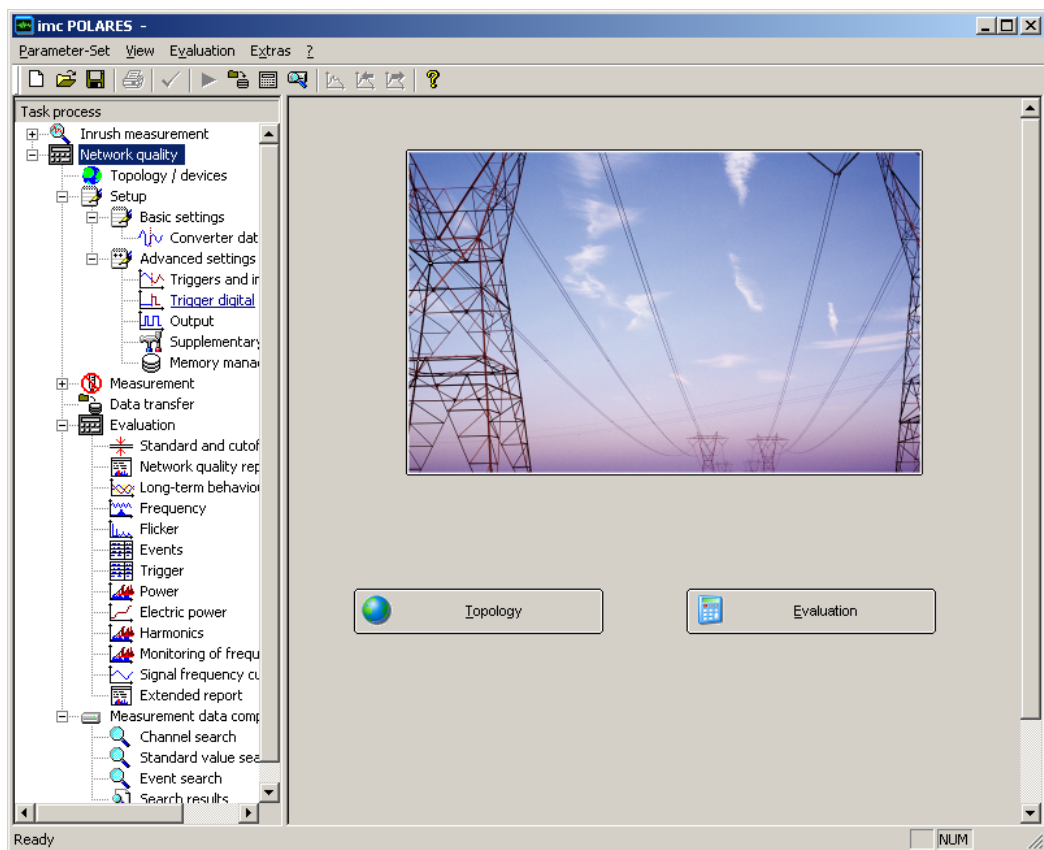# Power Quality Recorder

imc

integrated measurement & control

imc POLARES

System manual

Version 2.5, 05.09.2011

Inhaltsverzeichnis

1   imc POLARES

Version 2.5, 05.09.2011

Note

Please observe the instructions and warnings for your safety in chapter foreword "Information for your safety 8 "

Disclaimer of liability

The contents of this documentation have been carefully checked for consistency with the hardware and software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity.

The statements made in this document are regularly checked and any necessary corrections are reflected in subsequent editions. We gratefully accept any suggestions for improvements.

We reserve the right to make technical modifications of the systems.

Version 2.5

Release 05.09.2011

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Other designations in this manual might be trademarks whose useby third parties for their own purposes would infringe the rights of the owner.

2   imc Customer Support - Hotline

Germany:

imc Meßsysteme GmbH
Phone: ☎ 030 / 46 70 90 - 26
Fax: ▤ 030 / 4 63 15 76
WWW: www.imc-berlin.com
e-mail: hotline@imc-berlin.de

For our international partners see www.imc-berlin.com and click to *International Distributors*

When requesting telephone consultation, please be prepared to state the serial numbers for your device and for your software's data carrier, and have this manual present. Thanks!

3   Foreword

Purpose of the manual

This manual generally describes the installation, commissioning, parameterization and operation of the power quality recorder *imc POLARES*.

Target audience

This manual is intended for project engineers, commissioning and operating personnel in electrical systems and power plants.

Validity of the manual

This manual is valid for the power quality recorder *imc POLARES.*

Additional support

For any questions concerning your system, please contact your local imc representative.

3.1   Copyright-note for Open-Source-products

Copyright (c) 1998 - 2008, Paul Johnston & Contributors (http://pajhome.org.uk/crypt/md5/index.html)

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Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

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3.2   Information for your safety

This manual does not represent a complete listing of all the safety measures required to operate he equipment (module, device) since specific operating conditions may make further measures necessary.

However, it contains information which you have to observe in order to ensure your personal safety and in order to avoid material damage. The information is highlighted by a warning triangle and, depending on the degree of danger, is shown as follows:

Danger

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken. This particularly applies to damage on or in the device itself and consequential damage thereof.

Attention

indicates that property damage can result if proper precautions are not taken.

Note

indicates information about the device or respective part of these operating instructions which is essential to highlight.

3.3   Qualified personnel

Qualified personnel

Commissioning and operation of the equipment (module, device) described in this manual may only be performed by qualified personnel. Qualified personnel, in the context of the safety information contained in this manual, are persons authorized to commission, start-up, ground and label devices, systems and circuits according to all applicable safety standards.

Use for the intended purpose

The equipment (device, module) may only be used for the applications specified in the catalog and the technical manual, and only in connection with OEM devices and components recommended and approved by *imc*-.

The prerequisites for trouble-free, reliable operation of the product include proper transport, proper storage, proper installation and assembly, as well as proper operation and maintenance.

When operating electrical equipment, certain parts of this equipment are subject to dangerous voltage levels. Therefore, improper handling can result in serious injury or equipment damage:

❑ The equipment must be grounded at the PG terminal before making any connections whatsoever.

❑ Dangerous voltages may occur in all circuit components connected to the inputs or power supply.

❑ Dangerous voltages due to capacitor memory may still exist in the equipment even after it has been disconnected from the power supply or input circuits.

❑ Equipment with current transformer circuits must never be operated in any state where the current transformer circuits are open-circuited.

❑ The operating limits specified in the manual and in the operating instructions must not be exceeded at any time (including inspection and commissioning).

The parameter value limits stated in the instructions may not be exceeded; this also applies to inspection and commissioning situations.

3.4   Disclaimer of liability

The contents of this documentation have been carefully checked for consistency with the hardware and software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity.

The statements made in this document are regularly checked and any necessary corrections are reflected in subsequent editions. We gratefully accept any suggestions for improvements.

We reserve the right to make technical modifications of the systems.

4   Guidelines

4.1   Certificates and Quality Management

imc holds DIN-EN-ISO-9001 certification since May 1995.

You can download an English version of the CE Certification on our Webpage: http://www.imc-berlin.de/qualitaetssicherung. Current certificates and information about the imc quality system can be found on the Webpage: http://www.imc-berlin.com in section Customer Support.

For further information, please contact our hotline 5 .

4.2   imc Guarantee

Subject to imc Meßsysteme GmbH's general terms and conditions.

4.3   ElektroG, RoHS, WEEE

The company imc Meßsysteme GmbH is registered under the following number:

WEEE Reg.- # DE 43368136

Brand: imcDevices

Category 9: Monitoring and control instruments exclusively for commercial use

Valid as of 24.11.2005

Our products fall under Category 9, "Monitoring and control instruments exclusively for commercial use" and are thus at this time exempted from the RoHS guidelines 2002/95/EG.

_____

The law (ElektroG) governing electrical and electronic equipment was announced on March 23, 2005 in the German Federal Law Gazette. This law implements two European guidelines in German jurisdiction. The guideline 2002/95/EG serves "to impose restrictions on the use of hazardous materials in electrical and electronic devices". In English-speaking countries, it is abbreviated as "RoHS" ("Restriction of Hazardous Substances").

The second guideline, 2002/96/EG "on waste electrical and electronics equipment" institutes mandatory acceptance of returned used equipment and for its recycling; it is commonly referred to as WEEE guidelines ("Waste on Electric and Electronic Equipment").

The foundation "Elektro-Altgeräte Register" in Germany is the "Manufacturers' clearing house" in terms of the law on electric and electronic equipment ("ElektroG"). This foundation has been appointed to execute the mandatory regulations.

4.4   CE-Certification

Conformity Declaration

imc
* * * * Integrated measurement & control * * * *

imc Meßsysteme GmbH
Voltastraße 5, D-13355 Berlin,

hereby declares that our product

imc POLARES

in all its model varieties

conforms to the following applicable standards: [1],[2]

EC Low Voltage Directive 2006/ 95/EEC*
(implemented in Germany as the 1st regulation of the Device And Product Safety Law GPSG)

EMC Directive 2004/108/EEC
(implemented in Germany as the EMC-Law EMVG)

The system was designed, constructed and tested in accordance with the regulations delineated in

**Safety Regulations for electric measurement, open and closed-loop control
and laboratory devices DIN EN 61 010-1:2002**

and was subjected to a thorough routine test before shipment and left the production facility in perfect condition[3].

Berlin, 2008-JAN-04
Place and date of issue

Dipl. Ing. Josef Schwan
Production Department Head

Dipl. Ing. Michael Scheibner-Aden
Quality Assurance Manager

---

[1] This conformity declaration pertains fundamentally only to the system as delivered by imc. The user is solely responsible for alterations and expansions as well as for ensuring the altered system's compliance with the applicable EC-directives.

[2] Harmonized standards:
DIN EN 61326:2004 (product standard): conforms to requirements for electromagnetic immunity measurements of equipment intended for industrial use (as per EN 61326/ table A1) and for Radio Interference Intensity Class A (EN 61326 table 3).
DIN EN 61000-4-2:2001, -4-3:2003, -4-4:2002, -4-5:2001, -4-6:2001 DIN EN 55011:2003

DIN EN 61010-1:2002

[3] Quality management: imc holds DIN-EN-ISO-9001 certification since May 1995. imc's conformity to the world-wide accepted standard DIN EN 9001:2000 is attested to by the Certificate issued July, 2006 by the accredited TÜV CERT certification body of TÜV Anlagentechnik GmbH. imc's certificate registration number is 01 10085152.

QS_POLARES_CE_2008_1_E.doc

Conformity Declaration

imc integrated measurement & control

imc Meßsysteme GmbH
Voltastraße 5, D-13355 Berlin,

hereby declares that our product

miniPOLARES

in all its model varieties

conforms to the following applicable standards: [1],[2]

EC Low Voltage Directive 2006/ 95/EEC*
(implemented in Germany as the 1st regulation of the Device And Product Safety Law GPSG)

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The system was designed, constructed and tested in accordance with the regulations delineated in

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and laboratory devices DIN EN 61 010-1:2002**

and was subjected to a thorough routine test before shipment and left the production facility in perfect condition[3].

Berlin, 2009-JUL-27
Place and date of issue

iA. B. Schaefer

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Development Department

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Dipl. Ing. Michael Scheibner-Aden
Quality Assurance Manager

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[1] This conformity declaration pertains fundamentally only to the system as delivered by imc. The user is solely responsible for alterations and expansions as well as for ensuring the altered system's compliance with the applicable EC-directives.

[2] **Harmonized standards**:
DIN EN 61326:2006 (product standard): conforms to requirements for electromagnetic immunity measurements of equipment intended for industrial use (as per EN 61326/ table 1 and table A1) and for Radio Interference Intensity Class A (EN 61326 chapter 7.2 and CISPR 11).
DIN EN 61000-4-2:2001-12, -4-3:2003-11, -4-4:2005-07, -4-5:2001-12, -4-6:2001-12, DIN EN 55011:2003-08
DIN EN 61010-1:2002-08 incl. DIN EN 61010-1:2002-11 correction 1 + DIN EN 61010-1:2004-01 correction 2

[3] **Quality management**: imc holds DIN-EN-ISO-9001 certification since May 1995. imc's conformity to the world-wide accepted standard DIN EN 9001:2008 is attested to by the Certificate issued Juni, 2009 by the accredited TÜV Rheinland CERT GmbH. imc's certificate registration number is 01 10085152.

4.5   Product improvement

Dear Reader!

We at **imc** hope that you find this manual helpful and easy to use. To help us in further improving this documentation, we would appreciate hearing any comments or suggestions you may have.

In particular, feel free to give us feedback regarding the following:

- Terminology or concepts which are poorly explained
- Concepts which should be explained in more depth
- Grammar or spelling errors
- Printing errors

Please send your comments to the following address:

imc Mess-Systeme GmbH

Customer Service Department

Voltastrasse 5

D - 13355 Berlin

Telephone: 0049 - 30 - 467 090 - 26

Telefax: 0049 - 30 - 463 15 76

e-mail: hotline@imc-berlin.de

4.6   Important notes

4.6.1   Remarks Concerning EMC

imc POLARES satisfies the EMC requirements for unrestricted use in industrial settings.

Any additional devices connected to *imc POLARES* must satisfy the EMC requirements as specified by the responsible authority (within Europe[2]) in Germany the BNetzA - "Bundesnetzagentur" (formerly BMPT-Vfg. No. 1046/84 or No. 243/91) or EC Guidelines 2004/108/EEC. All products which satisfy these requirements must be appropriately marked by the manufacturer or display the CE certification marking.

Products not satisfying these requirements may only be used with special approval of the regulating body in the country where operated.

All signal lines connected to *imc POLARES* must be shielded and the shielding must be grounded.

☞ **Note**

> The EMC tests were carried out using shielded and grounded input and output cables with the exception of the power cord. Observe this condition when designing your experiment to ensure high interference immunity and low jamming.

⇨ **Reference**

> See also *General Notes \ Precautions for operation \ Grounding, shielding \ Shielding*

[2] *If you are located outside Europe, please refer the appropriate EMC standards used in the country of operation.*

4.6.2   FCC-Note

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules (CFR 15.105)[3]. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by **imc** may void the user's authority to operate this equipment.

[3]*FCC - United States Federal Communications Commission*

4.6.3   Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods to maintain compliance with FCC Rules and Regulations.

4.6.4   Other Provisions

Industrial Safety

We certify that *imc POLARES* in all product configuration options corresponding to this documentation conforms to the directives in the accident prevention regulations in "Electric Installations and Industrial Equipment" (BGV-A3 of the Index of Accident Prevention Regulations of the Professional Guilds in Germany).

This certification has the sole purpose of releasing imc from the obligation to have the electrical equipment tested prior to first use (§ 5 Sec. 1, 4 of BGV-A3). This does not affect guarantee and liability regulations of the civil code.

_____

* formely VBG-4, refer http://www.bgfe.de

5   Introduction

5.1   Application

imc POLARES is a **IEC 61000-4-30 Ed. 2 class A** measurement device for integral measurement of power quality. It encompasses all important quantities for the assessment of electrical supply networks at once. The user software serves the purposes of rigging the device, taking measurements with online monitoring and composing a report of the quality analysis.

imc POLARES enables you to measure on up to 4 differently configured leads with a resolution extending **up to the 50th harmonic**.

You can devise a variety of trigger mechanisms for **long-term monitoring** of events to freely configured **short-term measurements** with 4 available input channels having sampling rates of up to 50 kHz for the monitoring of any voltage or current events.

Along with the conventional trigger mechanisms which respond to the signal exceeding limit values which can be set, it is also possible to set **triggering** conditions representing the signal deviating significantly from the expected **curve shape**. Thus, as an example, any sudden signal deviations occurring during long-term monitoring which are due to **harmonics** or brief **voltage fluctuations (spikes)** can be captured even if the magnitude of the deviation is much smaller than the nominal value itself.

The **long-term monitoring** technique of measurements returns results with the following attributes: independent of the option of triggered measurement mentioned previously, all relevant measurement data are recorded. *imc POLARES* provides you with the ability to decide after the measurement what limits you wish to set for which quantity, and thus what to consider in the evaluation of results. The incoming data are converted online by the signal processor to useful information for the user. The data volume is reduced to the minimum necessary. This avoids the danger of losing record of relevant events which lie inside the boundaries.

Wherever Complete Recording isn't possible, the European **standard EN50160** forms the basis for proceeding. This standard stipulates minimum requirements for inspection of power quality, in terms of the scope and the precision of measurements taken. By collaborating with German power suppliers on its development, *imc POLARES* benefits from large amounts of practical know-how which enables the scope of its functionality to go far beyond EN50160.

By using multiple *imc POLARES* units with an external real-time clock (**GPS**, **DCF 77**, **NTP** or **IRIG-B**), measured data from different sources can be **synchronously** correlated. And with the help of the database module, it is possible to search through the data for any events or limit overstepping, and then display and compare them. It is also possible to synchronize multiple *imc POLARES* units even without a external clock, and to plot their respective data jointly in correct chronological relationship.

imc POLARES main field of application is stationary **network monitoring** with subsequent evaluation. But short-term measurements are also fully supported, in which highly fluctuating disturbance phenomena must be observed. For this purpose, the data can be displayed online on the connected PC.

And if the device is intended for stationary operation for longer periods (such as many months), a special data storage mode makes it possible for the **measurement results** to be generated on a **daily or even a monthly** basis for later retrieval at the user's convenience.

In the examples below, the values assume the European low voltage grid frequency of 50Hz, and a phase-to-neutral voltage of 230 Volt; for measurements of a 60 Hz grid or other voltages, the quantities must be converted/adapted accordingly.

5.2   Computation procedures
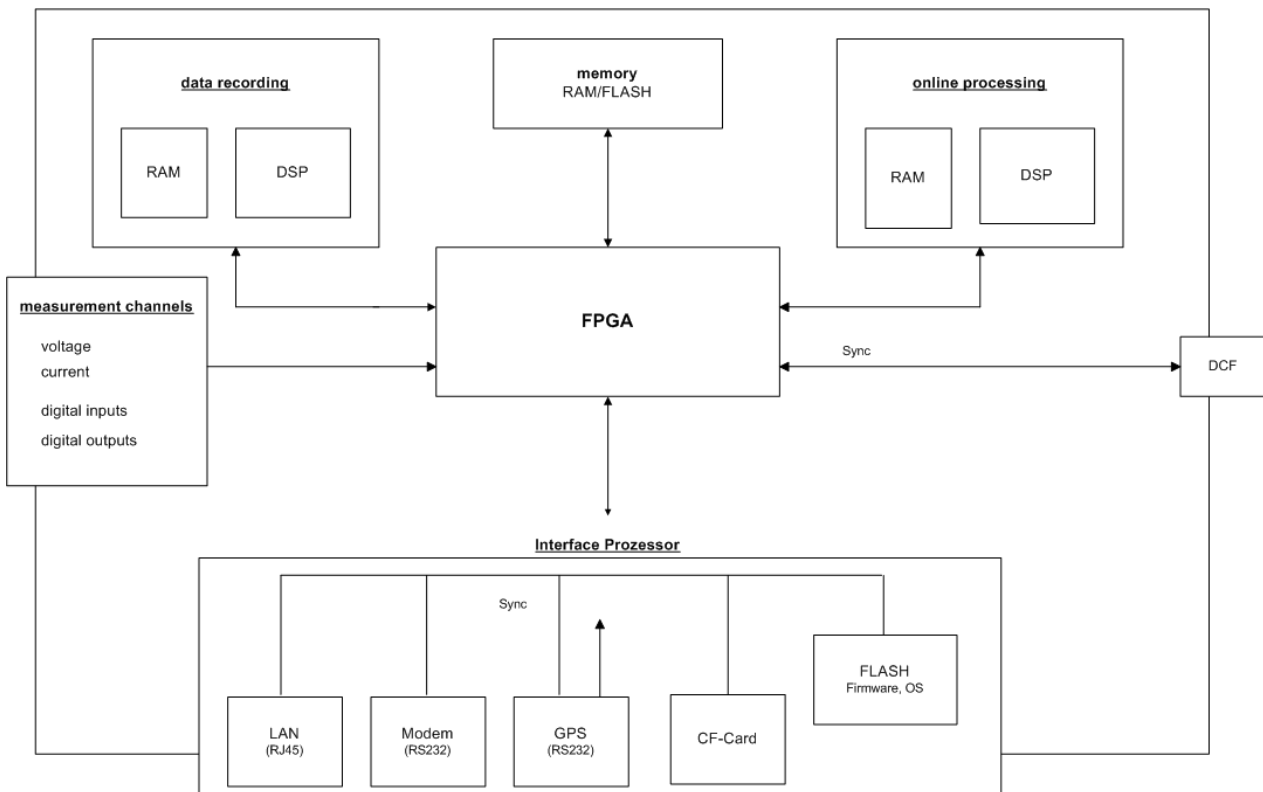
Concept of imc POLARES

The computations are performed in accordance with the standard IEC 61000-4-30 Ed.2 class A compliant for the following:

- Frequency
- Magnitude of Supply Voltage
- Flicker
- Voltage Dips, Swells, Interruptions
- Unbalance
- Harmonics
- Mains Signaling
- Time clock uncertainty
- Flagging

Note

imc POLARES is designed to be used in either 50 Hz or 60 Hz grids.

The sample values presented pertain to a low voltage power network of 50 Hz and 230 V; in case of any deviations, the nominal voltage or network frequency is noted.

5.2.1   Effective (RMS-) values

Calculation of the RMS values is calculated every half period over a complete period (20 ms @ 50 Hz or 16,66 ms @ 60 Hz).

This consists in **summing up** the squared input voltage values and taking the root of the result, as per the equation:

$$U = \sqrt{\frac{1}{P}\sum_{n=1}^{P} u_n^2}$$

Here, P stands for the number of samples. For a sampling frequency of 10 kHz and a network frequency of 50 Hz, P = 100.

5.2.2   Flicker

Calculation of the flicker proceeds according to the description of a flicker meter in the standard EN 610000-4-15 (IEC868). However, the entire structure has been replicated **completely digitally, i.e. as a component of DSP program**. Flicker calculation is performed at a sampling rate of 100 Hz. This means that the values arrive at the classifier at a rate of 100 Hz.

The flicker calculation's input signal is the squared mean value from the RMS-value filter. Block 3's weighting filter (see standard) can be realized completely correctly by digital signal processing. Switching between ranges isn't necessary, since calculation is performed with 32-bit Floating-Point numbers. Scaling of the output signal to the means value of the input voltage (Block 1) comes after the weighting filter.
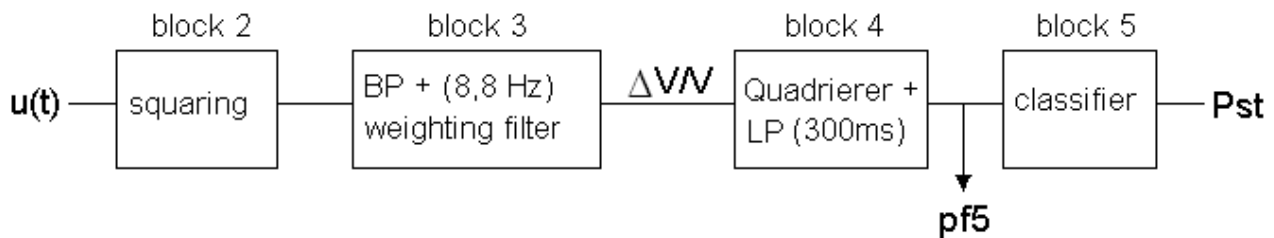
The classifier at the end of the chain (Block 5) computes P_{st}. The classifier's **operating range** is $\leq$ **20.** Up to a $P_{st} \leq$ 10, the error limit of 5 % is adhered to.

> **Note**
>
> If there are very strong amplitude fluctuations which would cause a value of P_{st} greater than 10, the tolerance of $\pm$5% is no longer assured. In this case, the error cutoff depends on the characteristic curve's interference and can range up to 12%.

5.2.3   Rapid fluctuations of the RMS-value

Rapid changes in the RMS-values of voltage and current are recorded in the *curve plots*. For this purpose, a patented procedure called **Transitional Recording** is used.
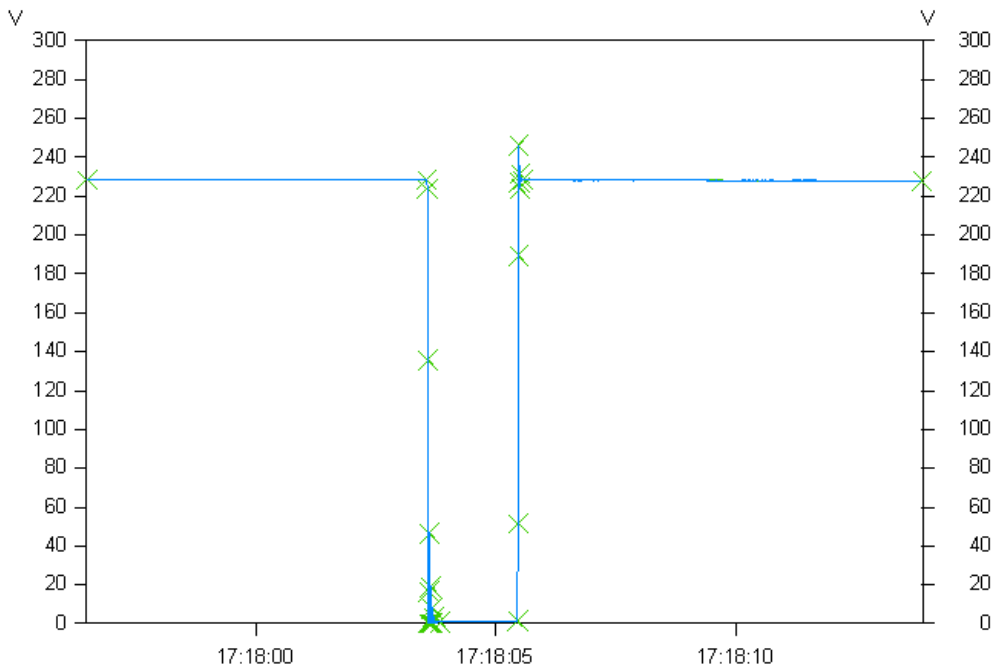
Fig 3-1 Curve plot of a voltage outage

The figure shows a voltage outage with data reduction. The crosses mark the sampled points of which the reduced curve plot consists.

A "**transition**" always refers to a change from a stationary amplitude state to a new state, where *state* can also mean a stretch of constant increase or decrease in amplitude. By comparing the slopes appearing within the curve to be reduced, sudden changes of the curve's course can be detected. The procedure is designed to limit the resulting curve plot's maximum deviation from the original signal.

The classic algorithm has been slightly modified for *imc POLARES*. Thus, within a tolerance band of 5 % around the nominal voltage, the algorithm works at its default accuracy of **1,5 %**, while outside of this band it works at twice that level, namely **0,75 %**. The values can be edited via the user interface. As a result, events such as voltage dips are represented in very high precision while within the uninteresting "passing" region, the data is strongly reduced. By extending the data format to 64 bits the bufferable time range between two points is increased so that for a constant voltage, an obligatory data point must be recorded only after approx. 23 hours.

These steps increase the achievable reduction factor al the way to **1:20,000** without sacrificing relevant information. Ideally, if the network is free from disturbances, there would be **eight data points per week**: one per day plus the initial point. By contrast, any disturbances are recorded with time resolution of one-half period. In any case: **no threshold values** need to be set.

5.2.4   Events

Typical courses of the voltage RMS-value which can be characterized by the duration and depth[1] of the amplitude, are recorded by *imc POLARES* as events.
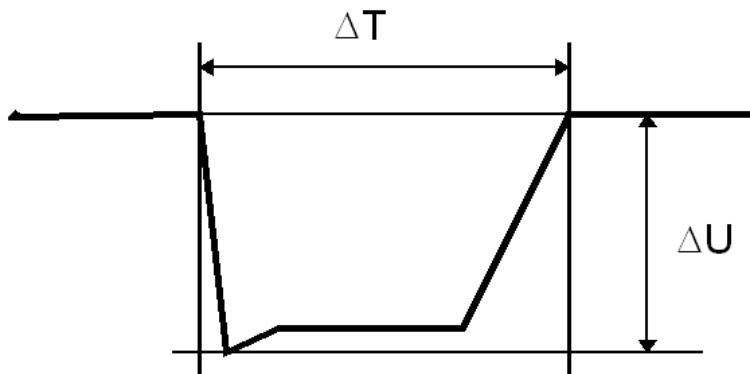
Fig 3-2 Event with duration and magnitude

The curve plots of the RMS-values serve as the source for the capture of events. While the deviation of the RMS-value in **one direction** leads to the recording of a data point in a reduced curve plot, an event is always defined by **two transitions**: one from the normal voltage level to the fault level one another one back to the normal level.

The duration of an event is measured between two departure points, in other words at the amplitude setpoint. The magnitude of the event is determined from the minimum or maximum amplitude in the disturbance region. This is done in the assumption that the amplitude remains relatively constant during the disturbance.

According to currently valid standards, every deviation of >10% form the nominal voltage counts as an event. Depending on the duration and amplitude, distinctions are made between sags and outages.

[1]For overvoltage, depth is the same as height.

5.2.5   Signal voltage (ripple control signals)

Signal voltage refers to a signal superimposed onto the supply voltage, which is used to communicate information. The most familiar example is so-called ripple control signals.

imc POLARES has three special channels, each with different time resolution, for monitoring signal voltages.

1. In addition to the harmonics and interharmonics, the mean voltage level at signal frequency is also recorded.

2. The RMS-value of the spectral line of the FFT corresponding to the signal frequency is recorded with data reduction.

5.2.6   Harmonics, interharmonics

Calculation of the frequency components in voltages, currents and thus also in power is performed by means of a Fast Fourier Transformation (FFT).
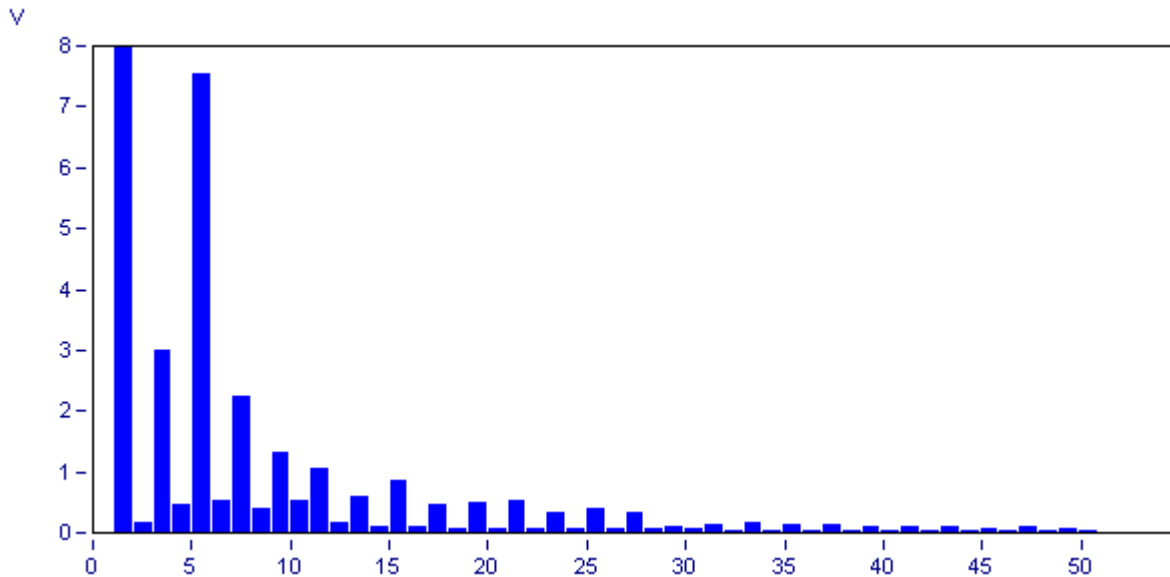
Fig 3-3 Mean values from FFT

The **FFT** is computed with a rectangular window as per the standard EN 61000-4-7 "Specifications for the measurement of harmonics and interharmonics in power supply networks". The harmonics are computed according to the method of harmonics-subgroups, where the RMS value is determined with the two adjacent frequency lines.

The **THD** (total harmonic distortion) is determined according to the method of harmonics-subgroups total distortion. This is the ratio of the RMS of the harmonics subgroups to the RMS of the fundamental oscillation subgroup.

This causes the number of samples to vary since it is chosen on the basis of the fundamental frequency in order to calculate exactly the harmonic and interharmonic components of that particular fundamental. Example: According to the standard, the frequency may deviate within the range 50 Hz ±1%. This means that for a 10 kHz sampling frequency, a period can vary between 98..102 sample values.

The resulting frequency vector is used to derive the aggregation of the 50 harmonics and 10 interharmonics. Together with the THD and signal voltage, 64 aggregations are derived for each input signal.

The spectra produced by the FFT can be viewed immediately by means of the online monitoring, for which purpose no aggregation are computed. The special channel for the signal voltage recorded with data reduction (ripple control signals) is fed directly from the FFT.

6   QuickStart

Brief instructions on starting *imc POLARES* for the first time.
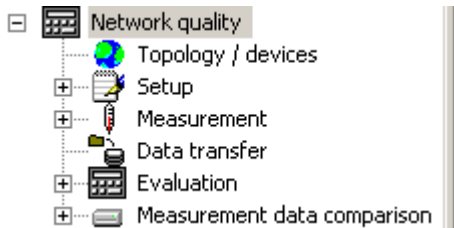
"Task process" the tree diagram on the left side of the interface; according to the selection made here; the right side displays corresponding options, data or lists

6.1   Installation

- Install the software
- Connect measurement unit to the communication network
- Connect measurement with all measurement leads (observe safety guidelines for dealing with high voltages!)
- Switch on measurement unit
- Set IP address with program IF-Config (*Start>program files>POLARES operating software>IF-Config*).
    o Click on the plus-sign by the network adapter in the left column
    o Click on the plus-sign for your device
    o Select the LAN branch
    o Set the IP-address
- Start the *POLARES operating software* program → Prompt for device definition → "**OK**"
- Device selection dialog opens
    o Select "New..."   → "Add device interface"-dialog appears
    o Select "Network settings..."   → "Settings for network"-dialog appears
    o "TCP/IP" must be selected   → Close with "OK"
    o Select "Network search"   → PC searches network for imc POLARES devices
                                               → Close with "OK"
    o Select *imc POLARES*

Note

If your device doesn't appear in the list, you must first call "IF-Config" and assign the device a valid address. (Start Menu/*imc POLARES*/IF-Config; rf. "Configuring the Interface 165").
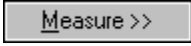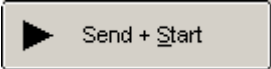
- The device selection dialog must be in the right-hand side list → finish with "**OK**"
- On the page Topology, right-click the mouse over the device and select *New Parameter Set...* 29 → the Assistant opens.
- (use the toolbar button or menu item "**Parameter-Set / New Ctrl+N**")
- Enter a name for a new measurement site → e.g. "Power Station 1" → [Next >]
- Device is selected → [Next >]

- Enter a name for the measurement task → e.g. "Test 1"

- Complete the summary form by clicking [Finish]
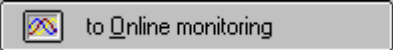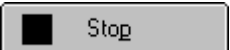
6.2   Making basic settings

- The description for the measurment task opens → 3-phase voltage measurement is selected,

- or **Task process/Network quality/Setup/Basic settings**

- Enter names for **"Company", "Department",.. "Comment**" → …optional

- If necessary, select the current probe used and the input range (definition of new current probes in *Task process / Network quality / Setup / Converter database)*

6.3   Measuring

- Scroll down in the window, click [Measure >>] → the start dialog opens

- or click on the toolbar key [▶], or *Task process/Measure/Start Stop network analysis*

- The device's current state is indicated → click [▶ Send + Start]

- The parameter are sent to the device. The device is started → "Measurement is active"

Device status
Measurement is active

imc_POLARES_120218   Start time: 01/19/2006 15:10:22
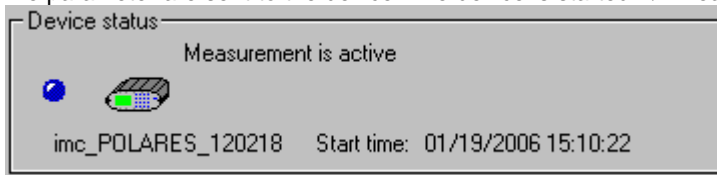
- You can now disconnect and exit the software; the device can continue measurement without the PC.

- Or online monitoring of the measurement

  o Click [🔲 to Online monitoring] → complete overview is displayed

  o *Task process / Measure / Standard display* → various data views can be selected

- Return to **Task process / Measure / Start Stop network analysis** → End measurement [■ Stop]
(to obtain analyzable data, measurement should run at least 20 min)

6.4   Data transfer

- Click on [📂 to Data transfer (F4)] in the start dialog

- or **Task process / Data transfer** or click [📂] in the toolbar

- Select [Search hard disk] → *POLARES operating software* searches the hard drive for saved measurements

- Select a measurement and move it to the lower list

  Select [⌄] → Measurement data are transferred and pre-processed

6.5   Evaluation

- Go to analysis mode via toolbar button 🔢 or **Task process / Evaluation**

- Select a measurement from the list → double-click or click ⸢ Switch ⸣

- **Task process / Evaluation / Network quality report** → opens the report dialog, with display measurement settings and measurement duration

- At the start of the evaluation, click ⸢ Calculate ⸣ → Evaluation as per EN 50160 NV and MV or select other value limits in **Task process / Evaluation / Standard and limit values**

- Summary form appears filled in → are there values which exceed standards limits?

- Clicking on a bar in the overview chart, you go to the corresponding results table.

- Use the toolbar button 🖨 or menu item "**Parameter-Set / Print.**." to print out the report

- Detailed observation of measured data → under **Task process / Evaluation**, special overviews are available for each type of measured data

- E.g. **Task process / Evaluation / Frequency** displays

  o table of all immediately displayable data,

  o table of minimum and maximum values of the displayable data.

- At the right edge of the window, there is a toolbar (the functions affect the data window selected, if more than one window is open. A mouse-click on a window highlights it).

- The available buttons are:

  o 📊 Calculates histograms for the selected data

  o 🔢 Opens the dialog for Measuring/displaying data values

  o 🔀 Opens a data navigator (for moving through a long measurement data set)

  o 📈 Opens the dialog **Channel selection…**, in order to be able to add any amount of additional channels to the data window

- Use the toolbar button 🖨 or the menu item "**Parameter-Set / Print**.." to print out the data window

- Menu item "**Parameter-Set / Print preview**" → see effect of printout settings; make changes before printout, for example, add comments…

7   Operation modes and settings

imc POLARES is able to perform either short-term or long-term analysis. The *short-term analysis* enables direct measurement in order to get a quick overview of the situation. Long term analysis is accessed under the tree branch *Network quality* and is the actual application complex which includes e.g. the standard EN50160 plus a few extras.
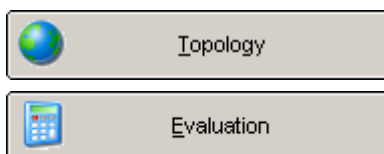
The task steps "Setup" and "Measurement" refer to the measurement task which was either just loaded or to be processed. The other task steps use the current settings as defaults, but do not change the configuration.

