DEWETRON

PNA-SOFTWARE

Incl. PNA-Post Software

SOFTWARE REFERENCE MANUAL

WELCOME TO THE WORLD OF DEWETRON!

Congratulations on your new device! It will supply you with accurate, complete and reproducible measurement results for your decision making.
Look forward to the easy handling and the flexible and modular use of your DEWETRON product and draw upon more than 25 years of DEWETRON expertise in measurement engineering.

ISO9001

EN ISO 14001


CUSTOMIZED

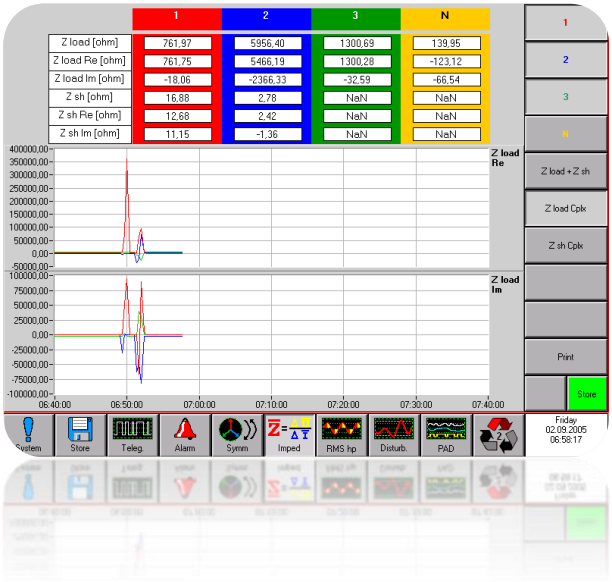

MODULAR

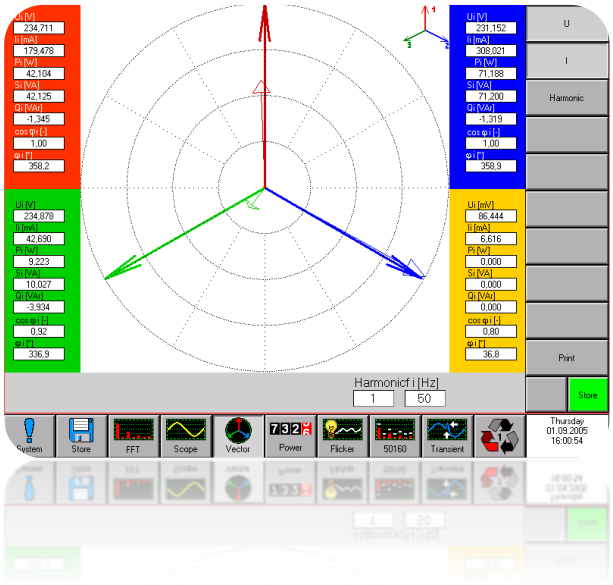

COMPETENT

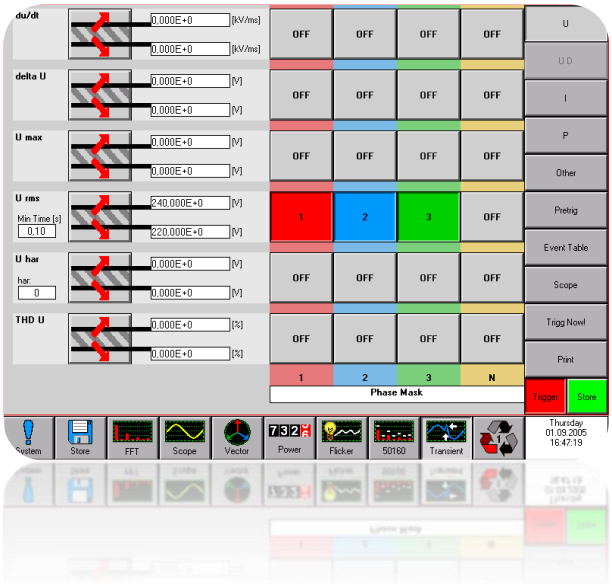

COMMITTED


APPROVED

PNA-Software







Content

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Warranty Information

A copy of the specific warranty terms applicable to your DEWETRON product and replacement parts can be obtained from your local sales and service office.

Support

For any support please contact your local distributor first or DEWETRON directly.

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Printing History

Meaning of symbol  **:**
WARNING! Consult the user´s manual before using the instrument.
In this user´s manual, instructions preceded by this symbol, if they are not carried out as shown, can result in a physical accident or damage installations.

Thank you for purchasing **PNA-SOFTWARE Power Network Analyser.**
To get the best service from the instrument:

- **read** carefully this user´s manual,
- **respect** the safety precautions.

Warranty

Our warranty is applicable, expect for expressed stipulation otherwise, for **twelve months** after the date on which the equipment is made available (extract from our General Conditions of Sale, available on request).

General System Information

Caution

- The system BIOS is protected by password. Any change in the BIOS may cause a system crash. When the system is booting, do not press ESC-button on keyboard. This may clear the BIOS settings and cause system faults.
- Any change in the file structure as deleting or adding files or directories might cause a system crash.
- Before installing software updates contact DEWETRON or your local distributor. Use only software packages which are released by DEWETRON. Further information is also available in the internet (http://www.deweton.com).
- After power off the system wait at least 10 seconds before switching the system on again. Otherwise the system may not boot correct. This prolongs also the life of all system components.

1. PNA Software

Recommended PC configuration for PNA-SW

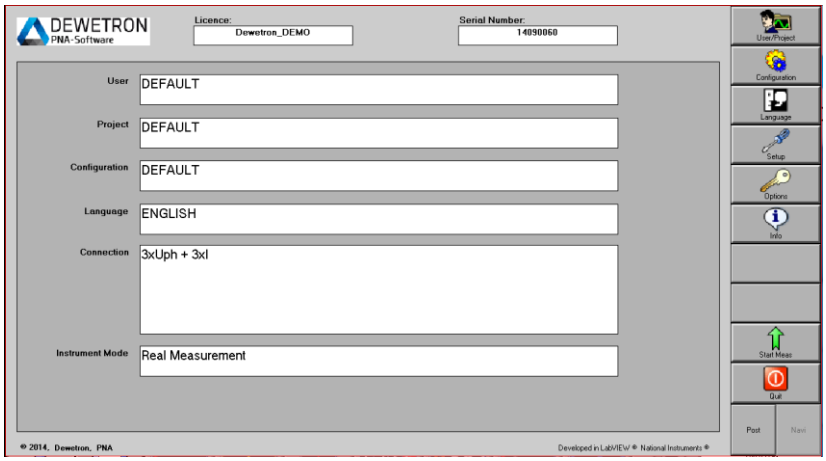
- Operating system: Windows (XP, 7 or 10) x86/64
- Processor: Intel core 2 Duo 1.2GHz or higher
- Memory: 2GB or higher
- HDD\SSD: 50GB or higher

Supported Dewetron Measurement Systems

The PNA-SW support all Dewetron measurement devices with compatible National Instruments A\D-cards and MDAQ-PQL (e.g. DEWE-571-PQA) or DAQP\HSI modules (e.g. DEWE-3300-PQA).

1.1 Main menu

After starting the data acquisition software (PNA – software) version 2.9.x, the following menu is shown:



Define user and project name

Store system settings

Language selection

Configuration set – up

Entry of instrument licence number for options

System information

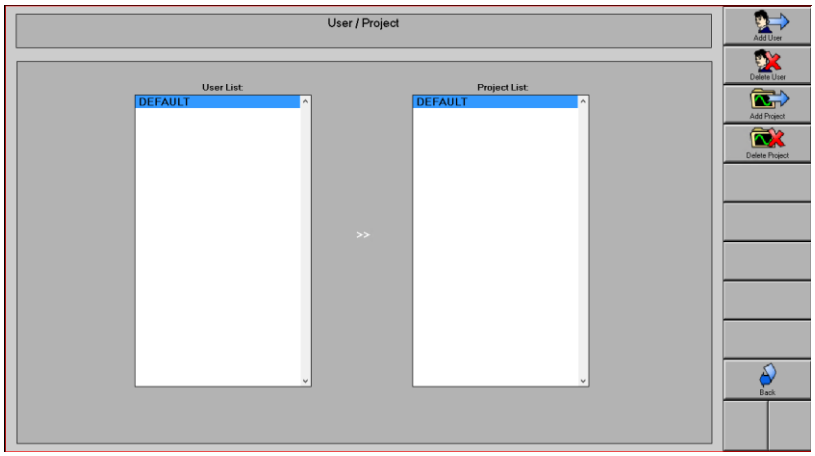
Start measurement

Quit application

Start Post-Processing

1.1.1 Defining user and project name

Pressing the *„User / Project“* button on the main menu leads to the menu below:



Enter a new user

Delete selected user

Enter a new project

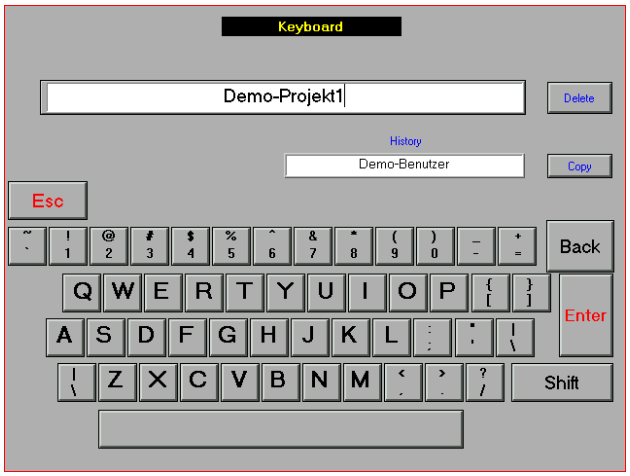
Delete selected project

Validate the selection and return to the main menu

Note: When deleting a user or project name, beware that the corresponding data will be deleted too.

1.1.2 Virtual keyboard

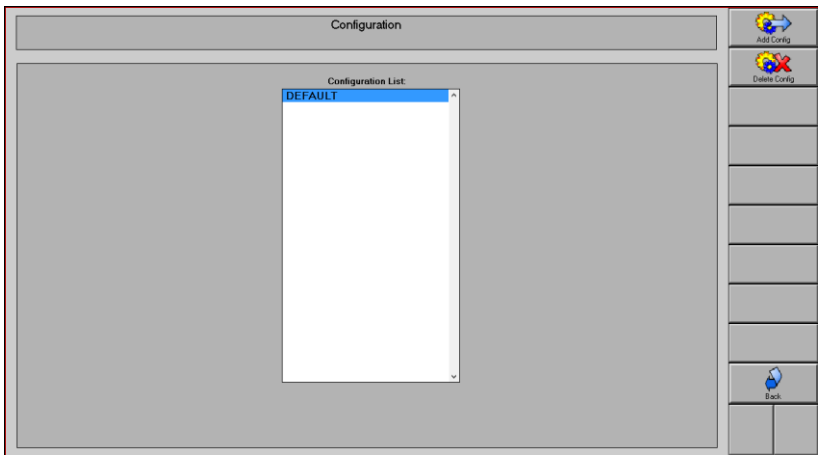
To enter a new user, project name or setup, an on screen “virtual keyboard” comes up, there´s no need for an external keyboard (requires Touch-Screen option).



New data are validated with *„Enter“*.

1.1.3 Saving the system configuration

Pressing the *„Configuration“* button on the main menu opens the window below.



Create a new configuration with new settings

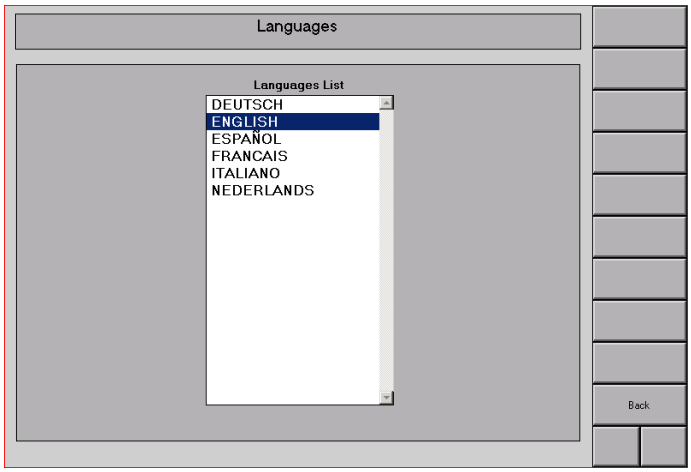
Delete the selected configuration

Validate the selected configuration (system setup)

Pressing *„Add Config“ calls* up the virtual keyboard and allows the user to enter a name for the new system configuration. Pressing *“Back”* returns to the main menu.

1.1.4 Setting the user language

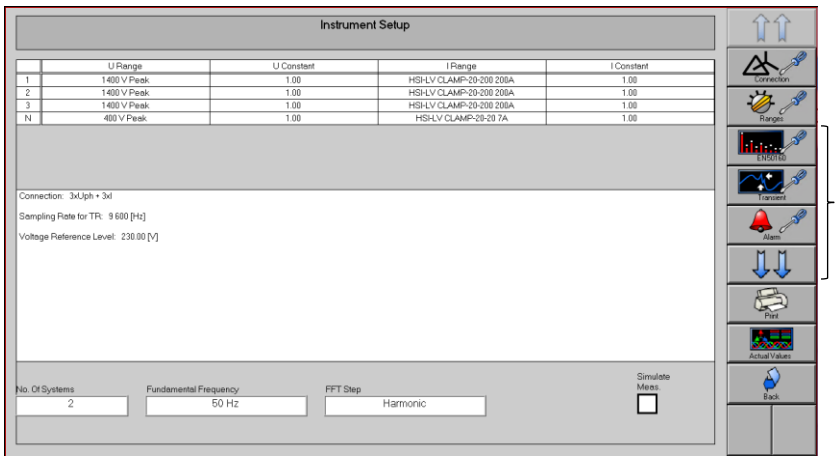
Pressing the *„Language“* button on the main menu enables the menu below.
(Other languages possible on request!)



Select the user language and press *“Back”* to validate this choice, which leads back to the main menu.

1.1.5 Selecting inputs and / or connected clamps

Pressing *„Setup“* button on the main menu displays the window below which gives access to:



Selection of connection

Selection of ranges

Setup for PNA modules

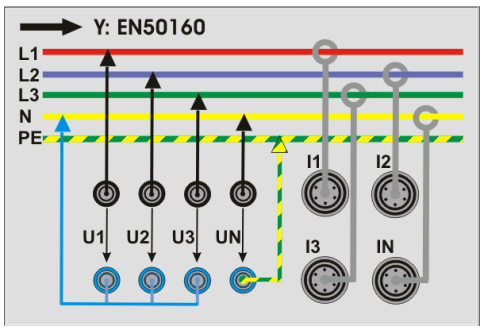
Actual values

Saves the input settings and returns to the main menu once more.

Selection of the type of connection, selection of the ranges, setup of PNA modules (EN50160, PAD, Transient, Alarm, Telegram). Selection between real data acquisition and simulation mode.

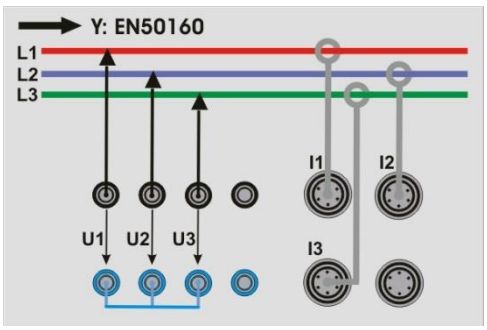
1.1.6 Selecting of the wiring type

Wiring diagram 1
Y-connection 5-wire system



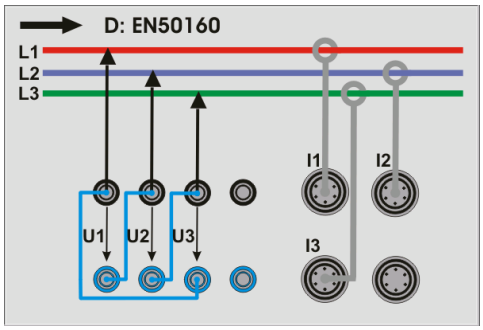
$3 \cdot U_P + 3 \cdot I_P + N$

Wiring diagram 2
Y-connection 3-wire system



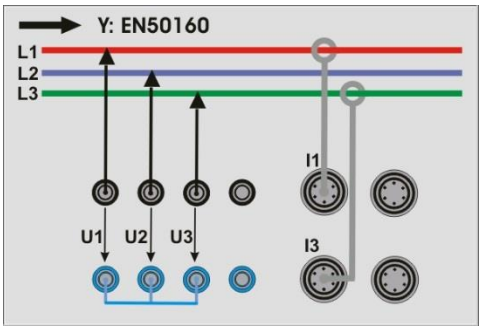
$3 \cdot U_P + 3 \cdot I_P$

Wiring diagram 3
D – Connection 3-wire system



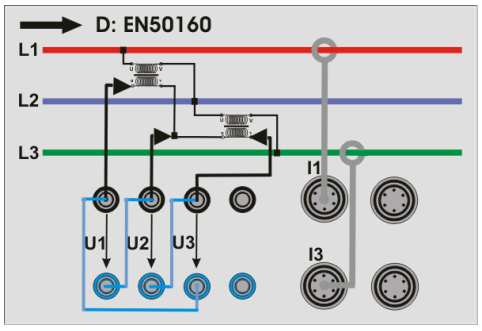
$3 \cdot U_{L-L} + 3 \cdot I_P$)

Wiring diagram 4
Aron - Connection



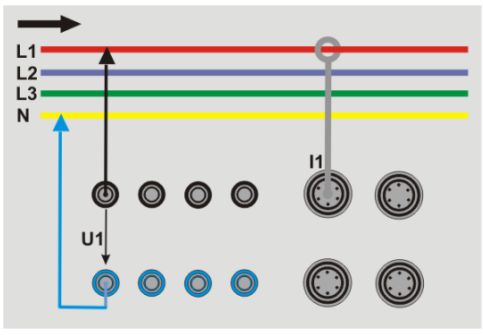
$3 \cdot U_P + 2 \cdot I_P$

Wiring diagram 5
V – Connection



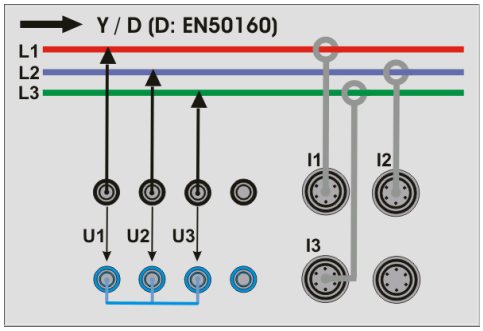
$3 \cdot U_{L-L} + 2 \cdot I_P$)

Wiring diagram 6
Single-phase



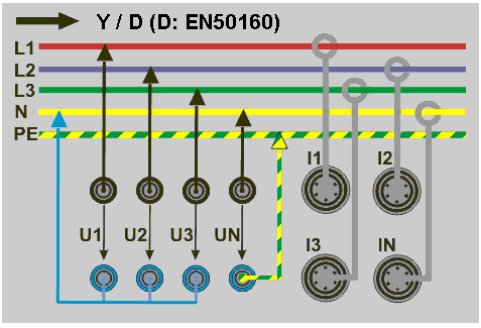
$1 \cdot U_P + 1 \cdot I_P$

Wiring diagram 7
Y-connection 3-wire-system - Delta calculation



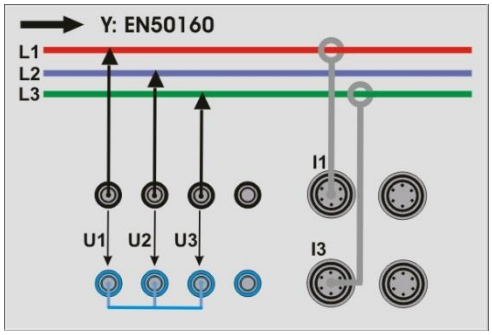
$3 \cdot U_P + 3 \cdot I_P$ Y / D

Wiring diagram 8
Y-connection 4-wire-system - Delta calculation



$3 \cdot U_P + 3 \cdot I_P$ Y / D + N

Wiring diagram 9
Aron connection -Delta calculation



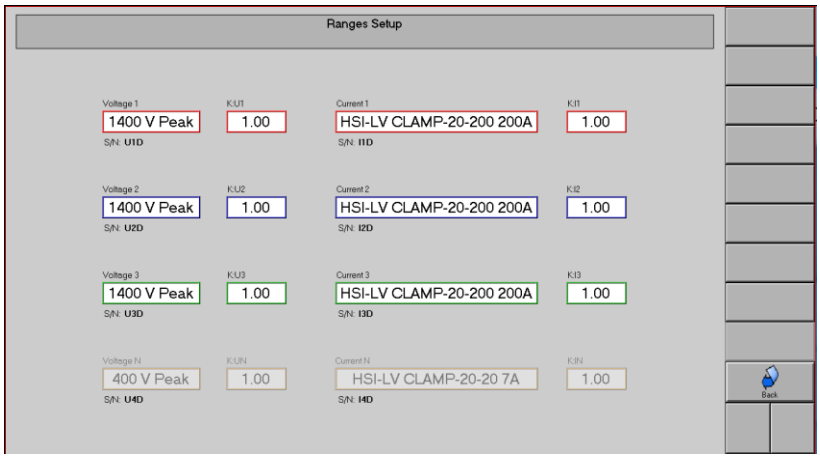
$3 \cdot U_P + 2 \cdot I_P$ Y / D

The usage of the last three connection diagram is intended for **medium-(and high-) voltage grids**, whose voltage measuring transformers are connected in Y (1 pole), but you want to know the line-to-line voltages also. With this connection diagram the line-to-line voltages are calculated out of the measured line-to-earth voltages. The calculated line-to-line voltages will be used for the evaluation in the modules EN50160 and Flicker (evaluation according EN50160 needs line-to-line voltages for medium voltage grids) and ripple control signals. In the modules Oscilloscope and Transient recorder, there are line-to-line AND line-to-earth voltages available.

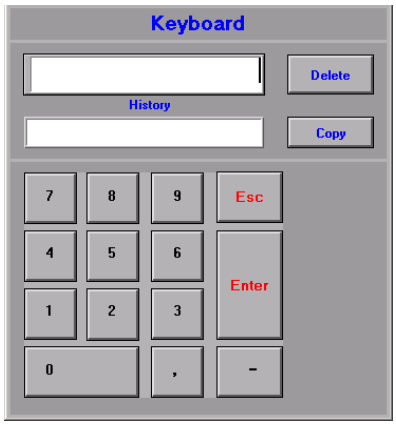
D: EN50160 means, that for evaluation according to EN50160, line-to-line voltage must be used as the EN50160 reference voltage.

