FLUKE®

1760

PQ Analyze Software

Reference Manual

July 2006

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Chapter 1
About this Manual

Structure

This manual consists of several chapters. Within these chapters, shoulder headings in the margin identify sections in the text focusing on the respective topic or procedure.

For example:

View details — The text associated with this shoulder heading informs you on how the details of a measured value can be viewed, including introductory notes, safety instructions, hints and tips, and instructions on procedures, figures, and tables, if any.

Symbols

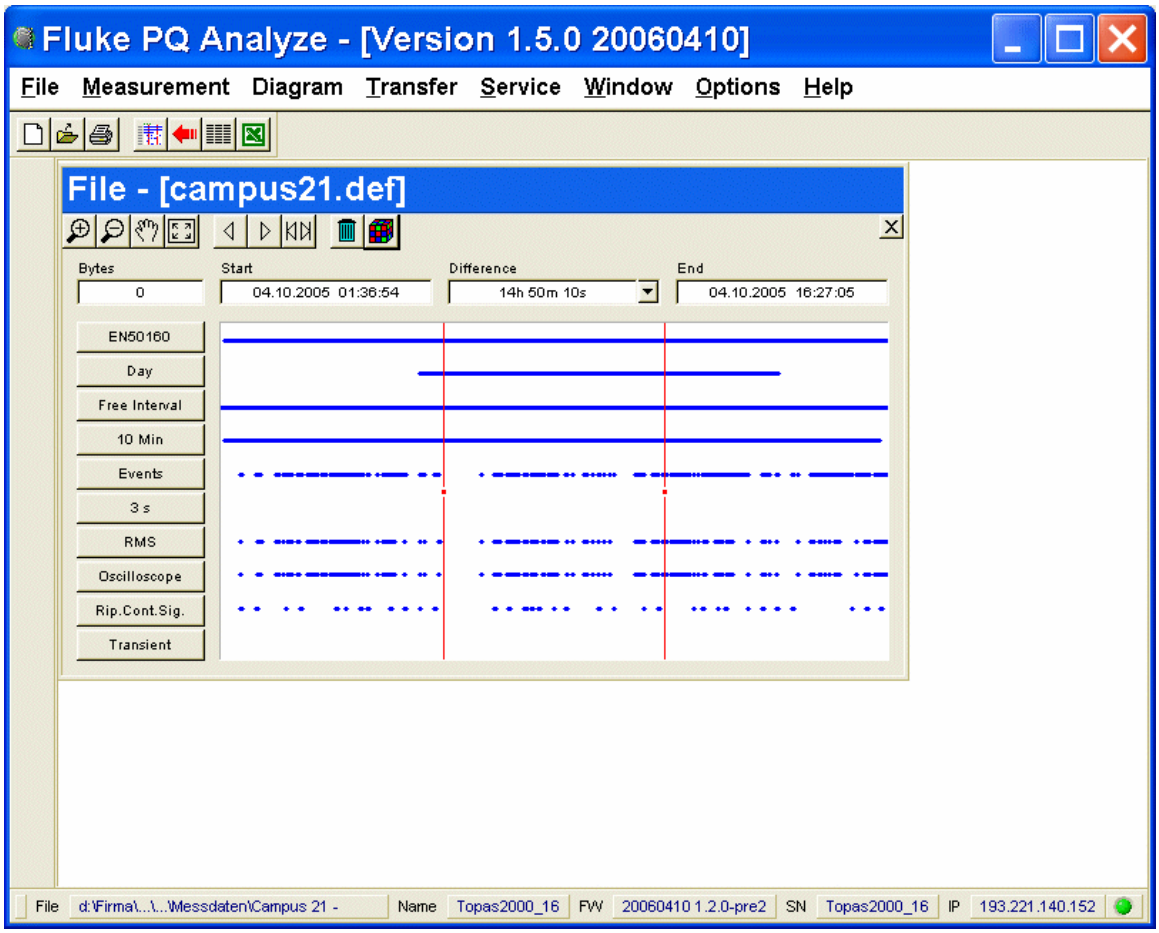
Symbol	Description
⚠	Identifies a **Warning** relating to a risk to life and limb from electric shock. If the instructions are not strictly adhered to, there is an inevitable risk to life and limb.
⚠	Identifies a **Warning** relating to a potential risk or dangerous situation. If the instructions are not adhered to, there is a risk of death, injury or damage to property.

Chapter 2
Design and Functions

Introduction

The following sections provide a brief overview of the basic functions of the PQ Analyze software.

- Communication with instrument
- Configuration of instrument for measurement
- Basic instrument settings
- Data transfer from instrument to PC
- Generation of measurement reports



programmfenster.bmp

Communication with Instrument

Chapters *Menu: Transfer* and *Software Installation – Ethernet Communication* contain detailed descriptions of the communication methods between the software and the instrument

Configuration of Instrument for Measurement

Chapter *Menu: File – New* contains detailed descriptions of all necessary settings:

- Adjustment of limit values according to EN 50160
- Hardware settings:
  - Selection/scaling of measuring sensors
  - Selection of measuring system (V-V, V-I, ARON, etc.)
- Recording modes (RMS, oscilloscope, transients, etc.)
- Definition of trigger conditions

Basic Instrument Settings

Chapter *Menu: Service* describes the instrument data that can be checked and/or adjusted:

- Date and time settings
- Firmware update

- Instrument status

Data Transfer from Instrument to PC

Chapter *Menu: Transfer* contains detailed information regarding connection to and data transfer from the instrument.

Generation of Measurement Reports

Chapter *Menu: Options – Export* configuration contains a detailed description of the available options for the configuration and automatic generation of reports. The following reports are produced by the PQ Analyze software:

- ASCII reports
- MS Excel® worksheets
- MS Word® reports
- Measurement tables in text format
- BMP images via Windows® clipboard

Note

This manual covers the functions supported by Fluke 1760. For details about the functionality of the Topas 1000 instrument, see the manual Fluke PQ Analyze for Topas 1000 *on the CD.*

Chapter 3
Commissioning and Functional Test

Introduction

The procedure described below allows users to familiarize themselves with the functions of the instrument, while testing all basic instrument functions.

Installation	Install the PQ Analyze software. For details see chapter *Software Installation*.
Communication	Establish a connection to the instrument, using one of the available interfaces. For details see chapter *Menu: Transfer*.
Connect Instrument	Connect the instrument as described in the Operators Guide in chapter *Connection to measuring circuits*.
Configure	Configure the instrument. For details, see chapter *Menu: File – New*.
Measure	Establish a connection to the instrument. For details, see chapter *Menu: Transfer*.
Activate	Activate *Live* mode. See chapters *Live Mode* and *Transfer – Live Mode*. You can now test live voltages and currents. If no errors are reported, all settings are correct and connections and sensors are working properly.
Transfer data	Transfer measured data from the instrument to a PC. For detailed instructions, see chapter *Transfer – Download Measurement Data*.
Evaluate	Evaluate the data according to your requirements. For details, see chapter *The Evaluation Window*.

Chapter 4
Software Installation

System Requirements

For trouble-free operation of the software, your system must meet the following minimum requirements:

System	Requirement
PC	IBM compatible
Processor	Pentium >500 MHz
RAM	>256 MB
	Minimum free space: 50 MB for the PQ Analyze software
Operating System	Microsoft Windows® 2000 / XP / NT 4.0
Network	Ethernet IEEE 802.3x 10Base-T
Other Drives	CD-ROM

Installation

Insert the supplied installation CD in the CD-ROM drive of your PC. If your CD-ROM drive is configured for *Autorun*, the software installation program is started automatically.

Hard Disk

1. Follow the instructions on screen
2. If the CD-ROM drive is not configured for *Autorun*, start the installation program by double-clicking *launch.exe* in the MS Explorer® window.
3. It is recommended that you restart the PC to complete the installation procedure.

Note

If there is an earlier version of the PQ Anlyze software installed on the PC, this version will be automatically removed. You must run the installation procedure again to install the current version.

Ethernet Communication

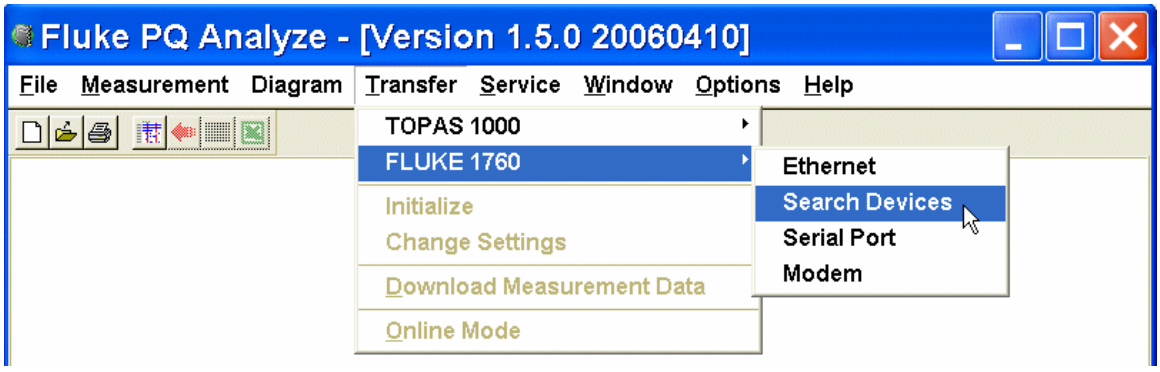
Ethernet communication with Fluke 1760 requires no configuration if your network supports dynamic IP address assignment (DHCP).

In the absence of a DHCP server, you can either

- establish an instrument to PC direct Ethernet connection using the red direct link Ethernet cable (for details see *Peer to Peer Connection PC to Fluke 1760*), or
- assign a fixed IP address to the Fluke 1760 instrument using the direct connection to the serial port (for details see *Direct Connection to the Serial Port*).

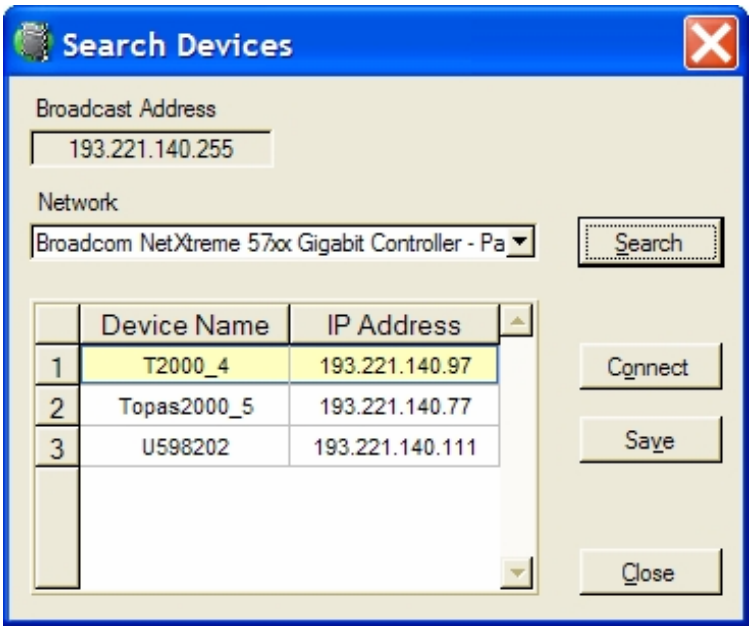
Connection to Fluke 1760 in local area networks with DHCP support

1. Connect the instrument to your local area network and turn it on. At power up Fluke 1760 automatically contacts the DHCP server for a valid IP address.
2. Lauch the *PQ Analyze* operating and evaluation software.
3. Close the Start Menu by clicking *Cancel.*
4. Call up menu *TransferFluke 1760/Search Devices*:

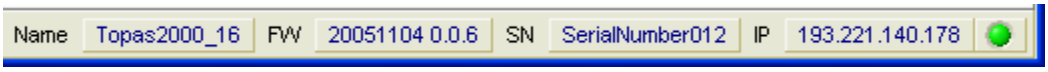


transfer2000.bmp

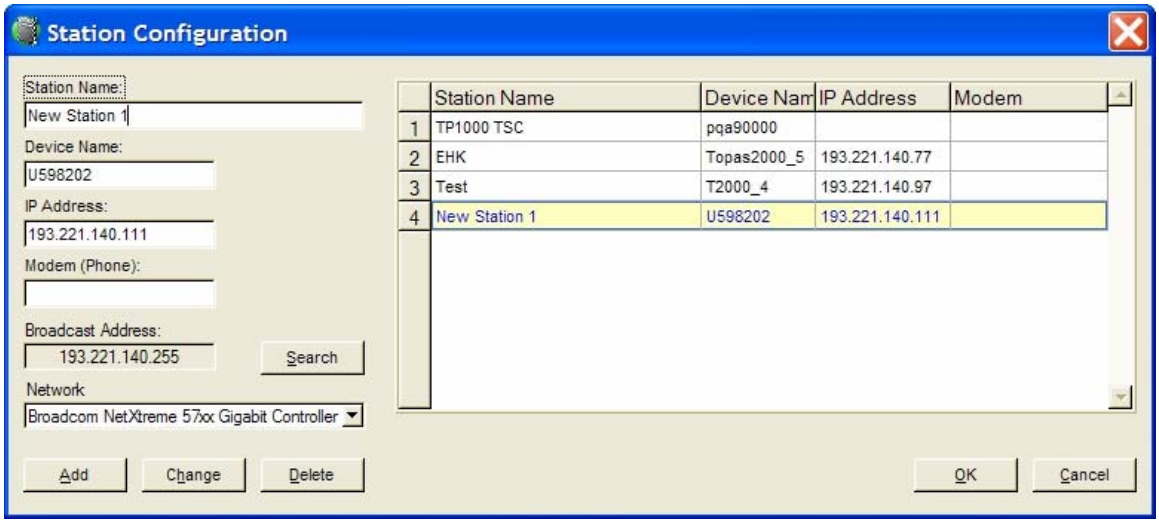
5. If your computer has multiple network interfaces installed, select the appropriate interface from the *Network* list. Click *Search.* After some seconds the list of instruments found in the local area network will be displayed.



6. Select your instrument and press *Connect* to establish a connection between Fluke 1760 and your computer. The status line shows information about the connection.



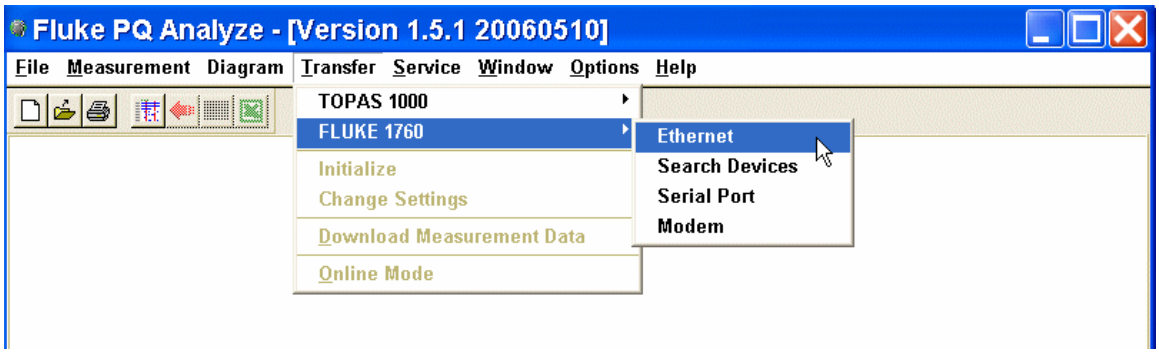
With the *Save* button, a screen is opened to display the station list:



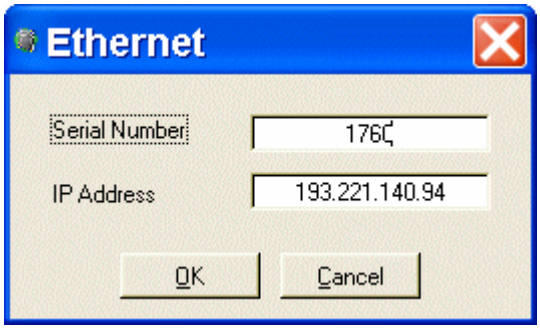
t2000 search devices5.bmp

A newly found instrument can be added to the list of stations by entering a specific name. Later on this name can be used to refer to the Fluke 1760.

7. As the IP address is known, we can connect to the Fluke 1760 also from the Transfer menu. The most recent IP address is supplied to the connection dialog as a default.



t2000 search devices3.bmp



t2000 search devices4.bmp

Peer to Peer Connection PC to Fluke 1760

We recommend the following procedure:

1. Configure the Fluke 1760 for DHCP (this is the factory setting).
2. Configure your PC for DHCP functionality (if there is a DHCP server it will lease an IP address to PC).
3. Power up the Fluke 1760.
4. Connect the PC to the Fluke 1760 via the provided cross link cable (with red plugs). After some time the PC automatically chooses an IP-address with the APIPA functionality in the range of 169.254.X.X .
5. Run the PQ Analyze software and use *Transfer – Fluke 1760 – Search devices*. The Fluke 1760 and the PC will have an IP address in the same class and can connect.

Note

We strongly recommend that you power off and power on again the Fluke 1760 if it is connected to another PC or to another network. This ensures that the Fluke 1760 is assigned a new IP address again using DHCP.

Connection to Fluke 1760 in local area networks without DHCP support

If your network has no DHCP support, you must assign fixed IP addresses to all your computers and also Fluke 1760 instruments.

For doing this you must connect to the Fluke 1760 via the serial RS232 port.

Short description of the procedure:

1. Connect your PC to Fluke 1760 using the red RS232 (null-modem) cable.

2. Start "Hyper Terminal" (found in *All Programs>Accessories>Communications)*. Select the correct COM port of your computer and set the COM properties to 57600 bits per second, 8 data bits, no parity, 1 stop bit, no flow control.
3. In the communication window, press ENTER.
4. The instrument login prompt will be displayed. Type *t2kconfig* and press ENTER. For password, again type *t2kconfig* and press ENTER.
5. After successful login you will see the configuration menu for setting a range of instrument properties. Select *Network Configuration* and assign a fixed IP address to your needs (you may need to consult your local network administrator for a valid IP address).
6. In the PQ Analyze software, call up *Tranfer/Fluke 1760/Ethernet* and manually type in the instrument's fixed IP address. Press OK to establish the connection.

Chapter 5
Live Mode

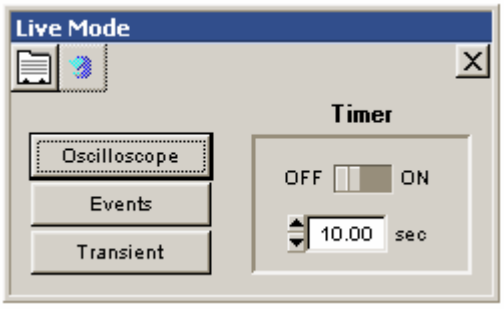
Preparation

Live mode performs the initial functional check of the instrument, and allows users to both test the measuring configuration and assess the received signals. If necessary, the range of measurement and the trigger settings might have to be adjusted in the Settings dialogue. In Live mode, you can at any time call up partial results without interfering with the current measurement.

To prepare the instrument for *Live* mode:

1. Connect the voltage and current sensors to the instrument and then to the network to be measured. For detailed instructions, please refer to the Operators Guide, chapter *Connection to measuring circuits*.
2. Establish an Ethernet connection between the PC and the instrument.
3. Activate the *Live* mode by selecting menu *Transfer – Live Mode*.

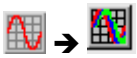
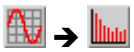
   The *Refresh* window is displayed:



online-refresh.bmp

4. Click  Hardware Settings to open the *Live* mode configuration dialogue for the instrument.

The following evaluation buttons are available in *Live* mode:

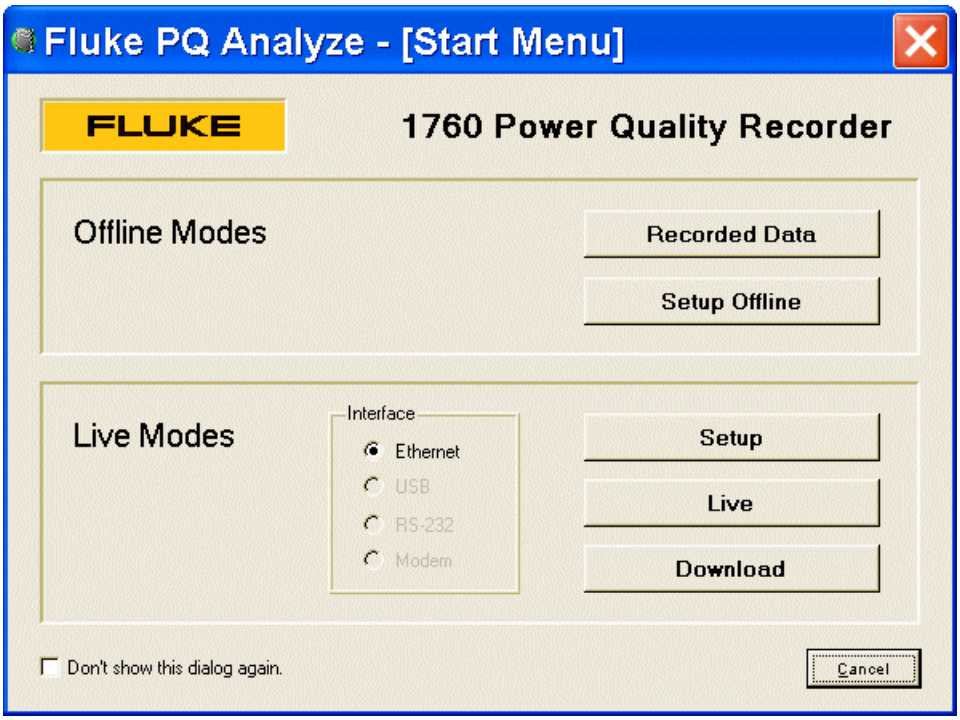
Settings	Descriptions
	Wave shapes
	Voltage, current and power spectrum
	Spectrum for power values
	Vector diagrams for voltage, current
	Vector diagrams for apparent power
	Measurement tables

For detailed descriptions of the output options, please refer to chapter *Menu: Transfer - Live Mode*.

Chapter 6
Operation of the Software

The Program Window

After start-up of the software the Start Menu is displayed:



startup.bmp

Offline Modes

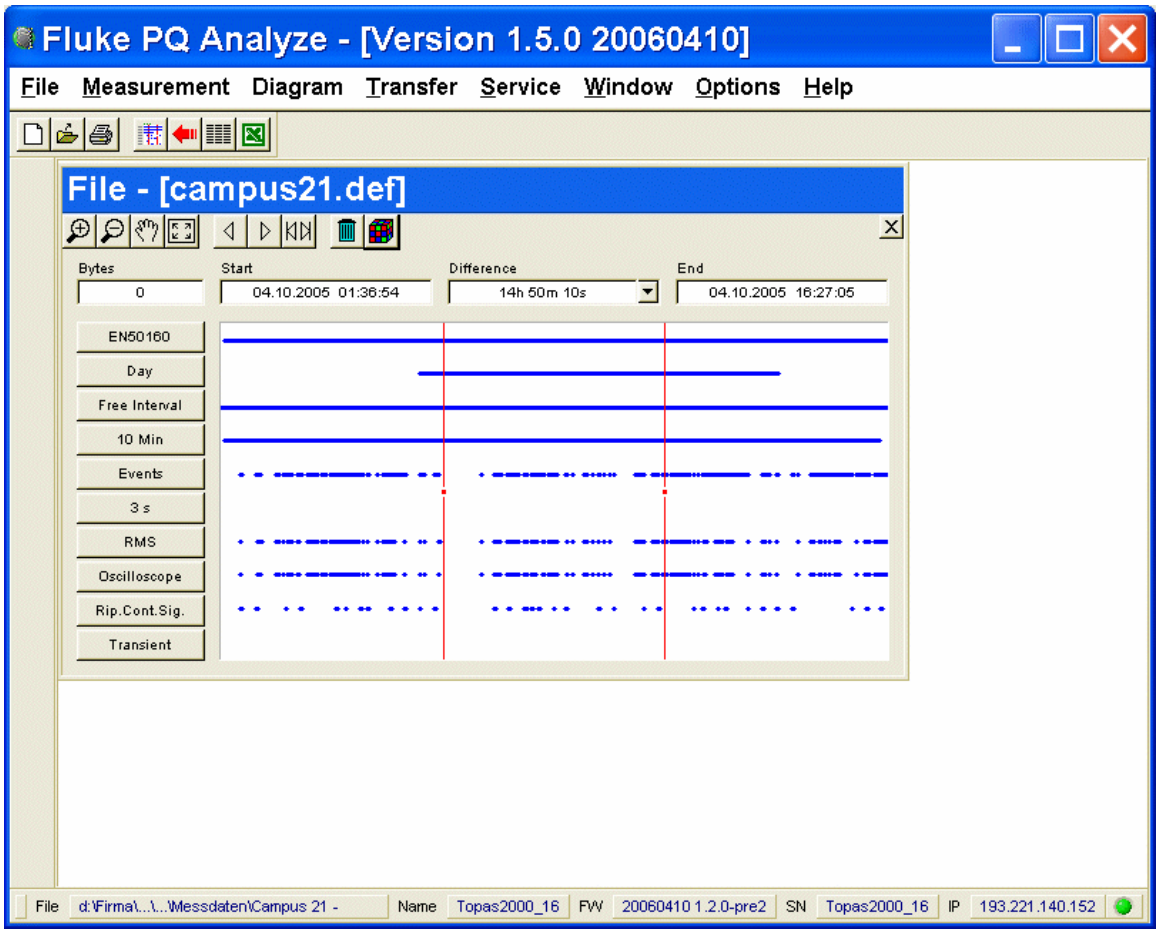
- *Recorded Data* opens stored measurement data files for evaluation.
- *Setup Offline* provides instrument setup without connection to an instrument

Live Modes

- *Setup* is for configuration of an instrument connected to the PC
- *Live* is an ONLINE mode for verification of setup and ranges
- *Download* retrieves data stored on the instrument

This dialog can be turned off by marking the appropriate option. Then the PQ Analyze starts with an empty screen.

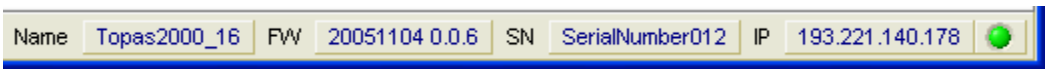
Open a measurement data file for evaluation.



programmfenster.bmp

In the window title displays the version and creation date of the software and name of the actual measurement data file.

The bottom line of the program window, if there is a connection to an instrument, displays a status line showing the following information:

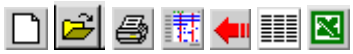


status line.bmp

Name	Description
Name	Designation of the Fluke 1760
FW	firmware version
SN	serial number of the Fluke 1760
IP	IP-address of the Fluke 1760
Red indicator	no connection to a Fluke 1760
Yellow	Searching for Fluke 1760 in the network
Green indicator	connection to Fluke 1760 is active

The file name of any open data files is visible on the left side of the status line.

Main Toolbar



Button	Function
	Select File/New to create a new definition file
	Select File/Open to open an existing definition or measurement data file
	Select this function to print the current screen contents on the system printer
	Click this button to open the evaluation window after the transfer of the measurement data
	If a connection is established between the instrument and the PC, click this button to open the target directory for the file selection/input for the transfer of measurements
	ASCII report generator – data in text format
	EXCEL report generator: automatic generation of measurement reports based on the export configuration

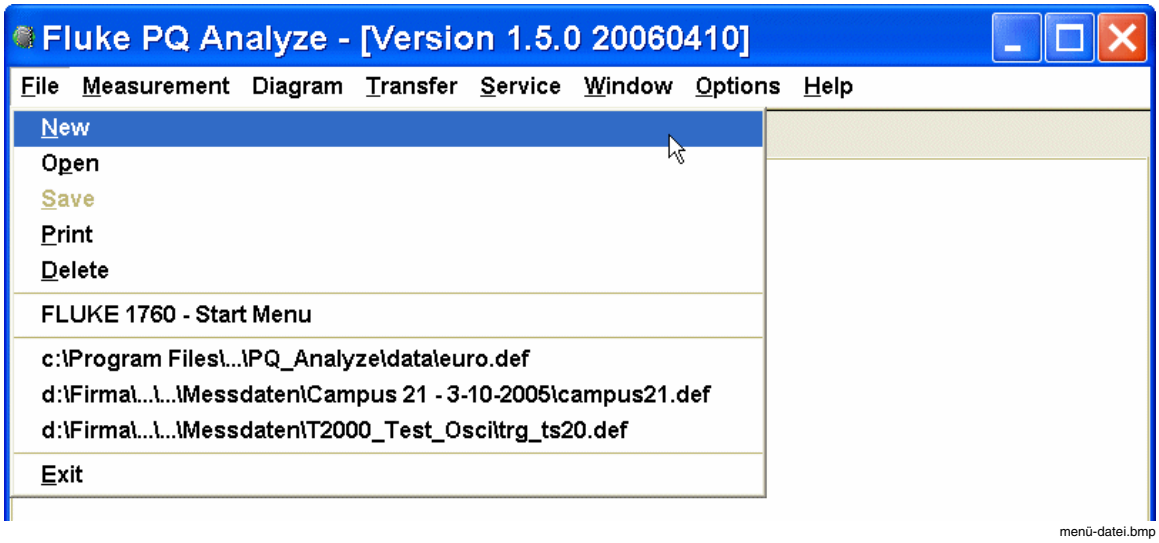
Menu: File

Note

Fluke 1760 has to be configured before you can use the LED indicators and the ONLINE mode. A new instrument is not yet configured.

The last used files are directly accessible via this pull-down menu.

File – New



menü-datei.bmp

1. Select *File/New* or click  in the toolbar to create a new definition file (*.def*). The window contains all information required for the configuration of a measuring procedure. The default values correspond to the requirements laid down in EN 50160.
2. To open an existing file or a template (**.vdf*), select *File>Open* and adjust the parameters to suit your specific measuring job.
3. *Save* the amended file under a new name.

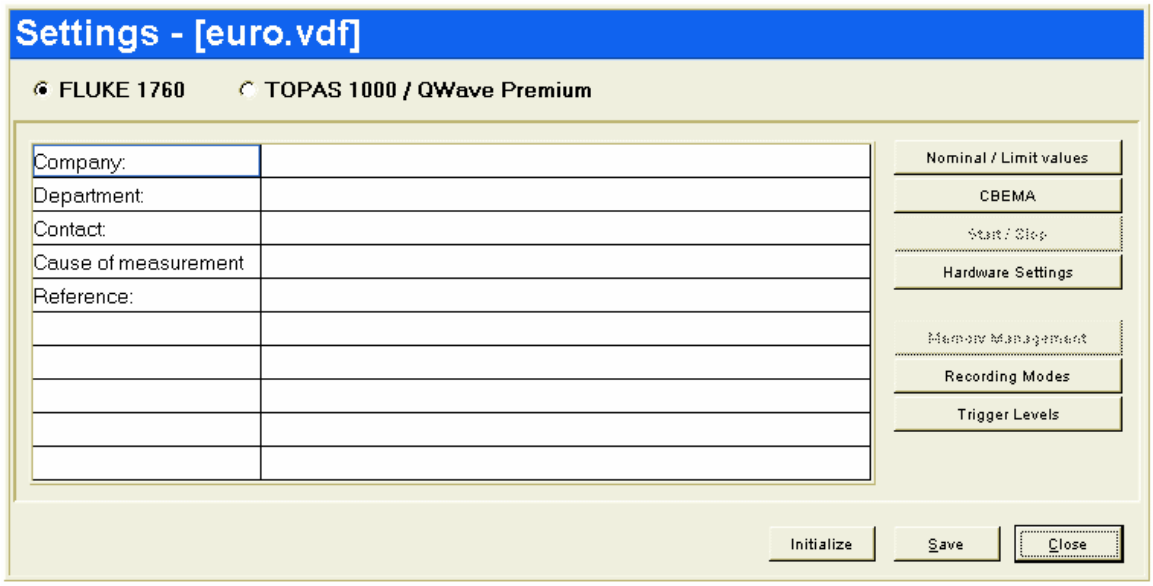
Note

Do not modify definition files assigned to measurements, as this might corrupt stored data. Saved data can only be loaded and analyzed with the associated parameter file.

You also have the option to enter a comment regarding the measurement. Enter a description of the measuring job by entering the details as suggested. Alternatively, you can delete or edit the existing text. You also have the option to amend a number of parameters that determine the evaluation and measuring procedure.

Note

We have to distinguish between settings for Topas 1000 and Fluke 1760. This manual covers only settings for Fluke 1760. There are several instrument specific differences in the settings specifically for recording modes, hardware, and trigger settings. For details about Topas 1000 settings, refer to the manual PQ Analyze for Topas 1000 *on the CD.*



settings.bmp

Note

For the initial test measurements, we recommend applying the rated voltage and default hardware settings of the sensors. We recommend you apply the default values for all other settings. Based on the initial results, you can then modify the trigger settings to optimize them.

4. To enter text, double-click the respective field.

Nominal and Limit Values

In this window, you have the option to change the nominal and limit values (default values corresponding to EN 50160 requirements). Such amendments might be necessary in connection with changes made to the standard or the application of more stringent requirements.

Note

All limit values can be changed. EN50160 evaluations are only possible if this option is activated by means of the appropriate permission code. There are different limits for low and medium voltage systems.

The settings dialog is organized in tabs with appropriate values.

Nominal Voltage Un

The voltage a system is designated and identified and to which certain characteristics are referred. In case of special agreements this is the declared voltage Uc. If in the hardware settings dialog the checkbox *Event, Flicker, Harmonics of U12…* is activated (this is automatically done in ARON2 method, and in Voltage PP/Voltage PP configuration) we have to enter the phase-phase voltage for Un (i.e. 400 V in the low voltage system). In this case event detection, Flicker, and harmonics are based on the phase-phase voltages. If required, a sliding reference according to IEC 61000-4-30 can be applied.

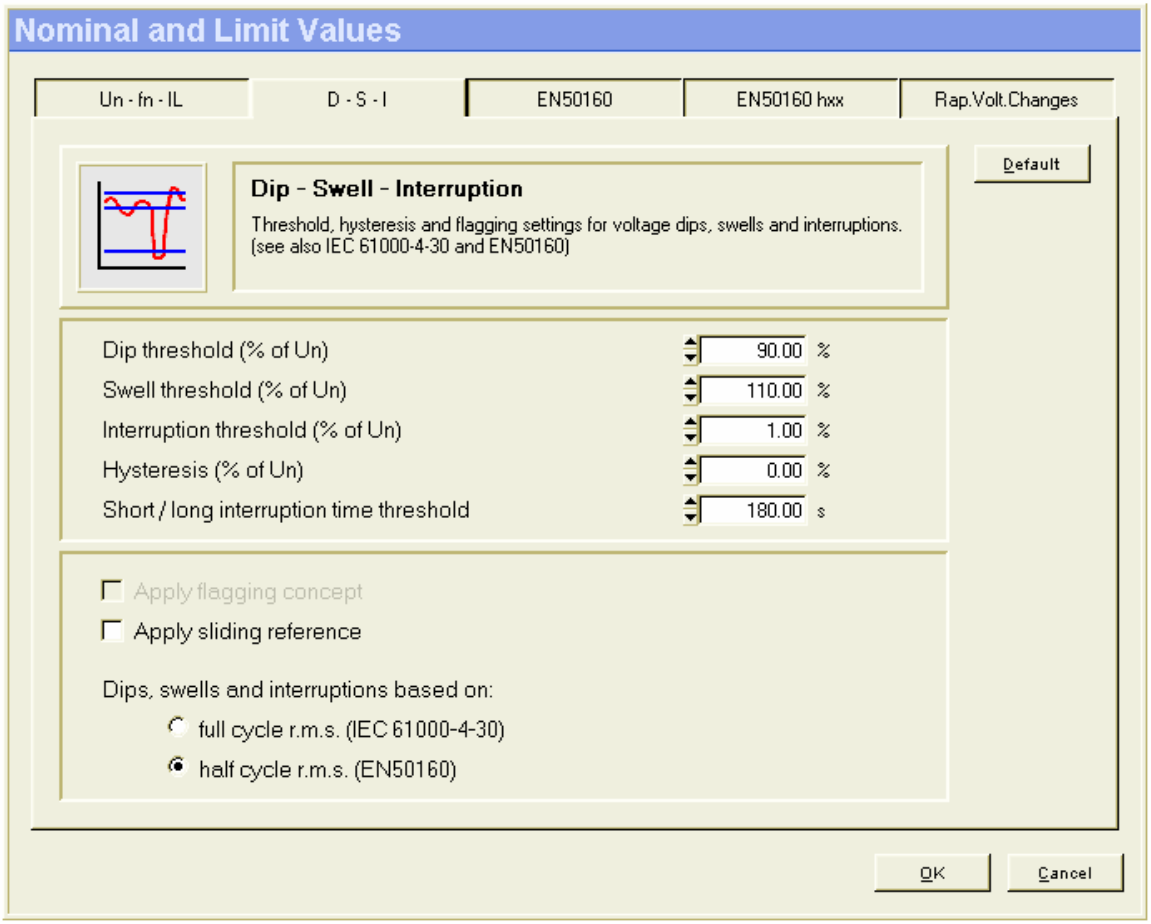
Nominal Frequency fn

Enter the power frequency.

Peak demand load current IL.

This parameter is required later for calculation of the TDD, the Total Demand Distortion.

Dips Swells Interruptions



en50160-limits.bmp

Dip and Swell Threshold

Set the thresholds for event detection (dips or swells according to EN50160) based on half wave/full wave rms values. All thresholds relate to the nominal voltage Un.

Interruption Threshold

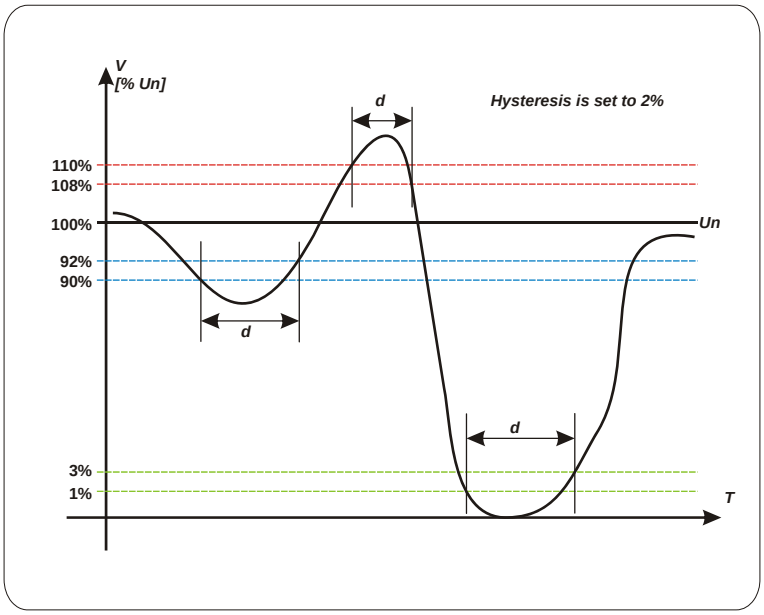
This threshold distinguishes between interruptions (voltage dips below 1 % of Un typically) and voltage dips (normally between 1 % and 90 % of Un).

Hysteresis

The hysteresis is recommended in the IEC 61000-4-30 with 2 %; it can be turned off with a value of 0 %. The hysteresis value is added to the preset threshold.

For example:

If the hysteresis is set to 2 %, the threshold for the beginning of dips is 90 % of Un, and the threshold for the end of dips is 92 % of Un. For swells, the limits are 110 % and 108%; for interruptions, 1 % and 3 %.



hysteresis-e.wmf

The figure shows how the duration d of events is determined.

Short/Long Interruption Time Threshold

This time interval in seconds is the border between short interruptions (normally <3 min) and long interruptions.

Apply Flagging Concept

Flagging means that in case of dip, swells, and interruptions, all other influenced quantities like frequency, harmonic, or flicker are suppressed in statistic evaluation to avoid multiple counting.

If this option is marked the flagging concept according to IEC 61000-4-30 item 4.7 is applied.

Note

After recording, the flagging concept cannot be changed, which means flagged data are not recorded, only events.

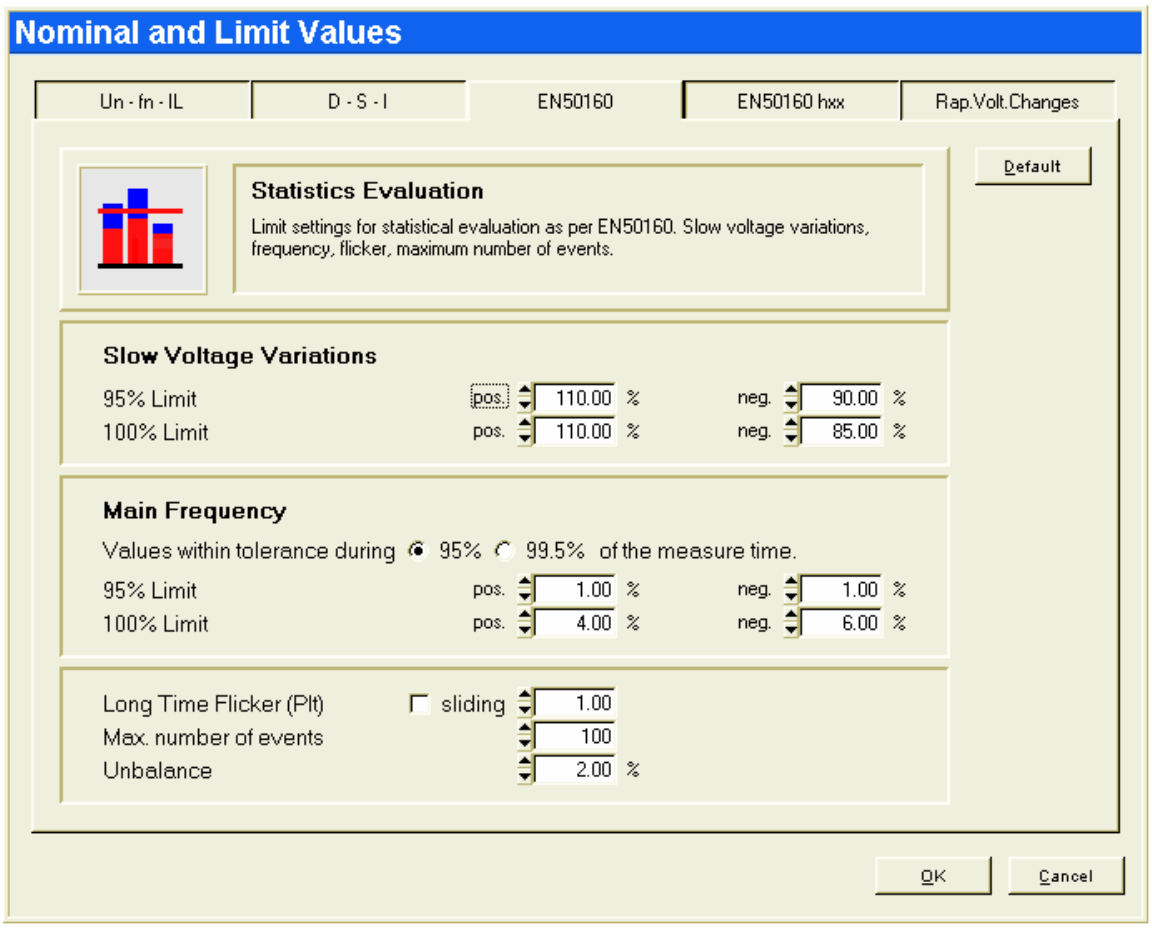
Apply Sliding Reference

If this option is marked, a sliding reference for detection of voltage dips and swells is applied according to IEC 61000-4-30 items 3.26 and 5.4.4

Select rms Value Basis for Events

IEC 61000-4-30 requires detection of full wave rms values for events, but the EN50160 uses half cycle values. Select the appropriate time period in accordance with the applicable standard. The default value is full wave in accordance with IEC 61000-4-30. This selection is not available for Topas 1000.

EN50160 Statistics



en50160-limits-3.bmp

Slow Voltage Variations

They are often caused by load variations in the distribution network. Enter the limit values for 95 % and for 100 % of the measurement time.

Mains Frequency

Enter the limit values for 95 % and for 100 % of the measurement time.

Please note that in unsynchronized “island” networks, the class for frequency variations is different: 95 % instead of 99.5 % of the measurement period for interconnected systems. A selection is provided.

Long-Term Flicker Plt

Voltage fluctuations cause changes in luminance of lighting systems, which can create a visual phenomenon which is called Flicker. The limit value for the long-term Flicker Plt is defined in the standard EN50160, but there is no limit for the short-term Flicker Pst.

If required, a *sliding* averaging algorithm can be applied. The norm requires building up of 2 hour values form the short term Flicker Pst. This setting is applied also for the level-time diagrams. The results for the different averaging methods can be different.