7.1   Network quality

Loading a new measurement configuration / New start
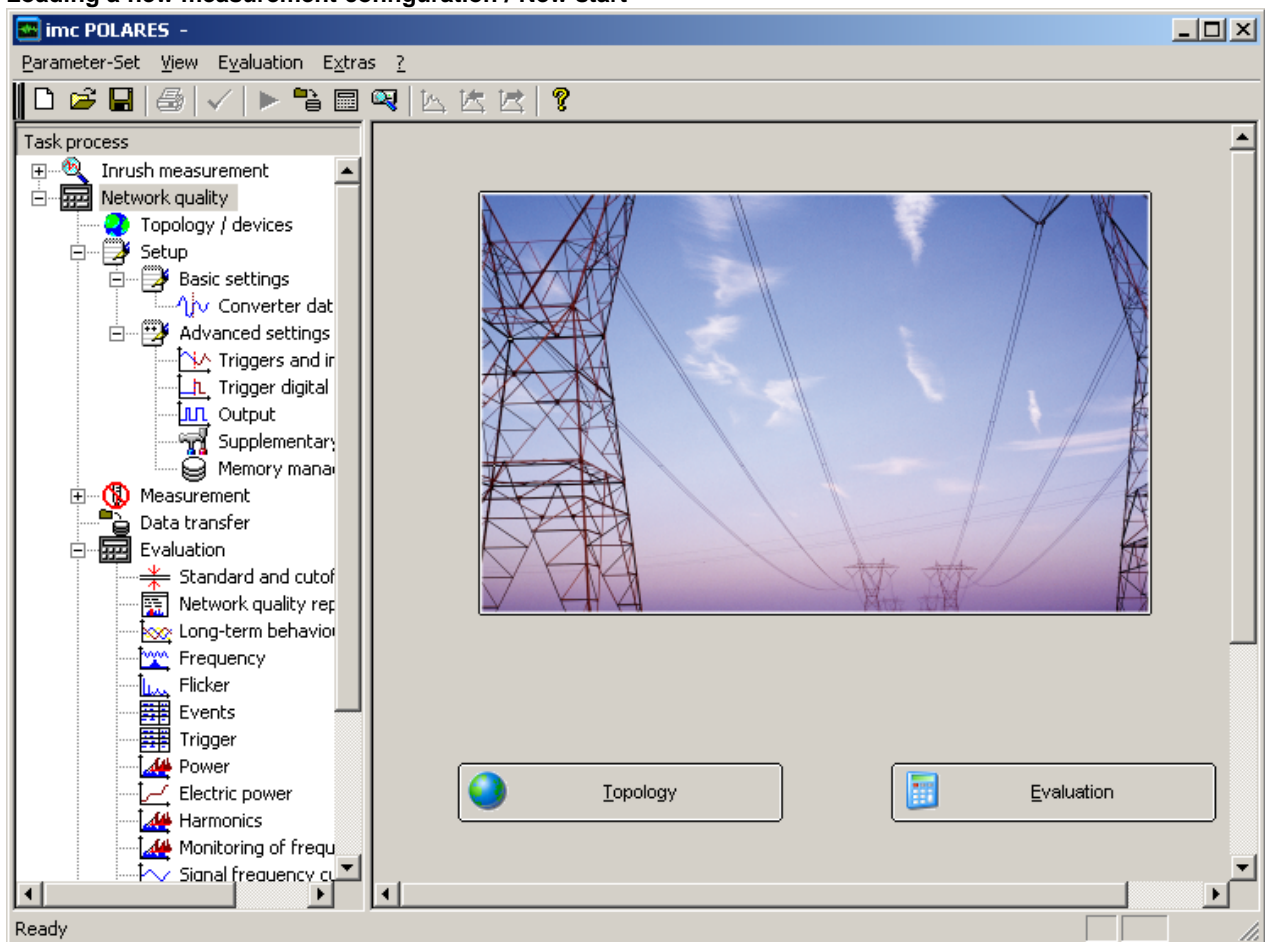
Loading a configuration

 | [Displays overview](#) 26 of all configured measurement devices

 | Switch to measurement data analysis and [Evaluation](#) 78

7.1.1   Topology / Devices

Total overview of all measurements

The page **Topology / Devices** is the starting point for administering the measurements and device access.

The first steps are selection of the measurement devices and creation of the respective parameter set settings for performing measurement.

In measurement operation, you are provided with an preview of the active measurement devices and the status of every measurement running.

General procedure:

1. Make device definitions

2. Assign device in the topology

3. Create new parameter set or load an existing parameter set

4. Measure

Analysis

Variant 1

1. Load the last parameter set by means of the *Device definition* 29 or using the Topology context menu item *Switch to analysis* 31.

2. Go to the analysis. There, all concluded measured data for this parameter set are displayed.

Variant 2

Go to the analysis and use the *Find...* 78 button to select a measurement location and data.

7.1.1.1 Device definition

The upper table shows all devices which have previously been used, and enables more devices to be added.

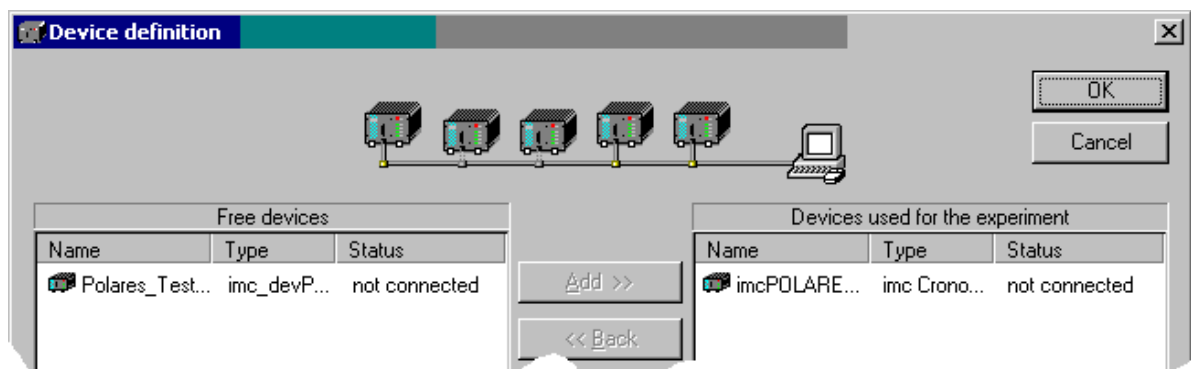The device status is indicated by various symbols.

Device is active

Device is active and is being parameterized at present

Device is passive

Context menu
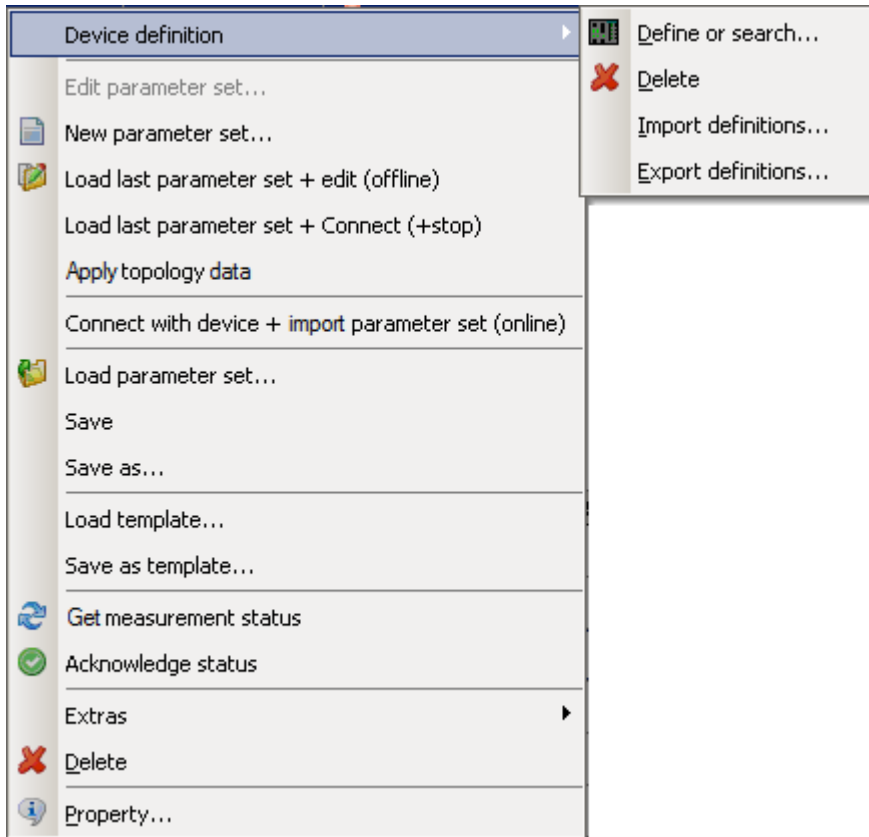
Device definition

- **Define or search...:** Opens the device definition dialog, see also "Commissioning \ Connection to the device" in the operating instructions.

Device definition

Calling this function is also possible by means of the toolbar at right:

- **Delete:** removes device from the table

- **Import definitions...**: opens the selection dialog for specifying the folder from which to import device definitions, <u>see here.</u> 30
- **Export definitions...**: opens the selection dialog for specifying to which folder to save existing device definitions, <u>see here.</u> 30

Parameter set

- **New parameter set...**: Starts the Assistant for <u>creating parameter sets</u> 25. Only available when the device is <u>active</u> 29.

- **Load last parameter set + edit (offline)**: Loads the last edited parameter set. Here, no connection to the device is established. The configuration can be changed while the measurement device is performing a measurement. Only available while the device is <u>active</u> 29.

- **Load last parameter set + connect (+stop)**: Loads the last edited parameter set. Subsequently, the software goes to the <u>Start/Stop</u> 62 page and establishes a connection with the device. The running measurement is automatically stopped. Only available while the device is <u>active</u> 29.

- **Apply topology data**: Applies the device assignment from the topology. This is necessary if the topology assignment was changed. In the program's title bar, the new assignment is displayed. Only available while the device is <u>active</u> 29.

- **Connection with device + import parameter set (online)**: The system goes to the <u>Start/Stop page</u> 62. The current parameters are imported from the device. This involves only a simple connection with the device in order to import the parameters. Online values are not displayed as part of this action. For that purpose, the <u>Connect-command</u> 64 must be called! Only available while the device is <u>active</u> 29.

- **Load parameter set...**: The dialog for selecting an arbitrary parameter set is displayed. The files are in the format *.nqa, see also <u>here</u> 25. Only available while the device is <u>active</u> 29.

- **Save**: Saves the current parameter set. Only available while the device is <u>active</u> 29.

- **Save as...**: Saves the current settings under a new name for the parameter set. Only available while the device is <u>active</u> 29.

- **Load template...**: Loads a template by means of the selection dialog which appears. Only available while the device is <u>active</u> 29.

- **Save as template...**: Saves the current settings as a general template. A template amounts to a parameter set without any fixed assignment to a device. Only available while the device is <u>active</u> 29.

Status of the measurement

- **Get measurement status**: The system queries the current measurement status for frequency and voltage U1. When the interface to the device is slow, only the frequency is queried. Only available while the device is <u>active</u> 29.

- **Acknowledge status:**: The entry returned by *Get measurement status* is deleted.

Extras:

- **Set as passive**: The device is not used in this topology, see also <u>here.</u> 30

- **Activate**: The device is used in this topology. Activation is also necessary so that other menu entries are operable, see also <u>here.</u> 30

- **Conclude measurement data**: Closes the current measured data in the device and makes them ready to be retrieved, see also <u>here.</u> 30

- **Stop measurement**: Stops the running measurement.

- **Update firmware...**: Starts a firmware update. For this purpose, the running measurement is concluded. The Autostart configuration is also deleted in the process, and is only generated again upon starting the new measurement.

General

- *Delete:* The selected entry (entries) and all associated sub-entries are deleted.

- *Properties*: The properties of the selected topology entry, see <u>here</u> 32

7.1.1.1.1 Import / Export of device definitions

In order to be able to define parameter sets offline, the measurement device's structure (amount and type of measurement channels) must be known. For each device configured, then, a device definitions file (*.umi) is saved to the PC.

If you create a parameter set for a device on a PC with which the device had never previously been connected, it is possible to adopt its device definitions from a different PC.

Export: The definition files are saved in the specified folder.

Import: All measurement devices in the selected folder which are not yet known to the system are made known to the PC.

> **Note**
>
> The measurement device count is limited to 99.

7.1.1.1.2 Conclude measurement data

- The smallest measurement interval is 30 min – shorted intervals are not generated. Repeated running of the commend is acknowledged but no additional measurement intervals are generated.

- The command can only be performed if no PC (except the one currently in use) is directly connected with the device. If that is the case, there is a timeout error, since it is not possible to access the device for a specified amount of time.

7.1.1.1.3 Active / Passive setting

- *Active* enables access to devices.

- If multiple devices are selected, many actions are only applied to active devices. Set any devices which are switched off or not accessible as passive so that the measurement status query of all devices can be carried out quickly. Otherwise, performing the command for inaccessible devices will cause significant delays.

7.1.1.1.4 Actions with the mouse

Selection of a device

- In the topology, the measurement location at which this device is active is highlighted:

- If the device is not active at any measurement location, the passive locations are displayed.
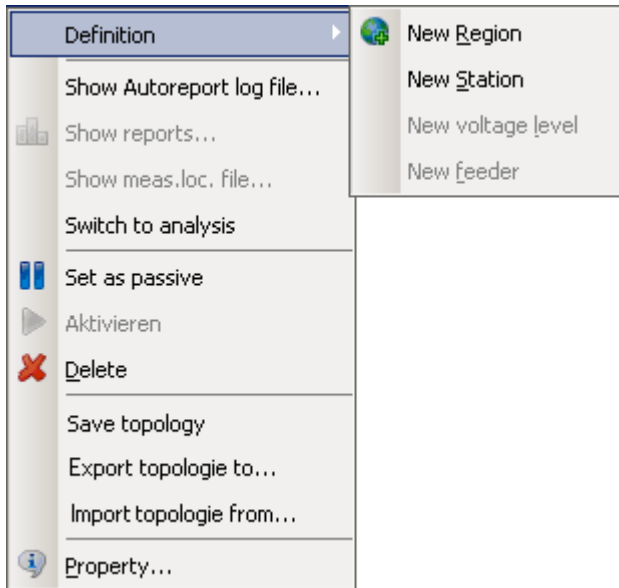
Double-clicking on the device name

The last configuration edited is loaded

7.1.1.2 Topology

The table below shows the topology and administers the measurement locations assignment of measured data.

Context menu

Definition: Creates new topology entries

- **New Region:** Generates a new entry for a region, see also here 33.
- **New Station:** Generates a new entry for a station, see also here 33.
- **New voltage level**: Creates a new entry for a voltage level, see also here 33.
- **New feeder:** Generates a new entry for a measurement location, see also here 33.

Report

- **Show Autoreport log file…:** Shows general log file of the Autoreport (start time, when ended...)
- **Show reports...:** Opens a selection dialog containing all reports. the reports are saved to the same older as the parameter sets.
  Default: *<Public documents>\ SIEMENS\SIMEASQ80\Data\<feeder>\<Parameter set>\<Reportx>.pdf*
- **Show meas. loc. file...:** Shows the measurement location's log file.
- **Switch to analysis:** Goes to the Evaluation 78 page .

Measurement location

- **Set as passive**: Sets the measurement location to passive, in order that the device / measurement group is assigned to another measurement location.
- **Activate**: Activates the measurement location, on the condition that it is not already active at another branch.
- **Delete**: Selected entry (entries) and all associated subentries are deleted.

Topology

- **Save topology:** Saves the current topology
- **Export topology to...:** Exports the current topology from an XML file.
- **Import topology from...:** Imports a previously exported topology in XML format.

General

- **Properties**: Properties of the selected topology entry, see here 32

Note

- When a device is parameterized, then this always refers to the current entries in the topology. Thus, in the reports on a measurement location, different reports may be listed! (e.g. due to exchanging devices, repairs etc.)
- Any empty topology always shows the entries *Collector \ Station \ Level*. These are required for storing data from unknown measurement locations for Autotransfer and -report purposes. These entries can not be deleted.

7.1.1.2.1 Properties of the topology objects

Depending on where in the program you right click for the context menu, selecting *"Properties..."* opens a variety of dialogs:

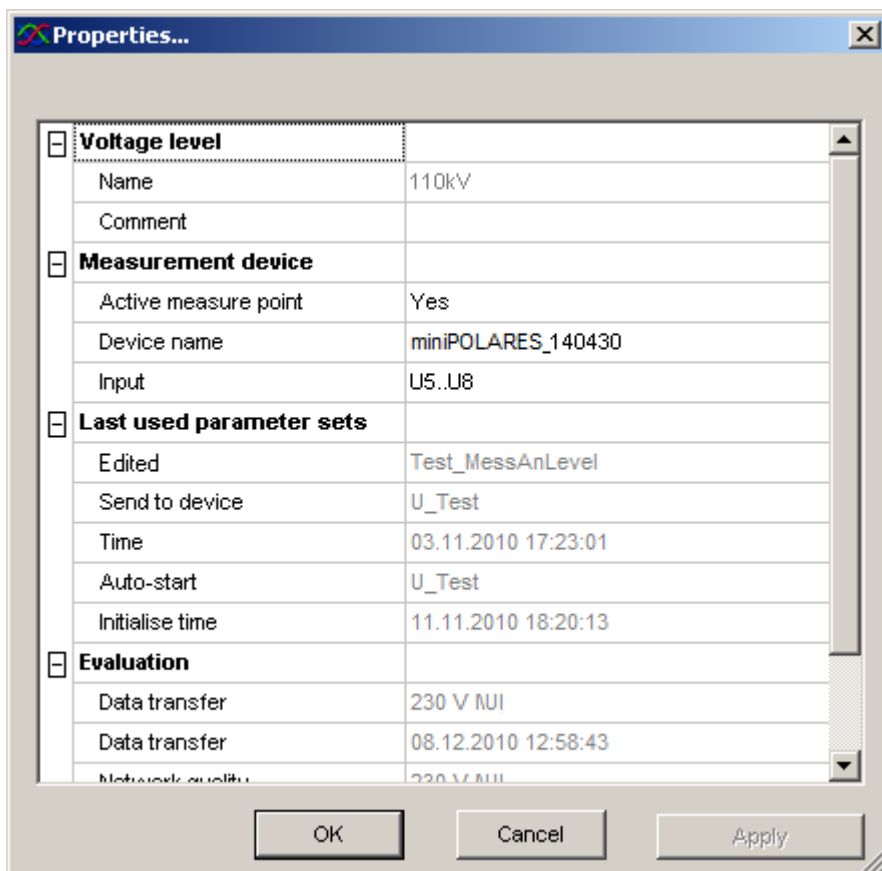| Region / Station / Level / Feeder	Device	Last
⊟ 🌐 Berlin		
⊟ 🗗 Trafo1		
⌇ 🗼 110kV **1**	miniPOLARES_140430 (U5..	**2**
⌇ 🗼 230V	miniPOLARES_140430 (U1..	

Excerpt from the topology. Selection of the properties by right-clicking in the areas 1 or 2 leads to the subsequent properties dialogs

1. Properties for Region, Station, Voltage Level

Properties...	✕

⊟ **Region**	
Name	Berlin
Comment	Test company ABC|

OK	Cancel	Apply
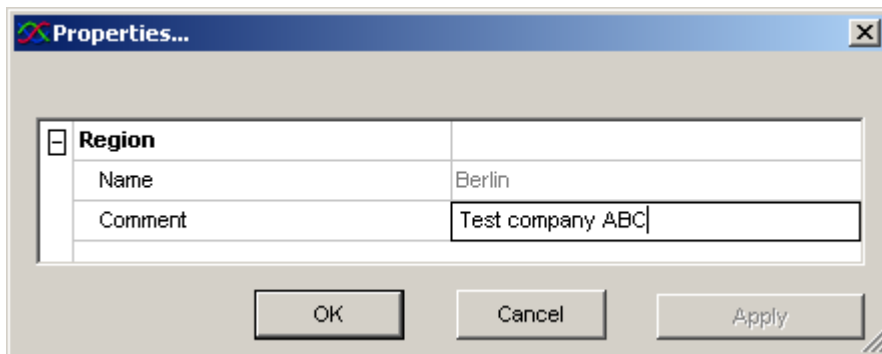
Properties context menu in the Region, Station, Voltage Level area

2. Also, for the measurement location

Properties...	✕

⊟ **Voltage level**	
Name	110kV
Comment	
⊟ **Measurement device**	
Active measure point	Yes
Device name	miniPOLARES_140430
Input	U5..U8
⊟ **Last used parameter sets**	
Edited	Test_MessAnLevel
Send to device	U_Test
Time	03.11.2010 17:23:01
Auto-start	U_Test
Initialise time	11.11.2010 18:20:13
⊟ **Evaluation**	
Data transfer	230 V NUI
Data transfer	08.12.2010 12:58:43
Network quality	230 V NUI

OK	Cancel	Apply

Properties context menu in the measurement location area

- **Measurement device**
  - ○ *Active measure point*: Activated in [Topology](#) | 31⌐
  - ○ *Device name*: Measurement device associated with the measurement location
  - ○ *Input:* Analog inputs. For devices having 8 voltage inputs: *U1..U4; U5..U8*, otherwise *U/I*
- **Last used parameter sets**
  - ○ *Edited:* Name of the last parameter set edited
  - ○ *Send to device:* Name of the last parameter set sent.
  - ○ *Time:* Time of the last parameter set sent.
  - ○ *Autostart:* Last parameter set loaded as autostart
  - ○ *Initialise time:* Time of last parameter set loaded to the device as autostart.
- **Evaluation**
  - ○ *Data transfer:* Name of the *feeder* and of the parameter set belonging to the last data transferred from the device.
  - ○ *Data transfer:* Time of last transfer
  - ○ *Network quality:* Name of the branch and of the parameter set
  - ○ *Measurement time:* Start and end of the measurement
  - ○ *Status:* Indicates whether evaluation requirements are met: *pass* or *fail*

In normal operation, the names of the parameter sets shown here are all the same.

Differences appear when you have new parameter sets or if the measurement location was moved within the topology.

7.1.1.2.2 Defining a new region, station or voltage level

- In the context menu, the only entry ever active is the one which can be performed in conjunction with the current selection. For example, for the station selected, only one new subordinate voltage level can be defined.

7.1.1.2.3 Defining a new measurement location

- Definable as a subentry for a voltage level or below the currently selected measurement location.
- A device can only be assigned to an active measurement location! With devices having 2 voltage measurement groups (8xU), assignment to 2 location is possible.
- If a device is to alternate between different measurement locations, the old location must be set to [passive](#) | 31⌐.

7.1.1.2.4 Actions with the mouse

Double-click on the device name

- This device is selected in the device list:

Double-click on the last evaluation

- The list of reports is displayed in accordance with the context menu entry for *[Show reports](#)* | 31⌐.

7.1.2   Setup

Use the mouse to fill in the boxes on the forms, which are later printed out. These forms provide the appearance of "virtual paper"; see also Chapter Forms [146].

7.1.2.1   Parameter set

7.1.2.1.1 Open parameter set

Opening a parameter set: Select the menu item *Parameter-set / Open* or click on the Open symbol 📂 or select *Load parameter set...* [27] with a right click to the device at the *Device definition*.

A selection dialog appears.
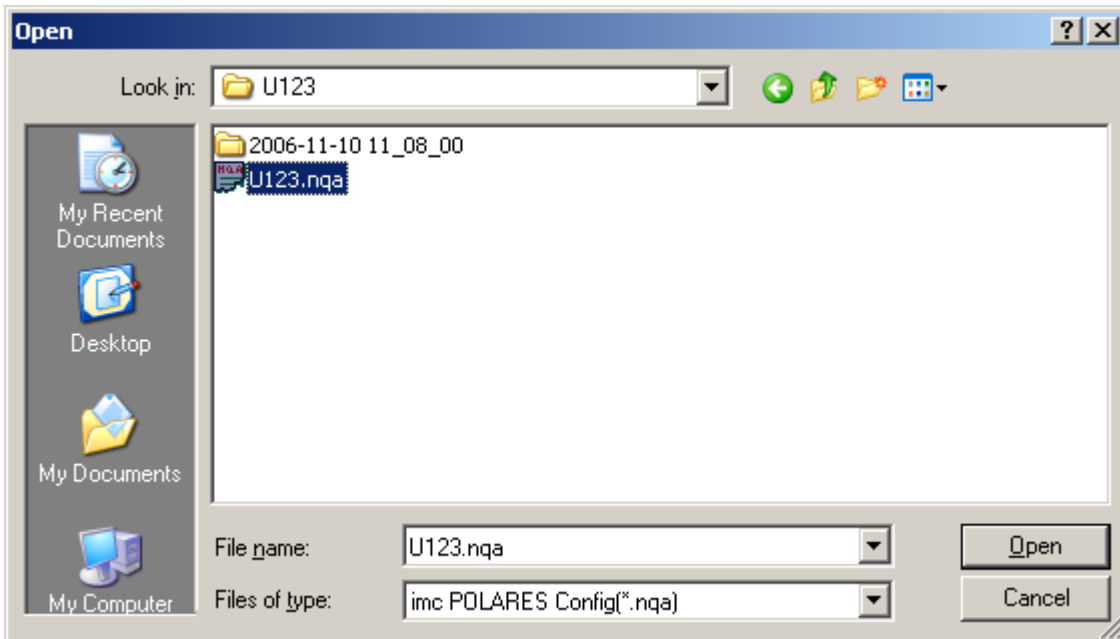
By default, the parameter sets already defined are displayed for the branch circuit assigned to this device. (For this reason, prior to this action the measurement must be assigned in the topology.) In the dialog shown, however, you can also view and open parameter sets of other branches. After opening, the devices for which the parameter sets were defined are activated. By saving these as templates, however, you can also assign them to another device.

Branch circuit 1
- ParameterSet11 (for device a)
- ParameterSet12 (for device a)
- ..

Branch circuit 2
- ParameterSet 21 (for device b)
- ParameterSet 22 (for device b)
- ..

Selected device: "Device a"
1. "Load a parameter set.." from "ParameterSet11"
2. The active device is "Device a"

Or:
1. "Load a parameter set.." from "ParameterSet21"
2. The active device is "Device b"
3. all further actions are performed with Device b.

### 7.1.2.1.2 Create a parameter set

Creating a new parameter set

Select the menu item *Parameter Set/ New*, click on the symbol ☐ in the toolbar or use the context menu in the Topology 27. To avoid name conflicts or errors in assigning measurement locations, it is recommended that you create new measurement tasks using the Topology 26.

A wizard leads you through various dialogs for entering the required names and, if appropriate, for changing the data storage location.
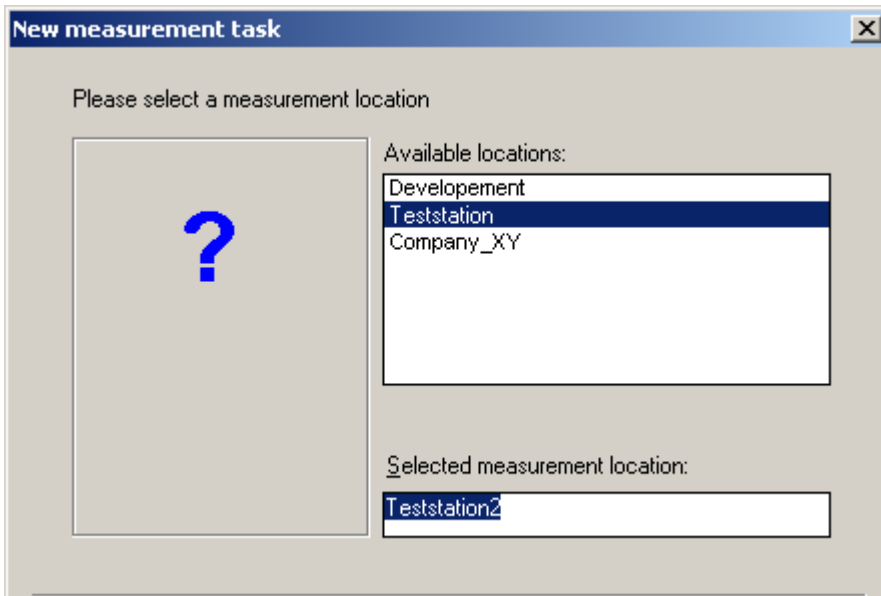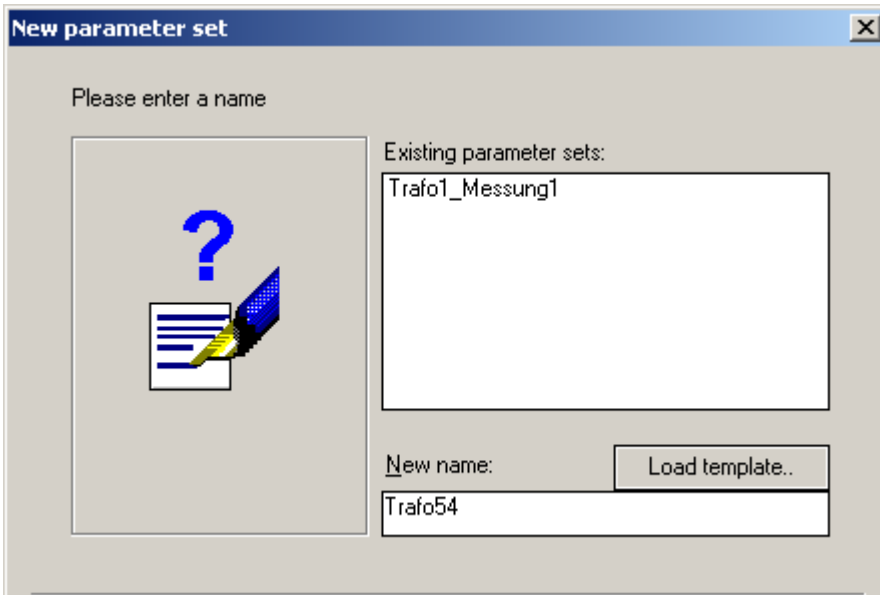
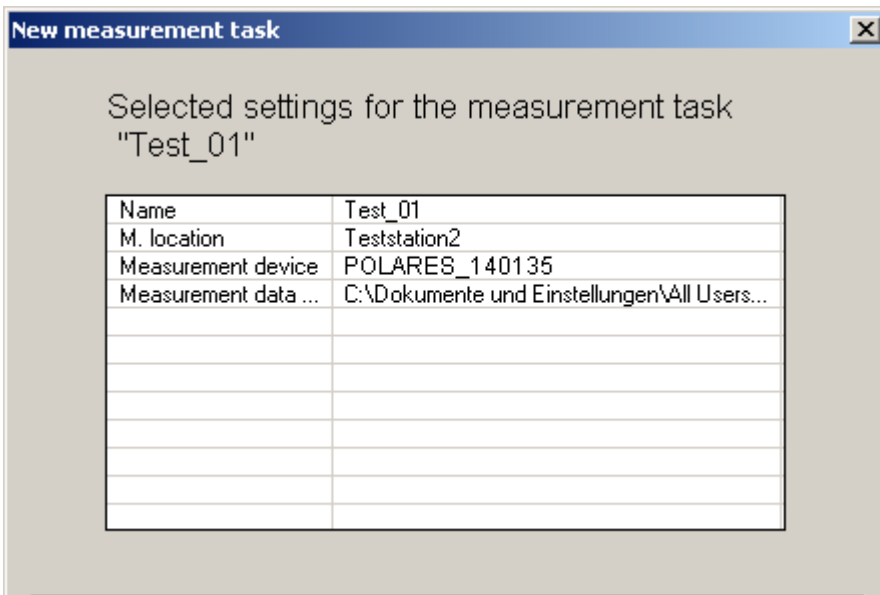**1. Name for the measurement location, assigned to device at the topology**

Use *Next >* to proceed to the next dialog
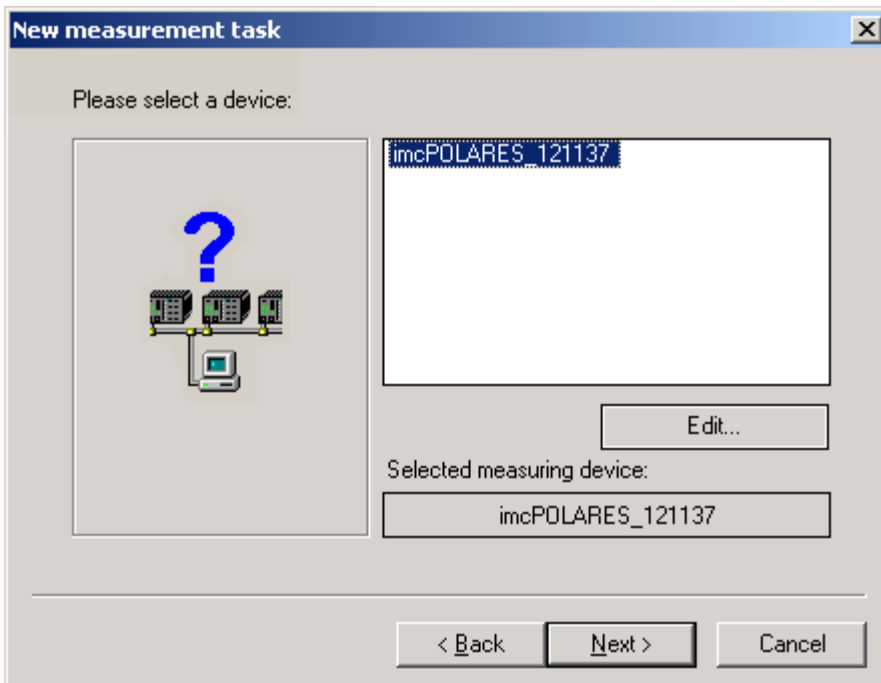
2. Selection of the measurement device to be used

3. Entry of an name of the measurement task

4. Summary of entries

By clicking on Finish, a new configuration is created with the default settings.

If an existing measurement task is to be applied to a different measurement location and a different device:

    a. Load the existing settings

    b. Select *Template/Save as...*

    c. Select another device

    d. Open the saved template with *Template / load...*

    e. Save as new parameter set

The storage of data is organized according to the following principle:

Data path   / Meas. Loc. 1   / parameter set 1_1   / parameter set 1_1.nqa (configuration file)
                                                        / 2004-11-25 17_40_00   (data of 1st measurement)
                                                        / 2004-12-10 10_10_00   (data of 2. measurement)

                            / parameter set 1_2   / parameter set 1_2.nqa
                                                        / 2004-12-16 14_00_00

             / Meas. Loc. 2   / parameter set 2_1   / parameter set 2_1.nqa
                                                        / 2005-01-12 12_00_00

             / Meas. Loc. N   / parameter set N_1   / parameter set N_1.nqa

If the button "Back" in the first dialog is clicked, the data path can be changed.
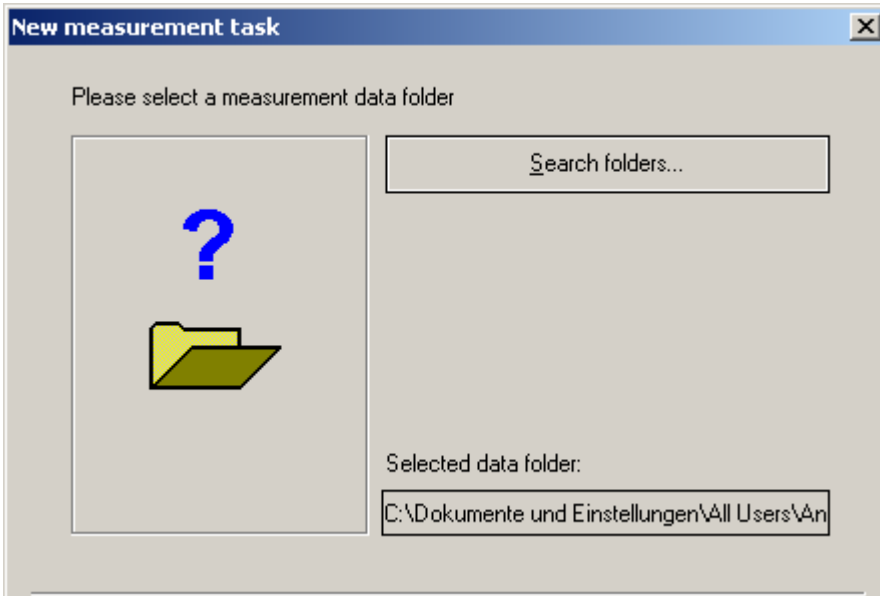
Changing a directory path

Using *Search folders…*, an existing path can be selected, or a new path created. The data folder can be set in
Options - Folders 138 .

Important Note

Always assign a unique name to a measurement assignment. If one device's measurement assignment is copied to a different device, the directory path for both devices is identical. In the evaluation of all devices, measured data having the same name would overwrite each other.

7.1.2.2 Basic settings

Here you make entries for the most important properties which affect the protocol and how the measurement is interpreted. The boxes whose entries can be edited are shaded in a certain color.
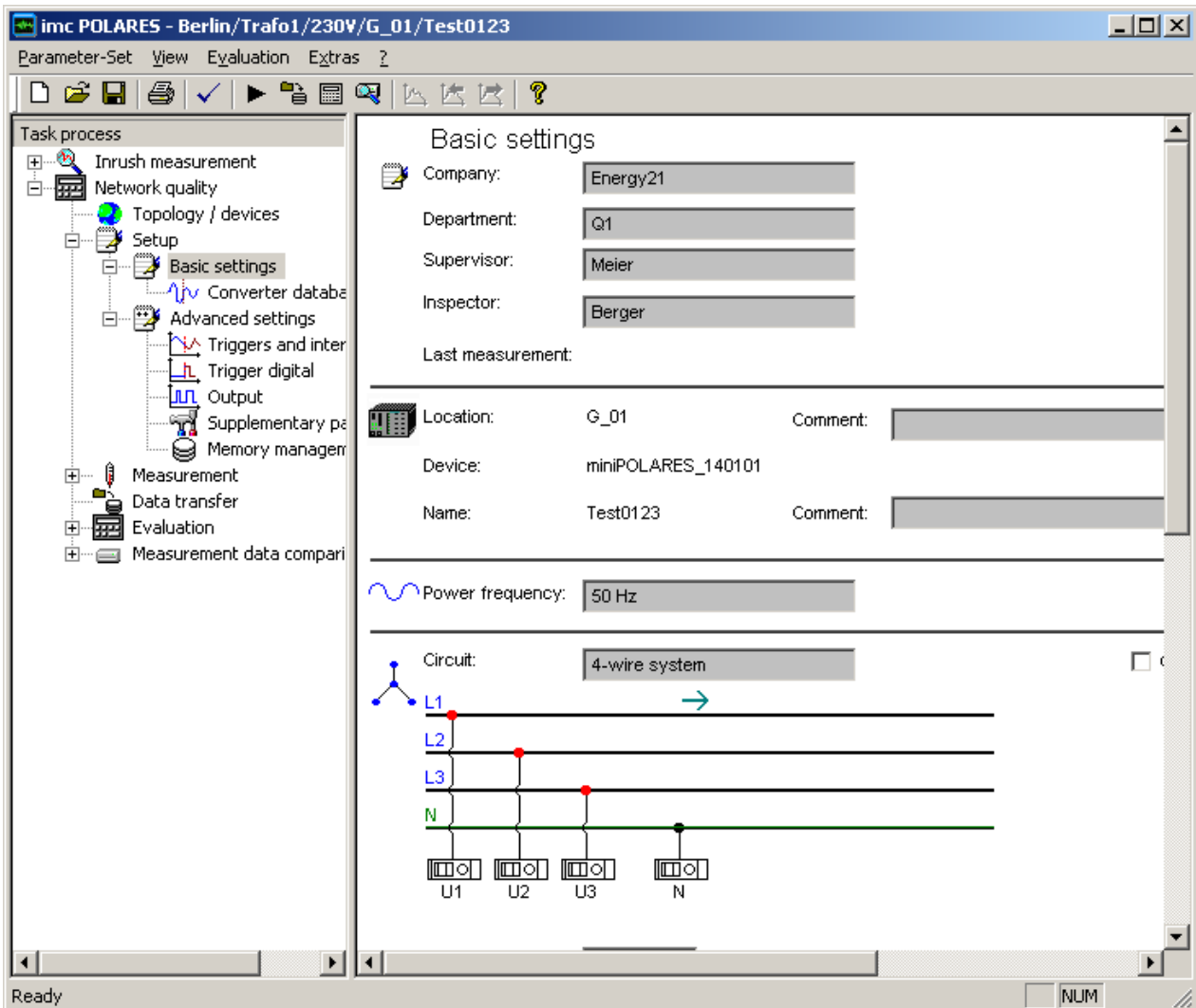
Fill-out form for basic settings

7.1.2.2.1 Personal data

This includes the boxes **"Company", "Department", "Supervisor" and "Inspector"**.