1.1.7 Selecting the ranges

Pressing the *„Ranges“* button displays the window below:

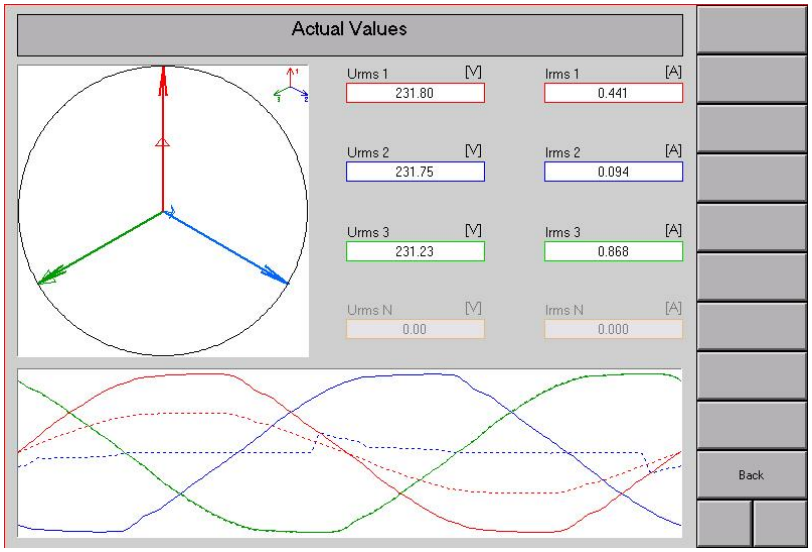


For changing the value of the k – factor, a virtual keyboard will be displayed.



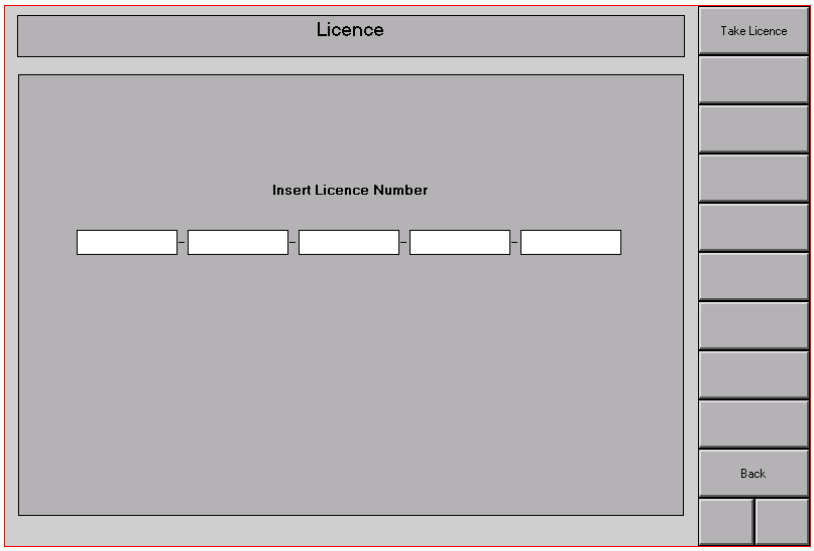
1.1.8 Display the actual values

Pressing *„ Actual Values“* displays the window below. For a simple check of the phase shift and phase symmetry.



1.1.9 Activate a software option

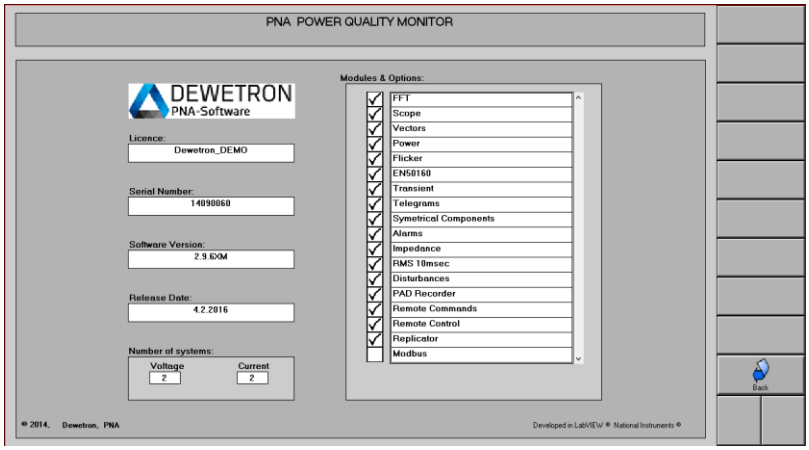
Pressing the *„Options“* button on the main menu opens the window below:



Enter the licence number with the virtual keyboard and press then *“Take licence”*. The system checks the licence number now. If the licence number is okay, the software option is activated. Press the button *“Back”* to return to the main menu.

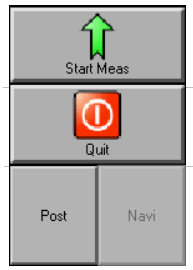
1.1.10 System Information

Pressing the *„Info“* button on the main menu opens the window below:



This section is only for information. It shows licence number, system serial number, software version and the installed analysis options.

1.1.11 Function of „Start Meas“, „Post“, „Quit“:



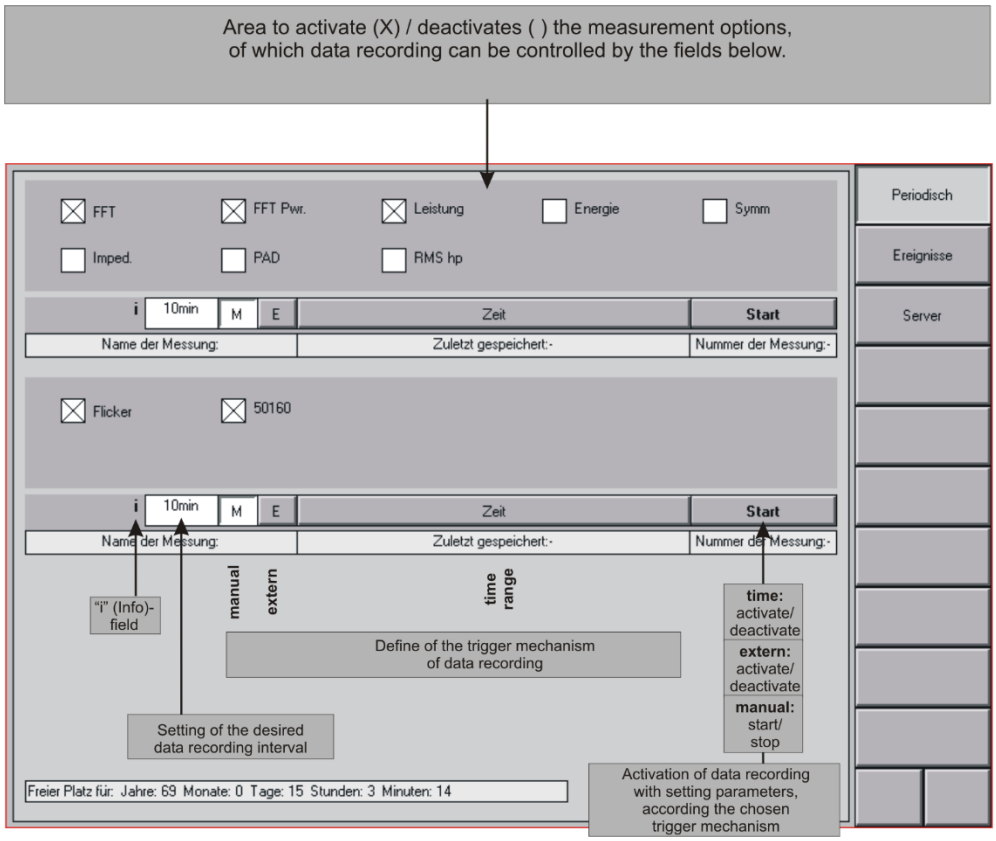
Start measurement

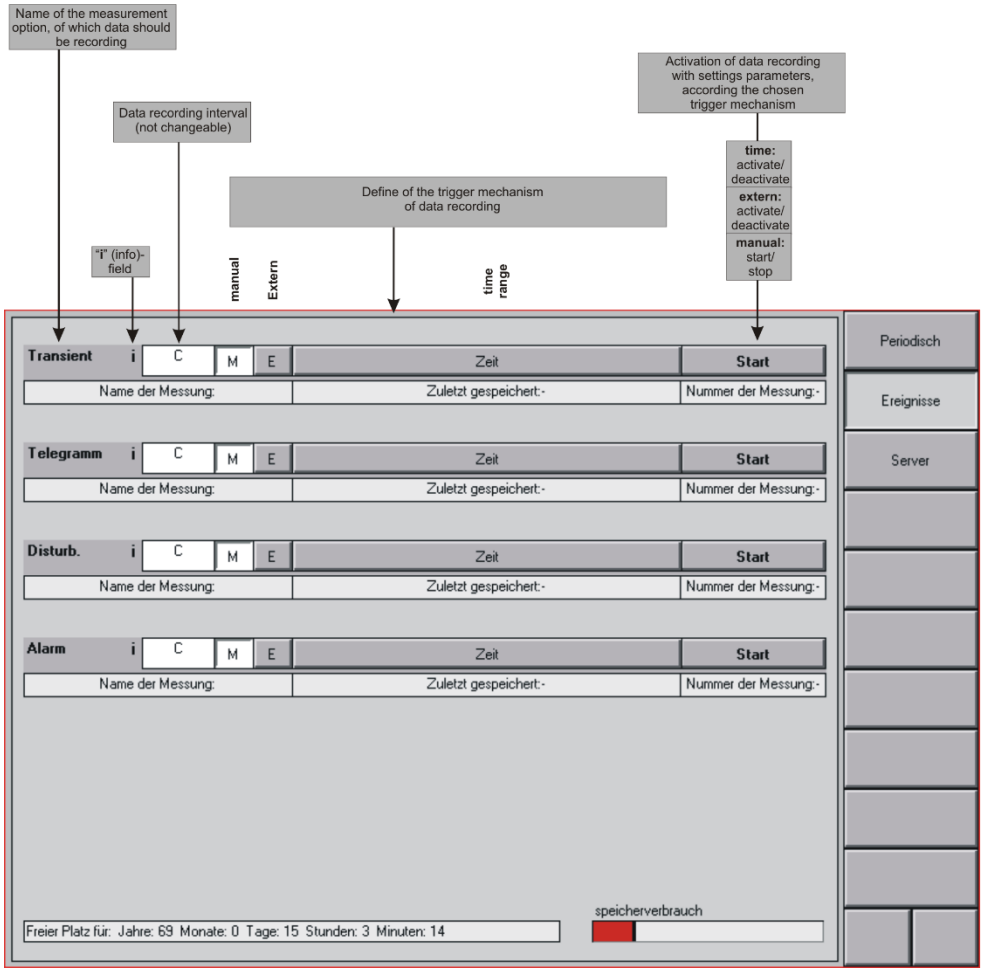
Quit data acquisition software

Quit the measurement software and start the analyses software PNA – POST.

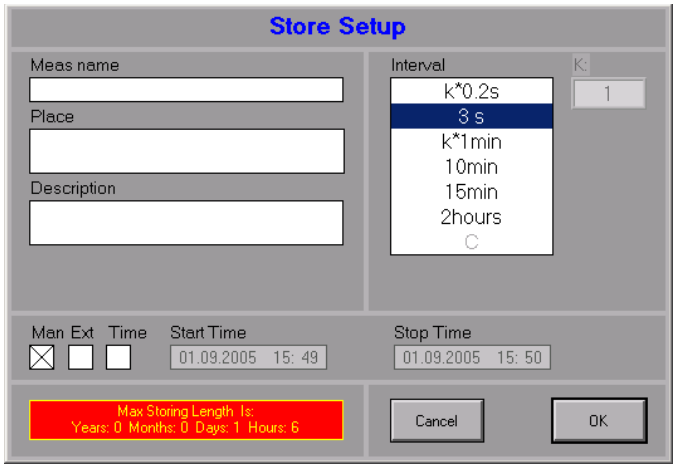
1.2 Data storage

User define store setup for measurement (data storage interval, select the type of save…).





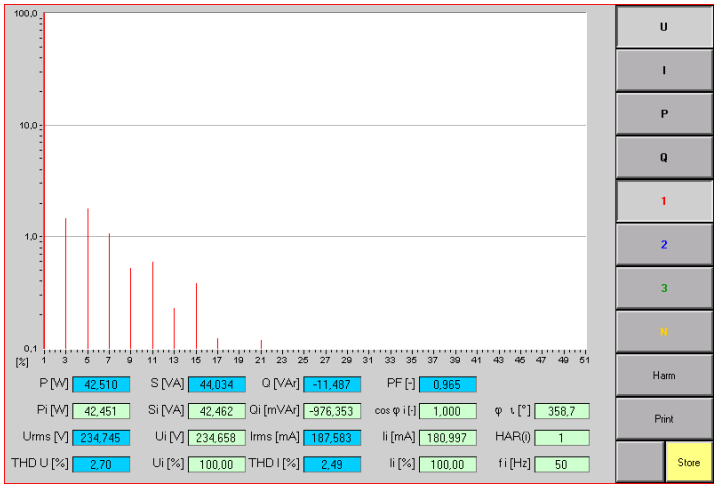
Press the ***„i“*** button opens the window below.



1.3 Measurement

1.3.1 FFT

Pressing the *„FFT“* button the window below comes up:



Select the FFT graph of voltage (U), current (I), active power (P) and reactive power (Q). The active and reactive power graphs are colour – coded to indicate the direction of each harmonic (red = IN, blue = OUT). In addition, the reactive power graph shows whether the selected harmonic is resistive, capacitive or inductive.

Select FFT graph for phases 1, 2, 3 or neutral.

Select the harmonic for readout values. Pressing this button calls up the on – screen keyboard, upon which the user can enter the desired harmonic.

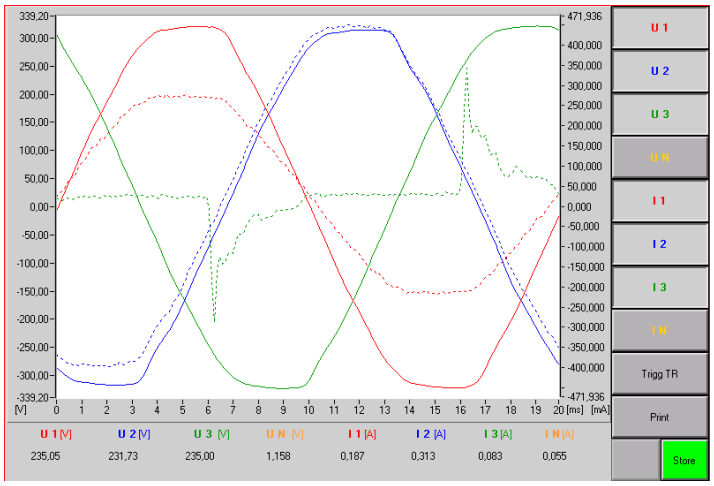
Print out the actual window **[Print]**

Only for information (storing is not activated).

Recording in progress (During recording of FFT data, the „REC.“-indicator goes green.

1.3.2 Oscilloscope

With the Power Network Analyser's scope function, you can display the measured signal waveform. Press the *"Scope"* button and the window below comes up:



Select the desired current and voltage phases to be displayed.

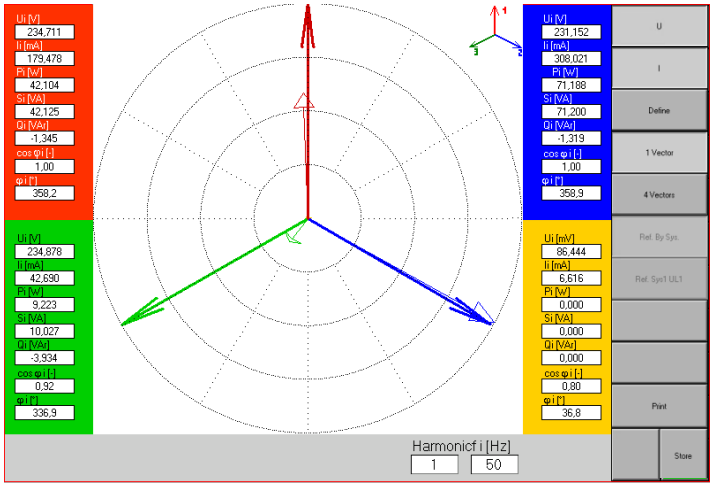
By pressing this button activates a manual trigger start, that mean that the actual graphs get stored in a transient event.

The **scale on the left** of the graph indicates the voltage (pulled through line: U_1, U_2, U_3, N).

The **scale on the right** of the graph indicates the current (intermitted line: I_1, I_2, I_3, N).

1.3.3 Vector scope

The vector scope shows phase shift and phase symmetry, as well as the voltage and current parameters which are listed on both sides.
Press the *"Vector"* button and the window below comes up:



Show / hide voltage and current vectors

Select and define your screen to see one or more Vector scope with different screens or harmonics on your screen

Choose the referents between the selected system itself or the first system

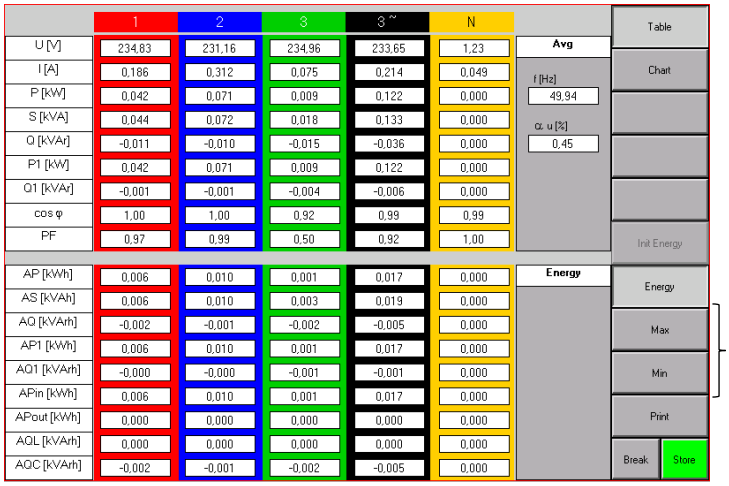
On both sides of the graph are the voltage, current, active power (P), apparent power (S), reactive power (Q), phase shift (cos φ) and phase shift angle (φ) values of the selected harmonic (displayed in the bottom right-hand corner of the screen).

U_1 = **red** U_2 = **blue**
U_3 = **green** U_N = **yellow**

1.3.4 Power and Energy analyser

The power analyser chart gives a complete rundown of all relevant power and energy measurements. Press the *"Power"* button and the window below is displayed:

Power analyser chart



Go to graph of power against time

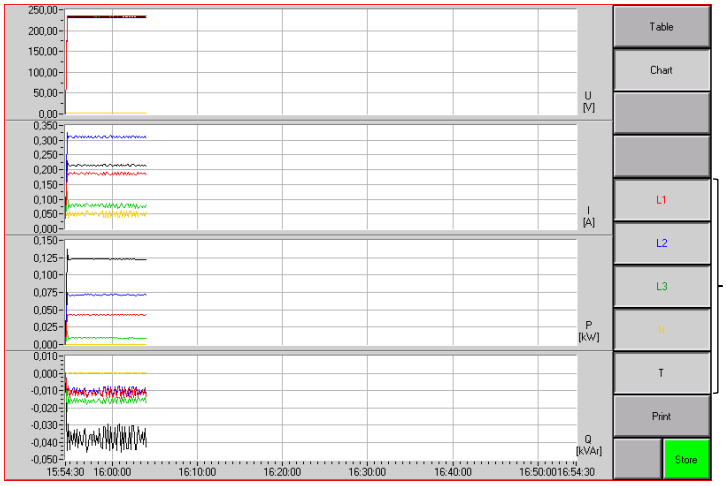
Reset all energy values (AP, AS, AQ, AQC…).

Displays all energy values after the last initialisation

Min – Max values are displayed

1st press: holds displayed values
2nd press: returns to values in progress

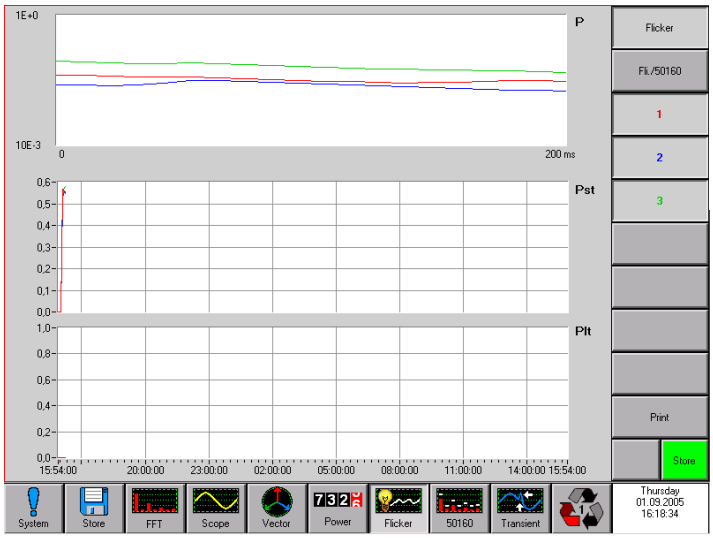
Power Analyse Graph



Select which phase should be displayed

1.3.5 Flicker meter

Press the *„Flicker“* button and the following window comes up:

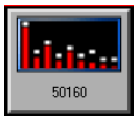


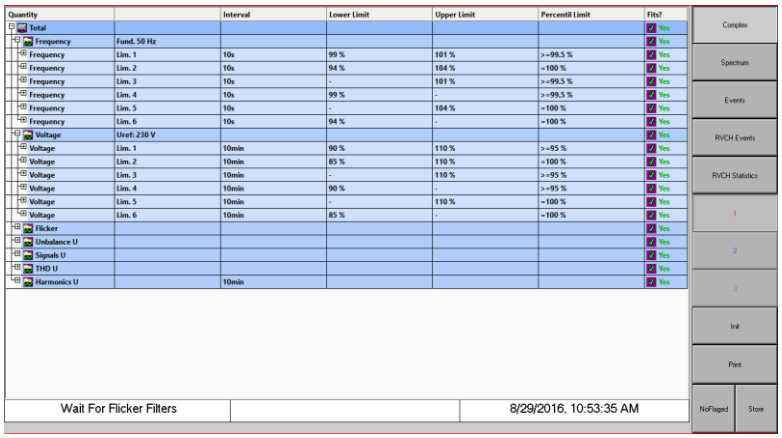
Here a correction of the values according to the standard EN50160 is made. This means all Events which are defined as an event in EN50160 are not considered in the flicker calculation.