Max. Number of Events

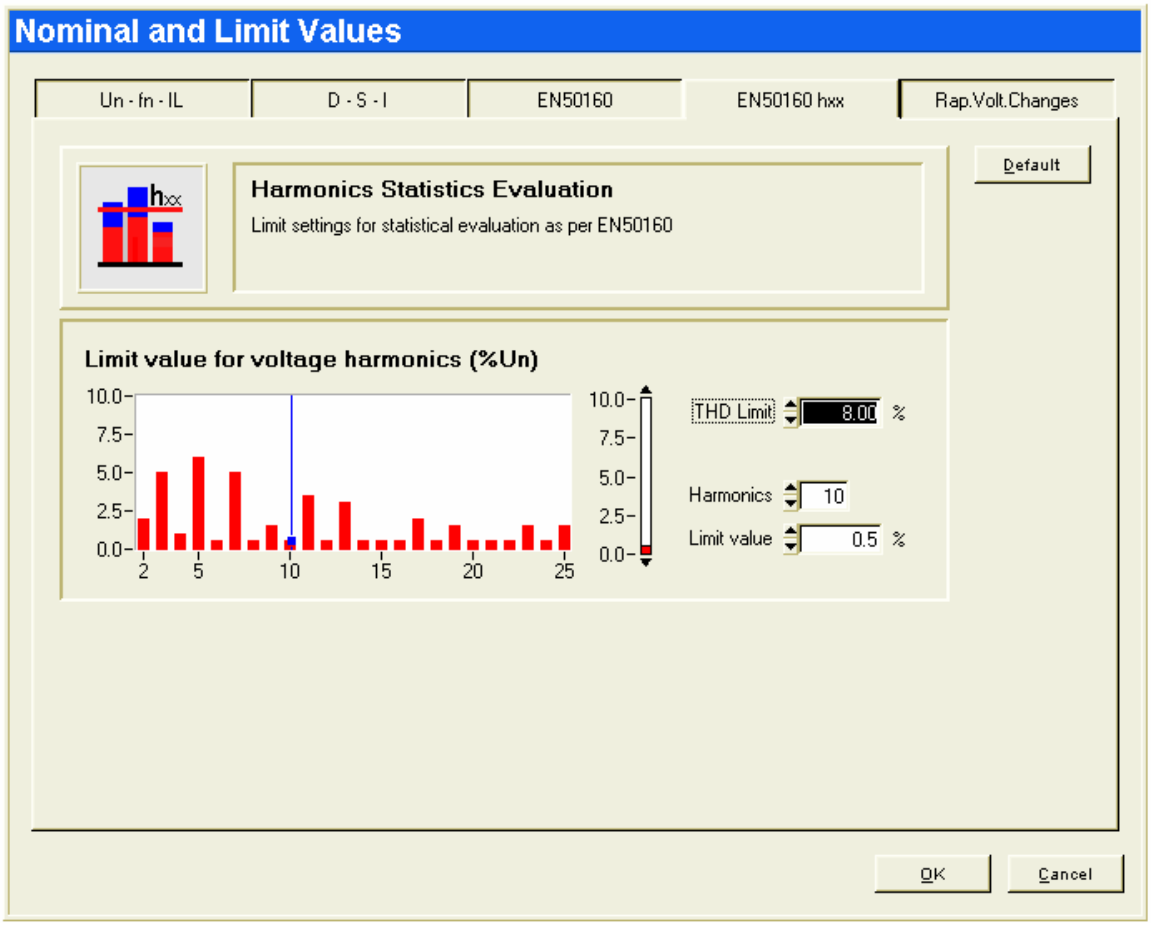
The maximum permissible number of voltage events (dips, swells, and interruptions) is defined here. The standard EN50160 does not specify a limit.

Unbalance

Unbalance occurs if the rms values of the phase-neutral voltages and the phase angle between them are not equal.

This is the limit for 95 % of the 10 min values during the measurement period.

EN50160 Harmonics



en50160-limits-4.bmp

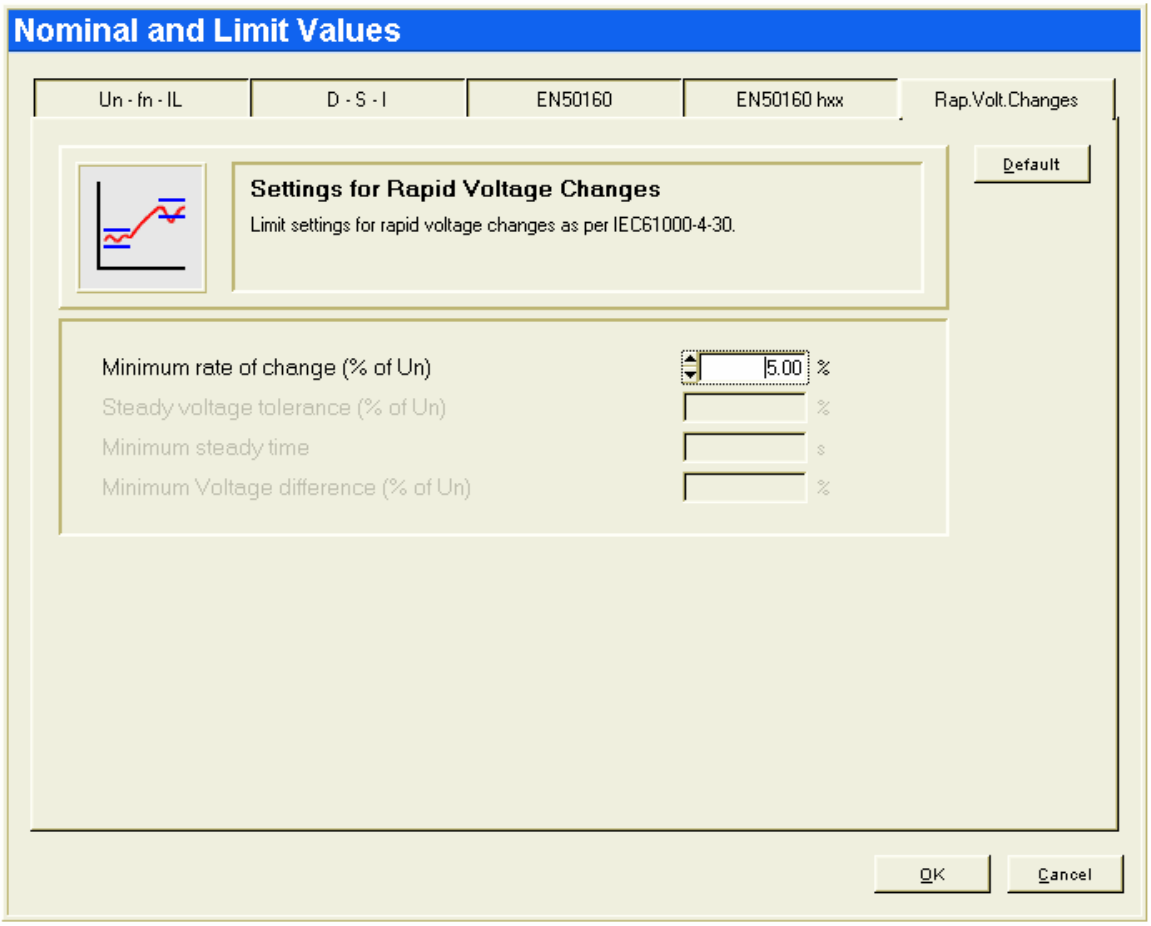
Limit Values for Voltage Harmonics

Harmonics are components of the supply voltage with integer multiple (order) of the fundamental of the supply voltage. A limit value can be assigned or each harmonic with orders between 2 and 25, including THD (total harmonic distortion).

Rapid Voltage Changes

This is a limit for 95 % of the 10 min rms values for each harmonic during the measurement campaign.

In the EN50160 the limit values for just 25 harmonics are defined, which is why this menu option is limited to 25 harmonics.



en50160-limits-5.bmp

These are rapid changes of the rms values between consecutive steady voltage levels. Enter the limit value for detection of rapid voltage change events.

The parameters are recommended in the IEC 61000-4-30, items 5.11 and A4.

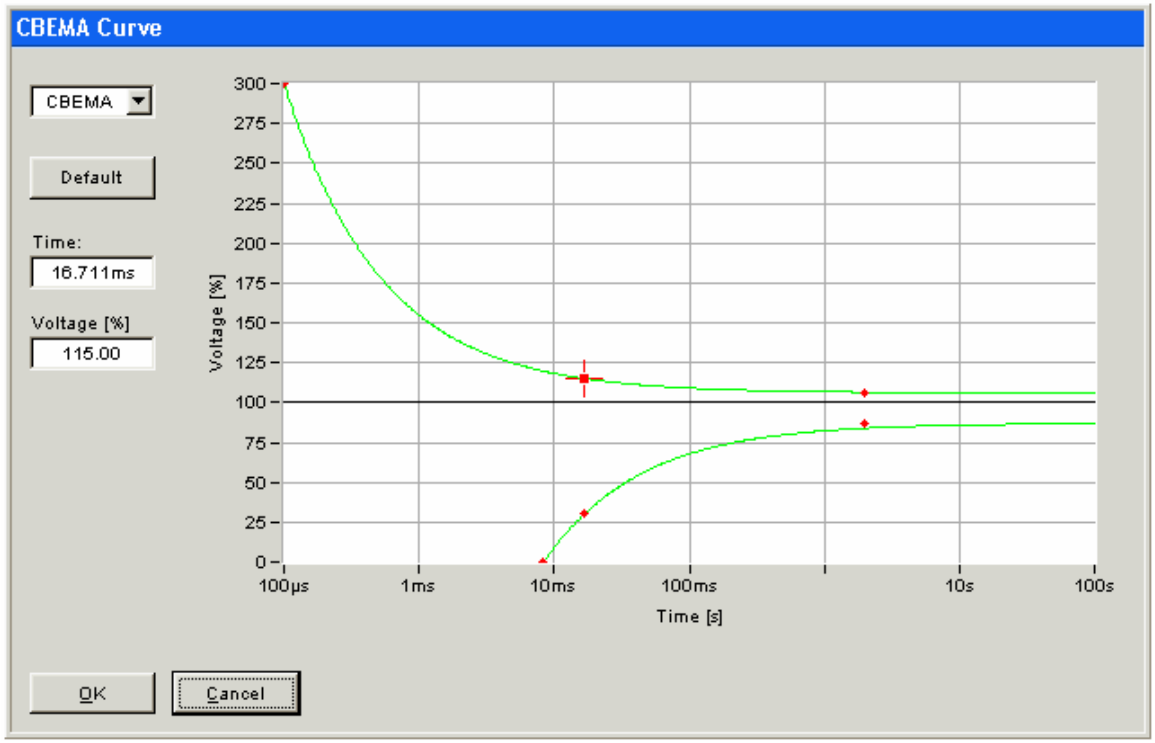
Click OK to save the changes.

CBEMA Window

In the CBEMA window, users can view and modify the permissible tolerances for the evaluation of events according to CBEMA or ANSI. The limit value graphs have been calculated by CBEMA (Computer and Business Equipment Manufacturers Association); these define the effect of voltage events on equipment, depending on voltage and duration. This feature allows for easy evaluation of expected malfunctions.

The limit curves can be changed by moving the red markers using the left mouse button. The color and the width of the curves cannot be changed.

To restore the default settings, click the *Default* button.

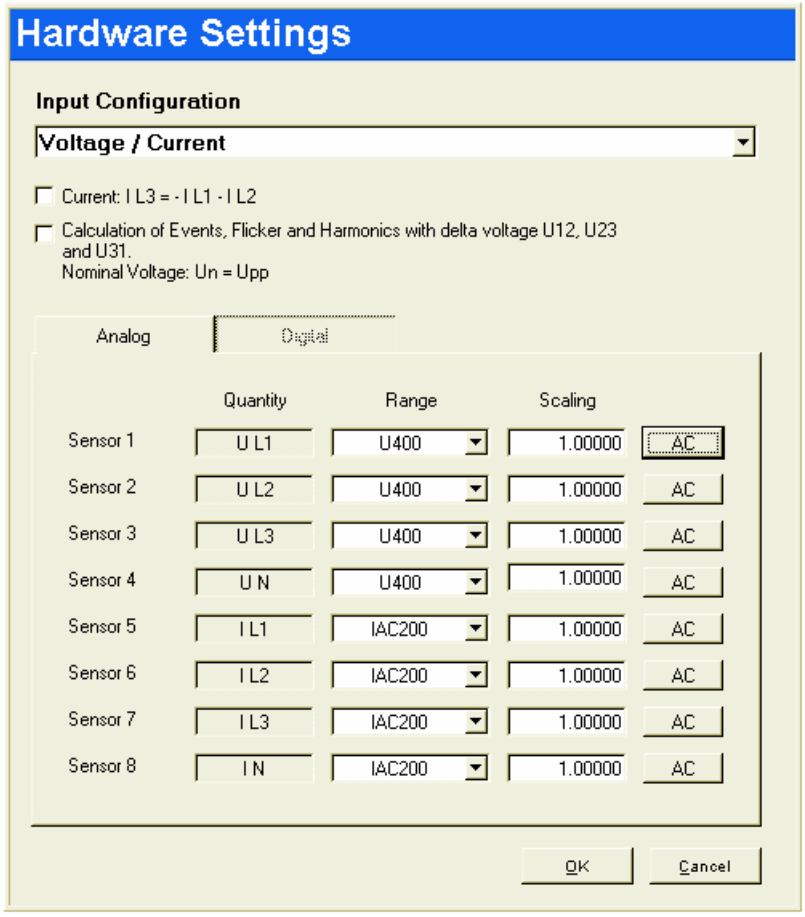


cbema.bmp

Hardware Settings

1. Select the *Measurement System* to change the sensor type and their ranges and scaling factors (if required) for each channel.
2. Select the *Measurement System>Input Configuration*.

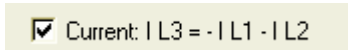
Configuration Voltage/Current



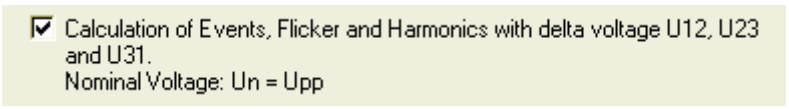
hardware settings.bmp

This is the most commonly used configuration.

Connect maximum 4 voltage and/or current sensors to the system under test; single-phase measurements (channel 4, 8: U+I only) are also provided. The standard 3-wattmeter method is applied, and neutral conductor voltage/current can be measured.

If the 

box is checked, current *IL3* is calculated rather than measured. This enables you to carry out measurements based on the 3-wattmeter method with all its advantages, rather than with the two-wattmeter method/Aron circuit in three-wire networks. This method should be used if (*I1+I2+I3=0*). Refer to the connection diagrams provided in the hardware manual of the instrument.



box_flharmpp.bmp

If this box is checked, the results for events *Flicker* and *Harmonics*, as well as all trigger conditions for *Events* and *Harmonics*, are determined based on the phase-to-phase voltages.

Note

If phase-to-phase voltages have been selected, the nominal voltage must be entered as a phase-to-phase voltage for the "Nominal /Limit" values.

Typical settings for phase-to-phase voltages:

nennspannung 400v.bmp

For phase to neutral voltages:

nennspannung 230v.bmp

Active/Reactive Power, 'COS Phi' of the Harmonics

If *Phase-to-Phase Voltages* are selected, the star voltages are calculated from the phase-to-phase voltages, and phase and total power values are determined accurately.

EN 50160 Report

If *Phase-to-Phase Voltages* are selected, the voltage events (over-voltage, under-voltage, short and long interruption) as well as the values for Flicker, harmonics, asymmetry and rapid voltage changes are calculated on the basis of the phase-to-phase 10 ms rms voltage values.

Configuration Voltage/Voltage

The phase voltages (phase-neutral conductor) of two three-phase systems are measured. In all analyses, the icon for current is replaced by that for voltage. The unit for all channels is V.

Phase-to-phase rms voltage values are calculated on the basis of the phase voltages UL1, UL2, UL3. There is thus no need for delta configuration. All voltage channels can be laid from phase to earth.

An index in the parameter name indicates the system to which the voltage value belongs:

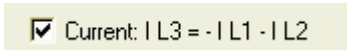
- Voltages of system 1 (CH1-CH4)
  - U L1 (1)
  - U L2 (1)
  - U L3 (1)
  - U N (1)
- Voltages of system 2 (CH5-CH8)
  - U L1 (2)
  - U L2 (2)
  - U L3 (2)
  - U N (2)

Configuration Voltage PP/Voltage PP

Similar to voltage/voltage configuration, but with delta configuration connection (phase-phase).

Configuration 2-Wattmeter Method - ARON2

Conventional 2-wattmeter method with connection of the current sensors to conductors *L1* and *L3*. The phase-to-phase voltages are calculated from the phase voltages and form the basis for all phase power values and the total power. All power parameters are thus determined accurately.

If the box 

is checked, the omitted current *IL3* is calculated. Alternatively, use 3 current sensors.

Note

The system offers a range of different operating modes so that the measuring procedure can be adjusted to the actual measuring task. For more information, please also refer to the connection diagrams in the hardware manual of the instrument.

Scaling

Select the appropriate sensor out of the pull down list and additionally the scaling factor if required.

The *scale* factor is calculated from the primary quantity/secondary quantity, e.g. 10.000 V/100 V = 100.

AC/DC Coupling

The button AC or DC respectively toggles between AC- and DC-coupling of the measurement inputs. The option ‘DC’ is only available for sensors supporting DC measurements. For example, for Clamps, this option is dimmed.

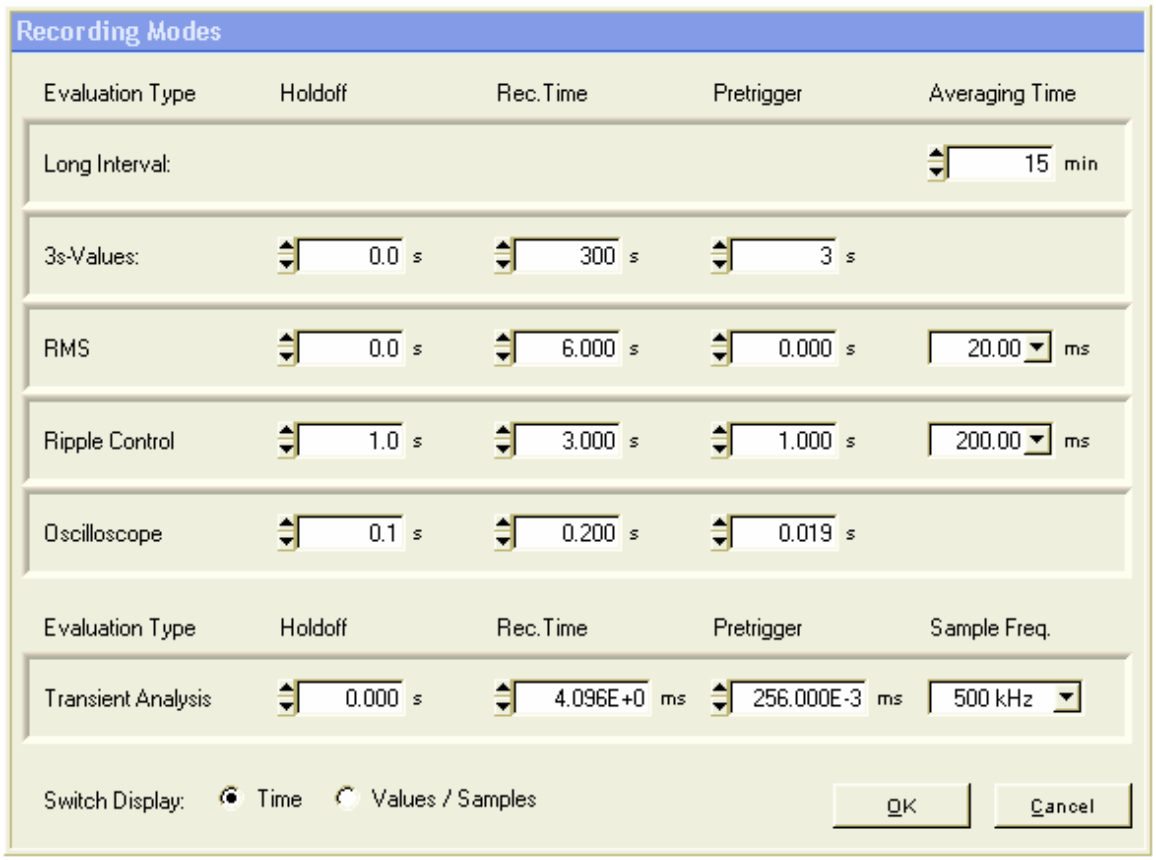
Note

In DC mode the recording is not gapless according to IEC 61000-4-30 because the DC-offset has to be recalibrated in regular intervals. Every 10 minutes a 200 ms measurement value will be missing.

Click *OK* to save the changes.

Recording Modes

In this window, you can define the recording times, pre-triggers, and hold-off times to the next recording for the virtual measuring instruments.



aufzeichnungsmodi2000.bmp

Hold off

This value indicates the period from the end of a recording to the next trigger ready state. This hold-off time has to be at least as long as the pre-trigger time.

Recording Time

This value indicates the duration of the recording from the trigger time.

Pre-trigger

To define the duration of the recording prior the trigger event, enter a positive time value. Negative values lead to delayed recording after the trigger time (post-trigger).

Averaging Time

Define here the averaging interval for the Free interval, rms values (10 ms, 20 ms, 200 ms, 3.000 ms = 3 s) and ripple control signals (200 ms or 3.000 ms = 3 s).

Sample Frequency

For transient recordings, enter here the sampling rate. The standard transient option supports for sampling frequencies between 100 and 500 kHz, the extended option, sample frequencies between 100 kHz and 10 MHz.

After setup we can switched the presentation in the bottom of the panel from seconds to samples/measurement values to check the number of values that will be recorded.

Note

The transient option is only available if it is built into the instrument. No error message is issued, if an invalid sampling frequency is selected.

Note

At the end of a trigger recording, there might be a delay of up to 0.6 seconds to the next trigger response. For gapless recordings, a suitable large number of recorded values or intervals must be selected. Trigger events at short intervals within a period of a second are aggregated to a single event.

The term 'Oscilloscope' refers to the sampled values.

Trigger Settings

Values for EN 50160 statistics, 1-day values, Free interval, 10 minutes, and events are always recorded, irrespective of the trigger settings. The other functions are recorded only, if the trigger activated in the settings is tripped.

Note

For practical use: If you wish to continuously record rms values with an averaging time of 20 ms, we recommend the following approach:

- *Set the 'Hold off' and the 'Pre-trigger' times to the same value of 4 seconds, and choose a recording time of 10 s.*
- *Activate the 'Time trigger' with a repetition rate of 10 s. Alternatively, select an 'Oscilloscope trigger', which is tripped at each network period. Do not combine an oscilloscope trigger with a time trigger, as this would lead to gaps in the recording.*

Adjustment of Trigger Levels

Note

In general for all trigger settings, procedure is as follows:

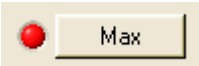
1. *Select the optimal trigger type for your application:*
   - *V-I-P trigger (rms trigger, average values)*
   - *Oscilloscope*
   - *Transient analysis*
   - *Ripple control signal analysis*
   - *Harmonics*
   - *Time*
2. *Select the trigge typer for Oscilloscope according to:*

- *Level, Sine, Max, Phase, Wave*
- *Define the recordings which shall be done in case of a trigger event*
- *RMS and/or*
- *Oscilloscope (samples) and/or*
- *Transients and/or*
- *3 s values and or*
- *Ripple control signals*

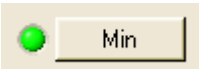
The recordings are done as defined in the dialog "Settings Recording Modes".

1. *Select the parameter for the trigger, e.g. V, I, P.*
2. *Click with the right mouse button into the field for the phase you want to trigger (L1-A, L2-B, L3-C, N). A further right click disables this trigger.*
3. *Click Reset to disable all triggers in this panel.*
4. *Click OK to save the settings.*

Buttons like Min, Max, Dif can be used to check the appropriate settings.



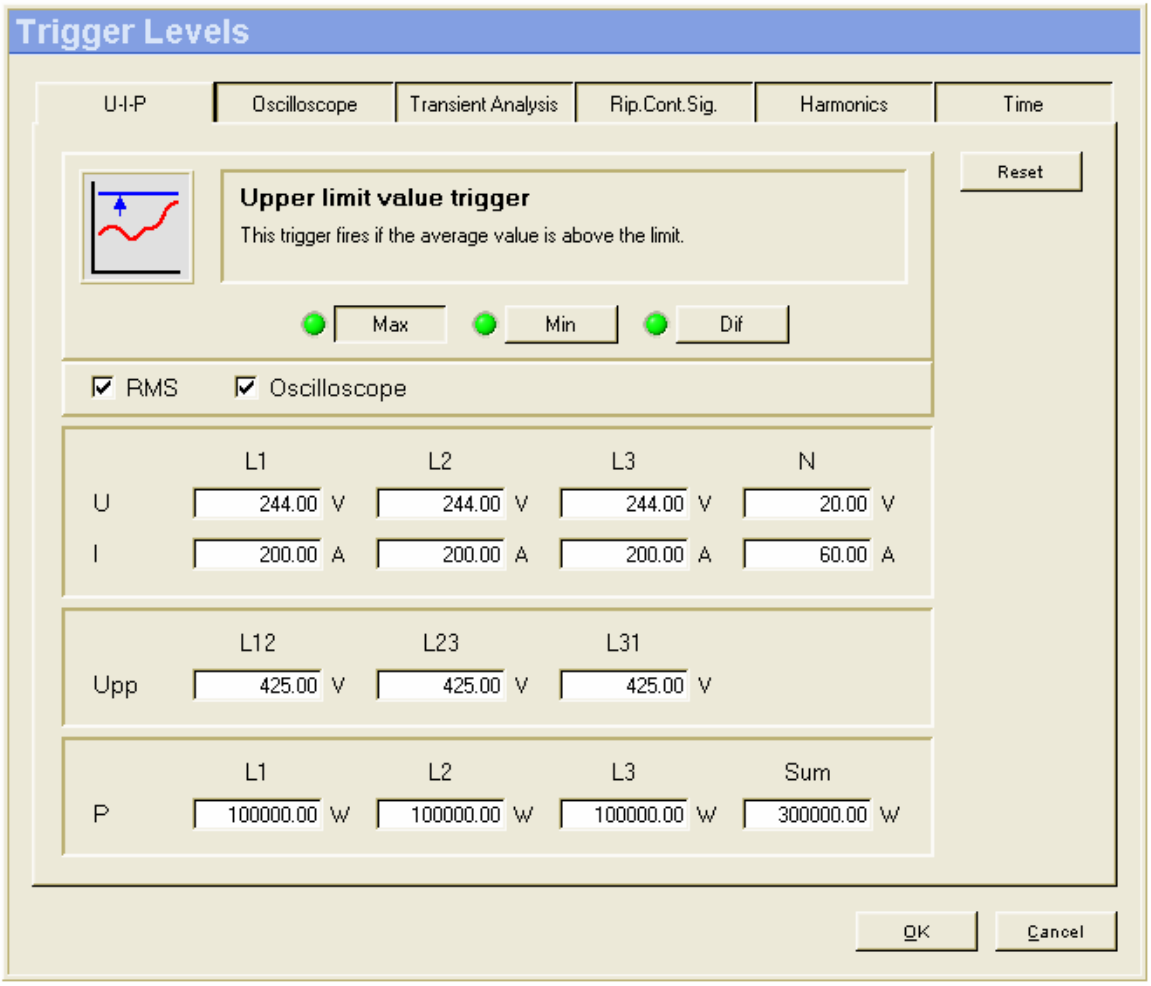
Red indicator: there is no threshold defined for this trigger



Green indicator: there is a threshold defined for this trigger

An event might meet more than one trigger condition. We recommend selecting only those triggers that best correspond to the event to be recorded, rather than activating too many triggers

U-I-P Trigger Level Monitoring-Maximum



trigger-effektivwerte-max.bmp

This trigger can be applied to phase voltages (U), currents (I), phase-phase voltages (Upp), and active power (P) values.

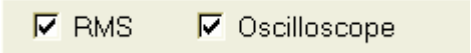
We have to enter the rms values of voltages and currents or the average values for power we want to monitor.

The trigger fires if the measurement values are above the limit value and records on request rms and/or *Oscilloscope* values.

The recordings are done as defined in the dialog *Settings Recording Modes*.

Note

To record rms values and/or Oscilloscope (sample) values, check the respective boxes:



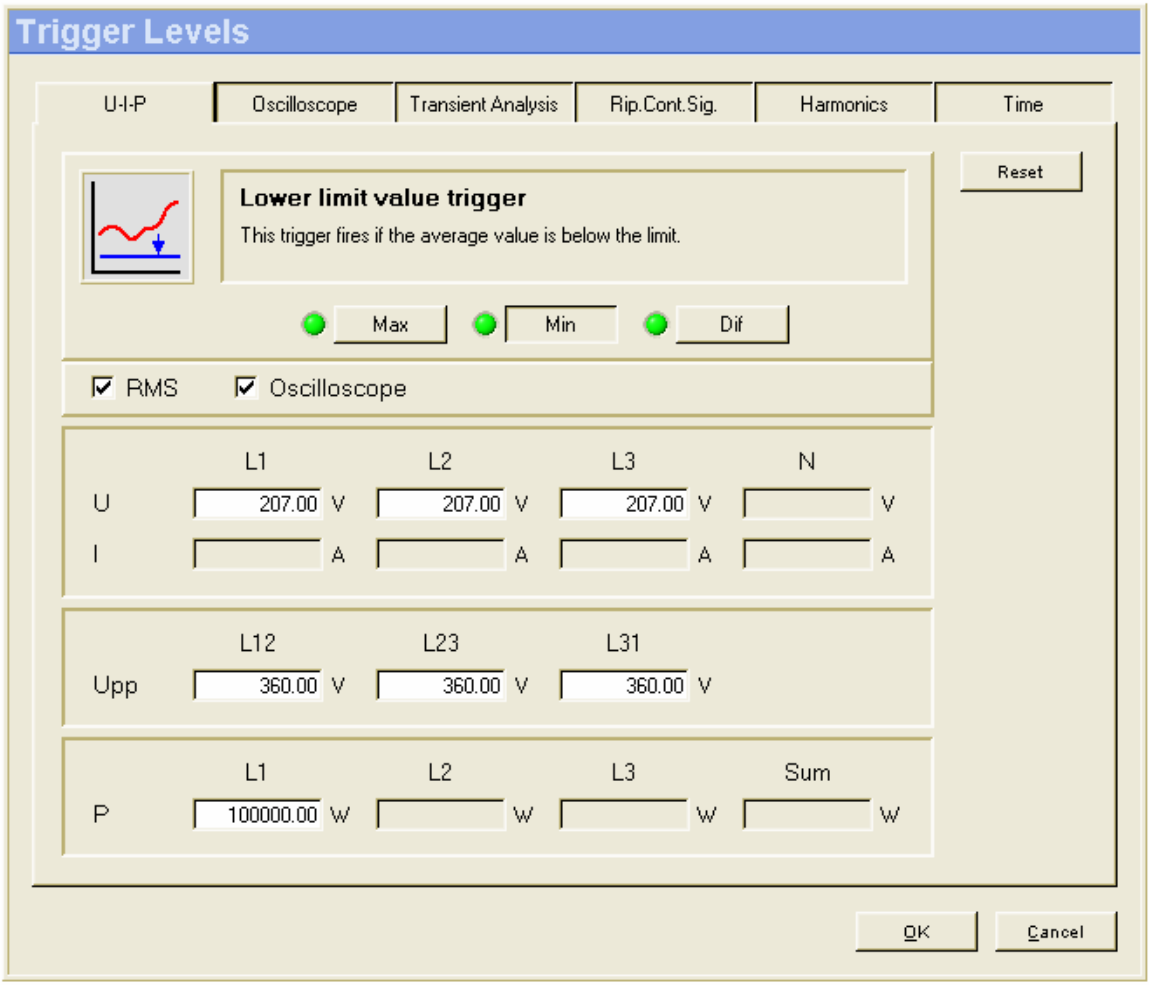
rms-oscilloscope.bmp

In the above example the trigger records *rms* values and Oscilloscope values if any of the phase voltages is higher than 244 V, or if one of the phase-phase voltages is above 425 V or one of the currents or one of the power values is above the limit.

Typical Applications

Detection of peak values of voltages, currents and/or power values, and alerts to turn off heavy loads to avoid peak tariffs if the power reaches defined peak values.

U-I-P Trigger Level Monitoring-Minimum



trigger-effektivwerte-min.bmp

This trigger can be applied to phase voltages (U), currents (I), phase-phase voltages (Upp), and active power (P) values.

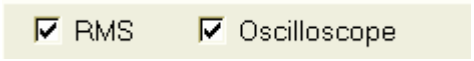
We have to enter the rms values of voltages and currents or the average values for power we want to monitor.

The trigger fires if the measurement values are below the limit value and records on request rms and/or *Oscilloscope* values.

The recordings are done as defined in the dialog *Settings Recording Modes*.

Note

To record rms values and/or Oscilloscope (sample) values, check the respective boxes.



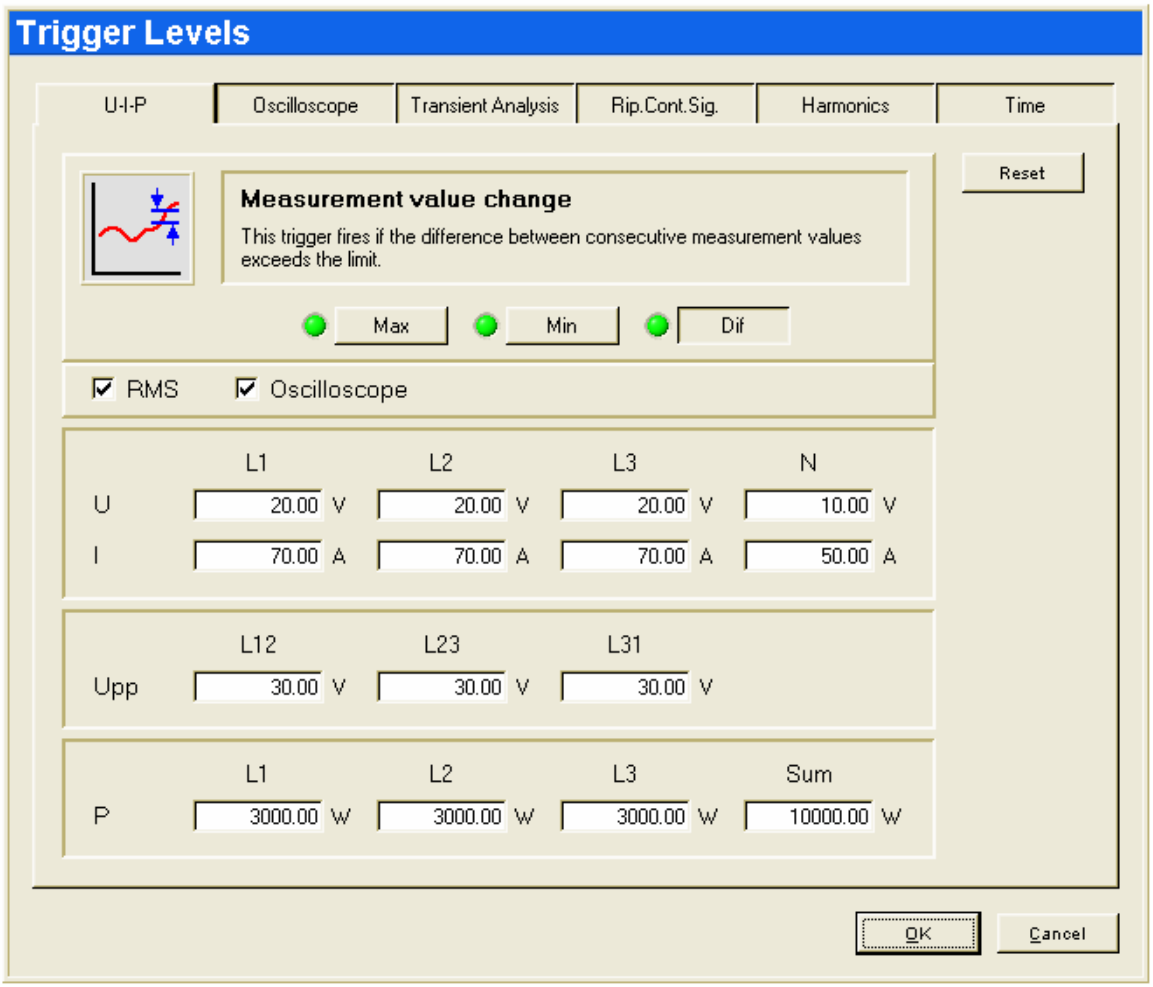
rms-oscilloscope.bmp

In the above example, the recordings of rms and Oscilloscope (sample) values are started, if one of the phase voltages drops below 207 V or if one of the phase-phase voltages exceeds 360 V, or if the active power on phase L1 drops below 10 kW.

Typical Applications

Detection of voltage dips.The concurrent recording of voltage and current values provides data to estimate whether load variations in the installation caused the voltage dips or if the voltage drops were delivered from other branches of the distribution network.

U-I-P Trigger Level Monitoring-Difference



trigger-effektivwerte-dif.bmp

This trigger can be applied to phase voltages (U), currents (I), phase-phase voltages (Upp), and active power (P) values.

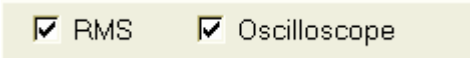
We have to enter the rms values of voltages and currents or the average values for power we want to monitor.

The trigger starts the recordings of *rms* values and/or *Oscilloscope* values on request if small, fast measurement value changes occur. The trigger does not react to slow, even large value changes. Disturbances produce rapid voltage changes between consecutive measurement intervals.

The recordings are done as defined in the dialog *Settings Recording Modes*.

Note

To record rms values and/or Oscilloscope (sample) values, check the respective boxes:



rms-oscilloscope.bmp

In above example the rigger will record rms values and Oscilloscope (sample) value if:

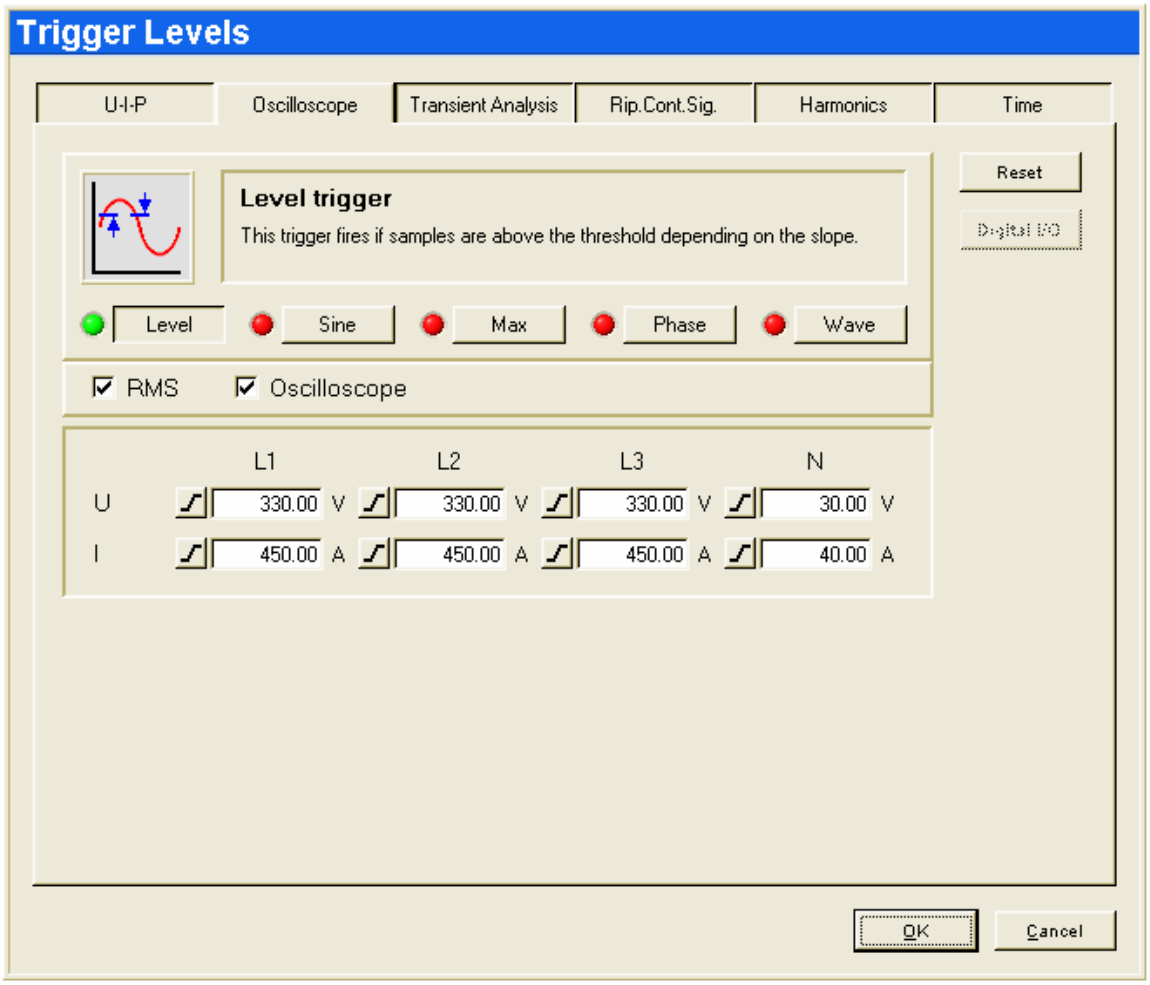
- One of the phase voltages changes for more than 20 V or
- If the Neutral-voltage changes more than 10 V or
- One of the phase currents changes for more than 70 A or
- If the N-wire current changes for more than 40 A or
- One of the phase-phase voltages changes for more than 30 V or
- If one of the phase power values changes for more than 3 kW or
- If the total power changes for more than 10 kW

Typical Applications

Detect any changes in the distribution system. It is possible to establish complex trigger settings, thus the Fluke 1760 will always record relevant data for troubleshooting or localization of the sources of the disturbances:

- Are there voltage dips, voltage swells
- Were there large loads switched on, did they produce voltage dips which had an impact to the distribution network
- Is the mains impedance low enough on the point of common coupling
- Monitoring of external signals coming from protection relays, industrial control systems etc.
- Trigger on status changes of specific external signals

Trigger – Oscilloscope Level



trigger-oszilloskop-pegel.bmp

This trigger can be applied to phase and Neutral voltages (U), and phase and Neutral currents (I).

We have to enter the sample values of voltages and currents we want to monitor.

The trigger starts the recordings of *rms*values and/or *Oscilloscope* (sample) values on request if the sample values are above or below the preset limit value.

The recordings are done as defined in the dialog *Settings Recording Modes*.

Positive (rising) or negative (falling) slope is determined by the symbol left to the numerical input field. The trigger is sensitive to slopes but not to levels.

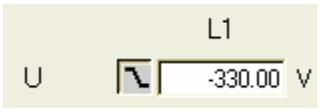
Example 1:

Trigger for positive slope on positive voltage on *L1*.

trigger-steigend.bmp

Example 2:

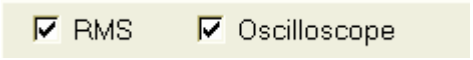
Trigger for negative slope on negative voltage on *L1*.



trigger-fallend.bmp

Note

To record rms values and/or Oscilloscope (sample) values, check the respective boxes.



rms-oscilloscope.bmp

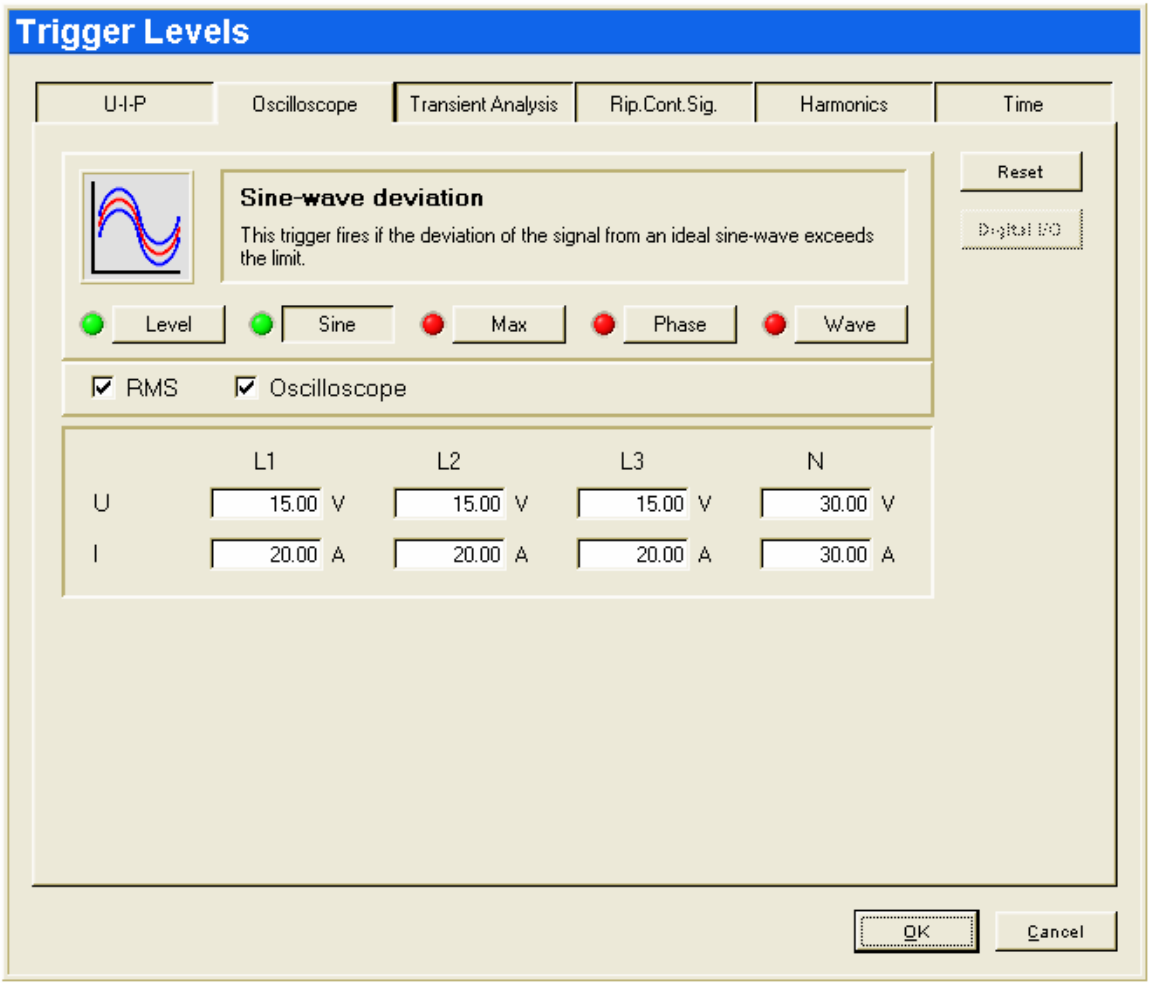
In the above example the trigger starts recordings of *rms* and/or *Oscilloscope* (sample) values if the sample values of the phase voltages are above 330 V or if the Neutral voltage is above 30 V, or if the samples of the phase currents are above 450 A or if the Neutral current is above 40 A and changes with positive/negative slope respectively.

The recordings are done as defined in the dialog *Settings Recording Modes*.