7.1.2.2.2 Location

Display of the measurement location (branch or voltage level) and of the measurement device.

Here, a comment for this parameter set can be entered. Changing these parameters is only possible by means of the Topology 31.

	Location:	Teststation	Comment:	engine 7807
	Device:	POLARES_140135		
	Name:	Standard_EN50160	Comment:	max. load

Note

- Only the device stated in the measurement protocol can be connected to the PC. If your *imc POLARES* has a different name than what appears in the box *Device*, it cannot be addressed with this configuration.

- To register new devices, follow the instructions in the manual's chapter Getting Started - Connect the device. Special connection options are presented here 163.

- Various words have distinctive coloring and change color when the mouse pointer is positioned over them. Clicking on such a word opens a dialog for setting the property which that word denotes.

- One measurement assignment can be used as the basis for other assignments. To do this, load the desired assignment assignment and save it as a template. This template can then be loaded in other devices. It is highly recommended to save the assignment under another name, since there may otherwise be conflicts when the data are later saved. One exception is when changing the device at one measurement location, in which case the name does not need to be changed.

7.1.2.2.3 Power (grid) frequency

Power frequency:	50 Hz ▼
	50 Hz
	60 Hz

Selection of the power frequency: 50 Hz or 60 Hz.

Note

For determining the frequency, all three phases are taken into account.

A calculation is performed whenever at least one line exceeds a threshold 10 V RMS.
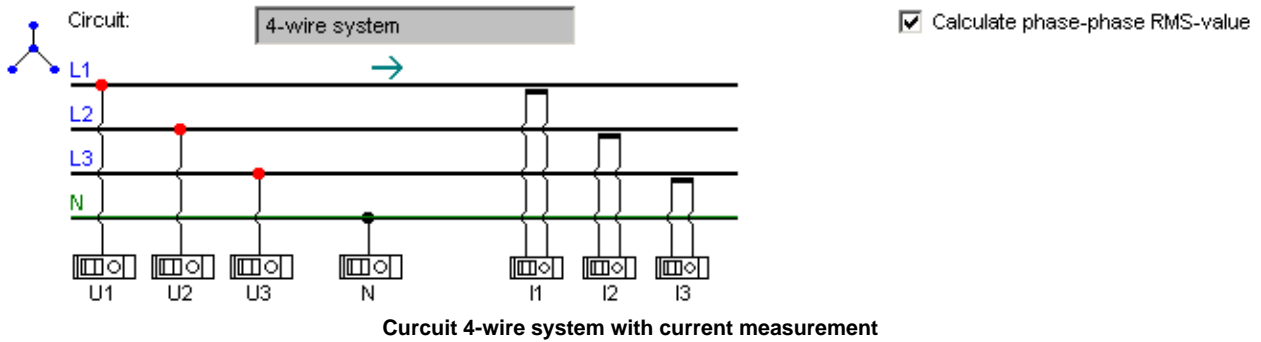
7.1.2.2.4 Voltage connection

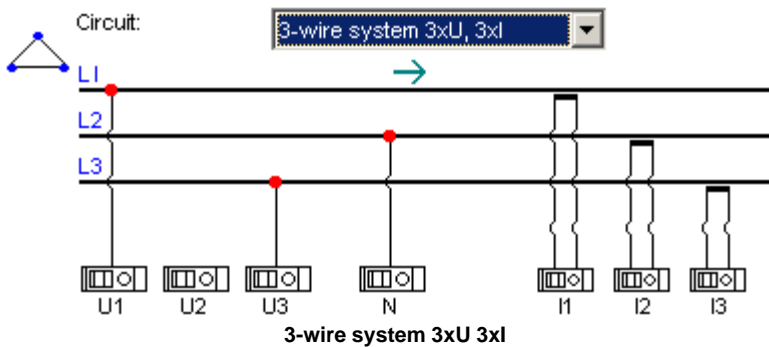Click on the list box *Voltage* to open it. You can choose from three possible configurations of the inputs U1 to U3:

- *Four-wire system* (*Star*)
- *Three-wire system 3xU* (*Delta*)
- *Three-wire system 2xU* (*Open delta*)
- *Single line P-COM*
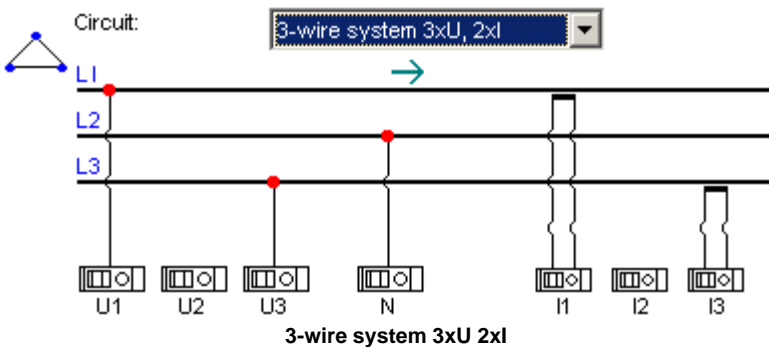
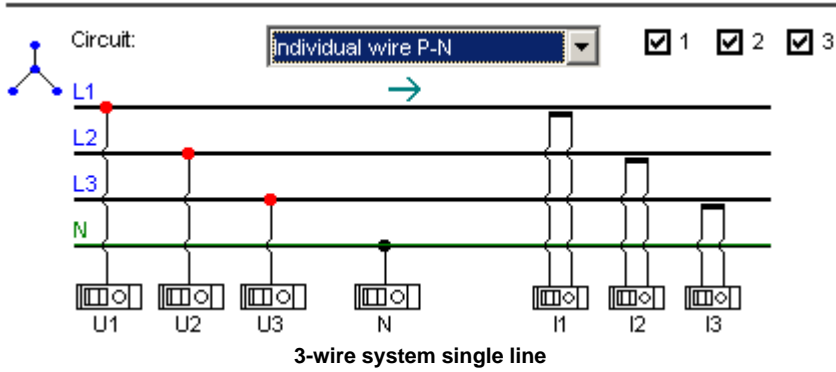The selected configuration is illustrated in a graphic.

Circuit 4-wire system

Curcuit 4-wire system with current measurement

Circuit 3-wire system 3xU 3xI

3-wire system 3xU 3xI

Circuit 3-wire system 3xU 2xI

3-wire system 3xU 2xI

Circuit Individual wire P-N

3-wire system single line
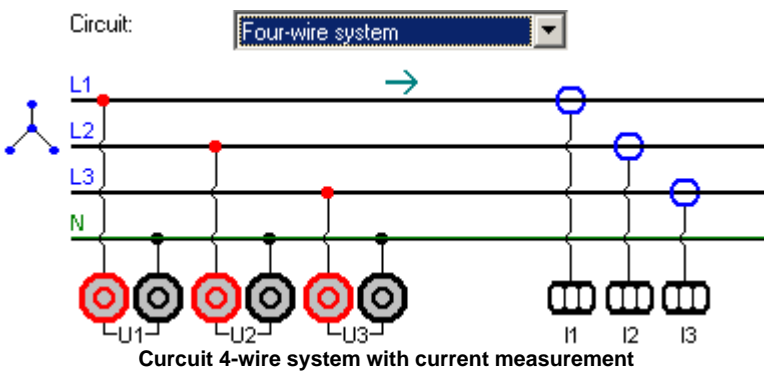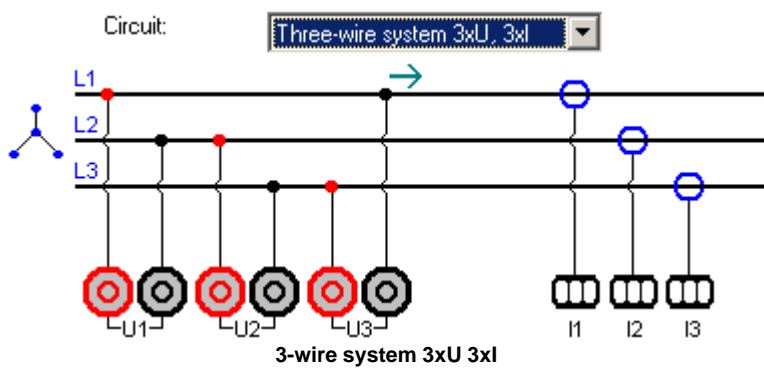
With *imc POLARES*, the symbols used are adapted according to the terminals.

Circuit 4-wire system

Curcuit 4-wire system with current measurement
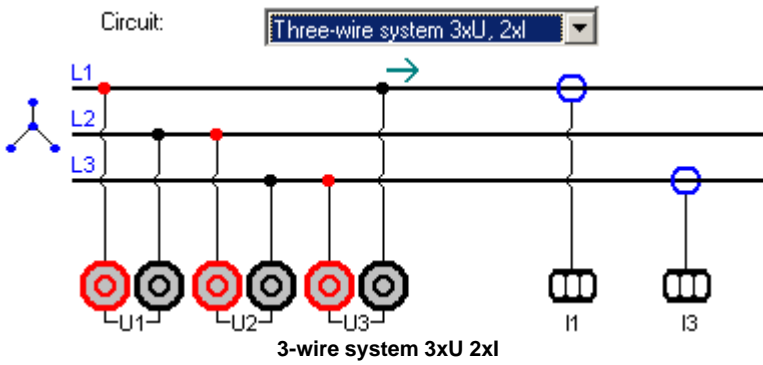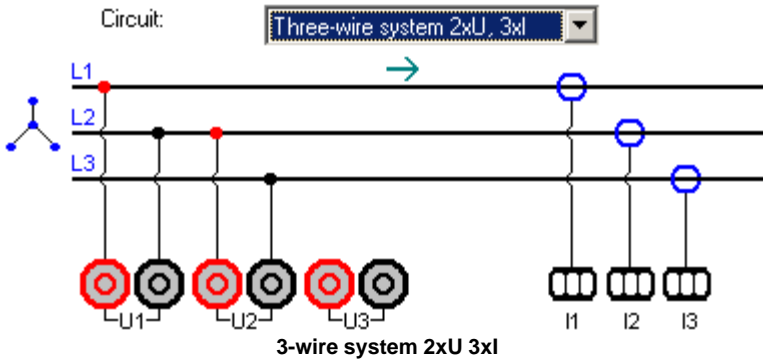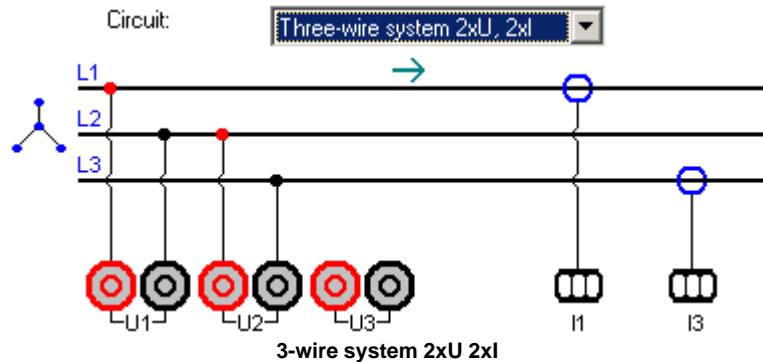
Circuit 3-wire system 3xU 3xI

3-wire system 3xU 3xI

 (not with miniPOLARES)

Circuit 3-wire system 3xU 2xI

3-wire system 3xU 2xI

Circuit 3-wire system 2xU 3xI

3-wire system 2xU 3xI

Circuit 3-wire system 2xU 2xI

3-wire system 2xU 2xI

Circuit Individual wire P-N

imcPOLARES individual wire
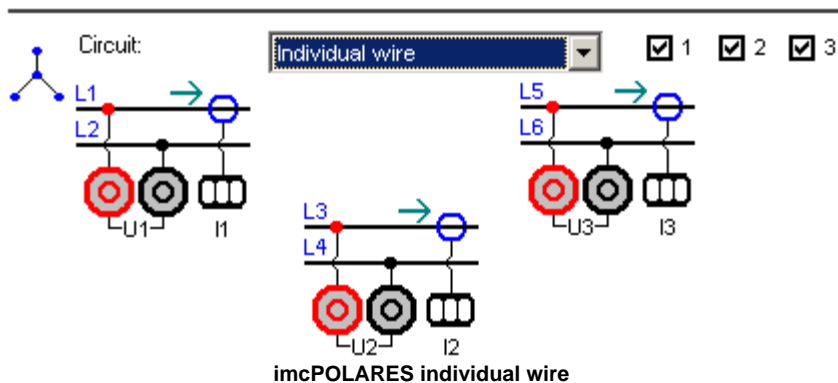
Two positions are provided for entering the nominal voltage and thus also the input range. The first, **Primary value**, represents the actual voltage at the measurement location. The second, **Secondary value**, indicates the voltage at the inputs of *imc POLARES*. If the measurement is performed without a converter (no check in the box **Converter**), then the primary side presents a list of possible nominal voltages which can be connected directly.

Nominal voltage:

- Nominal line voltage
- Serves as indicator variable and not used for calculations

Operating voltage:

- Expected or declared line voltage
- Normally equal to the nominal voltage, especially at low voltage
- The operating voltage is used for all subsequent calculations and value limits.

Voltage values

If the measurement is carried out with a converter, the list shows a selection of primary voltages, which you can define yourself under Converter database 47. In parallel to this, the corresponding secondary voltage at the device inputs is indicated.

Converter data base

Depending on the input configuration, the nominal voltage is interpreted either as the conductor voltage or as the voltage to the neutral point. This saves the trouble of value conversion. When you switch between different input configurations, the values are adapted automatically.

Setting the input range:

U1...U3   1. Without converter

The operating voltage set corresponds to the voltage at the measurement device. This is to be set internally as the input range.

2. With converter

Primary voltage is actual voltage

Secondary voltage is the voltage at the measurement device

The input range used internally is based on the secondary value.

U4   1. Without converter

Primary value is the voltage at the device

2. With converter

Primary voltage is actual voltage

Secondary voltage is the voltage at the measurement device

The input range used internally is based on the secondary value.

Note

- When entering the primary and secondary voltage, the converter ratio must conform to that used by the upstream converter.

  - If you need a voltage or a converter ratio which doesn't appear among the selections, you can manually overwrite the values offered.

  - Make sure that the selected input configuration is really used. Otherwise, the measurement values are incorrectly scaled and weighted.

  - The configuration *Open delta* calculates the third voltage according to the equation: u1 + u2 + u3 = 0. This only applies to the voltage between the conductors. (Aron-configuration)

  - Voltage converters affect the frequency and phase response of the original signal.

7.1.2.2.5 Second voltage system (U5 to U8)

If your *miniPOLARES* is equipped with a second voltage system, you will have extra setting options.

All necessary parameters are entered analogously to the settings for the first voltage module.

Second voltage system (U5-U8)

The configuration types for the second voltage module

| 4-wire system | 3-wire system 3xU | Single line P-COM |
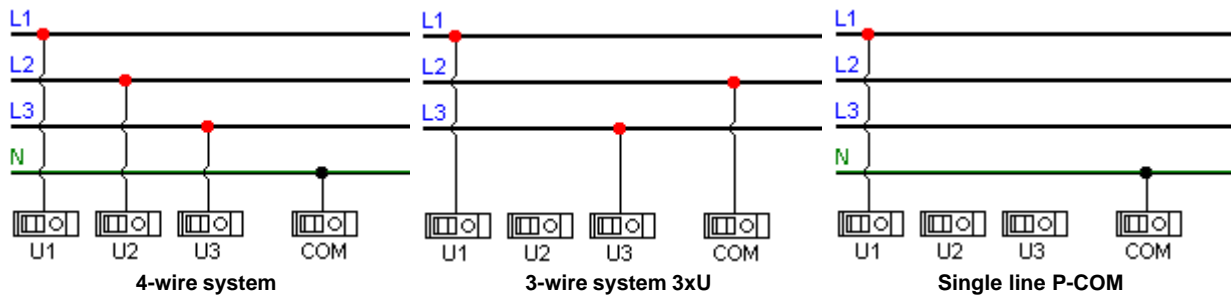
Note

- With measurement devices having the second voltage module, the current module is missing.
- *imc POLARES* does not come with this enhancement option.

7.1.2.2.6 Current connection

imc POLARES

Current transformers outfitted by imc come with input range recognition which *imc POLARES* reads if the automatic connection recognition option was selected. Use of this option is **strongly recommended**, since correction values and calculation algorithms which support proper operation of the transformer and improved measurement precision are also transmitted. The button **Line query** enables the transformer to be checked manually.

☑ automatic line recognition   Line query

imc miniPOLARES

Current transformers come with input range recognition which *imc POLARES* reads automatically.

There are two connection terminals:

- Terminal 5 A is for input ranges2,5 A, 5 A and 10 A.
- Terminal 1 A is for input range 0,5 A and 1 A.

Current transformer: Direkt 5.0 A~

Input range: 2.5 A~   Converter: ☐

Selection of current terminal and input range

Similarly to the case of the voltage terminals, there are various ways to define an external transformer. When you click on **Current transformer**, the entry box displays a list of all possible input ranges. Clicking on **Converter** opens the list of pre-defined external **transformers**.

(A) Current input definition

Converter name	Input range text	Current range (...	
Direct 5.0 A	10.0 A	10.00	1000.00
Direct 5.0 A	5.0 A	5.00	1000.00
Direct 5.0 A	2.5 A	2.50	1000.00
Direct 1.0 A	1.0 A	1.00	1000.00
Direct 1.0 A	0.5 A	0.50	1000.00

Current connector and -range (display only)

I4 can be used to measure current as well. In addition it is possible to do a calculation of I1 + I2 +I3:

☑ I4 active   ▯▯◇▯ Calculate ▼ ☐ automatic line recognition

Current input: I4 = I1 + I2 + I3

Input range: Converter: ☐

Definition for I4

Note

- You have the responsibility of making sure that the input range specified in the software matches that of the connector terminals. If they don't match, this will result in **incorrect scaling of the Y-axis.** However, the hardware is **not** in danger of damage.
- Current converter affect the frequency and phase response of the original signal.

7.1.2.2.7 Digital inputs miniPOLARES

☑ Record digital inputs

The digital inputs are captured at a sampling rate of 1 kHz and the data is reduced, wich means it is only recorded when it changes.

Note
- *imc POLARES* doesn't have any digital inputs.

7.1.2.2.8 Converter database

Here, data for the current and voltage transformation can be entered, which later are available for selection from the pop-down list boxes in the fill-out forms.

You can enter the commands *New* and *Delete* using the context menu.

New creates a new entry. By a click to the entry, a edit field appears to *change* the value.

Converter - Voltage transformation

Primary voltage (in V)	Secondary voltage (in V)
380000.00	100.00
220000.00	100.00
110000.00	100.00
35000.00	100.00
20000.00	100.00
10000.00	100.00
1000.00	100.00

Current input definition

Converter name	Input range text	Current range (...	Output voltage (mV/A)
Direct 5.0 A	10.0 A	10.00	1000.00
Direct 5.0 A	5.0 A	5.00	1000.00
Direct 5.0 A	2.5 A	2.50	1000.00
Direct 1.0 A	1.0 A	1.00	1000.00
Direct 1.0 A	0.5 A	0.50	1000.00

Converter - Current transformation

Primary current (in A)	Secondary current (in A)
5000.00	1.00
5000.00	5.00
1000.00	1.00
1000.00	5.00
500.00	1.00
500.00	5.00
100.00	1.00

Definition of voltage and current converters

7.1.2.3 Advanced settings

7.1.2.3.1 Triggers

This page presents the **Trigger options**. For a more detailed explanation, see instruction manual under "Computations - Trigger."

The *Trigger type* desired can be set by clicking the checkbox appearing next to its entry in the list. Once this is done, the entries in the column *Trigger condition* become enabled. All values are stated in terms of the unit specified in the input box. If you hold the mouse pointer over the input box for a moment, an explanatory text appears.

The settings only apply to any activated measurement inputs. For instance, the electric current triggers are only active if current measurement is switched on on the "Basic settings" dialog page.

The numbered items in the figure above are explained as follows:

| Nr	Trigger	Description
1	Voltage	Trigger settings for the voltage inputs. The grid frequency is defined at the basic settings 39. Find an explanation for the hysteresis here 50. With miniPOLARES: If yourminiPOLARES comes with a second voltage measurement system, a selection for the voltages U1..U4 and U5...U8 appears here. By this means it is possible to to set parameters 1 through 9, as described here, for each voltage system separately.
2	Monitoring	Selection of the event voltage • Phase-to-Neutral • Phase-to-Phase In 4-wire configuration, the signal to be monitored is selectable. Either the Phase-Neutral or the Phase-to-Phase voltage.
3	Limits in %	Selection of the specified cutoff limit • Absolute values (not activated) • % of operating voltage (activated) With the cutoff limit specified in % of the operating voltage, these settings can be applied to any voltage system, since they are independent of the absolute operating voltage.
4	Curve comparison trigger for the voltage	The discrepancy between instantaneous values at the same position in two periods must not exceed the specified value.
5	Threshold value trigger for the voltage	The signal's RMS-value may not sink below the lower threshold in a negative slope, and may not pass the upper threshold in a positive slope (range trigger).
6	Signal frequency	The amplitude of the modulated signal may not exceed the specified threshold. Each checkbox activates signal capture for one of the three conductors..
7	Curve comparison trigger for the current	The discrepancy between instantaneous values at the same position in two periods must not exceed the specified value.
8	Threshold trigger for the current	The signal's RMS-value may not sink below the lower threshold in a negative slope, and may not pass the upper threshold in a positive slope (range trigger).
9	Frequency trigger	Resolution of a trigger if the network frequency found either exceeds or falls below the respective limits.
10	Pretrigger	Recording duration preceding the event
11	Data capture duration	Recording duration 50 following the trigger event • min minimum recording duration • max maximum contiguous recording duration • block Blocking time after event detection. During this time, there is no new trigger release. *Example 1: Setting of a fixed recording duration of one second* *min = max = block = 1s* *Example 2: Variable recording duration* *Upon detection of an event, there is to be at least 0.5 seconds of data recording. Multiple releases from one event are to be prevented by means of a blocking time of 0.3 seconds (e.g. chatter of the digital input). The recording is to be extended upon occurrence of new events, but is not to exceed 60 seconds.* *min = 0.5; max = 60.0; block= 0.3*

Note

- You should only use the signal frequency trigger on one of the conductors, since the capacity of the device hard drive will otherwise be exhausted too quickly.

- Triggered signals can lead to data glut if the trigger is released often. For this reason it's recommended for long measurements to work without a trigger and to instead capture the disturbance source as interharmonics. The reduced signal enables equally good qualitative evaluation.

- The amplitude of the signal frequency is at first saved continuously as a **curve plot** and **aggregation**. Therefore it's absolutely necessary to specify the frequency.

7.1.2.3.1.1 Data capture duration

to11: Data capture duration
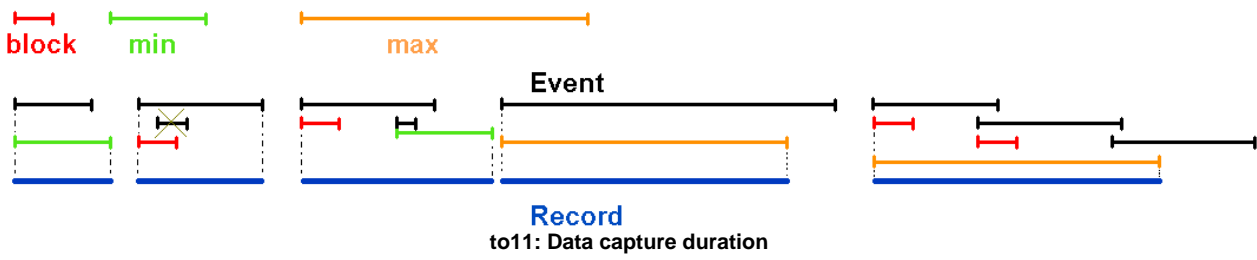
7.1.2.3.1.2 Hysterese
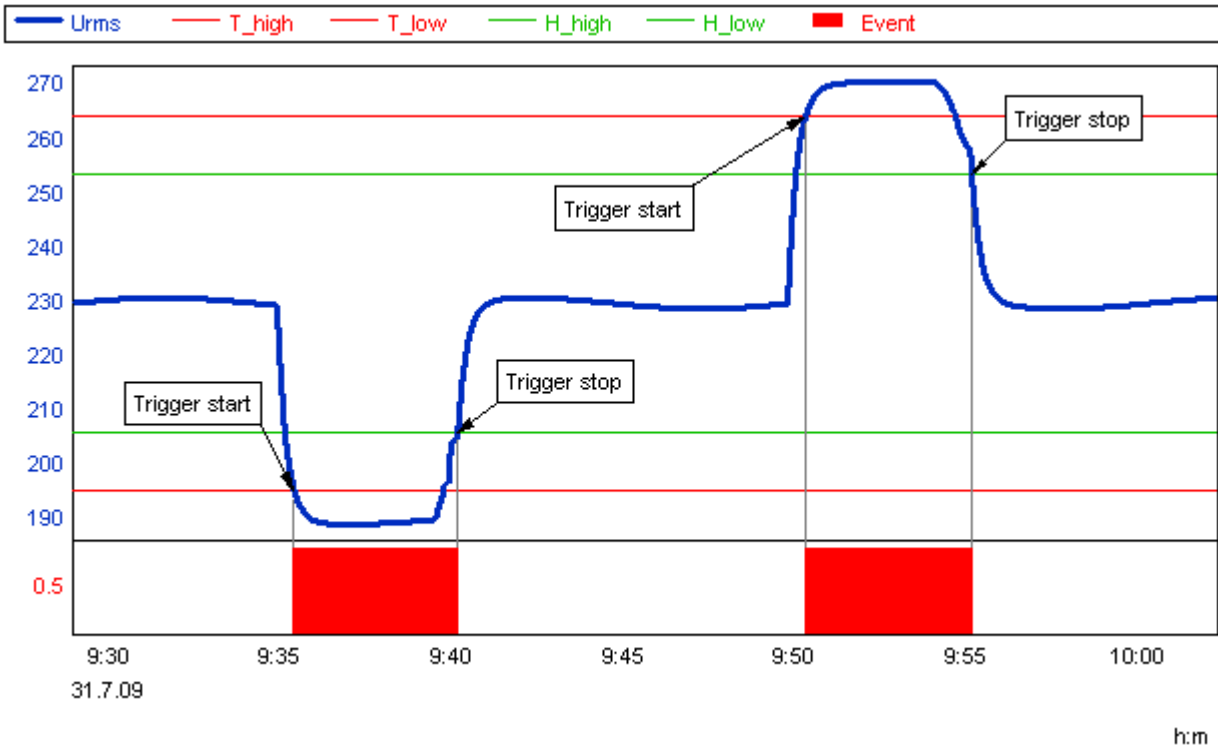
Effect of the hysteresis:
The value of the hysteresis is added to the trigger level (neg. slope) or. subtracted (pos. slope)

7.1.2.3.1.3 Event overview - Which value limit affects what

	Text-Notification	DO-output	Message (SMS, Email)	Data recording	LED
Value limits for event messages					
Voltage events	X	X	X	-	-
THD	X	-	-	-	-
Asymmetry	X	X	-	-	-
Frequency	X	-	-	-	-
Available memory	X	X	X	-	X
Value limits for triggering					
Voltage	X	X	-	X	X
Current	X	X	-	X	X
Frequency	X	X	-	X	X
Signal frequency	X	-	-	X	X
Digital input					
DI 1..4	X	-	-	X	X
Miscellaneous					
System error	-	X	-	-	X
Device active	-	-	-	-	X
Network trigger	-	X	-	X	X
Time synchronization	X	-	-	-	X
Frequency measurable	X	-	-	-	X

7.1.2.3.2 Inharmonics

In the table Interharmonic oscillations, you can select up to 10 frequencies which are to be captured in addition to the 50 harmonics included standard.

Click the mouse on a number to enter the frequency.

No.	Frequency - 5..3000 Hz (5Hz resolution, mean value record, power)	
1.:	16.67	Hz
2.:	75.00	Hz
3.:	125.00	Hz
4.:	275.00	Hz
5.:	500.00	Hz
6.:	0.00	Hz
7.:	0.00	Hz
8.:	0.00	Hz
9.:	0.00	Hz
10.:	0.00	Hz

Monitoring of fixed frequencies

Definition of monitored inharmonics

The permitted frequency range is between 10 Hz and 3 kHz. Thus it is possible to both monitor interharmonics below 50 Hz as well as signal frequencies in this range.

7.1.2.3.3 Digital triggers miniPOLARES

Triggers can also be defined by external events. This can be transported as network bits as well as be based on the device's own digital inputs (optionally).

Trigger digital

Trigger type   Trigger condition

Digital IN

Trigger start upon transition 0 --> 1 or 1 --> 0

Bit	Name	Status	Trigger if
DI_1	SPS_A01	active	0 -> 1
DI_2	emergency stop	active	0 -> 1
DI_3	power loss	active	1 -> 0
DI_4	DI_4	passive	0 -> 1

Network

☐ Distribution of a trigger release via the network   Hold time: 2   s

☐ Recognize trigger release via network

Triggering via digital IN:

If the device possesses digital inputs, then triggers can be configured to respond when a signal transition occurs at the digital input. All available digital inputs are displayed, in accordance with how the measurement device is equipped.

Name:	text	user defined
Status:	Active/passive	(De)-activation of the monitoring of a digital input
Trigger condition:	$0 \rightarrow 1$ / $1 \rightarrow 0$	Definition of the signal transition to be monitored

LED shines:

- Green - the high level is applied at the DI

- Yellow - High level recognized, but + and – were mistakenly switched in the wiring. The DI DOES NOT go to High level! There is no state transition and thus no trigger release.

Triggering via the network:

If multiple measurement devices are run, then when a device detects a trigger event, it can send a signal via the network which is recognized by other devices on the network, which causes then to start triggered measurement as well. This means that the effect of events at various measurement sites can be monitored, although the trigger threshold was only overstepped at one location.

Distributed trigger release	The measurement device should send a signal around the network indicating a locally recognized trigger event. A holdoff time must be defined, meaning the minimum distance between the signaling of consecutive trigger releases. This amount of time depends on how the network is structured, and how it is burdened. The minimum time to specify, assume 0,6 s. To ensure that the same event does not release the trigger repeatedly whenever it is detected and signalized at multiple sites, times > 1 s are recommended.
Recognize trigger release	The measurement device should start a triggered measurement if a trigger release is detected on the network.

The trigger distribution is limited to the active subnet!

Note

- For *imc POLARES*, these options are not available due to the missing digital inputs.

7.1.2.3.4 Digital outputs miniPOLARES

Pre-defined functions can be assigned to the digital outputs. By this means, for example, a variety of measurement states can be signalled by external display elements.

The digital outputs are designed as relay contacts: If a bit's value is 1, the switch is closed. The connected voltage must be supplied from outside. There is **no** internal connectable voltage (TTL etc.)

Clicking in the function column of a binary output opens a list of available functions:

LED – shines green when the relay is closed.

For cutoff values, values can either be defined or parameters of the selected standard can be used.

Output

Bit	Name	Function	Cutoff value	
DO1	DO1	System fault	----	
DO2	DO2	Low free memory	Freely specified li...	50.00 MB
DO3	DO3	Voltage dip	Standard value	90.00 %
DO4	DO4	Unbalance	Standard value	2.00 %

Dialog page: Digital outputs

Function	Description
System fault (device active)	The closed relay contact (LED=green) indicates that the device is measuring. If the relay fails during measurement (LED=red), there is a system error.
Voltage dip	The relay closes when the RMS voltage value falls below the cutoff value for event messages 57.
Low free storage	The relay closes when the free data storage falls below a cutoff limit. The cutoff limit is specified in MBytes.
Unbalance	The relay closes when the asymmetry exceeds a cutoff limit 57.
RMS trigger U	The relay closes when the RMS voltage value deviates according to the settings in the trigger dialog 48 (No. 5).
RMS trigger I	The relay closes when the RMS voltage value deviates according to the settings in the trigger dialog 48 (No. 8).
Frequency trigger	The relay closes if the frequency deviates according to the settings in the trigger dialog 48 (No. 9).

Note

- *imc POLARES* does not have any digital outputs.

7.1.2.3.5 LED indicator miniPOLARES

The LED functions are permanently allocated:

Name	Function
LED_01	Measurement active
LED_02	Trigger condition recognized
LED_03	No synchronization signal present
LED_04	Frequency not measurable
LED_05	Low free memory
LED_06	System error

Interpretation of the LEDs

Note

- *imc POLARES* does not have any LED indicator.

7.1.2.3.6 Supplementary parameters

Under "Additional parameters", you will find the tolerance ranges for data reduction and the parameterization of the message transmission (see Chapter Messaging 181). Optionally, the plot of the RMS-values' min/max points is recorded.

Expert insight into *imc POLARES*'s data processing methods is required for the purpose of making changes to this page, since any changes would render with the EN50160 standard void. Furthermore, the resulting data volume will be strongly affected– see e.g. Instruction manual section *Computations\Memory management \ Aggregation intervals*.

7.1.2.3.6.1 Recording of mean values

|	State	Averaging interval	Minima	Maxima	
U RMS	active	10 min	Calculate	Calculate	
I RMS	passive	10 min	–	–	
f	active	10 s			
Pst	active	10 min			
Pf5	passive	0.1 s		–	

Recording of mean values

Note

Per default the parameters are set to comply with the norm EN 50160. With different intervals an evaluation according the EN 50160 can not be assured.

Recording of the mean value enables the following computations and their activation:

- When you click on a cell with the mouse, a selection list with available options appears. The first column and any empty cells cannot be edited.

- Setting of the mean value intervals for various measurement variables.

- Activation of the recording of Min/Max values

- Activation of calculation of a variable (e.g. the flicker Pf5-value is deactivated as the default setting.)

- The aggregation intervals for "U RMS" and "I RMS" cannot be set separately!

Note

The averaged value appears in the curve window at the chronological start of the averaging interval. In the line display mode "Steps", the average value is dispalyed over the entire averaging interval.
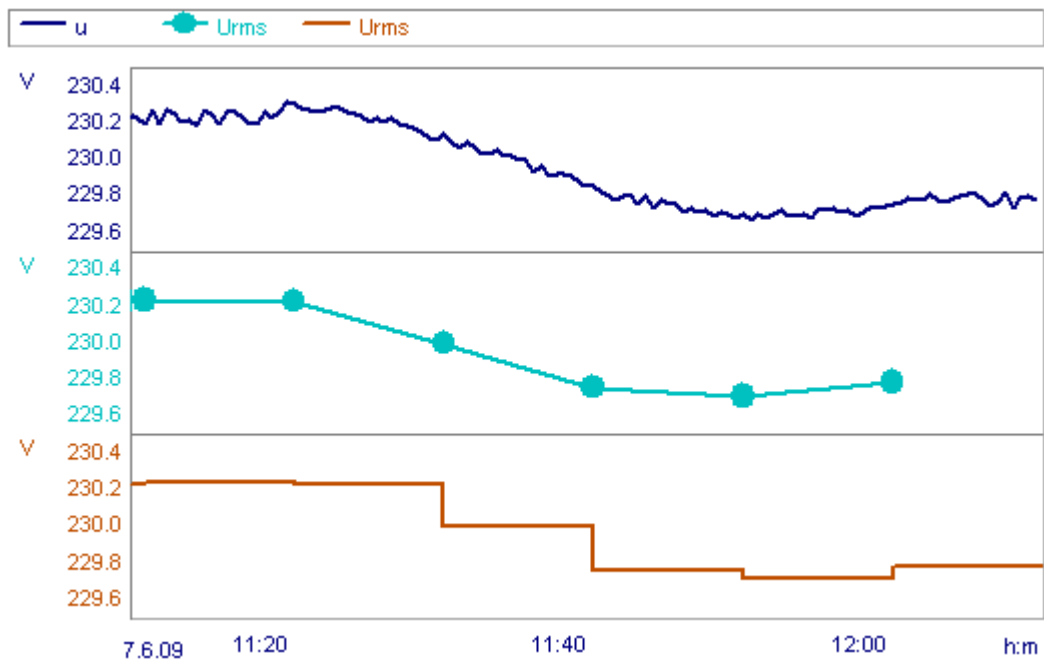
7.1.2.3.6.2 Tolerance range and data reduction

Data reduction tolerance range

- The data reduction tolerance range influences how voltage events are detected. The wider the tolerance range, the less precise the recognition of events will be.

- With the voltages L1-L3, the tolerance set is the range nominal voltage ±10%. Outside of that range the tolerance is divided by 2. For minor voltage fluctuations, you obtain highly reduced data (in extreme cases, less than for the averaging). If the voltage leaves the "good range", there is more precise recording, for better plotting of dips/surges.

- The current measurement channels can be deactivated since the accumulation of data can be very high when there is strong fluctuation!

- When the option box *active* is selected, along with the current mean values a data reducing channel based on RMS-values computed for each half period is recorded. When the tolerance is too small, or if there are strong current fluctuations, data are recorded in the worst case scenario every 10 ms or 8.3 ms (in the 50 Hz or 60 Hz networks, respectively). This means that the plot of the current is mapped very precisely, but in consequence, about 1.4 MByte of data are produced per channel and hour.
  For this reason, we recommend setting a small tolerance only for short measurements where the mean values are not adequate for the analysis.

7.1.2.3.6.3 Events / Messages

Events, messages and UDP

During measurement, the measurement device can both list certain events in the **Event table** and **send them as messages** .

Limits for event messages

Here, the value limits for all messages are entered. These are independent of the standard used in the evaluation.

Communications

With *Voltage event*, the value limits set for event messages are activated for sending. Also, messages can be sent *cyclically* or when the *free space* falls below a minimum amount specified by the user.

Using **UDP measurement data status t**he measurement device can send cyclical messages about the conclusion of the data measurement. The message contains the device recognition as well as information about concluded measurements, so that for consecutive measurements it is possible to recognize whether new measured data are available to be retrieved. The User Datagram Protocol (acronym UDP) is a minimalistic network protocol in the transporter branch of Internet protocols.