Measured value / function	Note
$P_{(t)}$ - Measurement	Actual flicker strength (200ms)
P_{st} - Measurement	Statistically-processed short-term flicker over 10 min
P_{lt} - Measurement	Statistically-processed long-term flicker over 120 min

1.3.6 EN50160 Analyser

Press *„50160“* button and the following window comes up:





Overview of the different limits in EN50160.

Frequency spectrum

Event table

RVC Events

RVC Evaluation

Reset all values to zero and start new measurement.

Analysis parameter	Remarks
Frequency	The following values are displayed *numerically*: ▪ Minimum frequency (f_{min}) ▪ Maximum frequency (f_{max}) The following is performed ▪ the analysis according to EN 50160 (> 95%), as well as ▪ the analysis EN 50160 (100%).
Voltage	The following values are displayed *numerically* for each individual phase: ▪ Minimum measurement voltage (U_{min}) ▪ Maximum measurement voltage (U_{max}) The following is performed ▪ the analysis according to EN 50160 (> 95%), as well as ▪ the analysis EN 50160 (100%). The voltage levels are generally expressed as average values over a storing period of 200ms –RMS-values. The detection and display of voltage - Events (Dips, interruptions, swells) with following parameters: ▪ Date and Time of the event ▪ phase, on which the event occurred ▪ Extrema in [V] ▪ Duration in [s] ▪ Classification in Extrema-value and duration

	The detection and display of Rapid Voltage Changes (RVC) with following parameters: ▪ Date and Time of the RVC ▪ phase, on which the RVC occurred ▪ dmax in [%] ▪ dc in [%] ▪ Duration in [s] ▪ Classification in dc-value and duration
Flicker	The following value is generally displayed *numerically* for each individual phase: ▪ Long-term flicker strength P_{ltmax} The following is performed: ▪ the analysis according to EN 50160 (> 95%)
THD and harmonics	The following values are displayed *numerically* for each individual phase: ▪ Maximum total harmonic content THD_{max} in [%] The following is performed: ▪ the analysis according to EN 50160 (> 95%) Additionally, an exact *graphical* analysis of the individual harmonics (harmonics value) is possible.
Voltage unbalance	The following values are displayed *numerically:* ▪ U_{max} in [%] The following is performed: ▪ the analysis according to EN 50160 (> 95%)
Signal voltages, ripple control signals	The following values are displayed *numerically* for each individual phase: ▪ Maximum signal voltage (U_{sigmax}) The following is performed: ▪ the analysis according to EN 50160 (> 99%) The voltage levels are generally expressed as rms values

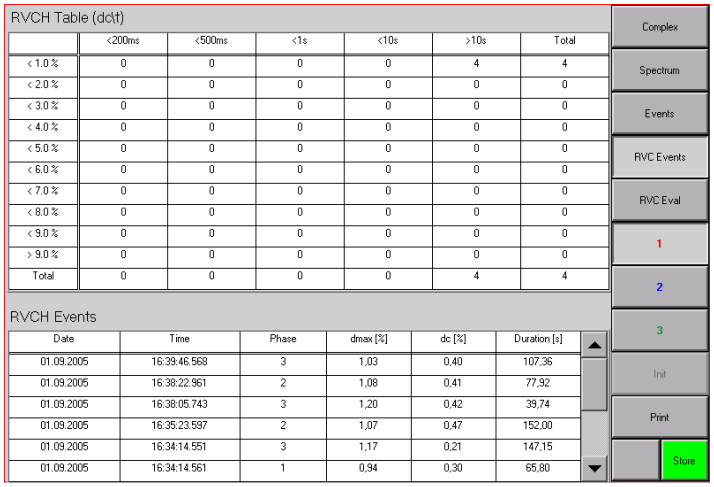
(green)

(red)

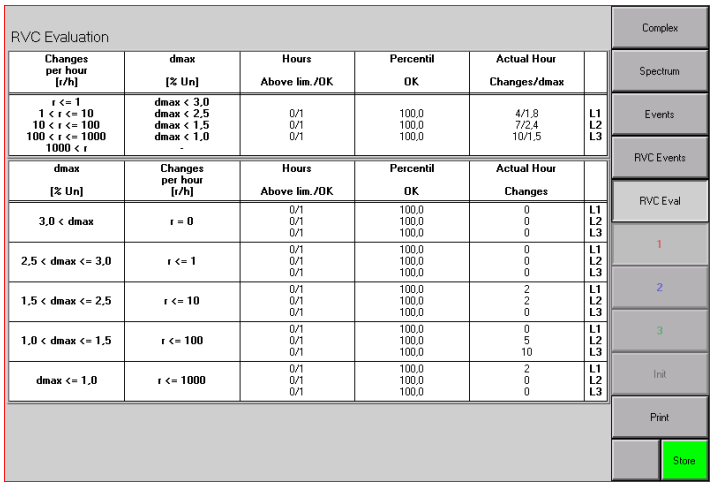
These fields give an overview about the accomplishing of EN50160 Limits.

For the green field:
EN50160 conform

For the red field:
Not conform EN50160



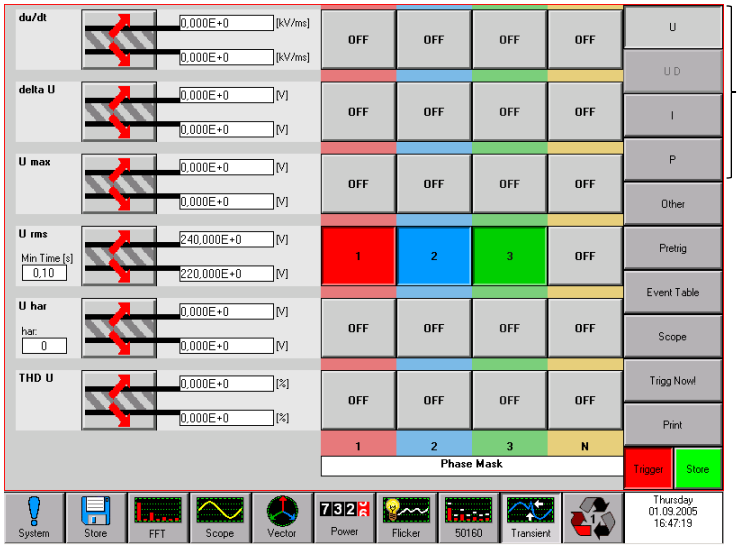
In the **upper half of the screen**, the residual voltage and duration of the individual voltage events since the last initialization are displayed in form of a matrix. The ranges of the residual voltages of the events are defined in the first column and ranges for the duration of the events at the top of each row.



In this display you can see an automatic evaluation of RVCs according to IEC 61000-3-7. The PNA collects all occurring RVCs every hour and evaluates them afterwards.

1.3.7 Transient recorder

1.3.7.1 Event definition



Trigger selection for voltage, current and power events

Trigger selection for other events

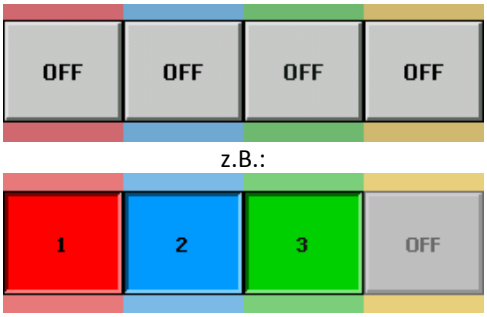
Pre / post trigger settings

Show table of events

Display last trigger event recorded in I(t) and U(t) (in 200ms time window)
By pressing this button, a manual trigger start, that mean that the actual graphs get stored in a trigger event

This field is not able to activate; it is only for information.

Recording in progress (During recording of transient events, the field goes red.

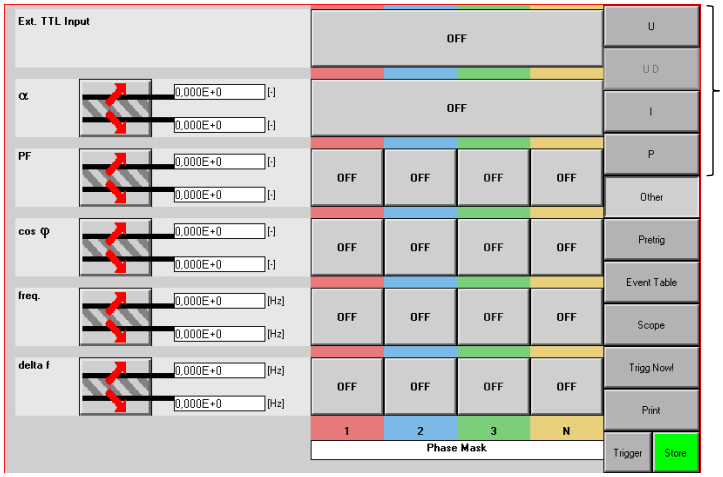


Buttons 1, 2, 3, N or OFF enable the trigger function.

Triggering of the instrument on values **outside** of the defined limits

Triggering of the instrument on values **inside** of the defined limits

1.3.7.2 Special trigger functions



Trigger selection for voltage, current and power events

Pre / post – trigger settings

Show table of events

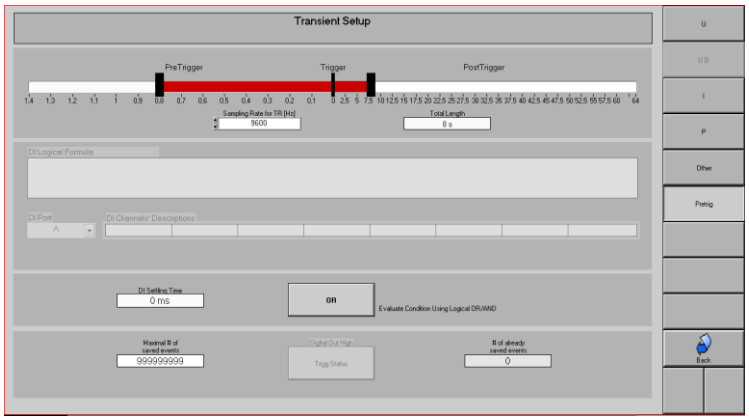
Display the last event acquired (in 200ms time window)

By pressing this button, a manual trigger start, that mean that the actual graphs get stored in a trigger event.

With this window you can select special trigger functions:

- Use of AND / OR logic functions for triggering conditions
- Triggering on an asymmetry α_U
- Triggering on PF (power factor)
- Triggering on cosφ

1.3.7.3 Pre / post – trigger settings

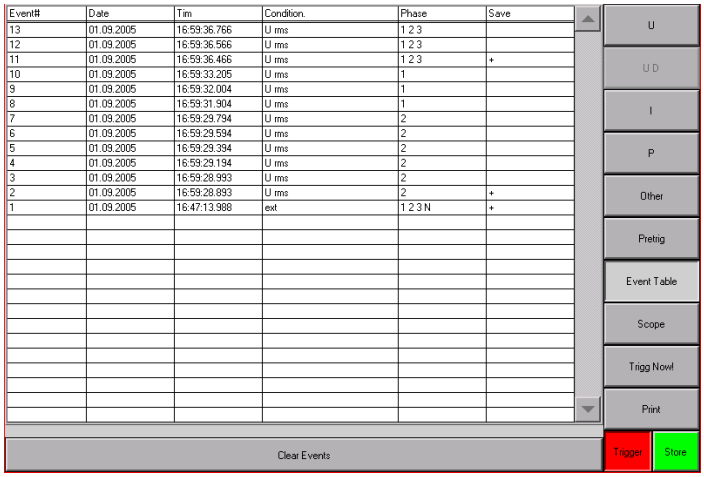


-

In the Pre / post – trigger settings you can manage the sampling rate, total length and number of max. stored transients.

1.3.7.4 Event table

This table summarises the date, duration and trigger conditions.



Trigger selection for voltage, current and power events

Trigger selection for Power values

Pre / post – trigger settings

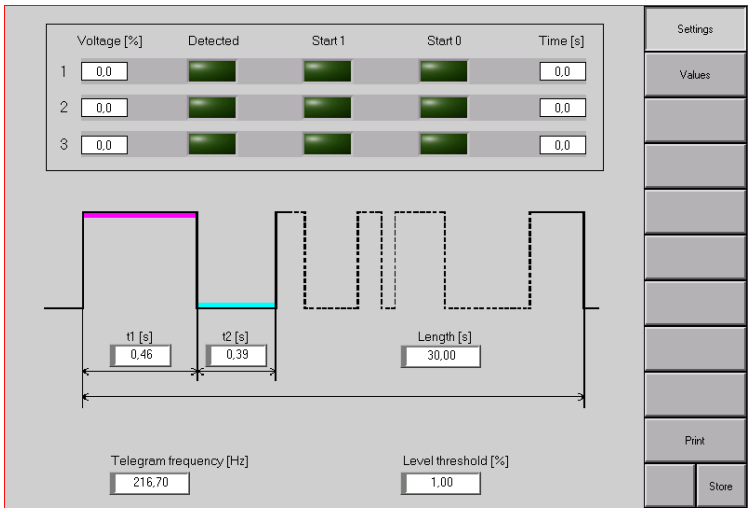
Show table of events

Display the last event acquired (in 200ms time window)

By pressing this button, a manual trigger start, that mean that the actual graphs get stored in a trigger event.

1.3.8 Telegram option

Press the *„Teleg. "*button and the window below is displayed:



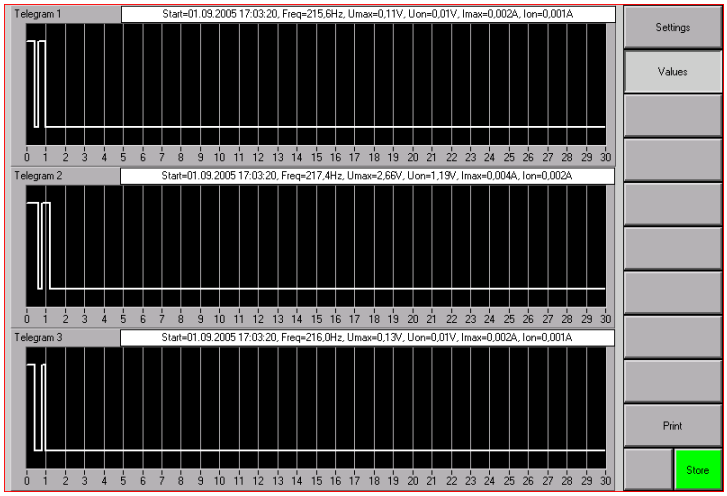
t_1 = Enter the length of the positive start bit in [s] with the virtual keyboard

t_2 = Enter the length of the negative start bit in [s] with the virtual keyboard

Length = Enter overall length (overall duration) of one datagram in [s]

Telegram frequency = Frequency of the input signal in [Hz] (frequency of the input telegram)

Level threshold = Level threshold in [%] of the fundamental wave (is the signal level lower than the level threshold, no telegram will be detected



The last stored telegram of all phases would be displayed in this diagram.

Start: Define the start moment of the telegram with data and time.
Freq: Define the precise measured frequency of the telegram.
Umax: Define the maximum voltage (RMS value) of the telegram.
Imax: Define the maximum current (RMS value) of the telegram.
Uon: Define the average voltage (RMS value) of the logical "high" signals, of the recorded telegram package for which the value was higher of the level threshold.
Ion: Same for current

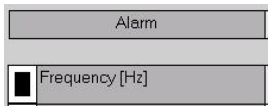
1.3.9 Alarm

Press the *„Alarm"* button and the window below is displayed:

Enter the limits with the virtual keyboard.

At "Harmonics" you can define the upper limits for each harmonic.
All harmonics are included, which are relevant for the EN50160, adherence several limits.

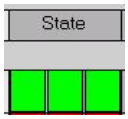
With the Alarm option you can oversee different parameter (measured value). Each phase will be separate oversees.



In the column **Alarm** there is standing the name of the parameter. On the left side is a check box:

If the check box is marked, the software analyses the parameter (Alarm message if the measured values are not in the space of defined limits).

If the check box is *not* marked, the software don´t analyse the parameter (*no* Alarm message if the measured values are not in the space of defined limits).



The column **State** displayed:

(green) The parameter (measurement value) is **inside** the defined limits.

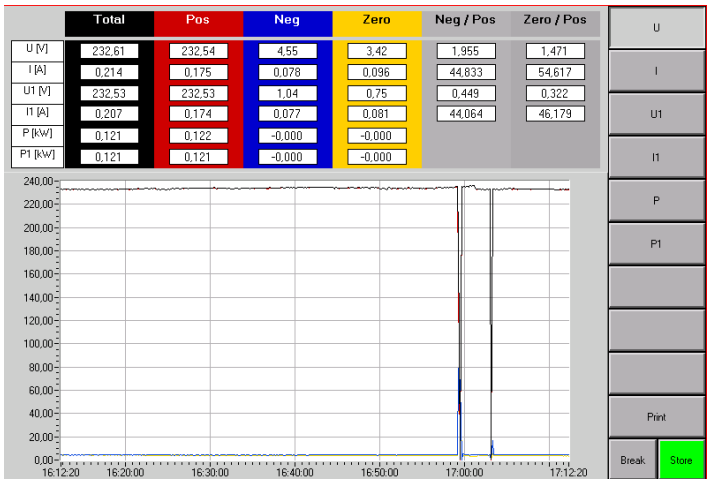
(red) The parameter (measurement value) is **outside** the defined limits.

For example:

In this case, the parameter is outside the defined limit on phase 1.

1.3.10 Symmetrical option

Press the *„Symm.“* button and the window below is displayed:



Select the desired input signal to be displayed.

U: RMS voltage value

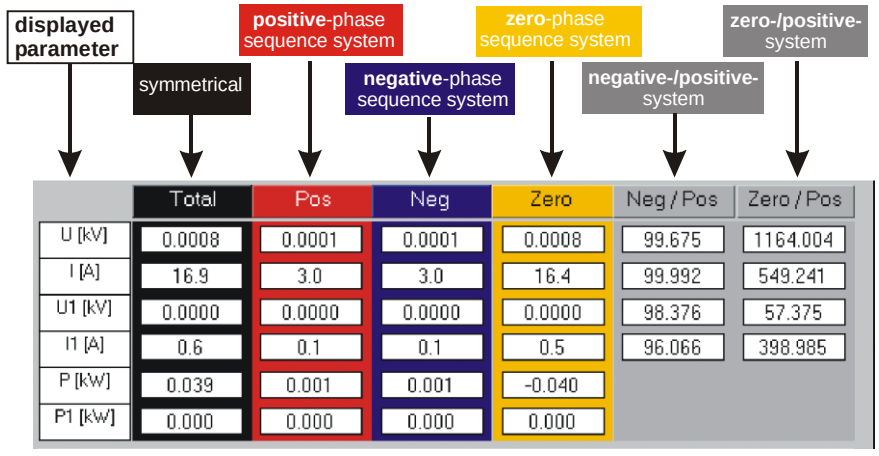
U1: RMS voltage value of the fundamental

I: RMS current value

I1: RMS value of the fundamental current

P: Total active power

P1: Total active power of the fundamental

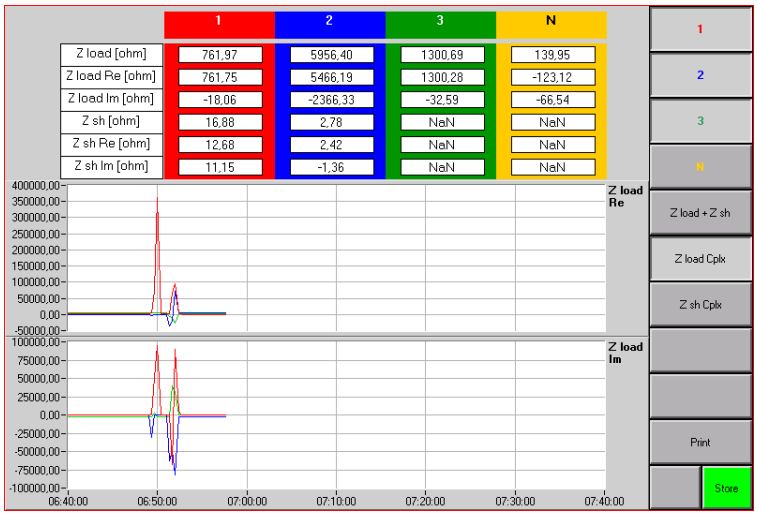


The [*Symm*] - Module serves its purpose only with measurement in a three-phase power supply (not with single-phase measurement). Under this condition the following measurements are possible:

Functions/Options	Remarks
U in [kV]	*voltage rms. values:* 3-phase, positive-, negative-, zero-phase sequence system
I in [A]	*current rms. values:* 3-phase, positive-, negative-, zero-phase sequence system
U1 in [kV]	*voltage rms. values of the fundamental harmonic:* 3-phase, positive-, negative-, zero-phase sequence system
I1 in [A]	*current rms. values of the fundamental harmonic:* 3-phase, positive-, negative-, zero-phase sequence system
P in [kW]	*active power:* 3-phase, positive-, negative-, zero-phase sequence system
P1 in [kW]	*active power of the fundamental harmonic:* 3-phase, positive-, negative-, zero-phase sequence system
NEG/POS in [%]	*ratio negative-/positive-components in [%] (corresponds the unbalanced factor* α_U of U, U1 and *unbalanced factor* α_I of I, I1)
ZERO/POS in [%]	*ratio zero-/positive-components in [%]* of U, U1, I, I1

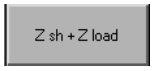
1.3.11 Impedance

Press the *„Imped.“* button and the window below is displayed:



The **left vertical axis** shows the impedance scale

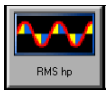
The **horizontal axis** shows the time axis.



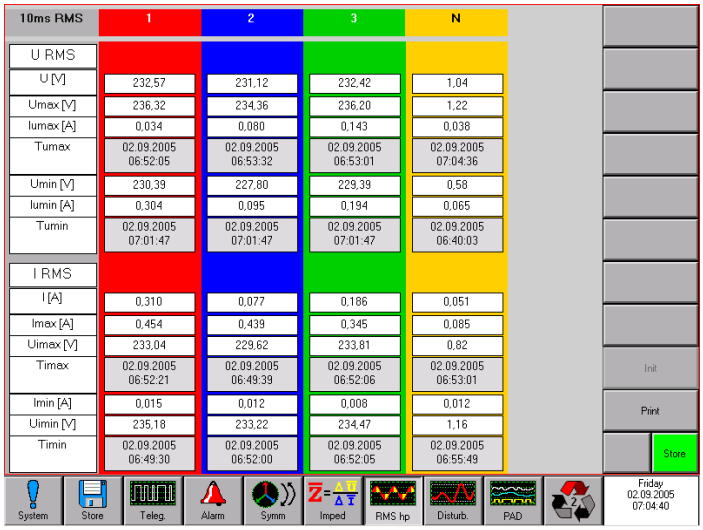
If the button [*Zsh + Zload*] is displayed, the time process of the parameters Zsh (short circuit impedance; net impedance) and Zload (Impedance of the load) is shown in the diagram. If you click on this button, the content of the button changes to…

If the button [*Zload Cplx*] is displayed, the time process of the parameters Zload real part and Zload imaginary part is shown in the diagram. If you click on this button, the content of the button changes back to [*Zsh + Zload*].