Typical Applications

Precise investigation of short term voltage and current peak values or voltage sags. It is important to define appropriate pre-trigger time periods in the *Settings Recording Modes*. This allows the history before the event and the whole event to be analyzed in detail.

Trigger – Oscilloscope Sine



trigger-oszilloskop-sinus.bmp

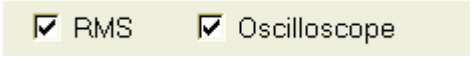
This trigger can be applied to phase and Neutral voltages (U), and phase and Neutral currents (I).

This trigger is sensitive for deviations from the ideal sine wave. Based on zero crossings and amplitudes of the last cycle an ideal sine wave is calculated. If the deviation of the samples of the actual mains cycle from this ideal sine eave is higher than the limit value a recording of *rms* values or *Oscilloscope* (sample) values is started.

The recordings are done as defined in the dialog *Settings Recording Modes*.

Note

To record rms values and/or Oscilloscope (sample) values, check the respective boxes.



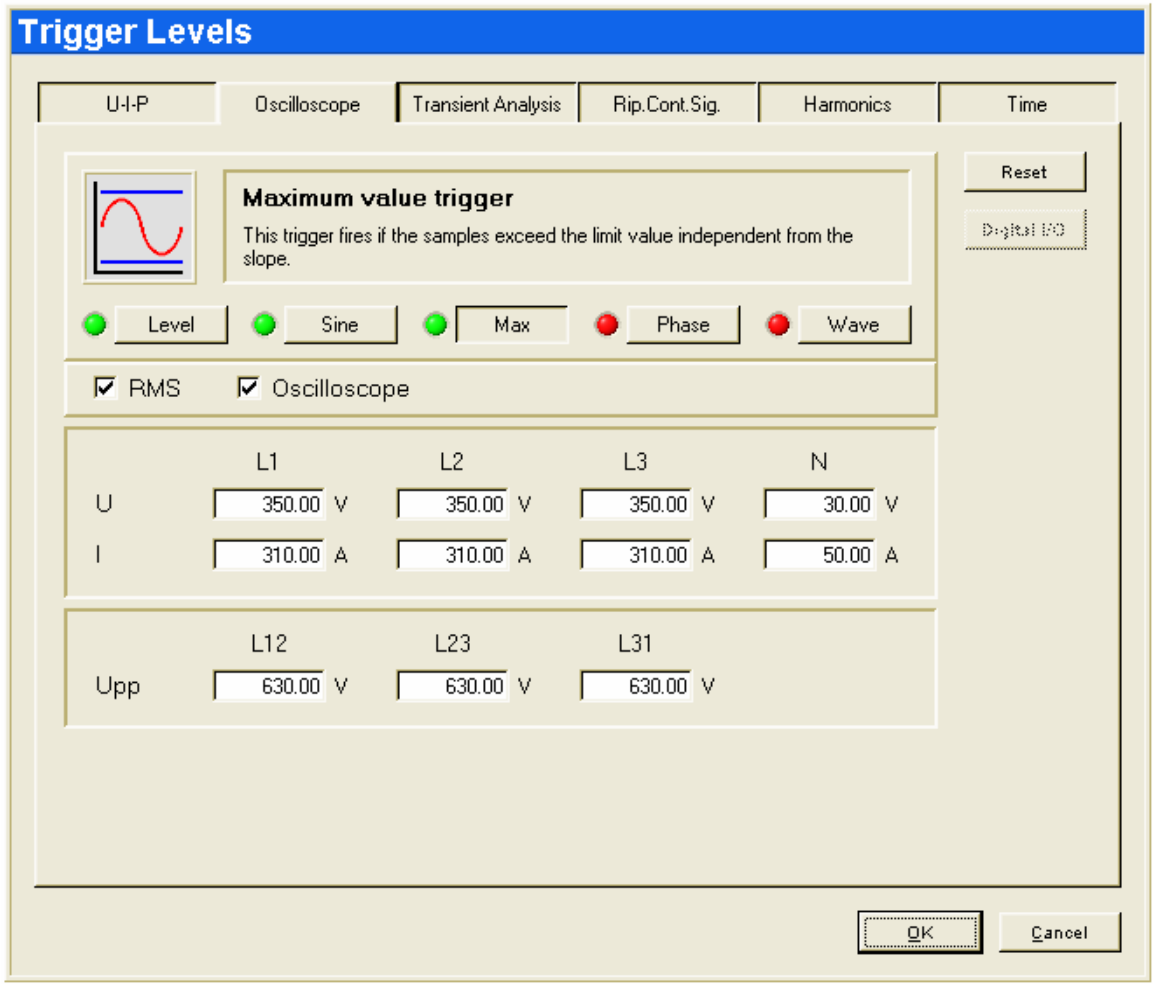
rms-oscilloscope.bmp

If for example the limit is 20 V, a recording will be performed if the deviation of the waveform from the ideal sine wave is more than ±10 V.

Typical Applications

- Detection of commutation of distortions
- Sudden distortions of the waveform

Oscilloscope Trigger – Maximum



trigger-oszilloskop-max.bmp

This trigger can be applied to phase voltages and Neutral voltage (U), phase currents and Neutral current (I), and phase-phase voltages (Upp).

This trigger monitors the maximum values independent of the polarity. We have to enter the sample values of voltages and currents we want to monitor.

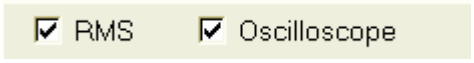
The recording is initiated if the sample values of the positive or the negative half cycle are above the limit value.

Example :

If the limit value is set to 350 V a triggered recording is started if samples are above +350 V or if samples are below −350 V. The recordings are done as defined in the dialog *Settings Recording Modes*.

Note

To record rms. values and/or Oscilloscop' (sample) values, check the respective boxes.

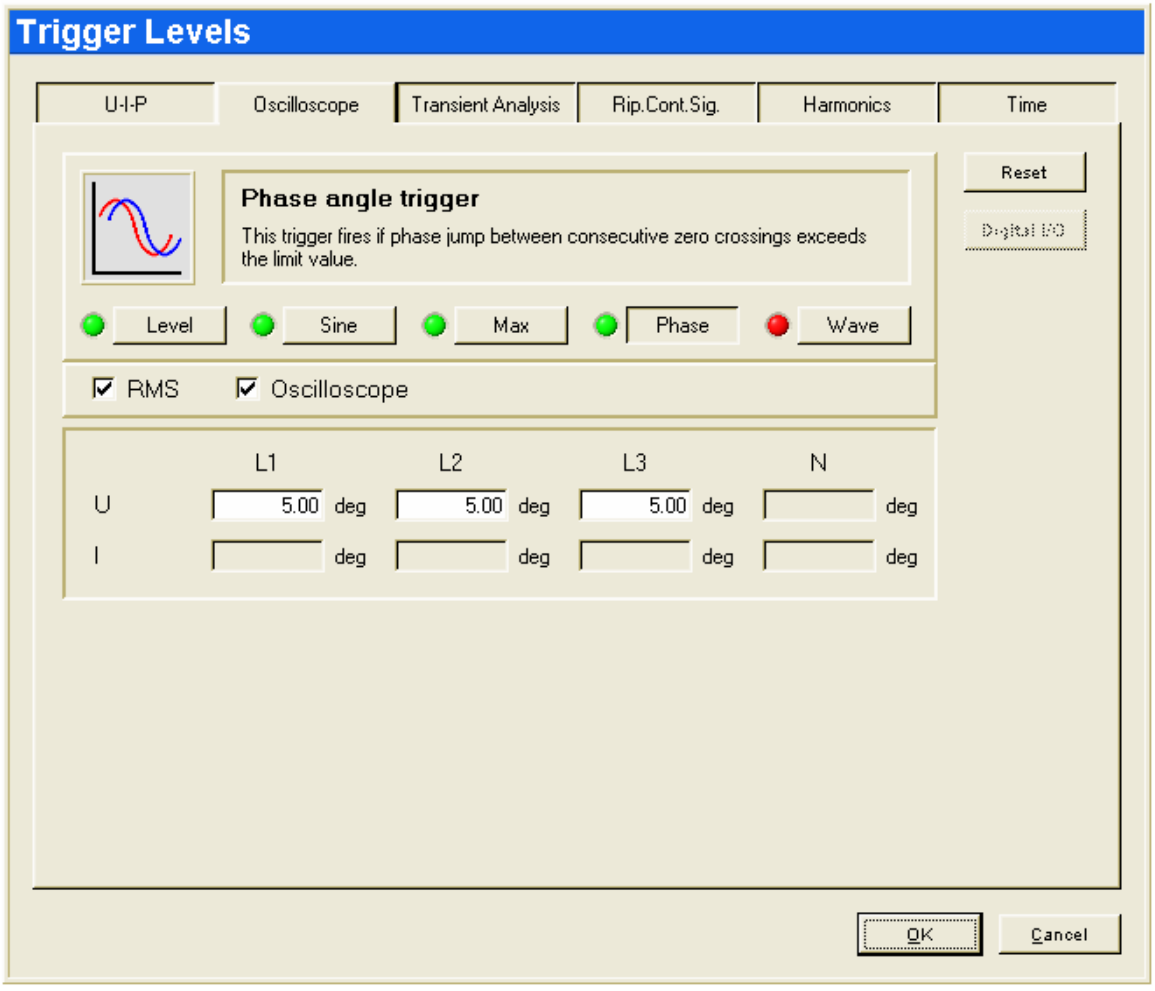


rms-oscilloscope.bmp

Typical Applications

Precise investigation of short term voltage and current peak values.

Oscilloscope Trigger – Phase



trigger-oszilloskop-phase.bmp

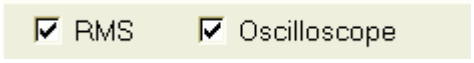
This trigger can be applied to voltages (U) and currents (I) of the phases and of Neutral.

The trigger responds to phase jumps between consecutive cycles. The zero crossings of adjacent periods are evaluated. If the limit is set to 0.5° the trigger will start recordings of *rms* and/or *Oscilloscope* (sample) values if phase jumps are above this value on request.

The recordings are done as defined in the dialog *Settings Recording Modes*.

Note

To record rms values and/or Oscilloscope (sample) values, check the respective boxes.

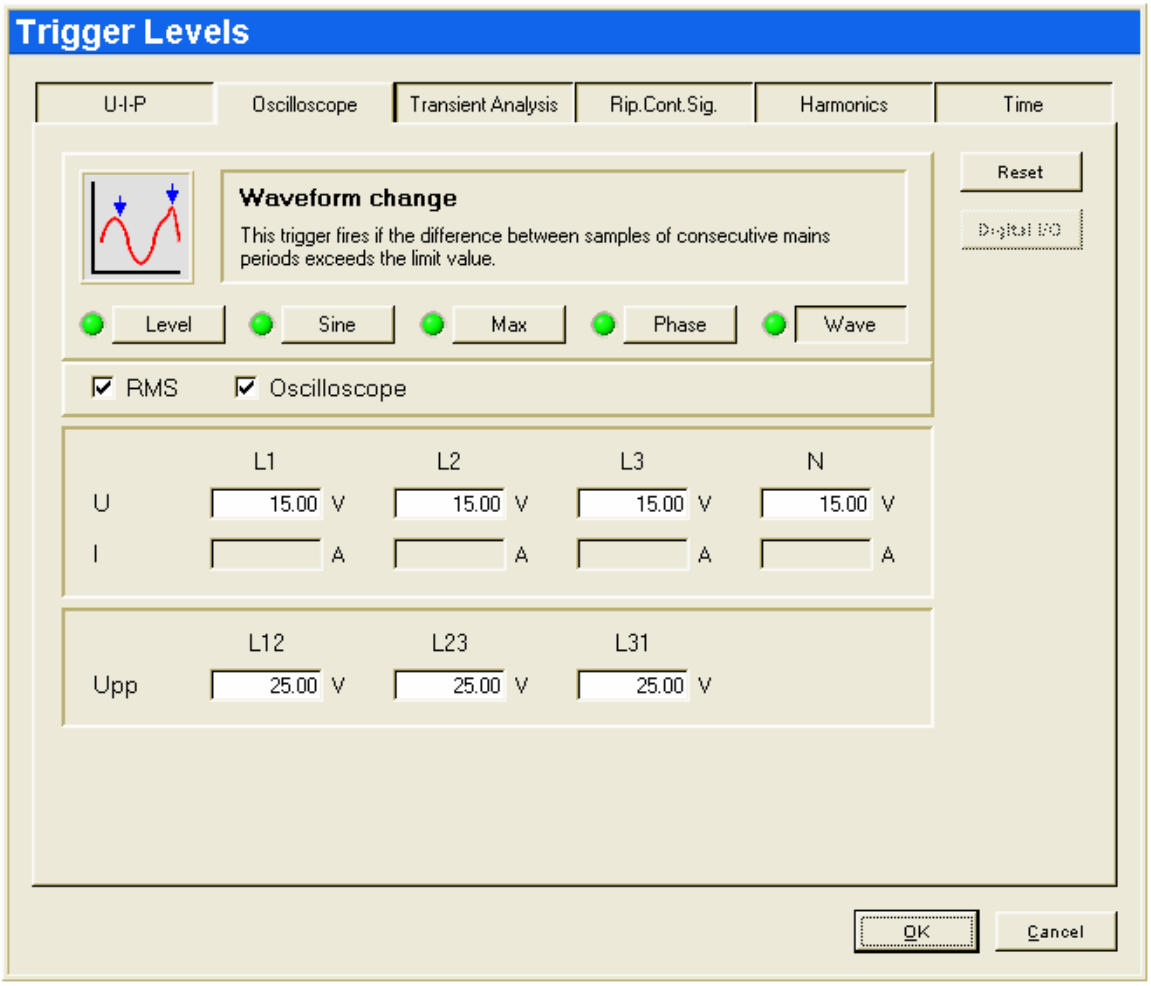


rms-oscilloscope.bmp

Typical Applications

Detection of over currents or short circuits in neighboring or host networks.

Oscilloscope Trigger – Wave



trigger-oszilloskop-kurve.bmp

This trigger can be applied to voltages (U) and currents (I) of the phases and of Neutral and phase-phase voltages (Upp).

This trigger monitors the differences in the waveforms of consecutive mains cycles. The samples of the last cycle are compared with the samples of the actual cycle.

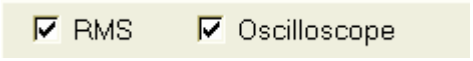
The trigger starts the recordings of *rms* values and/or *Oscilloscope* values on request if small, fast measurement value changes occur. The trigger does not react to slow, even

large value changes. Disturbances produce rapid voltage changes between consecutive measurement intervals and will be recorded this way.

If the limit is set to 15 V the trigger will respond if the difference between two sample values with a time offset of one cycle is more than 15 V.The recordings are done as defined in the dialog *Settings Recording Modes*.

Note

To record rms values and/or‘Oscilloscope (sample) values, check the respective boxes.

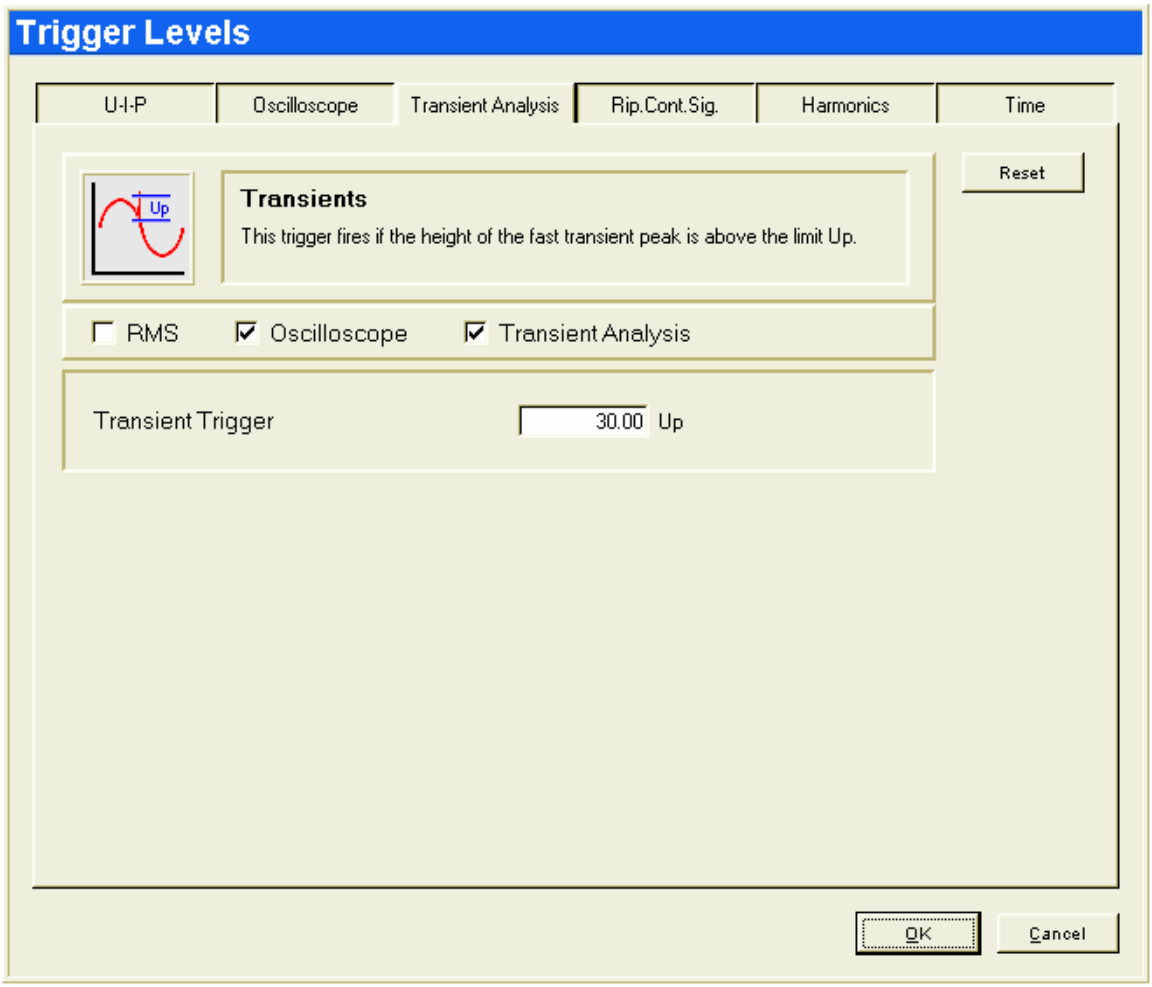


rms-oscilloscope.bmp

Typical Applications

This trigger type is perfectly suitable for all kinds of disturbance analysis and troubleshooting, because most of the power quality problems result in a sudden change of the waveform. From the recorded waveforms, we can find the cause of distortion in most cases: switching of capacitor banks, commutation distortions, oscillations in the network, or ground short in the medium voltage system show typical significant waveforms.

Trigger – Transient analysis



trigger-transienten.bmp

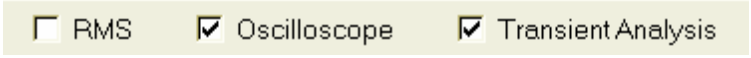
Transients are short, unexpected signals in the distribution network which occur only once and have high amplitude and high slew rate. They contain high frequency components. This is why the input signal has to pass a 1.500 Hz high-pass filter before it is fed into the trigger logic. If the voltage step is higher than the preset value Vp, a recording of transients, *rms,* and/or *Oscilloscope values* is triggered, depending on the actual settings.

The trigger is operational for the channels *CH 1 - CH 4* for voltages, provided that the transient option is mounted in the instrument.

The standard transient option allows for sampling frequencies of between 100 kHz and 500 kHz. With the extended option, this range is enlarged to 100 kHz – 10 MHz.

Note

To record rms values and/or Oscilloscope (sample) or Transient values, check the respective boxes.



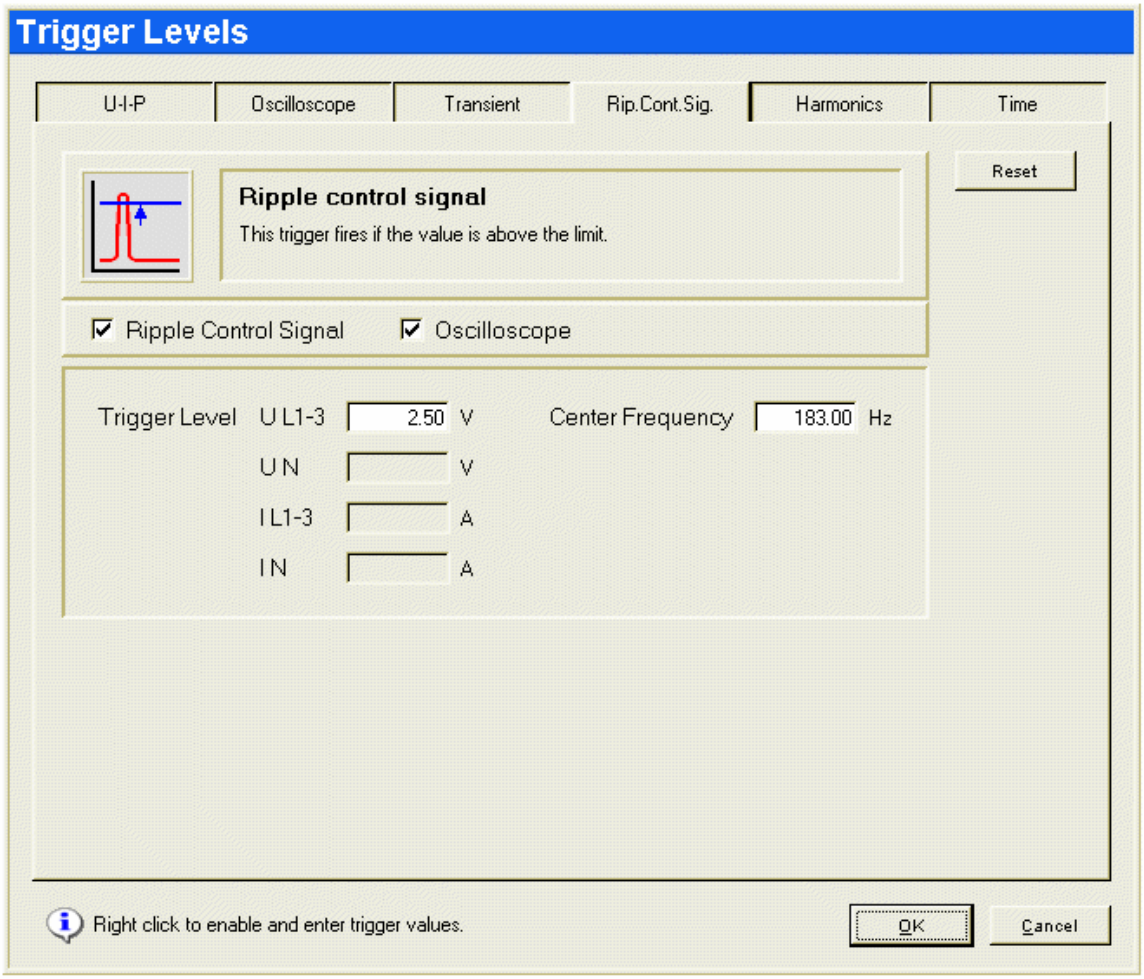
rms-oscilloscope-transienten.bmp

Right-click a value field 0.00 to activate or deactivate, and enter the threshold value.

Note

When using series transformers, the scale defined in the 'Hardware Settings' is taken into account.

Trigger – Ripple Control Signal Analysis



trigger-rundsteuer.bmp

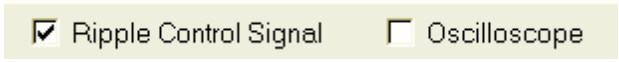
This trigger can be applied to phase voltages, to the Neutral voltage, to phase currents and to the Neutral current.

1. Right click into the appropriate field and enter the thresholds.
2. There is one limit for the phases *L1, L2, L3* for voltages and currents, and another one for the Neutral.
3. Right click again to deactivate a trigger.
4. Define the Center Frequency which is used by the local power utility.

The 50/60 Hz frequency components are attenuated to less than 1 %. If the ripple control signal exceeds the preset limit value, the system starts to record *Ripple control values* and/or *Oscilloscope* (sample) values.

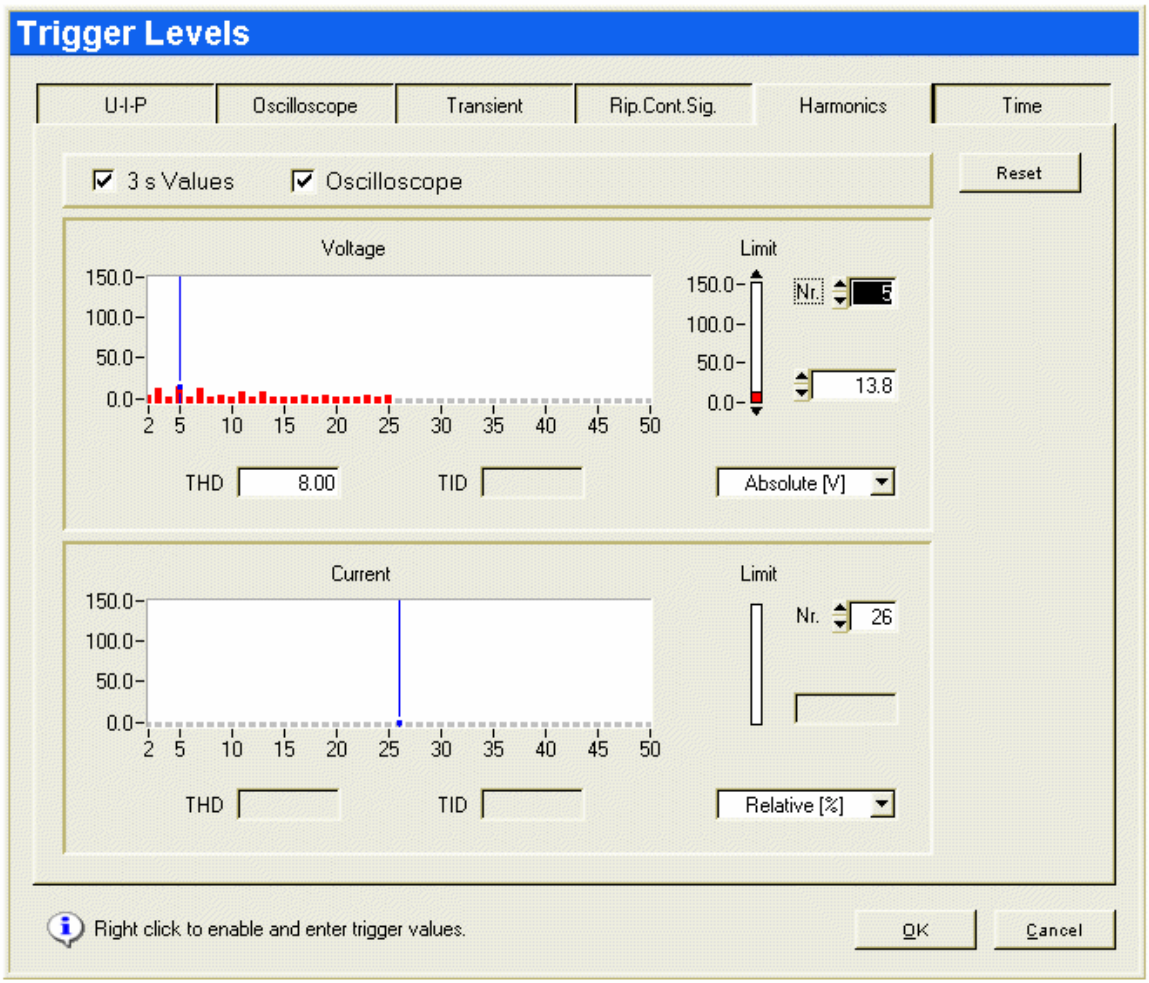
Note

To record Ripple Control Signals *and/or* Oscilloscope *(sample) values, check the respective boxes.*



ripple-oscilloscope.bmp

Trigger – Harmonics



trigger-harmonische.bmp

Harmonics are components of the signal integer multiples of the fundamental frequency.

This trigger can be applied to distinct harmonics of voltages and currents and also to the total harmonic contents THD and to the total interharmonics contents TID.

The values can be given absolutely in V or A, or relative to the fundamental.

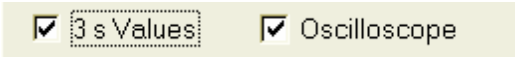
1. Right-click the desired position in the diagram to set the trigger level for each harmonic, the THD (total harmonic distortion) or for the TIS (total interharmonics distortion) for voltages and currents.
2. The individual harmonics can be defined by positioning the cursor in the spectral diagram or by means of an entry in the numerical field Nr. 30.
3. The trigger level can be a numerical value by keyboard entry or by means of the mouse. Harmonics which must not trigger the system must be switched off.
4. This is done by right-clicking the numerical field 0.00.
5. Triggers assigned to specific harmonics can be activated by means of a right mouse-click. These trigger settings are level-sensitive, i.e. the trigger responds if the measured value exceeds the preset rms limit value.

Note

TID is the total of all interharmonics frequencies. This function allows for the detection of intermediate-frequency interferences, irrespective of the frequency range in which these interferences occur. The TID trigger allows for the recording of instantaneous values. Based on the spectral analysis, you can then determine the frequency of the interference in offline mode. With this function, you have the option to determine effects of ripple control signals or power electronics.

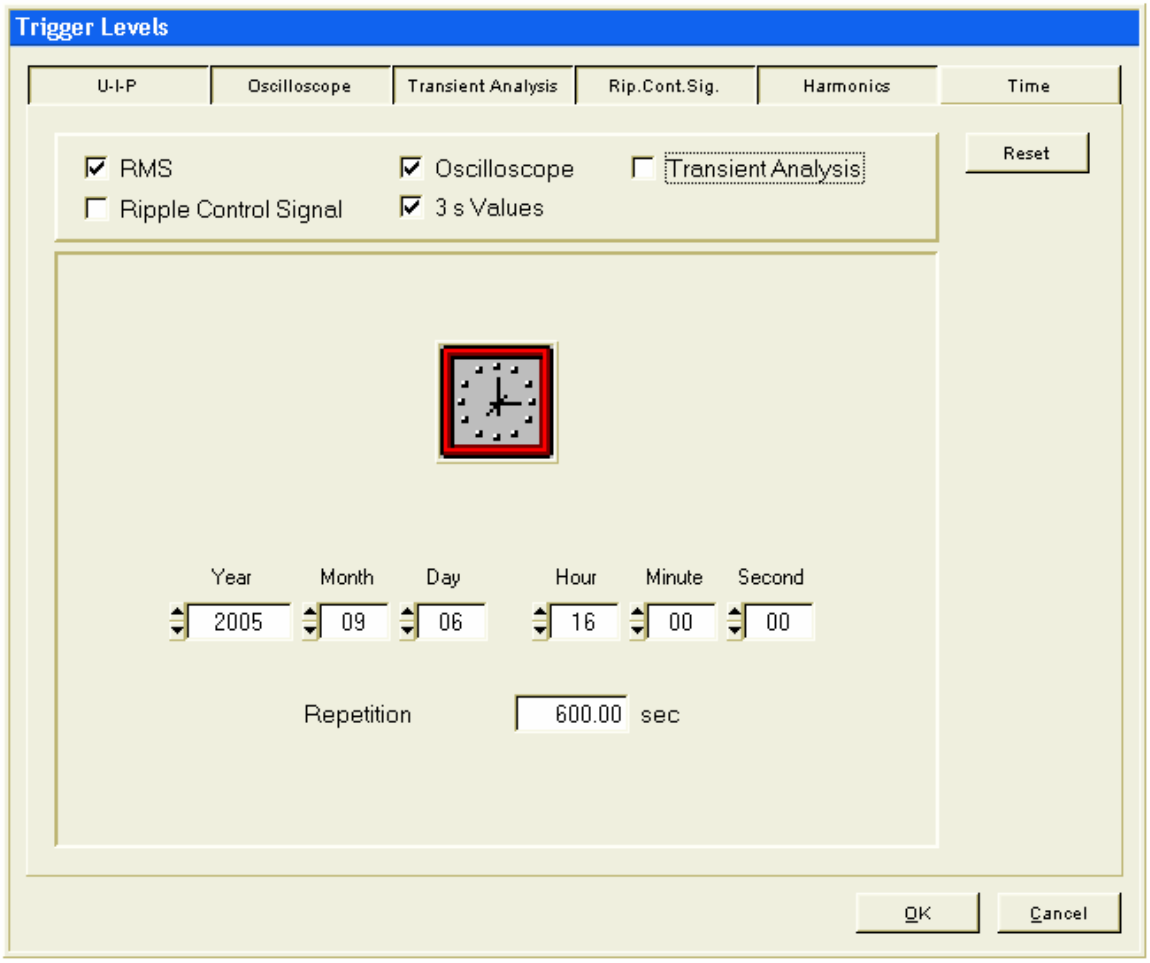
Note

For the recording of '3-sec' values and/or 'Oscilloscope' (sample) values, check the respective boxes.



3s oscilloscope.bmp

Trigger – Time



trigger-zeit.bmp

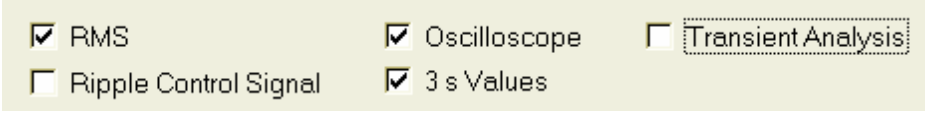
The time trigger allows for the recording of selected measurement values at preset time intervals, at a certain clock time.

The following options are available:

- Start time of the time-triggered recording (the default value is the next full hour to the actual PC-time)
- Repeat time in seconds
- To enter a value in the Repetition field, right-click in the field and enter the value in seconds

Note

For the recording of 'Transients', 'rms Values', 'Oscilloscope (sample) Values', 'Ripple Control Data' and/or '3-sec Files', check the respective boxes.



rms-oscilloscope-transienten-ripple-3s.bmp

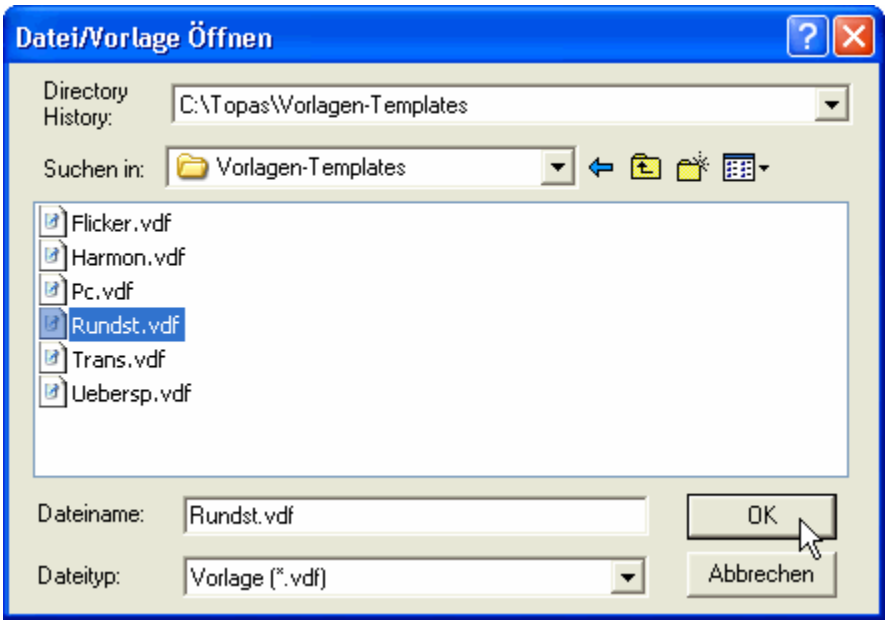
Note

The time trigger generates only one entry in the event list. The selected measurement data are stored at the required clock times in the actual data file on the Fluke 1760.

Templates

The software comes with a number of templates in the form of *.vdf* files, which have been preconfigured for certain applications. These files are stored in the *Vorlagen-Templates* folder on your PQ Analyze CD-ROM. If you wish to use these templates frequently, copy them into the PQ Analyze *Installation directory*.

The general templates (**.vdf*) can be customized to suit your specific requirements, and then saved as own templates.



vorlage öffnen.bmp

Flicker.vdf Template

This trigger configuration is used for the recording of Flicker. It responds if the absolute values are exceeded, and if voltage fluctuations between two intervals are greater than 5 V. It might be necessary to reduce the level to a smaller value, depending on the measuring conditions. In this template, only the rms value trigger is activated.

Harmon.vdf Template

This template contains the limit values according to EN 50160. A recording is started, if a limit value for voltage is exceeded. The system thereby monitors the 25 harmonics of the voltage and records 3-sec values. These trigger settings thus register any exceeding of the limit values of the voltage harmonics. The other triggers are not activated.

PC.vdf Template

This template has been devised for the detection of problems with the PC, voltage dips, and/or current fluctuations. It responds to under-voltages in the phases, voltage fluctuations in the neutral conductor, and wave shape faults in the phase voltages and at the neutral conductor as well as voltage transients. The other triggers are not activated.

Rundst.vdf Template

This template shows sample settings for a ripple control system. The centre frequency and bandwidth must always be adjusted accordingly. The ripple control signal frequency (centre frequency), the bandwidth, and the trigger level must be adjusted to the actual requirements.

Trans.vdf Template

Transients over 50 V trigger the recording of rapid sample values, oscilloscope and rms values.

These settings provide the recording of non-repeated, rapid events in the network, and is triggered by rapid voltage changes (over voltage and under voltage). The transient and rms data are recorded. The system detects any switching events. Peaks over 358 V trigger the recording of oscilloscope and rms values.

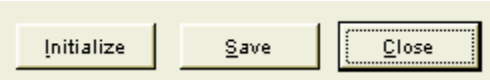
Übersp.vdf Template

RMS values over 253 V, sample values over 358 V, or transients over 50 V trigger the recording of oscilloscope and rms values.

These settings provide the recording of non-repeated, rapid events in the network, and is triggered by rapid voltage changes (over voltage). The transient and rms values are recorded. The system detects any switching events. Peaks over 358 V trigger the recording of oscilloscope and rms values.

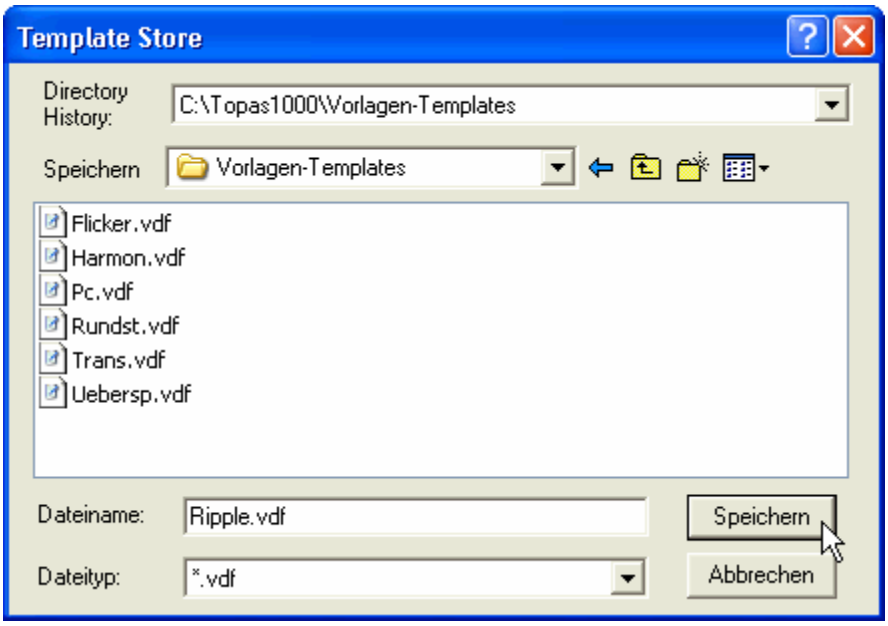
Exit settings menu

1. To save the definition data in a file on your PC, click on *Save*. Define a new file name if required.



initialisieren.bmp

2. Click Close to quit the settings dialog without saving the changes.
3. Click on Initialize to transfer the new settings to the instrument. This is possible only if the PQ Analyze software is in connection with an instrument.
4. If the definition file has not been saved, the following dialog is displayed.



vorlage speichern.bmp

Use Settings of an Existing Measurement for Further Measurements

Save the configuration file under a new name with the file extension *.vdf*. The new file can be used now as a configuration file for new measurements with the settings of the actual measurement. The old measurement data are no more associated to this configuration file.

Modify an Existing Measurement Data File

Save the configuration file under the same name with the file extension *.def*. This way we can modify something on the existing measurement data file. We recommend you modify texts only and not relevant settings like scaling, sensor type, and measurement system. This could corrupt the measurement data. The recorded measurement data are still associated to this configuration file and can be evaluated as usual.

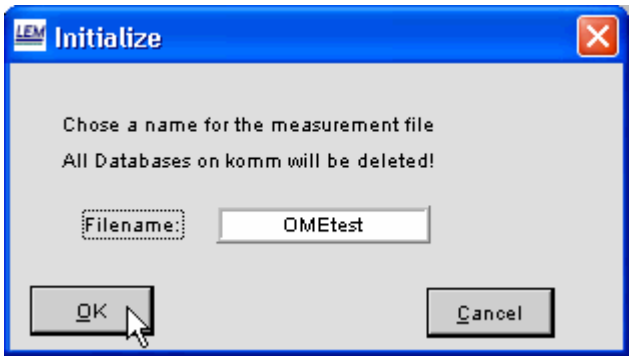
If you press *Save* to overwrite an existing file, a warning will appear.

1. Click *Initialize* to clear all memories of the instrument. In this case, the definition file is transferred to the instrument and a new measurement with the new settings can be started.

Note

The file name may not include special characters. If the file name is less than 8 characters long, this name is suggested as the name of the measurement.

Click ”OK” to save the file under this name.



initialisieren1.bmp

2. Click Cancel to close all windows without saving the changes you made. The system returns to the Settings window.
3. Click OK to send the data to the instrument.

File – Open

1. Select *File - Open* or click the  button to open an existing template/definition file (**.vdf*), or a measurement file for analysis (**.def*).
2. To gain a better overview of the available files, select the desired file type. You have the option to adjust the parameters of an existing file in the Settings window.

There are a number of templates available covering various applications. These files can be adjusted and then saved as new templates for further use. For details, see chapter *Menu: Measurement – Settings*.

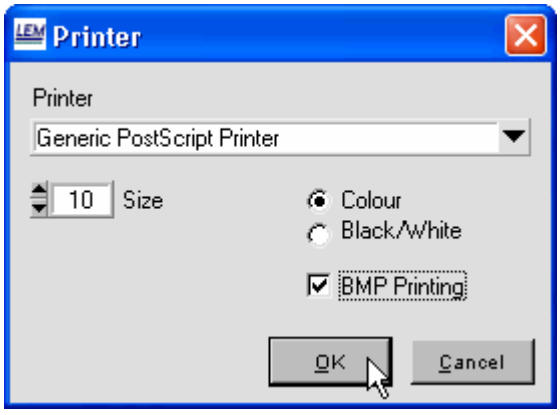
File – Save as

An open definition file can be saved under a different name. This is for example useful, if you want to save the set of measurement files under another name.

1. Open the file.
2. Enter the name of the new file in the *File Name* field.

The PQ Analyze software applies the new file name to all files of the set of measurement files.

File – Print



printer.bmp

Select *File – Print* or click the button to print out the current measuring data (screen with all open windows). You can choose between black&white or color printout, and select the number of copies you require.

Note

If you want to print out a diagram there is an option for printing Bitmaps (BMP Printing) – this overcomes some scaling and resolution problems on specific network printers.

File – Delete

Select *File – Delete* to delete obsolete files. For this purpose, enter the name of the file to be deleted and confirm with Select. The deletion of files is only possible, if no measurement file is open.

Note

Deleted files cannot be restored.

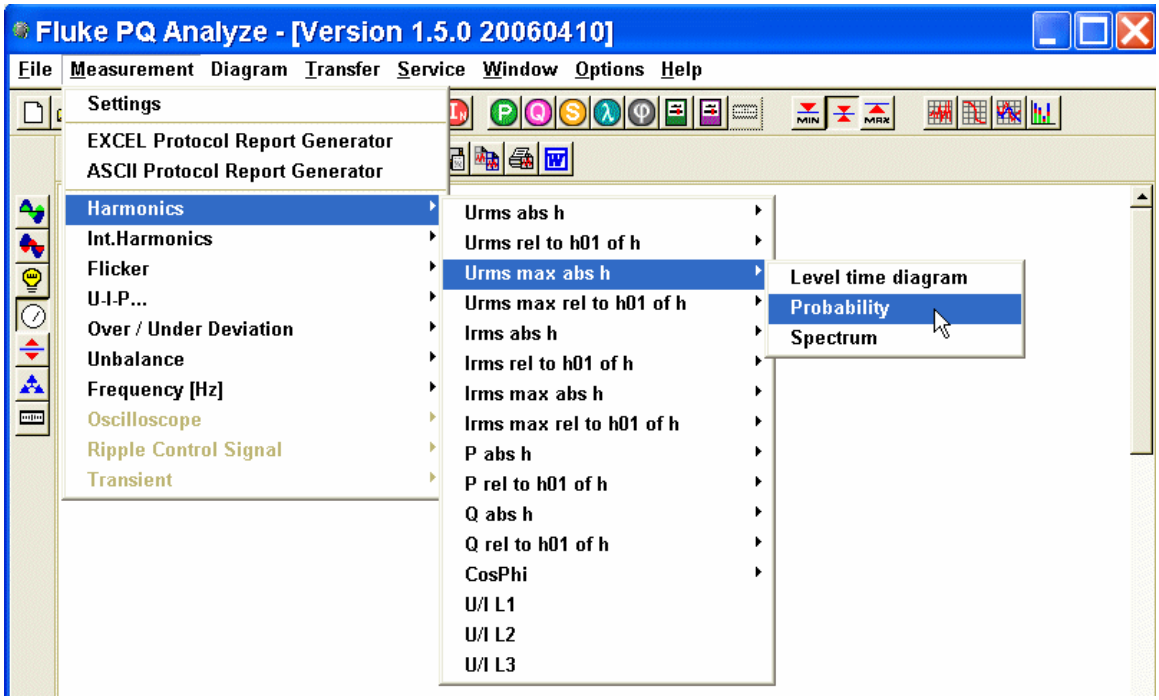
Fluke 1760 Start-Menu

Opens the start-up screen even if it is suppressed by the appropriate option.