The message recipient must be stated:

- **IP-address**: Address of the PC which is receive the messages.
- **Port**: Target port for receiver
- **Time interval**: Sending interval in minutes. The entry is made either manually or by means of the pop-down list.

Example: Sending a message every 10 min:

IP-address: 10.0.2.10; Port: 1205; time interval: 10 min

Note

UDP is used by Auto-Transfer 111, too. With it, the transfer program is able to read the device information (name, serial number and IP-address) directly.

7.1.2.3.6.4 Zero point suppression

Suppresses data acquisition while no signals are applied. By this means, the system avoids capturing noise near the zero level.

This option is activated separately for voltage and current. Likewise, the sensitivity is set separately.

7.1.2.3.6.5 Limited data monitoring

Any measured data with sampling rates higher than 1Hz are not transferred to the PC.

This means that the raw data and the triggered data are not visible at the PC.

7.1.2.3.7 Memory management

These settings affect the hardware and thus the *imc POLARES* unit must be connected for this purpose. There are options for time-limited measurements and for a trial measurement.

Memory management

Data storage on device hard disk

Storage location: Removable drive

Measurement intervals: 1 day   interval begins: 14:00:00

Overwrite oldest data if memory space exhausted: ☑

Storage space for events and triggers

Storage option: Use available space

If free space is less than   0 MB   stop trigger recording

Possible measurement duration

| | Trigger condition not met | Trigger condition met | |
		1 per day	5 per day
With free disk space (95.91 MB)	: 1 Year + 34 weeks	1 Year + 34 weeks	1 Year + 34 weeks
Entire hard drive (487.74 MB)	: > 5 years	> 5 years	> 5 years

Memory required for triggered acquisition

1 Event	:	4.57 KB

Dialog for data storage settings

Storage location: Selection of the storage medium. With *imc POLARES, only* Compact Flash cards are used.

Measurement intervals: Specification governing how long a measurement lasts before a new one starts. In this way, for long-term monitoring measurements, new data sets are created cyclically which are capable of transfer to the PC, and can be analyzed by it. This cyclical closing of the data files also provides increased data security.

Interval begins: Specifies a time (hh:mm:ss) at which data acquisition is to conclude. All other termination times are based on this time and on the interval duration.

    Example: Measurement intervals= 4 h, interval start = 12:00 PM

        If measurement starts at 2:30 PM, the first interval end is at 4:00 PM; then at 8:00 PM, 12:00 AM, 4:00 AM, 8:00 AM...

Overwrite oldest data if memory space exhausted: To make room, the oldest data are deleted automatically when the data carrier is full. Upon activating this option, the minimum size for *Storage memory for events* and Trigger is automatically set to 0. This applies not only to the measurement task in progress but also to any existing measurement data from previous measurement tasks.

Storage options for events and triggers: This option lets you set sensible limits to the data volume resulting from capture of trigger events.

- With *Use available space*, triggered data are captured until the hard drive is full. Then, since there is no more space for more data, data capture ends.

- *If free space is less than…* prevents triggered acquisition from leaving less space than the amount you specify

here.

- In the box **Possible measurement duration**, an estimate of the measurement duration based on the current settings is displayed. Additionally, the data volume to be expected based on the triggers set is indicated, which also serves to estimate the maximum measurement duration.

- When the option **Overwrite oldest data..** is activated, this option should be set to **Use available space**.

Note

- Calculation based on the actually free memory on the Flash-card is only performed if the measurement device is connected. If there is no connection yet, a memory card 2 GB in size is assumed.

- Some foresight must be exercised for correctly saving data to the hard drive. For instance, when the drive is almost full, it must be ensured that all data still to be accumulated on all channels are saved all the way up to the measurement's completion. In a configuration with the maximum channel count, however, up to 4 MByte of memory on the hard drive may remain reserved.

- In the memory storage, up to 500 measurement intervals can be managed, (if there are more, then accessing and validation can cause problems when saving data).
  In consequence, after a time of 500 x intervals, the oldest data are deleted. Which means with daily intervals, after 1.4 years, and with 2-hour intervals, after 6 weeks. Measurements according to standards, either daily or 12-hour intervals are recommended.

7.1.3   Measurement

Once a measurement has been sent under *Setup*, it can be run under *Measurement*.

7.1.3.1 Connect/Disconnect - imc POLARES in a network

**Example of a complex network with PCs and
multiple imc POLARES**
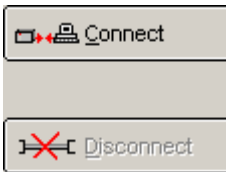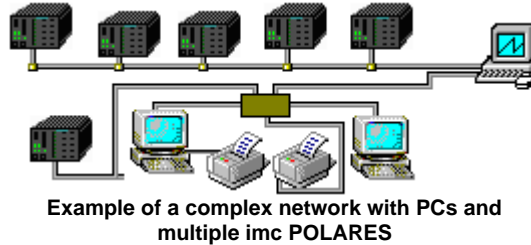
A device of the type *imc POLARES* can only ever be connected with one PC.

To enable a second user to observe a measurement in progress, the device must first be enabled.

This is accomplished by hitting the "Disconnect" button.

Sample case:

User 1 configures Device 1 using *POLARES operating software on* PC1. Next, user 1 starts the measurement, for which it must necessarily be connected with device 1. User 1 remains connected as well.

User 2 sits in a different location from user 1 and also starts measurement *POLARES operating software on* PC2. User 2 tries to connect with device 1. It contains an error message indicating that the device is already connected. For user 2 there is no way to force a connection to be set up. He must request user 1 to disconnect from the device.

Once 1 has disconnected the device from his PC, user 2 can set up a connection and observe the measurement in progress.

Note

At any given time, *POLARES operating software* allows connection with only one device. If multiple *imc POLARES* are to be configured, this can only be done one-by-one.

If *POLARES operating software* is closed while a connection exists to the device, it is automatically disconnected. Afterwards, the device can be connected with other users.

7.1.3.2 Start/Stop Network analysis

From here is where to access the hardware. By the time you open this dialog, the *imc POLARES* device needs to be connected. There are options for timed measurement and for a trial measurement.

Start measurement dialog

When you go to the Start dialog, you initially see a flashing display of the message Determining status…. The software starts the device driver for *imc POLARES* and queries the device's current. Depending on whether the device is in its resting state or running a measurement, the function (and labeling) of the buttons changes.

If the measurement device is not available, this takes longer to determine, since the system must wait for the maximum possible response time to elapse!

Supposing you have not yet begun a measurement and the device is in its *Online and stopped* state (connected):
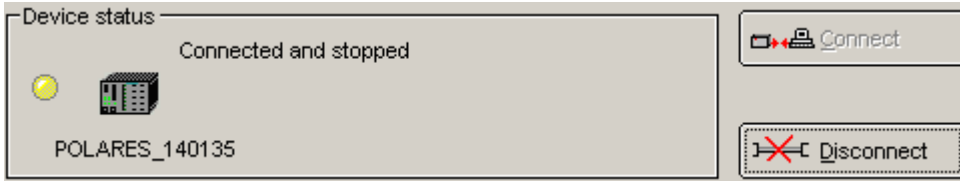
Starting the measurement involves the following steps:

1. *Connection*: The software sets up a network connection.

2. *Preparation*: The settings for the measurement task are written to the device. Then the device is ready to measure.

3. *Start*: Data capture is started. (Clicking on "Start" right away causes all three steps to be performed immediately).

The device state indicated is now *Measurement active*. As long as the device is connected to the PC, data are continuously transmitted to the PC via the communication network. This is absolutely necessary for the online display but it makes heavy demands on the communication network's resources.

Clicking on *Disconnect* ends the link between the computer and the measurement device. This neither ends nor disturbs data acquisition, since all measured data are saved to the internal removable hard disk.

The device setting indicated now is *Off-line, measurement active*. After disconnecting from the device, you can close the *POLARES operating software* software and deactivate the PC. To resume work, restart the program and re-connect the PC to the device. You can connect and disconnect as often as desired.

To **end the measurement**, the PC must be connected to the device. Use the button *Stop*. All folders on the hard drive are closed. Alternatively, the measurement can be ended by means of the device list on the Topology page 26. There, you can stop multiple devices at the same time.

To stop, you **don't** need to connect, which causes the procedure more quickly. When **connecting** with a measuring device, the current configuration is imported and the current measured values are immediately transferred, while for **Stop**, only the stopping command is transferred.

Note

- **Connecting to a running measurement** is only possible from the computer which was used to **start** the measurement. But stopping is always possible.

- When you disconnect, a connection file ***.umt** is created on the host PC. This file is used to identify the running measurement. Without this "key", no connection can be made to a device while it's running a measurement.

  - During active measurement and online monitoring, various pages of te *POLARES operating software* are disabled.

  - Changes to the settings only take effect the at the start of the next session.

7.1.3.2.1 Connecting

When connecting to a measurement device, it makes a difference which of several situations is in effect:

1. Device is in rest state:

Connection is carried out.

2. Device has been disconnected from the PC during a running measurement

A dialog prompts the user to decide whether to connect during the running measurement or to stop the measurement.

When connecting to the running measurement, the currently open measurement configuration is closed and the configuration required by the device is read and loaded. The program connects to the device and goes into measurement mode. If the required measurement configuration is not found, the process can be aborted. The device continues to carry out measurements without any connection having been made.

If the user chooses to stop measurement in order to set up the connection, the current measurement configuration remains open and unchanged.

3. The device was previously disconnected in an uncontrolled manner

The user is notified that connection is only possible after first stopping measurement. If the process is aborted, the device continues measuring without any connection having been made.

4. Measurement device takes measurements after an automatic start

Same procedure as under Point 2 above.

7.1.3.2.2 Test start
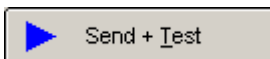
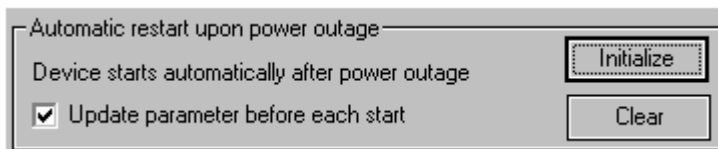|	
▶ Send + Test	To check your settings, it's possible to perform a test measurement. In this case, measured data are not saved. Click on the *online monitoring* to view the data measured.
✉ Messages	One-time triggering and transmission of messages. Strongly recommended for verifying the connection parameters entered. This button only appears if a [message](181) has been defined and the device was prepared.

7.1.3.2.3 Automatic restart upon power outage

imc POLARES has a number of features intended to ensure uninterrupted monitoring.

1. The device's built-in UPS secures continued measurement operation despite short-term failure of the power supply.

2. The device's automatic self-starting capability enables continuation of measurement following either a longer-term power outage or continual short outages: if the internal rechargeable battery's capacity is insufficient, the current measurement ends automatically. In this case, proper closure of all measurement files is ensured.

```
┌─ Automatic restart upon power outage ──────────────┐
│                                        ┌──────────┐ │
│  Device starts automatically after power outage  │ Initialize │ │
│                                        └──────────┘ │
│                                        ┌──────────┐ │
│  ☑ Update parameter before each start  │  Clear   │ │
│                                        └──────────┘ │
└────────────────────────────────────────────────────┘
```

The automatic starting mode can also be used to prepare and test a measurement at the office. When *imc POLARES* is subsequently hooked up at the measurement site and activated, measurement can begin without any further configuring.

The button *Initialize* writes the current setting to the device a single time.


ⓘ   Note

- After initialization, these measurement settings are in effect until the removable data carrier is totally cleared or the configuration is deleted.
- Regardless what other measurements are performed in the meantime, upon activating the device, exactly this measurement is started again.

7.1.3.2.4 Setting the start/stop time

Click on the check box *Start or Stop* to make the controls for the time and date appear:
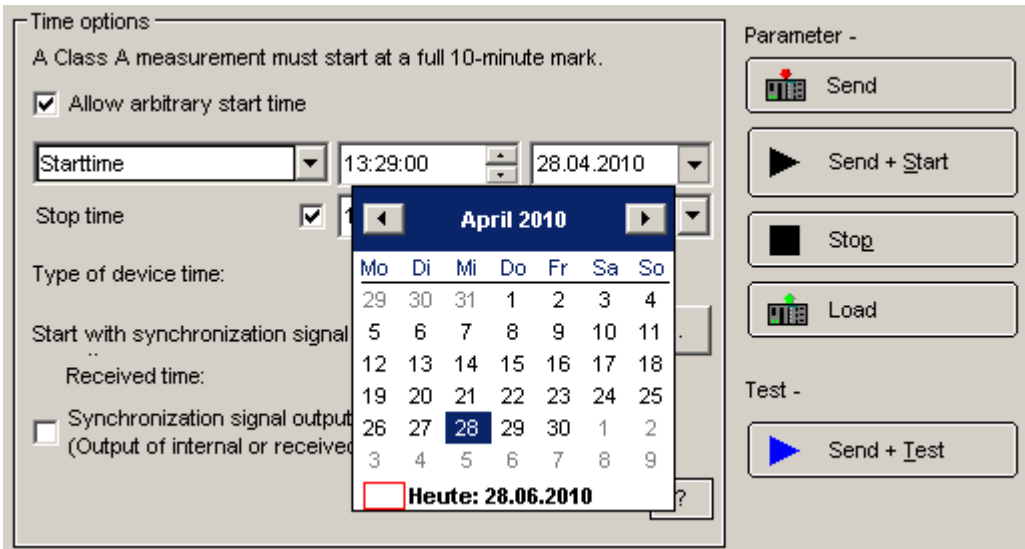
If the option *Allow arbitrary start time* is not selected, it is always necessary to enter a starting time with this time pattern, or other times are rounded up.
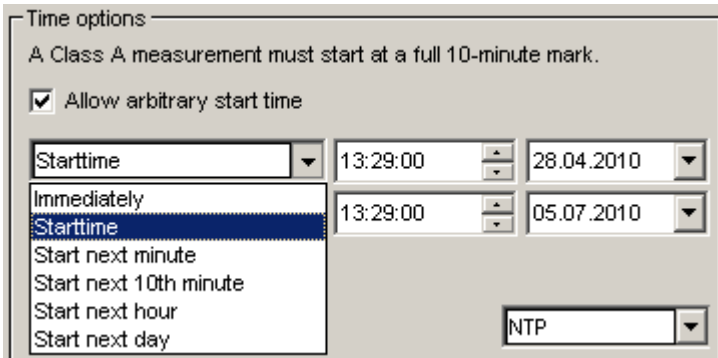
Instead of the previously set start time, the measurement can be set to start immediately, upon the next whole minute, 10th minute, whole hour or day.

Class A Measurement: The standard IEC61000-4-30 requires for this class of measurement that the start is at the stroke of a multiple of ten minutes of actual time, in order to enable comparison of data from different, spatially separated measurements. See also the menu item *Extras ⇒ Options ⇒ Start.*

Note

- Even if you have set a starting time, you must click *Send + Start* to prepare measurement by timed start.

- You can specify either the *Start time* or the *Stop time* or both.

- You can also use settings aid such as **arrow buttons** and **calendar**.

Time options

Time options

The device time type is recorded along with the measured data. This makes comparison of different measurement data possible.

Type of device time: sets the desired time zone

- For each device, the time zone and daylight saving time transition must be set. If it has not been done yet, a message appears prior to a measurement starting.

- The measured data are denoted with the time of their respective time zone. On the Analysis page, you can have the time zone used indicated by means of the measurement's properties.

- The relationship between external synchronization and the time zone set is described here 68 .

Attention

If update to a software version < 2.0 should become necessary, the time zone must be reset to "none"!

Start with synchronization signal

- Input of the time type of the synchronization signal. In contrast to *Type of device time*, this entry is not arbitrary. The time type is determined by the external timer, but can not be queried by the *POLARES operating software*. For this reason, the user must manually enter the time type here.

- If you wish to change time types, the timer must be reconfigured. To learn about this, read the instructions for your timer.

Behavior of the device upon activation

- Immediately upon activating *imc POLARES* the device begins the synchronization process. This is advantageous with protocols which require extensive time to synchronize due to system properties, e.g NTP. For this reason, the clock can be set as a default in the device configuration.
Confirm the new default using this button *'Type of device time...'*. The button is only operable if the device is connected.To apply it, it is necessary to restart the measurement device.

- Upon configuring the measurement device, this default is overwritten with the device clock type set above. If the default entry corresponds to the selected device clock type, the start can proceed immediately upon configuration of the measurement device. Otherwise, the measurement device first assimilates to the changed clock type.

Device configuration for imc POLARES

Selection of the time base in the device configuration is independent of the synchronization selected in the measurement task.

Upon beginning the measurement, the time base of the measurement task is used.

If the measurement task's time base is identical to that of the device configuration, the synchronization remains intact and can begin directly.

Synchronization signal input

0 none: not defined.

1 no synchronization signal: Synchronization signal input not evaluated

2 DCF synchronization signal: only DCF or IRIB-B is evaluated

3 GPS synchronization signal: only GPS receiver evaluated

4 DCF or GPS synchronization signal: depending on which signal is applied first upon deactivation, either DCF or GPS is utilized

5 NTP synchron signal: Network Protocol used

NTP: max time discrepancy [ms]:

States the permitted time discrepancy from the NTP-Server in ms, up to which the device is still considered synchronized. When this discrepancy is surpassed, the message – *"Not synchronized"* or *"Synchronization in progress.."..* is displayed. For the sake of the measurement precision and comparability of measured data, we recommend increasing the value of this entry if the discrepancy is big. Otherwise it will be necessary to dispense with synchronization completely.

Maximum wait time for synchronization [s]:

States for the case of a autostart the maximum time in seconds which the device waits (e.g. following a power outage) for successful synchronization before starting measurement. For a standard measurement comprising 10 min of mean values, a time of 5 min makes sense. If valid time signals are applied, this enables successful synchronization for all possible types.

Note

- In general, GPS receivers come with the ability to process the received UTC time internally in order to provide the measurement device with the local time. The manufacturer of the GPS receiver provides configuration software for this purpose.

- DCF77 works with the local time as a rule. However, it is possible to synchronize a GPS-equipped device A to UTC time. Device A then transmits its UTC time to device B as a DCF77 signal via the Sync terminal. In this case, device B receives UTC time via DCF77. In order that all device work on local time, device A must be set to the correct time zone.

- A description of the hardware wiring and of the synchronization procedure is available in the user's instructions in the chapter *Conditioning and terminals* under *Synchronization of multiple devices*.

Synchronization signal output

- The device can output the internal clock as a time signal via the synchronization terminal. An adjacent device which as a time signal recipient is supplied with this signal, can be synchronized in this way. The measurement then runs synchronously on both devices. This means that different measured values from the exact same time can be compared. Even without an external clock, it is possible to synchronize multiple devices with each other.

- For output of a time signal, no external clock needs to be connected!

7.1.3.2.5 Time zone synchronization rules

The rules delineated below must be adhered to in order to ensure correctness of the time information.

Input signal	Setting in the dialog "Type of device time": "Time zone" and "Daylight Saving Time"	Data display
Without external synchronization signal		
-	Setting of the desired time zone The measurement device clock is set by the PC, which causes time conversion according to the PC's and the device's time zone.	according to time zone set
DCF77, IRIG-B		
The time type can not be recognized based on the input signals and its time zone setting must match that of the external source!		
UTC	GMT Daylight Saving Time =0 (= 1 is ignored)	GMT
Local time	Find entry according to the local time supplied e.g. [GMT +01:00] – Berlin Daylight Saving Time 1 or 0 Attention: The time source must behave the same way! Meaning: for 0 not change and for 1 perform a time skip.	Time zone set (there is no correction or time shift!)
GPS, NTP		
For GPS and NTP, either a UTC or GMT signal is expected.		
UTC	choice of GMT or local time available	according to time zone set Device time is corrected according to the time zone set.

Display for the synchronization

	Message	Device state
1	No reception of any synchronization signal	The defined signal can not be received or decoded.
2	"Time signal present. Synchronization in progress..." or "The measurement device is not synchronized"	A valid signal has been recognized. The signal evaluation is running and synchronization is being performed.
3	The device is synchronized	The synchronization is competed. The external source has been adopted.

7.1.3.2.6 Switching to other views
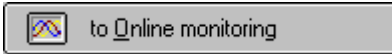
to Online monitoring	This option can be activated during a running measurement. The system skips to the branch *Standard display- Overview* 70 and displays important data already during the measurement. This also includes the alarm messages.
to Data transfer (F4)	This takes you directly to the Data Transfer branch.

7.1.3.3 Online display and Free display

For data display during a running measurement, there are two basic curve window types.

The ***Online display*** offers pre-defined views covering all basic curve types.

- ***Frequency, RMS, V, I***: Display of the RMS-values of voltage and current. Any events which occur and instantaneous frequency.

- ***Original U, I***: Display of the original voltage and current signals.

- ***Power:*** Display of power curves

- ***Overview:*** Display of all important values as well as vector representation of voltage and current.

- ***Harmonic online:*** Harmonic voltage and current values

- ***Harmonic - effective power:*** Harmonics of the active power – the direction of the power can be distinguished

- ***Free display:*** Up to four curve windows next to each other can be filled with any measurement channels.
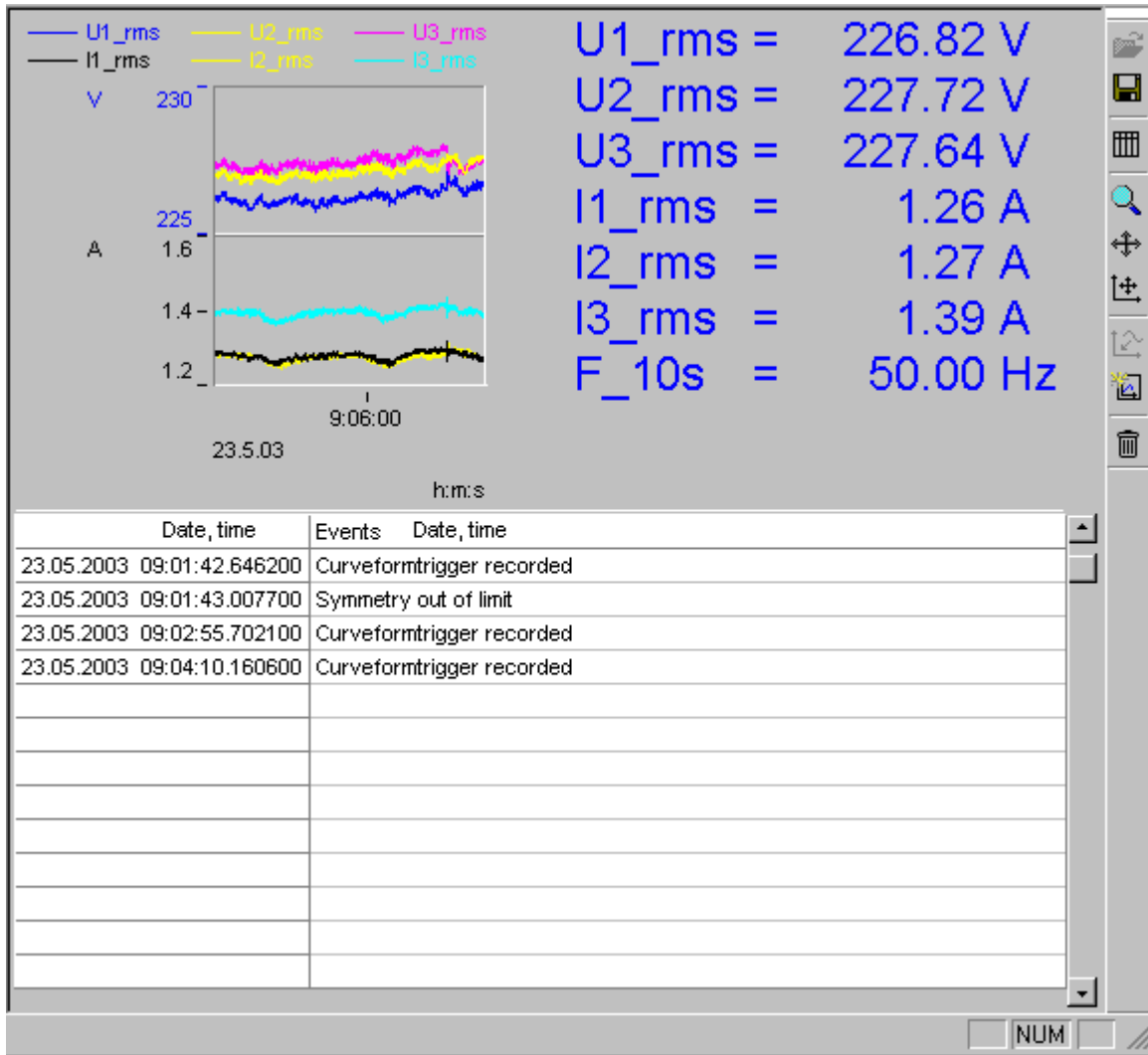
These windows can't be changed or deleted.

If you change a standard window, you can save it among the free displays (except the total overview and the display of harmonics).

7.1.3.3.1 Online display

There are several standard windows which provide a comprehensive view of the data:

F, RMS, U,I

Date, time	Events	Date, time
23.05.2003 09:01:42.646200	Curveformtrigger recorded	
23.05.2003 09:01:43.007700	Symmetry out of limit	
23.05.2003 09:02:55.702100	Curveformtrigger recorded	
23.05.2003 09:04:10.160600	Curveformtrigger recorded	

Frequency, RMS, voltage and current (RMS-values)

Here, the mean values of the current, voltage, and frequency are indicated. Additionally, messages announcing signal events, trigger releases and status messages about the synchronization and available memory appear here.

Note

- When the system connects with a running measurement, only current messages are displayed and not all messages accumulated since the start of the message.

Original V, I
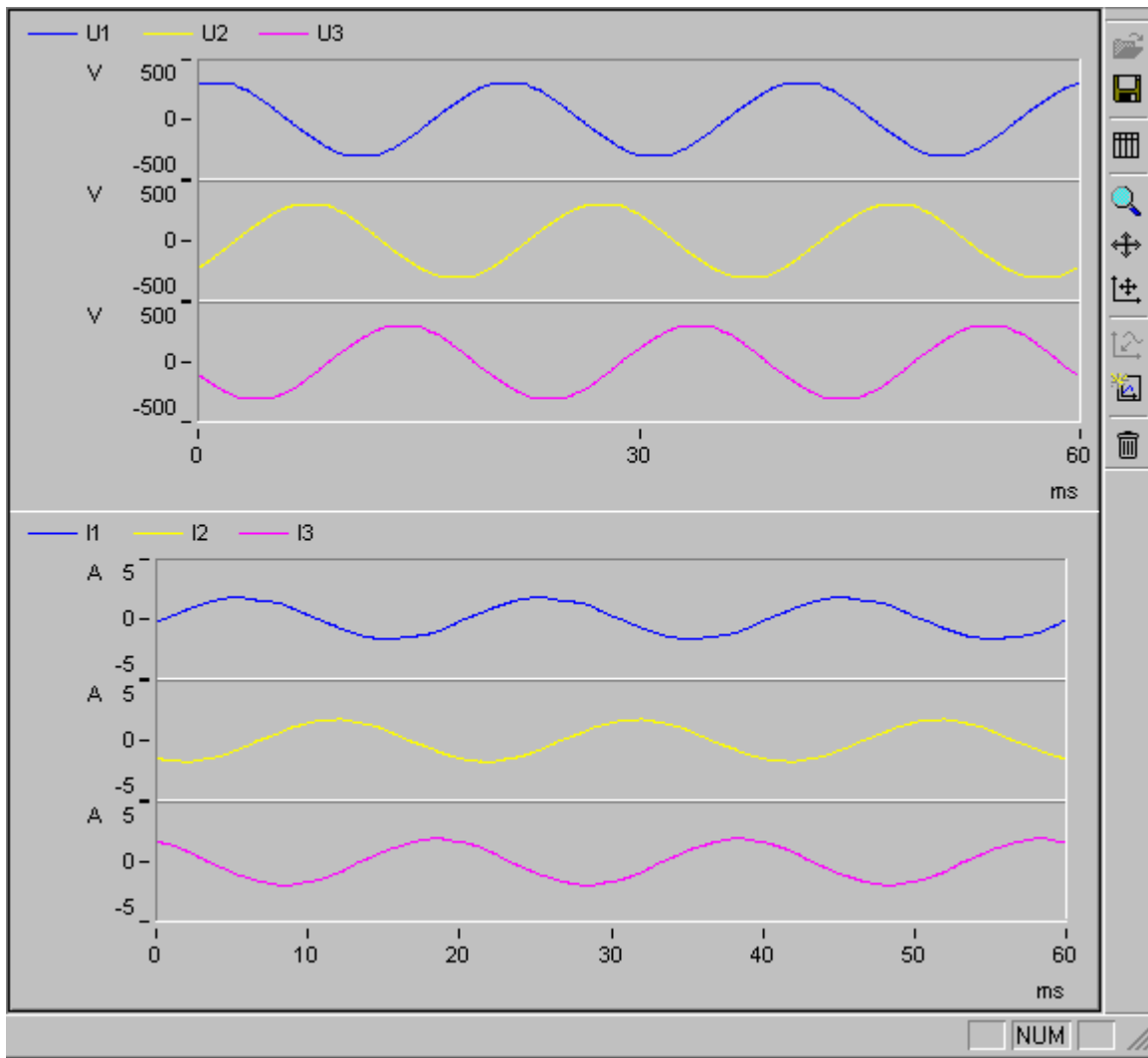
Instantaneous voltage and current values

Power

**Power (RMS-values)**
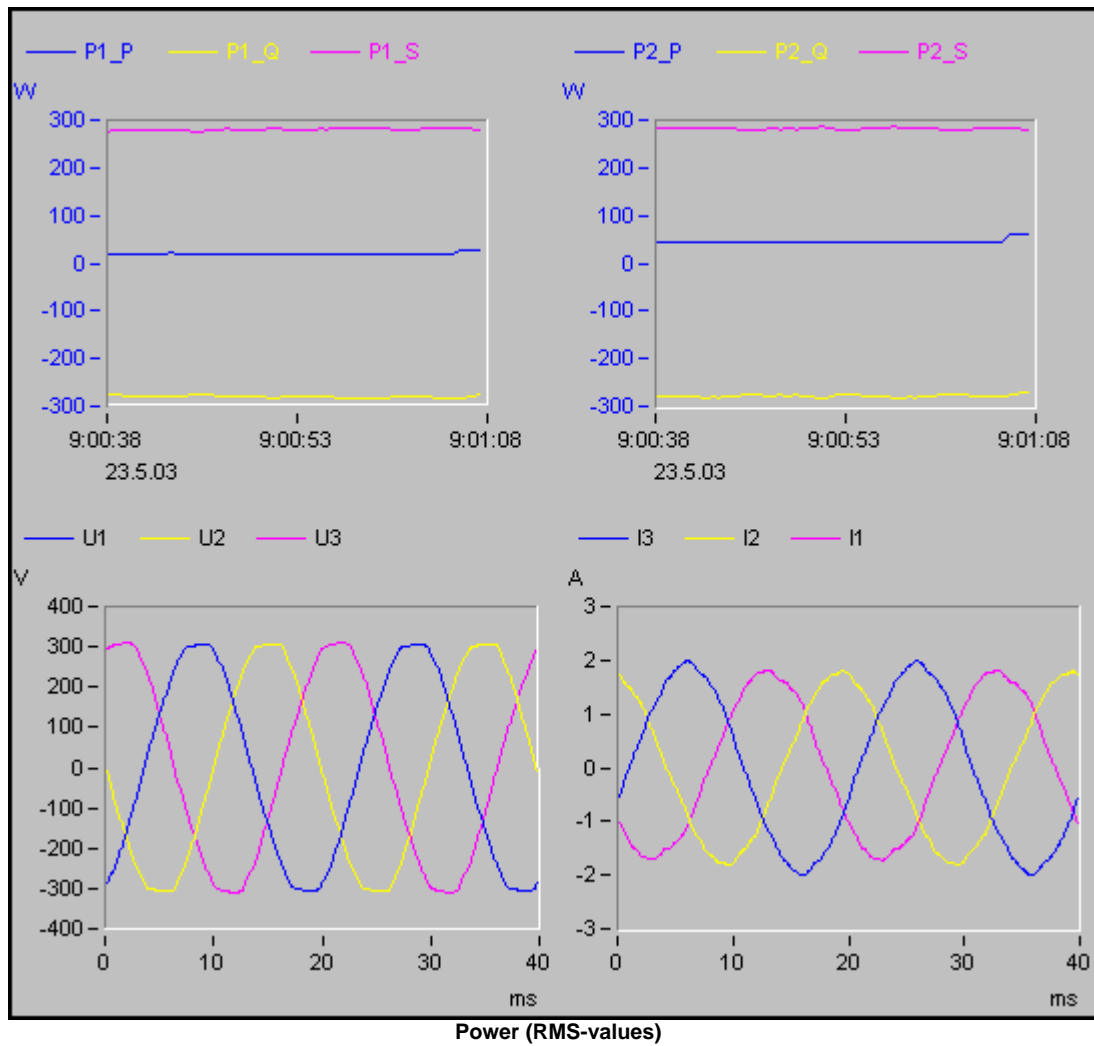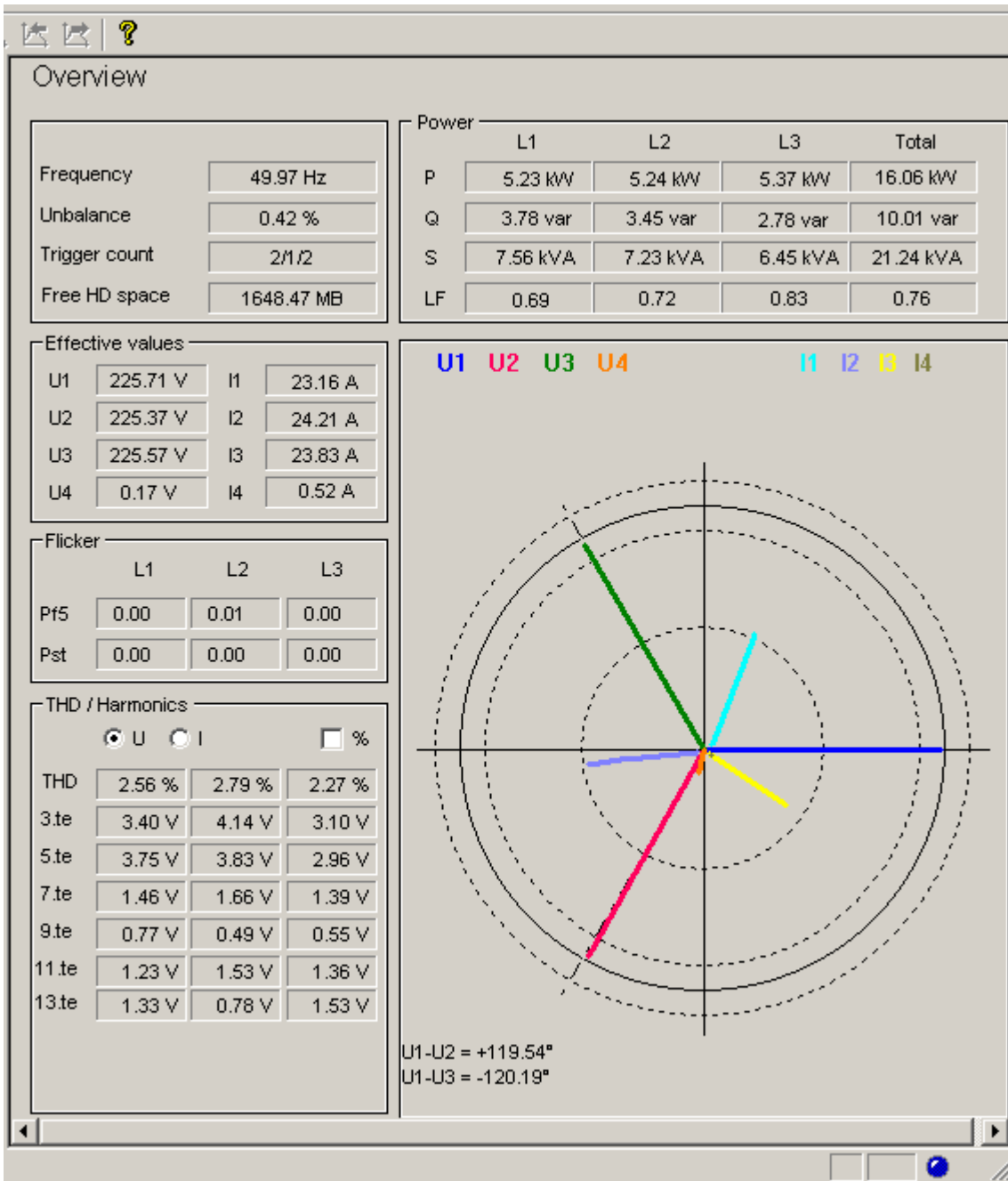
Overview

Overview of all important values and a vector diagram for displaying phase angle between conductors

Harmonics Online
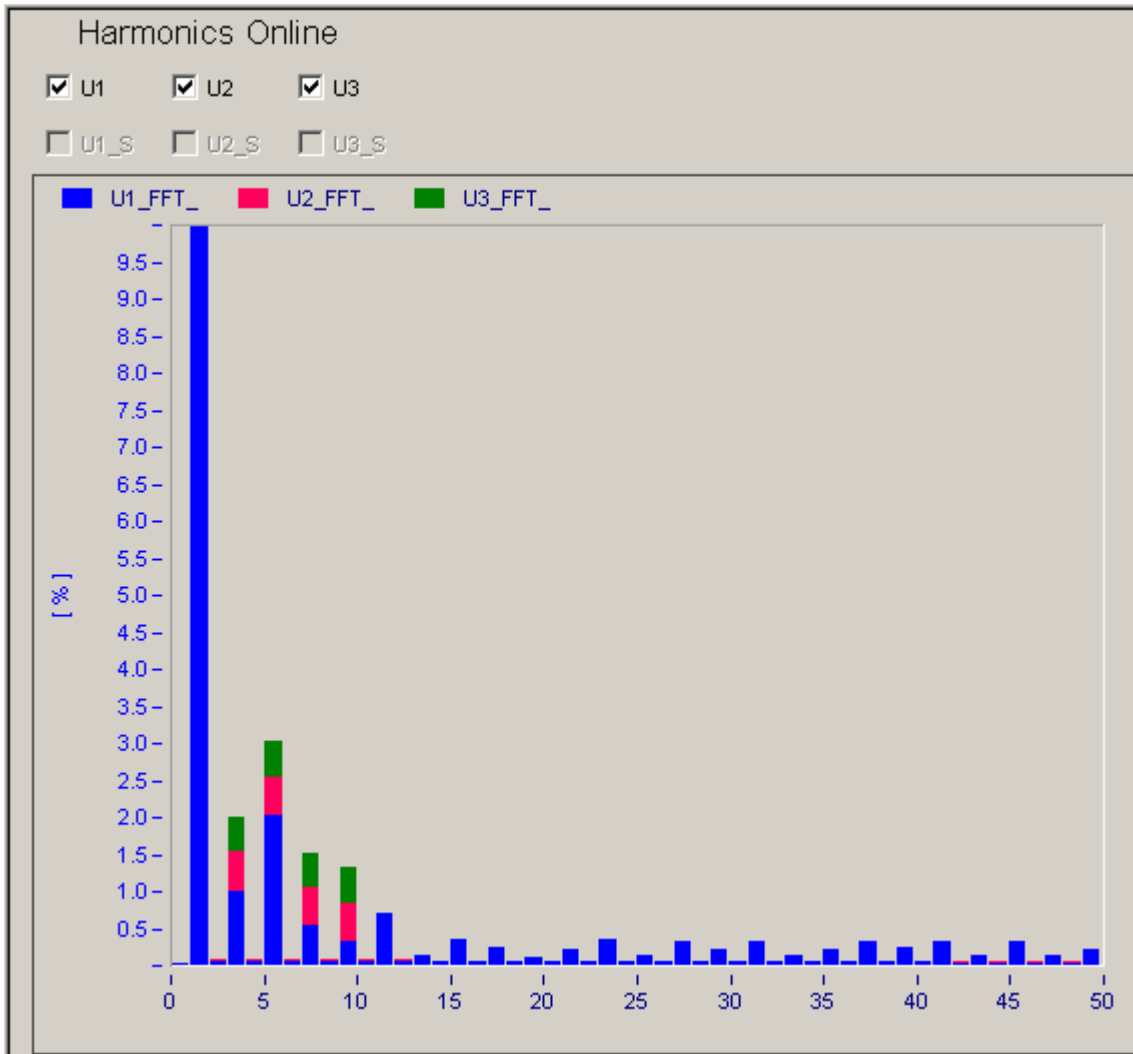

Overview of the harmonics U, I of Lines 1,2 and 3

The harmonics to display can be selected individually. Changes of the display, usually adaptation of the scaling to the existing level, can be saved and opened via the toolbar.