1.3.12 RMS hp values



Press the *„RMS hp“* button and the window below is displayed:



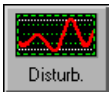
Reset of all values to zero and start a new measurement.

All measurement – parameter are RMS values, which are only about a **half cycle duration fundamental frequency** integrated, **10ms at 50 Hz**.

Functions/ Options	**Remarks**
U in [V]	*Rms. values of the voltage (integrated over a half cycle) of all connected phases (1, 2, 3, N)*
Umax in [V]	*Maximum half cycle rms. value of the voltage of the respective phase (1, 2, 3, N):* since last pressing  , or during the actual saving interval (with storing activated)

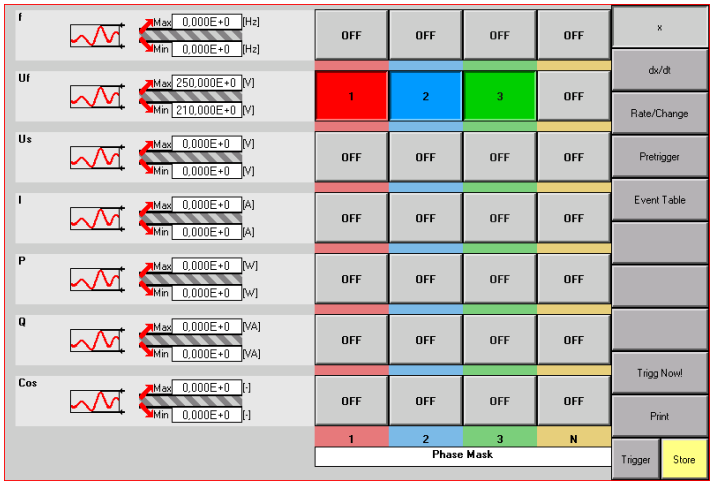
Iumax in [A]	*Half cycle rms values* *of the current of the respective phase (1, 2, 3, N)* *at the time of the Umax occurrence (see Tumax)*
Tumax	*Date and time of the occurrence of Umax*
Umin in [V]	*Minimum half cycle rms. values of the voltage* *of the respective phase (1, 2, 3, N)* since last pressing Init, or during the actual saving interval (with storing activated)
Iumin in [A]	*Half cycle rms. values* *of the current of the respective phase (1, 2, 3, N)* *at the time of the Umin occurrence (see Tumin)*
Tumin	*Date and time of the occurrence of Umin*
I in [A]	*Rms values of the current* *(integrated over a half cycle)* *of all connected phases (1, 2, 3, N)*
Imax in [A]	*Maximum half cycle rms values of the current* *of the respective phase (1, 2, 3, N)* since last pressing Init, or during the actual saving interval (with storing activated)
Uimax in [V]	*Half cycle rms values of the voltage* *of the respective phase (1, 2, 3, N)* *at the time of the Imax occurrence (see Timax)*
Timax	*Date and time of the occurrence of Imax*
Imin in [A]	*Minimum half cycle rms values of the current* *of the respective phase (1, 2, 3, N)* since last pressing Init, or during the actual saving interval (with storing activated)
Uimin in [V]	*Half cycle rms values of the voltage* *of the respective phase (1, 2, 3, N)* *at the time of the Imin occurrence (see Timin)*
Timin	*Date and time of the occurrence of Imin*

1.3.13 Disturbance Fault Recorder



It´s application is Disturbance Fault Recording. Beside Power Fault Recording (Transient Module, Wave form recording) and Data Logging (Power- and FFT Module) the PNA is now able to detect also Power changes, Frequency variations, voltage fluctuations and it can store the data based on RMS values of periods.

After starting measurement choose the *Disturbance* button in the Module Selector bar.

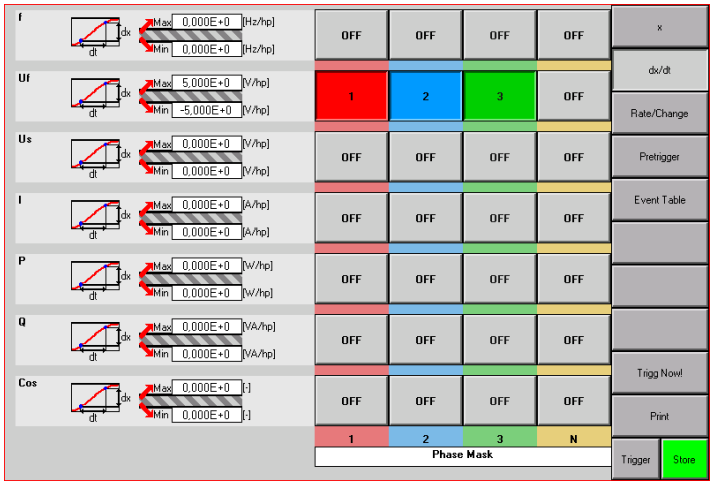


Show table of events

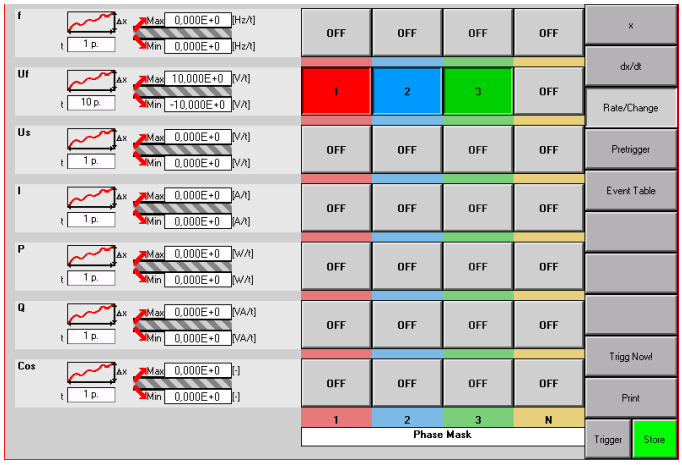
By pressing this button, a manual trigger start, that mean that the actual graphs get stored in a trigger event.

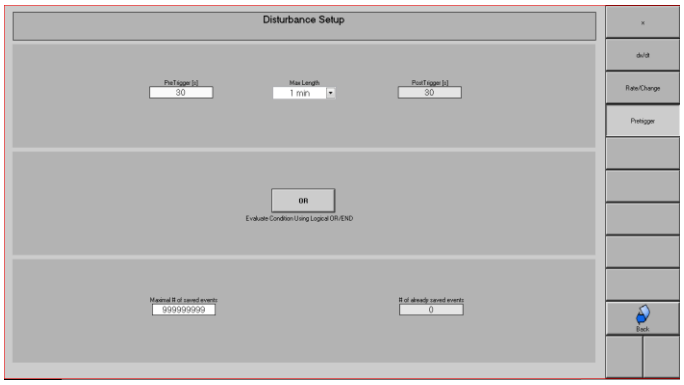
x The Events are evaluated as an edge trigger, so an event is generated only when the quantity crosses limits in/out.

dx/dt Data are evaluated every half period. The derivation is calculated as difference between two half period values.



Rate/Change The rate of change is calculated as difference between two values. The user can setup the calculation time – time between values used for the rate of change calculation. This can be: 1 period, 2p, 5p, 10p, 20p, 30p, 40p, 50p, 100p.





Stored are half period data, for maximum 10 minutes (selectable 1-10min), with pre triggering 0-60 seconds.

Event Table:

1.3.14 PAD Option

Connect the PAD-BOX with the fixed cable to the 9-pin Sub-D female connector to the PNA.

1.3.14.1 Modules of the PAD-BOX

The PAD-Box consists of two modules

→ **PAD-V8** module, 8 input channels, named as **GROUP A**
(address on 14)

→ **PAD-VTH8** module, 8 input channels, named as **GROUP B**
(address on 15)

1.3.14.2 Specifications of the modules

→ **PAD-V8:** 8 input channels with differential input
resolution: 16 bit

Input signals:

Voltage:	±10V, ±5V, ±1V, ±500mV, ±150mV
Current:	±20mA (with external 125Ω Shunt)
Accuracy:	<0.1%
OV-Protection:	±35V
Isolation Voltage:	1000VDC to the system, not isolated between inputs

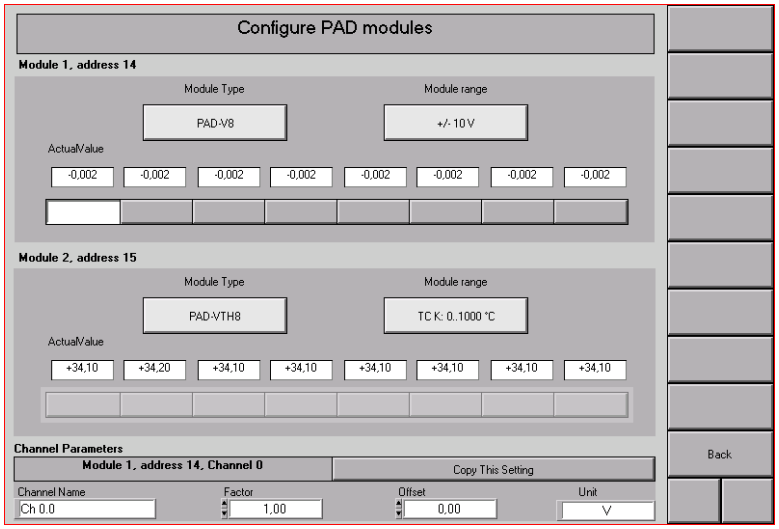
→ **PAD-VTH8:** 8 input channels with differential input
resolution: 16 bit

Input signals:

Voltage:	±2.5V, ±1V, ±500mV, ±100mV, ±50mV, ±15mV
Current:	±20mA (with external 125Ω Shunt)
Thermocouples:	J, K, T, E, R, S, B, N, C
Accuracy:	<0.1%
OV-Protection:	±35V
Isolation Voltage:	1000VDC to the system, not isolated between inputs

1.3.14.3 Setting up the modules

The following parameters can be set for each channel:
- Channel name
- Factor
- Offset
- Unit



After starting the measurement, press the button PAD.

Switch between the modules A (V8) and B (VTH8)

Make channel visible or invisible

2. Analysis of saved data

The data analysis can be done directly on the **PNA** system or on a conventionally PC.
The data will be analysed with the ***PNA-Post*** software.

2.1 Recommended PC configuration for PNA-Post

• Operating system:	Windows (XP, 7 or 10) x86/64
• Processor:	Intel core 2 Duo 1.2GHz or higher
• Memory:	2GB or higher
• HDD/SSD:	50GB or higher

2.2 Installing the analysis software PNA - Post

Copy and install “PNAPost_v[xxx]_setup.exe

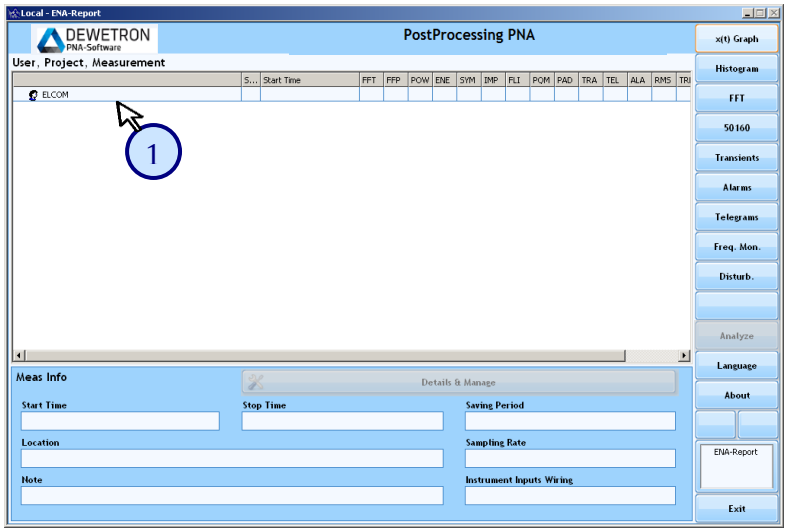
Information:

- For using PNA-Post you will need the *BK Lib software and the LabVIEW Runtime Engine 2011*
- Before installing please uninstall all older versions from your system!

3. PNA-Post

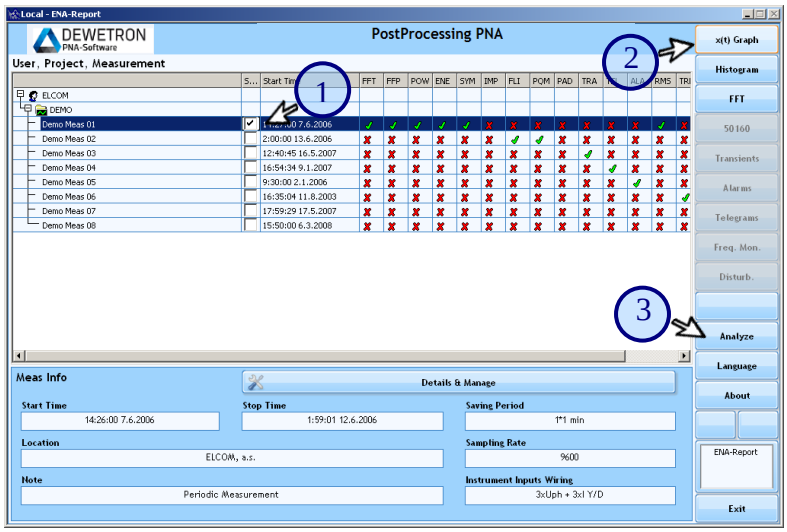
3.1. Basic functionality and control

After the application is launched a list of users and projects is shown.



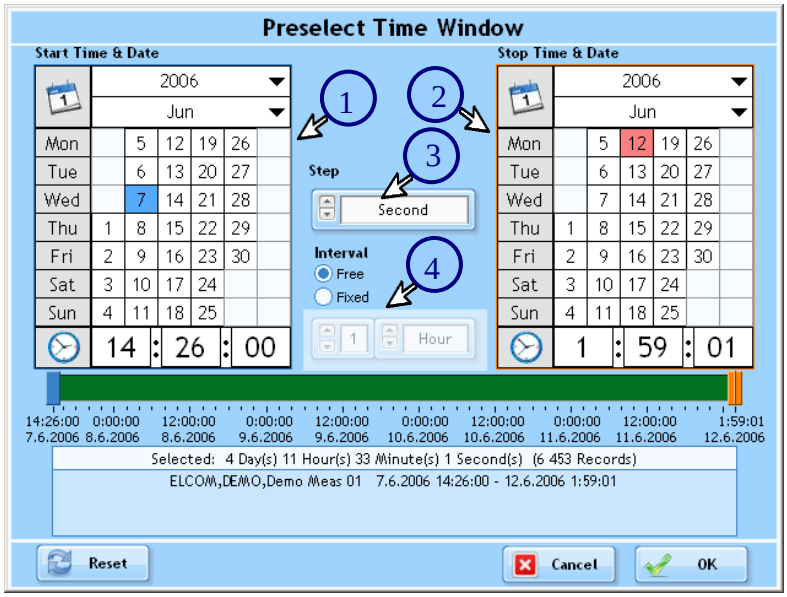
1. Users list

By clicking on a user, an expanded list of user projects appears. By clicking on a project, an expanded list of project measurements appears. By checking the “Sel” box, quantities for data analysis, can be presented and printed



1. Measurement data selection
2. Time domain analysis selection
3. Start of selected analysis

By clicking on the “Analyse” button, a dialog window for time interval selection appears.



1. Start of the time interval for data analysis can be set here. (Year, month, day and the start of time interval can be set by this calendar.)
2. End of the time interval for data analysis can be set here. (Year, month, day and the stop of time interval can be set by this calendar.)
3. Select step of time interval to move in analysed data.
4. Select free (user specified) or fixed time interval for data analysis.

Note: Left mouse click increases Hour:Minute:Second values, while the right mouse decreases Hour:Minute:Second values.

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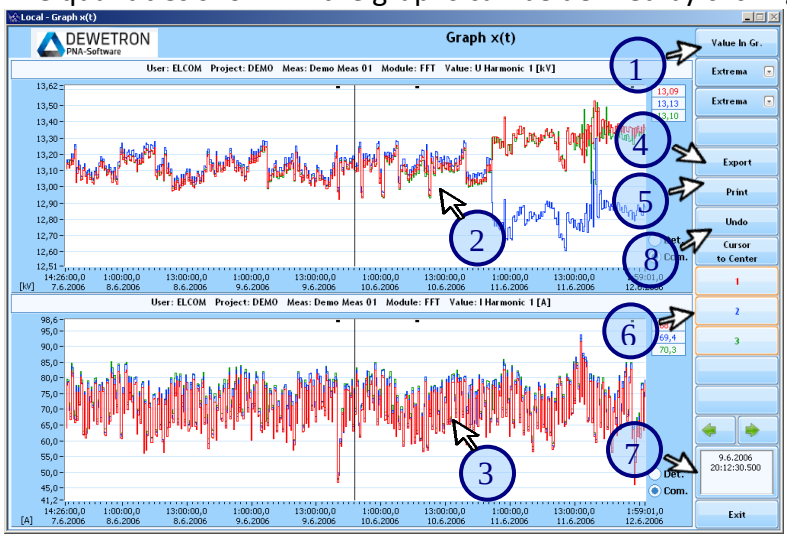
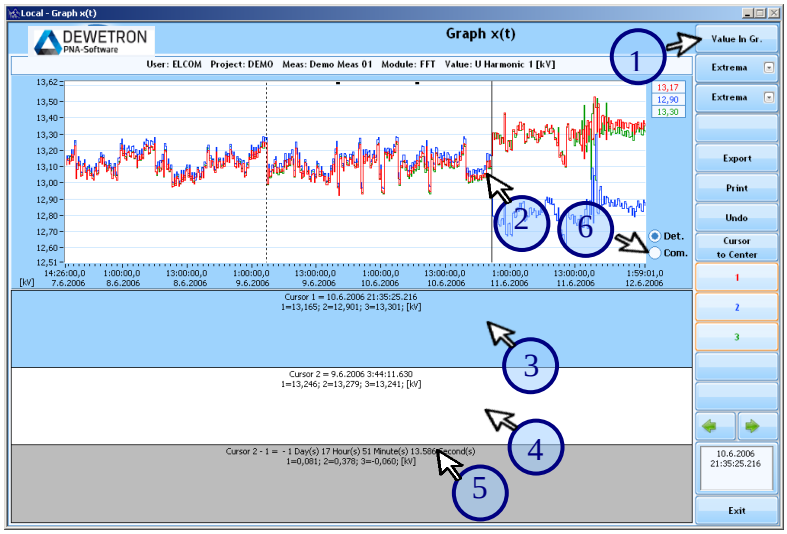
3.2. Time domain analysis

By clicking the “OK” button, in “Preselect Time Window” a new window with two graphs appears. The quantities shown in the graphs can be defined by clicking the “Value In Graph” Button.

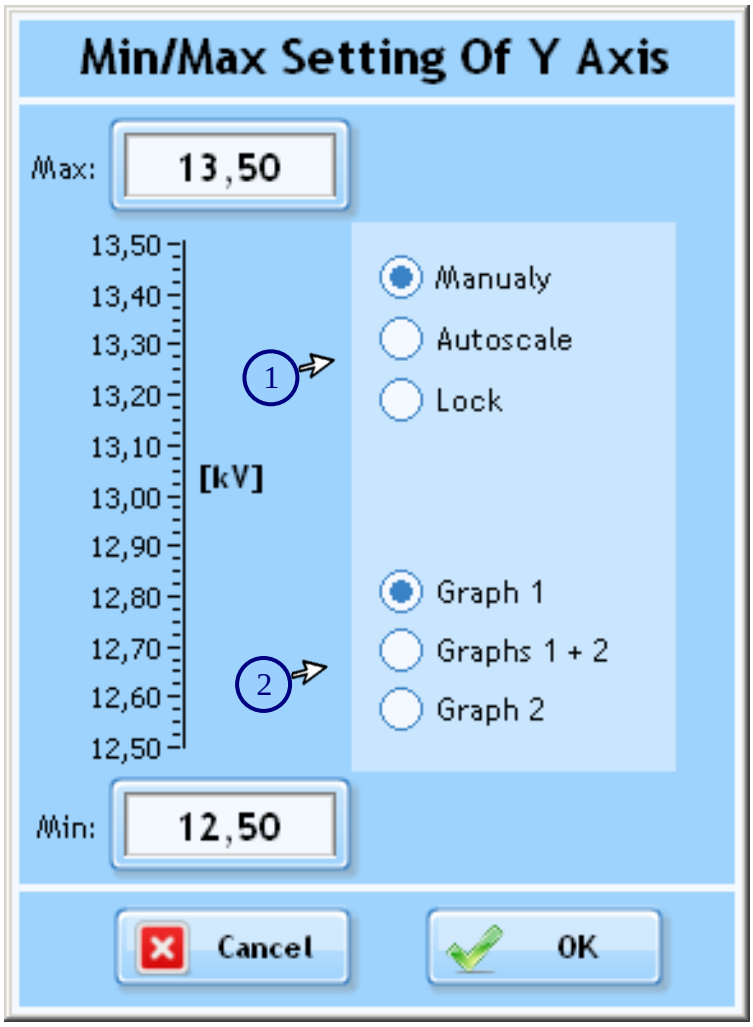


1. Quantities in graph selection
2. Graph no.1
3. Graph no.2
4. Export data into text (ASCII) file
5. Protocol printout (printer, BMP, HTML)
6. Selection of displayed phases
7. Display of detailed information about cursors and a selection between two cursors for precise time and amplitude measurement.
8. Zoom Out



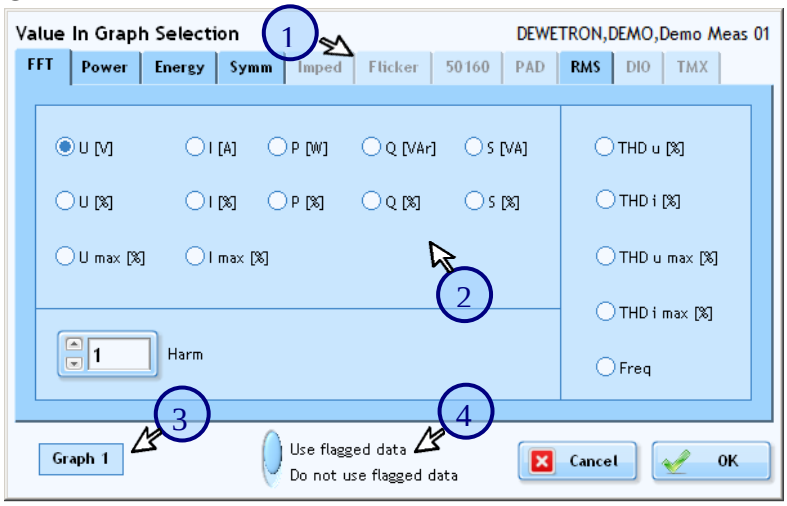
1. Quantities in graph selection
2. Graph no.1
3. Quantity amplitude and time on the first cursor’s position
4. Quantity amplitude and time on the second cursor’s position
5. Time and amplitude difference between cursors
6. Return to the two graphs display

By clicking on the Y-axis or time-axis can be set axis properties.



