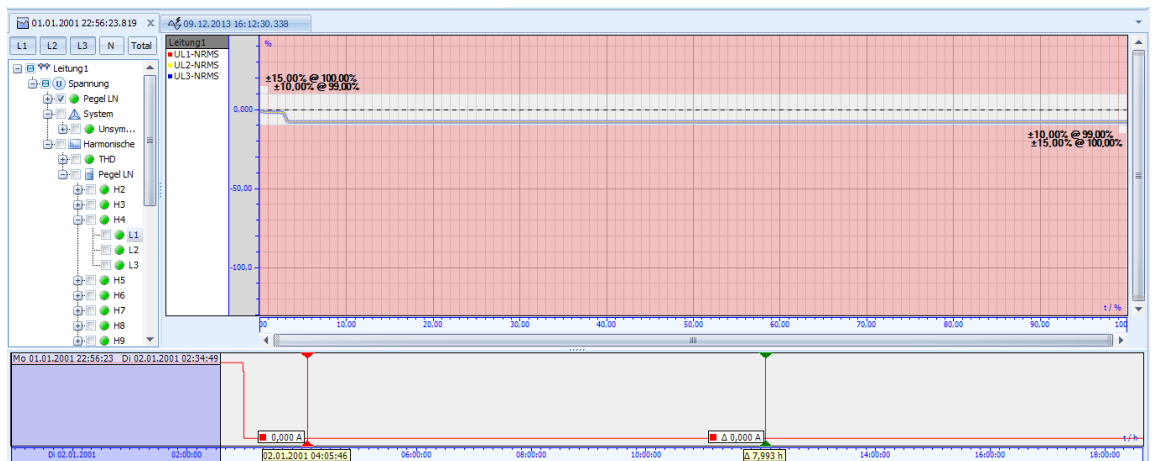
➤ Click the **RMS Duration** tab

The saved RMS values of the voltages or their deviation from the rated value are displayed, sorted by size (ascending).

As shown below, the impermissible value range for the voltage magnitude lies at $\pm 10\%$ from the rated value for 99% of the recorded values and at $\pm 15\%$ for 100% of the recorded values.

Measurement results, permissible in accordance with EN50160, lie in the white area of the display, impermissible measurement results lie in the red area.

The measurement values to be displayed can be selected in the selection bar at the left-hand edge of the window.



The following settings can be made on the **RMS Duration** tab:

Copy to clipboard

The current graph is copied to the clipboard for further processing in other programmes.

Signal browser

The signal browser is used to show or hide the signal to be displayed.

Show cursors

The cursors for detailed analysis are shown or hidden.

Fill signals

The area between signal characteristic and zero line is displayed in colour.

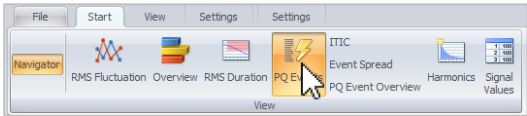
Reset

The graph is reset to its original state.

Legend width

The legend width can be varied freely with the slider.

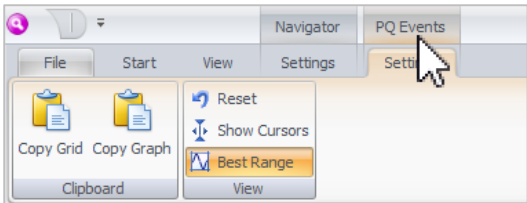
12.9.11 Events



➤ Click the **PQ Events** button

The events with their respective extreme values, classifications and event duration are displayed in table form.

Click a selected event to display the relevant signature for analysis.



The following settings can be made on the **PQ Events** tab:

Copy table

The event table is copied to the clipboard for further processing in other programmes (e.g. Excel).

Copy graph

The event signature displayed is copied to the clipboard for further processing in other programmes (e.g. Word).

Show cursors

The cursors for detailed analysis are shown or hidden.

Reset

The graph is reset to its original state.

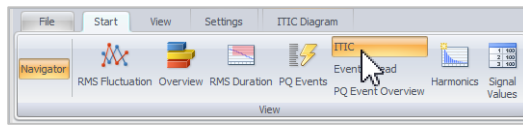


Here too, as in other graphs, the y-axis can be moved freely by clicking on the scale and dragging it to the desired position.