Opening a saved view:
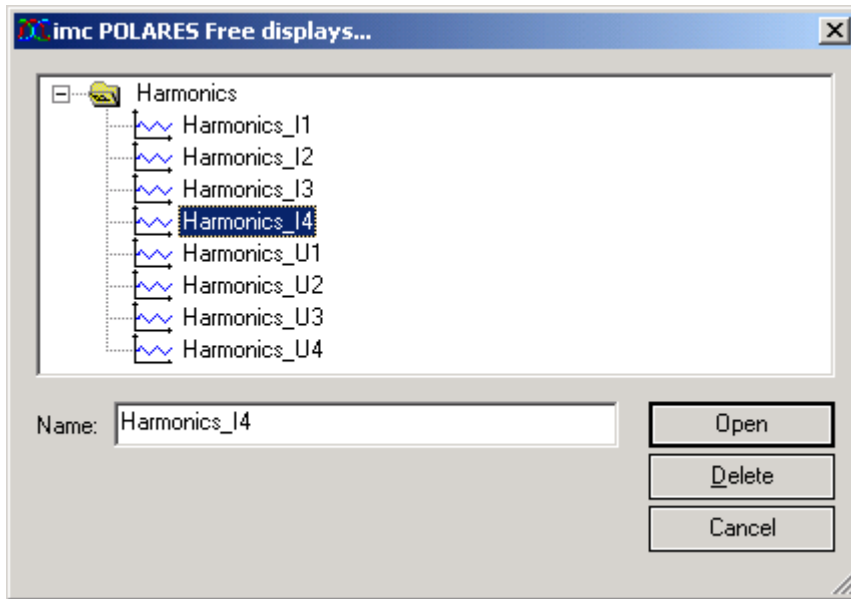
7.1.3.3.1.1 Free display

Here you can design curve windows to suit your wishes, which are added to the tree diagram upon being saved.
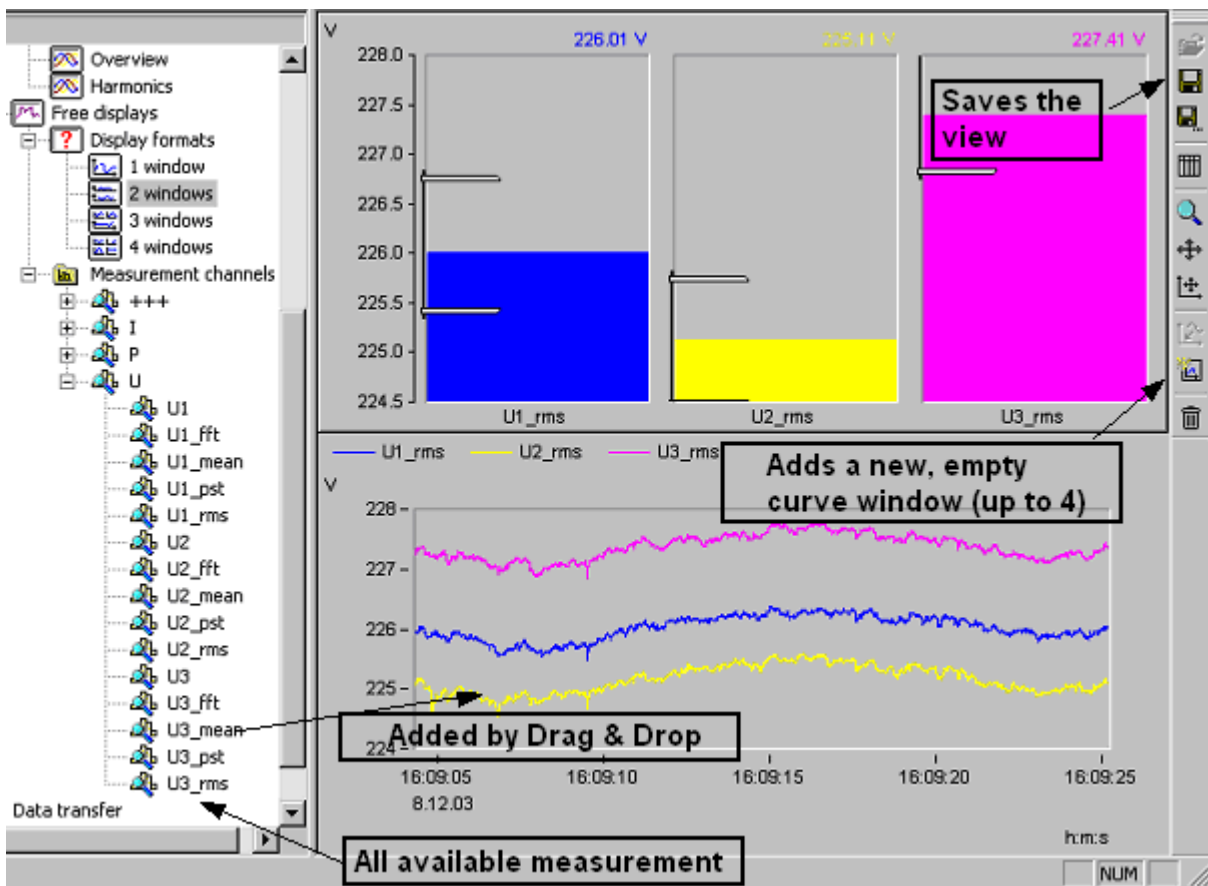
Example of a bar chart of voltage RMS-values

7.1.4   Data transfer

This dialog enables you to conveniently transfer data from the measurement device to the PC. Once the data have been transferred, they are available in the measurement database and can be investigated in the evaluation 78 or in the channel search 100.

The program Auto-Transfer independently performs the data transfer along with the evaluation 78.

- Use **Select device…** to specify the desired *imc POLARES* unit if you have multiple devices in your communication network. If you make a change, you exit the current parameter set's context menu and are prompted to save (if necessary). Subsequently, a default standard parameter set is loaded which is then displayed in the title bar.

- Clicking on **Search hard disk** to read out the contents of the selected measurement device's hard drive. The function initially starts with a search window while the software prepares a list of all data present on the device hard drive. The measurement's **Location, measurement task name, Start time** and **End** are indicated.

- If you wish to read-in the data stored on the Compact Flashcard inside a laptop slot, for example, select **Search PC.**

Data transfer selection window

Next. the following options are available:

- **Selecting data to transfer**: By dragging the entries for data from the upper list to the lower list, data from the source is transferred to the target. Alternatively, select the desired entries to highlight them and click the button ⌄. If the option *Load transferred data configuration* is active, the configuration values for this measurement are automatically set after the transfer, so that you can go directly to the evaluation page.

- **Deleting data**: Highlight the data to be deleted in the upper list and then click **Delete**.

Once the data has been successfully transferred, the data in the lower list appear with a checkmark.

Show unsent messages

Depending on how it is parameterized, the device can send messages in response to various events. If sending a message is not possible, a notification about it is left in the device, and additionally the message text contains the information about the number of messages successfully sent and of those not successfully sent.

Using the button *Show unsent messages*, the device information is sent to the PC and displayed in an Explorer window. The sending notification is deleted from the device.

- The filename contains the time when the notification is to be sent.

- The file contents is the message text.

imc POLARES data are stored on the device's hard drive in a **special format**. Only upon being transferred, the data are converted to a format which can be read.

Note

- **Measured data on the hard drive which originate from *imc POLARES* can only be processed by *POLARES operating software* software!**

- If your PC is equipped with a Compact Flashcard drive, the hard drive can be removed from the *imc POLARES* unit and inserted into the PC, and the data to be transferred are selected using the button **Search PC**.

- Only *imc POLARES* data contain extra information such as the measurement location and the actual measurement time.

- Information on this page have nothing more to do with the measurement configuration and isn't saved; only the device selection remains.

- With brief measurements it is possible that certain measured quantities can not be determined. In this case, a message appears indicating that no data are available.

If the extra information could not be found, this is indicated by asterisks around the measurement task name:

not imc POLARES	data don't come from *imc POLARES* !
auto	data which were automatically recorded when the device was started, but don't belong to any measurement task
not ready	measurement not finished yet -> data transfer not possible
unkown_place	couldn't find info about measurement start
unkown_Exp	measurement task info not present

7.1.5   Evaluation

A variety of different procedures are available for evaluation purposes:

Evaluation: Analysis of the measurement folder of a measurement. Based on specified value limits, a Network quality report ⎡82⎤ is generated. The time plots of the data can be observed in prepared evaluation windows ⎡87⎤. Events are listed along with curve windows. Once an evaluation has been performed and saved, these events are also available for the Standard value search ⎡102⎤.

Extended report: ⎡86⎤ Like Evaluation, only applied to multiple measurements. Additionally, the measured data in the measurement folders can be temporarily bound together.

Automated report ⎡141⎤: Cyclical report on a proceeding measurement. At specified intervals, reports are compiled for the measurement currently in progress. The reports adhere to the specifications for normal evaluation.

Measurement data base: The measurement results are entered in a measurement database by transmission from the device to the PC. The analysis tools mentioned above access these data. Additional results calculated and saved for the evaluations are also saved to the measurement database.

7.1.5.1   Selecting data folders

On the main screen of the task step "Evaluation" all measurements belonging to the current measurement task are listed.
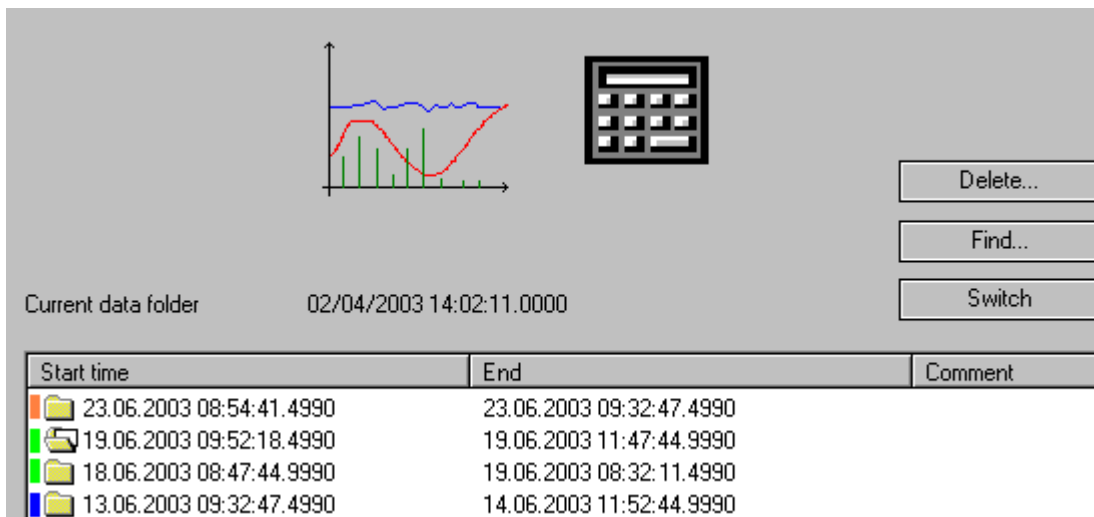
Excerpt of the dialog for selecting data to evaluate

The button *Find…* enables you to select the desired measurement from among those which exist.

Using the button *Change*, you can move to a different source data folder. First highlight the entry in the list for the measurement you wish to evaluate, or alternatively, double-click on it.

Identical measurement tasks can be recognized by the **color indicator** next to the folder symbol. Consecutive measurement tasks which are alike have the same color. Measurement tasks having the same color but not in succession do not necessarily have the same settings.

Any running measurements which are still disturbance logs and do not yet contain readings averages are denoted by this symbol:

Note

If you have kept curves or calculated results belonging to a previous measurement, these will be deleted when you go to a different measurement. The actual measurement data are preserved, but all views, formats and print layouts are lost.
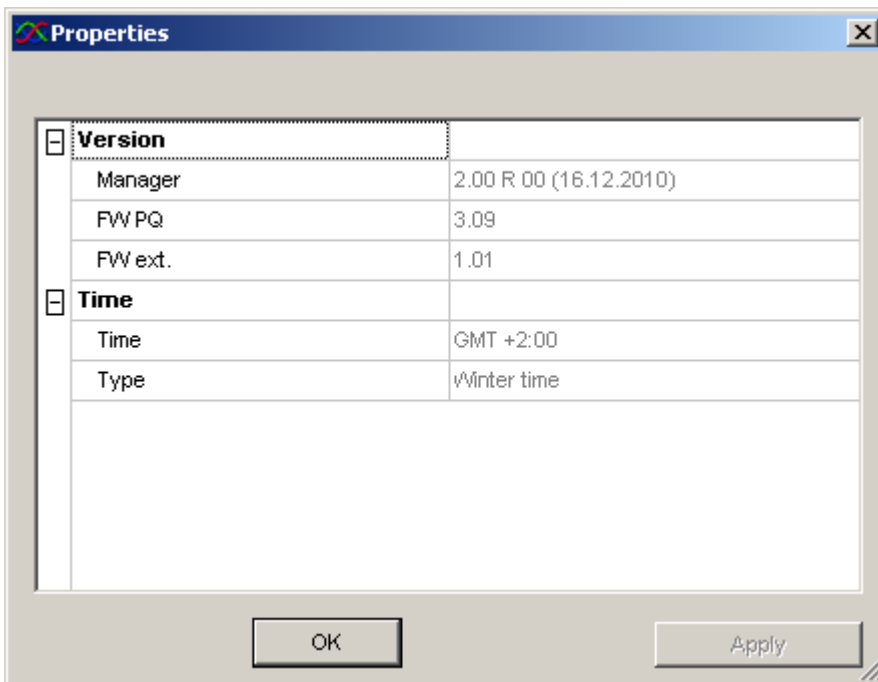

Use **Delete** to open a dialog for deleting measurement task configurations and measurement data:
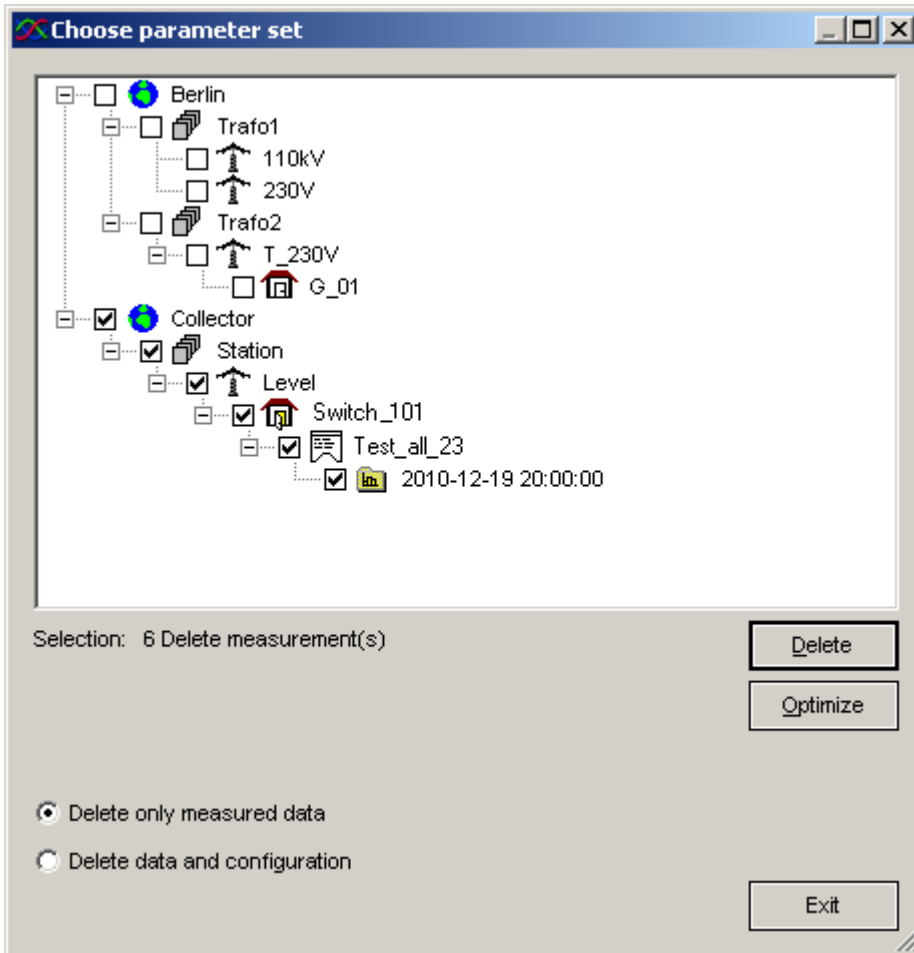
Deleting measurement tasks

Context menu: *Properties*

By right-clicking on a measurement folder, the parameter-independent information is displayed:

1. Version information about software used and the device's firmware

2. Time information

7.1.5.2 Creating a report

POLARES operating software automatically generates a report reflecting all settings.

The *Parameter-Set* menu in the <u>main dialog</u> 120 contains the following items:

- The menu item *Print* sends the report to the printer.

- *Report:*

  - *With Add Page*, you can add the current display of measured data to the report. The new page is appended to the existing report,re respectively, a new report is created.

  - *With Export page*, an image is created which is saved by default in C:\Documents and Settings\All Users\Application Data\imc\imc POLARES\Output.

- *With Page Preview*, the report is displayed in the Report Generator. You can edit the report further in the Report Generator, and from there either print it or export it in PDF format, for instance.

Note

Views in portrait and landscape format cannot be combined! A separate report is created in either format.

7.1.5.3 Standard and limits

The most important setting made before the start of an evaluation is of the limit values. By default, the limit values specified in the standard EN50160 are used. You can access already available files or create your own set of limit values. The *POLARES operating software* product package already includes the **limit values** for the European standard **EN50160**. Since this standard doesn't include all signal attributes which the software is able to determine, there are a few extra parameters. These are denoted by asterisks.

The fill-out form states all values currently in effect. The limit values can be changed and saved under any name specified.

Standard and cutoff values

Standard used: EN 50160   [EN 50160]   [EN 50160 MV]

Category   Cutoff values

Clicking here loads the values for the EN50160

Long-term flicker

95 % of measured   1

100 % of measured   1   * (Values denoted by * do not belong to the standard EN50160)

Voltage unbalance:

95 % of measured   2   %

100 % of measured   3   % *

Distortion factor (THD)

95 % of measured   8   % of the operating voltage

Voltage interruptions: U(t) < 1   %   Hysteresis 2   % of the operating voltage

Short interruptions until: 1   s duration *

Long interruption starting: 180   s duration

Long interruption starting: 300   s duration *

Voltage dips: U(t) < 90   %   Hysteresis 2   % of the operating voltage

Duration till: 60   s

Duration < 1s and U(t) > 60   % of the operating voltage *

Overvoltage: U(t) > 110   %   Hysteresis 2   % of the operating voltage

U(t) > 130   % of the operating voltage *

Fill-out form for the Standard and cutoff values for the evaluation
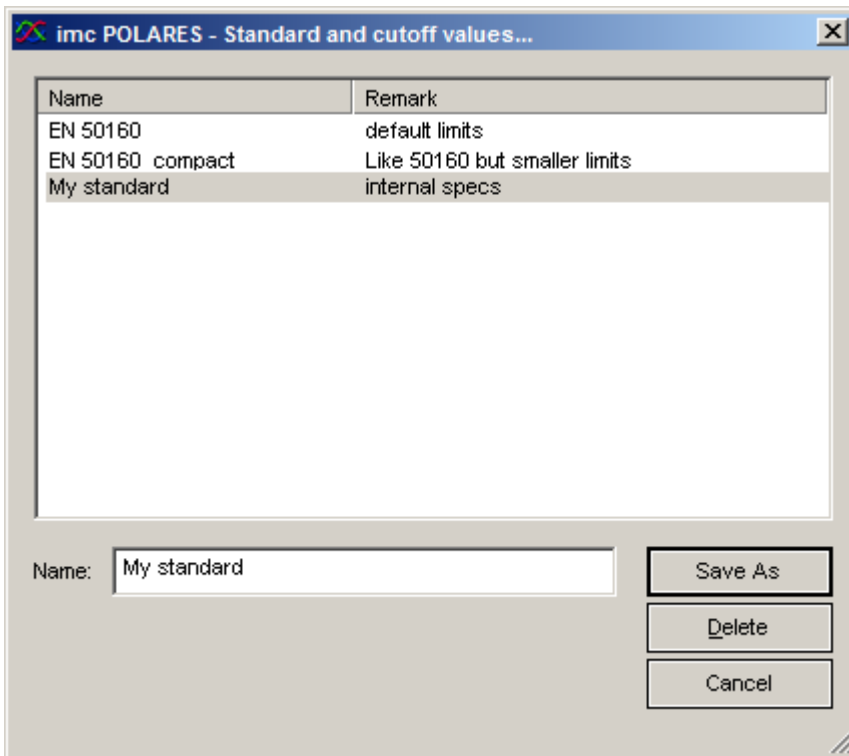
Save:
Enter the name of the new limit values or overwrite an existing set of values.

Save as...:
Saves the limit values currently in effect under a new name.

Open:
Select a limit value data set and close by clicking OK.

Note

- If the limit values specified are incorrect, the results of your evaluation will also be wrong. This is especially true for lists of events, such as dips and interruptions.
- The limit values are saved to the database.

7.1.5.4 Network quality report

This item is for the purpose of composing and printing out a measurement protocol reflecting all parameters required by the standard EN 50160. At the same time, there is an automatic analysis of the measurement results based on the limit values specified. If the option *Automatic correction* 141 is selected, the system takes account of the fact that in cases of voltage dips, overload, or outages, it is possible for invalid network frequency values, voltage fluctuations, flicker, asymmetry, voltage overload and THD to occur, and it prevents the event from being counted repeatedly in various quantities (in accordance with the standard IEC 61000-4-30's flagging technique).
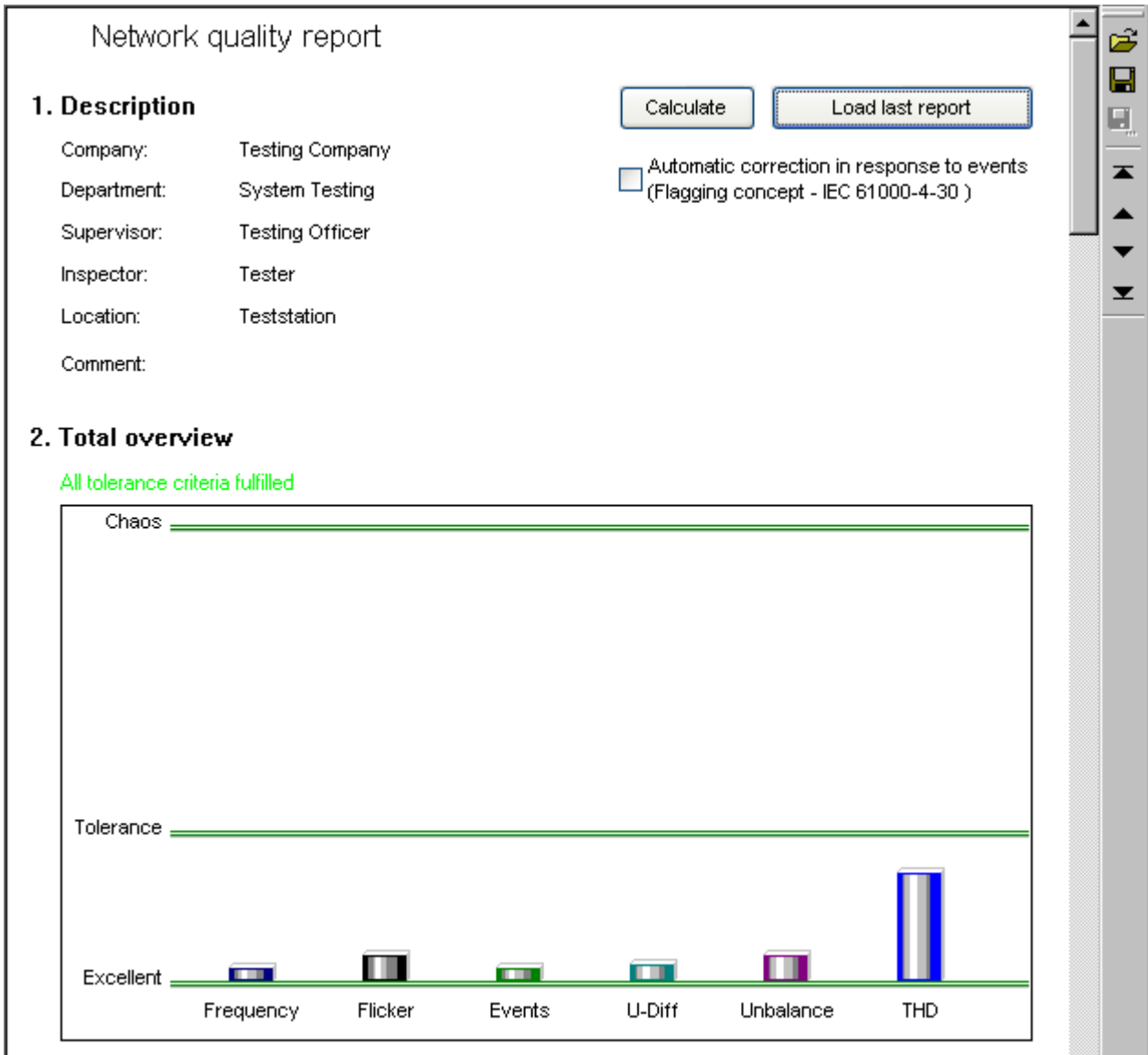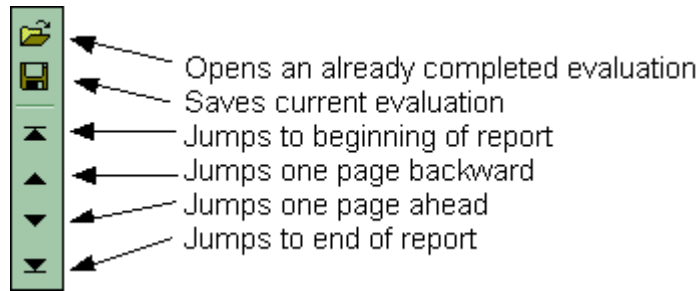
In the protocol's header, the data for measurement are applied from the program item Setup. Next is a total overview of the measurement results in order to display at a glance where thresholds were violated.

The report can be printed out and saved.

Structure of the results tables:

- **Unit** of the following quantities

- **Portion** of the measurement values taken into account for calculations. Usually 95 % or 100 %.

- **limit values,** on which the evaluation is based

- **Conductor (line)** under investigation if there is no evaluation of the overall system

- **Min/Max value** – the extreme signal values which occur during measurement

- **Values out of bounds** are values which exceed the specified limits

Toolbar:

Opens an already completed evaluation
Saves current evaluation
Jumps to beginning of report
Jumps one page backward
Jumps one page ahead
Jumps to end of report

First screen of network quality report

When you move the mouse cursor onto one of the histogram bars, the ranges measured are indicated. Left-clicking the mouse on a bar causes you to jump to the table displaying the explicit measurement results which follows the overview graphic.

The following value limits apply to the total overview:

Type	Tolerance line[1,2]	Chaos line[3]	Note
Frequency	-1 % .. +1 %	-12 % > f > +8 %	
Flicker	1.0	> 10,0	
Events		> 50 events	
Voltage differences	U_RMS < ± 10.0 %	U_RMS > ± 50.0 %	
Asymmetry	3.0 %	> 20.0 %	
THD	8.0 %	> 16.0 %	
Harmonics	0.5 % .. 6.0 %	> 15.0 %	depending on the number of harmonics

1) Up to this line, the measurement values are within the tolerance range.

2) Display of the values from the standard EN 50160.

3) Values lie far beyond accepted tolerances.

3. Measurement time frame

Total:	Wednesday, 04/21/2010 14:32:00 - Wednesday, 04/21/2010 15:59:59 lokal time
Duration:	01:27:59 h
Evaluation:	21.04.2010 14:32:00 to 21.04.2010 15:59:59 ☐ Auto
Standard:	EN 50160 (Averaging interval = 1 min/ f=10 s)

Measurement time frame

Evaluation: By default, the analysis is carried out for the entire measurement, and other time spans are available as alternative selections.

On the basis of a particular measurement, the analysis can be carried out over different timeframes and with different limits.

Standard: Since different limit data sets besides EN 50160 can be defined, it's possible to evaluate a measurement according to a variety of requirements and to save the results for subsequent comparisons.

4. Input range

Nominal voltage:	230.00 V	Power frequency:	50.00 Hz
Operating voltage:	230.00 V		
	L - N	L - L	
At object:	1000.00 V	---	①
At the input:	1000.00 V	---	

Case 1 - Measurement L-N (4 wire system), no converter

- The device is able to measure up to 1000 V

4. Input range

Nominal voltage:	20.00 kV	Power frequency:	50.00 Hz
Operating voltage:	19.50 kV		
	L - N	L - L	
At object:	---	20.00 kV	②
At the input:	---	100.00 V	

Case 2 - Measurement L-L (3 wire-system) with converter in a 20 KV

- operating voltage
- converter: 20kV primary voltage, 100 V secondary voltage

5. Network frequency

All tolerance criteria fulfilled

Unit	Component	Cutoff value (Deviation of 50.00 Hz)	Value min	Vaue max	Values out of bounds
%	99.50	± 1.00 %	-0.133 %	0.133 %	-
Hz		49.50 .. 50.50 Hz	49.93 Hz	50.07 Hz	
%	100	-6.00 .. +4.00 %	-0.156 %	0.171 %	-
Hz		47.00 .. 52.00 Hz	49.92 Hz	50.09 Hz	

6. Flicker

All tolerance criteria fulfilled

Unit	Component	Cutoff value (Flicker intensity)	Line	Value min	Vaue max	Values out of bounds
% plt			L1	0.055	0.104	-
% plt	95	0 .. 1.000	L2	0.054	0.109	-
% plt			L3	0.041	0.105	-
% plt			L1	0.055	0.177	-
% plt	100	0 .. 1.000	L2	0.054	0.183	-
% plt			L3	0.041	0.182	-

7. Voltage changes

All tolerance criteria fulfilled

Unit	Component	Cutoff value (% of 230.00 V)	Line	Value min	Vaue max	Values out of bounds
% V			L1	-1.87 % 225.70 V	-0.592 % 228.64 V	-
% V	95	± 10.00 % 207.00 .. 253.00 V	L2	-1.69 % 226.11 V	-0.327 % 229.25 V	-
%			L3	-1.31 %	0.275 %	

Second screen of network quality report

7.1.5.5 Extended report

Like Network quality report 82, but for different measurements.

Serves the purpose of comparing analyses. Changes in the power network quality over a longer time span can be detected, or comparisons can be made of simultaneous measurements at different locations.
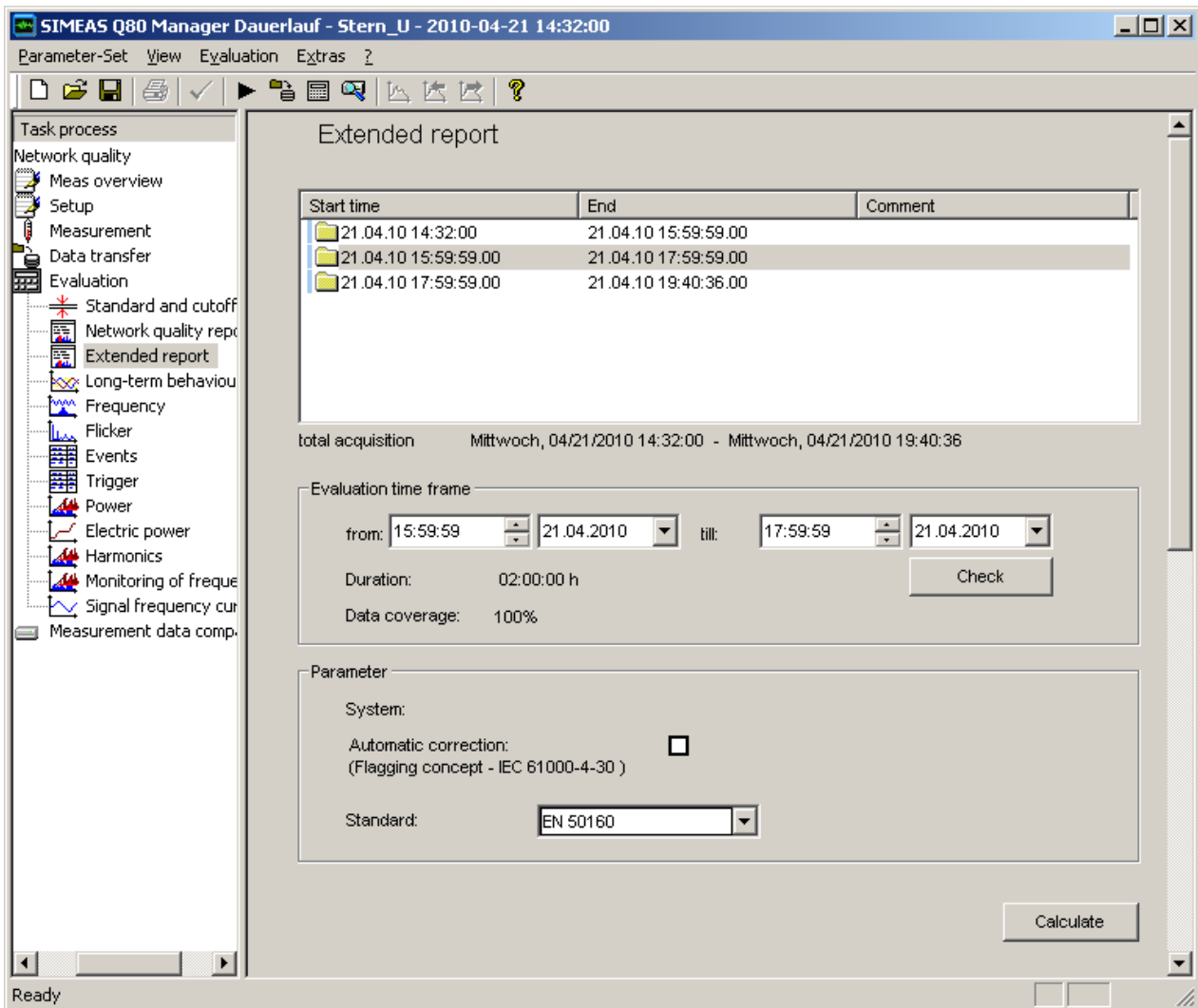
Extended Report

The **Extended Report** enables analysis to be performed across multiple measurements. To do this, proceed as follows:

1. Select the desired measurements from the list.

2. Set limits to the evaluation timeframe.

3. Use *Check* to obtain information on whether there were gaps in the record of data for the timeframe (0 through 100 %). This determines the duration of the measurement selected and the measurement gaps are displayed.

Evaluation is performed according to the settings in the Network quality report 80.

7.1.5.6 Evaluation window

Depending on the settings in effect, more than 500 data sets for evaluating a measurement's results can be available, which can be displayed as curves. In order to make this amount of data manageable, the data are grouped according to the results in a *Tree diagram*.

The data of the individual groups can be displayed directly and all other measurement curves can be accessed by means of the button ⬚.

Calculations

Called via:

- Menu item *Evaluation → Histogram*
- Menu item *Evaluation → Cumulative frequency*
- Toolbar button
- The calculation selected is carried out on the data set in the curve window selected. If the window contains multiple windows, a selection dialog appears and offers the data sets to which the calculations can be applied.