File – Exit

Select this menu option to exit the PQ Analyze software.

Menu: Measurement



menü-messung.bmp

Measurement – Settings

The settings of the currently open file can be checked.

EXCEL Protocol Report Generator

An automatic measurement report is created based on prepared templates. This is only possible, if a valid protocol.ini file has been generated. For details, see chapter *Export Configuration*.

ASCII Protocol Report Generator

In the ASCII report generator, enter a file name for the output of a text report of the open measurements. This is only possible, if a valid protocol.ini file has been generated. For details, see chapter *Export Configuration*.

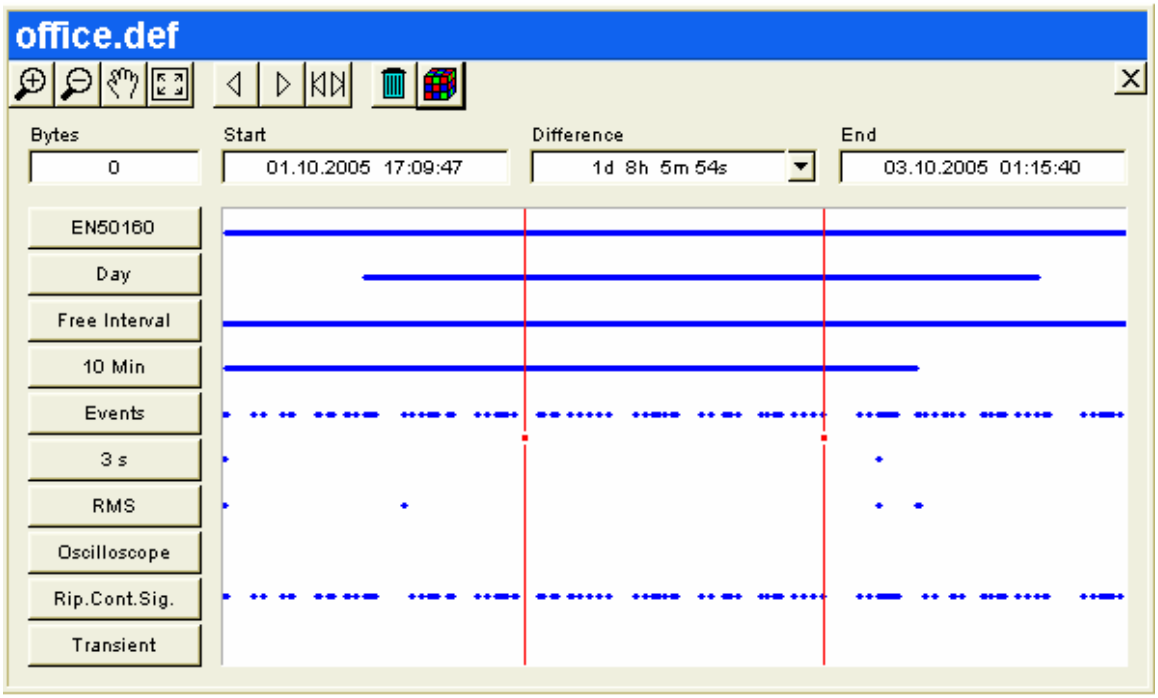
The Evaluation Window

General

To evaluate the recorded data, open the file (**.def*) with *File – Open,* or via the Startup screen with *Recorded Data*.

All associated measured data is stored in the measurement files that are filed in the same directory as the definition file.

As soon as a valid definition file is entered, the program loads all associated data files. In the evaluation dialog, the user is offered a range of functions for the analysis of the measured data.



auswertefenster.bmp

Dialog Field: Measured Data

In the *Selection* window, the various measuring recordings are shown. These systems operate independently and simultaneously. The blue bars indicate the measuring times at which data is available on the PC. It is not necessary to transfer all measuring data saved in the instrument to the evaluation memory. The data is structured in such a way that a small volume of data already provides an accurate overview of the situation in the network. The user has the option to import increasingly detailed data in order to assess one or more particular events.

The desired time range can be selected by means of the two red *cursor lines*, or entered directly in the *cursor windows*.

The *cursor windows* show the start, end and duration of the selected period of time.

Open the *Data Transfer Window*. In this window, you can select the event files and transfer them to the target directory.

Return to the *Evaluation Window*, where the selected data can be analyzed.

Zoom in
Magnify the time range between the red cursor lines.

Zoom out
Undo the last zoom command.

"PAN" function for moving the blue lines representing available data if zoom is active.

View complete measurement with activated zoom function.

Moving forward and backward in blocks.
Example: If 1 hour has been set in the Difference window, cursors can be moved forward and backward by 1 hour.

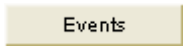
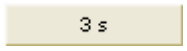
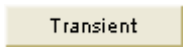
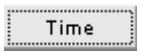
Deletes the recorded data referring to the range between the cursor lines.

Note

The Fluke 1760 measurement data are organized in blocks. The time cursors will very seldom be positioned at block borders. Therefore blocks are deleted only which are completely in the time period between the cursors to avoid deleting of too much data. A little bit less data will be deleted than marked.

Re-organize data structure (should be completed after the deletion of data to free unused memory).

Recording modes

Settings	Data	Recording Options
	Permanent, automatic recording of all data for PQ analysis	Automatic – recording is independent of trigger settings
	Permanent recording of values that are outside the range defined by the limit values, and recording of all trigger events	*Manual trigger* checkbox *Automatic trigger* (Topas 1000)
	Harmonics/THD/TID of voltages and currents	*Manual trigger* checkbox *Automatic trigger* (Topas 1000)
	Voltages and currents with different time raster settings	*Manual trigger* checkbox Ripple control only in manual mode *Automatic trigger* (Topas 1000)
	Transients	*Manual* checkbox *Automatic trigger* (Topas 1000)
	Time trigger	*Manual* checkbox *Automatic* (Topas 1000)

After the data source and the time period have been selected, the pre-selection toolbar appears at the left edge of the screen for data sources for which more than one evaluation function is available, e.g. day files, Free intervals, 10-min files, 3-sec files. Depending on the recording method, the list of available functions may vary.

The evaluation toolbar below the menu bar also changes depending on the selected recording type and measuring function. The icons of functions that are not available are grayed out.

The evaluation functions can be selected directly by clicking the respective button, or by selecting the respective option in the *Measurement* menu.

The following functions are available:

Main Toolbar

Select *File – New* to open a new definition file.

Select *File – Open* to open an existing measurement file or a definition template.

Select *Print screen* to print the current screen with all open evaluation windows on the system printe.

Evaluation Window

Start selection window in foreground/evaluation.After data transfer from the instrument to the PC, click this button to open a selection window for the data evaluation.

Data *transfer* - back to data transfer window (from instrument to PC).

ASCII *report generator* – automatic generation of selected measurements in a text file (*Name.txt*).

EXCEL *report generator* – automatic creation of measurement reports based on the *Export Configuration*.

Selection of the Variable

Select here the variables for the evaluation. Certain buttons might not be available, depending on the method of measurement.

Method of Averaging

Minimum – average - maximum – Definition of averaging method.

Method of Evaluation

Selection of Presentation:


Time plot, trend diagram.


Probability distribution.


Extreme values per day.


Bar diagram (extreme values per day).

Several variables are available, depending on the method of measurement. For Free intervals and 10-min values, you can choose from the following options:


Harmonics.


Interharmonics (Fluke 1760 only).


Flicker.


rms values.


Unbalance.


Frequency.


Spectrum – indicates the amplitude spectrum of voltages, current and powers.

Virtual Measuring Instruments

Different instrument types have been developed for different measuring tasks.

- RMS measuring instruments
- Power and energy measuring instruments
- Harmonic measuring instruments
- Oscilloscopes
- Transient recorders
- Data logger
- Event recording instruments

The idea behind the Fluke 1760 instrument was to realize a virtual unit based on software, combining various different measuring devices in a compact housing.

The instrument can thus complete a wide range of measuring tasks at the same time. Communication between virtual measuring instruments is generally better than that between physically separated units. The results obtained with one instrument can for example be used to control the recording of data by a different instrument. All measurements are sampled and recorded simultaneously and in a synchronized manner.

EN 50160

EN50160 EN 50160 files are generated at intervals of 10 minutes. All parameters required according to the European power quality standard are measured and monitored against pre-defined limit values. Per week, the data of 1008 10-minute intervals is saved.

Day

Day Measurements are recorded at intervals of 1 day. The interval starts at 00:00:00 hours. Incomplete intervals are not deleted. This means that the first day value is often only available after two days.

Variables:

- Harmonics
- Flickers
- rms values
- Unbalance
- Frequency

Free Interval

Free Interval Files whose measurements are recorded during user-defined intervals are referred to as Free interval files. (averaging time 1minute, 1440 minutes = 1 day).

Variables:

- Harmonics
- Flickers
- rms values
- Unbalance
- Frequency

10 Min

10 Min Measurements are recorded at intervals of 10 minutes. At the end of each 10-minute interval the data is saved.

Variables:

- Harmonics
- Flickers
- rms values
- Unbalance
- Frequency

3 Sec

3 s 3-sec files contain the measurements taken at intervals of 3 seconds. This data does not include Flicker or frequencies. The file is only generated, if a trigger event occurred. If you want to generate rms value files, activate the respective option in the

definition file by checking the 3-sec r rms values box in the harmonics trigger dialog window.

RMS

RMS The system caters for user-defined averaging times. This file type is primarily used for the recording of power and rms. values. The data is only saved, if a trigger event occurred. If you wish to generate rms value files, activate the respective option in the definition file by checking the rms values box in the rms trigger window.

Oscilloscope

Oscilloscope If one of the activated trigger conditions is met, sample values are saved. If you wish to generate oscilloscope files, activate the respective option in the definition file by checking the Oscilloscope box in the oscilloscope trigger window.

Variables: Instantaneous values, samples

Events

Events Event files contain all data regarding the time, duration and type of all events that occurred as a result of a trigger event or when EN 50160 limits were exceeded.

The system records the following event types:

- Overvoltage
- Voltage dips, interruptions
- Ripple control signals
- Transients, trigger events caused by rms and
- Sample values

Ripple Control Signal

Ripple contr. sig The ripple control trigger initiates the recording of ripple control signals, provided that the Ripple control signals box in the ripple control trigger window is checked.

Variables:

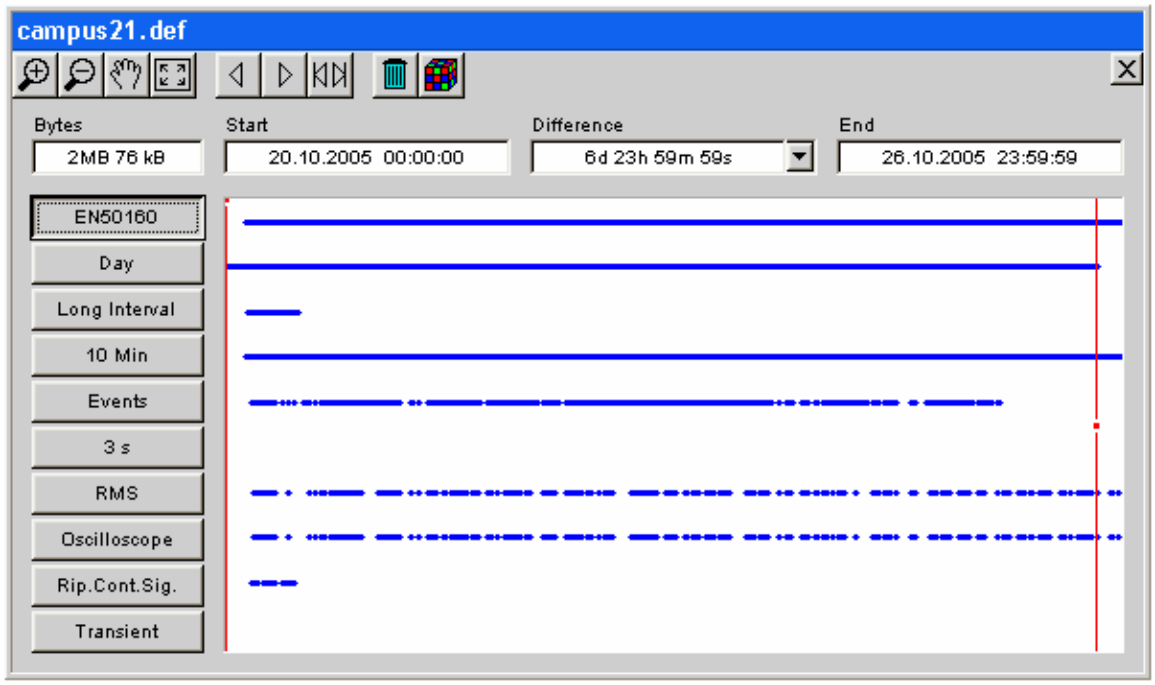
- Voltage
- Current
- Active power
- Power factor

Transient

Transients The transient trigger initiates the recording of measurements with a sampling frequency of between 100 kHz and 10 MHz, provided that the Transients box in the transient trigger window is checked.

Virtual instruments – Evaluation Functions

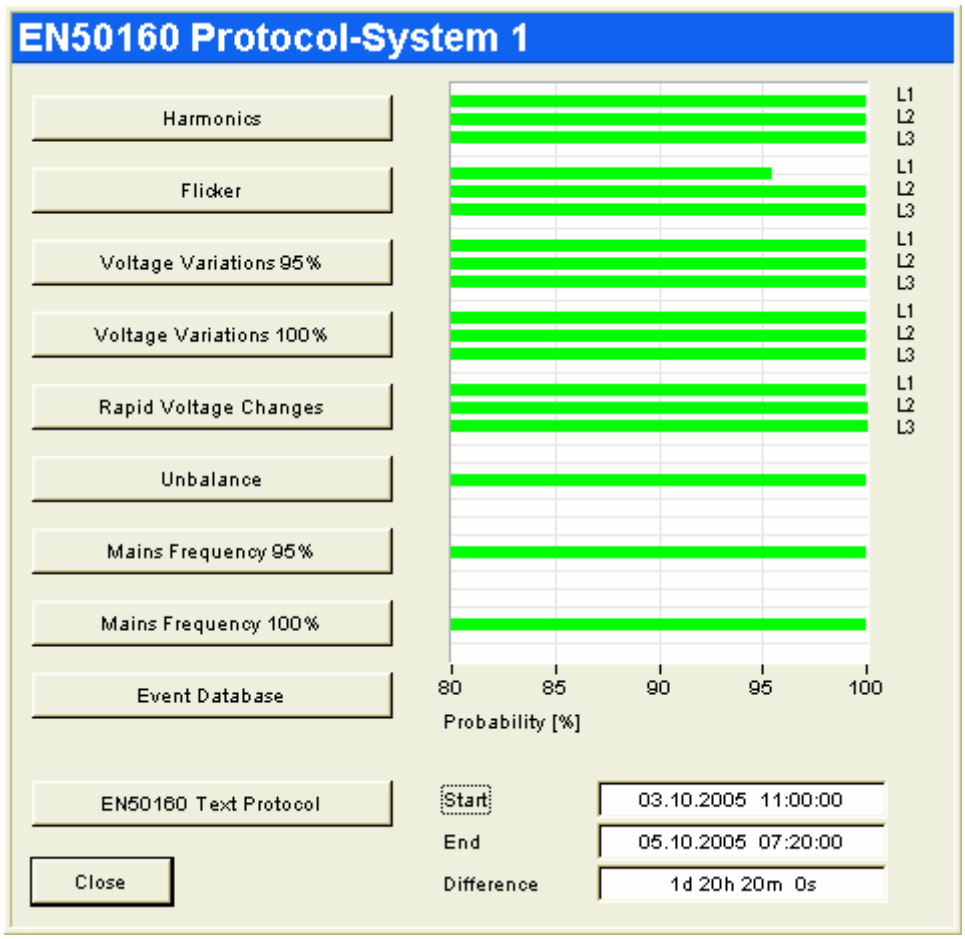
EN50160 Evaluation



en50160pro.bmp

There are two diagrams available for EN50160 evaluations.

Click on the EN50160 button and select the interval to be evaluated, and then click the  button.



en50160.bmp

Note

If the measurement has been done in the Voltage/Voltage or in the VoltagePP/VoltagePP configuration there are two icons for system 1 and system 2. Thus the power quality can be assessed in the low and medium voltage system in parallel with one instrument.

Note

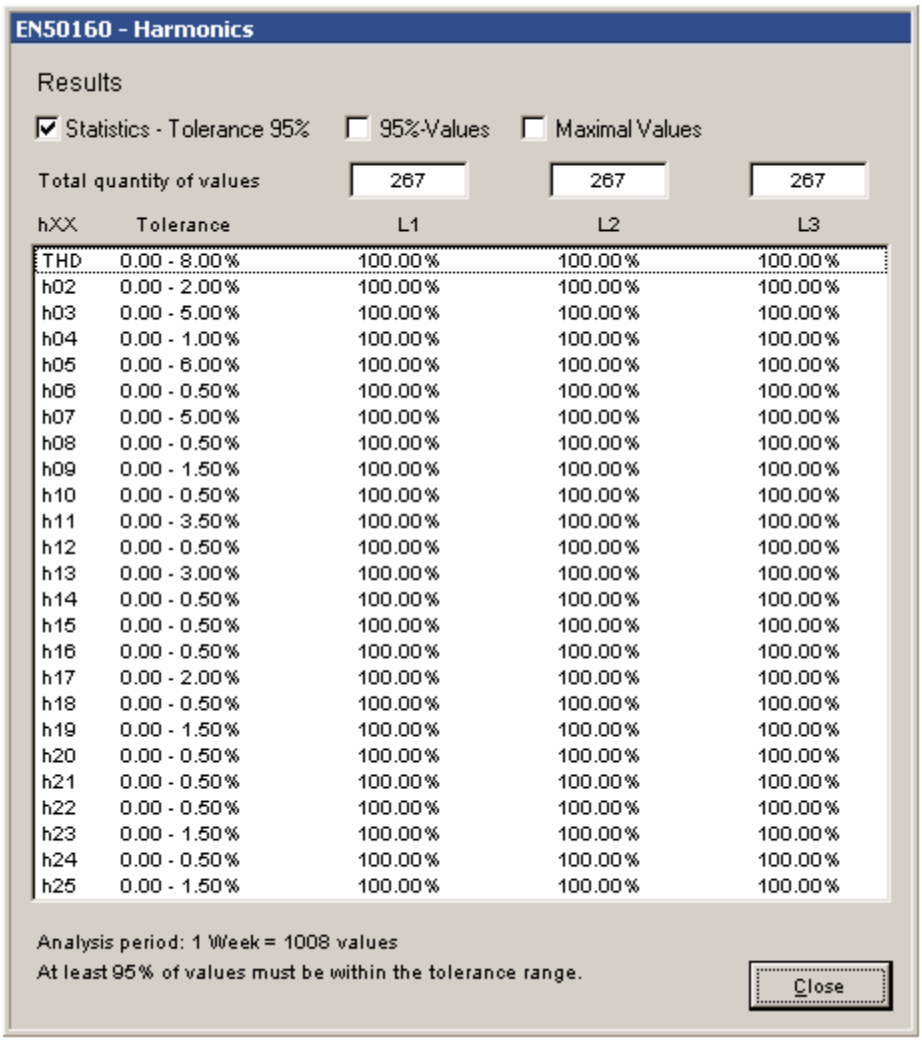
If there are too less measurement values available an error message <80 % is put in place of the green bar in the appropriate line.

This evaluation offers a quick graphical overview of all EN 50160 parameters. The green bars represent the values defined in the definition file. The diagram shows the share of measurements that was inside the permitted range, expressed in percentages. For most values, the percentage range must be at least 95 %. Red bars represent measurements that were outside the permitted range.

To view details, click the respective buttons in the diagram window.

Harmonics

Shows the number of measurement values, THD, and the rms values of each harmonic per phase.



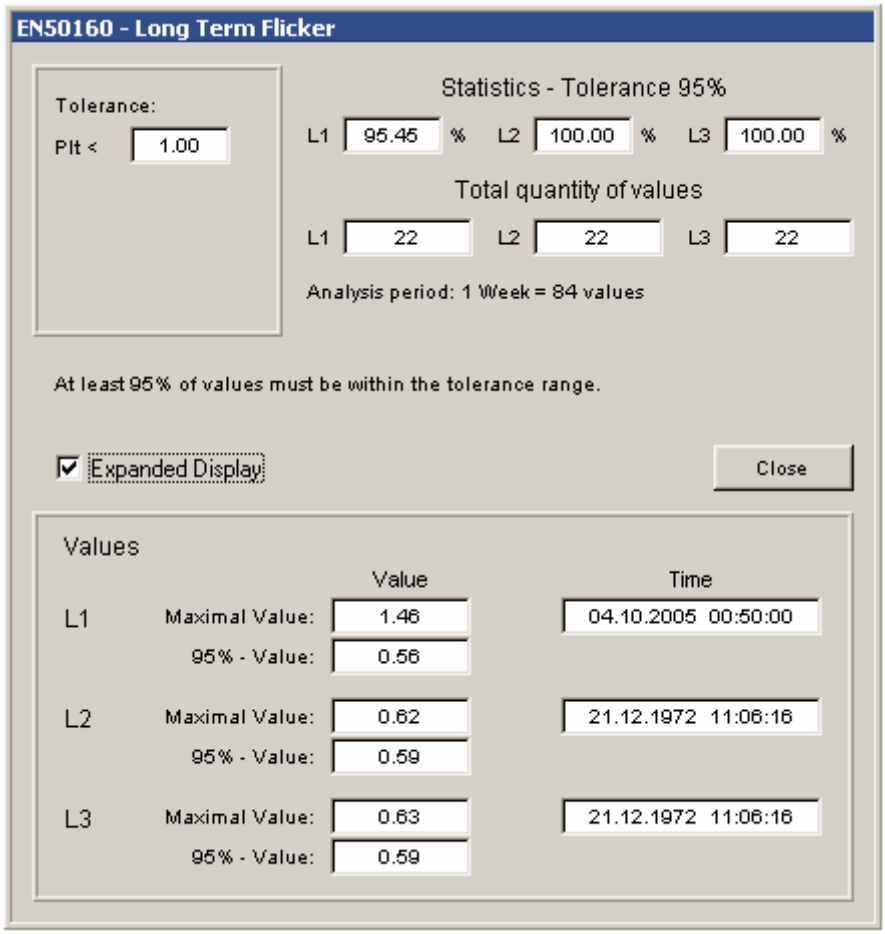
en50160-harmonics.bmp

The test results can be presented as:

- *Statistics – Tolerance 95 %*: Percentage of measurement values which are within the 95 %-tolerance range
- *95 %-values*: 95 % of all measurement values of the campaign are below this value. The tolerance range is also given
- *Maximal values*: Gives the maximal value in the measurement period with date/time

Longterm Flicker

Shows for each phase the tolerance range, number of measurement values, and percentage of measurements within the permitted range for 95 % of the time period.

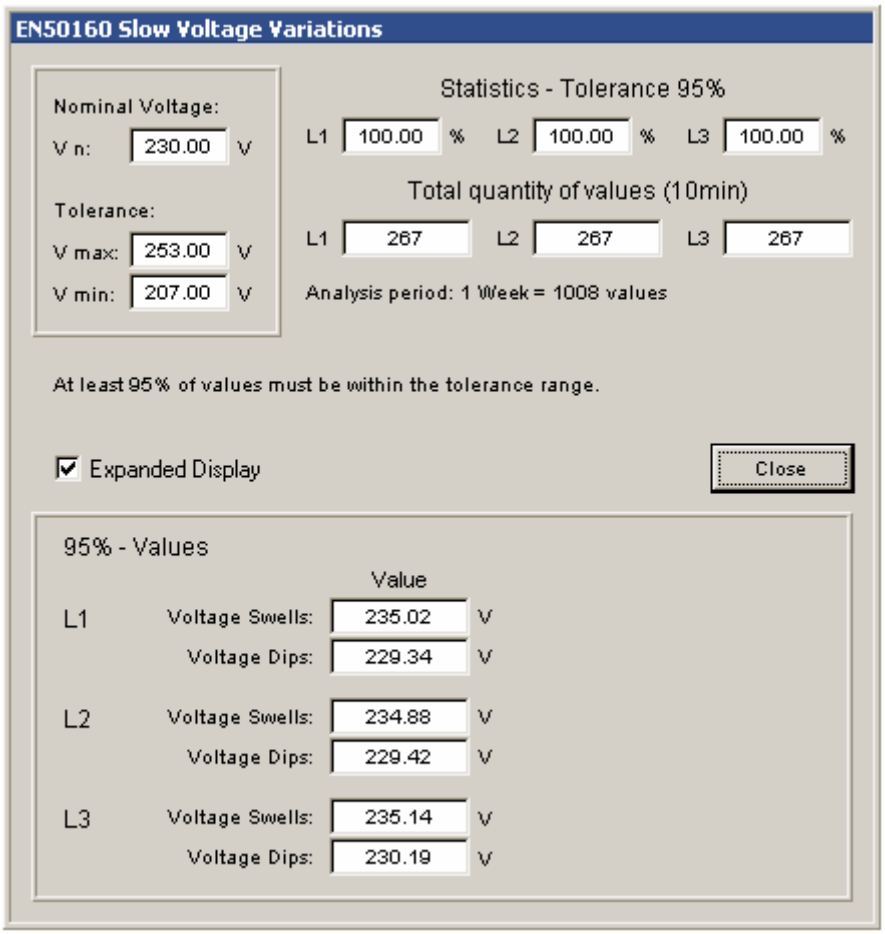


en50160-flicker.bmp

In the Expanded Display the 95 % values and the maximal values are presented with date/time per phase.

Voltage Variations 95 %

Shows, for each phase, the tolerance range, number of measurement values, and the percentage of measurement values within the permitted range for 95 % of the time period.



en50160-slow voltage.bmp

In the Expanded Display the 95 % values are presented for over voltages and voltage dips per phase.

Note

The 95 %-values are calculated as follows: All voltage measurement values are sorted according to value. Starting at smallest and at highest value 2.5 % of the values are deleted. Thus 95 % of the values remain in memory. This set of values is fit into the tolerance range that it is centered as close as possible to the nominal voltage and to the limit values. The results are 95 %-values for voltage dips and swells weighted according to the tolerance range even if the range is unsymmetrical to Un (e.g. –6 % /+4 % instead of ±10 %).

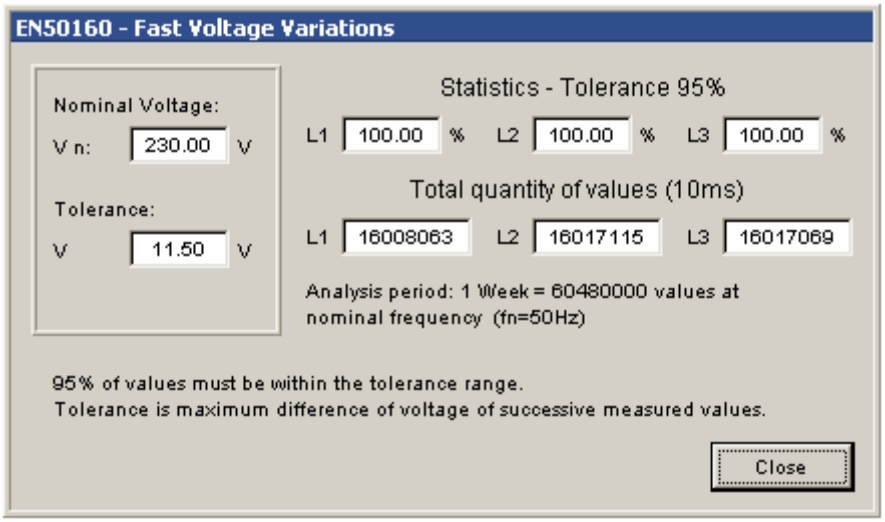
Voltage Variations 100 %

Shows, for each phase, the tolerance range, number of measurement values, and the percentage of measurement values within the permitted range for 100 % of the time period.

In the Expanded Display, the maximal values are presented for over voltages and voltage dips with date/time per phase.

Rapid Voltage Changes

Shows, for each phase, the tolerance range, number of measurement values, and percentage of measurement values within the permitted range for 95 % of the period.



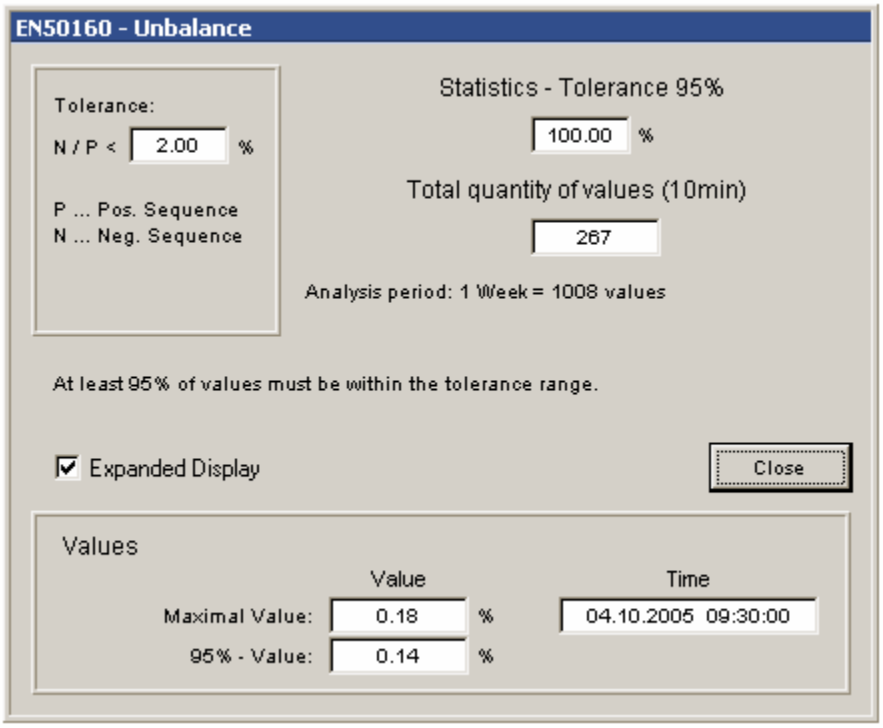
en50160-fast voltage.bmp

Note

The instrument checks the difference of consecutive 10 ms rms values. If the difference is higher than the tolerance value an event is recorded.The precise number of 60.480.000 measurement values per week is achieved only if the power frequency was exactly 50 Hz during the complete measurement period. Frequency deviations and supply interruptions will have an impact on the number of 10 ms rms values.

Voltage Unbalance

Shows the unbalance, tolerance range, number of measurement values, and percentage of measurement values within the permitted range for 95 % of the time period.



en50160-unbalance.bmp

In the Expanded Display the 95 % value and the maximal value is presented with date/time.

The unbalance is calculated according the formulas in the norm IEC 61000-4-30.

Power Frequency 99.5 %

Shows, the tolerance range, number of measurement values, and the percentage of measurement values within the permitted range for 99.5 % of the time period.

In the Expanded Display the 99.5 % values for maximum and minimum are presented with date/time.

Note

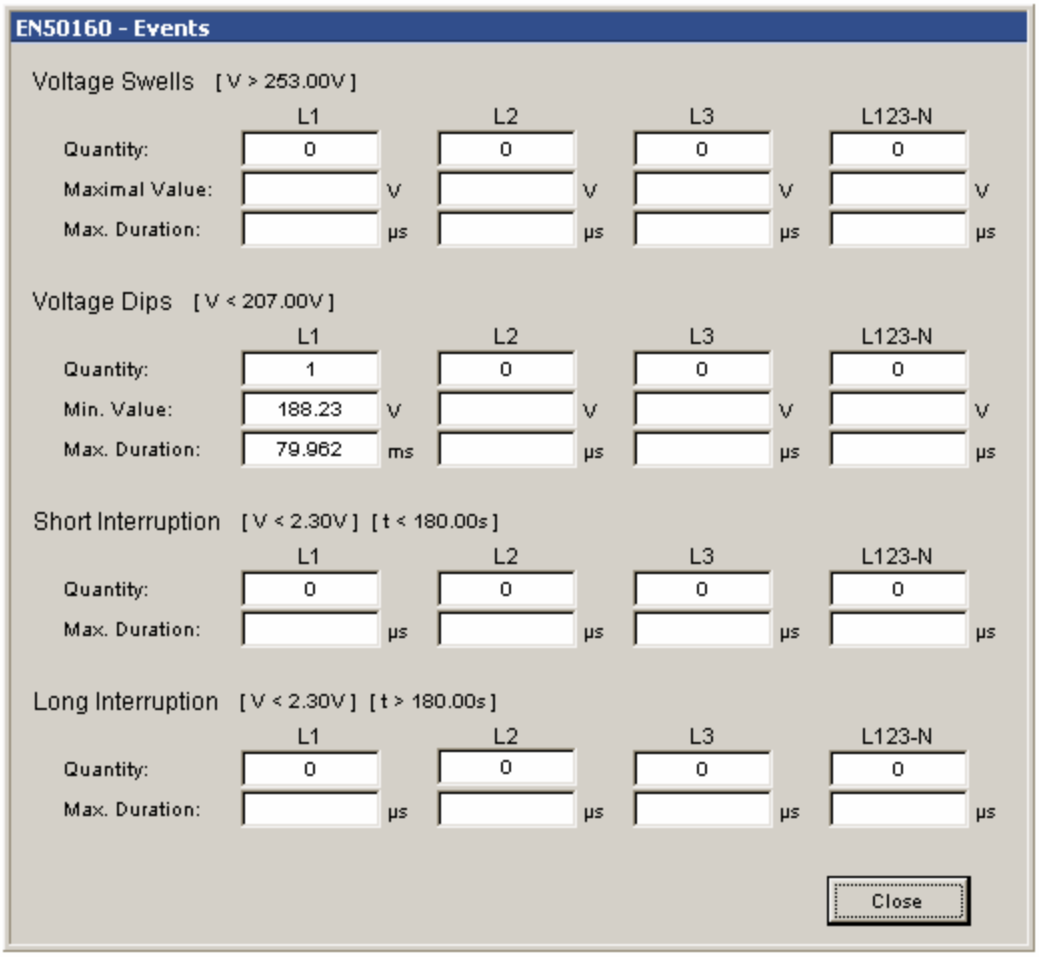
The precise number of 60.480 measurement values per week is achieved only if the power frequency was exactly 50 Hz during the complete measurement period. Frequency deviations and supply interruptions will have an impact on the number of 10 s values.Please, not that in unsynchronized "island networks" another classification of 95 % of the time period is required. This can be selected in the Settings Nominal /Limit values dialog. This value can also be changed after completion of the measurement because the statistical evaluation is done offline in the PQ Analyze software.

Power Frequency 100 %

Shows, the tolerance range, number of measurement values, and the percentage of measurement values which were within the permitted range for 100 % of the time period (always). In the Expanded Display the maximum and minimum value is presented with date and time.

Events

Shows the limits for over-voltages, voltage dips, short and long interruptions, including total number of events, maximum value, and duration.



en50160-events.bmp

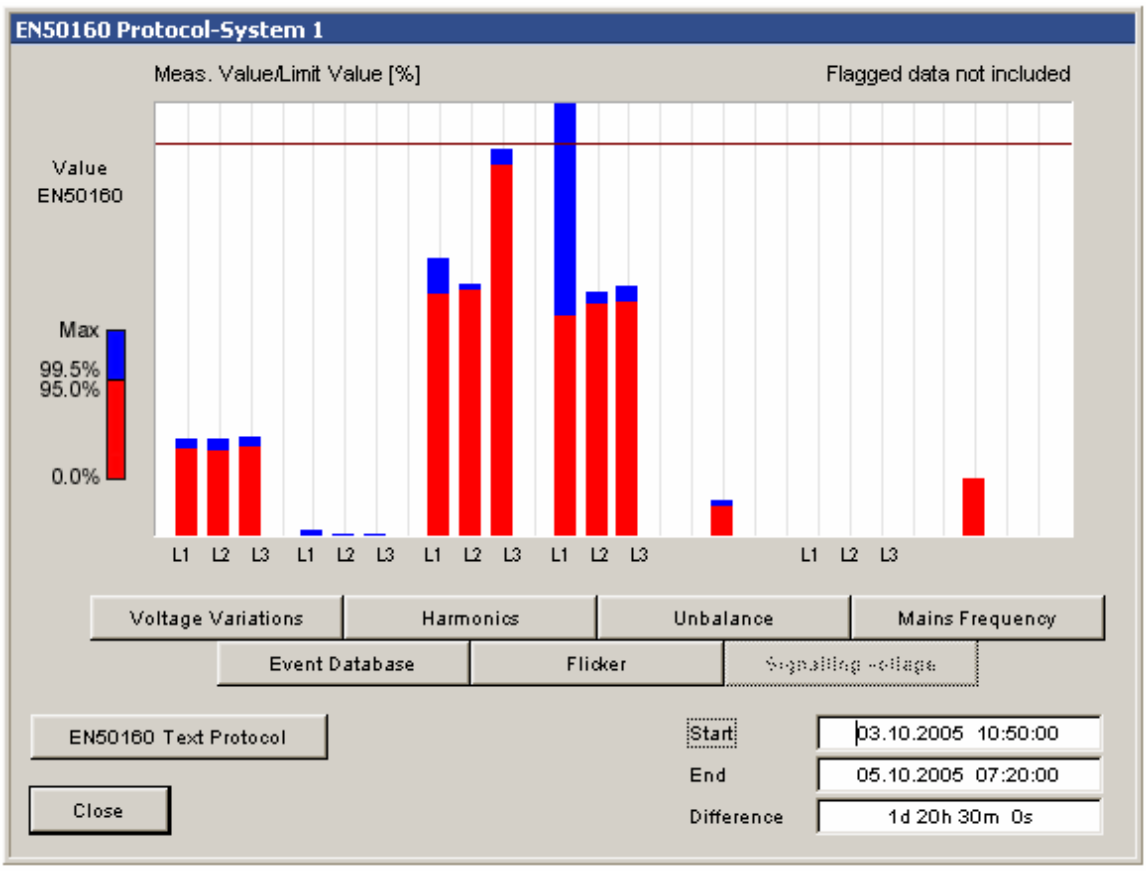
EN50160 Text Report

Shows all results of the EN50160 evaluation, including additional information such as a description and indication of the measuring period, in text format. The text report can be printed, saved, copied into another application via the Windows® clipboard, or exported to MS Word®.

From MS Word® it can be stored in HTML-format for web-oriented applications.

EN50160 Evaluation PQ Log Style

To open the diagram window select the evaluation time period, and then click on the EN50160 button.



en50160800.bmp

This diagram corresponds to the standard diagram for PQ Log users.

The results during the 95 % measuring time are represented by red bars, while the results of the 100 % measuring time are shown as blue stacked bars. The 95 % value corresponds to the absolute standardized tolerance deviation that may not be exceeded for 95 % of the time. The 100 % value corresponds to the absolute standardized tolerance deviation that may not be exceeded for 100 % of the time. The distance to the standardized limit lines indicate the reserve value.

To view details, click the respective buttons in the diagram window. The details windows are identical to the windows described in the last chapter.

Note

There is no evaluation for rapid voltage changes.

Evaluation of Day, Free Interval - 10-Min, 3-Sec Data

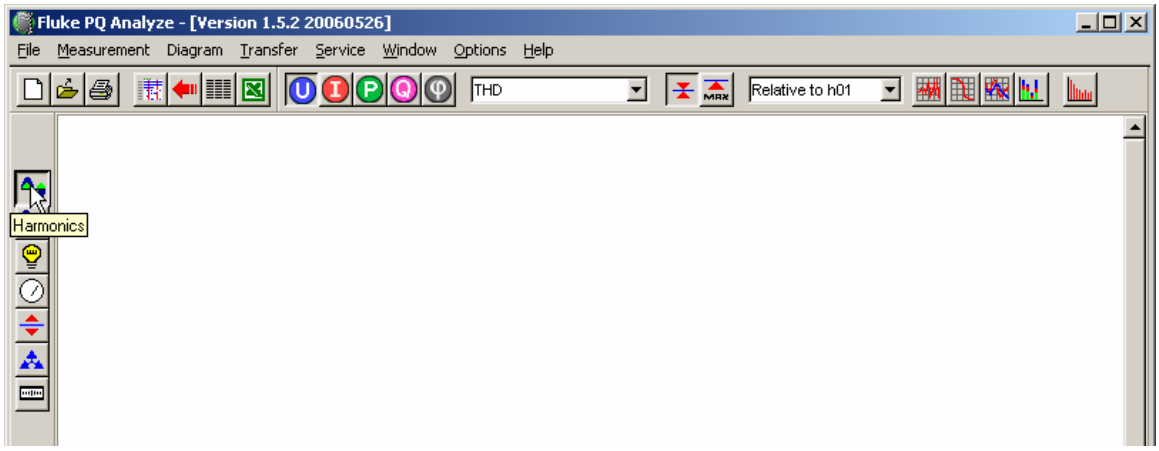
Click one of the above virtual instruments to call up the following evaluations:

Virtual Instrument Evaluation	Day	Free interval	10 Min	3 s
Harmonics	✓	✓	✓	✓
Interharmonics		✓	✓	✓
Flicker	✓		✓	
rms values	✓	✓	✓	
Underdeviation, overdeviation		✓	✓	
Unbalance	✓	✓	✓	
Frequency	✓	✓	✓	

Note

Icons are visible only if appropriate measurement data are available.

Harmonics Interharmonics

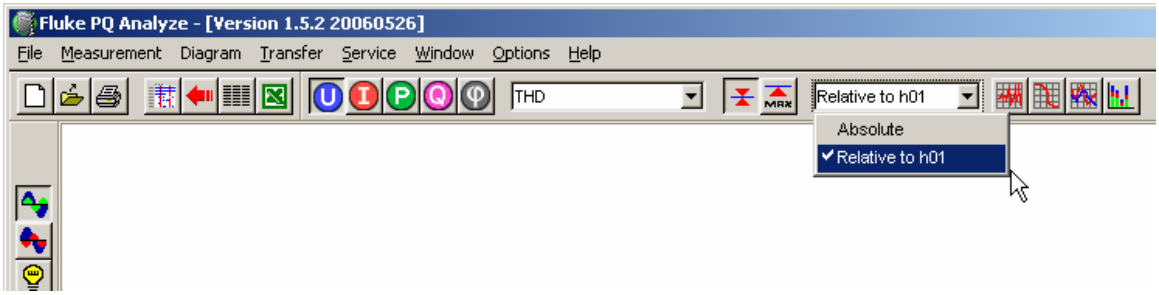


fenster-oberschwingungen.bmp

The harmonics/interharmonics evaluation includes:

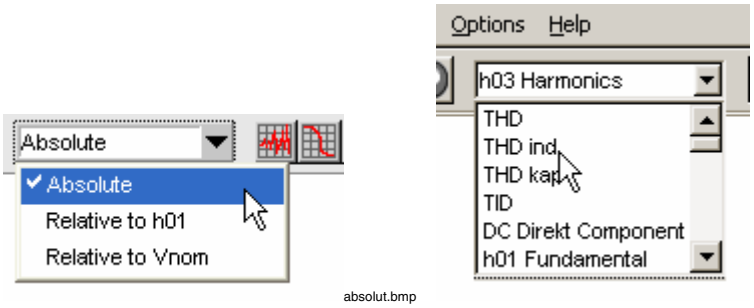
- Time graph, average and maximum values
- Probability
- Day extreme values (Free interval, 10-min values only)
- Day extreme values bar (Free interval, 10-min values only)
- Frequency spectrum

Voltage harmonics can be viewed as absolute values in V, in percentages of the fundamental, or relative to the nominal voltage.



ober_a.bmp

Click U or I or P or Q or (Φ) and MEAN (average values).



absolut.bmp

ober_b.bmp

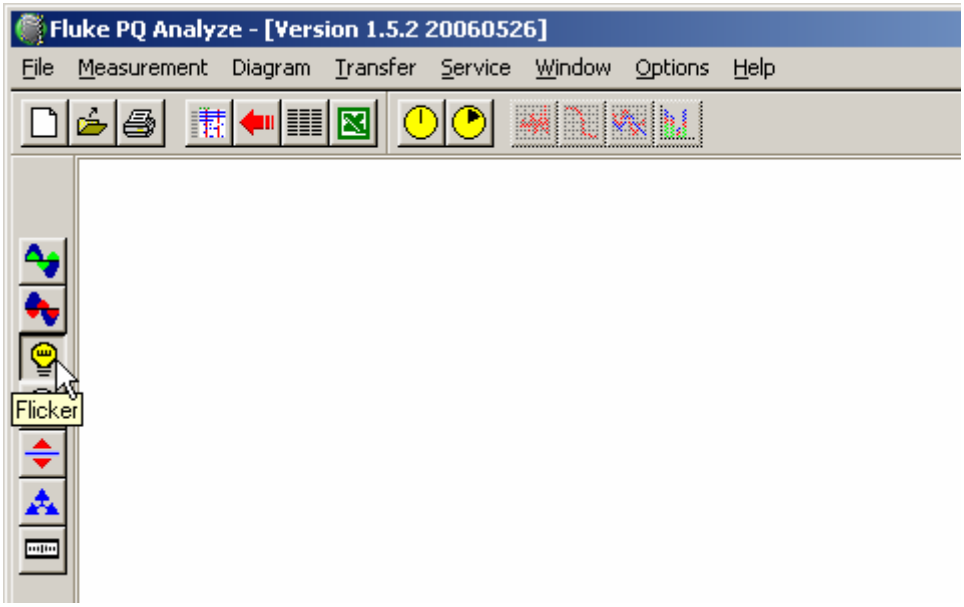
With this function, the rms or average value for powers (absolute, relative to fundamental) of a harmonic or the fundamental over the measuring interval is presented. The voltage can also be viewed relative to the nominal voltage. Cos φ can be viewed for harmonics and fundamental.

For voltage and current, you can also select THD, THD ind, THD cap, THD interharmonics and DC component.

Flicker (for Day and 10-min values only)

Click U or I or P or Q or (Φ) and MAX (= maximum values)

With this function, the maximum value (absolute, relative to fundamental, or relative to nominal voltage) or a harmonic or the fundamental across the measuring interval. The maximum value is shown for an interval of 200 ms.