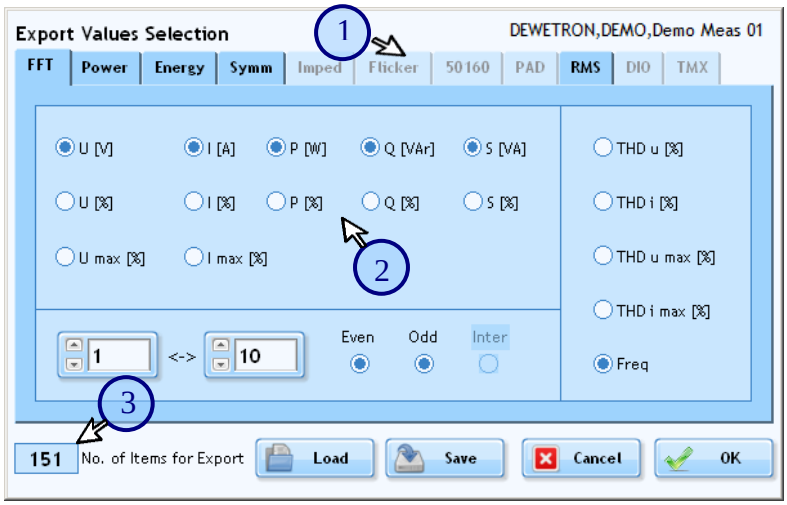
1. Selection of the Y-axis behaviour
2. Selection of graphs on which the axis behaviour will be applied

A pop-up selection window appears, of the quantities displayed in the graphs by clicking “Value In Gr.”



1. Selection of quantities group according to “Storing Time Panel” in PNA-Touch.
2. Selection of the specific quantity
3. Graph (no.1 or no.2) selection in which the selected quantity will be displayed.
4. There’s an option to display “unflagged data” according to the IEC 61000-4-30 definition.

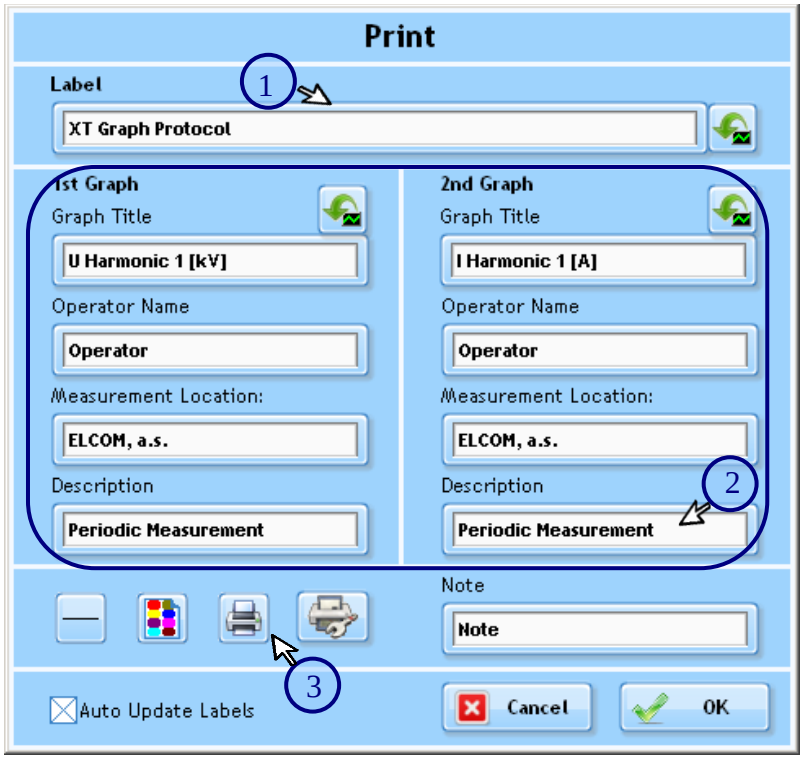
By clicking “Export”, quantities for export to ASCII files can be selected.



1. Selection of quantity groups according to “Storing Time Panel” in PNA-Touch.
2. Selection of the specific quantities for exporting
3. Total number of columns in exported ASCII file.

3.3. Protocol print

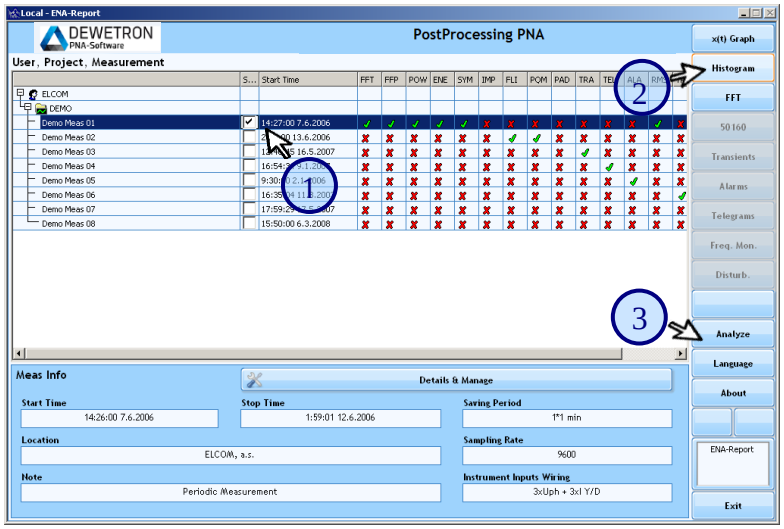
By clicking “Print”, a printed copy of the protocol with graphs can be obtained.



1. Main label on the protocol can be modified here.
2. Labels for graph no.1 and no.2 can be defined here.
3. Parameters like line width, colour or BW print, printer / BMP/HTML, printer type can be set-up here.

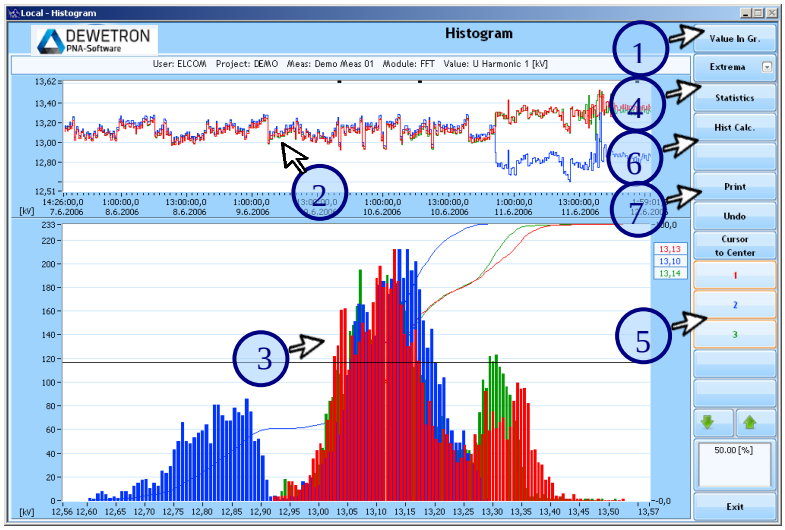
3.4. Statistical analysis

A selected quantity can be statistically evaluated and displayed in a histogram. The statistical analysis is accessible via “Histogram” button.



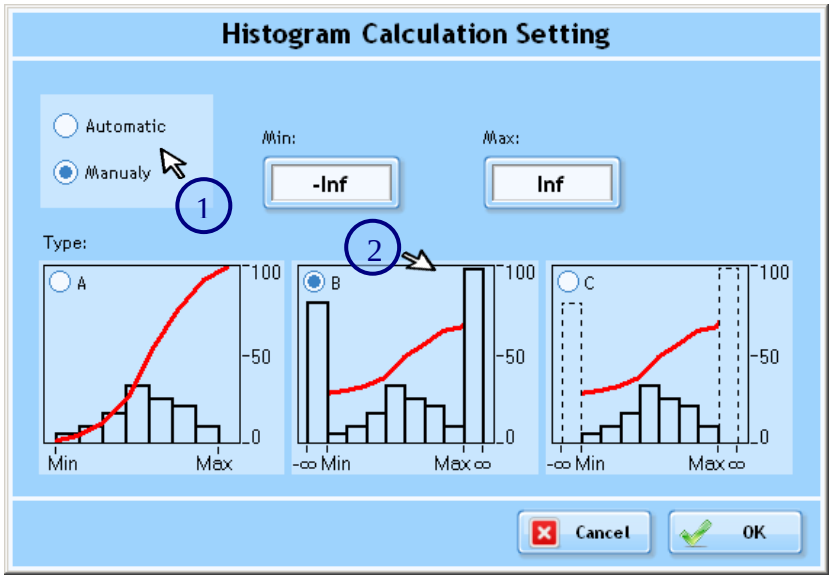
1. Measurement data selection
2. Statistical analysis of the data in the time domain
3. Start selected analysis

By clicking “Analyse”, a dialog window for the time interval selection appears as previously described. The quantity of the two selected graphs appear: x(t) graph and histogram for selected quantity. Statistical information can be displayed by clicking “Statistics”.



1. Selection of quantity for statistical evaluation.
2. x(t) graph of selected quantity
3. Histogram of selected quantity
4. Statistical details
5. Selection of displayed phases
6. Parameters for histogram calculation set-up
7. Protocol printout (printer, BMP, HTML)

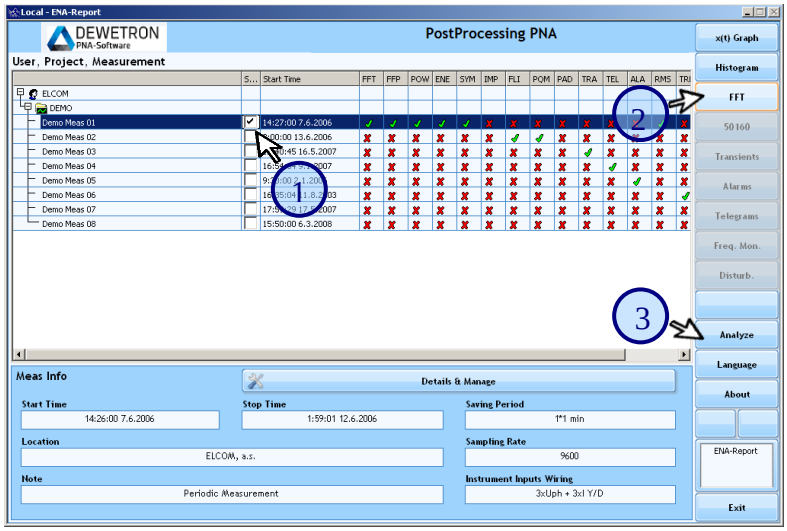
Parameters for histogram calculation set-up can be set by clicking “Hist Calc”



1. Set-up of histogram boundary (automatic/ manual)
2. Variation of possible min/max boundary bins.

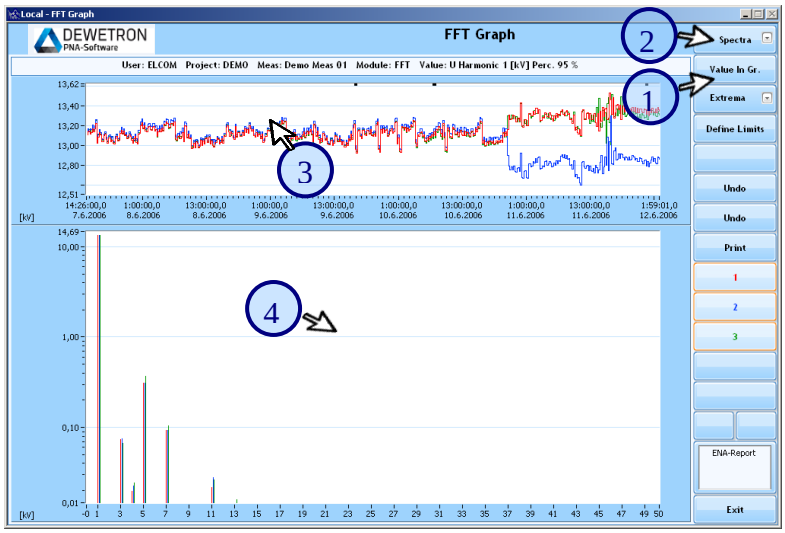
3.5. Frequency domain analysis

Frequency domain analysis of stored data can be displayed by clicking “FFT” in the main panel



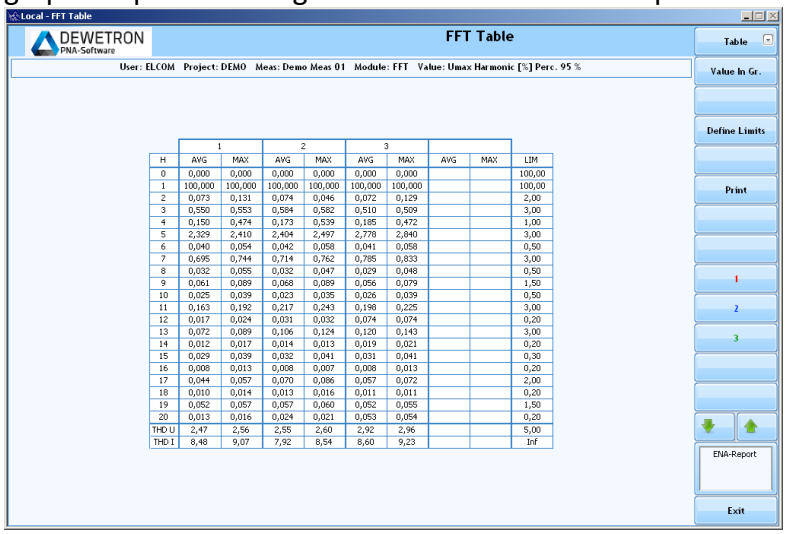
1. Measurement data selection
2. Frequency domain analysis
3. Start of selected analysis

By clicking “Analyse”, a dialog window for the time interval selection appears as previously described. If the “OK” buttons have been pressed the x(t) and spectra graphs appear.



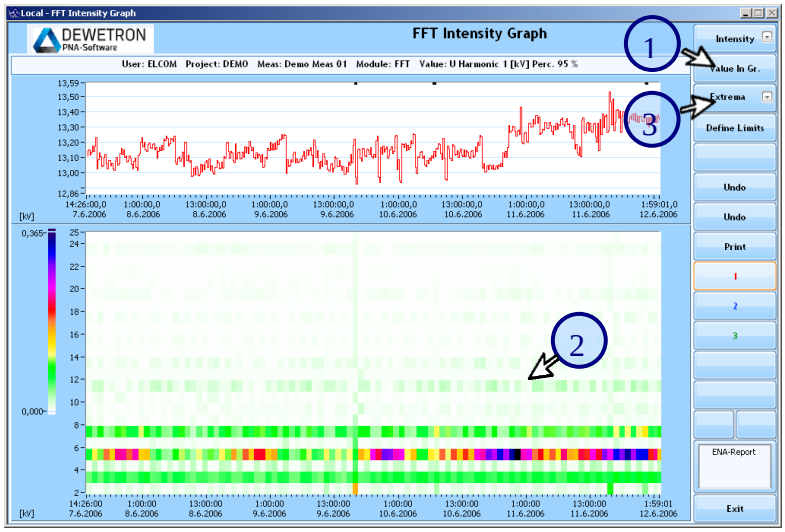
1. Selection of quantity for statistical evaluation.
2. Selection of spectral data presentation.
3. x(t) graph of selected quantity
4. Spectra of selected quantity in selected type of presentation.

By clicking “Spectra”, spectral data will be presented in a graph with lines, tables and an intensity graph of spectra during time interval and instant spectra.



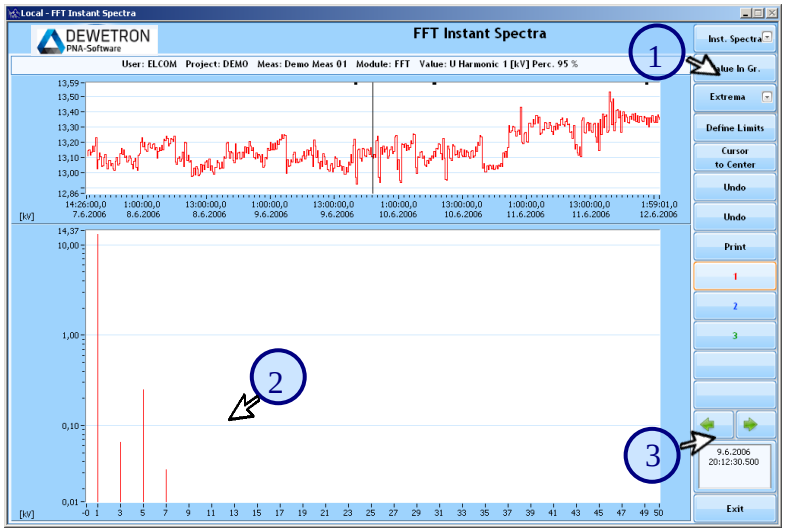
	1		2		3				
H	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	LIM
0	0,000	0,000	0,000	0,000	0,000	0,000			100,00
1	100,000	100,000	100,000	100,000	100,000	100,000			100,00
2	0,073	0,131	0,074	0,046	0,072	0,129			2,00
3	0,550	0,553	0,584	0,582	0,510	0,509			3,00
4	0,150	0,474	0,173	0,539	0,185	0,472			1,00
5	2,329	2,410	2,404	2,497	2,778	2,840			3,00
6	0,040	0,054	0,042	0,058	0,041	0,058			0,50
7	0,695	0,744	0,714	0,762	0,785	0,833			3,00
8	0,032	0,055	0,032	0,047	0,029	0,048			0,50
9	0,061	0,089	0,068	0,089	0,056	0,079			1,50
10	0,025	0,039	0,023	0,035	0,026	0,039			0,50
11	0,163	0,192	0,217	0,243	0,198	0,225			3,00
12	0,017	0,024	0,031	0,032	0,074	0,074			0,20
13	0,072	0,089	0,106	0,124	0,120	0,143			3,00
14	0,012	0,017	0,014	0,013	0,019	0,021			0,20
15	0,029	0,039	0,032	0,041	0,031	0,041			0,30
16	0,008	0,013	0,008	0,007	0,008	0,013			0,20
17	0,044	0,057	0,070	0,086	0,057	0,072			2,00
18	0,010	0,014	0,013	0,016	0,011	0,011			0,20
19	0,052	0,057	0,057	0,060	0,052	0,055			1,50
20	0,013	0,016	0,024	0,021	0,053	0,054			0,20
THD U	2,47	2,56	2,55	2,60	2,92	2,96			5,00
THD I	8,48	9,07	7,92	8,54	8,60	9,23			Inf

1. Selection of quantity for statistical evaluation.
2. Spectral data in the table
3. Scroll up and down



1. Selection of quantity for statistical evaluation.
2. Intensity graph of spectra up to the 25th harmonic during the time interval.
3. Selection of Extrema

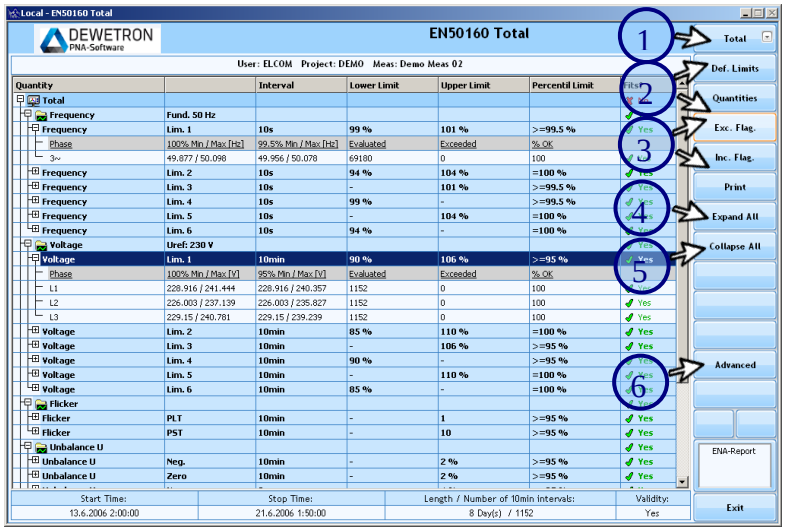
When an instant spectra display is selected and the cursor in the x(t) graph move simultaneously, some instant spectra is displayed



1. Selection of quantity for statistical evaluation.
2. Instant spectra graph.
3. Cursor buttons

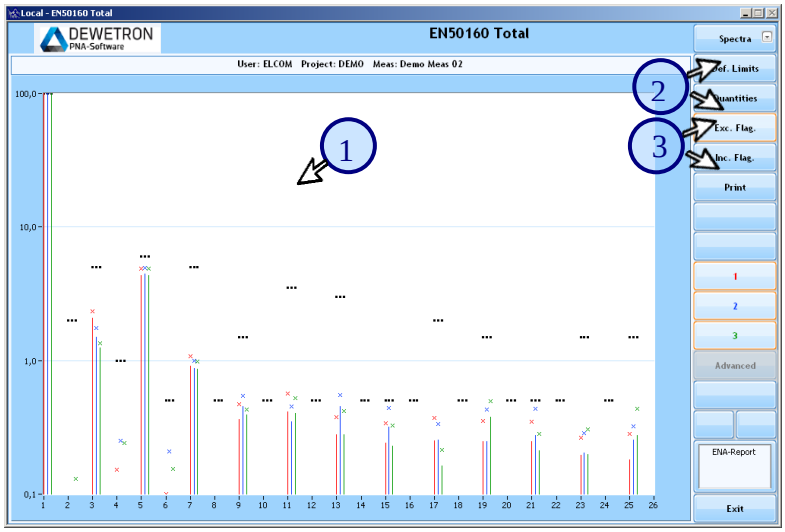
3.6. Power Quality according to 50160

The Voltage quality monitor evaluation according to standard EN50160, can be seen once the “50160” button has been selected and the “Analyse” button is pressed. By clicking “Analyse”, a dialog window for time interval selection appears as previously described. The complex EN50160 results screen is then displayed.