The navigator can be used to subsequently limit or extend the interval which is to be analysed. Only those events are displayed which occurred within the selected (marked) time period. For more information, see the section of this manual titled **Navigator**.

	Fr 01.11.2013 08:47:03 >	00:00:16	< Fr 01.11.2013 08:47:19
Line 1 (Un): 230.0 V			
(GMT+01:00) Amsterdam, Berlin, Bern, Rom, Stockholm, Wien			
50,0 Hz			

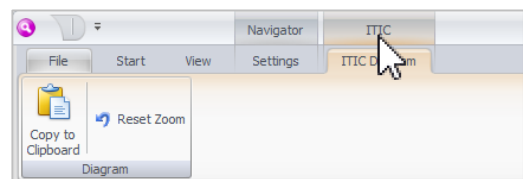
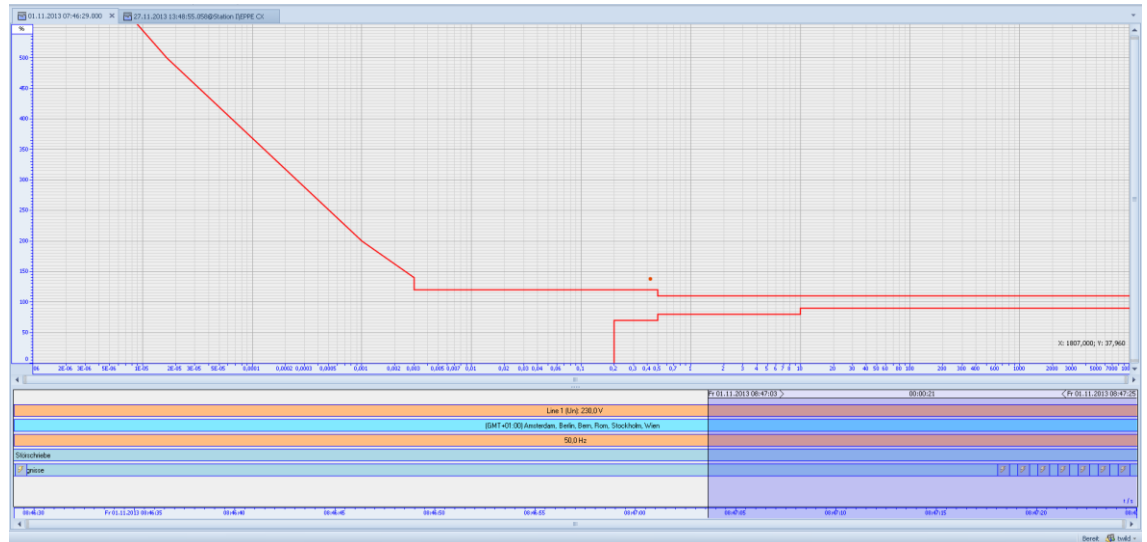
12.9.12 ITIC chart



➤ Click the **ITIC** button

Events can be displayed in the form of an ITIC chart.

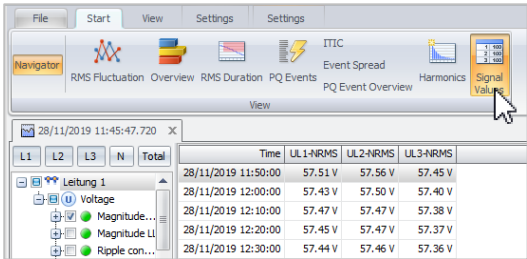
Voltage events, shown as dots, which lie to the left of the red limit line are permissible according to ITIC recommendations.



On the **ITIC** tab, the current graph can be copied to the clipboard for further processing in other programmes.

Use the **Reset zoom** button to reset the graph to its original state.

12.9.13 Value table



➤ Click the **Signal Values** button

In the signal values table all recorded and saved measurement values are displayed.

On the **Values Table** tab, the measurement values can be copied to the clipboard for further processing in other programmes (e.g. Excel).