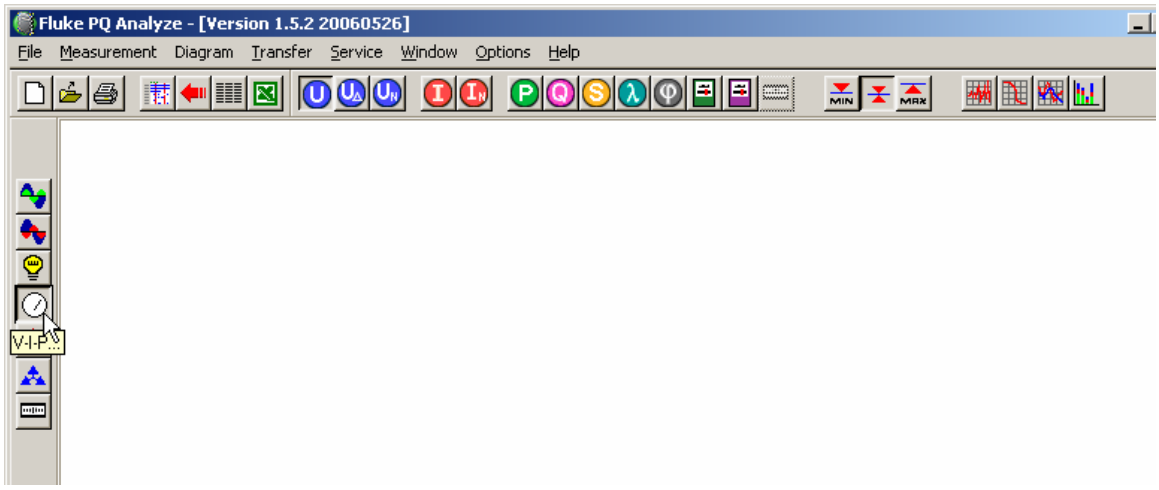
fenster flicker.bmp

The Flicker evaluation includes functions for the calculation of short-term Flicker Pst and long-term Flicker Plt and shows the developments over time or a statistical analysis of the level values. A number of different evaluation options are available for the various recording methods.

The short-term Flicker value Pst is calculated for periods of 10-minutes.

The long-term Flicker Plt is calculated for periods of 2 hours. A continuous averaging method is applied, so that at the end of each 10-minute interval, a Plt value is available.

rms values: Day Free Interval 10 min



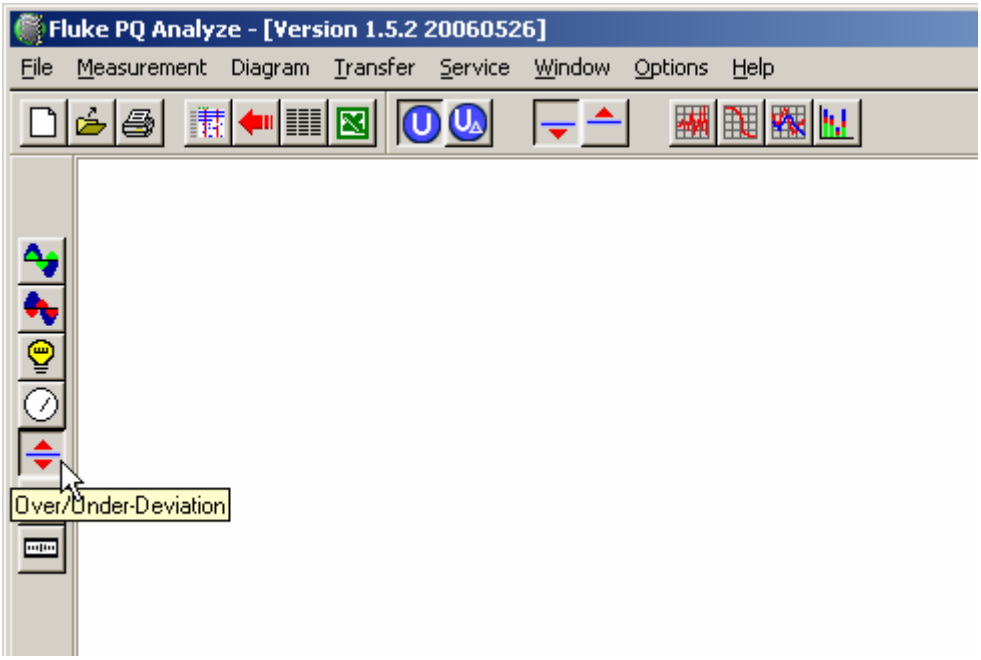
fenster-effektivwerte.bmp

This window is used for the evaluation of rms voltage and current values, as well as power. For each data source, only a subset of evaluations is available. By clicking some buttons, you can assess average, minimum, and maximum values of the measured parameters.

Settings	Application
	rms voltage value per measuring period
	Maximum or minimum rms voltage values per measuring interval
	rms values of phase-to-phase voltages, based on phase voltages
	rms value of neutral conductor voltage over the measuring interval
	Maximum or minimum rms values of neutral conductor voltage per measuring interval
	rms current value over selected averaging interval
	Maximum or minimum rms current values per measuring interval
	rms value of neutral conductor current over measuring interval
	Maximum or minimum rms values of neutral conductor current per measuring interval
	Phase and total active power over averaging time
	Maximum or minimum active power per measuring interval
	Reactive power over selected averaging time
	Maximum or minimum reactive power per measuring interval
	Apparent power (Ieff * Ueff) over selected averaging time
	Maximum or minimum of apparent power (Ieff * Ueff) per measuring interval
	Power factor P/S) over selected averaging time•
	Displacement power factor over selected averaging time
	Active work (W=P*° t) over selected averaging time
	Reactive work (Wq=Q* °t) over selected averaging time

Underdeviation Overdeviation

The calculation of underdeviation and overdeviation parameters is done in accordance with IEC 61000-4-30 item 5.12.



Settings	Application
	Underdeviation of phase to neutral voltages •
	Overdeviation of phase to neutral voltages
	Underdeviation of phase to phase voltages
	Overdeviation of phase to phase voltages

Unbalance

See also EN 50160 – Unbalance. With this function, you can evaluate the values versus time and statistics of:

Settings	Application
	rms value of voltage of the zero sequence system, averaged over measuring period
	rms value of the voltage of the positive sequence system, averaged over measuring period
	rms value of the voltage of the negative sequence system, averaged over measuring period
	Negative sequence system/positive sequence system ratio, averaged over measuring period

Frequency

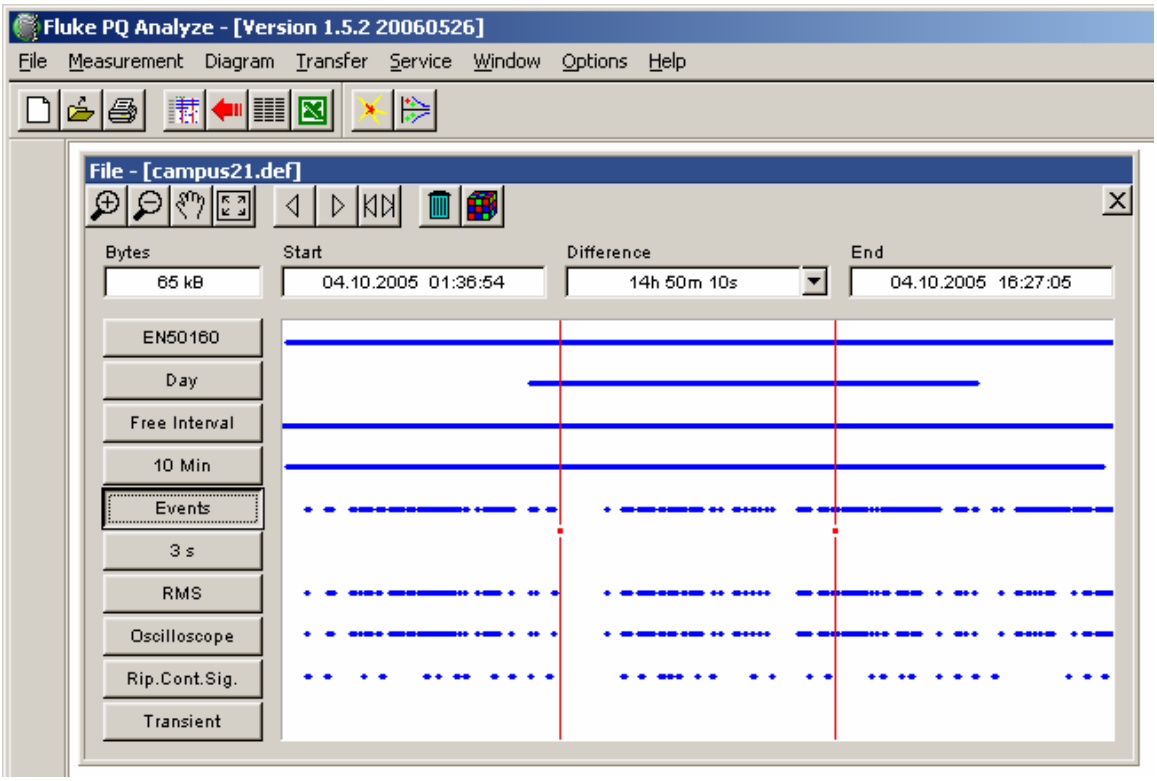
See also EN 50160 – power frequency. The system provides level-time diagrams and statistical analyses. The following functions are available for frequency evaluations:

Mean frequency over measuring period (e.g. 10 minutes)

Maximum frequency averaged over 10 seconds in measuring period

Minimum frequency averaged over 10 seconds in measuring period

Evaluation of Voltage Events



ereignisauswertung.bmp

Sorting Records

In addition to the event analysis in the EN 50160 report, you have the option to view detailed diagrams for over-voltages, voltage dips, short interruptions, long interruptions, ripple control signal events, transient events, harmonics (2nd – 50th harmonic), deviations of rms values (upper, lower limits) and deviations of oscilloscope (sample) values (slope/level, envelope sine, constant, phase shift).

All events where the EN 50160 limit values are exceeded and all trigger events result in an entry in the event list.

1. Click the  utton to generate an event list.

Such lists contain all voltage events that may occur during a measurement. The number of events that have actually occurred is indicated in the right column.

2. To select event types, click the respective line.
3. If you wish to select all active events, click the  button.
4. To select all events, click the  button.
5. To obtain a detailed output of all selected events, sorted by type, unit, start, duration and peak value, click the  button.
6. Click the respective headings. (Example: click heading *Peak value* –> the peak value records are sorted). Click the heading once to sort the records in descending order, click the heading twice to sort the records in ascending order (similar to MS Windows®-Explorer details view).

Viewing Events

1. To view other events, or to add new events to the list, select the desired events from the pre-selected list and click the  button.
2. Click the  button to view the selected events in a CBEMA diagram.

Event List

The events selected in the event list are displayed in the form of a diagram. Select Lock cursor to highlight individual events.

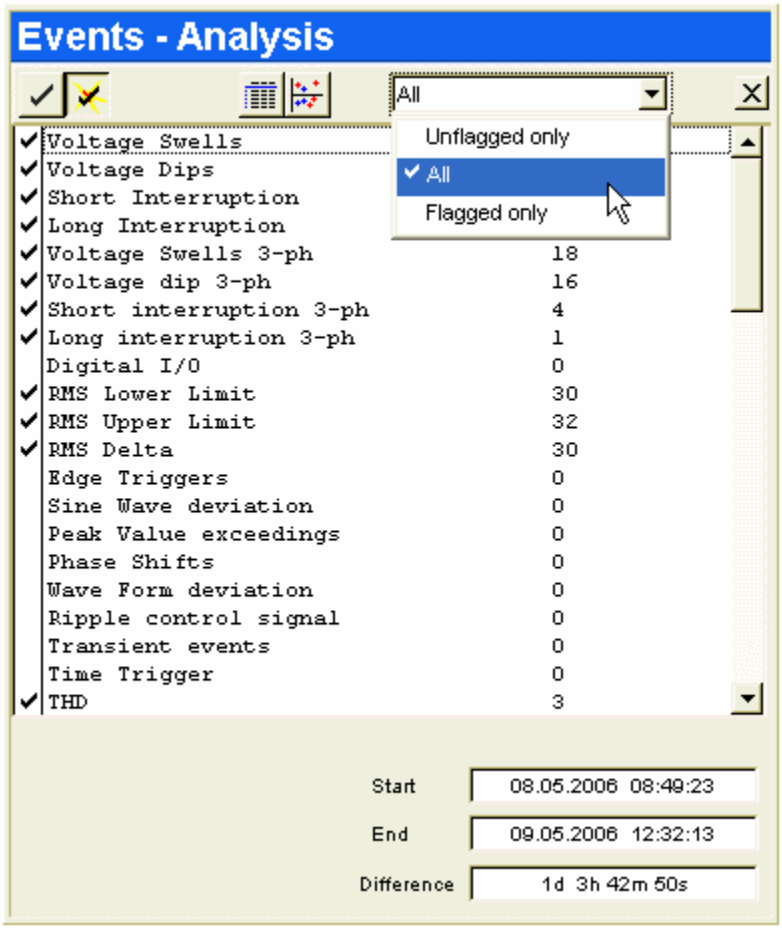
1. Double-click an event to open a separate window for detailed analysis.
2. The CBEMA function can also be selected directly by clicking the  button.

Online Event Display

For the Online event view, select the events as described above.

1. In Online mode, you can also retrieve new data by clicking the  button.

The pre-selection also shows the start and end time, as well as the duration of the measurement.



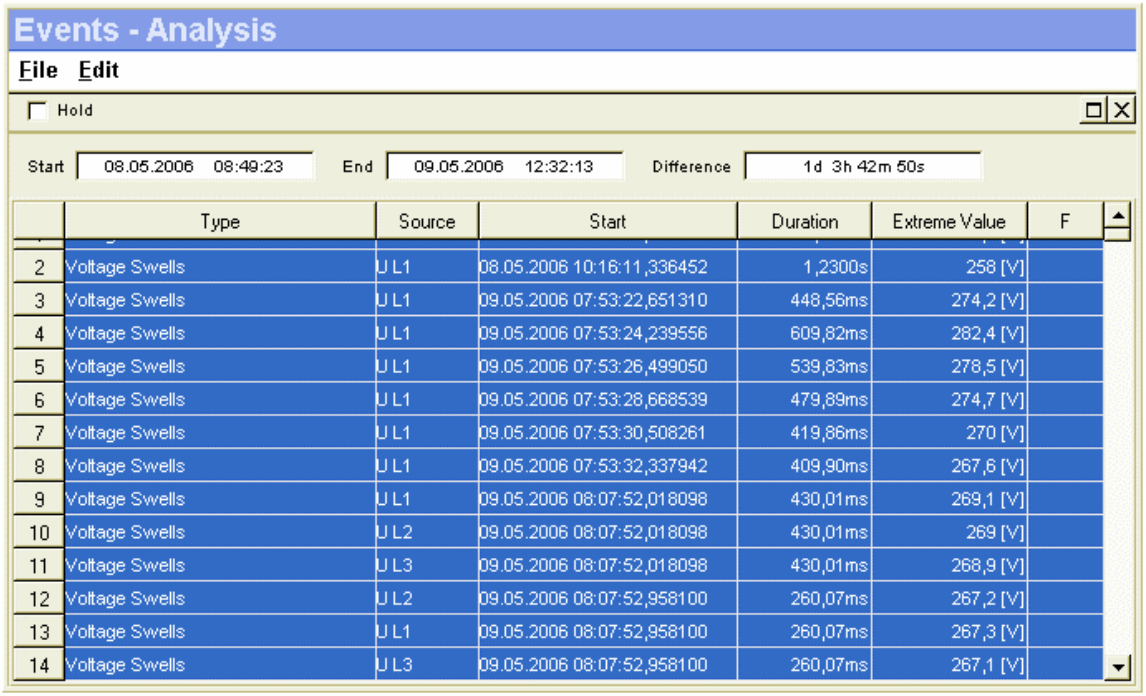
ereignisübersicht.bmp

Note

There is a selection to show All events, Flagged only, or Unflagged events only.

MS® Excel-Compatible Table for Events

Click on  to get the event list for detailed view is compatible with MS Excel®.



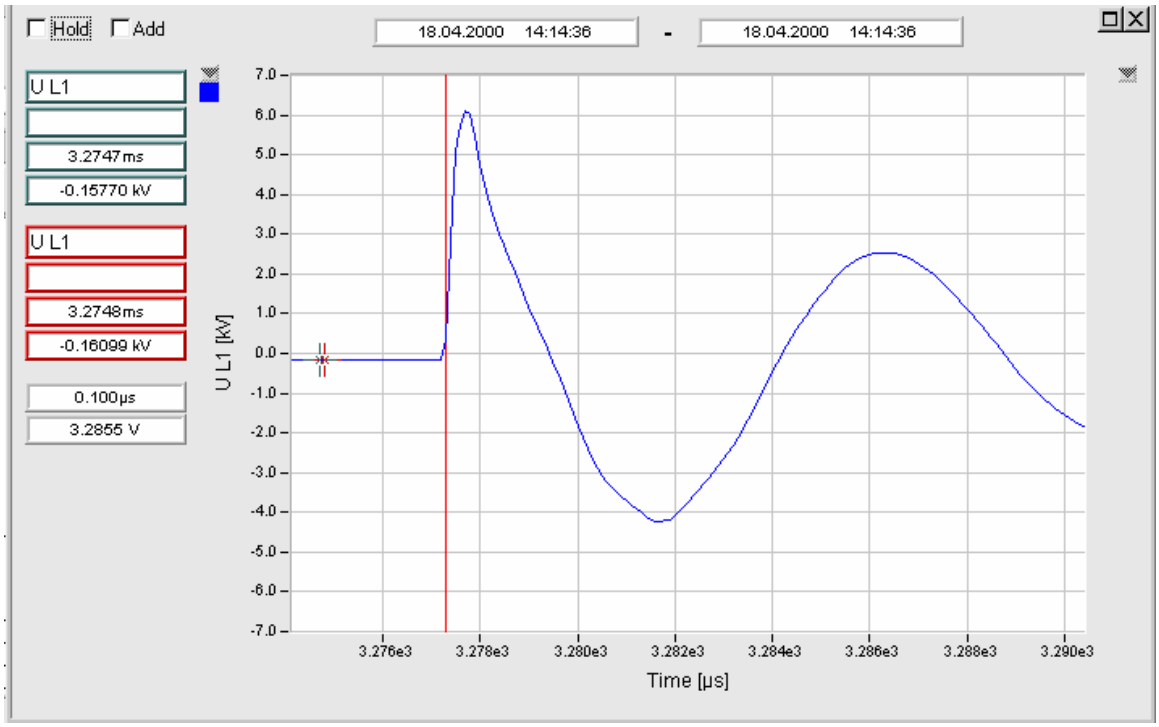
	Type	Source	Start	Duration	Extreme Value	F
2	Voltage Swells	U L1	08.05.2006 10:16:11,336452	1,2300s	258 [V]	
3	Voltage Swells	U L1	09.05.2006 07:53:22,651310	448,56ms	274,2 [V]	
4	Voltage Swells	U L1	09.05.2006 07:53:24,239556	609,82ms	282,4 [V]	
5	Voltage Swells	U L1	09.05.2006 07:53:26,499050	539,83ms	278,5 [V]	
6	Voltage Swells	U L1	09.05.2006 07:53:28,668539	479,89ms	274,7 [V]	
7	Voltage Swells	U L1	09.05.2006 07:53:30,508261	419,86ms	270 [V]	
8	Voltage Swells	U L1	09.05.2006 07:53:32,337942	409,90ms	267,6 [V]	
9	Voltage Swells	U L1	09.05.2006 08:07:52,018098	430,01ms	269,1 [V]	
10	Voltage Swells	U L2	09.05.2006 08:07:52,018098	430,01ms	269 [V]	
11	Voltage Swells	U L3	09.05.2006 08:07:52,018098	430,01ms	268,9 [V]	
12	Voltage Swells	U L2	09.05.2006 08:07:52,958100	260,07ms	267,2 [V]	
13	Voltage Swells	U L1	09.05.2006 08:07:52,958100	260,07ms	267,3 [V]	
14	Voltage Swells	U L3	09.05.2006 08:07:52,958100	260,07ms	267,1 [V]	

ereignisauswertdetail.bmp

The column labeled with “F” shows Flagging information

Example

- The area marked in blue can be copied directly into an MS Excel® worksheet (use key commands CTRL-C and CTRL-V)
- You can adjust the column width by moving the vertical cell borders
- Click the cell in the column heading to sort the records by the variable in this column. Double-click a row to view the associated diagrams with time graph, provided that the data has been recorded
- Double-click an event record to view the associated detailed diagram



transiente-neu.bmp

Note

A red line indicates the time of the trigger event, making it easier to accurately evaluate the data.

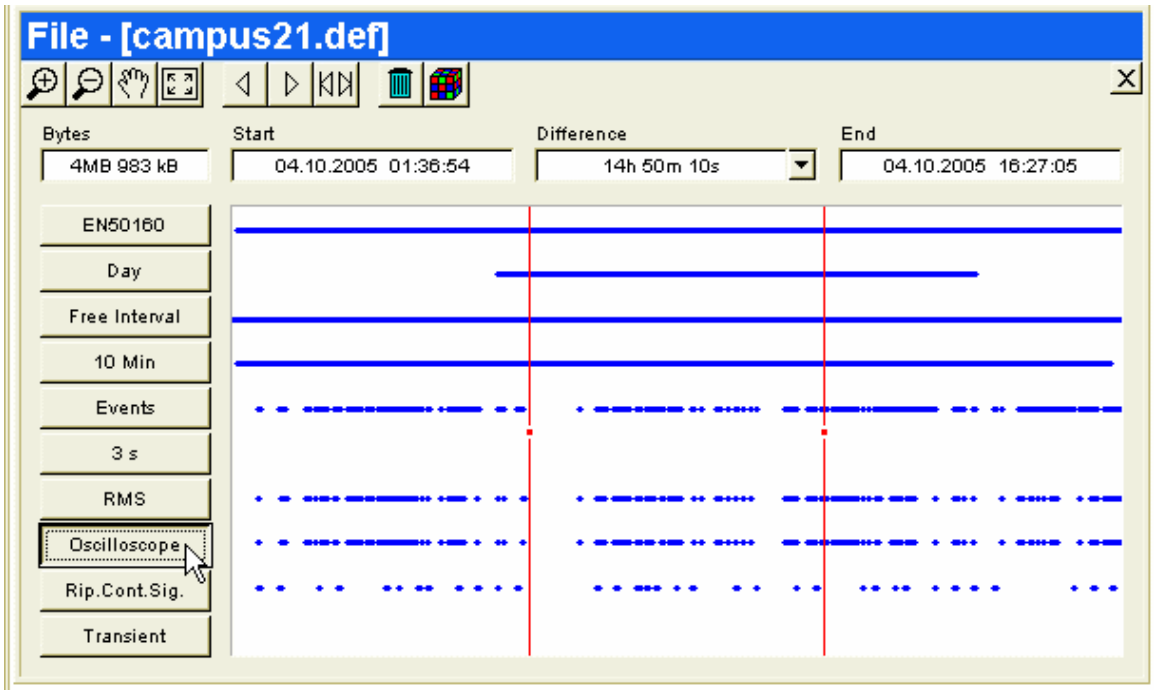
All recordings made at the time of the respective event are shown in individual windows (e.g. rms values, oscilloscope data, etc.). This approach allows for accurate analysis of the events at various resolutions per time unit. The diagram of the respective entry in the event list remains displayed in the foreground.

If you have for instance selected transients, the transient diagram is shown in the foreground window, all associated diagrams behind.

transienten-ereignis.bmp

Oscilloscope Evaluation

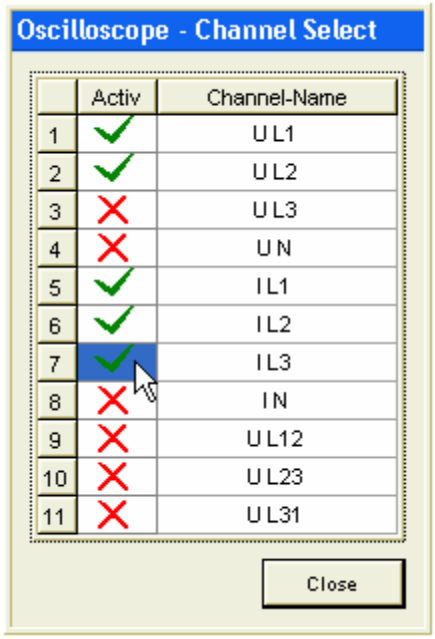
This window shows the level-time diagrams, amplitude spectrums, and vector diagrams for instantaneous values (samples).



oszilloskop-auswertung.bmp

The following tools are available:

Opens the following selection window to choose the channels of which you wish to view the level-time diagram, frequency spectrum and vector diagrams for voltages and currents:



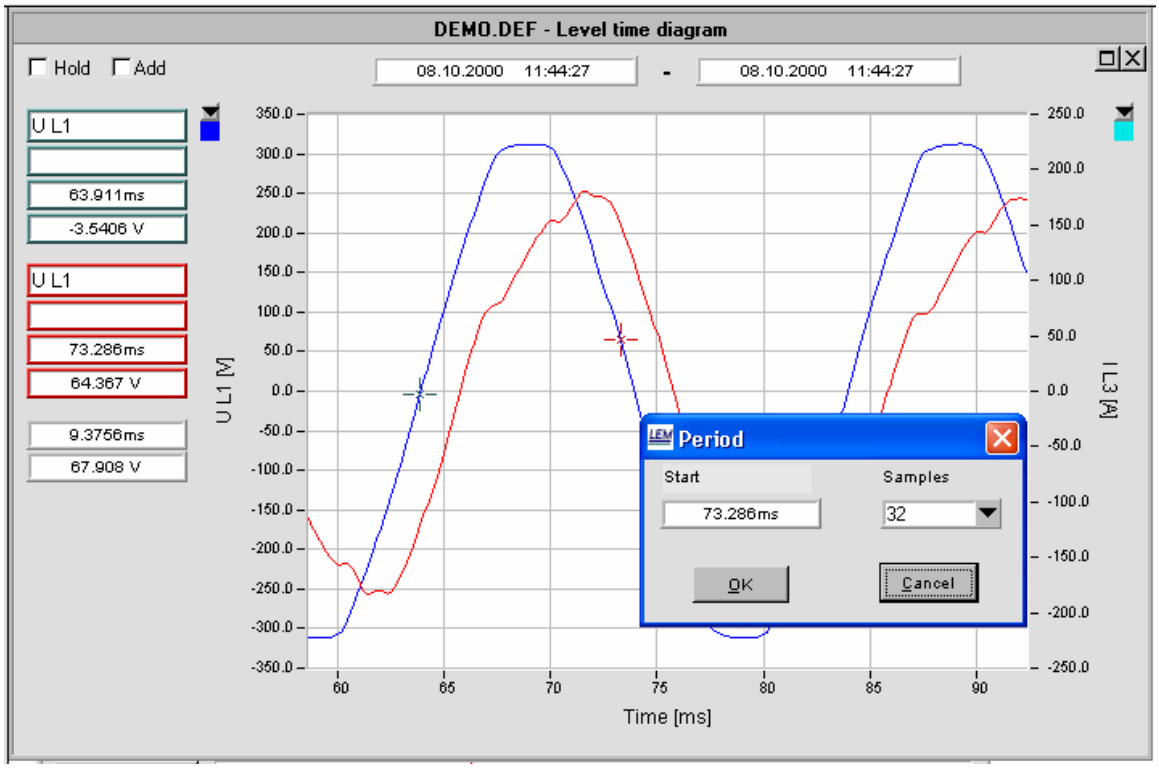
osziauswahl.bmp

Note

Multiple selections with the CTRL and SHIFT keys are possible.

Evaluation of Sections of the Trend Graph and Frequency Spectrum

Level-time diagram for selected channels.

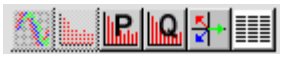


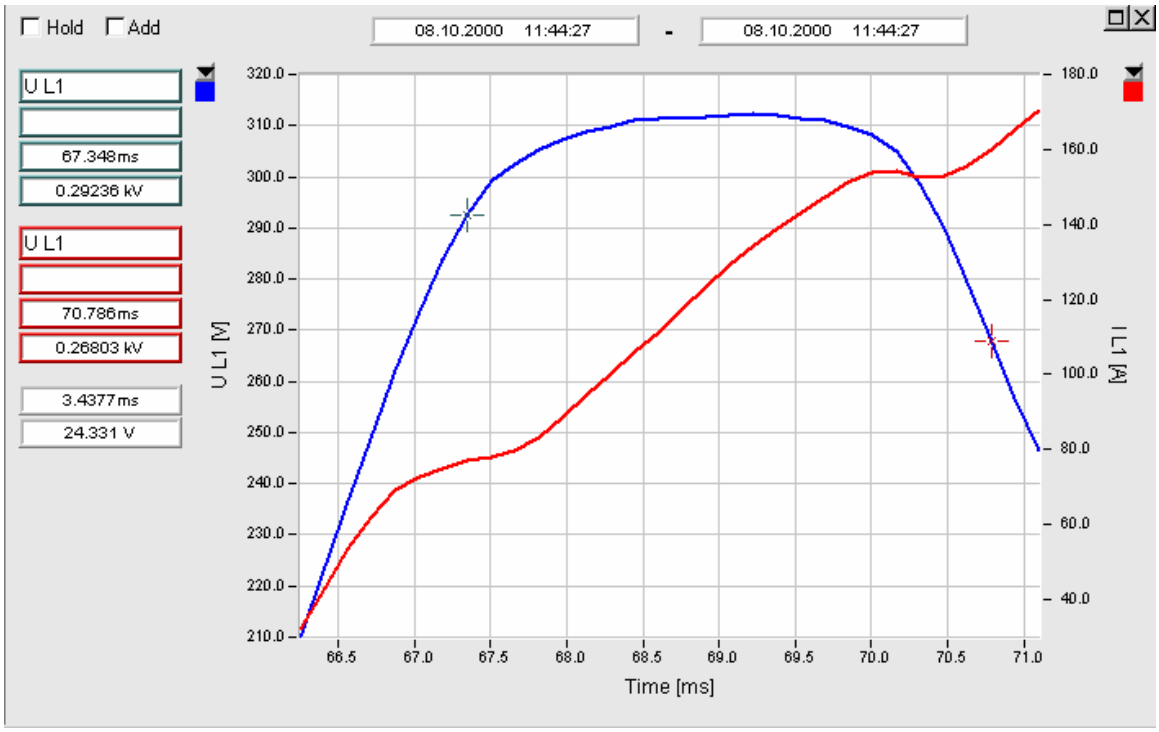
oszilloskop-ausschnitt wählen.bmp

Select section: Double-click the desired start point and enter the number of samples.

All subsequent evaluations (e.g. for spectrum, average and rms values, vector diagram, output in table format) refer only to the selected section then.

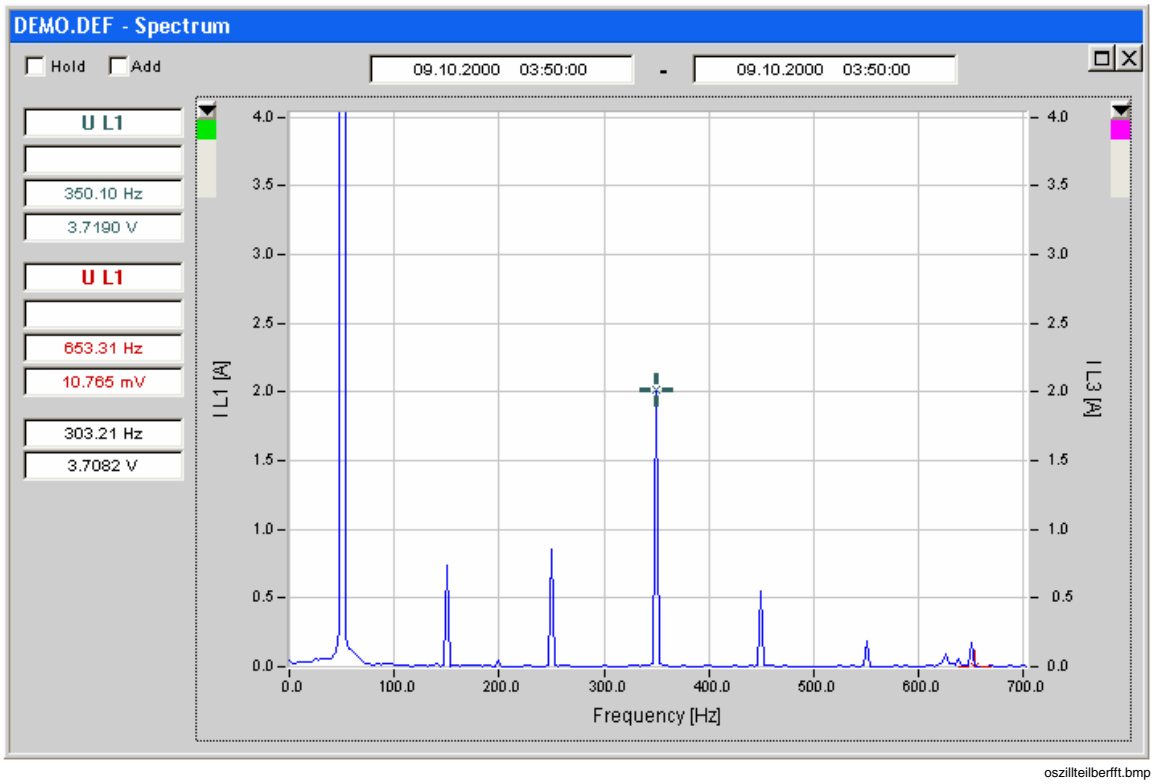
Examples:





oszillteilbereich.bmp

Frequency spectrums for the selected channels.



oszillteilberfft.bmp

The frequency resolution of the spectrums increases with the number of recorded samples.

For Fluke 1760

Samples	Frequency Resolution	Measuring Time
1 024	10 Hz	100 ms
2 048	5 Hz	200 ms
4 096	2,5 Hz	400 ms
8 192	1.25 Hz	0.8 s
16 384	0.625 Hz	1.6 s
32 768	0.3125 Hz	3.2 s
65 536	0.156 Hz	6.4 s

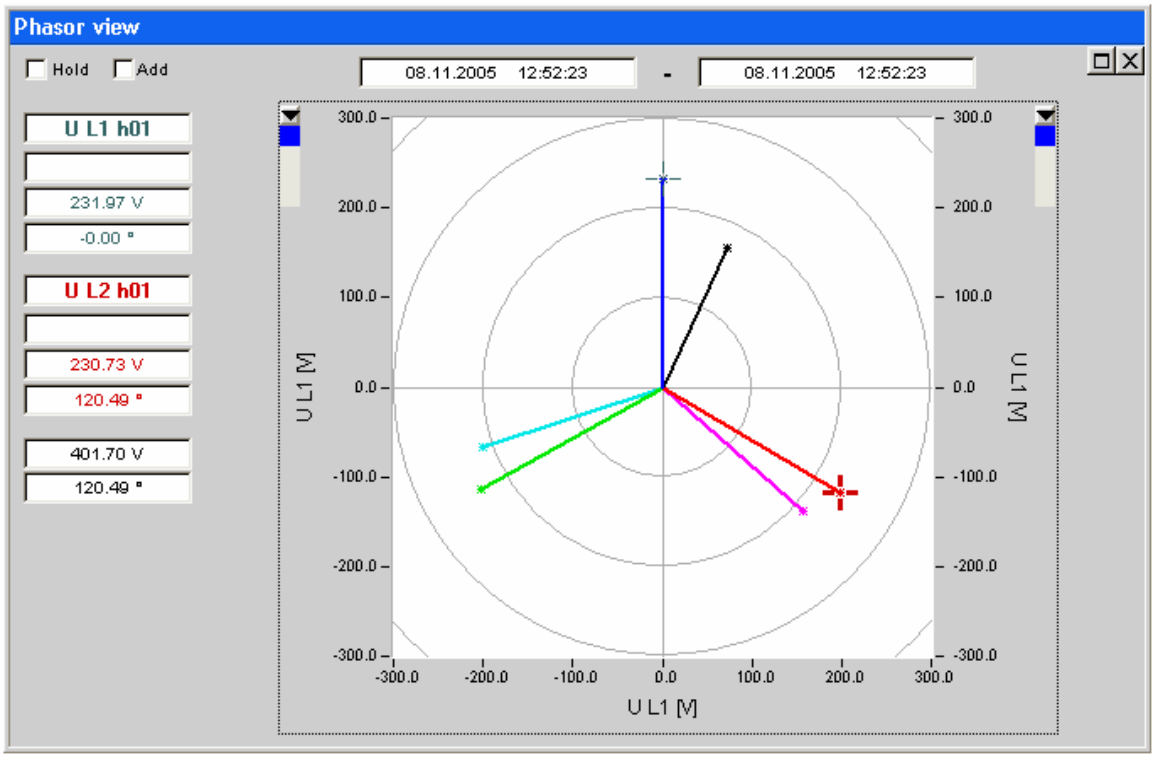
 Select the phases for the diagram of the active and reactive power spectrums and the vector diagram of the apparent power.

 If currents and voltages were recorded, you can display the active and reactive power spectrums for the individual phases.

Vector (Phasor) Diagram

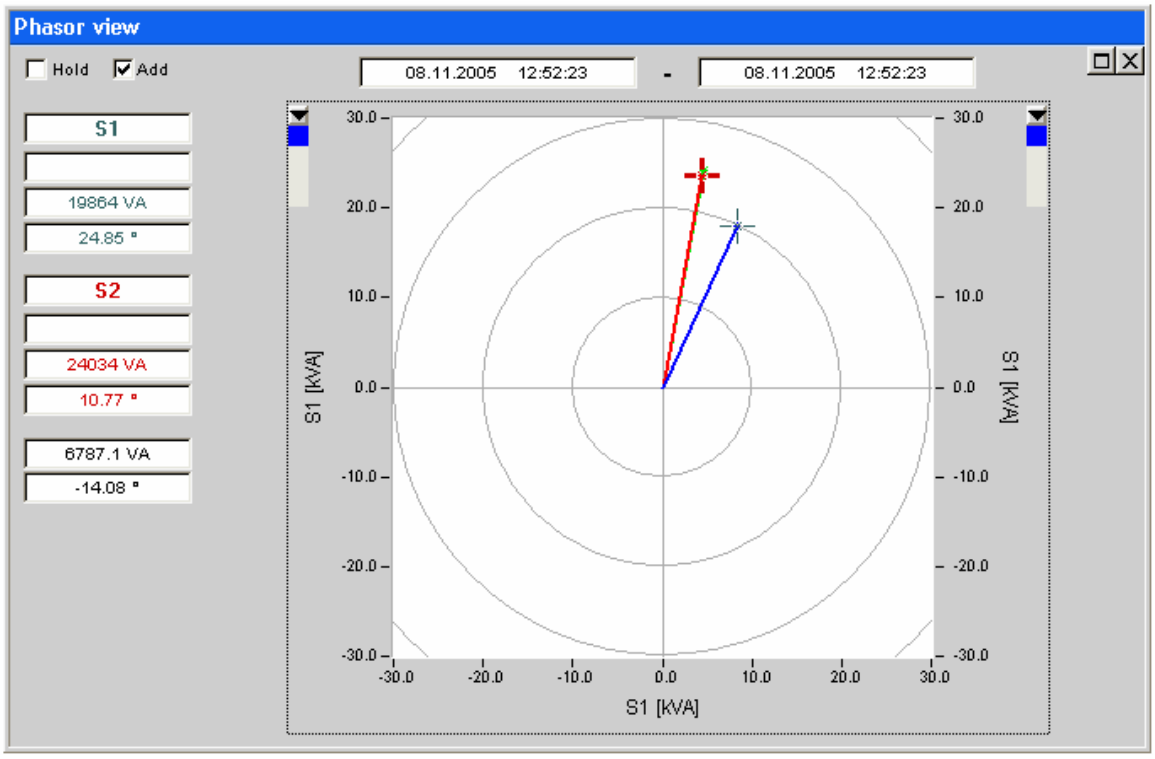
1. Select the desired channels.
2. Click the  button to display voltage and current vectors.
3. Click Phase selection in order to call up the vectors for the apparent power.
4. To add more indicators, check the  box.

Voltage Vector Diagram



zeigerdiau.bmp

Vector Diagram for Apparent Power

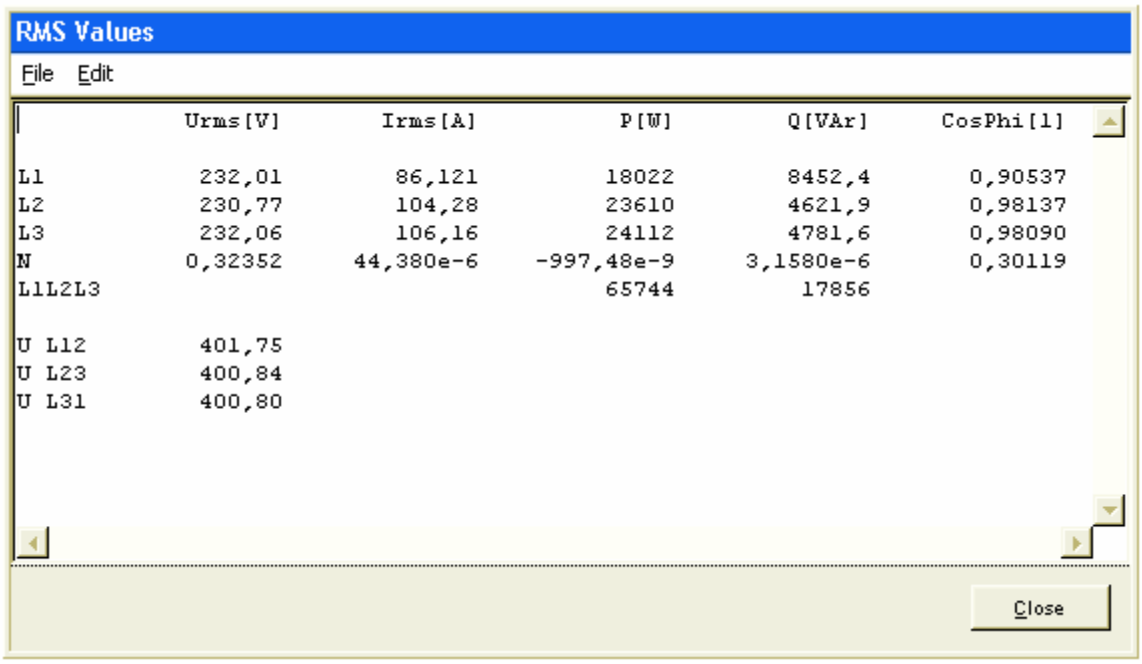


zeigerdiagramm-scheinleistung.bmp

The fundamentals of the apparent powers S1 of the three phases are shown according to their value and phase angle.