Measured data list and *Extreme value list* → see explanations under "Long-term behavior", below

Extreme value list:

- Double-clicking in an entry displays the maximum value in the corresponding data set
- Right-clicking the mouse opens a context menu:

Show	Displays the data curve
Show maximum	Displays the data curve + selects the maximum value
Show minimum	Displays the data curve + selects the minimum value

---

Notes

- Display data in curve window: Highlight the data desired in the measured data list. You can have an entire group of results displayed or can select individual data sets.
- Changes to the curve window can be saved 💾 / 💾 and opened again later 📂

7.1.5.6.1 Long-term behavior
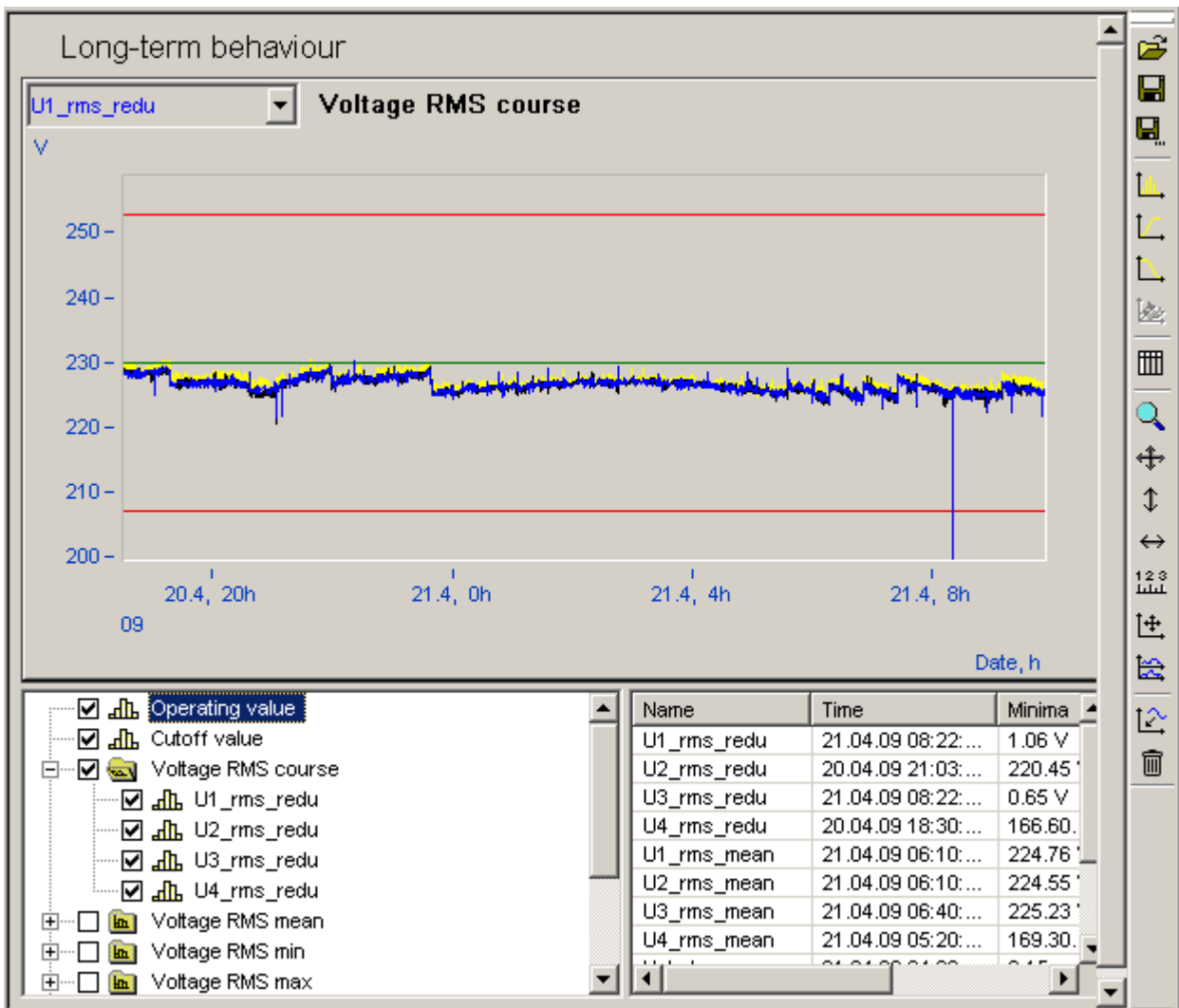
Long-term behavior of the RMS-values of U1 with maximum and minimum values. The green line at 230V shows the nominal value, the red lines at 208V and 253V the permissible cutoff values
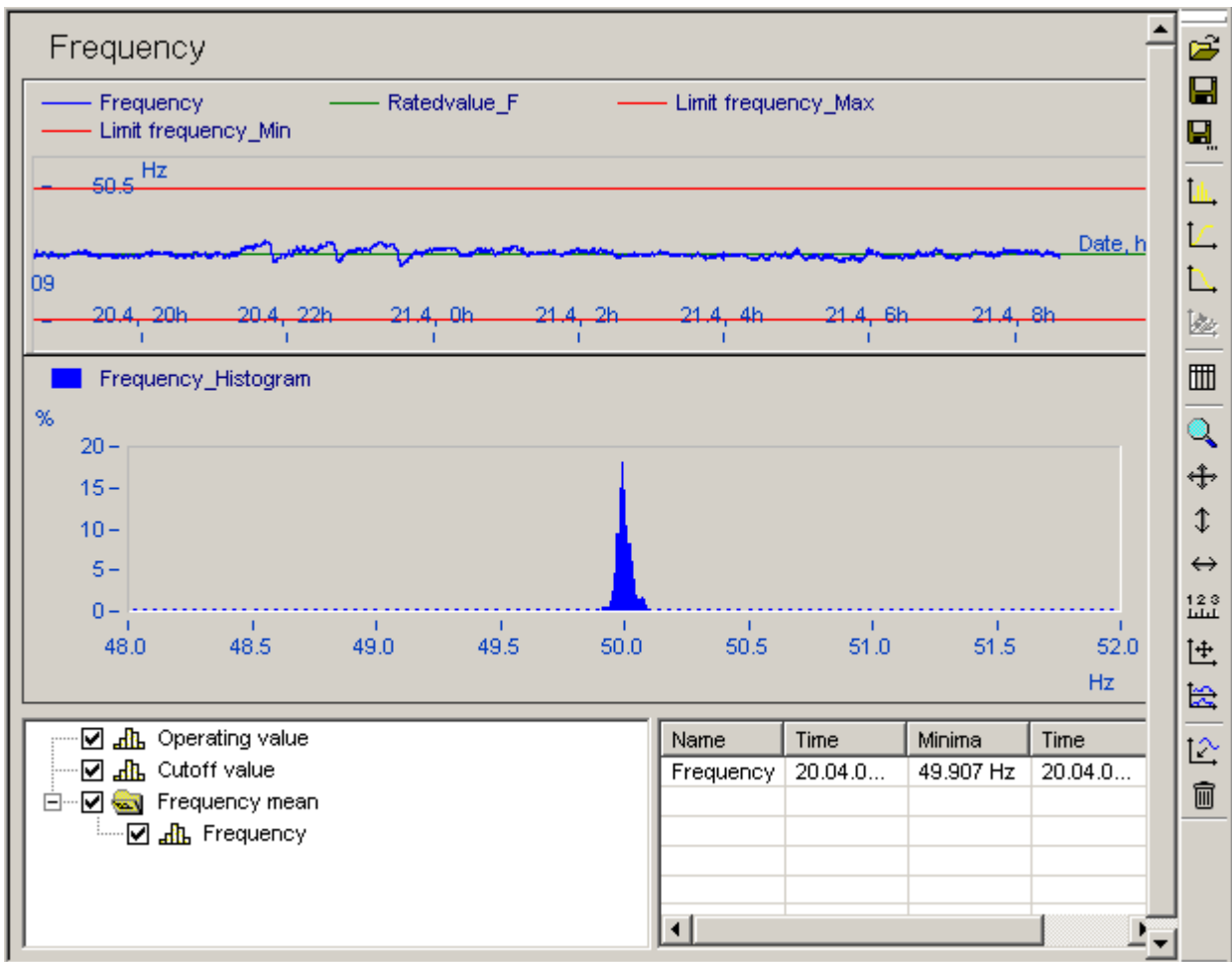
Measured data list

- Nominal voltage value
- limit values for slow voltage fluctuations
- Data-reduced voltage plot
- Mean values, minima and maxima in the aggregation interval for the voltages

With simultaneous current measurement:

- Data-reduced current plot
- Mean values, minima and maxima in the aggregation interval for the current
- Balanced components, Unbalance
- Digital inputs

7.1.5.7 Frequency

Frequency over time and distribution in a 50 Hz network

Measured data list

- Nominal network frequency value

- Cutoff network frequency value, minima and maxima

- Mean values of the measured frequency

- Histogram of the frequency in the range nominal values ± 10 Hz

The histogram calculated by default features a fixed range, which simplifies making comparisons of different measurements. When you select the calculation *Histogram*, the statistical observation distribution over the actual input range is found, which usually returns a higher resolution, since the frequency in normal cases fluctuates in the range (nominal values ± 1 Hz) at most.

7.1.5.8 Flicker
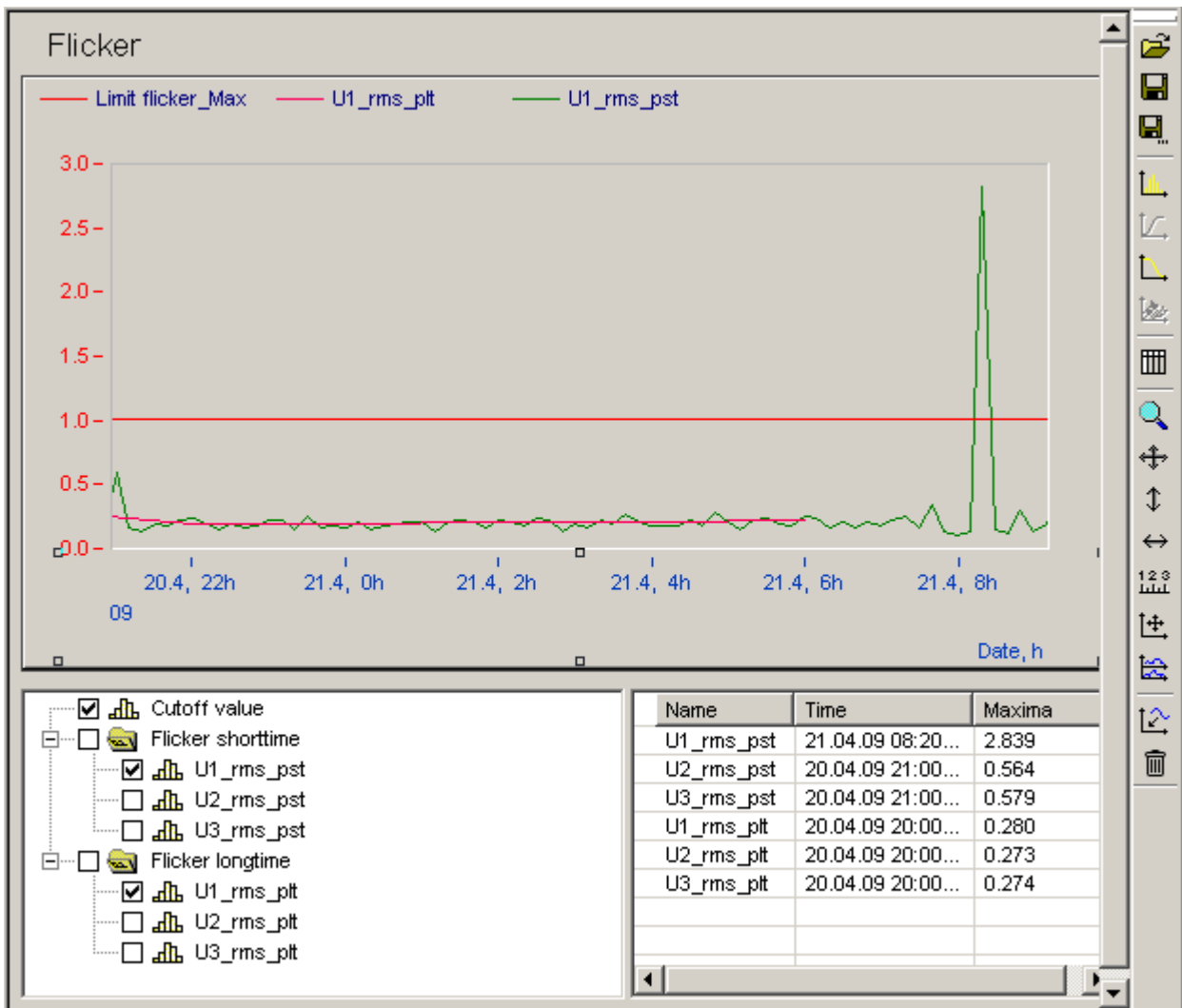
Flicker plot with display of a cutoff limit (1.0)

Measured data list:

- Limit for long-term flicker
- Flicker shorttime
- Flicker longterm, if measurement duration has been long enough

7.1.5.9 Events
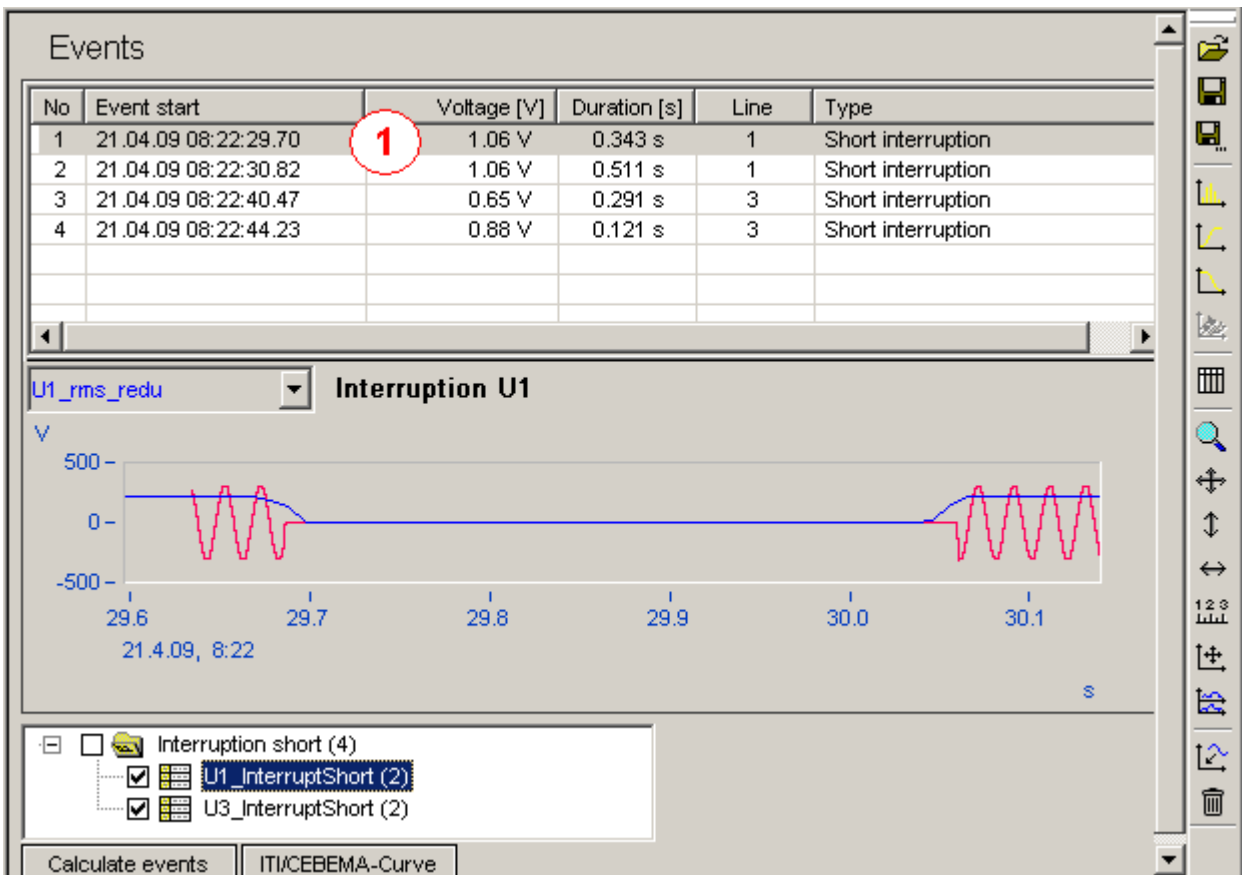
Table of events with curve graph display of the selected event

List of measured data contains the events which occurred, sorted by type and line number:

- short outages
- long outages
- voltage sags
- overvoltage
- rapid voltage fluctuations
- events that affect all lines get one entry with the line number is 0

(1) Tabular display of the measurement data list of selected events

Displaying measured data on event

- By double-clicking on an event's entry, you can display the plot of the voltage (see figure above, plot of Event 6)
- After opening the context menu (right click of mouse in the list), you can choose between displaying the plot of either the voltage or current.

Calculating events

- If no evaluation was yet performed for this measurement, you can use this button to start a search for events.

No	Event start	Voltage [V]	Duration [s]	Line	Type
1	11.06.09 15:10:54.59	0.31 V	5.321 s	1	Short interruption
2	11.06.09 15:11:01.60	0.46 V	14.192 s	1	Short interruption
7	11.06.09 15:11:05.48	0.10 V	7.175 s	3	Short interruption
9	11.06.09 15:11:05.49	0.06 V	7.161 s	0	Short interruption
5	11.06.09 15:11:05.49	0.06 V	11.471 s	2	Short interruption
6	11.06.09 15:13:08.33	0.40 V	7.673 s	2	Short interruption
3	11.06.09 15:13:00.17	0.61 V	6.141 s	1	Short interruption
8	11.06.09 15:13:08.32	0.06 V	2.720 s	3	Short interruption
4	11.06.09 15:13:14.59	0.07 V	4.320 s	1	Short interruption

One entry for poly-event

Events that affect all lines get one entry with the line number is 0

No	Event start	Voltage [V]	Duration [s]	Line	Type
1	11.06.09 14:56:30.02	259.50 V	19.858 s	0	Swells
2	11.06.09 14:57:20.97	265.00 V	2.968 s	0	Swells
3	11.06.09 14:56:30.95	259.00 V	6.777 s	1	Swells
4	11.06.09 14:57:20.97	265.00 V	2.968 s	1	Swells
5	11.06.09 14:56:34.00	259.50 V	15.878 s	2	Swells
6	11.06.09 14:56:30.02	259.00 V	9.972 s	3	Swells

swells (overvoltage)

7.1.5.10 Triggers

Triggered voltage range

Measurement data list:

- Plot of voltage signal
- Plot of current signal
- Triggered voltage channels

Triggered current channelsIf you have set monitoring of trigger events for your measurement, then the list on the right side will display all events whose occurrence released the trigger for data acquisition. During a triggered acquisition, monitoring of the trigger thresholds is deactivated, and remains so until the end of the acquisition. In monitoring of RMS and curve form triggers, it's thus probable that only one trigger release is displayed although the conditions for release of both triggers have been met.

Displaying a triggered recording

- double-click on an event's entry in the trigger list to show the measured curve,
- or open the context menu (right mouse button) and click *Show*

7.1.5.11 Harmonics and interharmonics
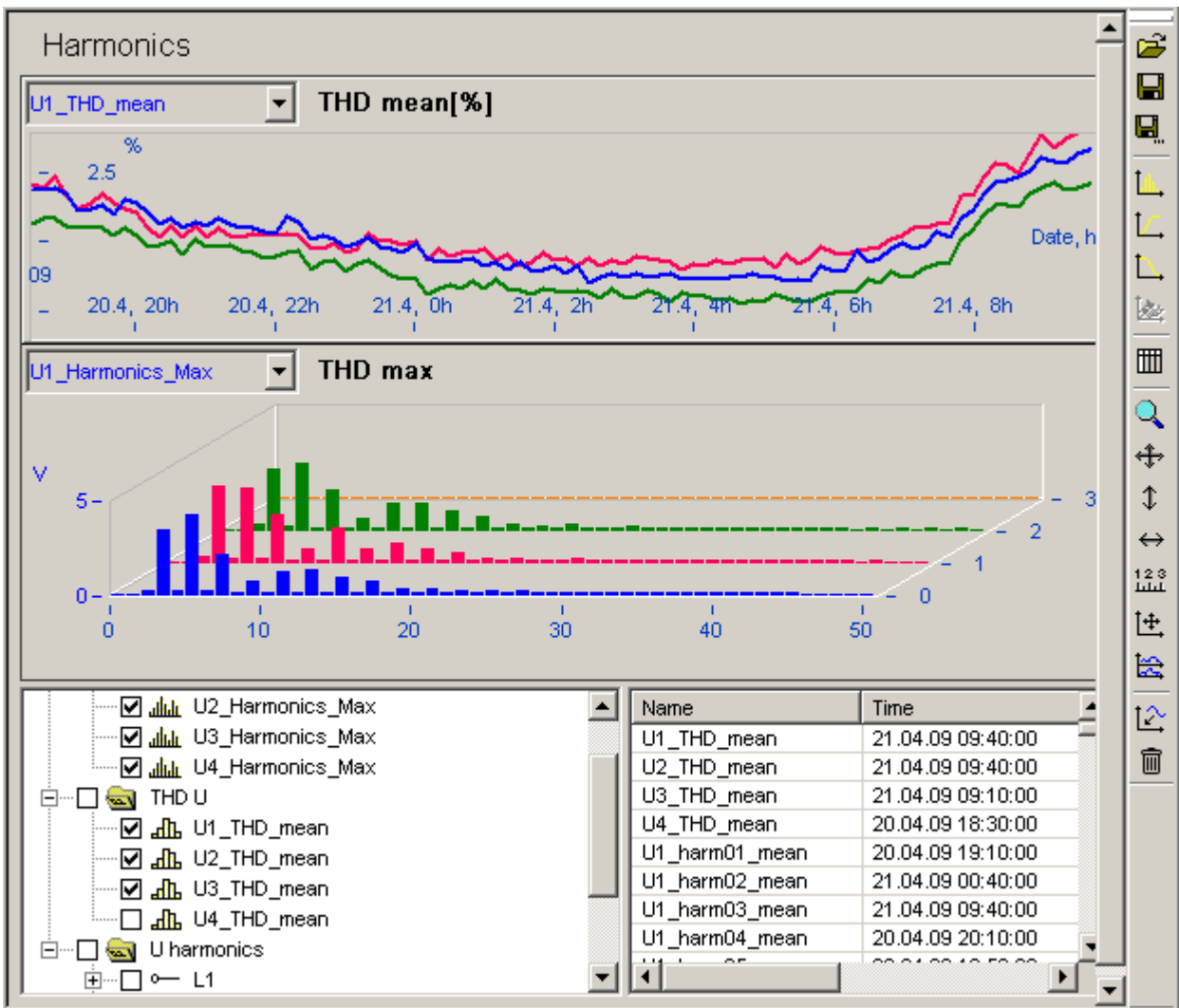
Plot of THD over time and as a histogram

Measurement data list

- Contains THD and all harmonics 1 to 50

- Under Maxima, an overview of the maxima of all harmonics can be displayed for each conductor monitored. Note that this doesn't include the fundamental frequency, since it is usually much greater and the harmonic components would barely be visible in comparison.

7.1.5.12 Power
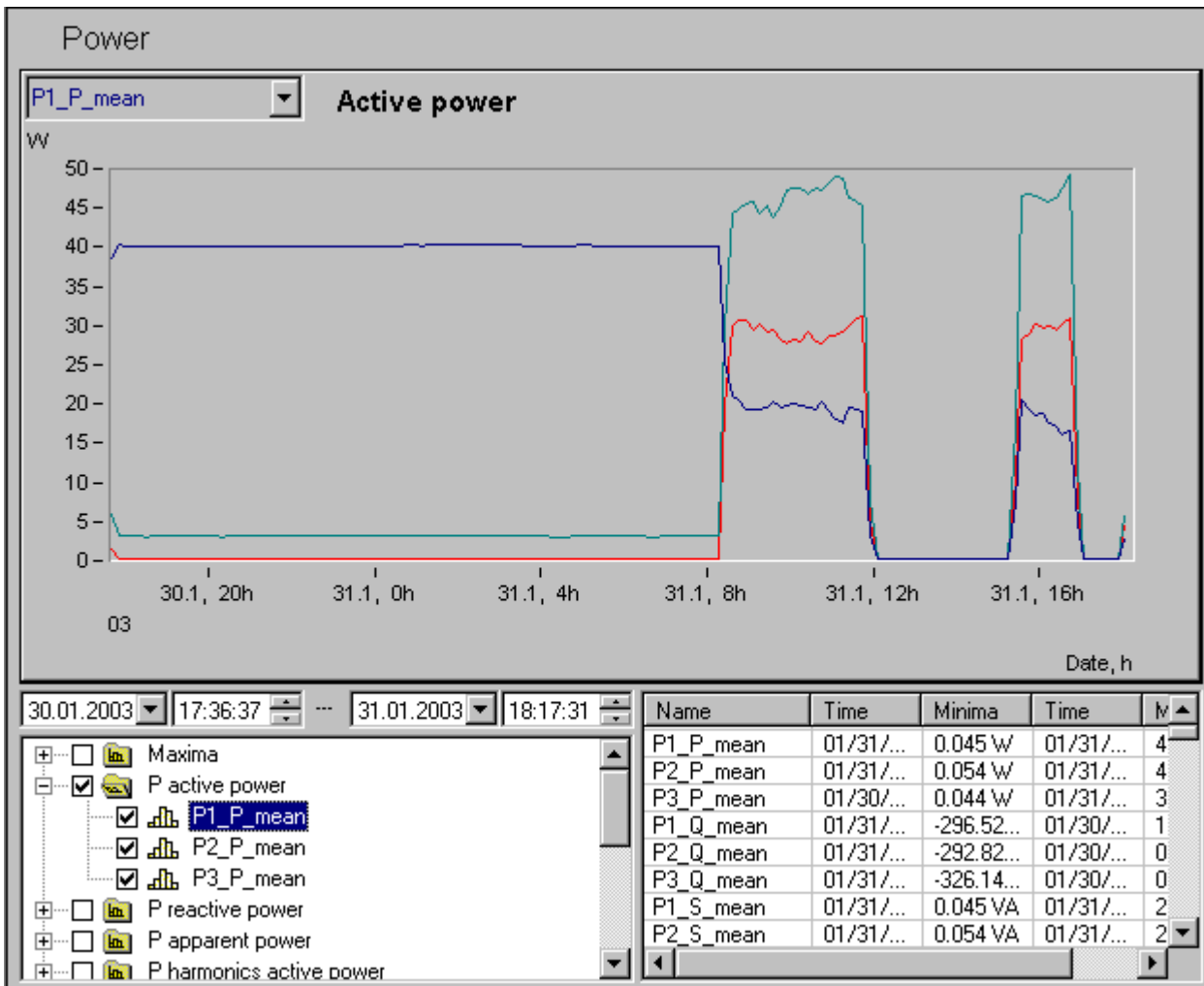
Power and phase from P1-P3

Measurement data list contains:

- the active, reactive and apparent power, phase of harmonics,
- the active, reactive and apparent power, phase and power factor of the individual conductors and of the overall system,
- under Maxima, the range of the harmonics' phase which occurs during measurement

7.1.5.13 Electric energy
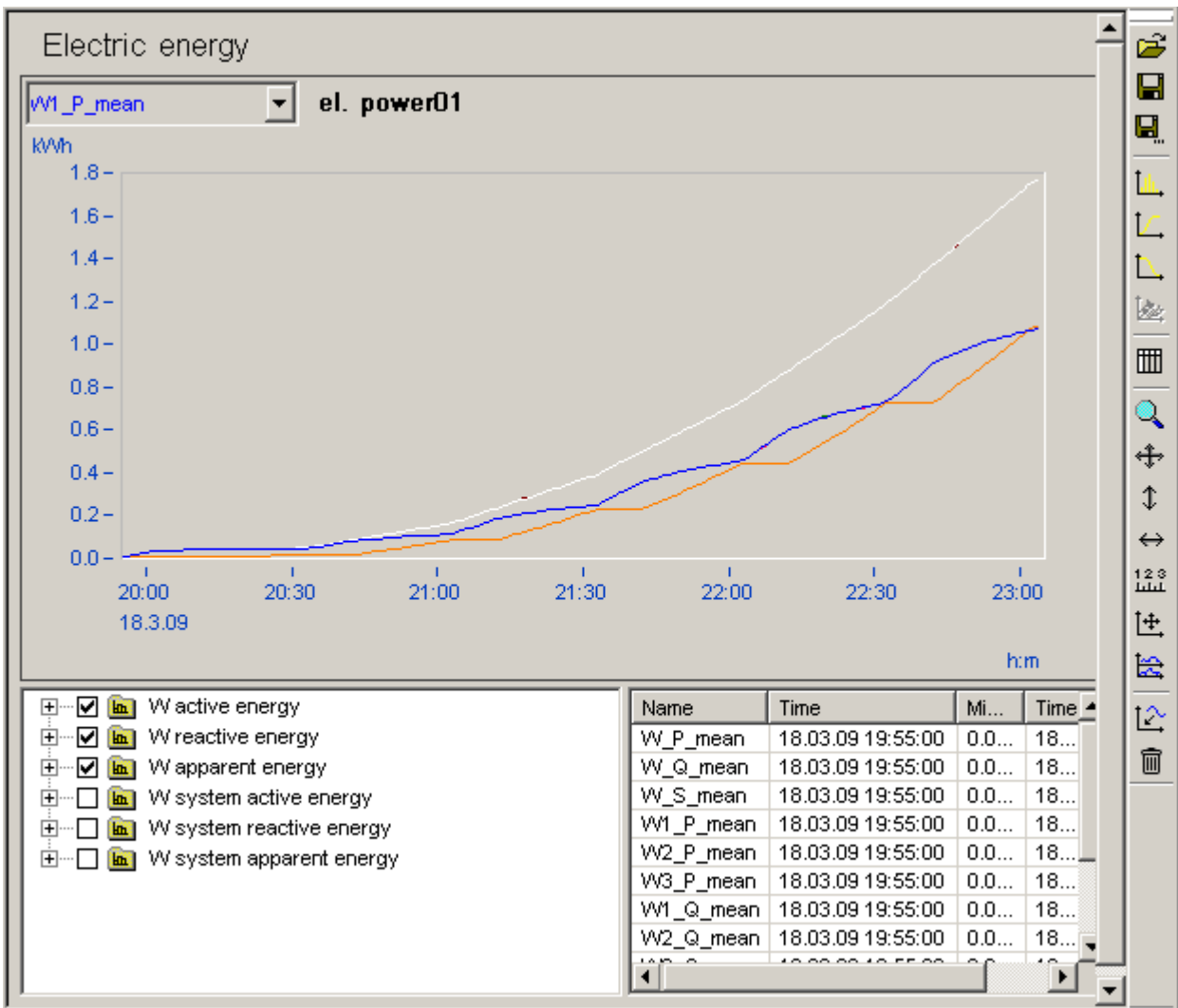
Electric energy of all three lines as active, reactive and apparent energy

Measurement data list contains:

- the active, reactive and apparent energy
- the active, reactive and apparent energy of the overall system,

7.1.5.14 Interharmonics
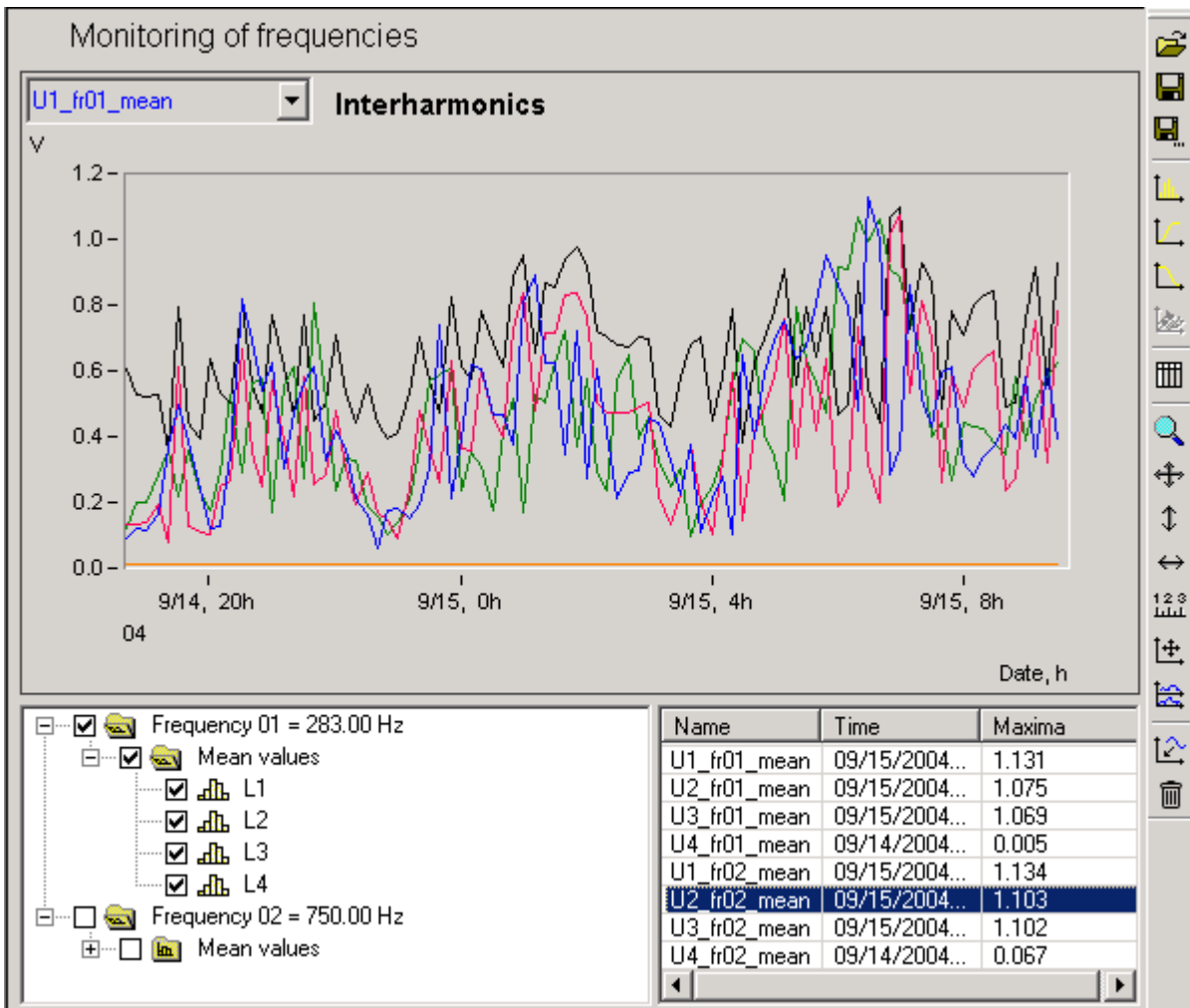
Mean values of the monitored frequencies

Measured data list:

- Mean values of voltage

Also, in case of simultaneous current measurement:

- Mean values of active, reactive and apparent power
- Means values of the phase between U and I
- Mean current values

7.1.5.15 Signal frequency curves
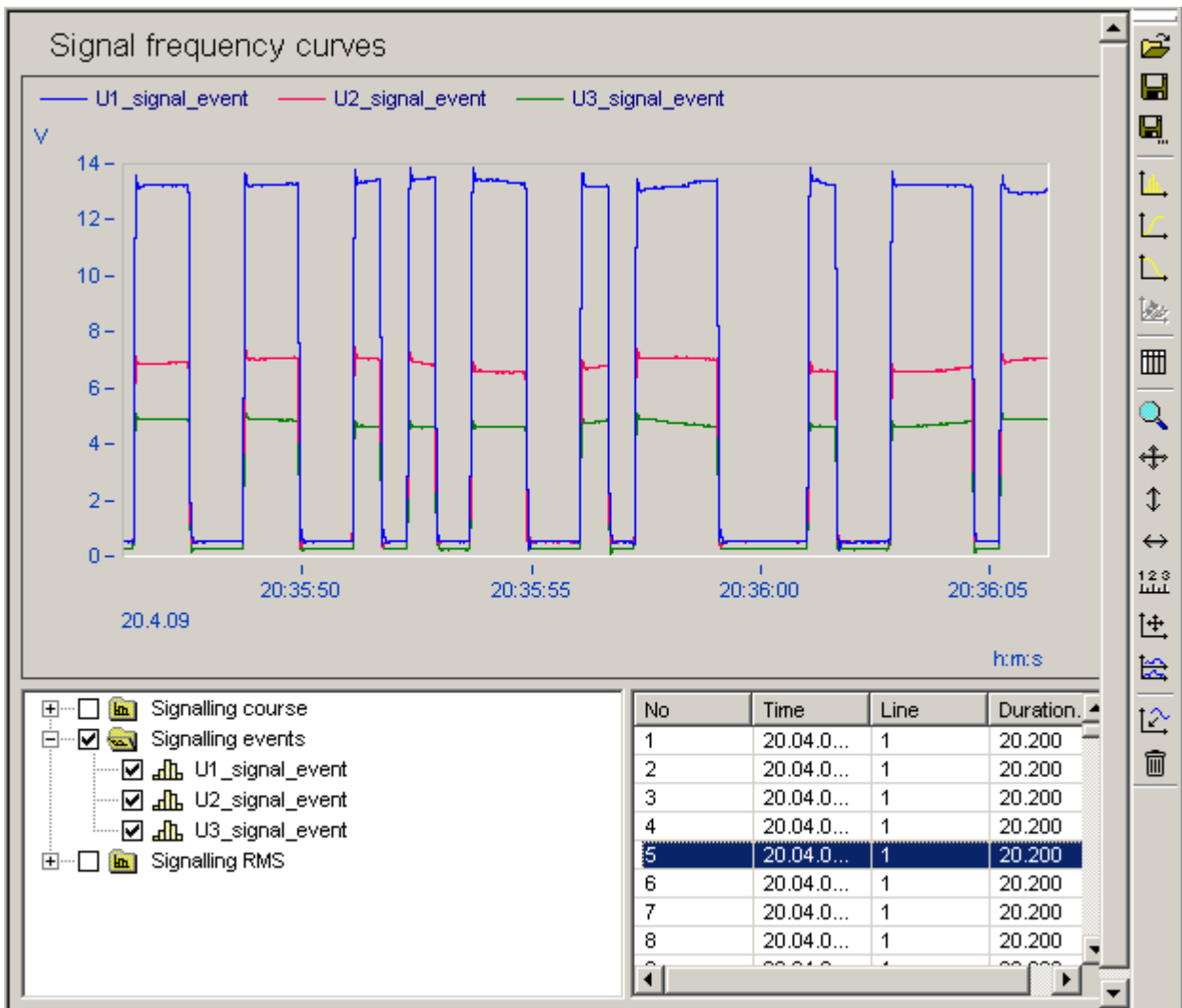
Table of recognized signal curves with curve plot of a selected signal trigger

Measurement data list contains:

- plot and mean values of the monitored signal frequency
- calculated power components
- event data, if the voltage set is exceeded.

Event list

- contains all trigger events recorded
- double-clicking displays the selected event
- in the context menu, you have a choice between:
  - o *Show* – displays the event
  - o *Show entire signal sequence* – displays the entire event sequence if it is longer than a triggered acquisition lasted (10 s)

7.1.6   Measurement data comparison

Measurement data comparison enables comprehensive analysis of different measurements. This comparison can be applied either to different measurements from a single measurement location or from different locations.