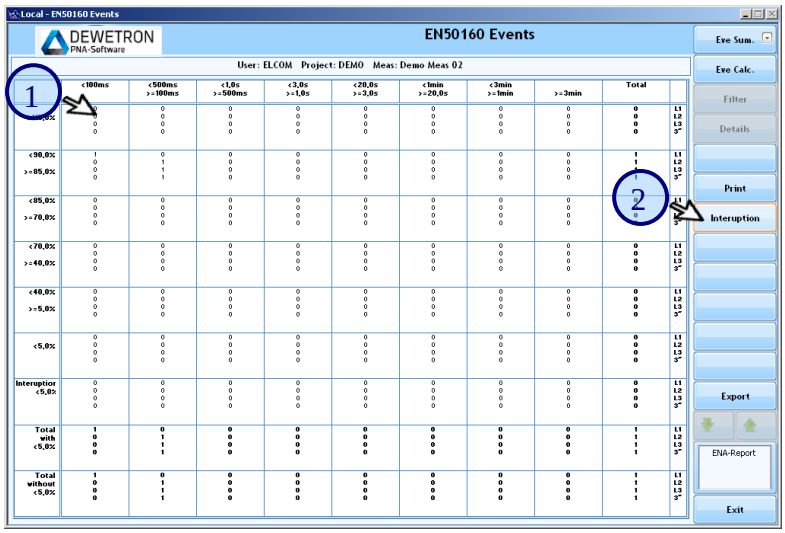
1. Selection of displayed 50160 information
2. 50160 limits and quantities definition
3. Flagged data included or excluded in calculations
4. Expansion of all nodes
5. Collapse all nodes
6. Advanced/Basic view

EN50160 voltage spectrum up to 25th harmonic can be displayed



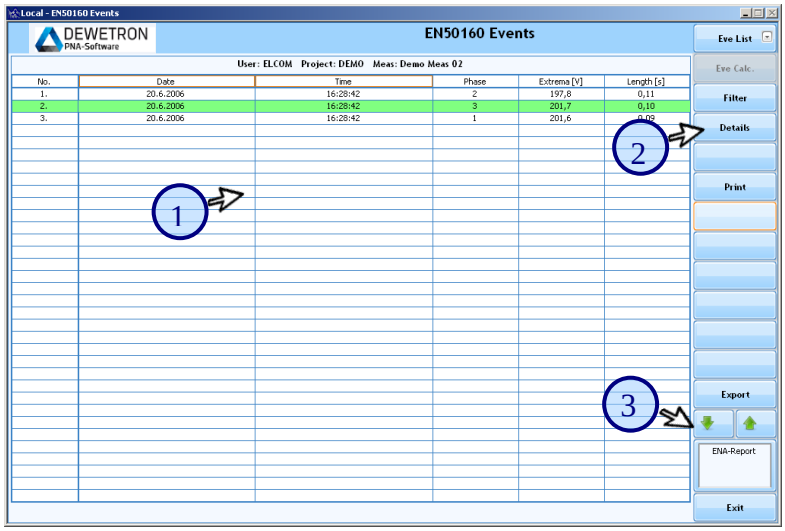
1. EN50160 voltage spectra
2. 50160 limits and quantities definition
3. Flagged data included or excluded in calculations

Statistically processed information regarding voltage events can be displayed



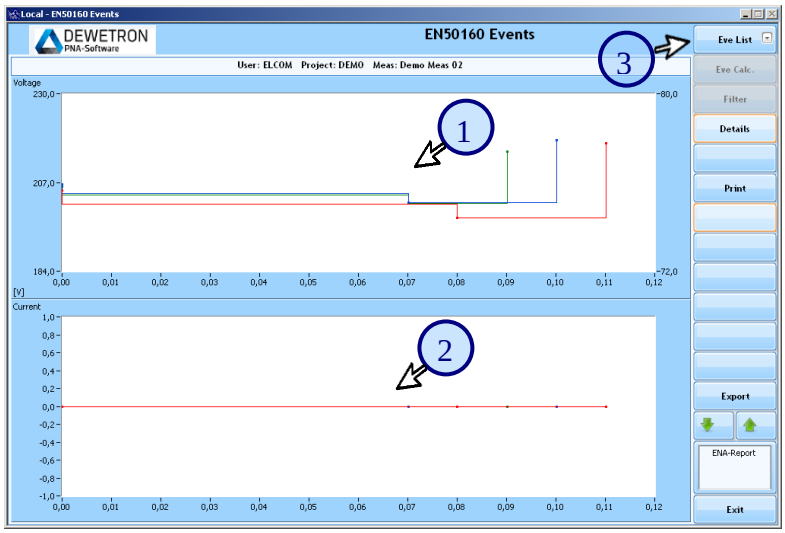
1. Table of processed voltage events
2. Interruptions can be added to the voltage events table

A Chronological list of voltage events can be displayed as a table. Selecting one or more events displays provides detailed information regarding the event.



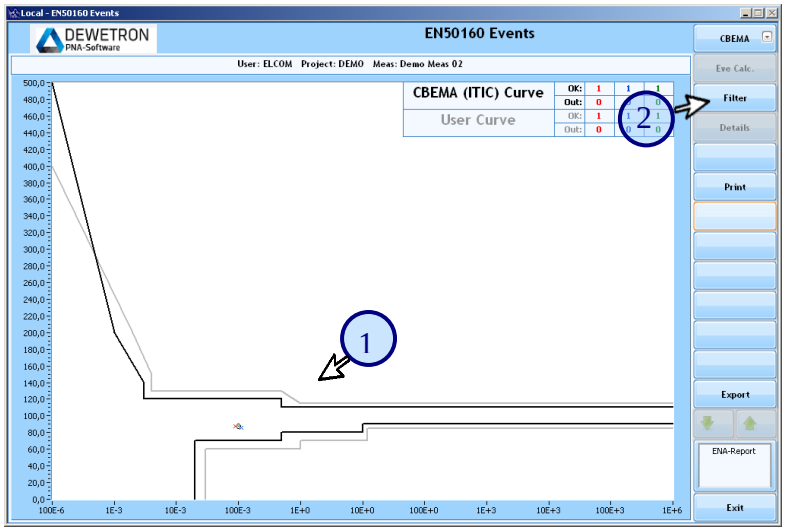
1. Table of chronological list of voltage events.
2. Display selected event detail
3. Scroll up and down in the events table

By selecting one or more events, more information can be displayed by clicking “Details”.

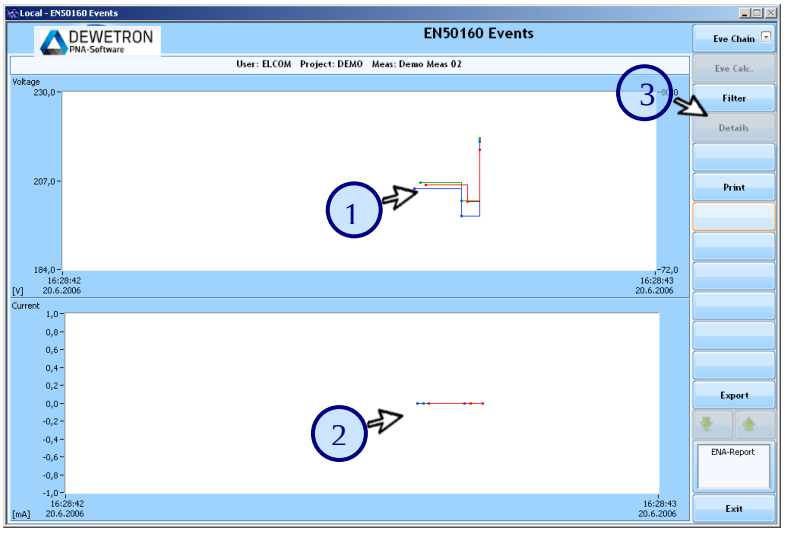


1. Voltage event detail in x(t) graph.
2. Current during voltage event
3. Selection of displayed EN50160 information

Events can be graphically displayed in a CBEMA graph, where each event is represented as points.



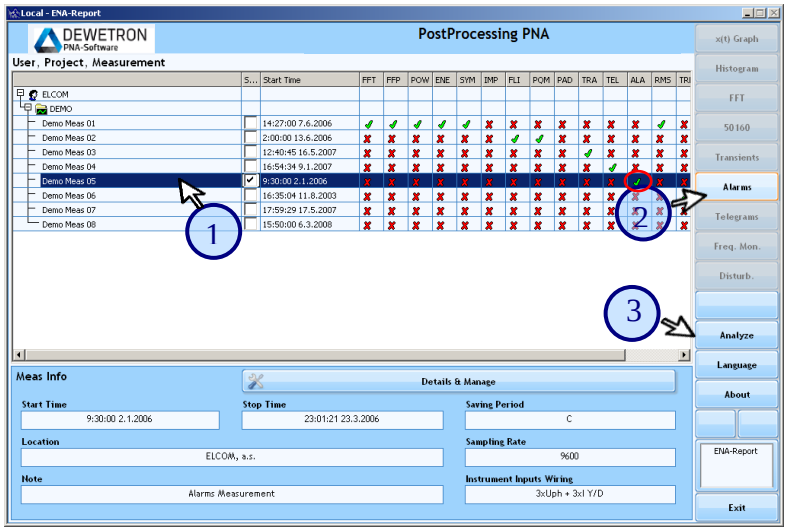
1. CBEMA curve with events
2. Filter events.



1. If multiple events are selected in an event table, they are all displayed in one graph.
2. Current during voltage event
3. Filter events

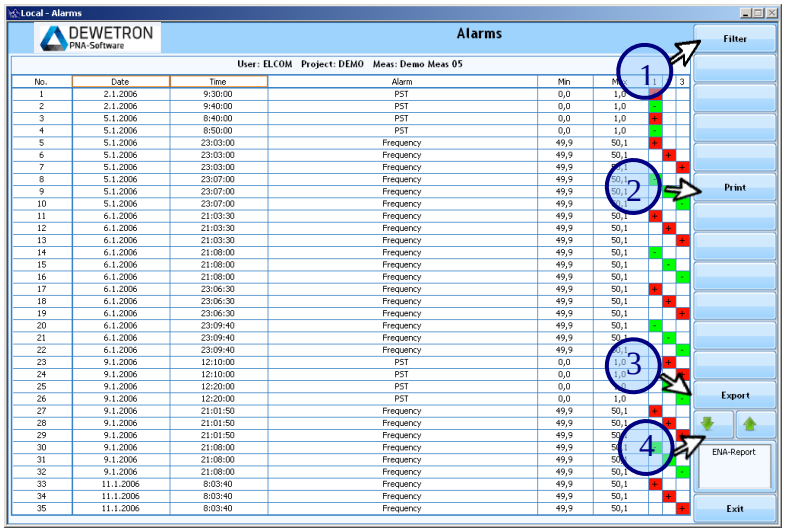
3.7 Alarms monitor

The user can click “Alarms”, once the measurement selection containing the alarm measurement data is saved.



1. Measurement data selection
2. Alarm data analysis selection
3. Start of selected analysis

By clicking “Analyse” the “Preselect Time Window” dialog appears. In this dialog box, the user can specify the time interval for data analysis (in the same way as in previous cases). Clicking “OK” closes the “Preselect Time Window” dialog and opens the alarm list table shown in next picture.



1. Filter listed alarms (according to the quantity, time interval etc.)
2. Protocol printout (printer, BMP, HTML)
3. Export data into a text (ASCII) file
4. Scroll up and down the table

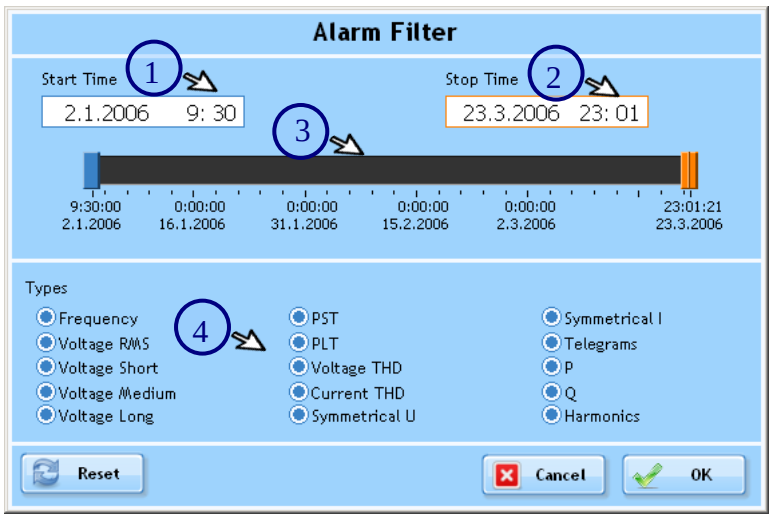
All alarm quantities are chronologically listed according to time when they have been detected. These values are listed in appropriate columns (No., Date, Time).

+ Indicates that alarm quantity goes out of specified limits.

– Indicates the alarm quantity goes back into specified limits.

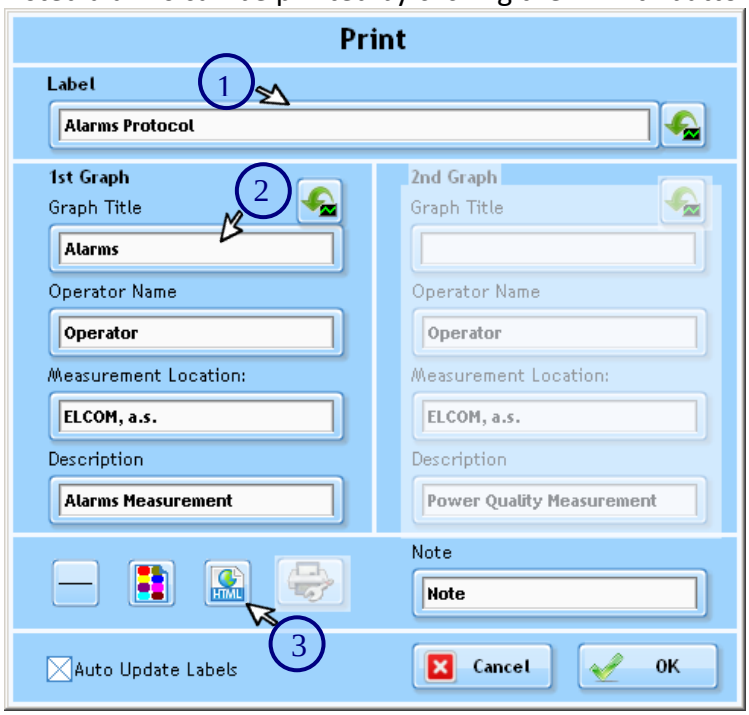
Use the “Export” button to export a list of alarm quantities into a text (ASCII) file.

List of quantities can be affected by filter. Clicking “Filter” opens the next form.



1. Set start of time interval for list of alarms
2. Set stop of time interval for list of alarms
3. Drag manually sliders to set the time interval of displayed data
4. Select monitored alarm quantities to list in the table

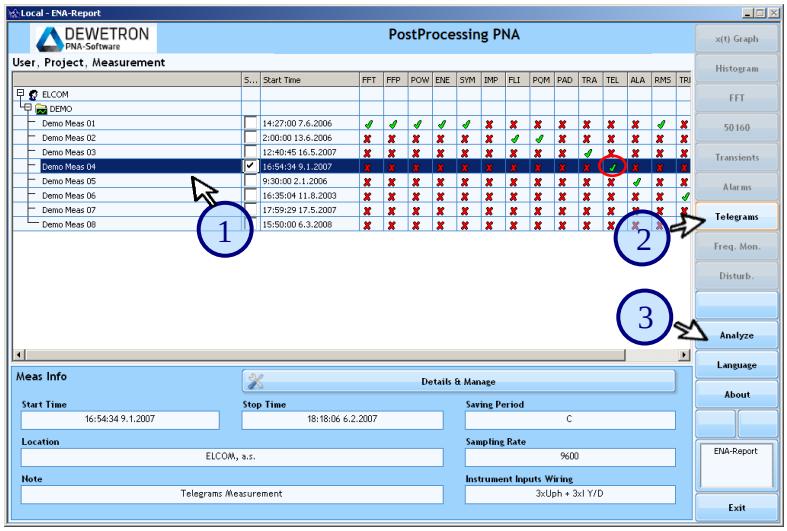
Listed alarms can be printed by clicking the “Print” button. Next dialog is then displayed.



1. Main label on the protocol can be modified here.
2. Label for alarm table can be defined here.
3. Parameters like line width, colour or BW print, printer / BMP/HTML, printer type can be set-up here.

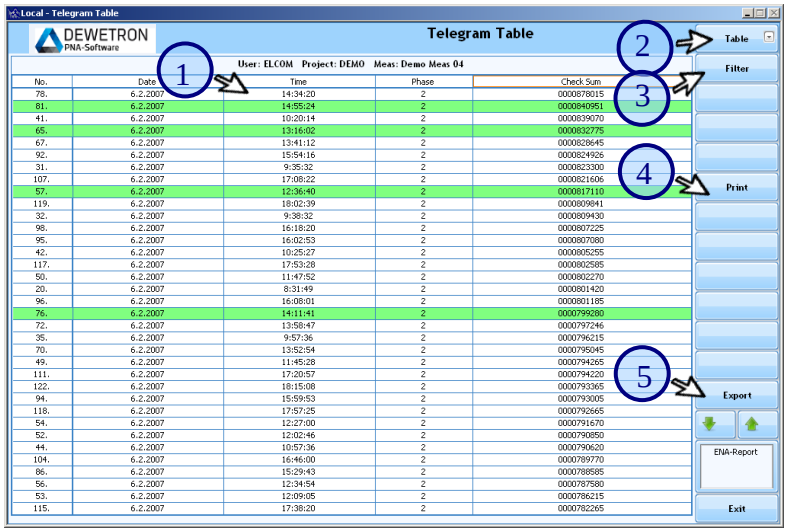
3.7. Monitor of Telegrams

If the user selects a measurement containing saved telegrams, the “Telegrams” button becomes enabled.



1. Measurement data selection
2. Telegrams analysis selection
3. Start of selected analysis

By clicking “Analyse”, the time interval selection dialog appears. In this dialog box, the user can specify the time interval for data analysis (in the same way as in previous cases). Clicking “OK” closes the time interval selection dialog and opens the telegram list table as shown in the next form.

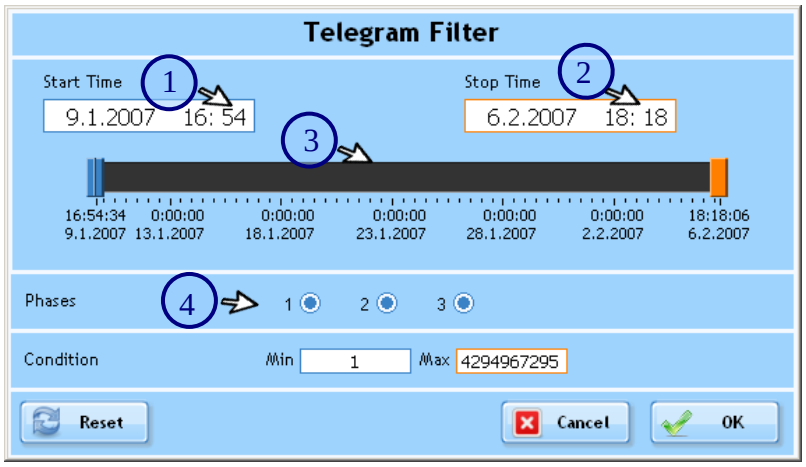


1. Table of listed telegrams
2. Filter listed telegram (according to phase and time interval)
2. Represent the selected data in a table or a time graph
3. Protocol printout (printer, BMP, HTML)
4. Exports all listed telegrams into a text (ASCII) file

The table of listed telegrams shows:

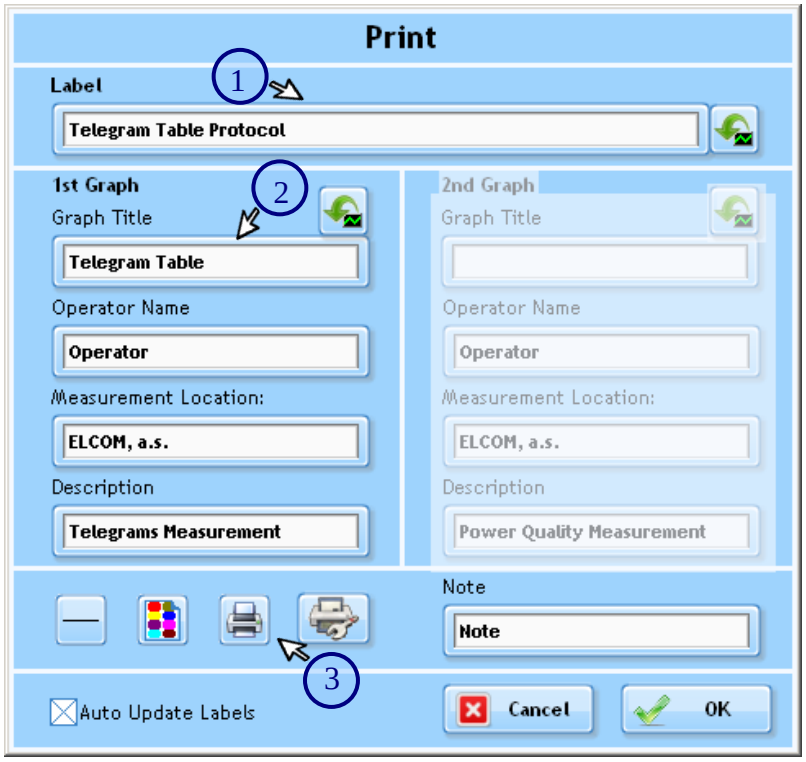
- The number of telegram in chronological list and the date/time of each telegram
- The phase the telegram was detected on
- The checksum of telegram

The “Filter” button filters the list of telegrams. The next dialog is shown in the following case.