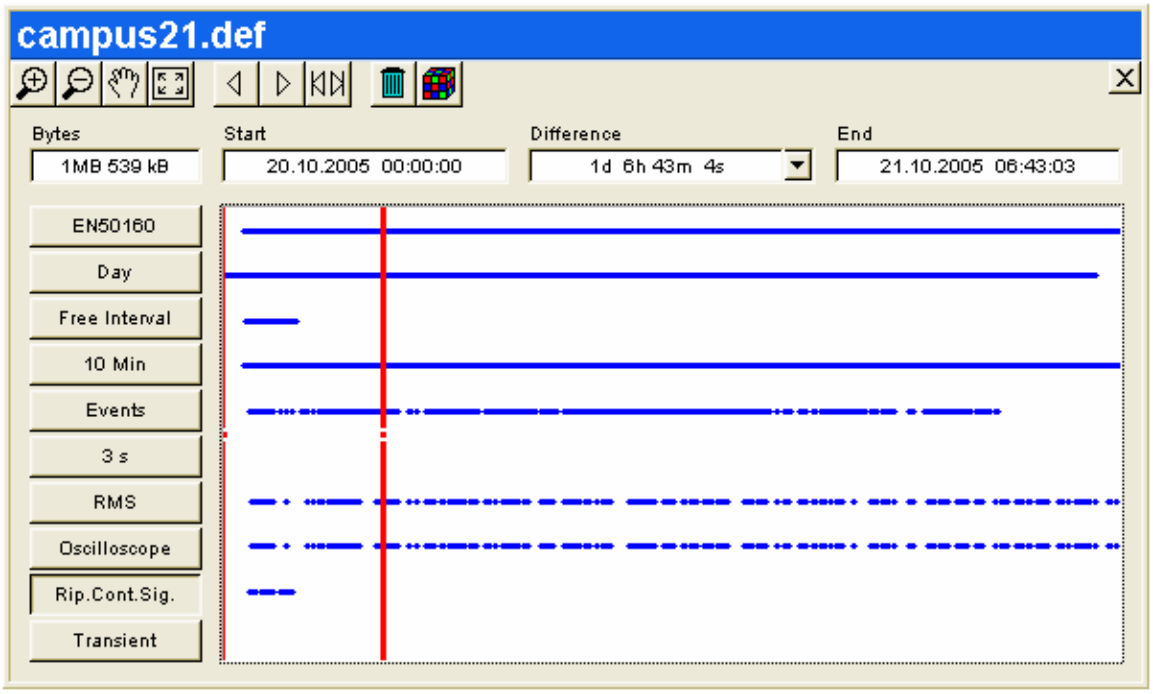
Table Format

The system allows tabular display of rms and mean values for recorded measurements based on the number of samples per triggered recording.



mitt_effe.bmp

Evaluation of Ripple Control Signals



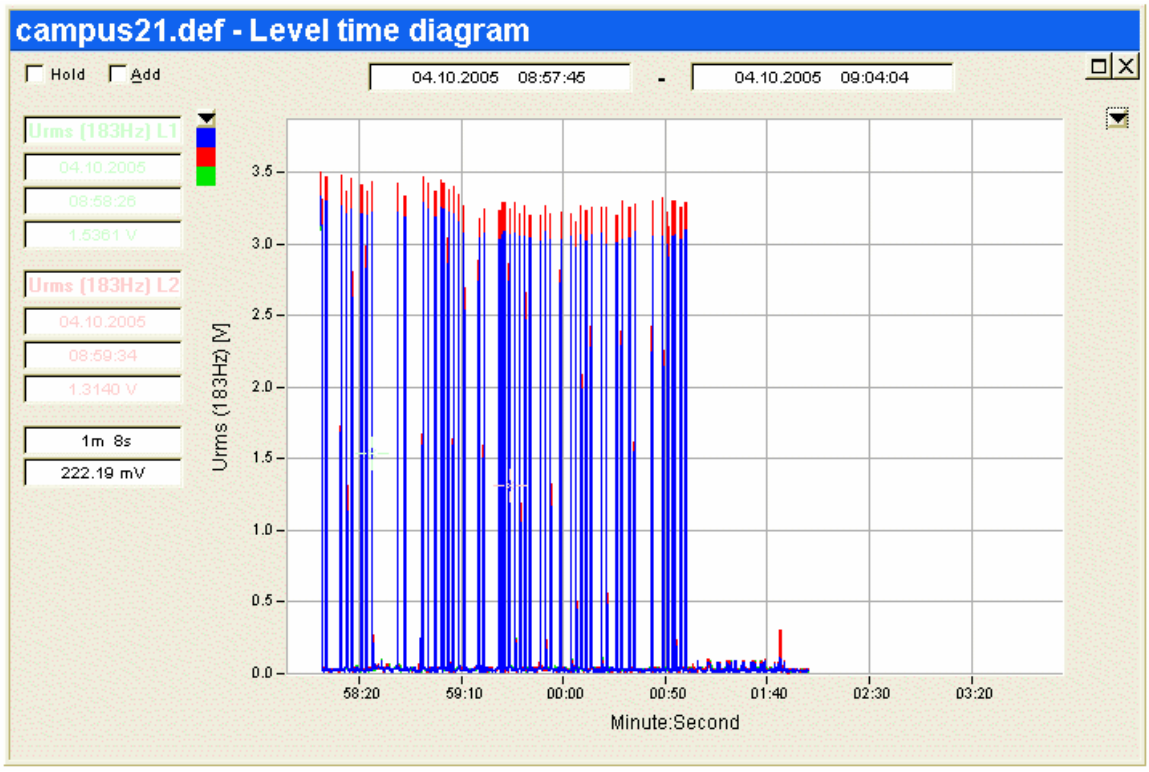
rundsteuerauswertung.bmp

The input signals are filtered and analyzed for the following parameters:

Parameters

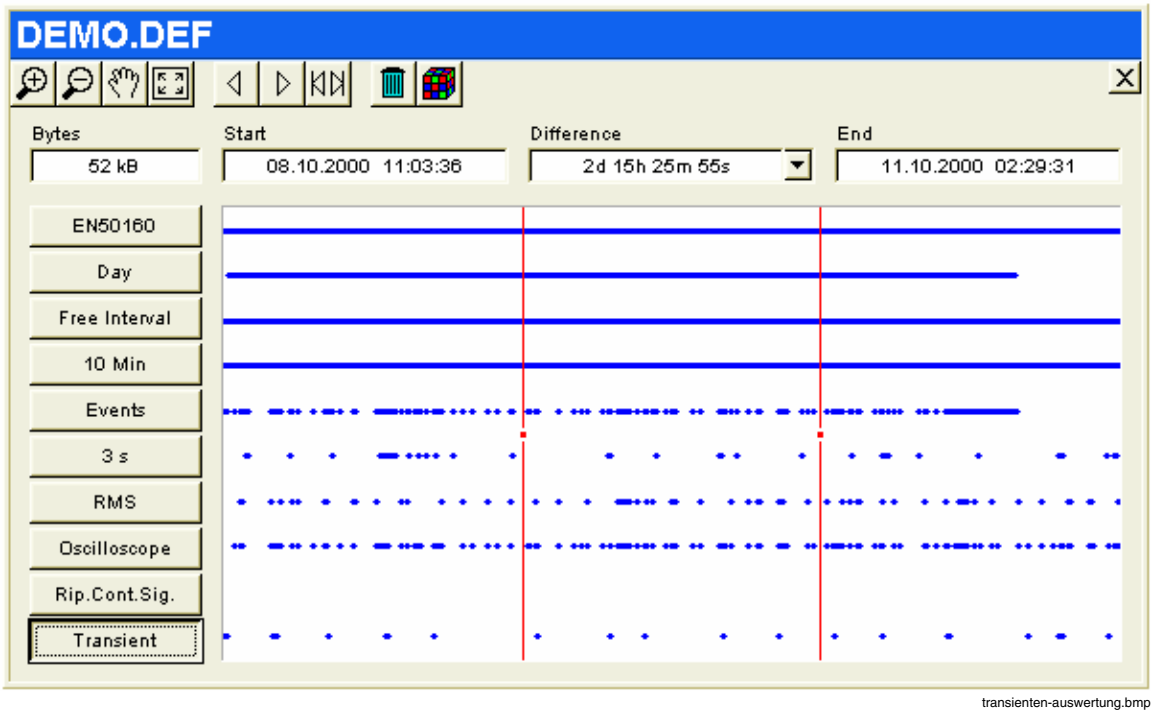
Trend diagrams and probabilistic evaluations are provided over the measurement period.

Selection	Evaluation
	Voltage rms values
	Current rms values
	N-wire voltage rms values
	N-wire current rms values
	Active powe
	Power factor



ripple telegramm.bmp

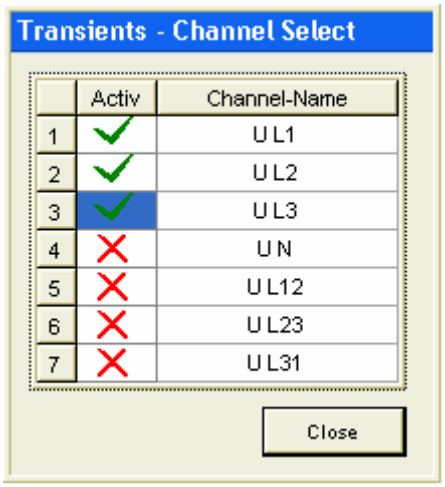
Evaluation of Transients



transienten-auswertung.bmp

Channels CH1 to CH4 are available for voltage transient measurements. The system provides *level-time diagrams* and *spectrums*.

Click this button to open the selection window where you can choose the cannels for the level-time diagram and the frequency spectrum:



transauswahl.bmp

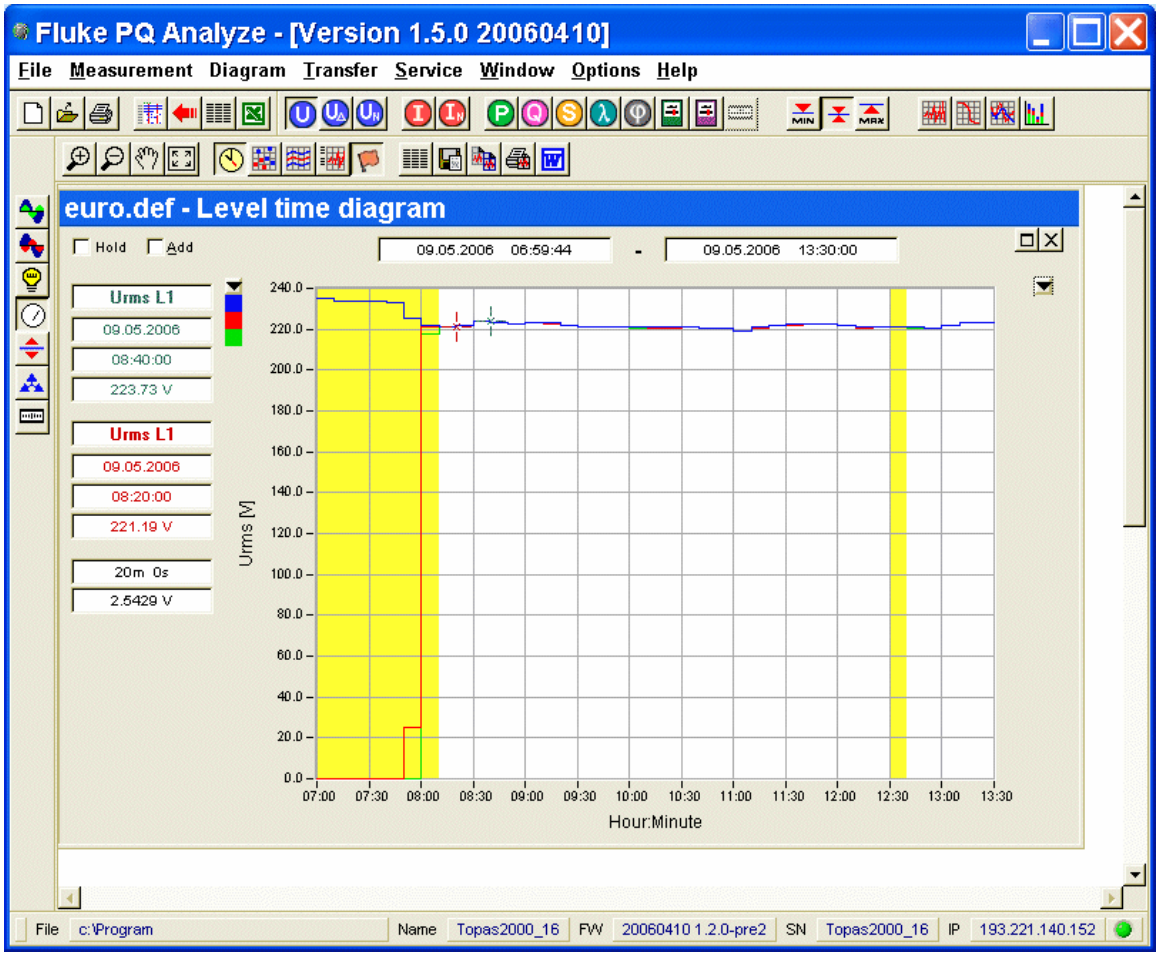
Note

Multiple selections with the CTRL and SHIFT keys are possible.

Transients of the selected channels.

Frequency spectrum for the selected channels. The frequency resolution of the spectrums increases with the number of recorded samples.

Presentation of Measurements in Diagrams



timeplot.bmp

Stored measurement data can be represented in two different ways:

- Time plot diagrams
- Statistical analysis (cumulative frequency)

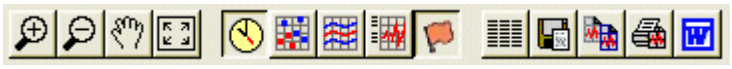
The diagram window can be opened several times, whereby the data in the windows is not changed. The name of the parameter file of the associated measurement and the evaluation function are quoted in the title bar.

To select between the representations options, click the following buttons:

Representation of one variable in the form of a level-time diagram

Representation of the probability distribution of a series of measurements

Diagram Toolbar



This toolbar allows for the modification and visualization of the graphs.

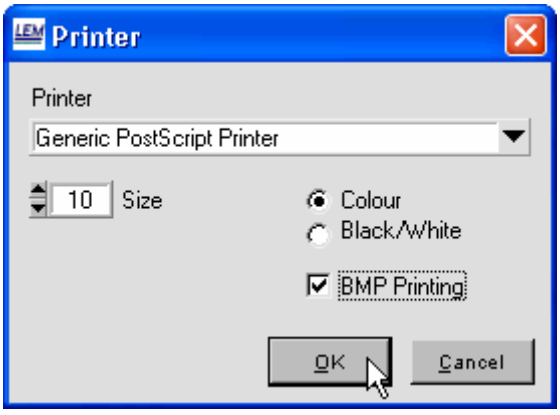
Selection of Period

A period for analysis can be selected by positioning the *red cursor lines* or selecting a *rectangle*. To choose between these two options, right-click the diagram area and then select the desired mode in the *Zoom Mode* menu. The period selected by positioning the red cursor lines must be within a rectangular frame.

Zooming

1. To zoom in or out, click the  or  button.
2. To zoom in on a selected range highlighted with a rectangle, define the desired zooming range while keeping the mouse button pressed.
3. As soon as the mouse key is released, the selected area is increased in size.

Settings	Application
	Zoom in.
	Undo the last zoom in action.
	The zoomed area can be moved within the diagram area (PAN function).
	After zooming, click this button to reset the view to show the entire measurement.
	Switching between absolute or relative time representation.
	Switching between line diagram and dot chart. The generation of dot diagrams, where every dot represents a measurement value, might take some time for large volumes of data.
	Add or remove the measurements of individual channels.
	Add or remove the various display fields of the cursor positions (graph selection, time, value).
	Activate/deactivate the presentation of flagged area.
	Export displayed data to an ASCII file. The data can be printed, saved or copied to a template.
	Copy the ASCII log to a file.
	Copy diagram to clipboard.
	Print diagram.



printer.bmp

By activating BMP printing, you can print the diagrams in bitmap format instead of vector graphic format, so that the widths of the lines are the same, irrespective of the printer type.

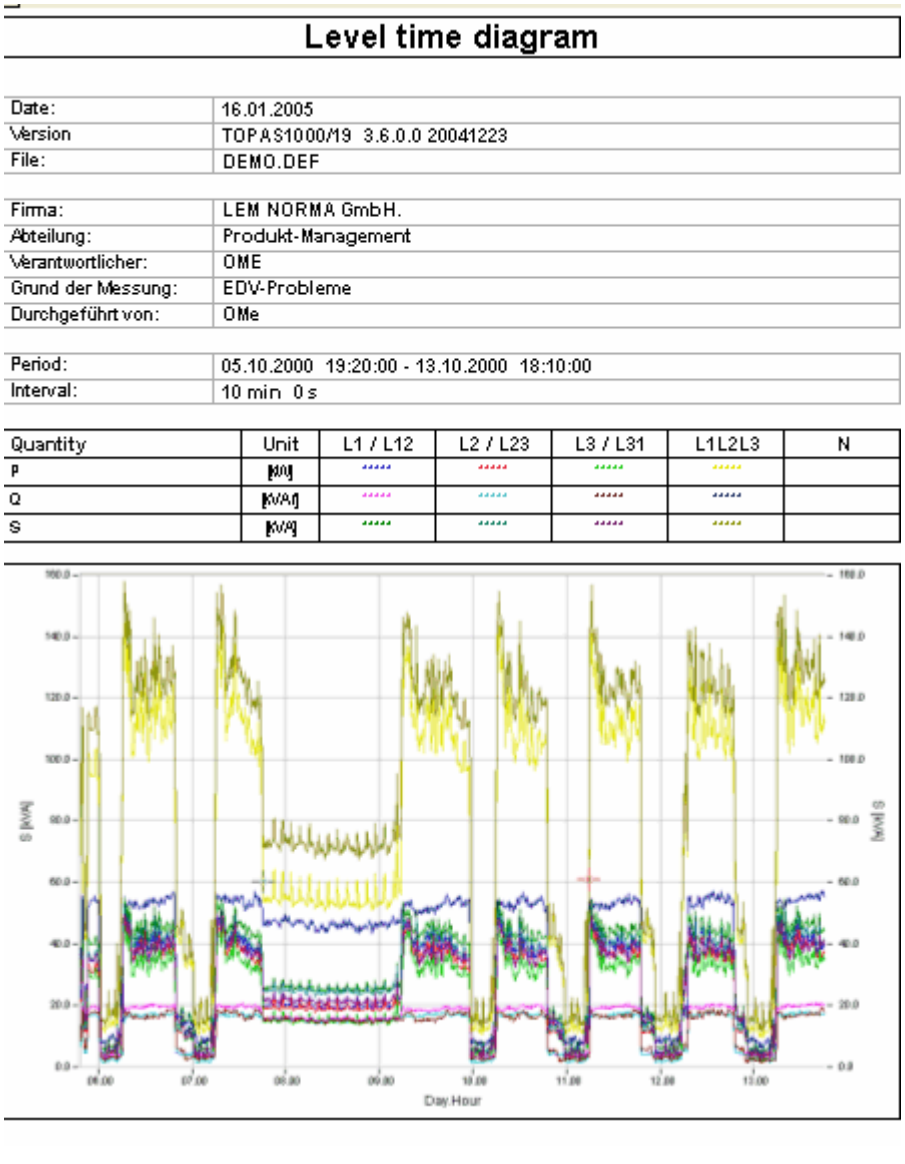
Select the graph for scaling of Y-axis.

Hold — Prevents the current diagram from being overwritten. This means that several diagrams of various measurement files can be opened and evaluated.

Add — Adds the diagram to the next selected evaluation. If this option is selected, several graphs representing the same variable can be compared in one evaluation. Please, note that only measurements with identical time scales can be superimposed.

Generate a log of the active graph window in MS Word® format. The header showing the main settings and a legend explaining the graph are added automatically.

Example:



Level time diagram

Date:	16.01.2005
Version	TOPAS1000/19 3.6.0.0 20041223
File:	DEMO.DEF

Firma:	LEM NORMA GmbH.
Abteilung:	Produkt-Management
Verantwortlicher:	OME
Grund der Messung:	EDV-Probleme
Durchgeführt von:	OMe

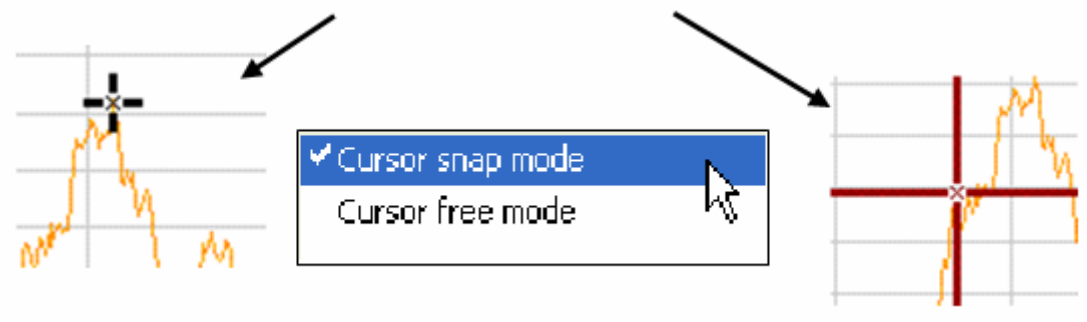
Period:	05.10.2000 19:20:00 - 13.10.2000 18:10:00
Interval:	10 min 0 s

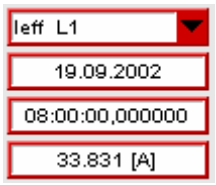
Quantity	Unit	L1 / L12	L2 / L23	L3 / L31	L1L2L3	N
P	[W]	*****	*****	*****	*****	
Q	[VAr]	*****	*****	*****	*****	
S	[VA]	*****	*****	*****	*****	

word-protokoll.bmp

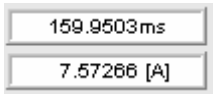
These fields show the start and end time of the displayed measurement data.

Right-click the diagram to toggle between the two available cursor modes: locking of measurements (*cursor locking*) and free positioning (*cursor free*).





These fields show the variable, date, time, value and unit. Select cursor mode Cursor locking.



Time and amplitude difference between the two cursors. The time difference is always displayed, while the amplitude difference is only shown, if the cursors are locked to graphs with identical units.

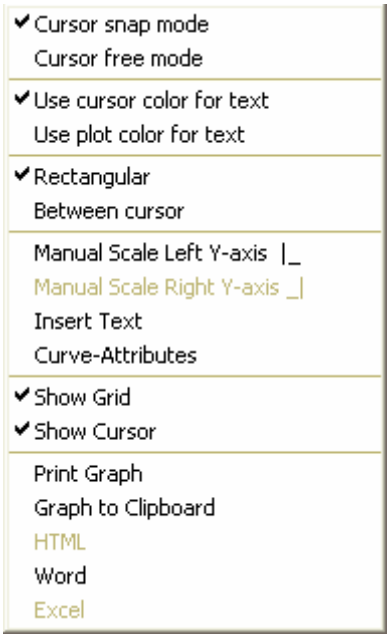
Maximize window.

Standard window size (restore).

Close window.

Mouse Functions

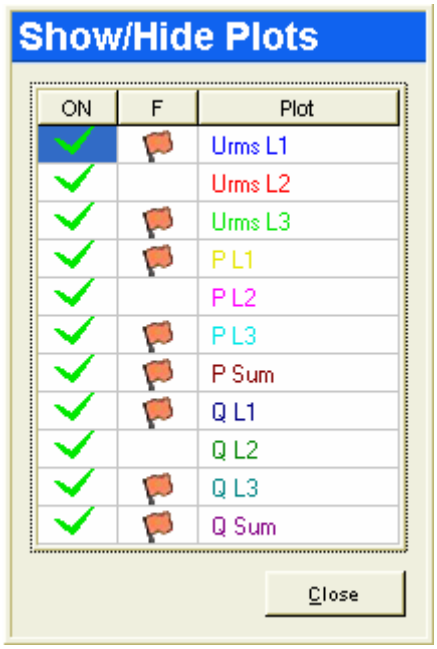
Right-click the diagram to access the following tools:



grafikmausre.bmp

Show/Hide Plots

With the button  plots of a certain diagram can be turned on and off. In the column F we can see clearly which curve initiated the flagging.



show-hide plots.bmp

The phase can be identified which contains measurement values which shall not contribute to statistics.

Placement of Text Labels in Diagrams

Comments can be placed directly into diagrams in order to mark specific areas of the curves. The text modules are linked to the curves and will move during scroll but not during ZOOM actions. The top left corner is the reference location. The text will also appear on printouts of the diagram.

Open an evaluation diagram

ZOOM in as required

Right click into the diagram and select menu *Insert text*.

In the dialog window *enter/modify* the diagram headline, the required text and font size. Multiple independent text boxes are allowed.

Quit the dialog with *OK*.

Move the text box to the final location with the left mouse button.

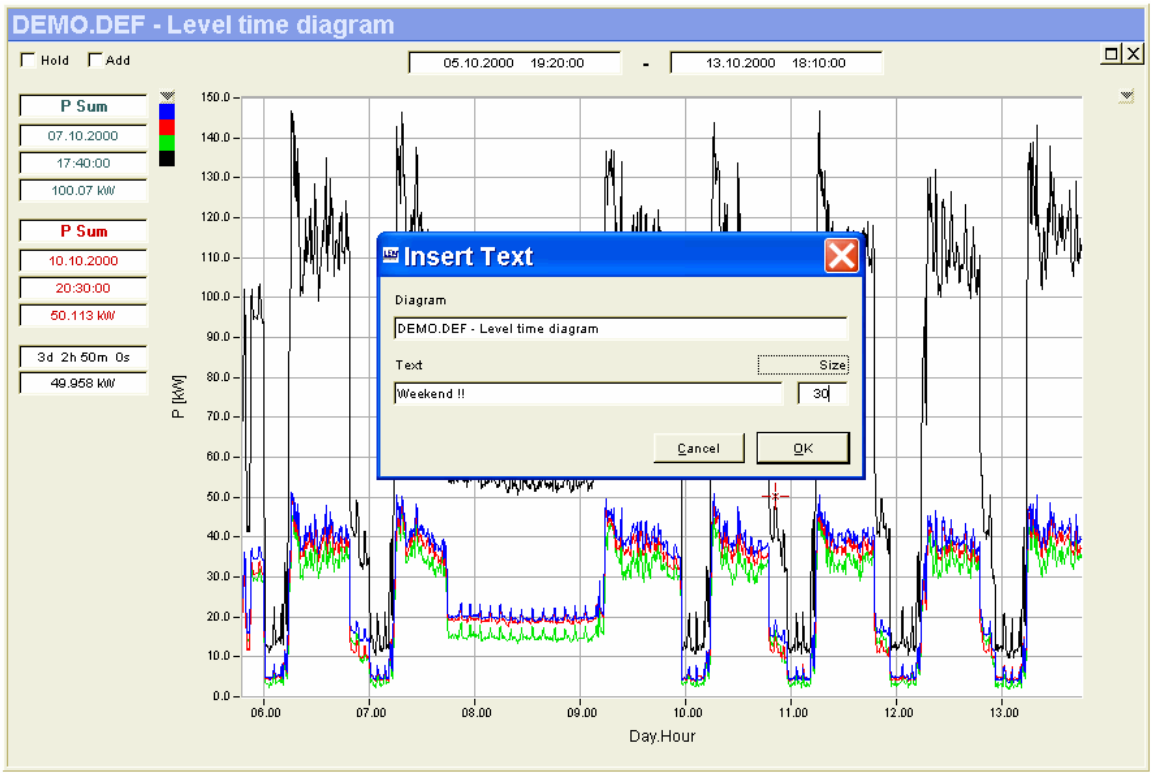


diagramm-text.bmp

The result:

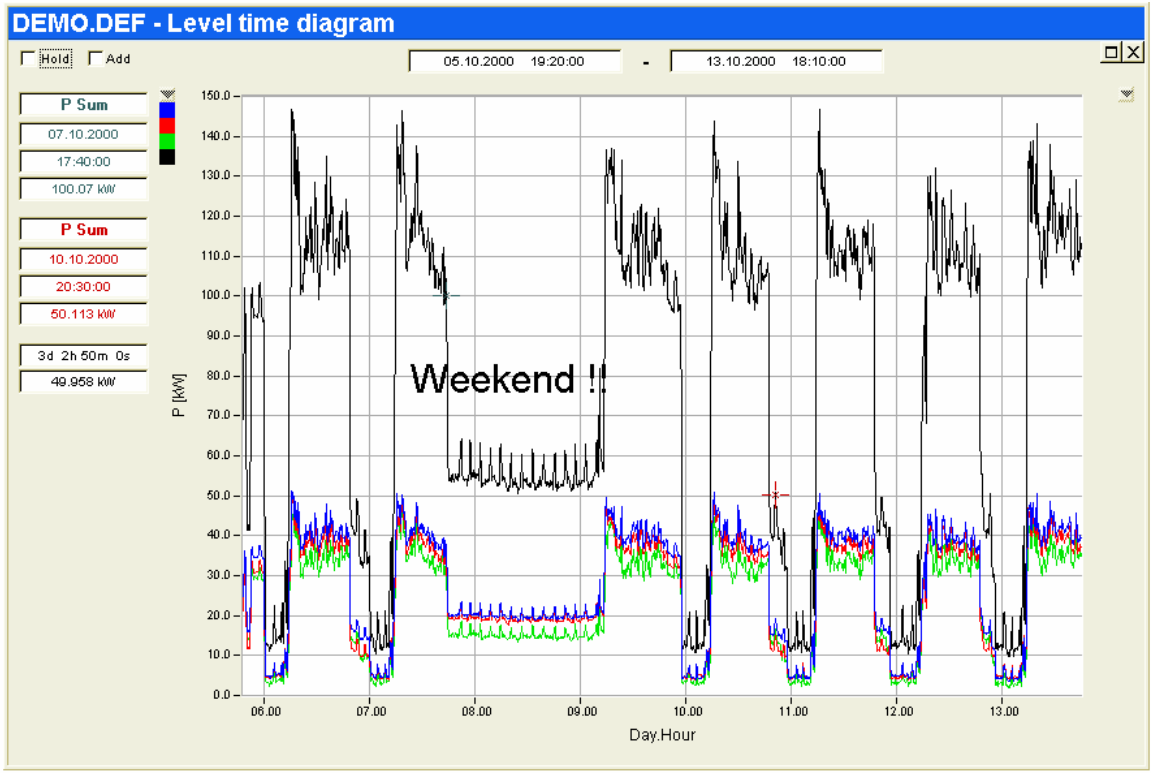
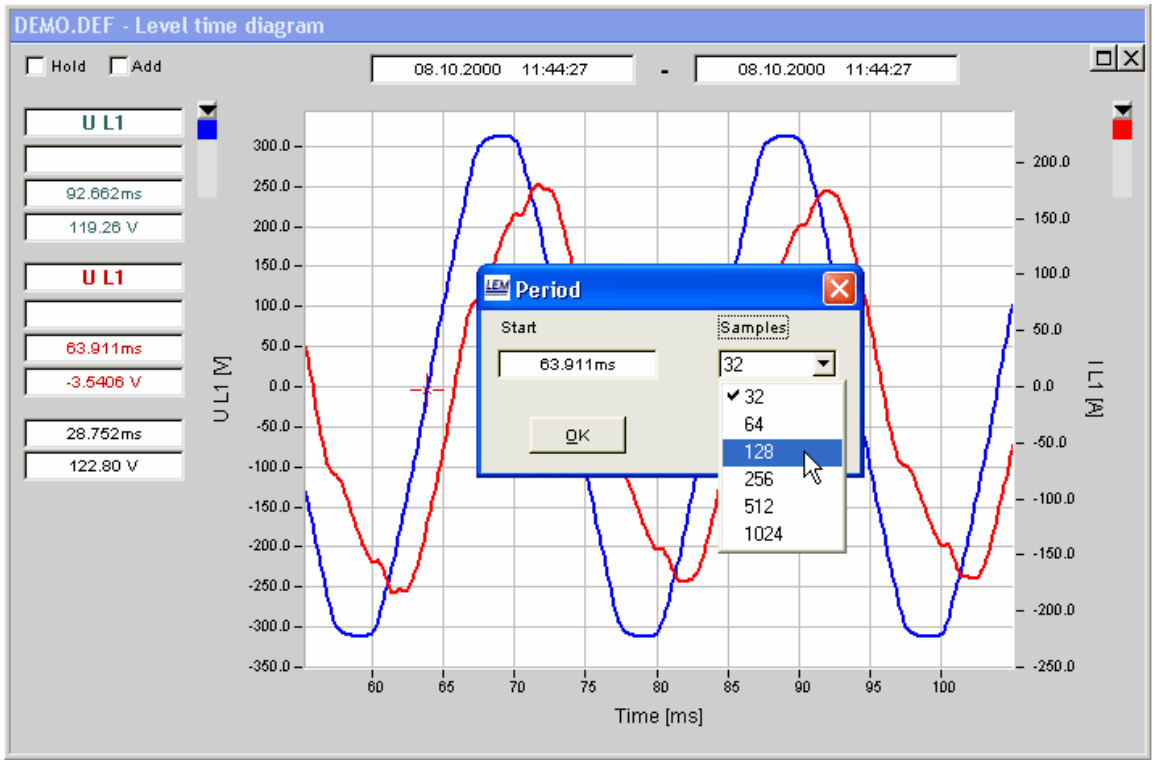


diagramm-text1.bmp

Oscilloscope Diagrams

Special Function Period

By double clicking with the left mouse button into an oscilloscope diagram we can set the start position for a segment evaluation.



abschnitte.bmp

In the dialog window we can see the start time and we can enter the amount of samples, (i.e. length of the segment; for example, 128) to be evaluated.

Close the dialog with *OK*.

Open a new diagram with icons  or  .

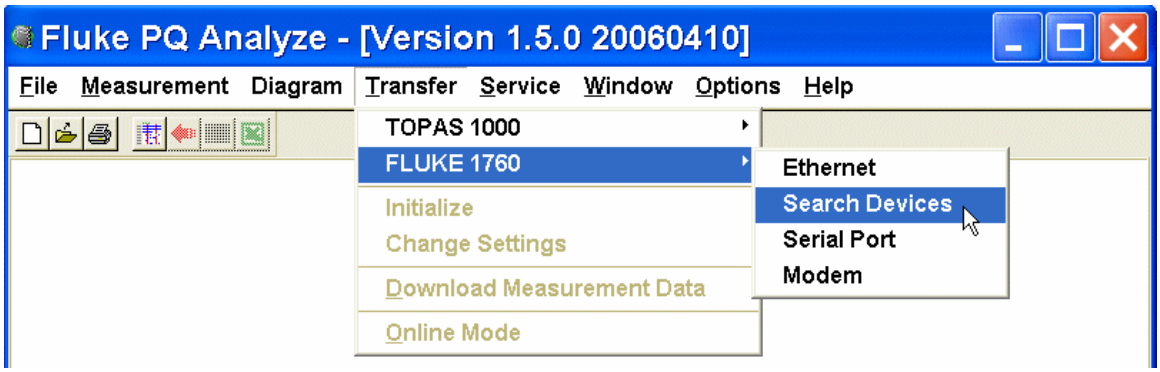
From now on all evaluations like amplitude spectrum are based on the selected evaluation period.

Moving the time cursor in the evaluation window resets the segment settings.

Menu: Transfer

Transfer – connection

To establish a connection to the Fluke 1760, open menu *Transfer/Fluke 1760/Search Devices*.



Press the *Search* button and locate the instrument in the list of devices found in the network. The device name corresponds to the 7 digit serial number printed on the back of the instrument.

Select your device and press *Connect.*

As soon as a connection is established, the device information and a green LED is displayed in the status line.

In case of communication problems, please refer to chapter *Ethernet Communication* and *Service TCP/IP settings*.

Note

If you are running different software versions on the PC and the instrument, we recommend that you upgrade your system. The release date of the software indicates the software version. It is not possible to configure the instrument, if the software version on the instrument deviates from that on the PC.

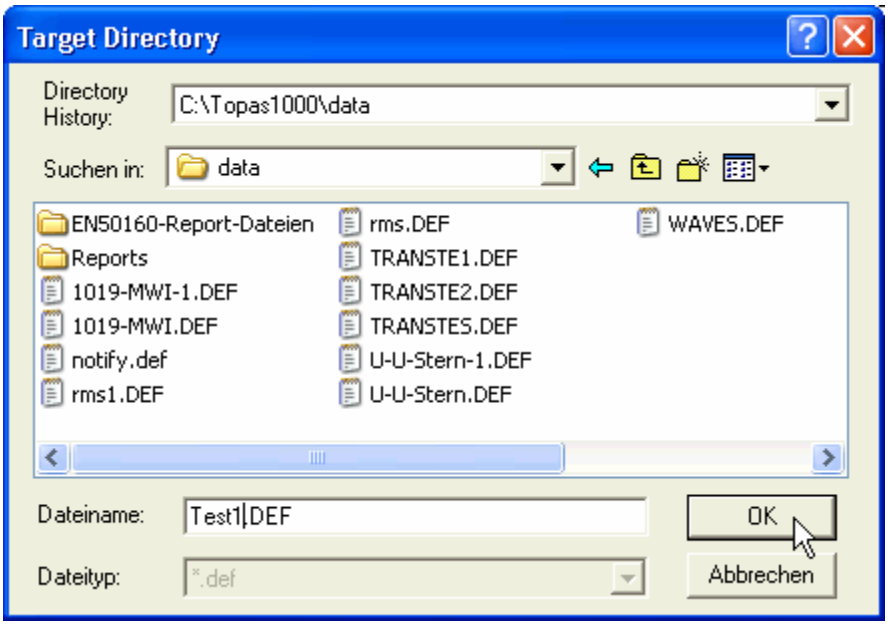
Transfer – Download Measurement Data

This command transfers the data stored in the instrument to the evaluation PC. This process can be completed at any time, without affecting any current measuring process.

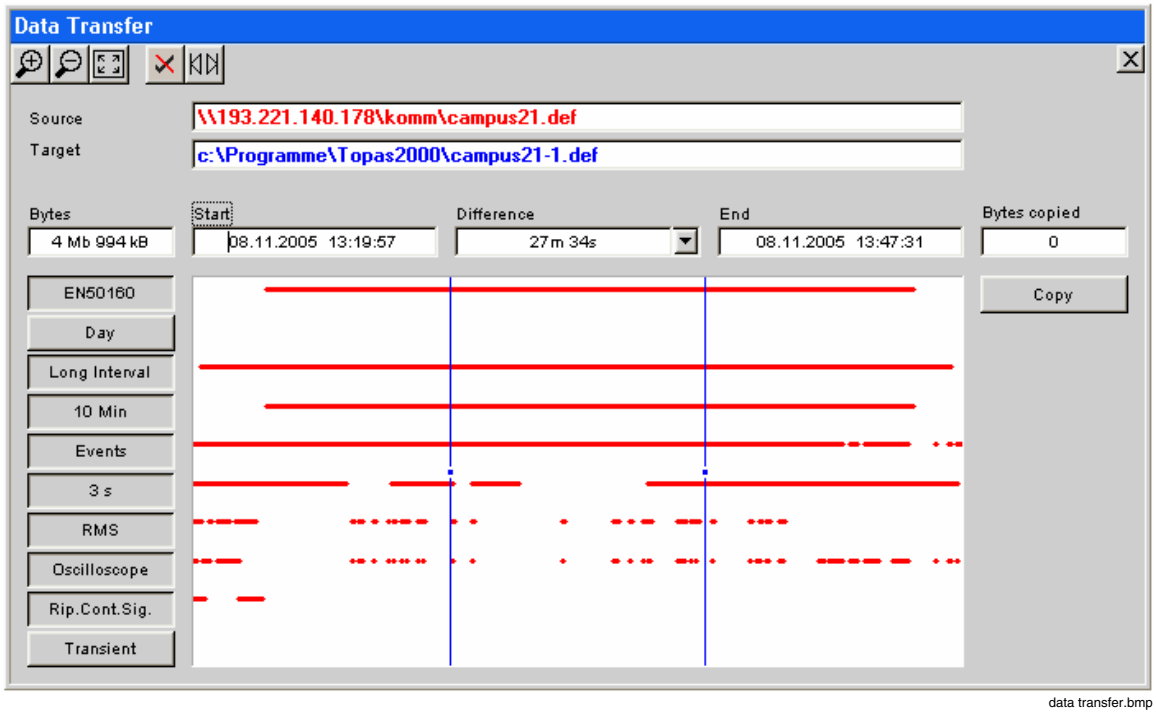
In the next window, specify the *target* directory.

Confirm with *OK*. The name shown in the *File name* field corresponds to the name of the *definition file* used for initialization.

You have however the option to enter a different name.



zielverzeichnis.bmp



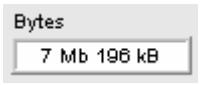
data transfer.bmp

The next window shows the source and target directory and their contents.

1. Select the desired recorded data
2. Choose the desired time period, using the two cursors. If several result files have been highlighted for copying, you can deselect a file by clicking it again.

Note

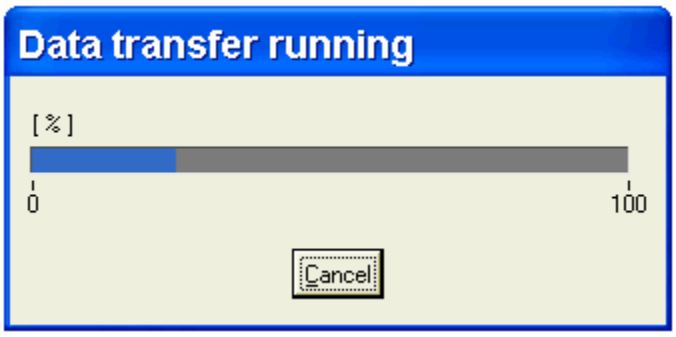
All virtual instruments are marked automatically if measurement data are available on the Fluke 1760. If you do not want to transfer data from a specific instrument deactivate it. Activation/deactivation of all virtual instruments is done with the icons  *and*  .



Shows the amount of data to be transferred.

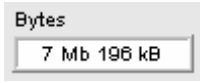
Transfers the data to the target directory of the evaluation computer.

A small message window shows the progress.



transfer-progress.bmp

Shows the data that has already been transferred.



To terminate the copying process, click *Cancel*.

Note

Data that has been transferred previously to the PC is not copied again, even if it is included in the 'Selected bytes'.

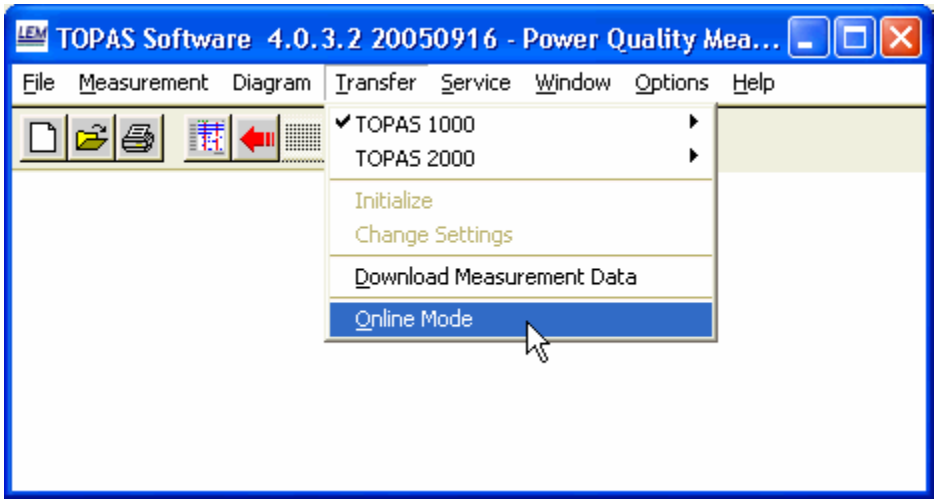
The Fluke 1760 measurement data are organized in blocks. The time cursors will very seldom be positioned at block borders. Therefore blocks are copied which are partially within the time period between the cursors to ensure to copy all required data. A little bit more data will be copied as have been marked.

Already copied data is indicated with blue lines below the red lines.

Evaluates the selected data.

Click this button to return to the data transfer window. Continue with selecting and transferring other data.

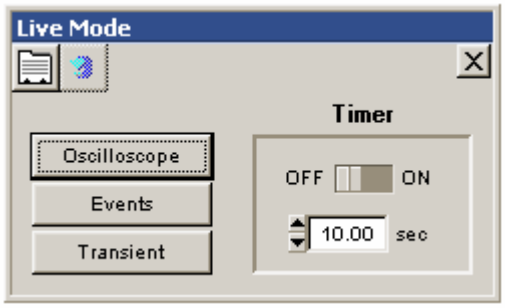
Transfer – Live Mode



transfer online.bmp

In Live Mode, the instantaneous values and frequency spectrums of the currently applied signals are displayed.

To activate the *Live* Mode, select *Transfer - Live Mode*.



online-refresh.bmp

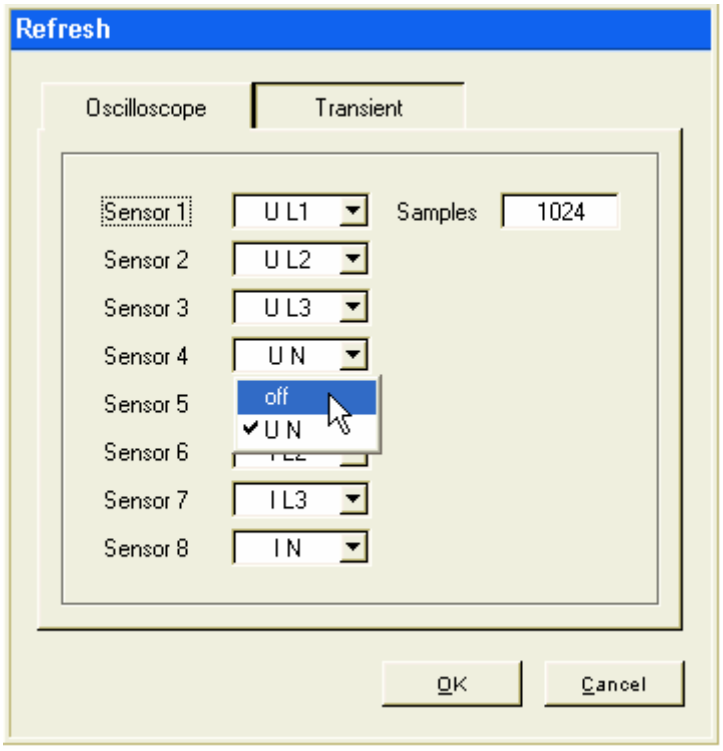
Retrieving new measurements

The retrieval of new measuring data from the instrument can be automated and timer-controlled (Timer ON) or started manually by clicking the  (Refresh) button.

Hardware settings for Live operation.

Note

These settings apply only to online operation.



online-refresh-hardware.bmp

Samples

Number of samples for a measurement.

1024 is sufficient for measurements in the power supply network.

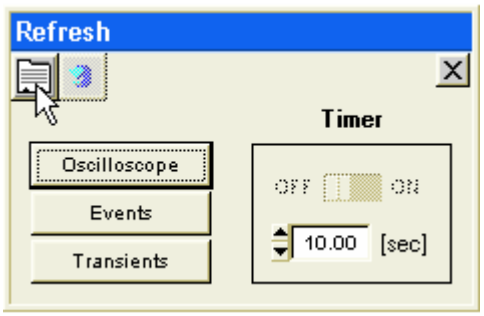
The number of *samples* determines the time required for the transfer of the data, the measuring time and the frequency resolution in the spectral analysis:

For Fluke 1760:

Samples	FrequencyResolution	Measuring Time
1 024	10 Hz	100 ms
2 048	5 Hz	200 ms
4 096	2.5 Hz	400 ms
8 192	1.5 Hz	0.8 s
16 384	0.625 Hz	1.6 s
32 768	0.3125 Hz	3.2 s
65 536	0.156 Hz	6.4 s

onlinerefresh-transienten.bmp

Oscilloscope Online View



Click the  button to evaluate waveforms.

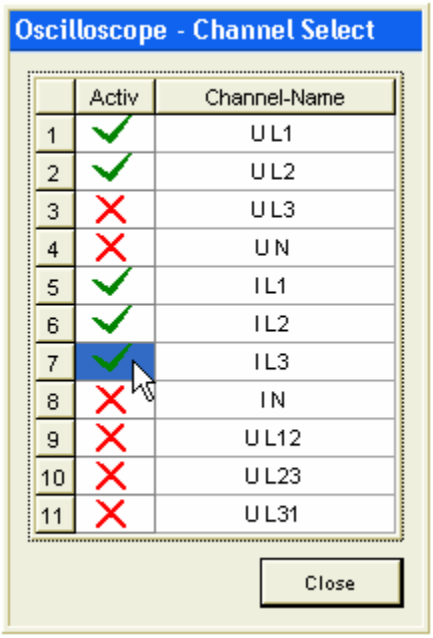
To retrieve new measuring data, click the  button.

Generate diagrams, using the buttons in the toolbar.

Voltages Currents

Select the channels for the diagram with the  button.