The comparisons are made in the context of specific signal groups. These are:

Channel search	*Standard value search*	*Event search*
• Voltage	• Flicker	• Outages
• Current	• Asymmetry	• Voltage dips
• Frequency	• Voltage change	• Overvoltage
	• Frequency	• High-speed voltage fluctuations
	• THD	• Transients
	• Harmonics	
all directly recorded channels	all quantities calculated for the network quality	all voltage events

7.1.6.1   Channel search
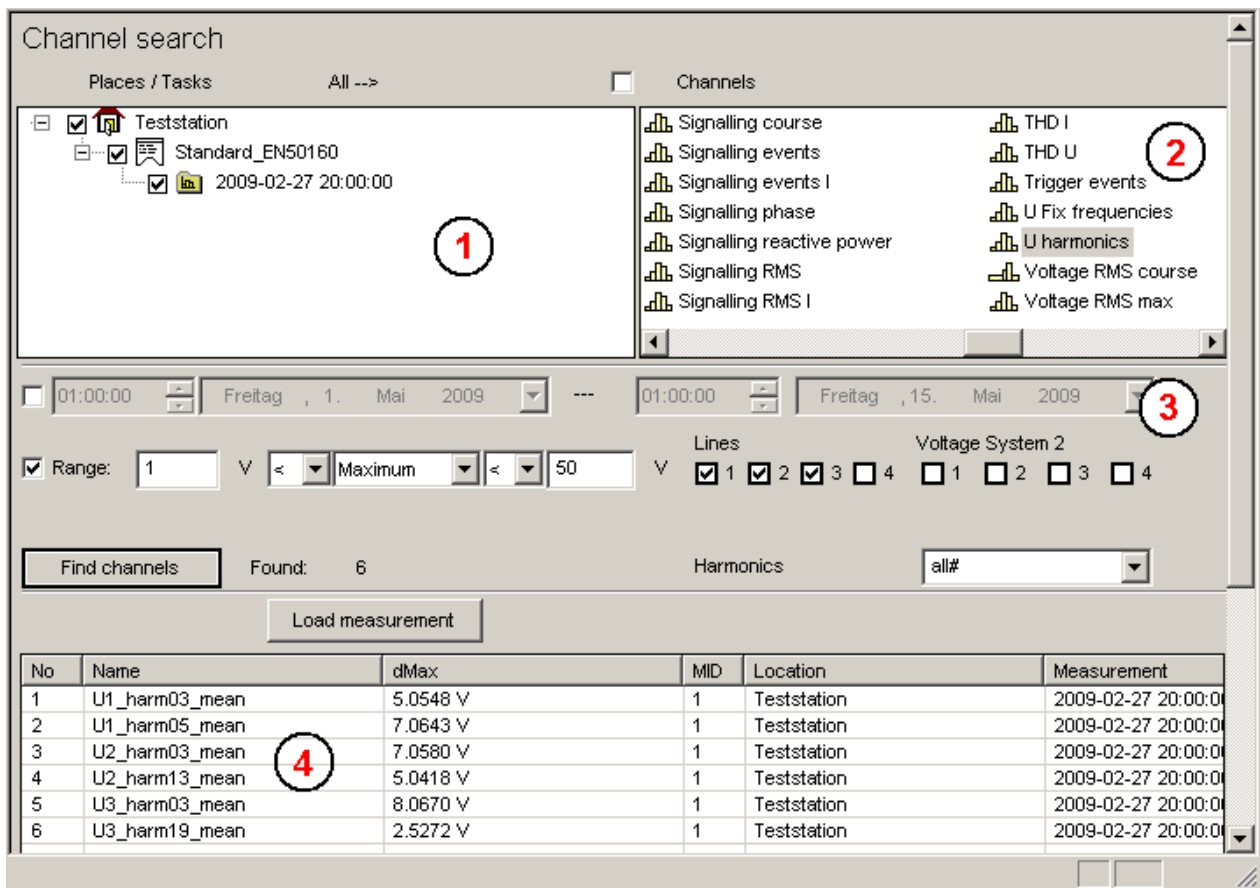
Key to dialog elements:

(1) List **of all measurements available**, sorted by measurement location, measurement task name, time of measurement

Use *All→* to select all available measurements

(2) List of the **measurement data groups**

(3) Search criteria– the following criteria can be set:

    a time frame,

    a measurement data value range,

        I. e.g. all data, where the voltage maxima > 240 V

II. all data, where the voltage minima < 200 V

III. all data, where the maxima and minima lie within the range 210...250 V
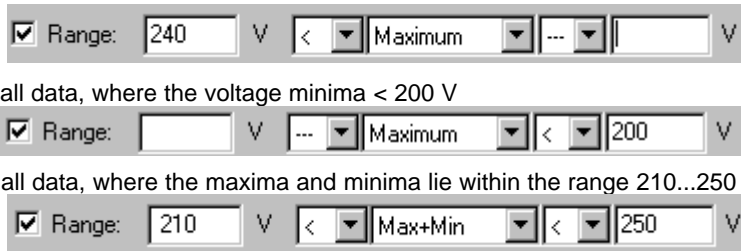
the conductor L1..L4 to find,

the harmonics ranges for upper harmonics

I. e.g. selecting all odd-numbered harmonics up to the 25th

(4) Search results – The channels displayed here are also displayed in the task tree under "Search results". However, the limitations on the display of search results stated in the Options dialog (*Extras/Options/Evaluation*) are applicable.

No	Name	MID	Location	dMax
1	U1_harm01_mean	1	Station 1	228.5197 V
2	U2_harm01_mean	1	Station 1	229.1634 V

a. Name   – Name of data channel

b. MID   – ID of measurement, appended to channel name for better distinctions

c. Location – location of measurement

d. dMax   – maximum value of data channel

Search results in the task tree (see Section)

Channel Search 2 comprises 5 search results.
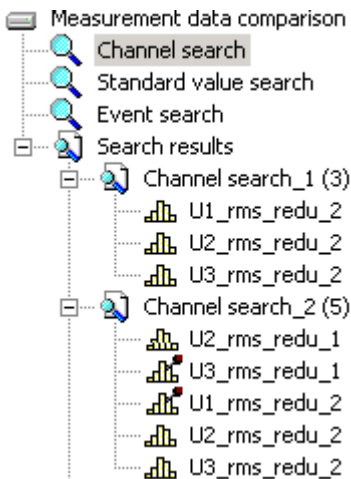
Channels U3_rms_redu_1 and U1_rms_redu_2 contain the desired results and were frozen. Now for better clarity, the entry *Channel Search 2 (5)* can be selected and the context menu deleted → only the two fixed channels are left.

Search example:

7.1.6.2 Standard value search

Example of a standard value search as per EN 50160

Key to dialog elements:

1. List **of all available measurements**, sorted by measurement location, measurement task name, time of measurement; use *All* → to select all measurements

2. List of **limit value sets,** all defined limits; use *All* → to select all sets

3. List of **limit values**, all quantities to be calculated as per the standard 50160

4. **Search criteria –** the following criteria can be set:

    a. a time frame,

    b. value range for the measurement data (see <u>Selecting data folders</u> 78)

    c. the conductor L1..L4 to find,

    d. selection of the harmonics ranges for upper harmonics (see <u>Selecting data folders</u> 78),

    e. compliance or non-compliance with standards and percentage of values beyond standards limits.

    E.g. search of all frequency measurements, where at least 0.5 % of the measured values exceed the standard

    | ☑ Standard: ○ fulfilled | ⊙ not fulfilled | >= | 0.5 | % of readings outside of |

5. **Search results –** List of all measurement channels found:

No	Cutoff ...	Out of ...	MID	Location	Experi...	Measu...	Minima	Maxima	Line	Amount
1	Freque...	-	1	Station 1	engine...	2003-0...	49.922...	50.086...		100.00 %

    a. limit value   Name of limit value

    b. Out of bounds   Percentage of measured data lying outside of the limits

    c. MID   ID of the measurement, appended to limit name for better distinctions

    d. Location   Measurement location

    e. measurement task   Name of measurement task

    f. Measurement   Measurement designated by its starting time

    g. Min/Maxima   Extreme values in waveform

    h. Conductor   Number (1..3) of conductor

    i. Amount   percentage of measurement values accounted for in evaluation

7.1.6.3 Event search

Example of an event search as per EN50160

Key to dialog elements:

1. List **of all available measurements**, sorted by measurement location, measurement task name, time of measurement; use *All* → to select all measurements

2. List of **limit value sets,** all defined limits; use *All* → to select all standards

3. List of **event types** as per the standard 50160

4. **Search criteria –** the following criteria can be set:

   - a time frame,

   - a voltage value range

   - the conductor (L1..L3) to find or overall system,

     - e.g. search for an outage in the overall system, which means on all conductors at the same time. If L1, L2,L3 is selected, all outages are included,

   - an amount of events; all measurements having either more or fewer than a defined amount of events are found,

   - Sorting criteria.

     - If you search for individual events, they can be classified by, for instance, event duration or depth of voltage dip.

5. **Search results** – the list's structure depends on the search criteria

   - Classification of events by time

Events	< 10...	< 50...	< 1 s	< 3 s	< 20 s	< 1 ...	< 3 ...	>= 3 ...	Total
Short interruption	0	2	2	0	1	0	0	0	5
Long interruption	0	0	0	0	0	0	0	0	0
Voltage dip	0	2	2	0	1	0	0	0	5

   - Events   – name of event type

   - Total   – total number of events

   - Other columns – Number of events whose duration fell within the particular class.

- Classification of events according to voltage range
- Search with event count as criteria – displays a list of voltage channels with the channel count searched for.

7.1.6.4 Search results

In the task tree, the search results are listed:
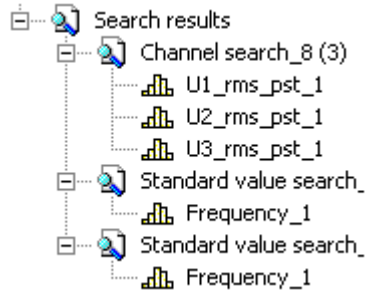
* Channel search_8 (3)

- Eighth search in dialog "Channel search" with 3 results
- context menu (right mouse button) allows deleting of result list
- By making a channel permanent (in the example shown: U1_rms_pst_1), it's possible to protect it from being deleted when making blanket deletions of whole channel groups.

* U1_rms_pst_1

- Result channel named "U1_rms_pst" from the measurement with the ID 1
- By clicking on the channel's entry, the data are displayed in the curve window
- Context menu (right mouse button):

Display	
Make permanent	
Delete	
Properties	
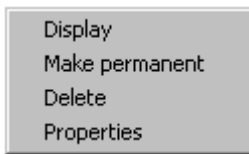
Display   - Display of channel data in the curve window
Make permanent - Blocks/enables deletion of channel
Delete   - Deletes a channel (from list of results only)
Properties   - Display of result channel properties
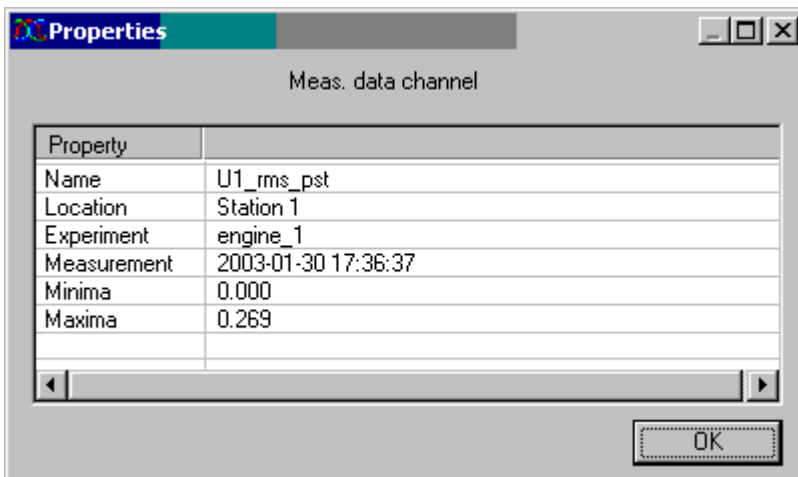
Channel properties

Double-clicking on a channel or the context menu command **Display** switches to the curve window mode and the data are displayed. The search screen is exited.
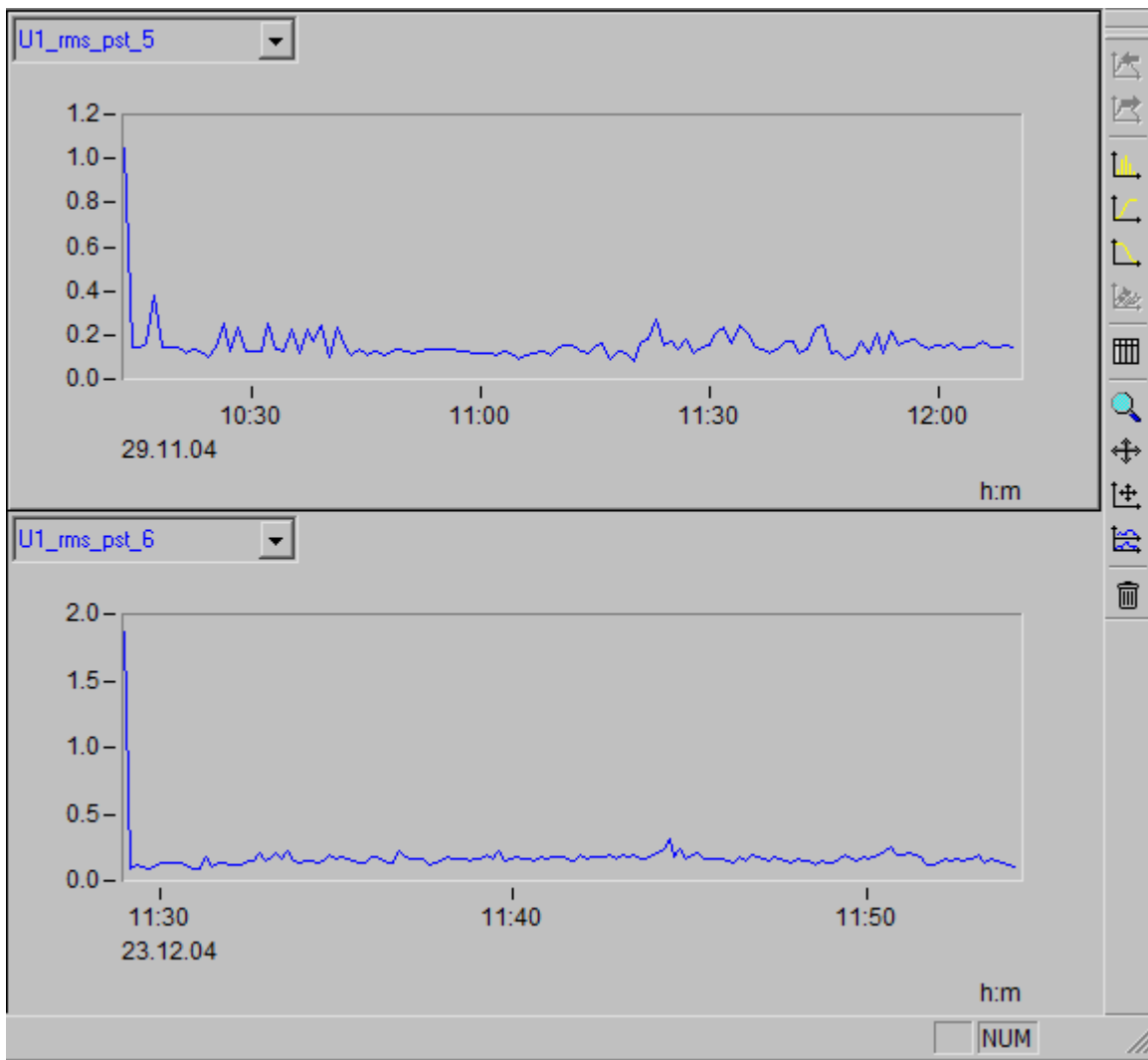
Display of 2 channels found in a search

7.1.7   Automated operation with multiple devices

A measurement with multiple measurement devices can easily be automated. For such automated operation, the two supplemental programs *Auto-Transfer* [109] and *Autoreport* are required.

POLARES operating software configures:			
⇓	⇓	⇓	⇑
measurement devices ⇒	**auto-transfer** ⇒	**autoreport** ⇒	**data base**
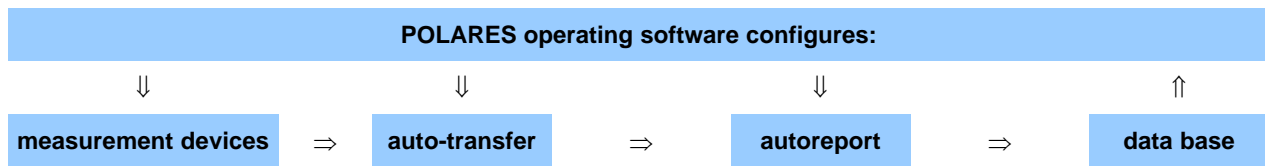
Task assignment

- To configure the measurement devices, use the **POLARES operating software**. This starts the measurement and saves the data in normal cases to the internal removable storage unit. Additionally, a running measurement can be observed and cyclically evaluated.

- Transfer of multiple devices' data to a temporary storage unit is performed with the program ***Auto-Transfer*** [109]. There, the data await evaluated by Autoreport.

- The program ***Autoreport*** accesses the data available from *Auto-Transfer* and cyclically generates a report for each device.

- The results generated by Autoreport are written to the database.

These programs appear as independent programs in the program group imc\ *Auto-Transfer* or *Autoreport*
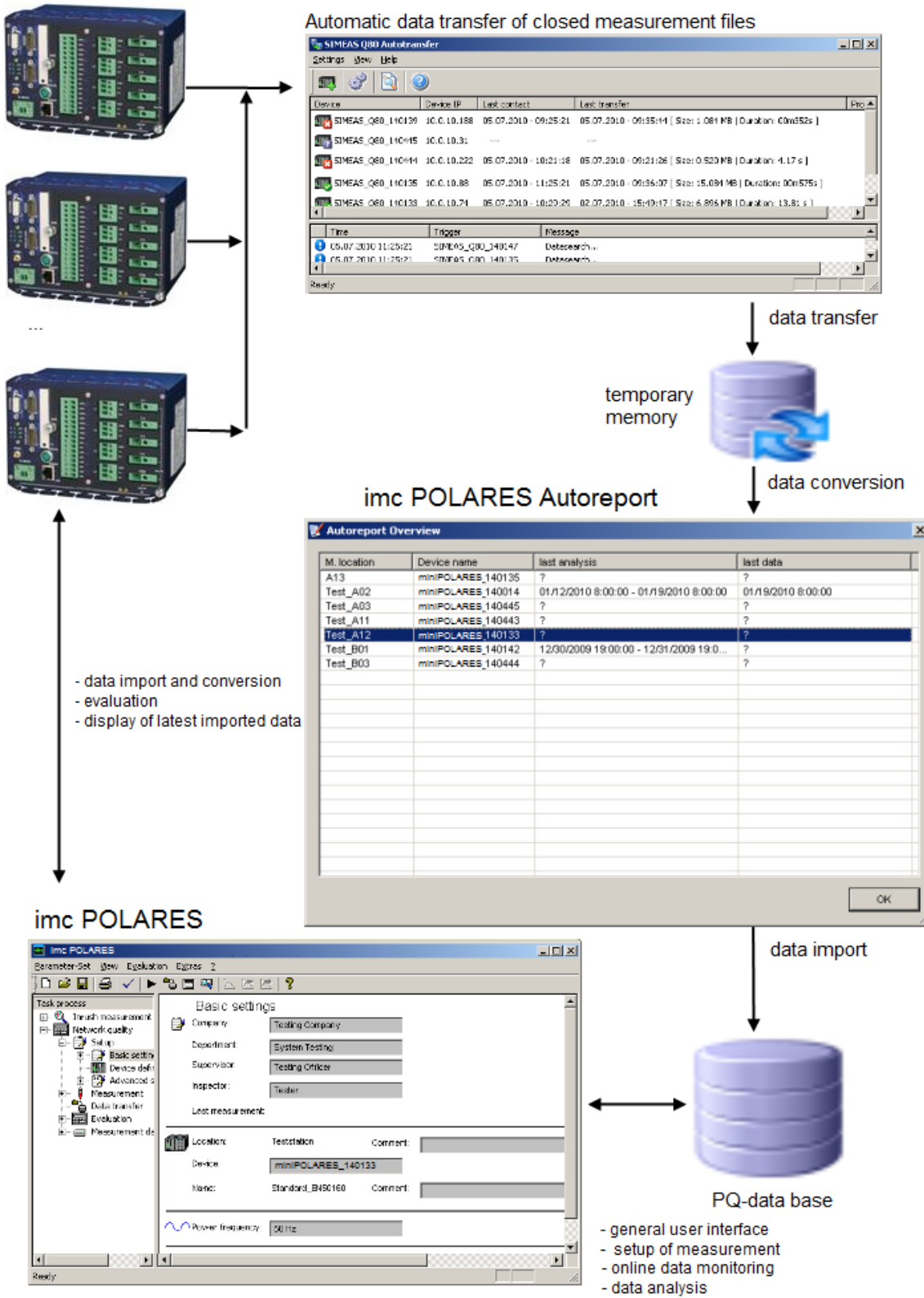
7.1.7.1 Auto-Transfer

For collecting measured data from multiple imc POLARES, the program Auto-Transfer was developed.

As an FTP client, it cyclically connects with the measurement devices and copies the completed measured data files to a server.

The **main window** lists all devices whose data are automatically copied to the server entered.
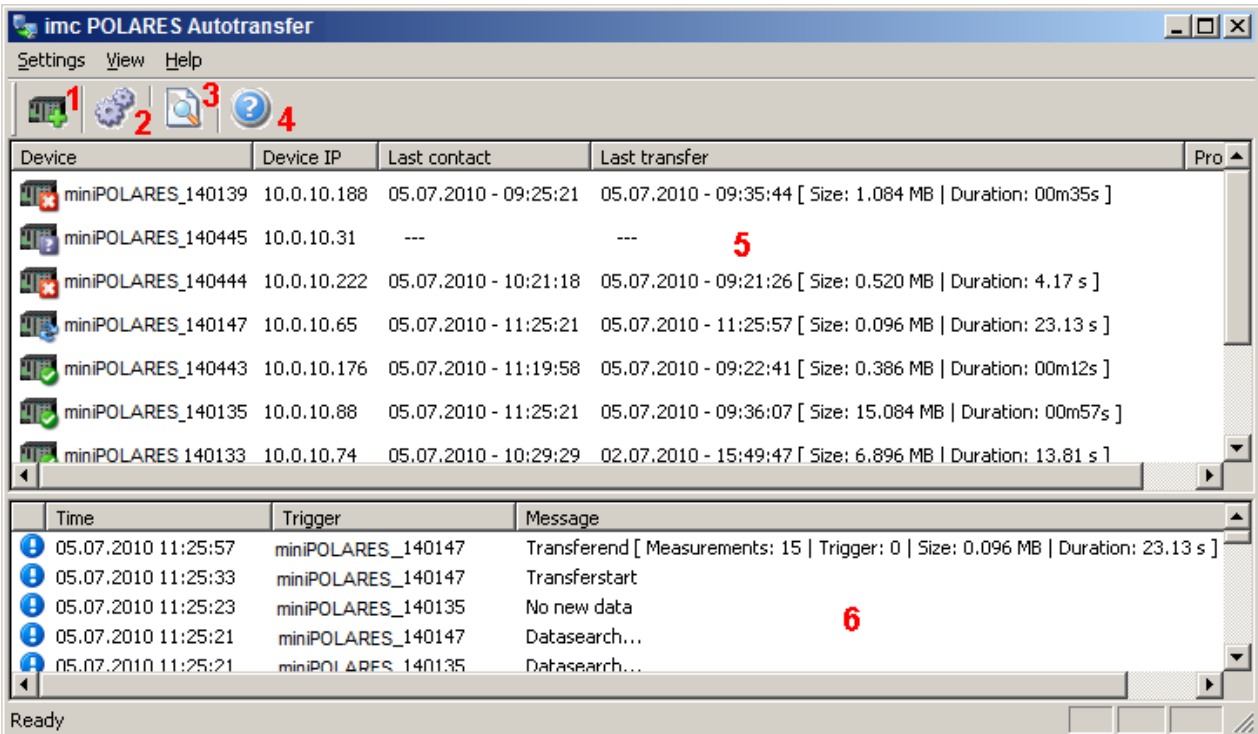
Supplemental program Auto-Transfer

1 Add device 110

2 Open settings dialog 111

3 Display logfile in Editor 114

4 Info on Autotransfer (version and date)

5 Status window: device names - device-IP - date and time of last connection and download - progress of data transfer

6 List of the last actions

Note

A comfortable step-by-step configuration is found here 114.

⊞ Add device

Here, manually enter the devices whose data are to be automatically transfered. The definitions for devices which are integrated via UDP ⌐113¬ is performed automatically.

Auto-Transfer Devices: Manually enter the devices whose data are to be automatically transfered

Properties: Under *Properties* you set the *IP-address* and enter its *Name* and *Serial number* and activate the transfer by means of *Status*.

Transfer Automatic: The transfer can be set separately for each device. The beginning of the transfer is set using *Interval start*. For the *Interval*, the available settings range from 10 min to 1 week. Additionally, there is the option of using a *user defined* interval. For devices which were integrated via UDP, the entry *UDP Autotransfer* is provided.

Data filter: Older data can be ignored by means of *Data option - Data since...* .

Error sequence: If the connection fails, it is possible to provide *Connection retries* at a specified *Interval*.

![gears icon] **General settings**

This page contains the settings for the Transfer data directory and the UDP settings.
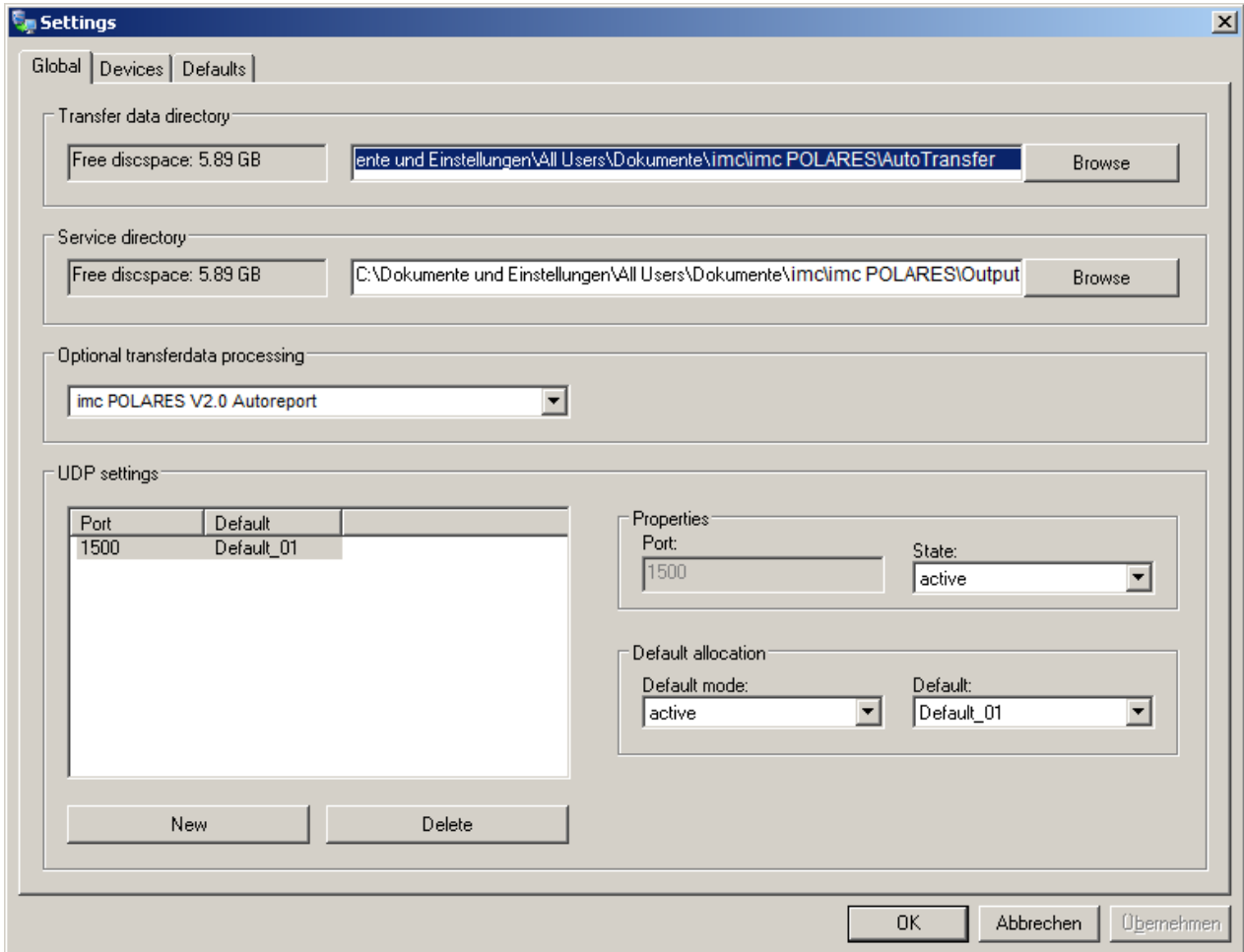
Auto-Transfer General: Transfer folder and UDP settings

Transfer data directory: Under *Global Settings* , the target folder for the transferred data is set. This can also be a central server computer which is accessible as a network drive.

Service directory: Storage space of the log file.

Optional transferdata processing: The program for subsequent processing is the default selection here. By means of selecting "-" , it is possible to deactivate this option.

UDP settings: In the UDP settings, you specify the port, which must match the UDP device settings. On this page, you activate UDP settings which were previously prepared under Defaults 112.

Settings Defaults

For the use of UDP, you can create a variety of profiles. If *Auto-Transfer* detects a program via UDP, the device information Name, Serial number and IP-address are applied and supplemented with the remaining settings on this page. The new device is then appears on the list on the page <u>Devices</u> 110.

Auto-Transfer Defaults: Presets for device integration via UDB

UDP settings for the devices

The UDP settings of the devices are made in *POLARES operating software* in the measurement setup 57 under *Setup\Advanced settings\Supplementary parameters*.
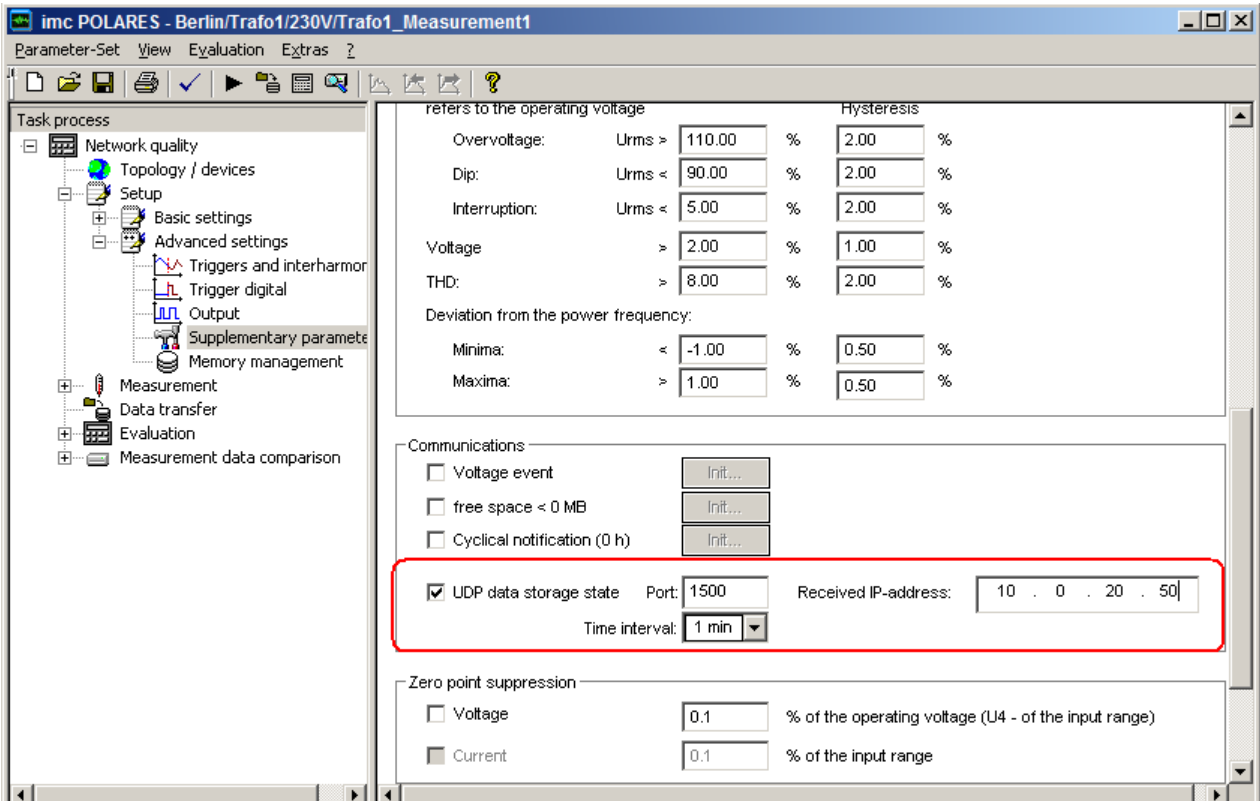
UDP device preparation

UDP-data storage state: Activates the UDP transfer

Port: Port for the UDP transfer. This must match the port in the *Auto-Transfer* program. Also, ensure that this port is not blocked by the firewall.

Received IP-address: IP-address of the computed running the *Auto-Transfer* program.

Time interval: Interval for the UDP update.

Call to the AutoTransfer log file

Open the log file with any text editor.

Log file of Auto-Transfer

7.1.7.1.1 Comfortable configuration step-by-step

1. *POLARES operating software* Messgeräte unter „Supplementary parameters" 57 mit aktiven UDP-Signal konfigurieren .

2. Autotransfer: Define a "default device" under Settings\Default 112 : *Status= active + Transfer Option* to "*UDP Autotransfer"*

3. In the *UDP settings properties* under *Settings\General* 111*, assign a port and set to active.

   i. Set the port number as previously under item (1).

   ii. Activate the default assignment and select your default device (2).

All measurement devices which were configured for sending UDP are then automatically recognized and perform the default device's options. If there are new devices, the program Auto-Transfer does not need to be configured.

7.2   Inrush measurement
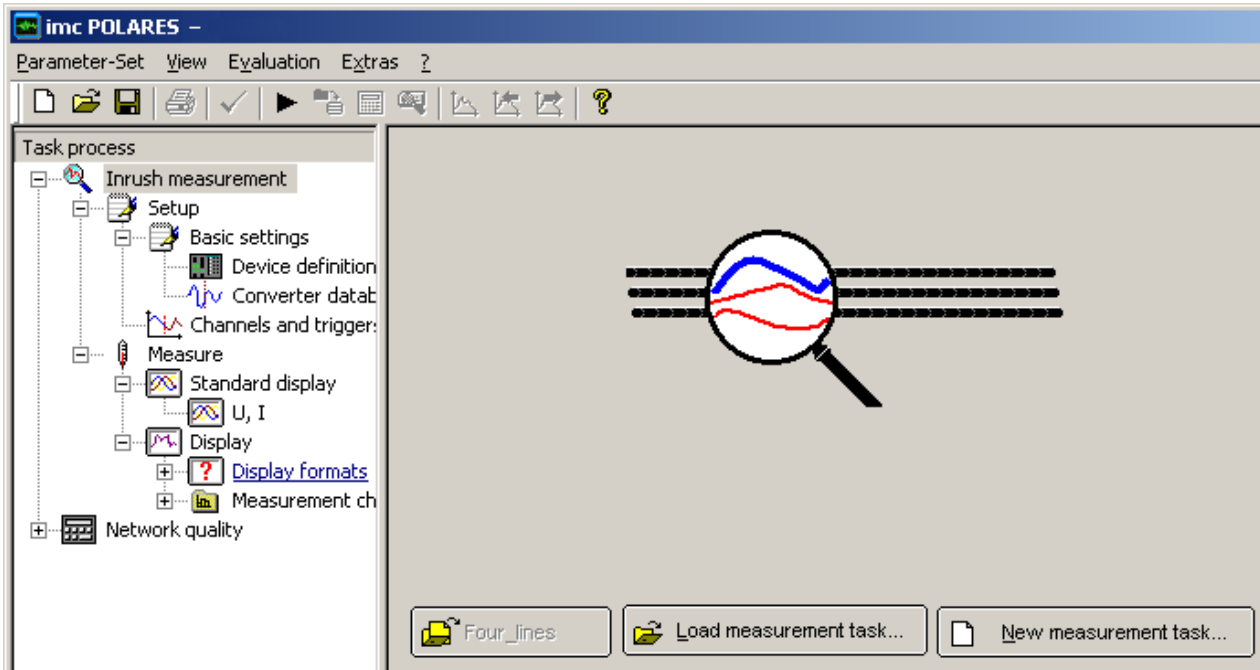
Inrush measurement start screen

Inrush measurement with *imc POLARES* lets you make short-term, triggered, online measurements with the 8 available channels. The standard EN50160 is not adhered to.

With just a few, clear options to set, it is easy to take measurements of, for instance, power-up processes, quick test measurements settings on unknown lines and recurrent measurements.

7.2.1   Setup

7.2.1.1   Basic settings

The basic settings for the Inrush Measurement closely match those on the first screen for Network Quality 38. Harmonics are not available here, the trigger has more limited functionality and its controls are on the next screen, *Channels and triggers*.

7.2.1.2   Channels and Triggers

Here you can select the desired quantities to measure. Depending on the channels to be monitored, the available sampling rate can be as high as 50 kHz.

Maximum duration:

Target value for maximum measurement duration. This is adapted to the sampling rate and the number of active signals. The transfer of measured data straight to the PC without being temporarily stored on the device hard disk is thus ensured. This target value can also be met under suboptimal network circumstances. If *imc POLARES* is connected directly to the PC and if the PC's resources aren't being burdened by other tasks, even longer times can be set.

The limits are drawn by the PC's RAM. For 2 channels and a sampling rate of 50 kHz, about 11.5 MByte of data accumulate per minute! (60 s * 2 channels * 50000 values * 2 Byte per sample).

Pretrigger:

Specifies how long before the trigger event to record data.

Fill-out form for channels and triggers in inrush measurement

Oscilloscope mode: Infinite repetition of the measurement until discontinued by Stop command.

The Trigger definition dialog appears when you click on *Add* or *Edit*. The available options are threshold triggering and range triggering.

The triggers defined are listed under *Trigger Conditions*:

View of defined trigger conditions

7.2.2   Measure

7.2.2.1 Start

This dialog starts the inrush measurement. The connection to the device can be set up or disconnected. the data displayed can be saved, if desired.
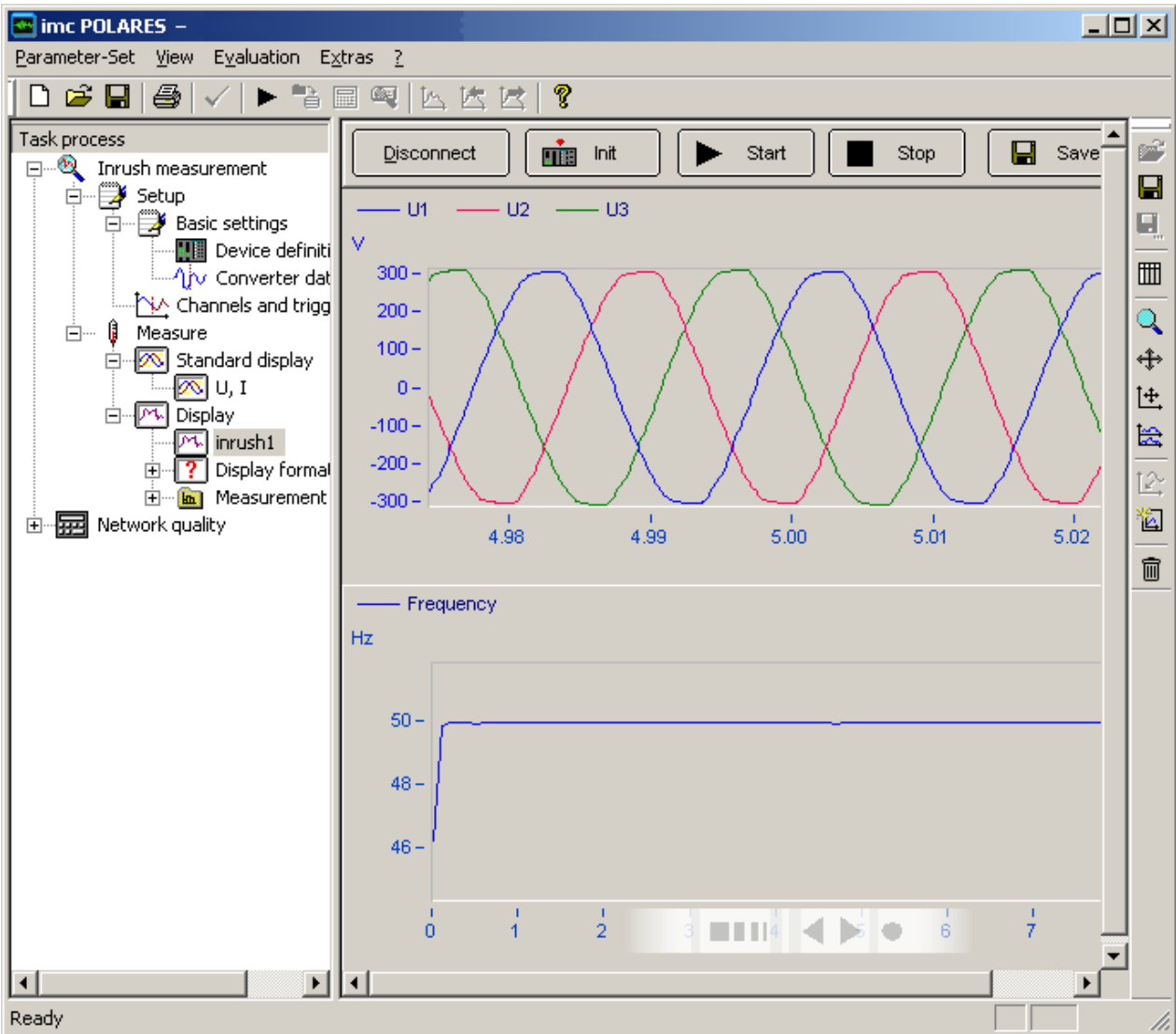
Standard inrush measurement screen

7.2.2.2 Display

You can also create additional display windows. How the windows are arranged depends on your choice under *Display formats*. The window contents can be determined by dragging the entries for the desired data from the *Measurement channels* and dropping them in the curve window.