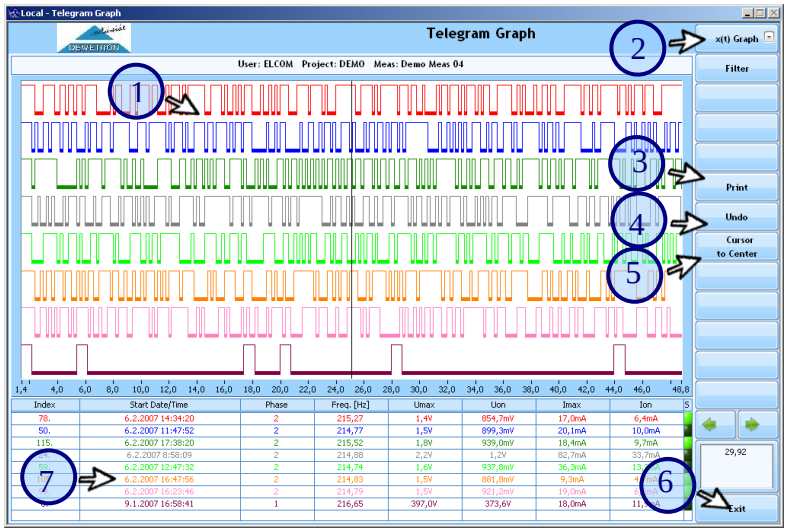
1. Set the start time of the time interval
2. Set the stop time of the time interval
3. Manually drag sliders to set the time interval of the displayed data
4. Select phases included the list of telegrams

The “Print” button opens a print dialog box shown in the following form.



1. Main label on the protocol can be modified here.
2. Label for the telegram table can be defined here.
3. Parameters like line width, colour or BW print, printer / BMP/HTML, printer type can be set-up here.

By clicking the telegram list table, several telegrams can be selected (or deselected). Clicking “Table” makes it possible to switch between the telegram list table and the time graph representation of selected telegrams. The time graph window of selected telegrams is shown next to the form.



1. The time graph for selected telegrams.
2. Choose between the time graph and the telegram list table representation
3. Prints displayed telegrams
4. Zoom out
5. Move cursor to the centre
6. Move cursor right and left
7. Shows signal details of displayed telegrams

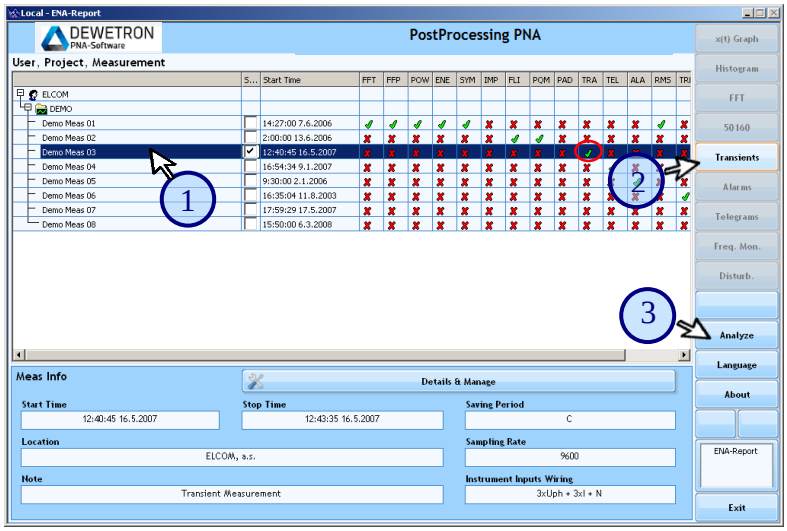
The time graph of selected telegrams also shows:

- The Index of the displayed telegram (according to the telegram table list)
- The date and time when telegram detection starts
- The phase where the telegram detected
- The frequency where the telegram was detected
- Umax – maximal effective (RMS) voltage of modulation signal
- Uon – average RMS value of voltage when the detected logical state is high (=1)
- Imax – maximal effective (RMS) current of modulation signal
- Ion - average RMS value of current when the detected logical state is low (=0)
- S – actual logical state according to cursor position

The telegram table and the telegram graph can be printed by clicking “Print” (in the same way as for previous cases). Telegrams listed in the table can be exported into a text file located in EXPORT subdirectory of DATA directory.

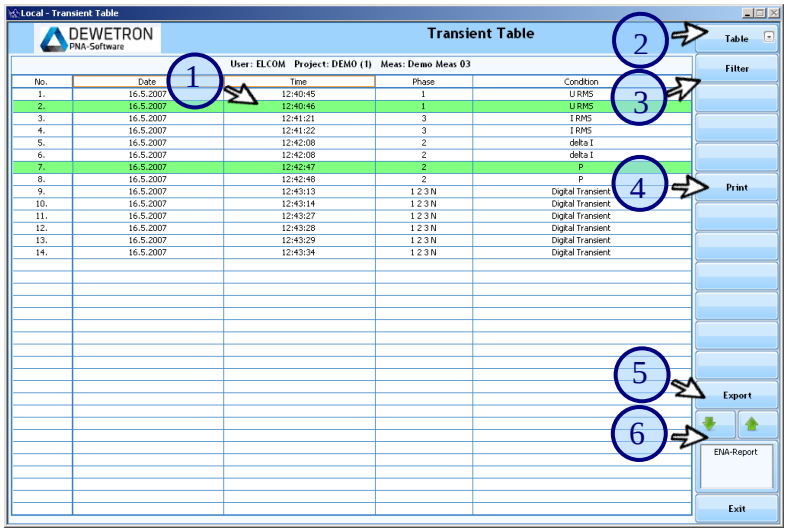
3.8. Transient Recorder

“Transient R.” button becomes enabled, once the measurement containing saved transient records is selected.



1. Measurement data selection
2. Transient recorded data analysis selection
3. Start of selected analysis

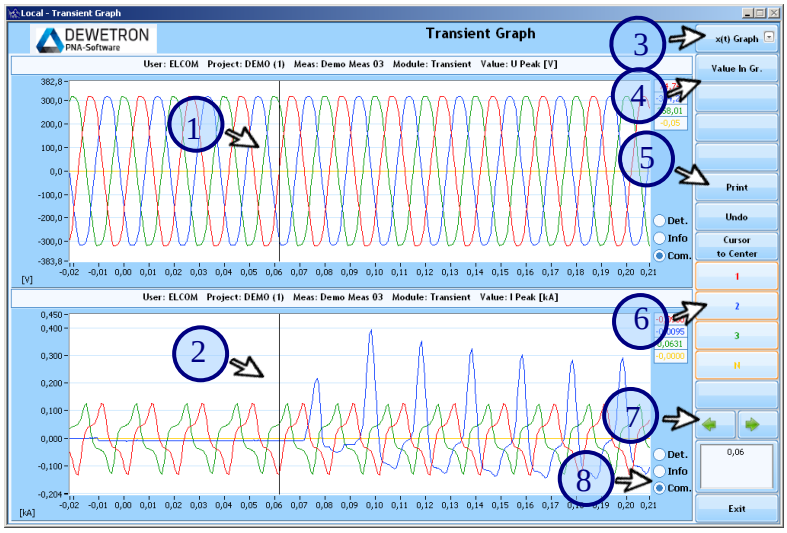
By clicking “Analyse”, a dialog displaying the time interval appears. In this dialog, the user can specify the time interval for the data analysis (in the same way as in previous cases). Clicking the “OK” button closes the time interval selection dialog and opens the transient event list as shown in the table shown on next form.



1. A table containing chronological ordered transient events
2. Select view type - the event list table, selected transient event time and spectra graph
3. Filter listed transient events (according to trigger condition, phase and transient type)
4. Protocol printout (printer, BMP, HTML)
5. Exports all listed transient events into a text (ASCII) file
6. Scroll up and down the table

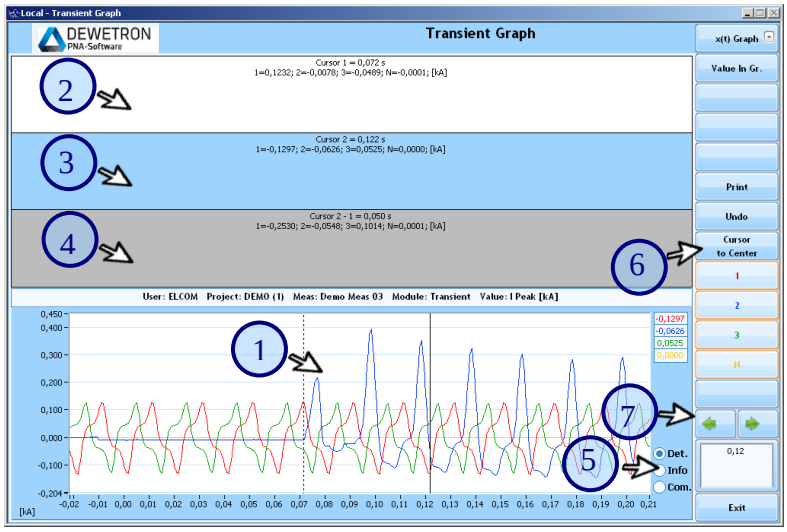
Up to 2 transient events can be simultaneously selected by clicking the left mouse button when the mouse pointer is situated on the appropriate table row (the table raw marks green colour).

When the x(t) graph representation is selected (by the item no. 2 in the previous form) the graph of quantity in time is displayed.



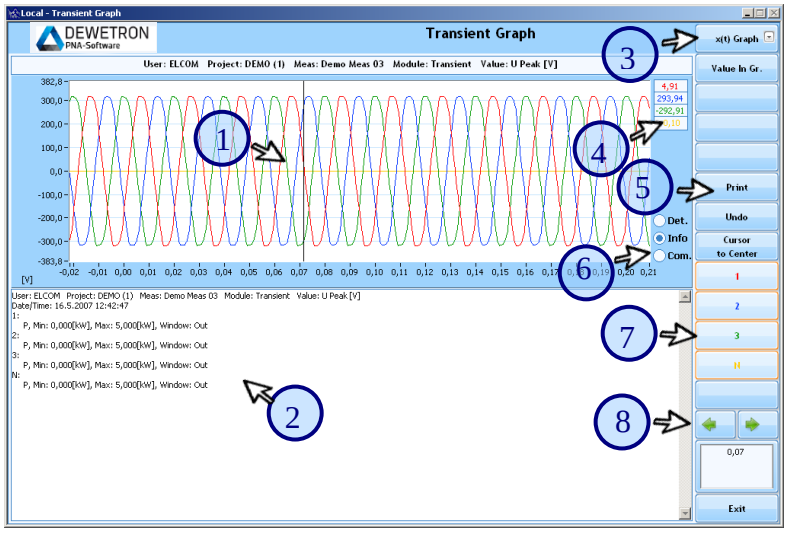
1. Graph no.1
2. Graph no.2
3. Select view type - the event table, selected transient event time graph and spectra graph
4. Select displayed quantity
5. Protocol printout (printer, BMP, HTML)
6. Buttons enable or disabling displayed phases
7. Move the cursor left or right
8. Select between time graph display, cursor details or trigger condition description

Selecting the “Det.” Choice form item no.9, in the previous form, divides the opposite graph into three cell divided tables where every row contains information about the cursor position and the quantity value (see next form).



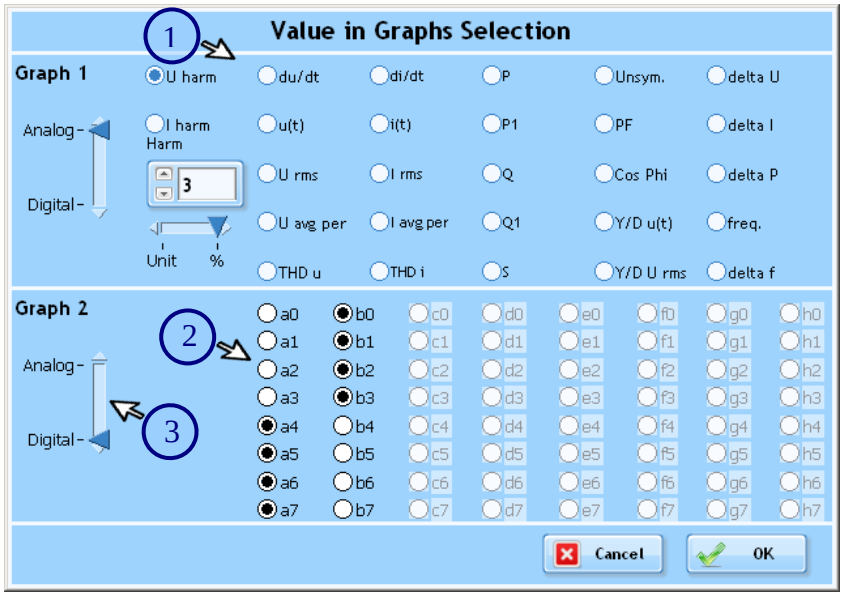
1. Time graph of selected transient quantity
2. 1st cursor position and quantity value information
3. 2nd cursor position and quantity value information
4. Time delta and quantity value delta calculated for cursors position
5. Select between time graph display, cursor details or trigger condition description
6. Centre the cursor position
7. Move the cursor left or right

Clicking the appropriate table row (items no. 2 and 3) causes the 1st or 2nd cursor to become active (focused). Using the arrow button (item no. 7 in the previous form) moves the selected cursor right or left. Using “Info” variant (item no. 5 in the previous form) shows the trigger condition description (see the next form).



1. Time graph of selected transient quantity
2. Information about the trigger condition
3. Select time graph view of transient quantity
4. Quantity value at the cursor position
5. Protocol printout (printer, BMP, HTML)
6. Select between time graph display, cursor details or trigger condition description
7. Buttons enable or disable which phases are displayed
8. Move the cursor left or right

The displayed quantity can be changed by clicking the “Value in Gr.” Button in the quantity selection dialog box.

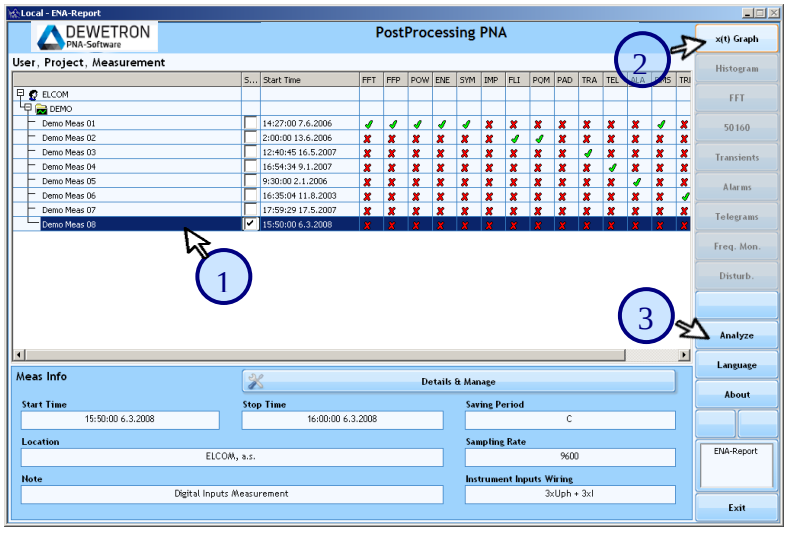


1. Analog quantity selection list for the 1st graph
2. Digital channels selection list for the 2nd graph
3. Select between analog quantities and digital channels to display time in the graph

Up to 64 digital channels can be monitored using the digital transient module and up to 8 digital channels can be simultaneously displayed in a onetime graph view.
The spectra of voltage or current signal can be displayed using the “Spectra” choice after click on “x(t) Graph” or “Table” button. The next form is displayed.

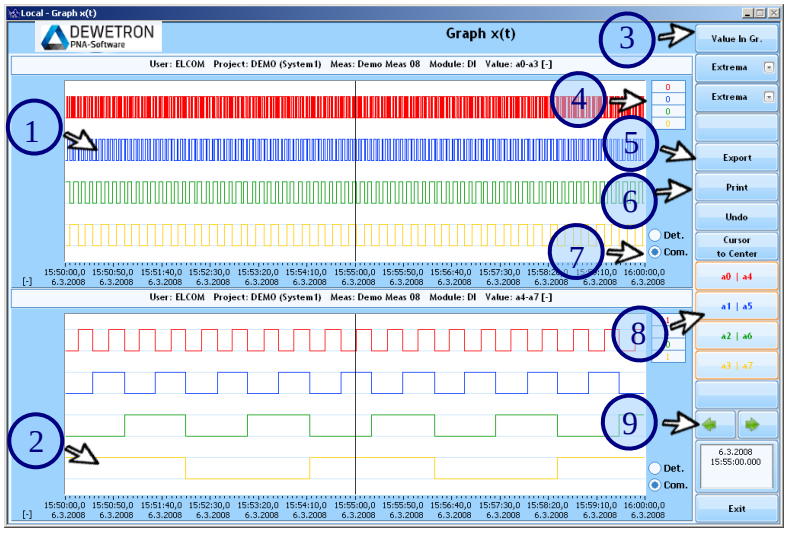
1. 1st spectra graph of selected transient quantity
2. 2nd spectra graph of selected transient quantity
3. Select spectra graph view for selected quantities
4. Transient quantity selection dialog
5. Protocol printout (printer, BMP, HTML)
6. Buttons enabling or disabling which phases are displayed
7. Move the cursor left or right

Digital channels are stored with analog data in the Transient recorder and can also be stored separately when the digital line is switched on. Selecting measurements containing DI information (DIO files) offers another way to see the digital inputs. First, select the measurement containing DIO measurement and set up the time interval for the data analysis (in the same way as in previous cases).



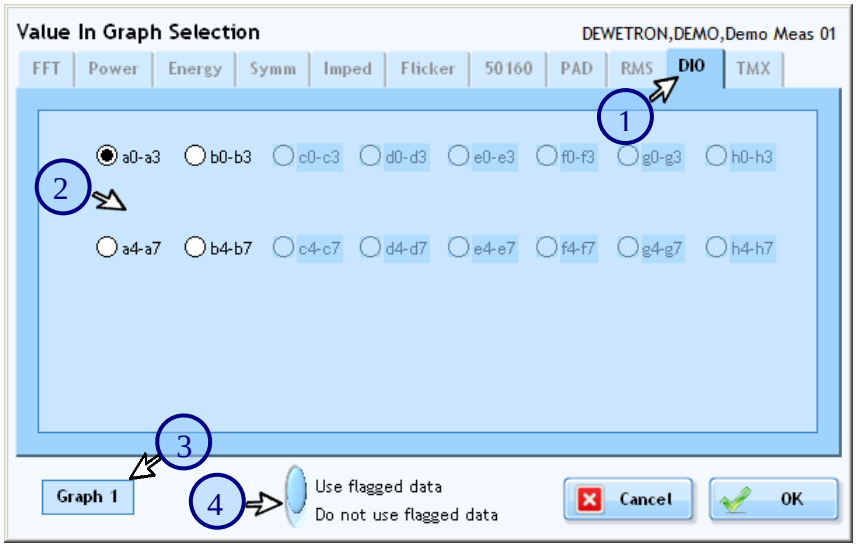
1. Measurement data selection
2. Selected time graph view for transient record data
3. Start of selected analysis

BY clicking “Analyse”, the time interval selection dialog is displayed. In this dialog, the user can specify the time interval for the data analysis (in the same way as in previous cases). Clicking “OK” closes the time interval selection dialog and opens the time graph of stored digital channels shown in the following form.



1. 1st time graph of selected digital channels
2. 2nd time graph of selected digital channels
3. Select displayed digital channels
4. State of digital line corresponding to cursor position
5. Exports displayed graphs into a text (ASCII) file
6. Protocol printout (printer, BMP, HTML)
7. Select the time graph or cursor detail view
8. Buttons enabling or disabling which selected digital lines are displayed
9. Move the cursor left or right

Click “Value In Gr.” (item no. 3 in the previous form) to select the digital channels(lines) you wish to display in the time graphs. The next form appears.

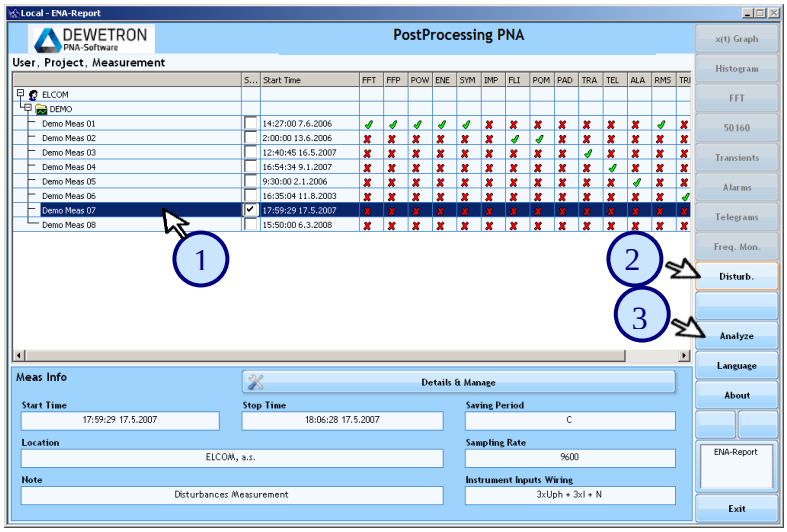


1. Digital channels selection tab
2. Digital channels to be displayed (up to 4 channels can be displayed simultaneously)
3. Graph selection (graph no. 1 or graph no. 2)
4. Add or remove the flagged data from the time graph display

One-time graph can simultaneously display up to 4 digital channels (lines). The number of available digital channels corresponds to the power quality analyser hardware configuration. Up to 64 digital channels can be monitored simultaneously.

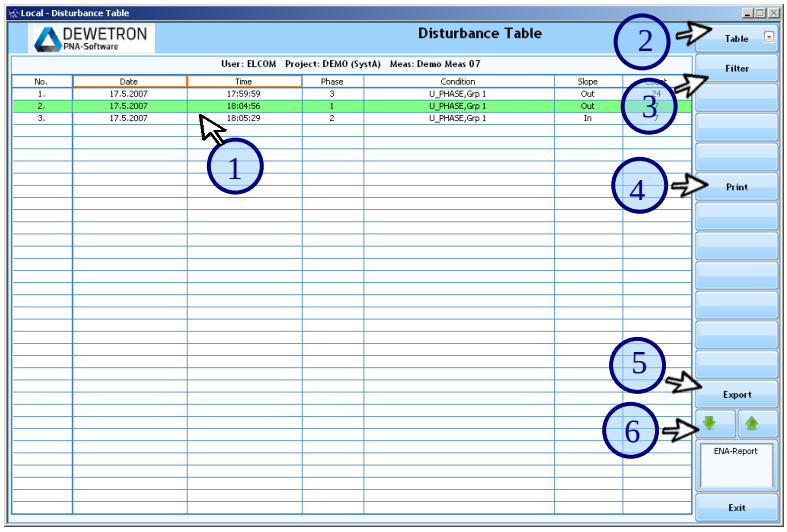
3.9. Disturbance Recorder

Just like the transient recorder, the disturbance recorder allows the user to store disturbances in a power network system triggered by a set of conditions and their combinations. In comparison with a transient recorder, the disturbance recorder stores only half period values for monitored quantities. The stored time interval, for disturbance records, can be much longer in comparison to the transient recorder but the disturbance recorder does not provide the oscilloscope details.
The “Disturb.” Button become available once the measurement containing saved disturbance records is selected.