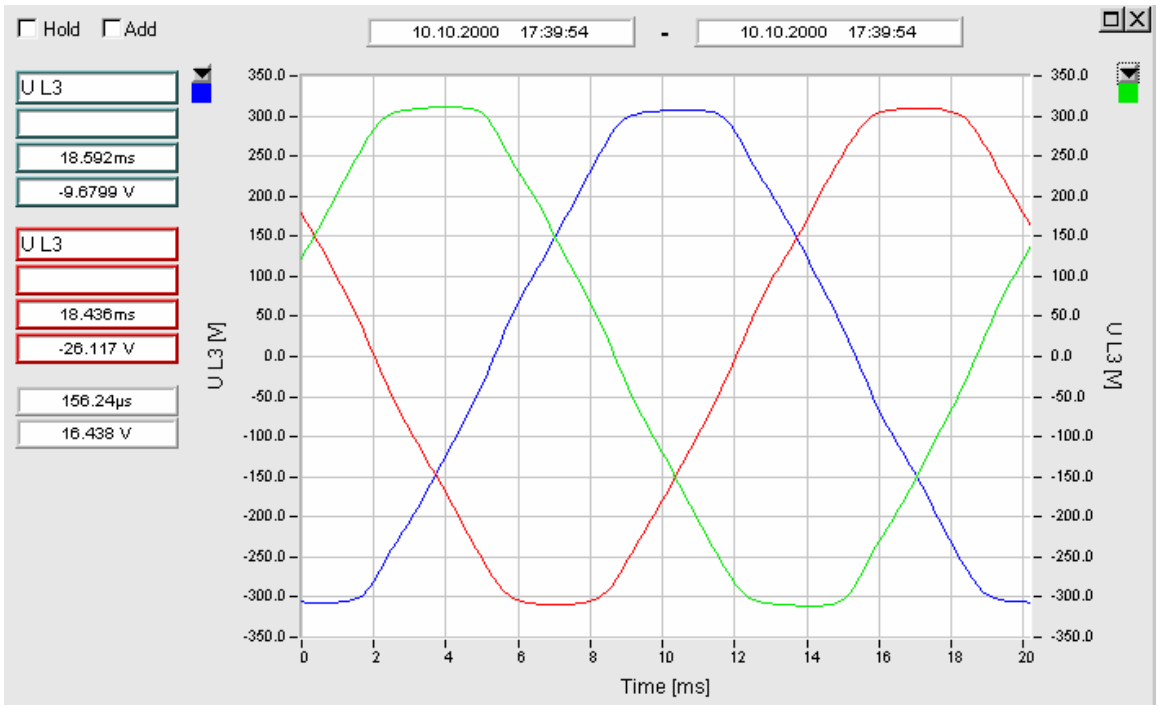
Use the *SHIFT* and *CTRL* keys for multiple selections as usual under Windows®.



Click a button in the toolbar to select the diagram type.

- Level-time diagram
- Frequency spectrum for voltage and current
- Vector graph for voltages and currents
- Mean values over a measuring interval, displayed in table format

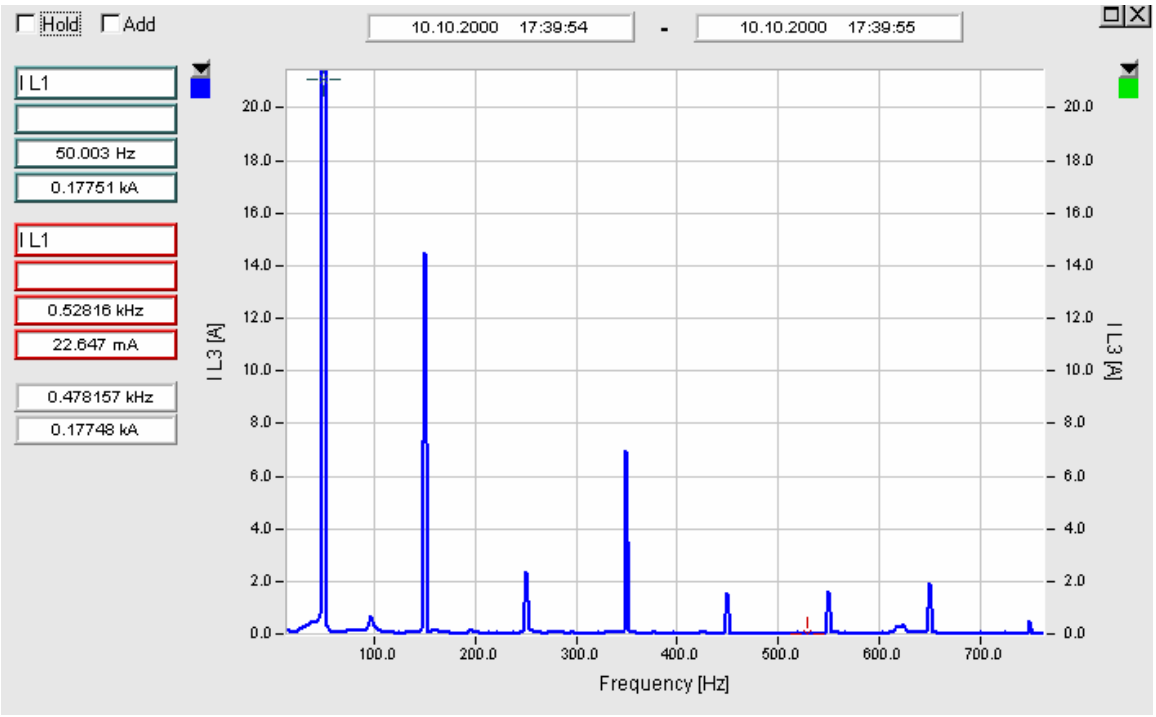
Time Plot Diagrams



online-spannungen.bmp

1. To include other variables in a diagram, check the *Add* box. 
2. Click again the button for *graphs*. 
3. Select the channel you wish to add.
4. Click the button to display the *graphs*. 

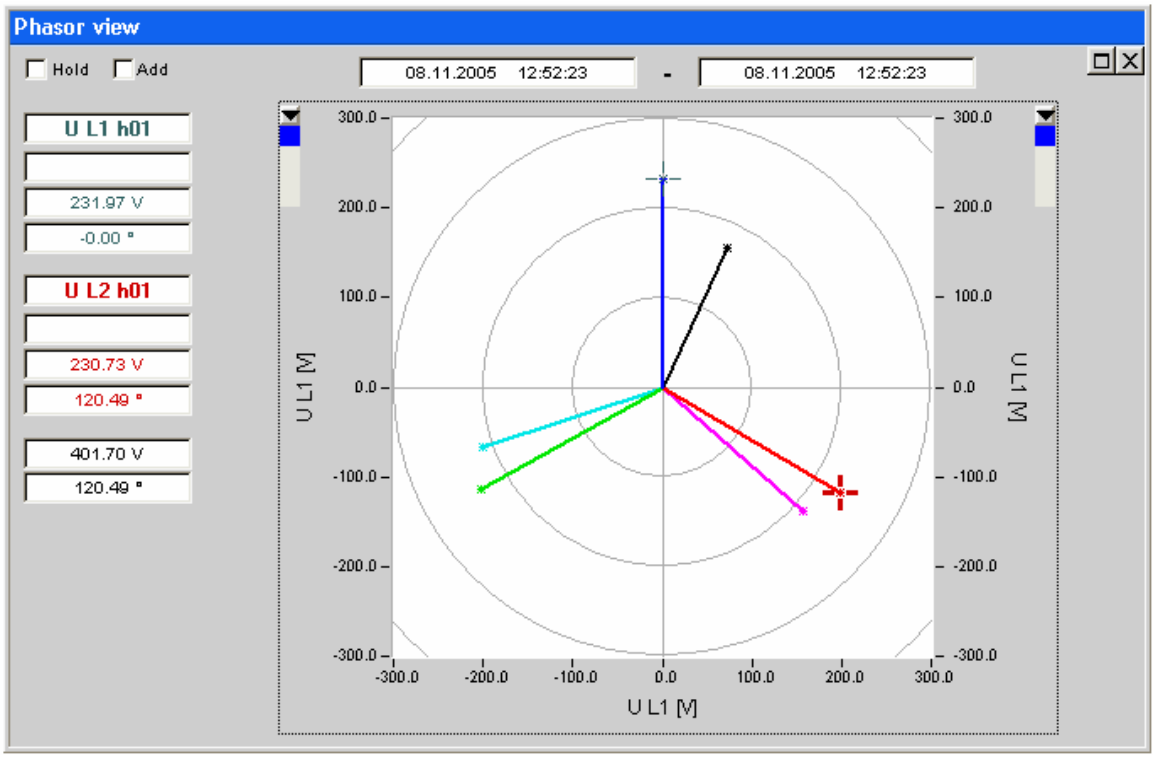
Amplitude Spectrum



spektrum.bmp

The amplitude spectrum of the selected graph(s) is displayed.

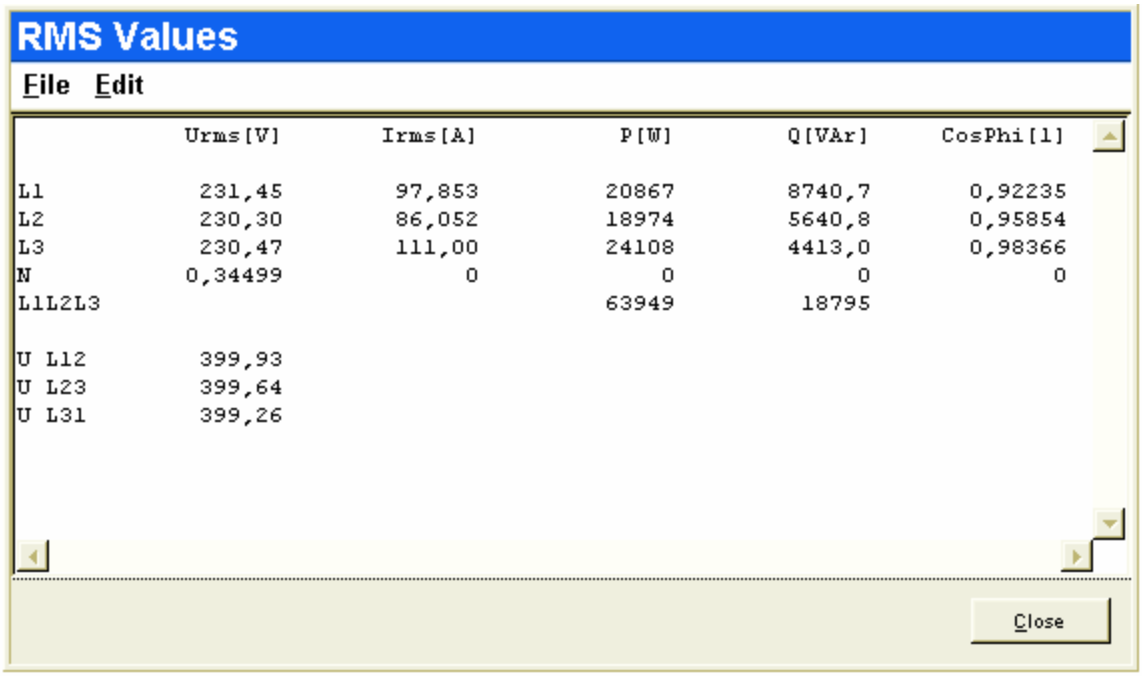
Vector Diagrams



zeigerdiau.bmp

The relation between phases for voltages and currents, as well as between different phases, is visualized and can be accurately quantified by means of the cursor.

Table of Mean Values



online-mittelwerte.bmp

Note

The list of rms values can be used to check whether the sensors are correctly connected.

Power Values

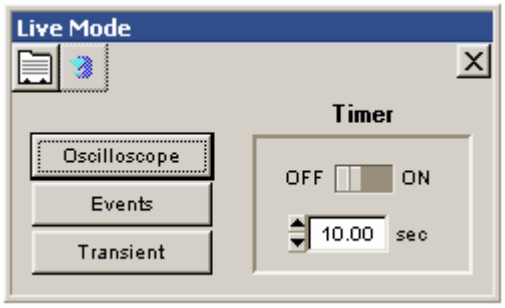
1. Click the button for *L1-L2-L3*  .
2. Click a button in the toolbar to select the diagram type:


Display Options

1. Frequency spectrum of active power P or reactive power Q
2. Vector diagram of the fundamental apparent power S
3. Mean values over a measuring interval, displayed in table format

Click the Refresh button  to manually retrieve the new measurements from the instrument, or activate the Timer (Timer ON) for automatic retrieval.

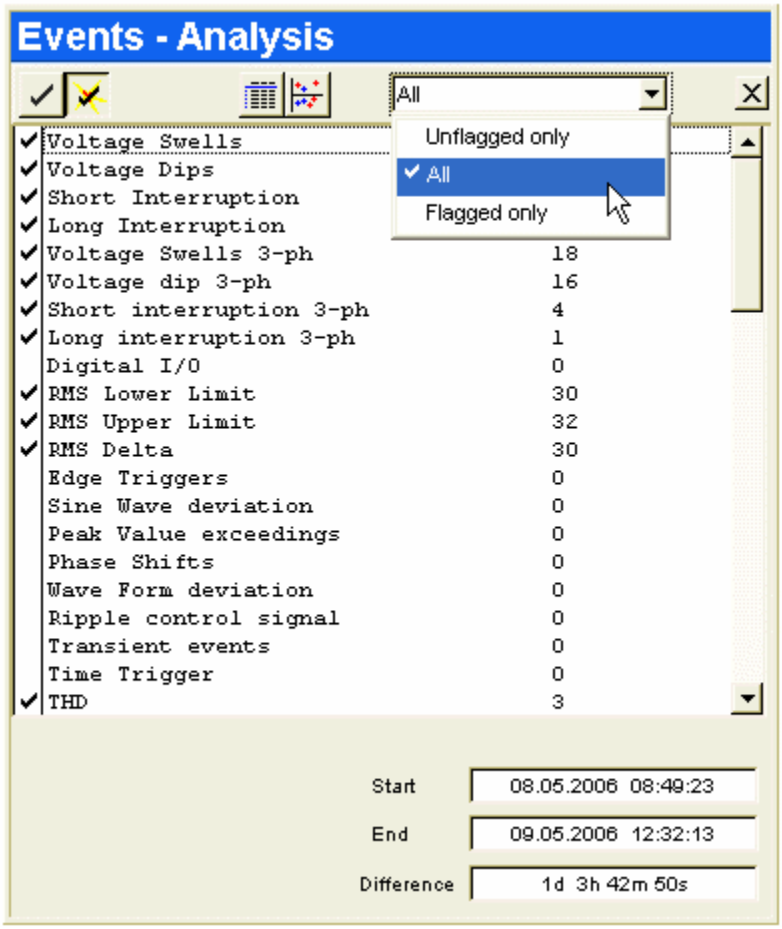
Live Mode Event Display



onlinerefresh-ereignisse.bmp

The Live Mode event display shows all active events and enables users to optimize the *trigger limit* settings.

Click the *Event* button in the *Refresh window* to view the events that are currently active. Completed events are not displayed. The active events can be viewed as an *event evaluation*  in the form of a list, or as entry in the *CBEMA diagram*  .



ereignisübersicht.bmp

Click the Event list button  to view the related details for active events.

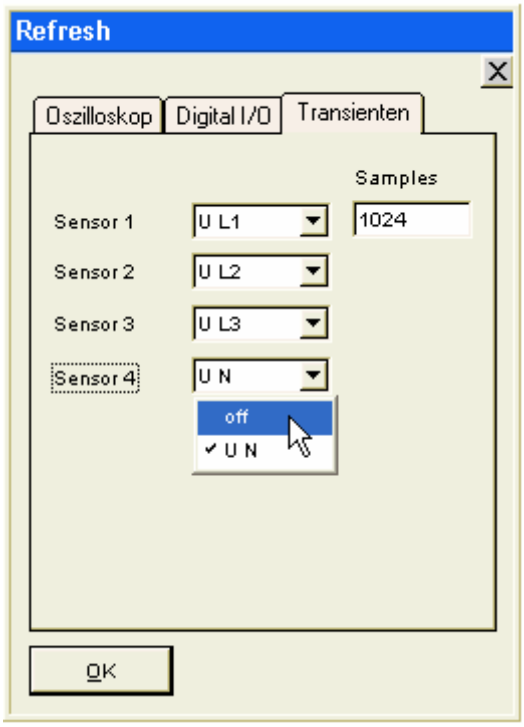
Note

Active but not yet completed events are listed without duration.

Double clicking on an event opens all associated recordings in appropriate diagram windows.

Transient Online Mode

This window shows the current instantaneous values and frequency spectrums.



onlinerefresh-transienten.bmp

In the Online Hardware Settings – Transient Analysis window, select the channels you wish to display, and the number of measured samples per measurement. The duration of the measurement depends on the set sampling rate.

The sampling rate can be adjusted in Settings – Recording Modes to a value between 100 kHz and 10 MHz.

Note

This function is only available, if a transient option is installed. Sampling frequencies of > 500 kHz require a permission code.

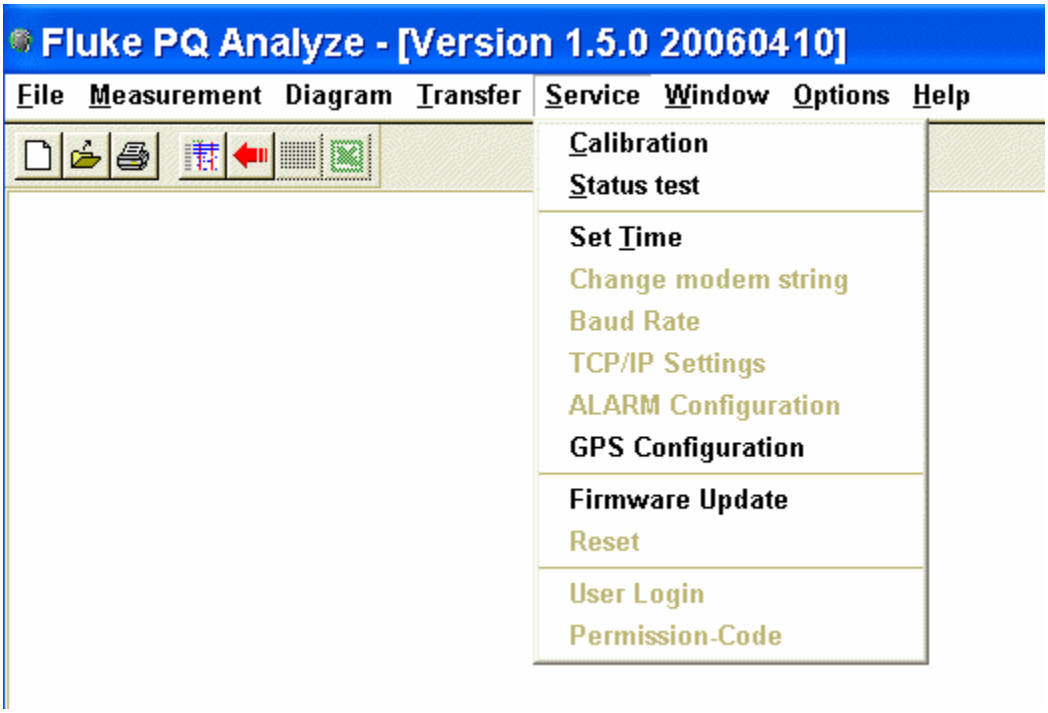
The number of samples determines the duration of the data transfer, as well as the frequency resolution of the spectral analysis.

It is therefore recommended to switch off (

) channels that are not used.

The variables are displayed as described in chapter Level-time diagrams.

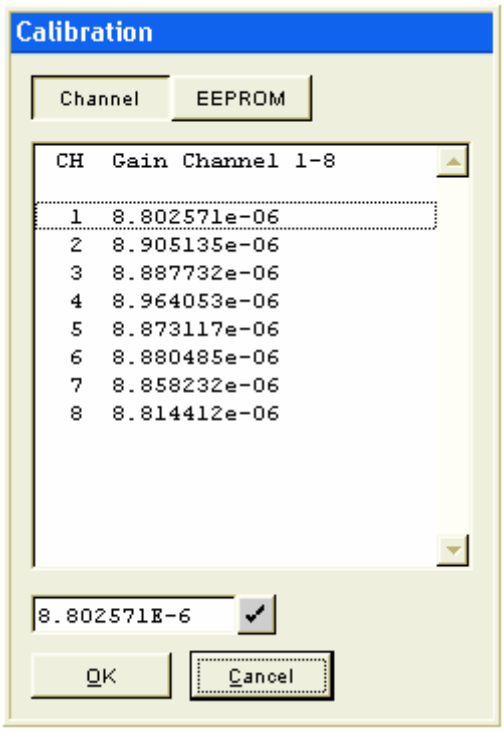
Menu: Service



menu service-cal.bmp

This menu allows users to view and adjust the basic instrument settings.

Service – Calibration



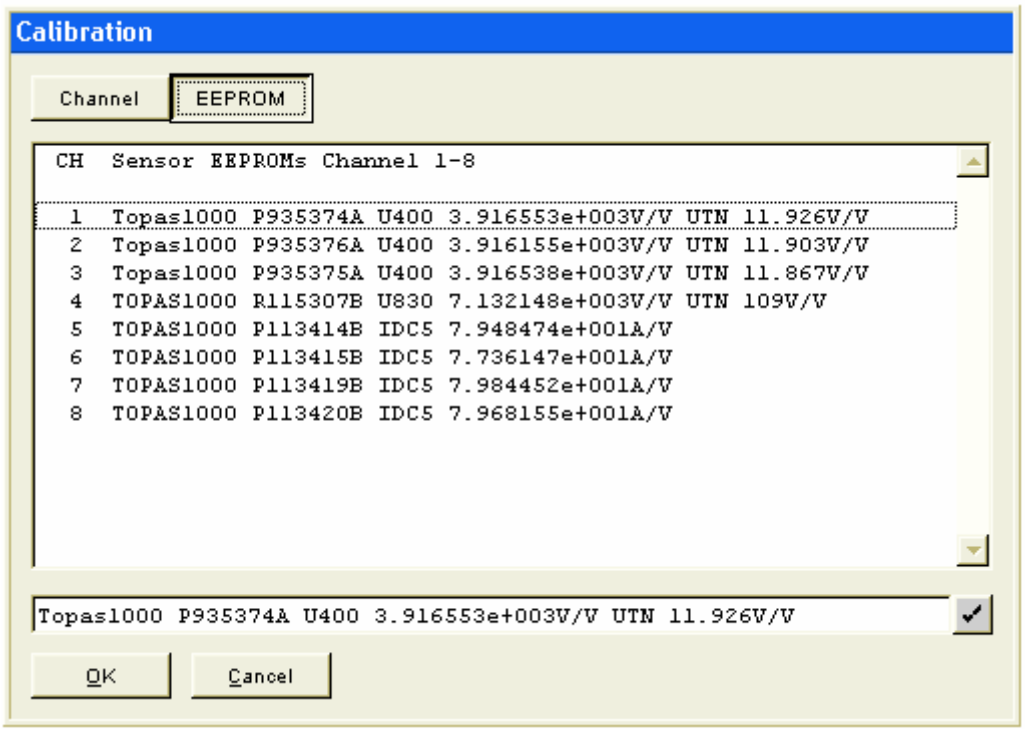
calibration.bmp

With this function, you can view the gain factors of the eight channels CH1 to CH8, and the calibration data stored in the sensors.

Note

The gain factors may not be changed, as they determine the accuracy of the instrument.

To view the calibration data of the connected sensors, click the EEPROM button:

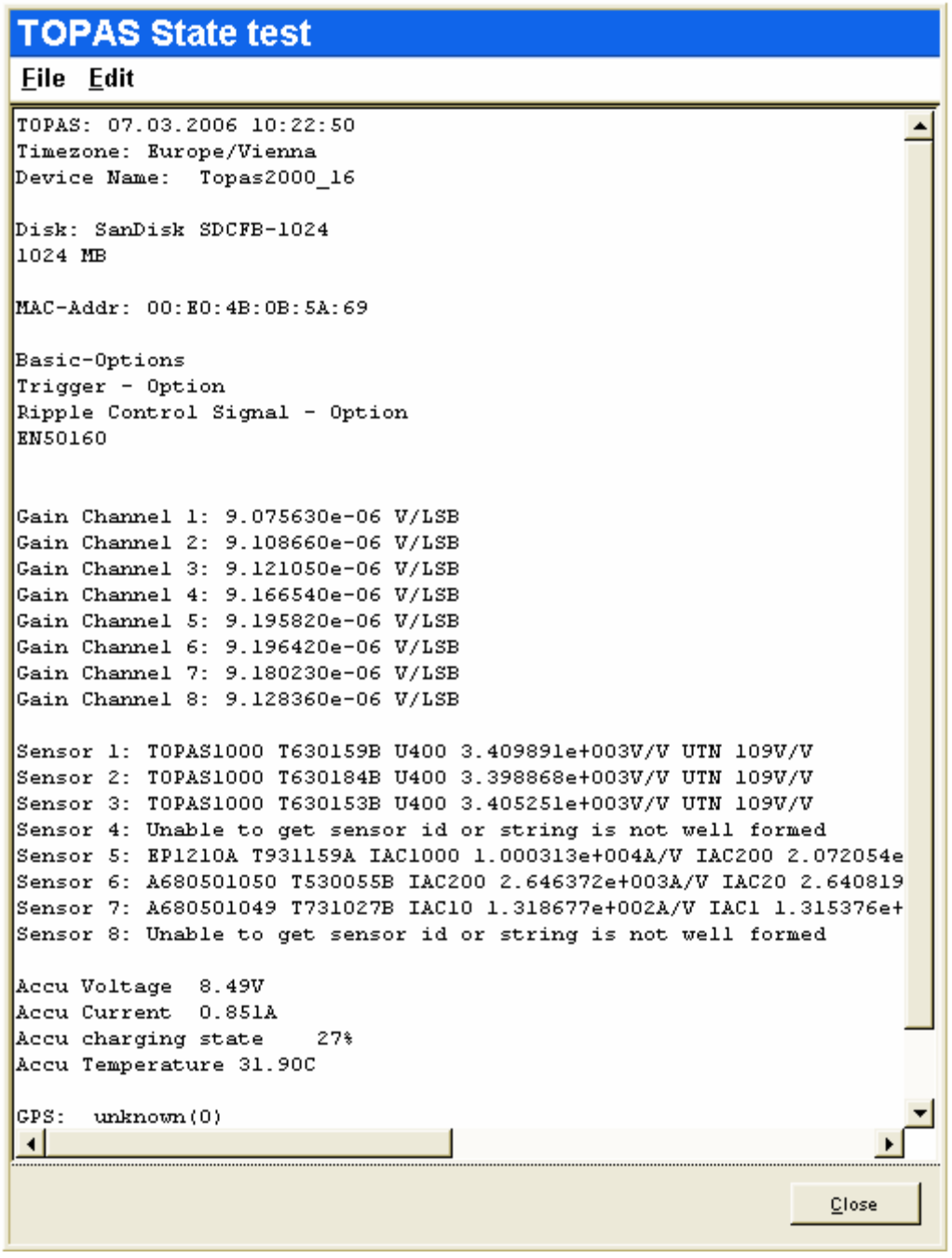


calibration eeprom.bmp

Note

The identification string of a sensor cannot be modified or, the device might not be detected by the instrument any more.

Service – Status Test



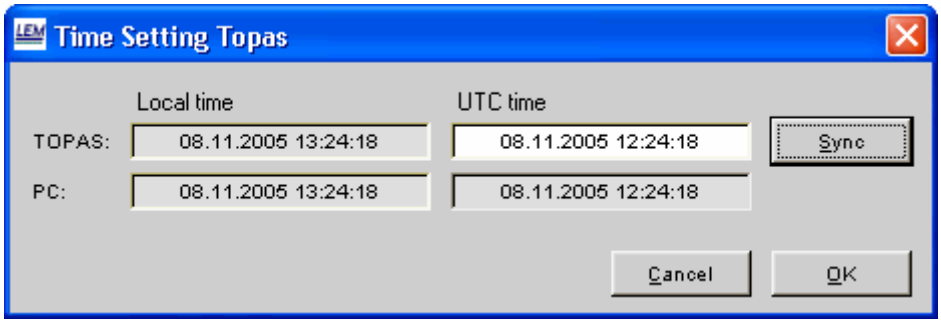
statustest.bmp

This status test assesses and displays the following information about the instrument:

- System time and time zone of instrument
- Time zone
- Device name
- Type of data storage medium

- MAC address
- Options installed at instrument
- Gain factors of measuring channels
- Valid connected sensors
- Battery: voltage, temperature, current, capacity
- Status of the GPS-option

Service – Set Time



uhr.bmp

Local Time: Shows the current PC time.

Instrument time: Shows the current instrument time

Synchronize:

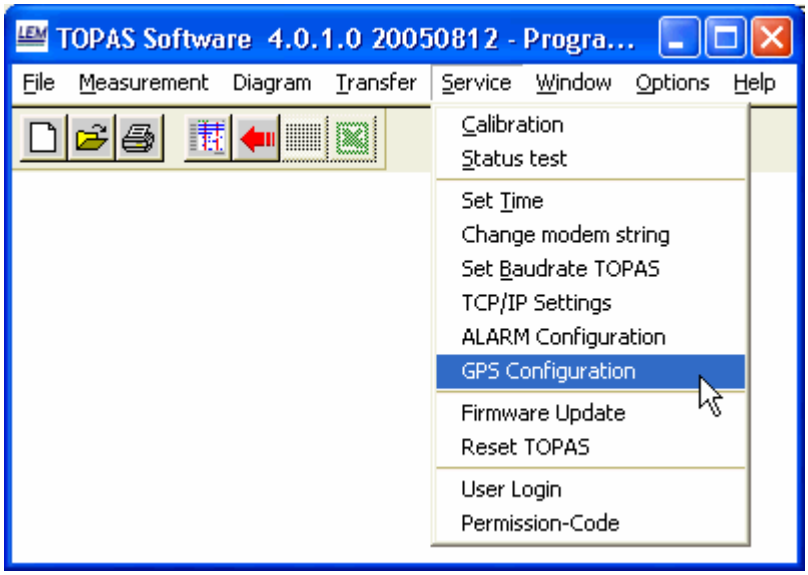
Click the Sync button to apply the PC system time to the instrument.

OK:

Click OK to transfer the current time to the instrument and to close the window.

.

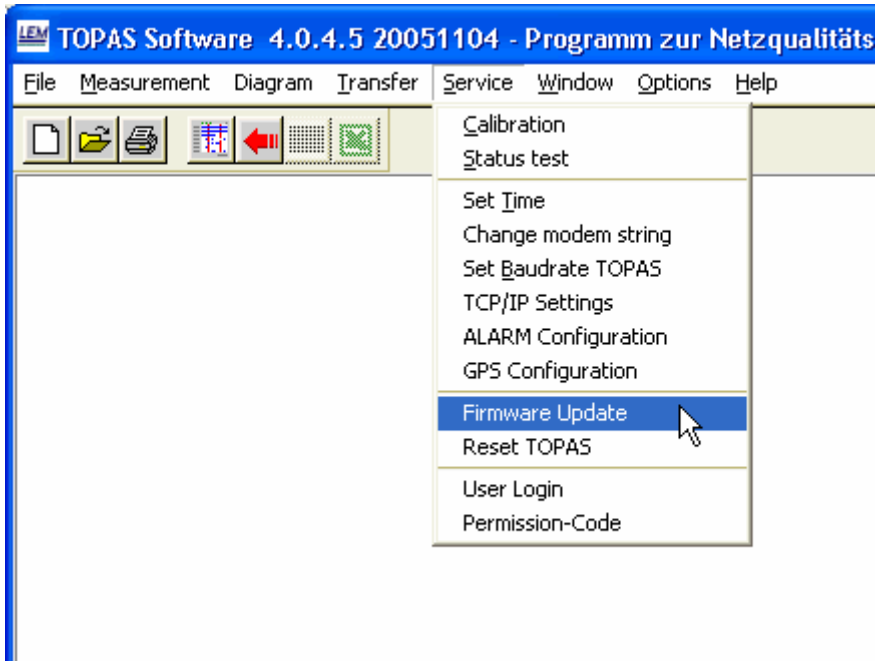
Service – GPS Configuration – for GPS Option



gps-1.bmp

For details, see chapter Options – GPS time synchronization.

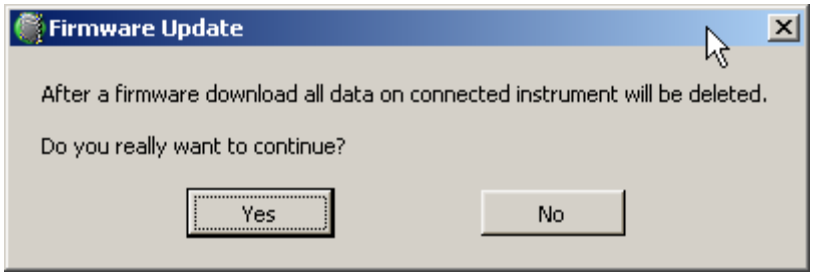
Service – Firmware Update



firmware update.bmp

Upgrades of the firmware can be installed on the Topas. The latest firmware is always supplied as a part of a new evaluation software package (i.e. included on supplied CD-ROM).

There is a warning message to avoid inadvertent loss of data.



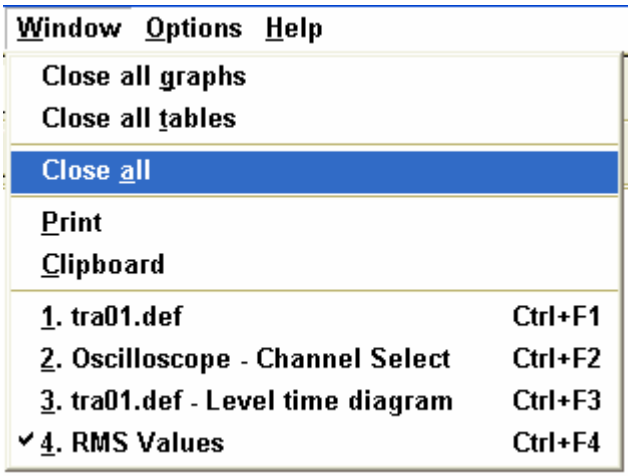
warnung-installation.bmp

Note

To ensure trouble-free operation, ensure that the versions of the software installed on the instruments and the PC are identically.

Menu Window

Window – List



menü-fenster.bmp

For ease of use there are items to close all windows of a certain kind:

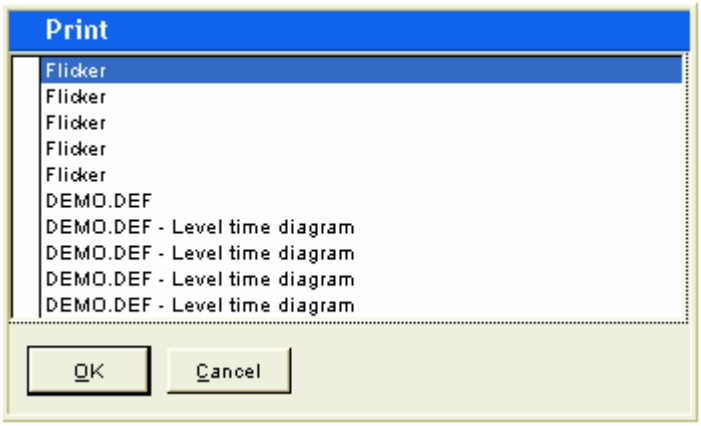
- *Close all graphs*
- *Close all tables*
- *Close all*

This is very useful if many evaluation windows are open and have to be closed at once.

Window – Print

Select menu option Print in the Window menu to view a list of all open windows.

Select all windows you wish to print and confirm with OK.



prin1.bmp

The Window menu includes a list of currently open diagram windows.

By clicking an entry in the list, the associated diagram is displayed in the foreground.

Window – Clipboard

The window contains a list of currently open windows.

You have the option to select a window and to copy it to the clipboard. In this manner, you can export evaluations (diagrams), events and trigger settings to an MS Word® or MS Excel® file.

Note

You can only copy one window at a time to the clipboard.

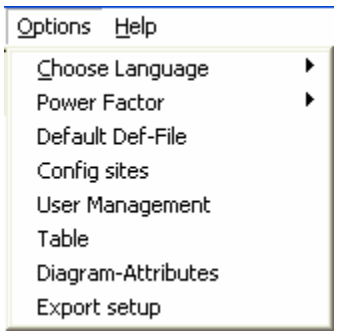
The Window menu includes a list of currently open diagram windows.

By clicking an entry in the list, the associated diagram is displayed in the foreground.

Menu: Options

Options

This menu allows you to enter the required basic settings as regards user interface, data administration and output formats.



optionen.bmp

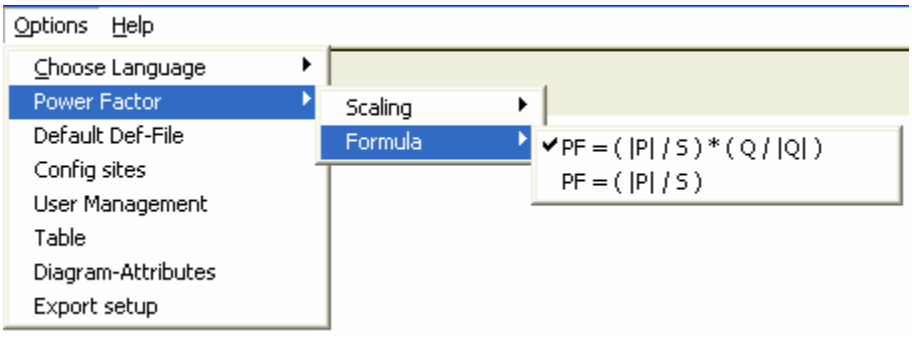
Options – Choose Language

Language Selection

Select this menu option to select the language of the user interface.

Options – Power Factor

There are different algorithms for calculation of the power factor depending on the application. Select the appropriate formula.



leistungsfaktor-formel.bmp

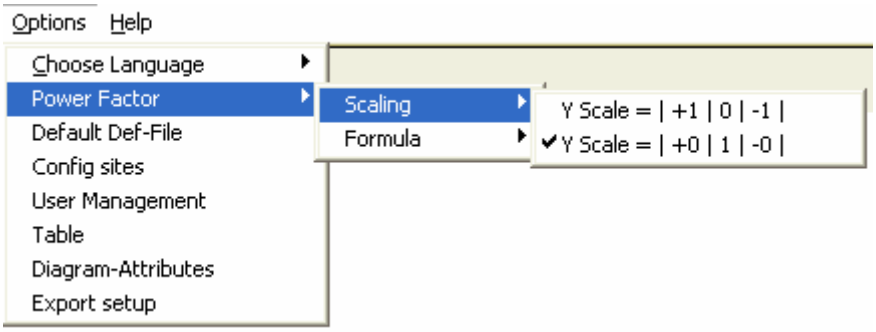
Note

Select the required formula before you open the measurement data file.

In the first formula, the sign of the reactive power Q defines the sign of the power factor. According to the load type (inductive or capacitive) the sign of the power factor changes.

The second formula is the classical definition. The sign is always positive, independent of load type and direction of power flow.

Additionally the scaling of the diagrams can be defined.



leistungsfaktor-skalierung.bmp

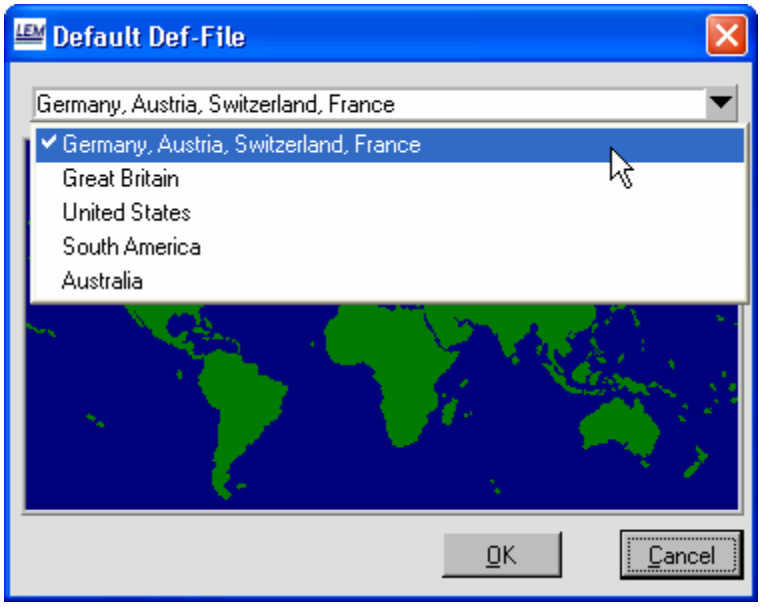
Note

Select the required formula before you open the measurement data file. The second scaling method is optimal if the power factor fluctuates permanently around +/-1. Then the diagram is not overcrowded with vertical lines.

The second type is commonly used in power metering applications in energy distribution.

Options – Default Definition File

Select here the Default.def files you want to use in connection with menu option File – New, e.g. euro.def. These templates have been customized to suit the different regions (for example, in the United States f= 60 Hz).



defaultdef.bmp

These files are supplied with the program and are located in the vdf_10 directory. Adjust the template by setting the limit values to suit your needs. Save the amended file under the old name, so that it will be opened as the standard template.

Note

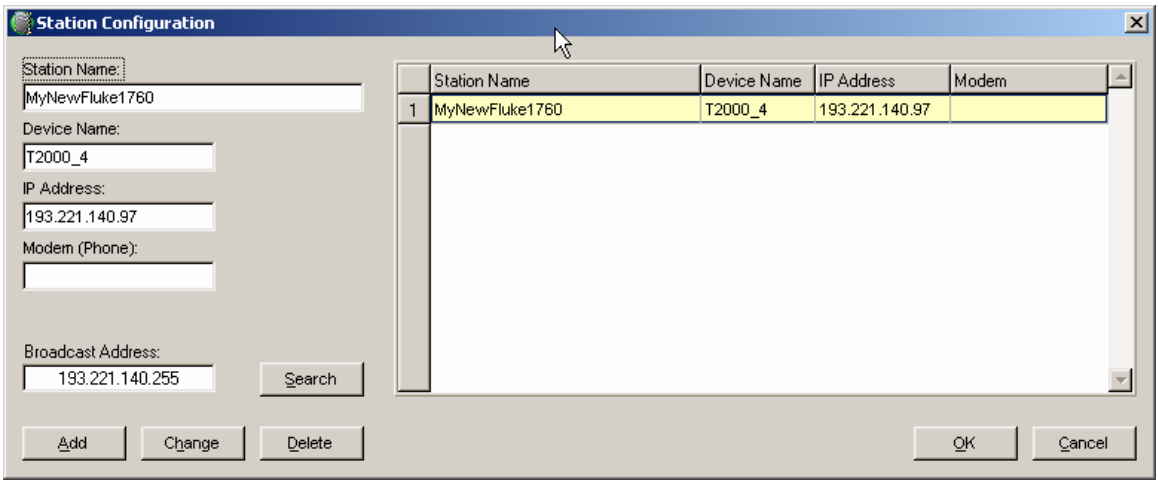
Before amending templates, we recommend to make a backup of the original files.

Options – Configure Sites

The menu option allows you to assign station and instrument names to your devices. These names can then be used when establishing connections to the instrument using the Transfer menu (see chapter Menu: Transfer).

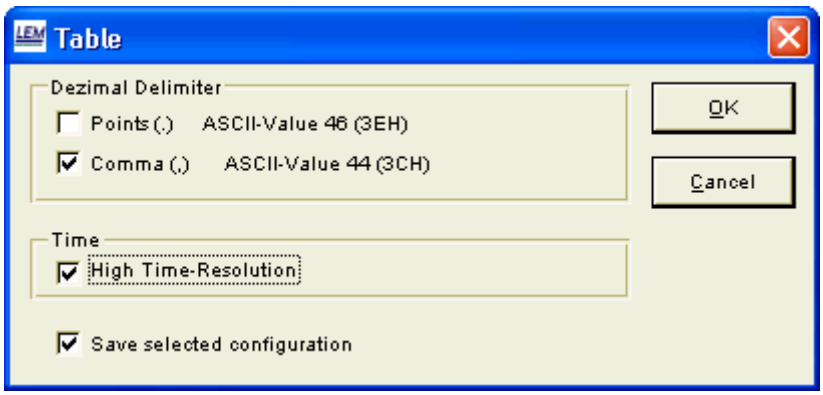
Enter all information re your instrument:

- Station name
- Device name
- IP Address
- Phone number of the modem if available
- Broadcast address



stationsliste.bmp

Options – Table

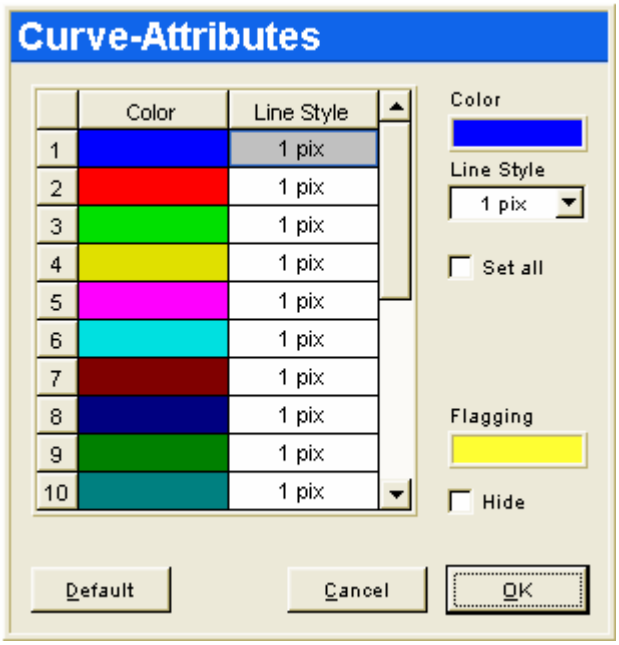


optionen tabelle.bmp

Principle

Selection	Description
Decimal delimiter.	With this option, you can define the format of export tables for transfer to spreadsheet programs (text file). In the various countries, a comma or a full stop are used as a decimal separator Ensure that your settings in this window correspond to those of your spreadsheet program
High time resolution	If this option is checked, fractions of seconds are shown, where appropriate. This is useful regarding events
Save selected settings	The settings are saved as defaults and remain thus active even after a restart of the system

Options – Diagram Attributes



opt_kuven_attribute_a.bmp

Each graph is assigned a color and line thickness. The settings are saved as defaults and remain thus active even after a restart of the PQ Analyze software. If we check the Set all box, this Line Style is used for all curves, which makes settings easier.

Define the color for marking of flagged intervals in the field Flagging.With the option Hide activated, the shading for flagged data will not be visible any more.