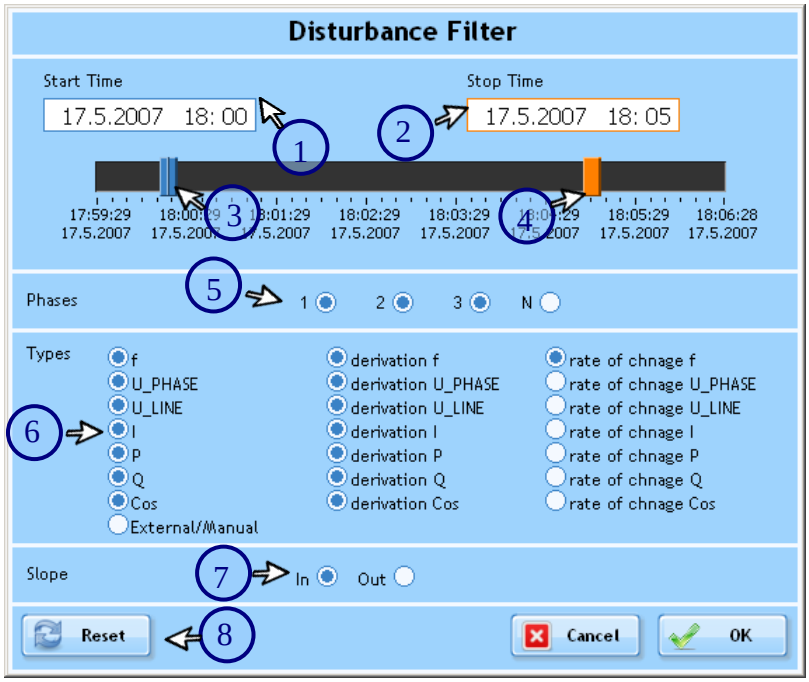
1. Measurement data selection
2. Disturbance record data analysis selection
3. Start of selected analysis

By clicking “Analyse”, the time interval selection dialog displays. In this dialog box, the user can specify the time interval for the data analysis (in the same way as in previous cases) Clicking “OK” closes the time interval selection dialog and opens the main disturbance event table views (see the next form).



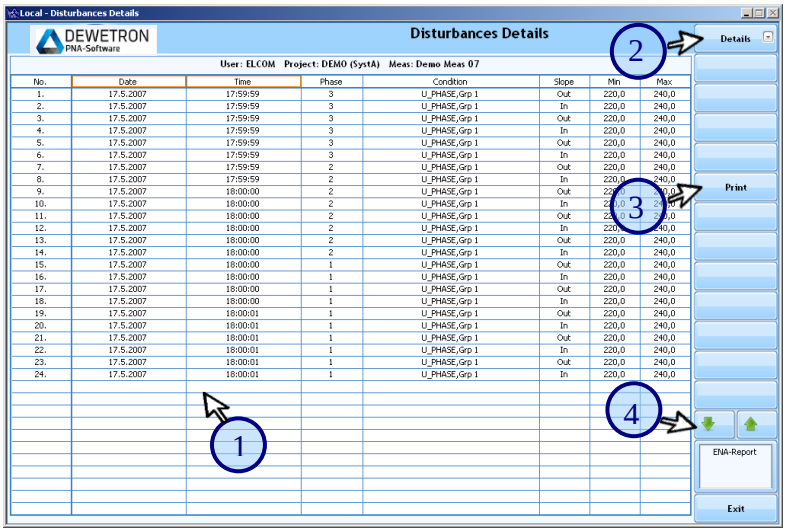
1. Table view of chronological ordered disturbance event records
2. Select the view type of recorder data (table, event details or event time graph)
3. Filter the list of displayed disturbance records
4. Protocol printout (printer, BMP, HTML)
5. Exports displayed graphs into a text (ASCII) file
6. Scroll up and down the table

Use the “Filter” button (item no. 3 in the previous form) to select which events will be included into the list table. By clicking “Filter”, the next dialog is opened.



1. Edit the start time of the event list
2. Edit the stop time of event list
3. A Slider to manually change the start time of listed events
4. A Slider to manual change the stop time of listed events
5. Select phases – only events detected on this phase will be listed
6. Select the trigger types – only events triggered by this trigger type will be listed
7. Select trigger slope (In/Out)
8. Reset the setting of the filter (all events will be listed)

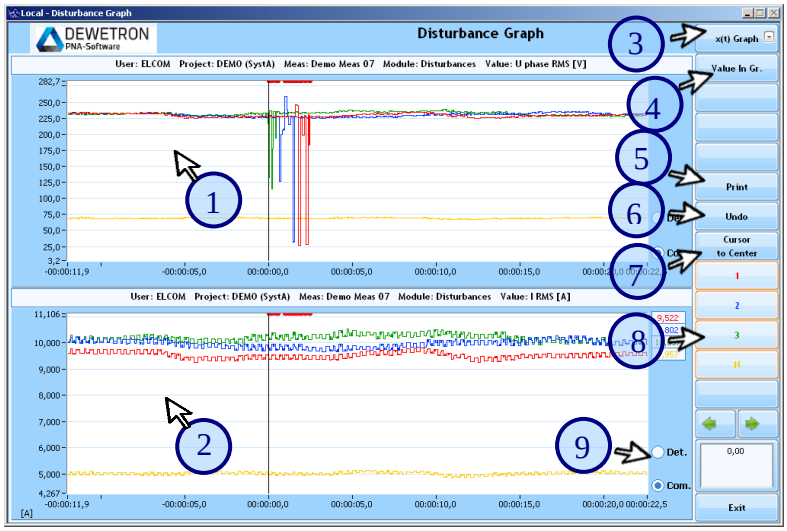
The disturbance table displays the chronological order of events (displayed in col. 1 of the table) date and time of the event, the phase an event was detected on, trigger slope and a count of detailed events that have occurred during the disturbance record. Selecting one of the events in the list (clicking on the appropriate row of the table) and clicking “Details” (item no. 2 in the next form) displays the next form.



1. Detailed event list
2. Select the view type of recorded data (table, event details or event time graph)
3. Protocol printout (printer, BMP, HTML)
4. Scroll up and down the table

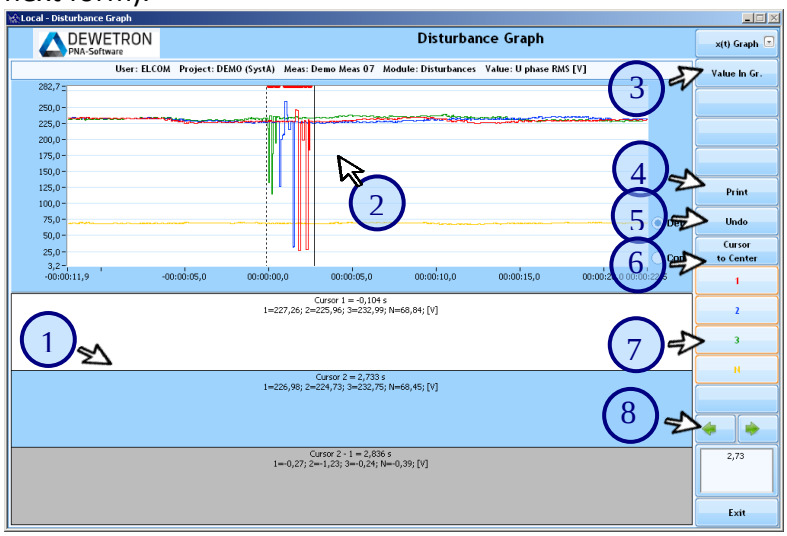
The disturbance detail list informs the user about the chronological ordered sub events that occurred during the selected event (in the disturbance table). The detail event list table includes the

date and time of event, phase the event was detected on, trigger condition, trigger slope and set limits (according to trigger type).
Selecting an event in the disturbance table and choosing the x(t) graph opens the time graph for the selected event (see the next form).



1. The 1st time graph
2. The 2nd time graph
3. Select the time graph view for the disturbance quantities
4. Select the quantities to be displayed
5. Protocol printout (printer, BMP, HTML)
6. Zoom out
7. Move the cursor to the centre
8. Select the displayed phase curves in the time graph
9. Select the time graph or cursor detail view

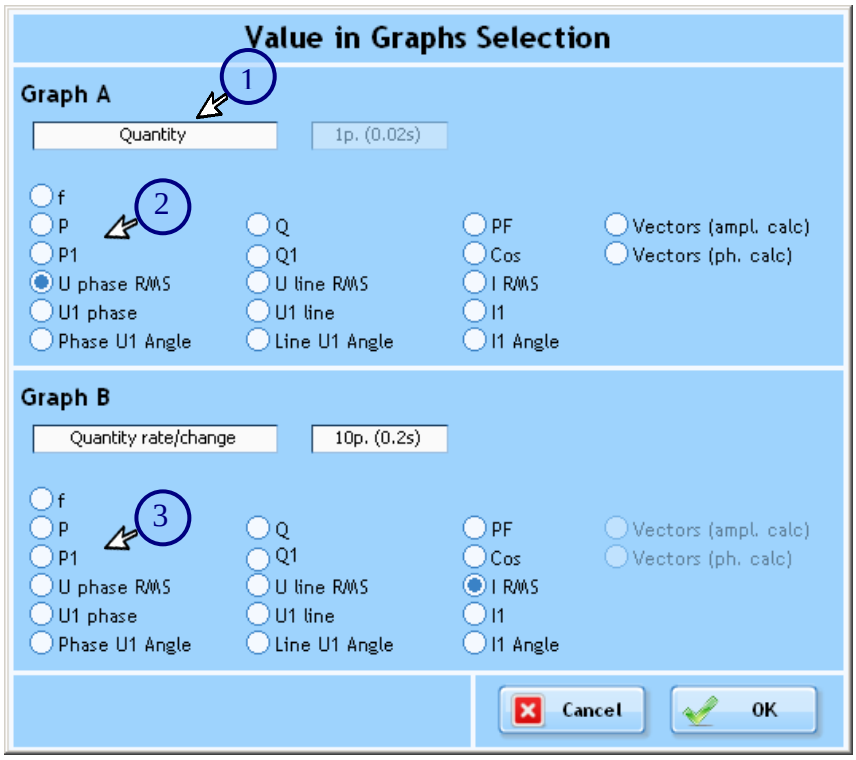
Selecting “Det.” (item no. 9 in the previous form) displays a table with detailed information (see next form).



1. The cursor detail table
2. The time graph area
3. Select the quantities to be displayed
4. Protocol printout (printer, BMP, HTML)
5. Zoom out
6. Move the cursor to the centre
7. Quantity value corresponding to the cursor position
8. Move cursor left or right

The detail cursor table informs the user about the cursor position, the quantity value at the cursor position, delta time and delta quantity value calculated for 1st and 2nd cursor position. The cursor is selected by clicking on the appropriate cursor detail table row and moving them into the desired position (using buttons item no. 8 in the previous form). Press “Curs. To C.” to move the cursor into centre of the time graph.

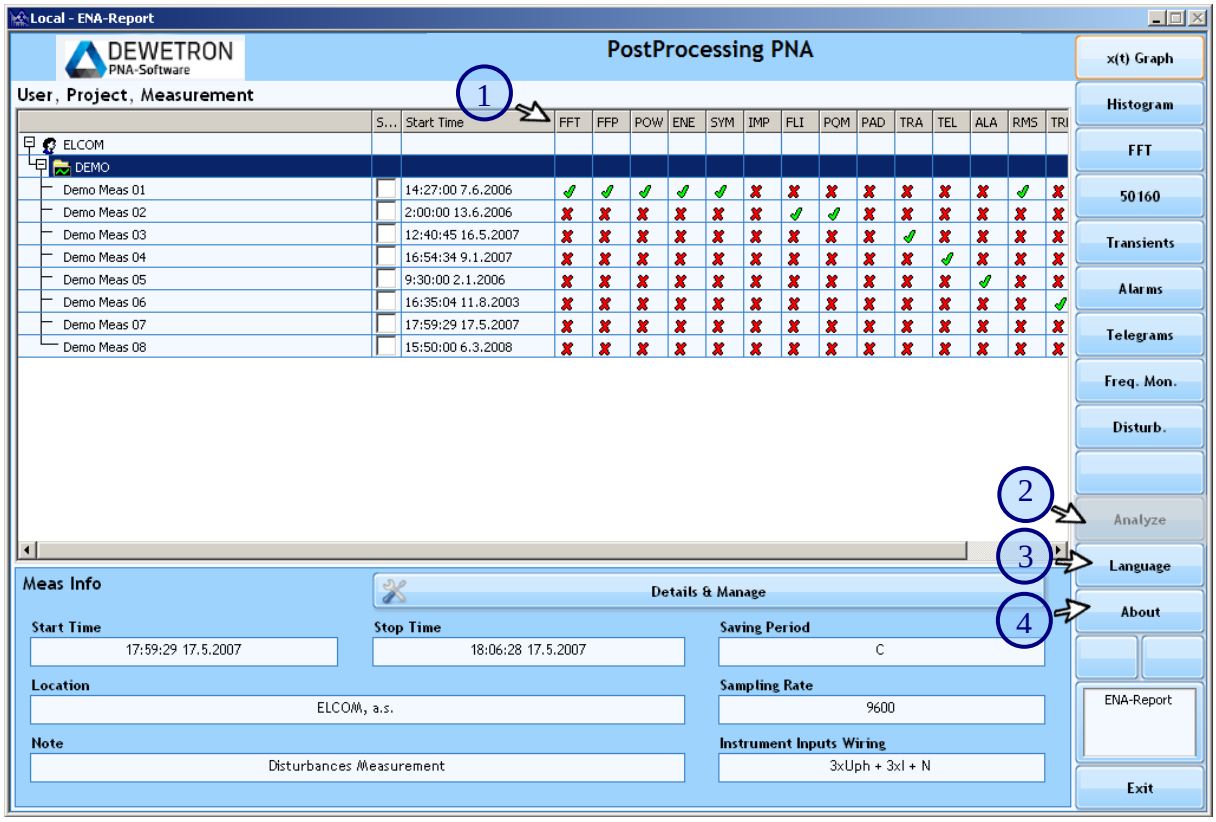
Click “Value In Gr.” (item no. 3 in the previous form) to select the desired quantity displayed in the time graph.



1. Select between the quantity, quantity derivation and quantity rate / change
2. The quantity list to be displayed into the 1st time graph
3. The quantity list to be displayed into the 2nd time graph

3.10. General notes

Before any data analysis, it is necessary to **select the appropriate measurement and time interval for data analysis**. This is always done in the same way.
Every listed measurement may have checked components (see the item no. 1 in the next form).



For **FFT, FFP, POW, ENE, SYM** and **RMS** components are possible:

- x(t) Graph (time domain graph) analysis
- x(t) Histogram (time domain histogram) analysis
- FFT (spectral) analysis

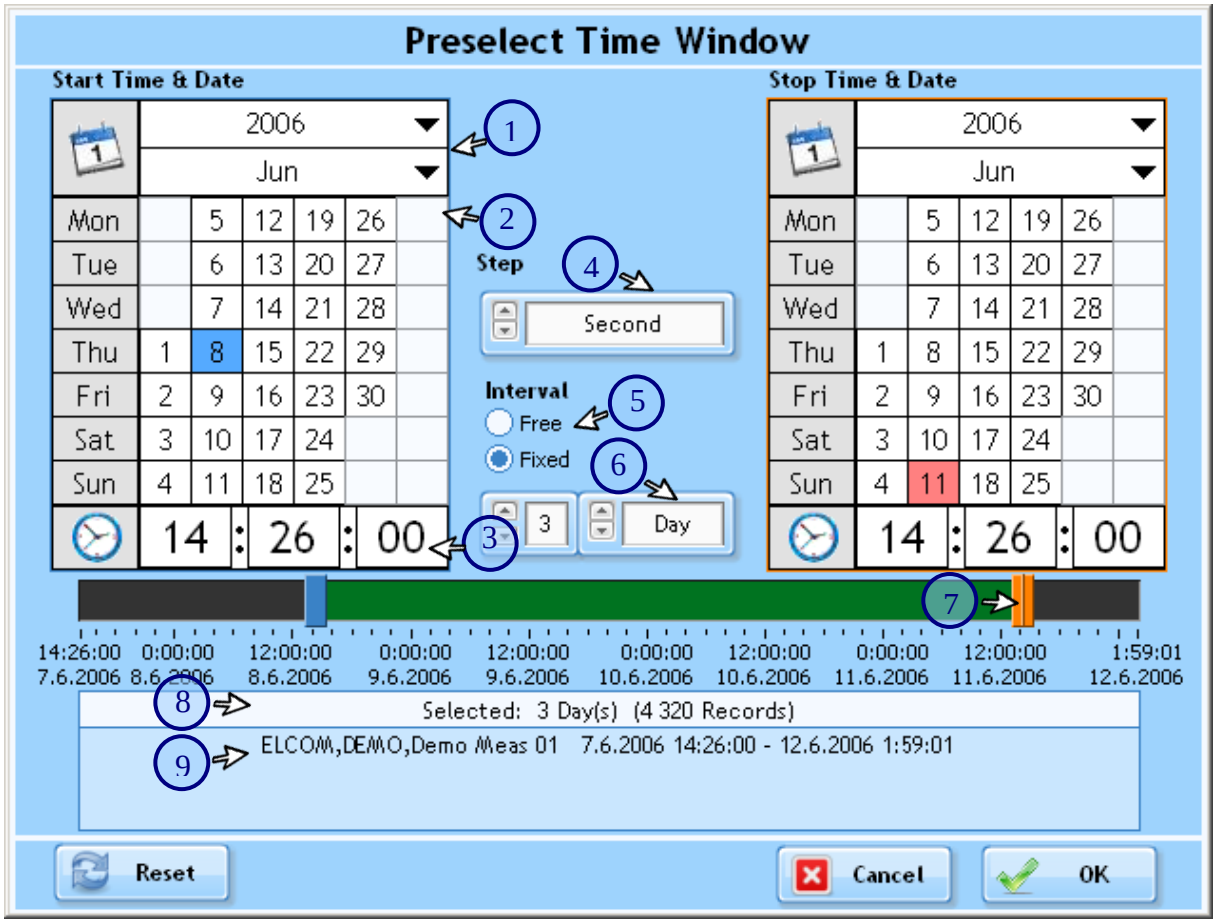
FLI and **PQM** components enable:

- x(t) Graph (time domain graph) analysis
- Histogram (time domain histogram) analysis
- 50160 complex view analysis

Another component:

- **TRA** and **DIO** contain saved Transient Recorder data and enable only “Transient R.” analysis
- **ALA** contain saved alarms and enable only “Alarm” analysis
- **DIS** contain saved Disturbance Recorder data and enable only “Disturb.” analysis

The “Language” button (item no. 3 in the previous form) changes the language mutation of application.
The “About” button (item no. 4 in the previous form) displays the version and release information.
If the measurement and appropriate type of analysis are selected, analysis can be begun by clicking “Analyse” (item no.2 in the previous menu).
By clicking “Analyse”, the time interval for the analysis must be set. This is always done in the same way by the next dialog (see the next form).



The calendar situated on the left side of the dialog window (bordered by blue colour) sets the start time for data analysis. Year and month (item no. 1 in the previous form) list box can be listed simply by clicking, using the left mouse button, on the appropriate area and selecting correct values. The day (item no. 2 in the previous form) may be selected by clicking on the cell with the appropriate value.

The time (item no. 3 in the previous form) is set by clicking on the cell displaying hours, minutes or seconds to increase the value or right clicking to decrease the value.
The red bordered calendar has the same functionality but sets the stop time of data analysis. The start and stop time can be also set using the sliders (item no. 7 in the previous form). The blue coloured slider sets the start time of data analysis and red coloured slider sets the stop time of data analysis.
Item no. 8 in the Preselect Time Window (the previous form) provides information on the number of stored records and item no. 9 shows the measurement information (name, location etc.).

All **exported quantities are structured into a text (ASCII) file,** to allow easy importing of the file into a table processing application (like MS Excel etc.) This file is located in DATA directory in subdirectory EXPORT.

4. Specification PNA-SW with DEWE-571 (MDAQ-PQL)

Reference conditions

Temperature:	25°C
Relative Humidity:	50% RH

- **High Voltage inputs**

Measurement range:	4 programmable ranges up to 950Vrms (1400Vp)
AC Accuracy @ 230V (400Vp range), 15Hz-3.6kHz:	0.1% of reading
Input resistance:	10 MΩ

- **Current inputs**

Measurement range:	5Arms (10Ap)
Overload capability:	15Ap
AC Accuracy 15-500Hz:	0.1% of range / 0.2% of reading
Input resistance:	1.62 mΩ
Input impedance:	0.12 µH

- **Current input with CLAMP-1000**

Measurement range:	1000Arms (1400Ap)
AC Accuracy 15-500Hz:	0.4% of range / 0.2% of reading

- ***Ampflex* input with FLEX-300**

Measurement range:	30Arms, 300Arms, 3000 Arms
AC Accuracy 45-1kHz:	0.4% of range / 0.2% of reading
Input resistance:	10 kΩ

- **Low Voltage input with CLAMP-5**

Measurement range:	5Arms (10Ap)
AC Accuracy:	0.45% of reading / 0.15% of range
Input resistance:	1 MΩ

- **Low Voltage input with CLAMP-200**

Measurement range:	200Arms (300Ap)
AC Accuracy:	0.95% of reading / 0.15% of range
Input resistance:	1 MΩ

- **System specifications**

A/D converter:	National Instruments (e.g. PCI-6220, 250kS/s,16Bit)
Measurement HW:	MDAQ-PQL and DAQP\HSI modules

- **Data storage intervals** — k*200ms, 3 s, k*1min, 10 min, 15 min, 2h
  (k… multiplies the time interval with an eligible value)

<u>Further information:</u>

All technical information about certain devices, modules or additional current transducers you will find in the corresponding technical reference manual or in our ENERGY & POWER ANALYSIS Solution Guide.