Options – Export Configuration

The PQ Analyze application software can be used to generate freely configurable measurement reports in MS Excel®. In a further step, such files can be processed with a macro (supplied with the software) to create reports in MS Word®, which are based on predefined templates.

Advantages

The templates must only be formatted and configured once, and later for consistently formatted reports.

- Reports showing the latest measurements can be generated with a click of a mouse button
- First, you must define the variables to be exported and save this information in a configuration file

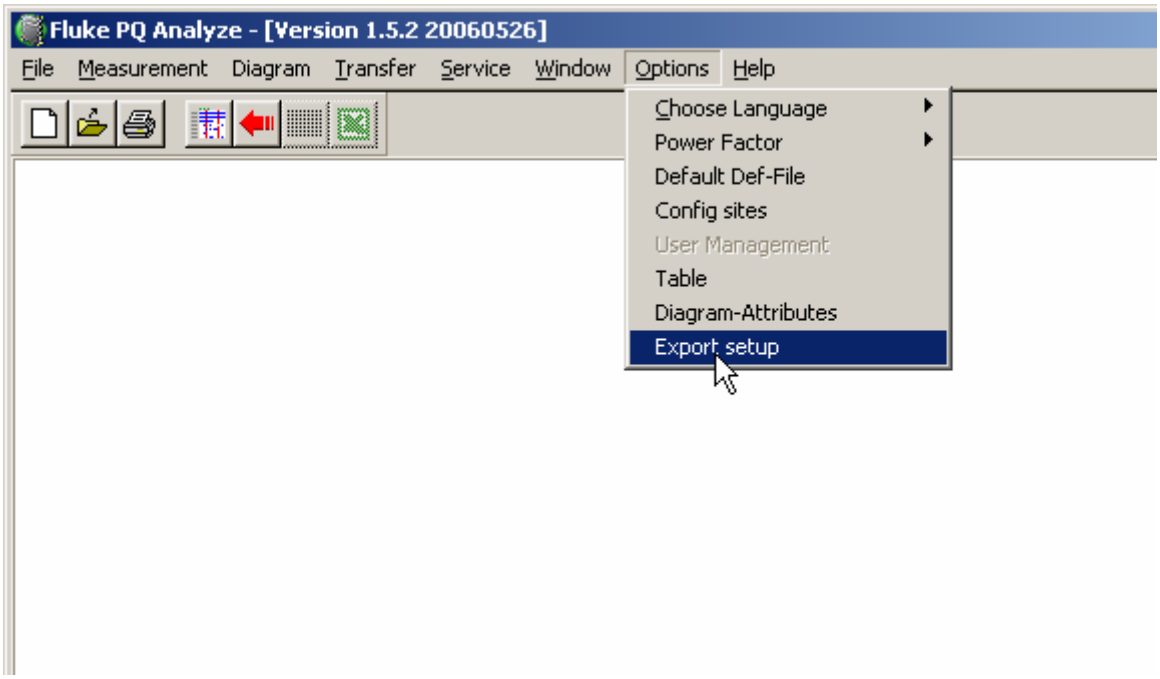
The system supports customized reports containing design elements in MS Excel®.

- Using the supplied macro, you can then generate the final report in MS Word®, based on such a temporary MS Excel® file

The final report includes all basic instrument settings and all diagrams from the MS Excel® file. The position of the various elements is defined by means of placeholders, e.g. #pic1# in the template.

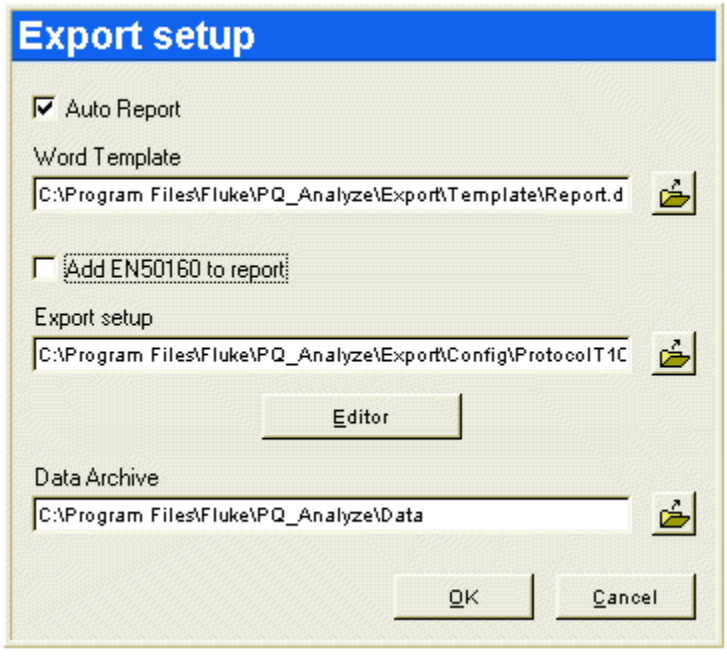
Define Export Configuration

Select Options – Export Setup



exportkonfiguration.bmp

In the Export setup dialog, enter the file names for the export file (configuration of variables) and the MS Excel® file to which the data is to be copied.



exporteditor.bmp

The option Auto Report creates the intermediate MS Excel® file and automatically invokes the procedure for creation of the final MS Word® report based on the provided Word template.

Activation of the option Add EN50160 to report provides that the graphical EN50160 summary is inserted in the final measurement report.

The supplied MS Excel® and MS Word® files are write-protected.

- Please, make a backup of these files and work only with copies
- Save files containing data under a different name

Files ProtocolT1000.ini and Protocol_empty.ini are not write-protected and can thus be used at once for setting up the export configuration.

By default, the files necessary for this procedure are stored in the C:\Program Files\Fluke\PQ_Analyze\Export directory:

Configuration

ProtocolT1000.ini

In the ProtocolT1000.ini file, define and save the measurement parameters for export. File ProtocolT1000.ini already contains a number of useful variables. Alternatively, use the blank Protocol_empty.ini file.

EXCEL Makro

Export_to_Word.xls

The program includes two pre-formatted MS Excel® files:

With the ExportT1000.xls file, you can export measurements into MS Excel®.

The Export_to_Word.xls contains a macro for the subsequent transfer of the evaluation diagrams into an MS Word® files.

Data Archive

Enter the path of measurement files. The archive also contains the MS Word® templates for final reports.

The Report.doc file is the template for a report containing the measurement configuration and all exported diagrams. The data is imported from string #settings# in the sequence in which it is displayed in the MS Excel® file.
The ReportExt.doc file contains a number of placeholders for the positioning of diagrams, tables and labels.

Name	Description
#settings#	Placeholder for the settings.
#table1#, #table2#:	placeholders for tables (diagram legends
#pic1# #pic2#, etc.	placeholders for diagrams that are inserted as graphics

The Report_2Spalten.doc file is formatted in such a way that the diagrams appear in two columns in the report.

The file names can be entered manually or selected by browsing with  .

The selected file names are saved when the window is closed and are subsequently used for the export of data.

The Export Editor

1. Open a Fluke 1760 measurement data file.

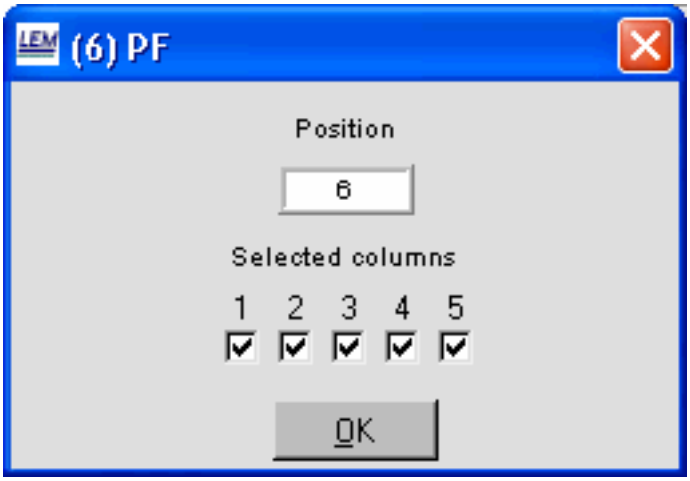
2. Open the export editor, using Editor in the menu *Options/Export Setup*
3. The export editor contains lists of the already defined variables.
4. Expand list by clicking the + symbols (similar to the Windows® Explorer). Figures in brackets after the variables indicate the column position of the respective measurements in the MS Excel® table.

Note

The number does not correspond to the column number but to the sequence of export. Many variables are actually displayed in several columns (e.g. time and 3 phases, shown in 3 columns).

Position — Opens a dialog where the position number of the variable and the number of columns to be exported can be edited.

If the new position number corresponds to a number that is already assigned to another variable, all subsequent numbers are incremented by 1. This allows for the insertion of a variable at any chosen position.



exporteditpos.bmp

One variable may be displayed in 1 to 5 columns.

Example:

Power factor PF:
column 1: time; column 2: PF phase L1; column 3: PF phase L2; column 4: PF phase L3.

Normally, all data relating to a variable is exported, including time axis and all value axes.

For the export of several variables measured during the same interval, it might be useful to import the time axis only once.

If the time axis of some of the variables is hidden, these respective graphs are combined into one diagram. If the time axis of the variables is not hidden, a separate worksheet is set up for the diagram.

Users also have the option to omit individual phases.

Click Delete to remove already configured values from the list.

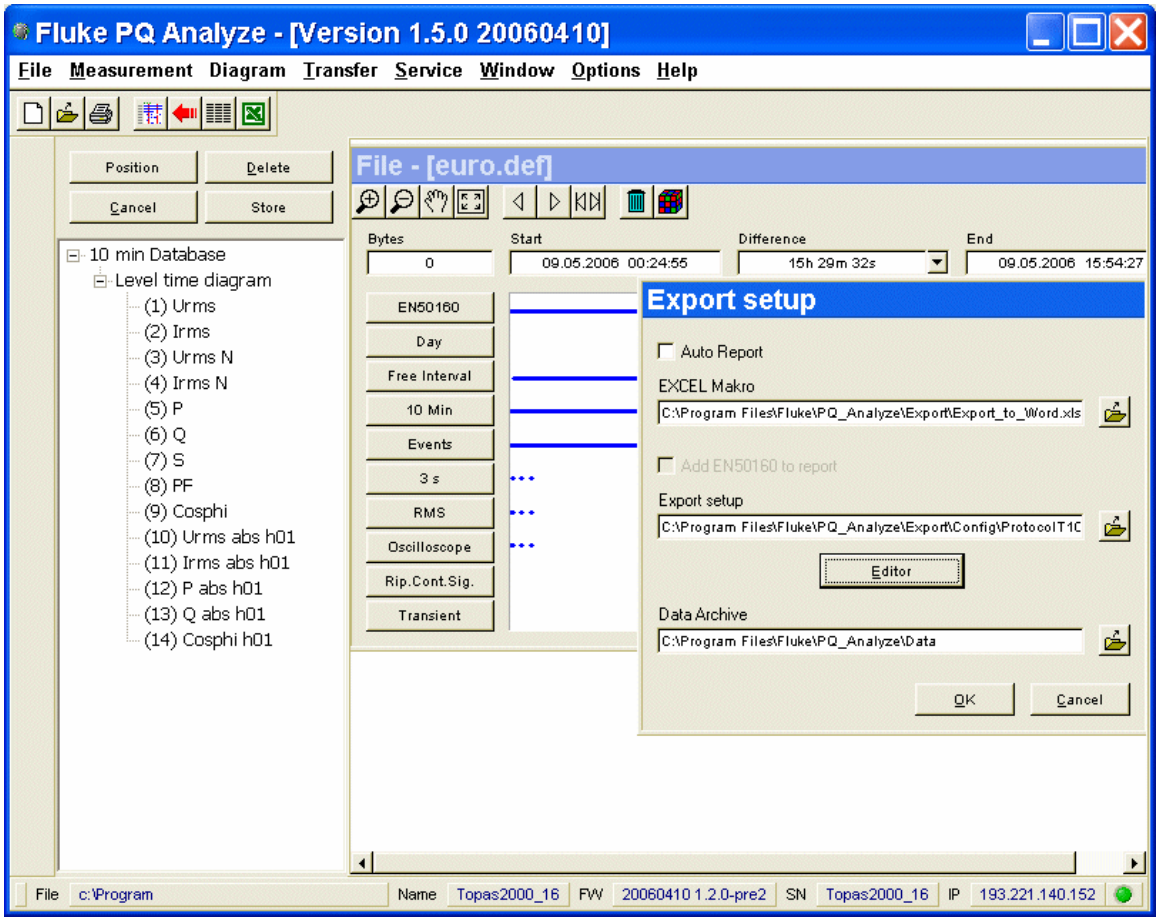
Click Cancel to close the export editor without saving the changes made to the configuration.

Click Save to save the changes made in the configuration to the selected file and to close the export editor.

Adding New Parameters

The logic of the export editor is similar to that of the macro tool in MS Office® applications.

If the export editor is activated, each evaluation carried out with the loaded measurements results in a new entry in the list.



exporteditmw.bmp

Procedure

1. Open measurement and select time period in the evaluation window
2. Select variable  .
3. Select averaging mode 

4. Select evaluation  .

The program returns a diagram and a list entry for the respective variable.

1. In Position, hide columns you do not wish to display (for example, time for other variables).
2. Select the next variable.
3. Save the protocolT1000.ini file by clicking 

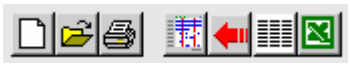
.

Report Generation

To create reports, we have to prepare a configuration file (see previous chapter) and create an MS Excel® file into which the data is exported, e.g. the supplied Export.xls file.

If a measurement file has been loaded, all variables included in the configuration file can be exported by a simple mouse-click.

However, you must first select the period for the export.



Starts the Excel report generator

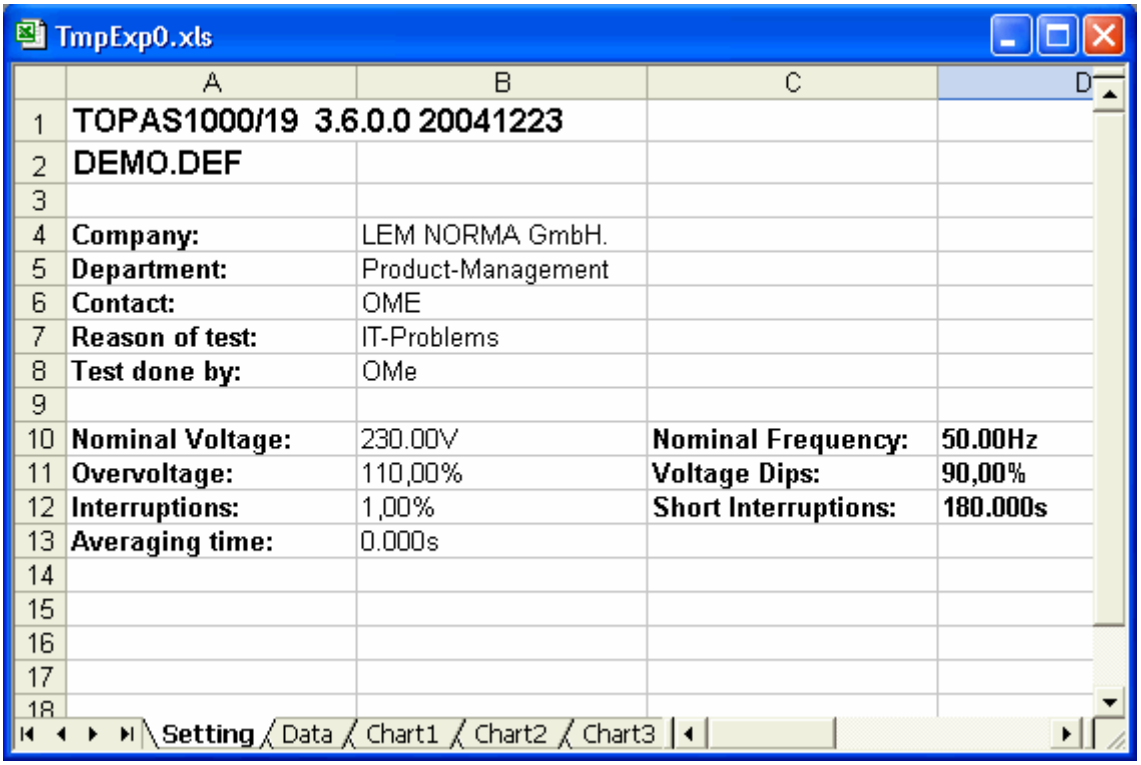
Alternatively you can also create an ASCII Report:

Starts the ASCII report generator

MS EXCEL® Reports

1. Select measurements.
2. Select time period.
3. Create or select configuration file.
4. Click Excel Export  in the standard toolbar.

MS Excel® is started and the temporary file TmpExp0.xls is generated: The variables are imported into worksheets. The number of rows is determined by the number of exported time intervals.


TmpExp0.xls

	A	B	C	D
1	TOPAS1000/19 3.6.0.0 20041223			
2	DEMO.DEF			
3				
4	**Company:**	LEM NORMA GmbH.		
5	**Department:**	Product-Management		
6	**Contact:**	OME		
7	**Reason of test:**	IT-Problems		
8	**Test done by:**	OMe		
9				
10	**Nominal Voltage:**	230.00V	**Nominal Frequency:**	**50.00Hz**
11	**Overvoltage:**	110,00%	**Voltage Dips:**	**90,00%**
12	**Interruptions:**	1,00%	**Short Interruptions:**	**180.000s**
13	**Averaging time:**	0.000s		
14				
15				
16				
17				
18				

Setting | Data | Chart1 | Chart2 | Chart3

excel-export.bmp

Note

The export might take some time, depending on the number of selected time periods and parameters.

Worksheets	Contents
Settings.	File name user texts important measurement settings such as limit values and conversion factors of the channels.
Data	Measurements organized in columns as defined in the configuration file. The number of rows is determined by the number of exported time intervals. The next sheet is labeled Chartx and contains diagrams (with legends, etc.) for each variable.

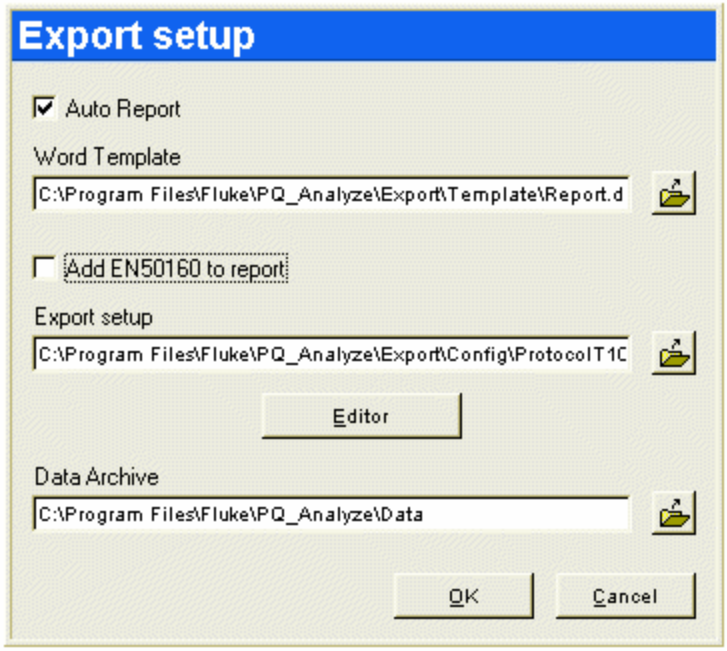
This MS Excel® sheet can be saved under a different name. You also have the option to generate charts for any series of measurements in the file using the MS Excel® chart tools.

Note

If the variables that are specified in the configuration file are not available in the export data, blank columns are inserted at the respective positions in the MS Excel® worksheet. The positions of the columns are thus not adjusted.

MS Word® Reports

In the export configuration, select the Export_to Word.xls file (included in software) as the target file for the export. This file contains a macro that allows you to generate perfectly formatted MS Word® reports at the click of a button.



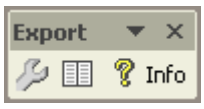
exporteditor.bmp

1. Open the measurement file.
2. Select a time period, using the red cursors.
3. Click the Excel Export button in the top toolbar.
4. The Export_to_Word.xls file is opened in MS Excel®. It contains a macro and a temporary file TempExp.xls, which is the actual report to be exported to MS Word®.

The first worksheet is named Settings and contains the file name, user texts and the important measurement settings such as limit values and conversion factors of the channels. The second sheet is labeled Data and contains the measurements values organized in columns as defined in the configuration file.

In addition to these two sheets, there is a separate worksheet labeled Chart xxx for each diagram. The number of rows is determined by the number of exported time intervals.

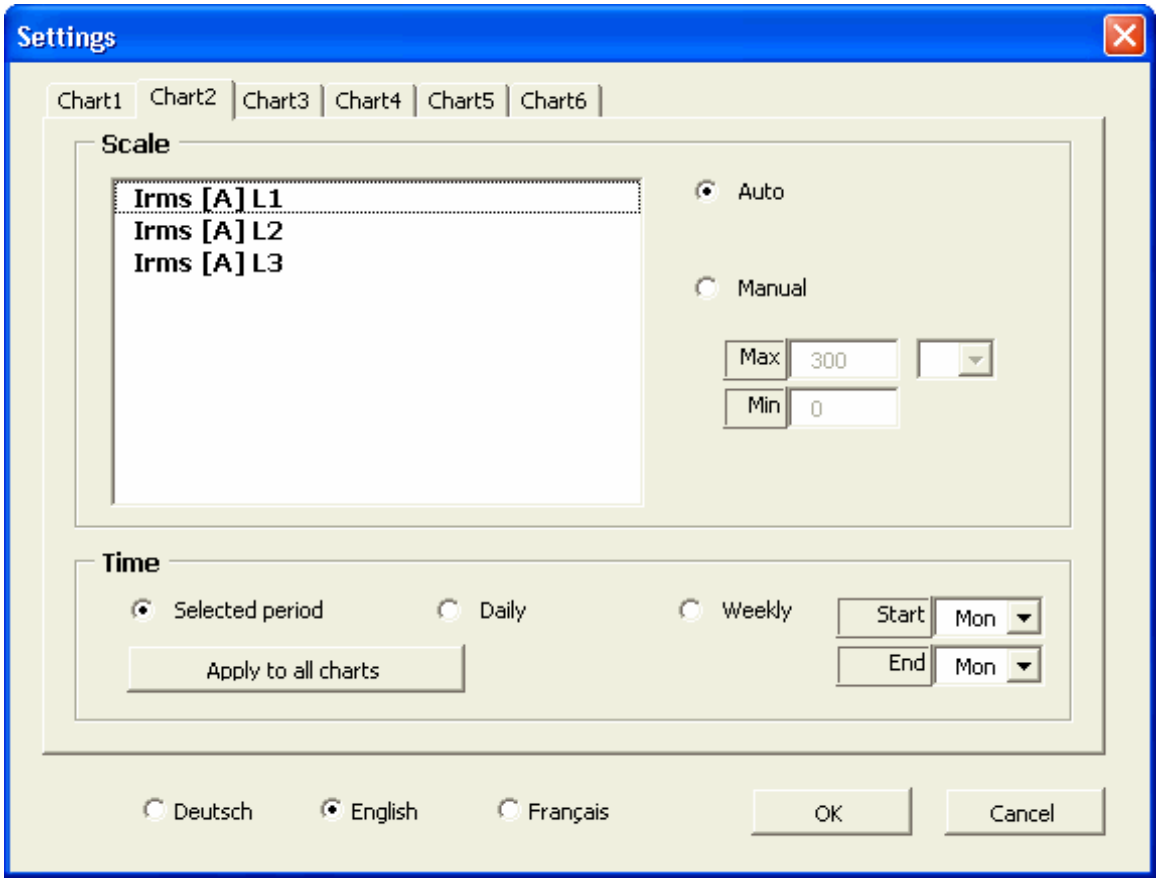
The worksheet window includes the following toolbar.



export to word-tools.bmp

Additional Settings for the Export

Click  .



settingsdialog.bmp

Languages

Select the report language (German, English or French).

Scaling of diagram

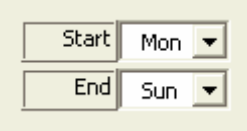
Automatic or manual scaling of diagram: With manual scaling, enter the lower limit value (min) and the upper limit value (max) of the scale; you also have the option to add a prefix such as"kilo" or "mega". With automatic scaling, the ranges and the prefix are selected automatically for best display.

Choose the time period

time auswahl.bmp

Choose between Selected period, Daily, or Weekly.

Settings	Description
Selected period	The diagrams on the worksheets are generated across the time period selected in the software for export.
Daily.	In addition to the current sheets, new worksheets are generated, each containing the data of one weekday, provided of course that this data is available in the system
Weekly	The diagrams are generated for weeks.

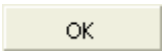


beginn-ende-tag.bmp

Enter the first and last weekday of the period to be displayed. Ensure that all weekdays are entered, e.g. Mon-Sun. Sat-Sun results in a diagram for a single day.

apply to all.bmp

Click this button to apply the settings you made for the current sheet to all other table sheets.



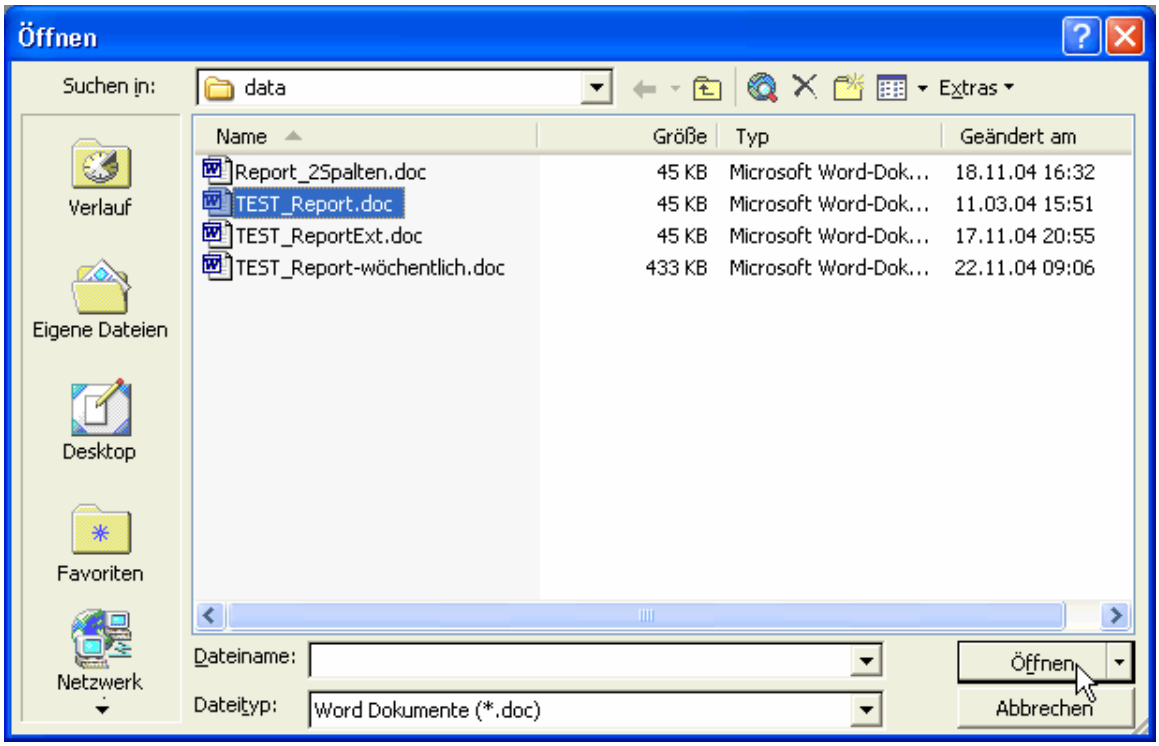
ok.bmp

Click OK to close the configuration window and apply the settings to the measurement diagrams.

icon word-report.bmp

Click this button to transfer the diagrams from the MS Excel® file to the MS Word® template.

Choose one of the supplied MS Word® files or a file prepared by you.

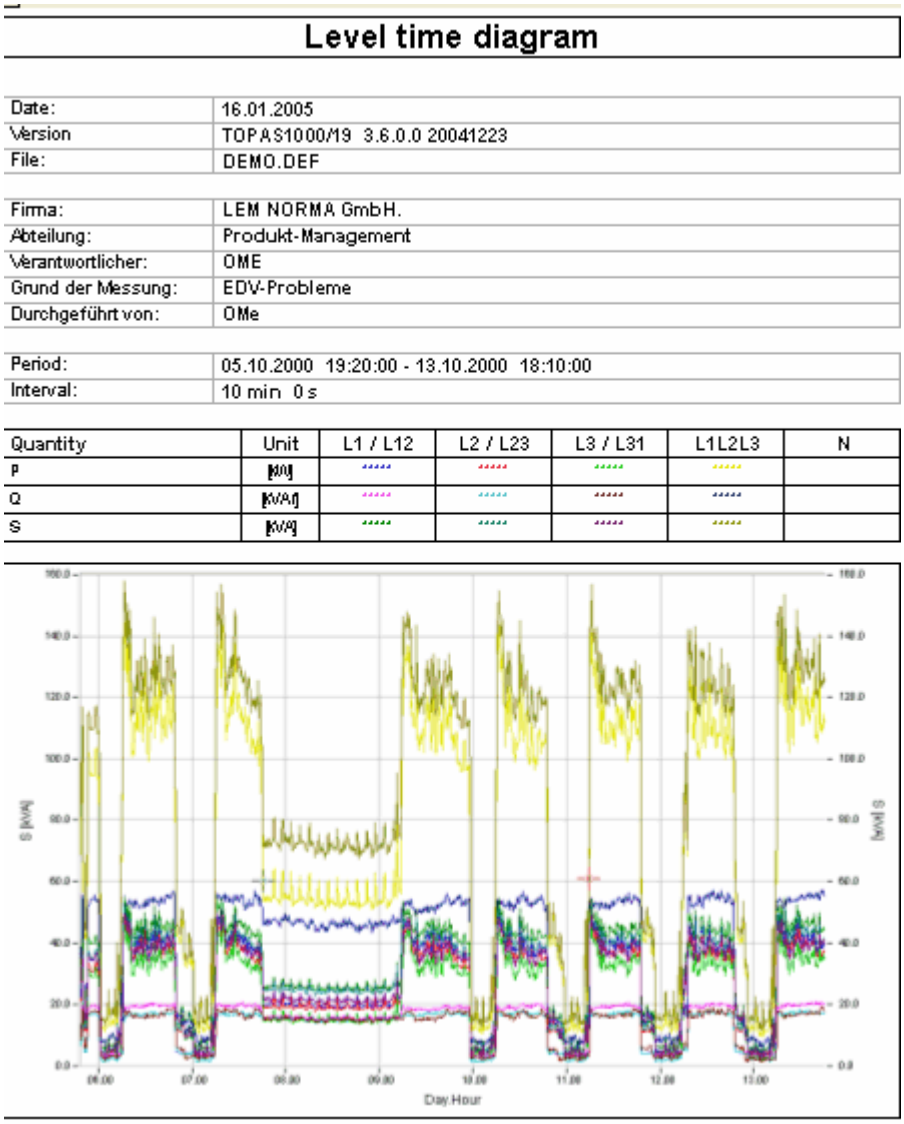


wordauswahl.bmp

Use files Test_Report.doc or Test_ReportExt.doc, or select a suitable MS Word® document formatted by you for this purpose. Use the following placeholders for MS EXCEL® diagrams:

Placeholders	Used For
#ettings#t	Settings
#pic1#, #pic2#	Diagrams
#table1#, #table2#	Tables (legends of diagrams)

A properly formatted report is generated, whereby the diagrams are inserted into the MS Word® document. This export facility saves time and ensures a consistent layout for your reports, especially in connection with repeat measurements, at the click of a mouse button.



Level time diagram

Date:	16.01.2005
Version	TOPAS1000/19 3.6.0.0 20041223
File:	DEMO.DEF

Firma:	LEM NORMA GmbH.
Abteilung:	Produkt-Management
Verantwortlicher:	OME
Grund der Messung:	EDV-Probleme
Durchgeführt von:	OMe

Period:	05.10.2000 19:20:00 - 13.10.2000 18:10:00
Interval:	10 min 0 s

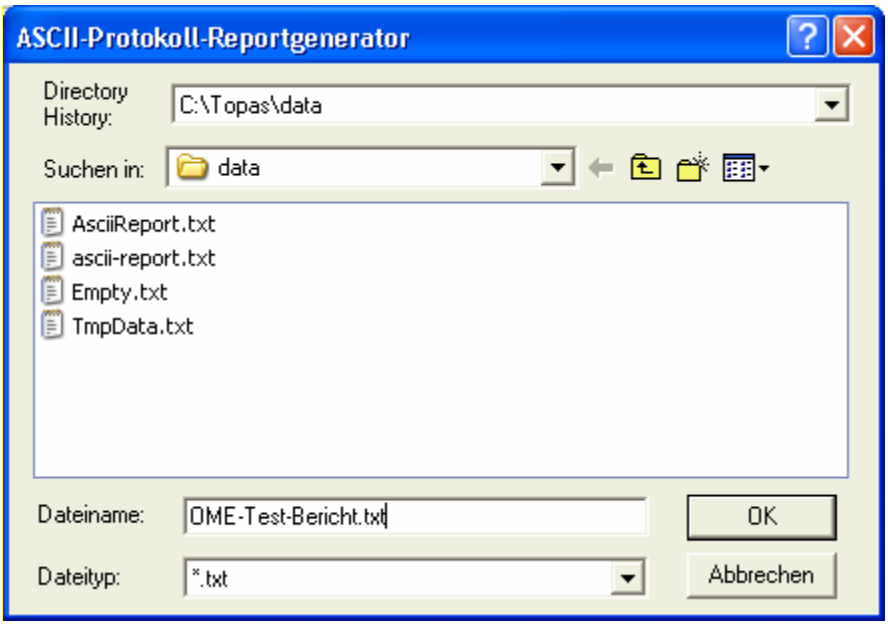
Quantity	Unit	L1 / L12	L2 / L23	L3 / L31	L1L2L3	N
P	[W]	*****	*****	*****	*****	
Q	[VAr]	*****	*****	*****	*****	
S	[VA]	*****	*****	*****	*****	

word-protokoll.bmp

ASCII Reports

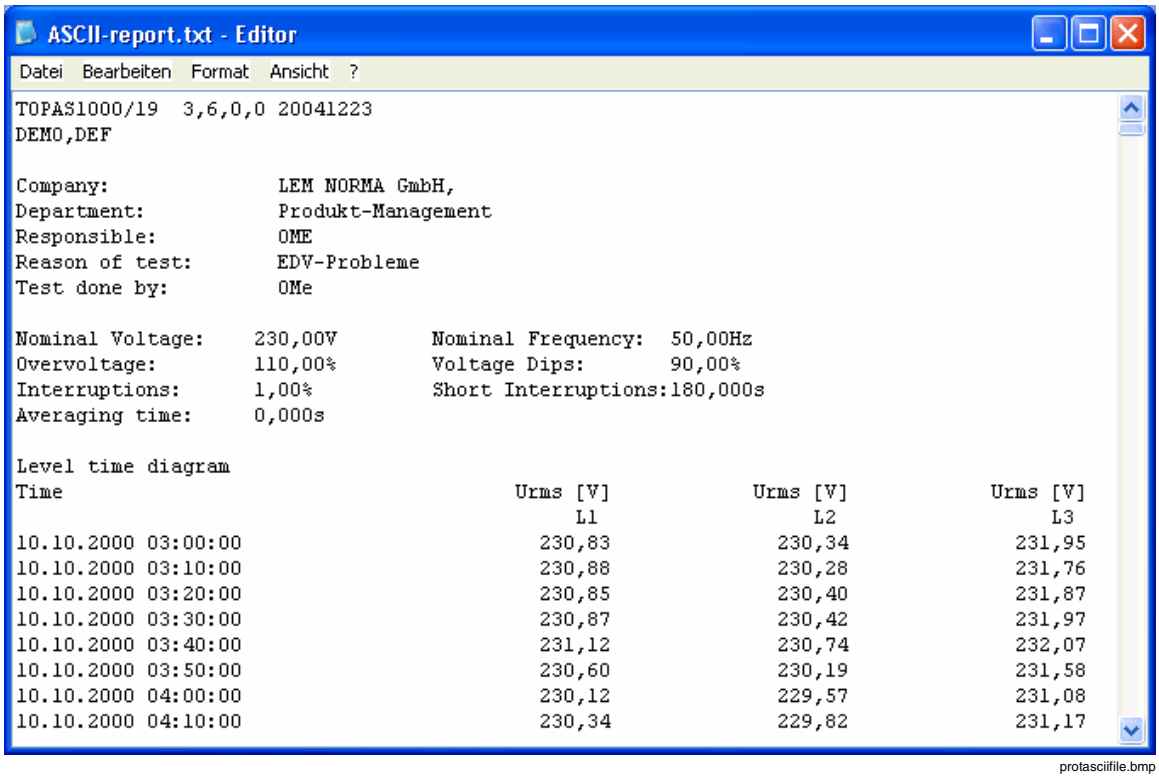
To generate ASCII reports, use the preset configuration file ProtocolT1000.ini (see also chapter Generation of MS Excel® reports).

1. Open measurement file.
2. Select period.
3. Create or select configuration file.
4. Click the ASCII report generator button:  .
5. Enter a new name for the file.



protrepasciisave.bmp

The system generates an ASCII file (name.txt), which can be edited with any text editor. Alternatively, the data can be imported into a database or similar application.

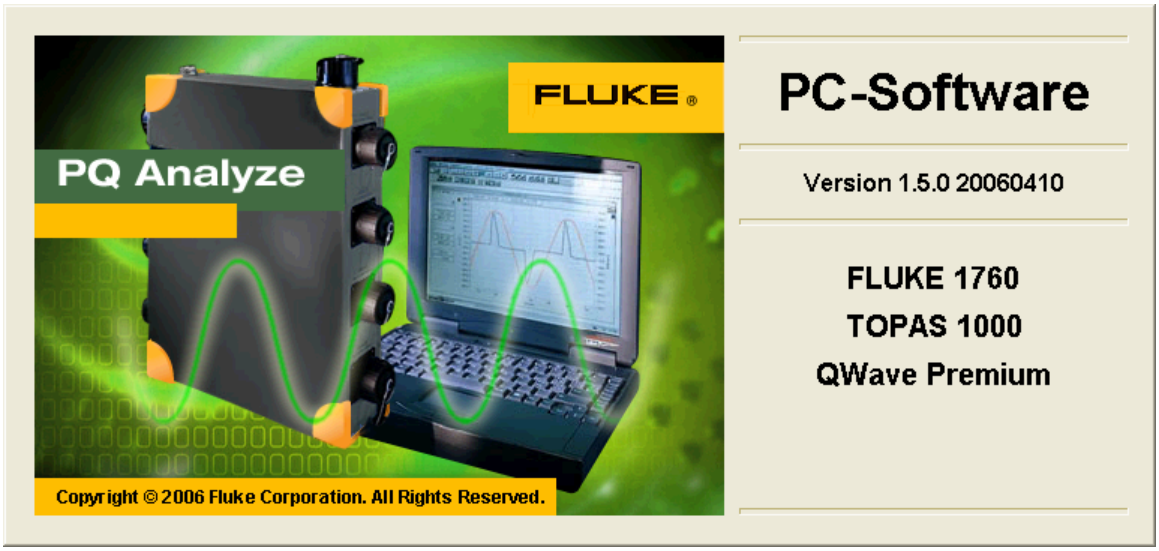


protasciifile.bmp

Menu Help

Select Info to view the software version details.

The enclosed operating instructions, in pdf format on the CD-ROM, also contain useful information about the software version.



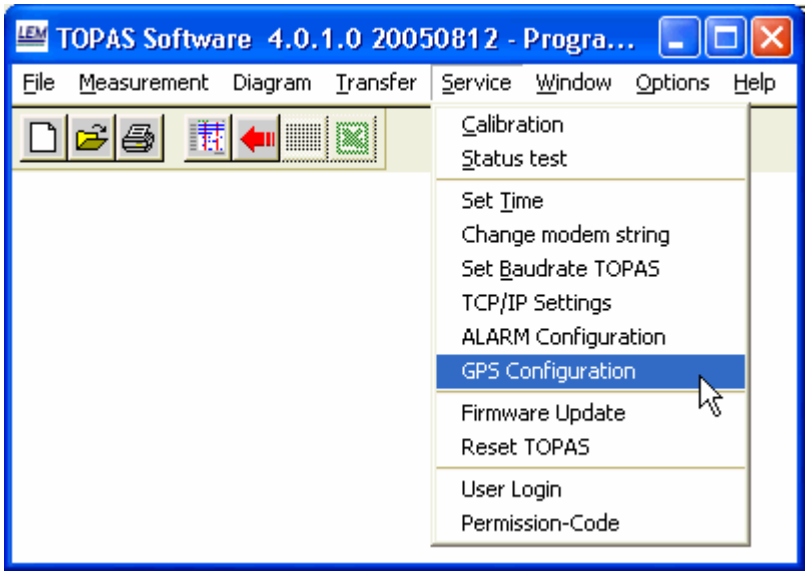
info.bmp

Chapter 7
Options

GPS Time Synchronization Option

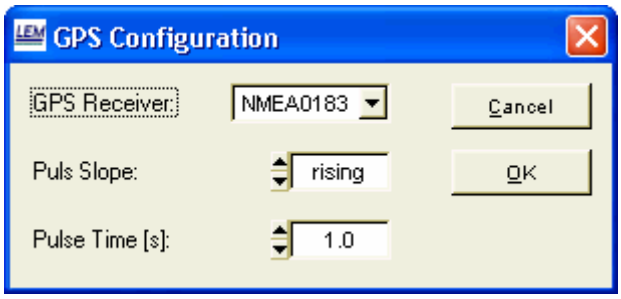
Note

This option is required if power quality measurements according to the norm IEC 61000-4-30 have to be performed.



gps-1.bmp

In this window, all basic settings for the GPS options are defined.



gps-2.bmp

GPS Receiver

To configure GPS receiver:

1. Select the protocol your receiver is using.
2. Select between:
   - NMEA 0183
   - None

Note

Select None if you want to use external pulses without a GPS-time – information.

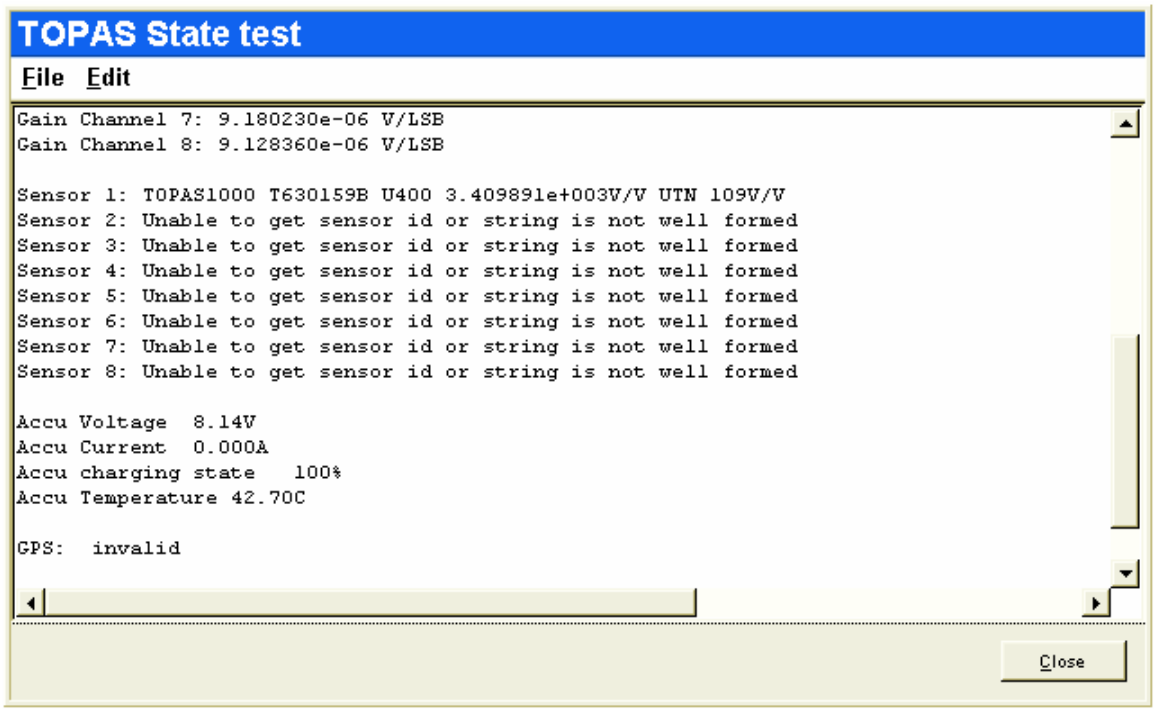
Pulse Slope

To configure the pulse slope, select which slope of the synchronization pulse to be used for time synchronization, either the rising or the falling.

Pulse Time

To configure the pulse time:

1. Enter the pulse duration seconds between 1 s and 70 s. Usually 1 s or 1 min (= 60 s) pulses are applied.
2. Close the window with OK.
3. Select the *Service Status* test menu option to view additional information regarding GPS time synchronization.



gps-state.bmp

GPS: Off

The GPS option has been deactivated in the menu *Service - GPS Configuration* (selection “None”).

GPS: Invalid

The GPS option has been activated in the menu *Service - GPS Configuration* (selection “NMEA0183”) but there is no such option connected to the Fluke 1760.

GPS: Unlocked

The instrument is receiving correct protocol data from a connected GPS option, but time synchronization is not yet achieved (maybe too few satellites in receiving area or the signal strength too low).

GPS: Locked

Data packets with correct protocol containing time information are received through the serial interface of the instrument. The instrument is time synchronized to UTC (Universal Coordinated Time).

Time Synchronization Details

Data of the transient option (maximum sampling rate 10 MHz) and the graphs of the standard channels of various instruments can be synchronized to each other with a tolerance of 1 microsecond. The time is added after the conversion from analogue to digital. This means that the measured event actually occurred at the indicated time, minus the signal delay time.

The delay of the channels of the transient option is <1 microsecond. There is currently no automatic compensation for this delay.

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