[M] New curve windows will be created when pushing this button.

[?] Display formats: Layout of the display as up to four windows. Select a format and drag it with the mouse to the desired window. Arrange the curve window according to the instructions on p 4-24.

[In] Measurement channels: All active signals under Channels and Triggers are available here. Signals are denoted by this symbol: .
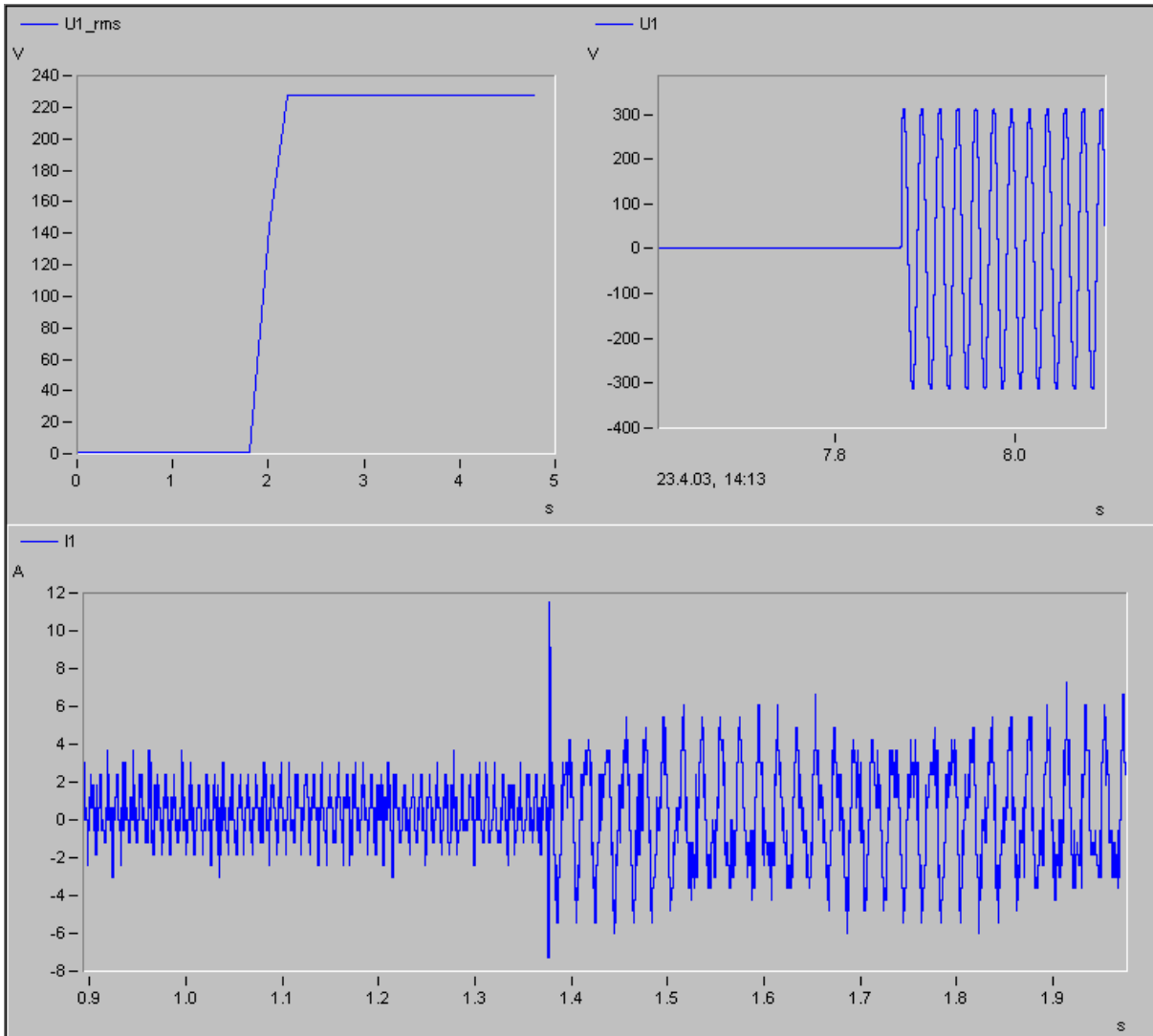
Possible display of a short-term analysis

8   Operation of the Software

A user interface was designed for *imc POLARES* which resembles the familiar Windows® - Explorer in terms of both appearance and functionality.
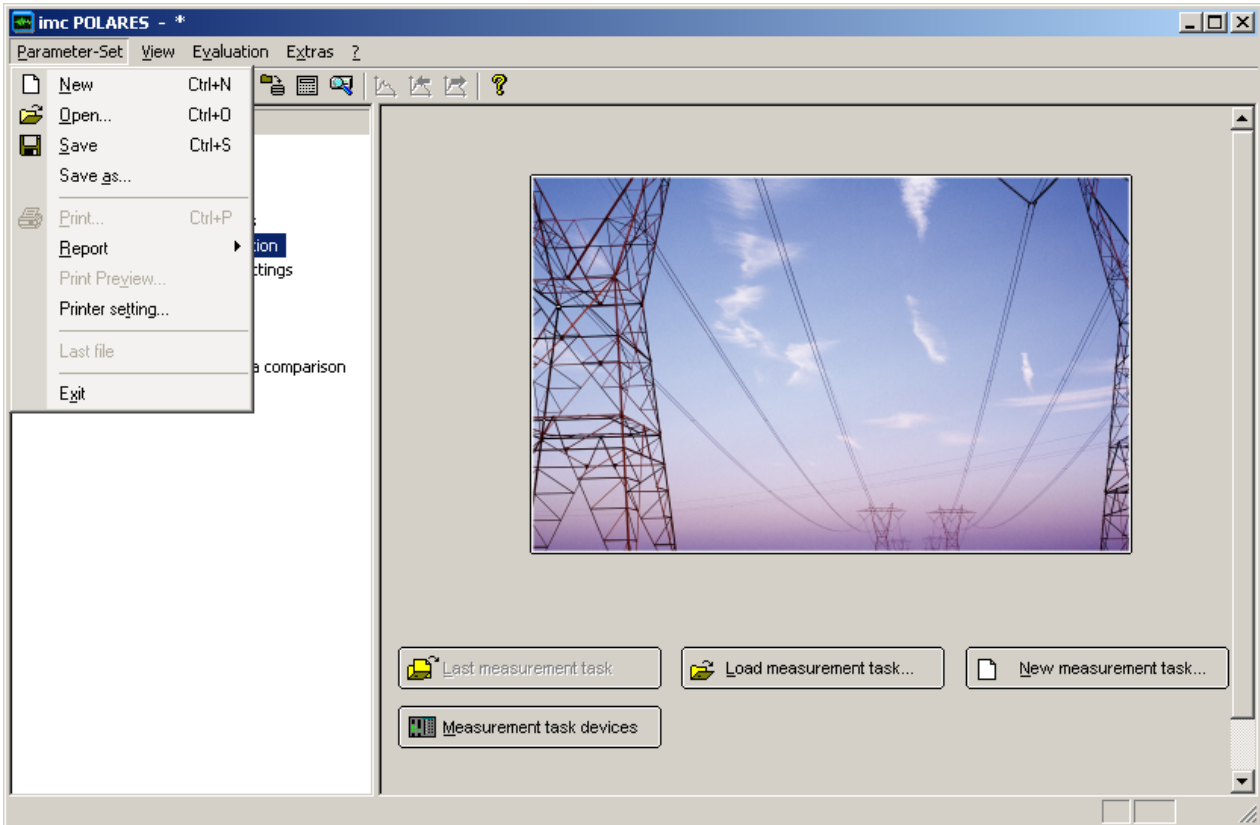
Startdialog POLARES operating software Manager

The picture on the Start page can be replaced. To do this, save the desired picture in Bitmap format (bmP) in the installation path (by default "C:\imc\imc POLARES\") under the name "UserIntro.bmp". Other formats are not supported. Upon starting the program, the system checks whether this file is present. The maximum resolution is 800x800 pixels.

8.1   Tree diagram
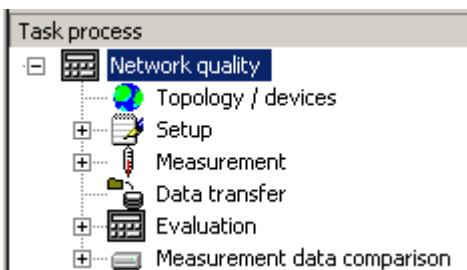
On the **left side** of the screen is the so-called ***tree diagram***. Here, you can always see on which level of the program you are currently located. Clicking on an entry in the tree enables you to proceed to the next task stage.

Depending on what software components you have purchased, some entries may be missing from the tree.

At the top of the hierarchy are the steps *Topology / devices, Setup, Measurement*, *Data transfer, Measurement data comparison* and *Evaluation*. All other functions are subordinate to these.

8.2   Editor

On the **right side** of the screen is the *editor*. Its particular structure depends on the task step currently active.

8.3   Menu

In addition to the tree diagram, the menu also enables you to access important functions. This goes especially for saving and loading the configuration files. The main working areas are also accessed via the toolbar.
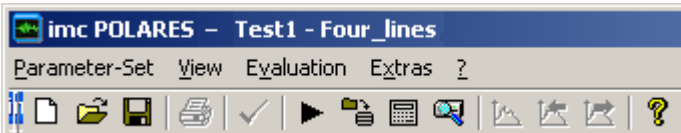
8.3.1   Parameter-Set menu
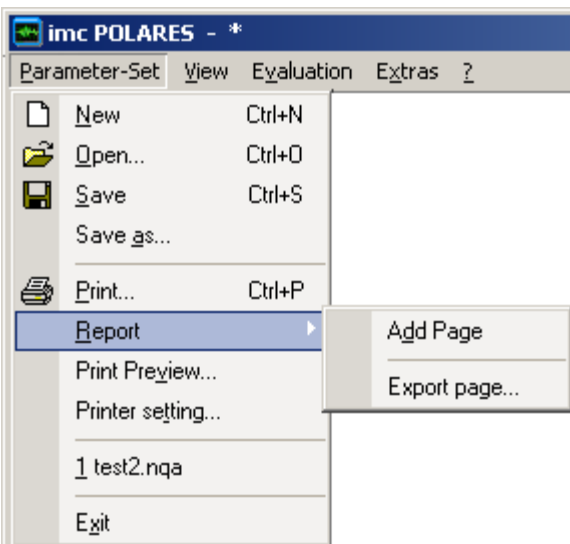
File menu

Here, measurement tasks (measurement configurations) are set up, loaded and saved. See in details at Loading a new measurement configuration or New start 25.

All settings for printout of the displayed page are available here 80.

8.3.1.1   Update-Information

The structure of the parameter sets has been changed between the software version 1.0 and 2.0. When adopting parameter sets from software version 1.0, note the following:

Old structure:

Measurement location / Parameter set name / ParameterSetName.nqa

New structure:

Region / Station / Level / Feeder / Parameter set name / ParameterSetName.nqa

1. Set up the topology so that the new branch name is the same as the name of the old measurement location. Then in the evaluation, all already existing measurement data are assigned to there.

2. The available/old parameter sets can be loaded by means of the device list and the context menu item "Load parameter set.. 29". If a different measurement device than the desired one is set in this parameter set, you can save the configuration as a template and later load it for any device.

3. All existing measured data assigned to a measurement location, which was not defined as a branch in the topology, appear in the list of all measured data next to the topology.

General notes on "Load parameter set.."

By default, the parameter sets already defined for the branch, which is assigned to the device, are displayed. Therefore, prior to this action, the the measurement device must be assigned in the topology. However, you can also view and load parameter sets belonging to other branches in the dialog displayed. After loading, the device which had been defined for the parameter set is activated. However, by saving the parameter set as a template, you can also assign the parameters to a different device.

Branch1

- ParameterSet11 (for device a)

- ParameterSet12 (for device a)

- ..

Branch2

- ParameterSet 21 (for device b)

- ParameterSet 22 (for device b)

- ..

Selected device: "Device a"

1. "Load parameter set.." -> Load "ParameterSet11"

2. active device -> "device a"

or:

1. "Load parameter set.." -> Load "ParameterSet21"

2. active device ->„device b"

3. all further actions are carried out with device b.

8.3.2   View menu

View menu
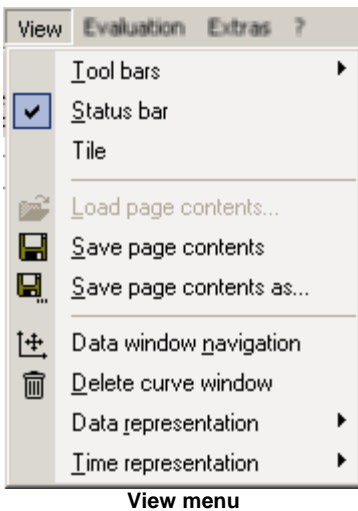
Toolbar, Status bar: Shows/hides these two interface elements.

Tile: Shifts the dividing border between the tree diagram and the editor. It's also possible to move the line directly by clicking it with the mouse and moving the mouse with its button held down.

Load/Save page contents (as): In some formulas, the content displayed (e.g. value limits) can be saved independently of the measurement task

Curve window navigation: Opens the toolbox, see Section Toolbox 161.

Delete curve window: See Section Working with the curve window 148.

Data representation: Affects the active window, e.g. by clicking in the curve window.

- Line: Default representation, samples are connected by straight lines

- Bar graph: Each sample is represented by a bar, suitable for histograms

- Table: Tabular representation of samples, suitable for events

- Bar (Histograms): Each sample is a bar and the x-unit is adapted for histograms.

Time representation: Time axis with relative or absolute time. Affects active curve window.

8.3.3   Evaluation menu
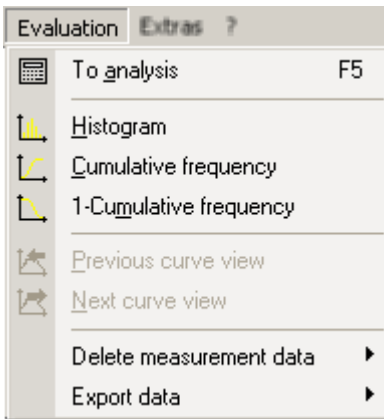
Evaluation menu

To analysis: Goes to the start page for data analysis

Histogram, (1-) Cumulative frequency, see Section Working with the curve window 148.

Previous/Next curve view: Moves to a different screen; see Working with the curve window 148

Delete measurement data: Deletes result data sets produced by the analysis. The data to be recorded are not affected. Either the currently displayed measurement or all evaluation results generated thus far can be deleted.

Delete measurement data:

Deletes temporary calculations and closes the measurement data sets which are open. In the process, recorded data are not deleted, but the currently displayed measurement or all evaluation results generated to date can be deleted. If the data evaluation is very elaborate, the large amount of measured data open can cause slowing of the PC's operation, so deleting and closing some data can be a remedy.

Export data:
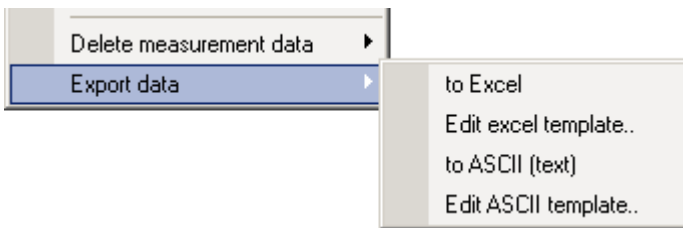
Evaluated measured data can be exported either in Excel format or as text files. The condition for Excel export is installation of Microsoft Excel.

Descriptions of the format templates for Excel 131 and ASCII 123 are presented further below.

8.3.3.1   ASCII Format (export template)

8.3.3.1.1 Overview

Waveforms can also be saved in a configurable ASCII-format and thus made accessible to other programs for further processing. It is also possible, for example, to save multiple waveforms together in a multi-column file, to record extra infos in a file header or in column title, as well as to define numerical formats and column separators.

Such a format definition is called an ASCII export template. A template is defined by the user with the help of a dialog, and saved under a permanent name.

When saving structured data types (segmented waveforms, waveforms with events, 2-component waveforms), the individual parts (channels, events, segments, components) are branched out in the display, appearing in respective rows.

8.3.3.1.2 Defining ASCII export templates

The template definition dialog offers controls for all settings necessary for complete definition of an ASCII export template. Because of the large amount of available options, the dialog is divided into different index cards.
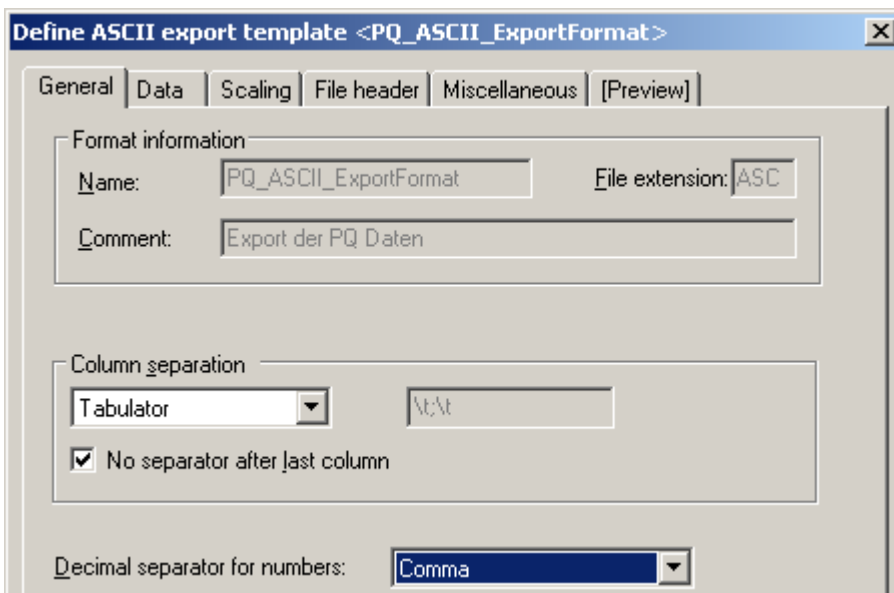
Dialog define ASCII export template

The division of the dialog also reflects the basic structure of an ASCII-file.

```
FAMOS ASCII export
Company: J. Doe Corp.      ①
Prepared by: J. Blow
Comment: Analysis
```

Date: 04/19/02 ②a	Name: Test1 ③a Unit: [V];	Name: Test2; Unit: [km/h];	Name: Test2 Unit: [km/h]
11:01:07;	0.0100;	142.0400;	
11:01:07;	0.0123;	;	12.5000
11:01:07;	0.1000;	167.5000;	15.3000
11:01:07;	0.1200;	;	9.2000
11:01:07;	0.4214;	189.2000;	7.1100
11:01:08;	0.9200;	;	5.1200
11:01:08;	1.2300;	195.2300;	1.2200
②b 11:01:08;	③b 3.0000;	;	0.0002
11:01:08;	6.1230;	205.1000;	0.0000
11:01:08;	15.2000;	;	−6.2000
11:01:09;	;	;	−15.2000

Example of an ASCII-file with 2 data sets

In general, it consists of a file header [1], which can contain a permanent text and/or general information. Next, the data set readings follow in adjacent columns [2], [3]. Each column, in turn, can have its own column header [2a], [3a], which can feature indications of the column contents, such as channel name, sampling rate, comments or similar things. Below the column header, the actual numerical values appear [2b], [3b]. The individual columns are separated by a defined separator; in this example, by a semicolon.

There is also a distinction between scaling columns [2] and readings columns [3]. A scaling column returns the scaling (e.g. the time axis) for all readings columns to its right. In the case of multi-column files, one scaling column at left can be valid for all subsequent readings columns, or each data set can come with its own scaling column, as illustrated in the example.

This basic structure determines what specifications are necessary for describing such a format.

- The index card **"General"** covers global settings such as column separators and the decimal character to use with numbers, along with export template specifications.

- The index card **"Data"** describes the structure of a readings column, including column header, column width and numerical format.

- Analogously, the index card **"Scaling"** controls the arrangement and format of the scaling column(s).

- The index card **"File header"** defines the introductory text at the beginning of a file.

- Under **"Miscellaneous"**, further options mainly affecting only special data types can be found.

- **"Preview"** enables you to see in advance how the format as currently defined is applied to sample data sets.

Once you have made all settings necessary, you can save the export template definitions to a file by hitting the **"Save"** button.

This file is stored in the default definitions folder. It bears the export template's name, plus the extension ".**aet**". If the "Save file"-dialog is opened, the definitions folder is searched and all export templates found are added to the format selection list.

The button **"Close"** exits the dialog. If you have made changes previously, a prompt appears asking you to confirm that the template changes are to be saved.

Defining ASCII export templates/ General

The index card **"General"** covers global settings such as column separators and the decimal character to use with numbers, along with export template specifications.

Dialog define ASCII export template / General

Name: PQ_ASCII_ExportFormat, not to be changed

File extension: ASC, not to be changed

Comment: not to be changed

Column separation

This group of options determines how individual columns are to be separated from each other. In the list box, you can first select a fixed separator character (Tab, semicolon, Space or comma), or "string".

If "String" is selected, you can enter a string in the adjacent input box. A tabulator can be entered as the special character '\t'. The string "\t;\t", for instance, sets the separator between two columns to be the combination <Tabulator>, semicolon, <Tabulator>.

If the option **"No separator after last column"** is selected, the last column remains open, meaning that it is not completed by the selected separator.

Decimal separator for numbers

Set here whether the decimal marker in numbers is a point (e.g. "3.142" or a comma ("3,142"). With the option "Automatic" active, the valid setting in the Windows Control Panel, under "Regional Settings/ Number" is used.

Defining ASCII export templates/ Data

This index on this index card affect the format of the data readings columns.

Dialog define ASCII export template / Data

Column header

In this input box, you can set the title appearing above each individual column of readings. This can be a combination of fixed text and placeholders. Such placeholders represent specific characteristic values belonging to the data set written in the respective column, and are filled with the current texts (e.g. name, comment, units) or numerical values (e.g sampling interval, length) upon saving. A placeholder can be recognized as a fixed designation surrounded by percent signs.

%NAME%, for instance, means the name, %YUNIT% the y-unit of the data set recorded. In the selection list at right, all placeholders defined are listed. Double-clicking on the desired entry (or selecting the entry and hitting the **[<<]**-button) copies the placeholder to the current cursor position in the input box.

You can also use the input box's context menu (called by right-clicking in the input box) to insert a placeholder. This also offers a list of available placeholders.

If no column header is needed, simply leave the input box empty (or completely delete its contents).

Minimum column width

Determines the minimum width a data column can have. If the actual contents are narrower than the specified width, the left side is filled with empty spaces and the contents are right-justified. However, if the actual contents are wider, they are still displayed entirely, and the column is widened for the purpose.

Numerical format

Here, you specify the numerical format and resolution of numerical output. You can choose among exponential notation (e.g. "1.23E3"), decimal notation ("123.4") and "Automatic". Automatic means, in this case, that the shortest possible notation is selected for the given numerical value. The "Digits" box is for entering the number of decimal places to be displayed.

Defining ASCII export templates/ Scaling

On this index card, you can find controls for positioning and formatting scaling columns.

Dialog define ASCII export template / Scaling

Scaling column

Here, you can set whether the file comes with any scaling column. In general, the scaling column states the x-position corresponding to a y-value (amplitude) in the data set; a frequent example is a time-axis. This is analogous to the portioning of the (horizontal) x-axis used in graphical data display. How the scaling column is created depends on the data type, according to the scheme below:

Normal (equidistantly sampled) data set	Generated from sampling interval/ pretrigger/ trigger time (or x-delta/x-offset)
XY-data set	The data set's X-component is used
Complex data sets	The frequency (for magnitude/ phase representation) or the independent parameter (for real/ imaginary part-representation)

[None]

No explicit scaling column is stored. This can be sensible if the information either isn't relevant or can be derived from other data in the file (e.g. if the sampling rate is specified in the column header of the data column). If this option is selected, all further input controls in this dialog are disabled.

[Common]

A common scaling column (at left) is created for all data sets stored. In consequence, it is possible that gaps can appear in the matrix of data columns if a certain data set has no value assigned to a particular x-position (in other words, there is no interpolation; the corresponding cell simply stays empty).

Thus, this display style is sensible only if all the data sets stored have the same scaling (because, for instance, they

all are derived from the same measurement with a common time base) or at least all cover approximately the same x-range.

[Per waveform]

Each data set receives its own scaling column, which appears at the left of its respective data column.

Column header

In this input box, you define a title which appears above each individual scaling column. To do so, you can combine fixed text with placeholders. Such placeholders denote specific values belonging to the data set and are filled upon data saving with the current strings (e.g. name, comment, units) or numerical values (e.g. sampling interval, length). A placeholder can be recognized as a permanent name bracketed from both sides by the "percent" character.

%NAME%, for example, denotes the name, and %YUNIT% the y-unit of the particular data set. In the list box at right, all placeholders already defined are listed. Double-clicking on the entry of the desired placeholder (or selecting the entry and hitting the button **[<<]**) copies the placeholder to the current input position in the input box.

You can also use the context menu (right mouse click) of the input box to insert a placeholder. This also presents a list of all available placeholders.

If no column header is needed, just leave the input box empty (or delete all the contents).
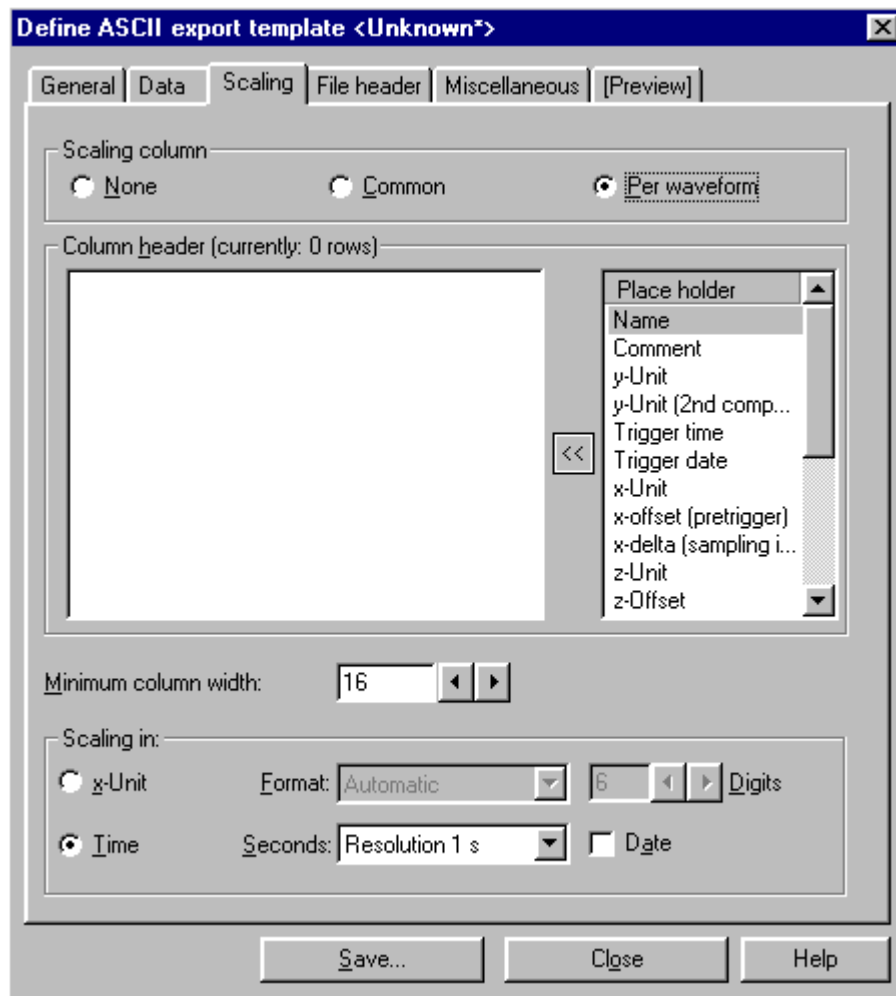
Minimum column width

Specifies the minimum width of the scaling column. If the current content is narrower than the specified width, the left side is filled with empty spaces and the content thus right-justified. If, however, the current content is wider, it is displayed in full and the column is widened accordingly.

Scaling in: x-Unit

The scaling corresponds to the data set's x-unit.

Here, you can set the numerical value and the resolution of the numerical values. You have a choice between exponential notation (e.g. "1.23E3"), decimal notation ("123.4") and "Automatic". Automatic means in this case that the shortest possible notation is used, which depends on what the particular numerical value is. In the 'Digits' box, you specify the number of decimal places to display.

Scaling in: Time

The scaling output is expressed as absolute time and date. This option, of course, only makes sense if data sets recorded over time and having "s" (seconds) as the x-unit are actually involved.

Seconds

Here you specify the resolution for the time display. "None" means display of the time of day in terms of "Hours: Minutes", for instance "23:11". For the setting "1 s", the seconds are also indicated ("23:11:59"), "100ms" also indicates tenths of seconds 1/10 ("23:11:59,4"), etc. The separator in front of the fractions of seconds (comma or point) depends on the current system setting for "Decimal symbol" (which is set in WindowXP, for instance, under "Settings/Control Panel/Region and Language Options/Regional Options/Customize").

Date

If this is selected, the date (in abbreviated form, e.g. "11.12.01") is output together with the time of day.

Defining ASCII export templates / File header

Here you can configure a file header to be entered at the beginning of the file to be saved.

Dialog define ASCII export template / File header

File header

Enter in this input box the text you wish to have at the beginning of the file. To do so, you can combine fixed text with placeholders. Such placeholders denote specific values belonging to the data set and are filled upon data saving with the current strings (e.g. name, comment, units) or numerical values (e.g. sampling interval, length). In the case of placeholders referenced to data-sets, the first data set's characteristic values are used in the file, if multiple data sets are stored.

A placeholder can be recognized as a permanent name bracketed from both sides by the "percent" character.

%NAME%, for example, denotes the name, and %YUNIT% the y-unit of the particular data set. In the list box at right, all placeholders already defined are listed. Double-clicking on the entry of the desired placeholder (or selecting the entry and hitting the button **[<<]**) copies the placeholder to the current input position in the input box.

You can also use the context menu (right mouse click) of the input box to insert a placeholder. This also presents a list of all available placeholders.

If no file header is needed, just leave the input box empty (or delete all the contents).

You can also divide the file header into multiple columns. To do this, use the arrow buttons associated with the "Current column" control, in order to add a column or to switch to another column. Empty columns are "optimized" away upon saving and therefore do not need to be explicitly deleted.

Defining ASCII export templates / Miscellaneous

This index card offers additional options mainly interesting only for special data types.

Dialog define ASCII export template / Miscellaneaous

Switch rows/ columns

The rows of the data matrix are switched with its columns, including the column header, which means that what once was the first row becomes the first column. This option makes most sense in the case of segmented waveforms (matrices), for instance. If the option is deactivated, then for a segmented waveform, each segment is written to its own column, but if this option is activated, the values belonging to a single segment are written side by side in a row.

Ignore phase in magnitude-phase waveforms

If this option is selected, then only the magnitude component of complex data sets in magnitude/phase representation is saved.

Placeholder for channel name

These options affect how the placeholder for the channel name %NAME% is interpreted in file or column headers.

Prefix group name

In data sets belonging to groups, the group name is placed before the channel name (and is separated from it by a colon).

Append segment/ event index

In the case of segmented or event-based waveforms, each column contains one event or segment. If this option is active, the index of the current segment/event is appended (in square brackets). The setting is ignored if the placeholder is positioned in the file header or in the header for a common scaling column.

Append component identifier

In the case of complex or XY-data sets, one component per column is stored. If this option is active, the standard component tag in FAMOS is appended, e.g. ".M" for a complex data set's magnitude or ".X" for the X-component of an data set. The setting is ignored if the placeholder is positioned in the file header or in the header for a common scaling column.

Defining ASCII export templates / Preview

The effect of the currently valid settings is demonstrated by applying them in a preview based on already provided sample data sets.
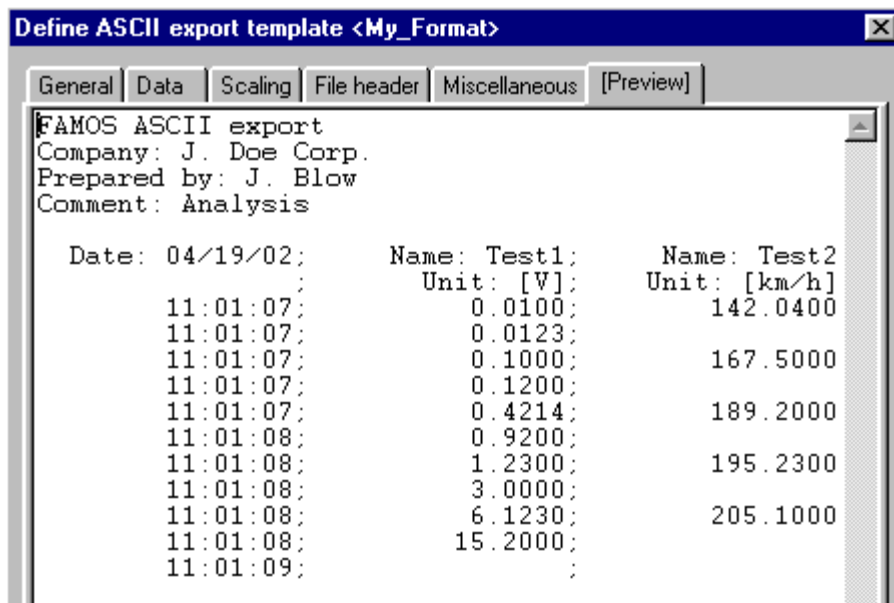
ASCII export template definition dialog / Preview

Thus, this provides help in predicting the results of the settings you make.

8.3.3.2 Excel (XLS)-Format

8.3.3.2.1 Overview

This functionality is only available to FAMOS if Microsoft ® Excel is installed on the same system. The program versions Excel 95 to Excel 2007 are supported.

XLS-format is the default file format for the widely circulated spreadsheet program Microsoft ® Excel. If Excel is installed parallel to FAMOS, XLS-files can be exported by FAMOS directly. For this purpose, Excel is remotely controlled by a mechanism called "OLE-Automation". Excel is started in the background, advised to receive the data from FAMOS and to store the file and is finally closed again.

Constraints

- Excel can only administer a limited number of data sets of limited length. The maximum number of rows (=maximum length of a data set) **is limited to 65536 values** (Excel 95: 16384 values). The **maximum number of columns is 256** (= number of data sets which can be transferred).

- Only one table per XLS-file can be exported.

- Only data sets (not text variables) can be exported.

- Note also that there are different versions of the XLS-format. Excel 95, for instance, cannot read XLS-files saved in Excel 2000 format.

When saving structured data types (groups, event-based and segmented waveforms, 2-component data sets), the individual parts (channels of the group, events, segments, components) are extracted and written out each in its own column.

Data export in XLS-format comes with many configuration options. Naturally, it is possible to save multiple data sets together in a table with multiple columns. A table header, column titles and scaling column(s) all can also be defined.

Such a format definition is called an XLS export template. A included template can be changed by the user with the help of a dialog.

Technically, there is no difference between an XLS export template and an ASCII export template. Only the number of settings available is different, since some specifications needed for ASCII-export are not necessary for Excel-export.

8.3.3.2.2 Defining EXCEL export templates

The template definition dialog offers controls for all settings necessary for complete definition of an EXCEL export template. Because of the large amount of available options, the dialog is divided into different index cards.
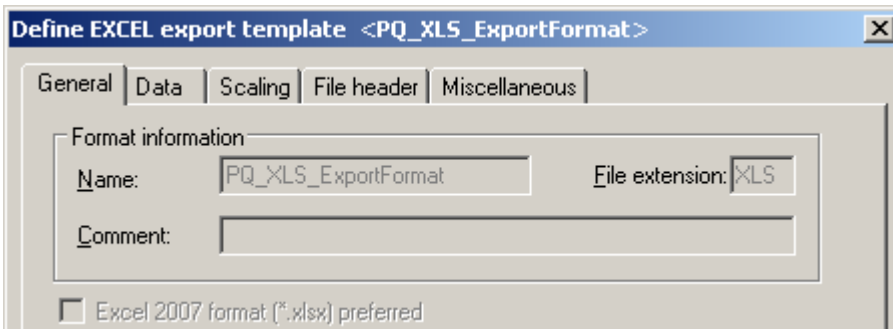
Dialog: Define EXCEL export template

The division of the dialog also reflects the basic structure of an `XLS-file:

Example of an EXCEL-file with 2 data sets

In general, it consists of a file header [Cells A1 to A5], which can contain a permanent text and/or general information. Next, the data set readings follow in adjacent columns. Each column, in turn, can have its own column header [Cells 6 to 8], which can feature indications of the column contents, such as channel name, sampling rate, comments or similar things. Below the column header, the actual numerical values appear [starting at Row 9].

There is also a distinction between scaling columns [Columns A and C and readings columns [Columns B and D]. A scaling column returns the scaling (e.g. the time axis) for all readings columns to its right. In the case of multi-column files, one scaling column at left can be valid for all subsequent readings columns, or each data set can come with its own scaling column.

This basic structure determines what specifications are necessary for describing such a format.

- The index card **"General"** covers global settings such as column separators and the decimal character to use with numbers, along with export template specifications.

- The index card **"Data"** describes the structure of a readings column, including column header, column width and numerical format.

- Analogously, the index card **"Scaling"** controls the arrangement and format of the scaling column(s).

- The index card **"File header"** defines the introductory text at the beginning of a file.

- Under **"Miscellaneous"**, further options mainly affecting only special data types can be found.

Once you have made all settings necessary, you can save the export template definitions to a file by hitting the **"Save"** button.

This file is stored in the default definitions folder. It bears the export template's name, plus the extension "**.aet**". If the

"Save file"-dialog is opened, the definitions folder is searched and all export templates found are added to the format selection list.

The button **"Close"** exits the dialog. If you have made changes previously, a prompt appears asking you to confirm that the template changes are to be saved.

Defining EXCEL export templates/ General

This page presents the designation of the export template.
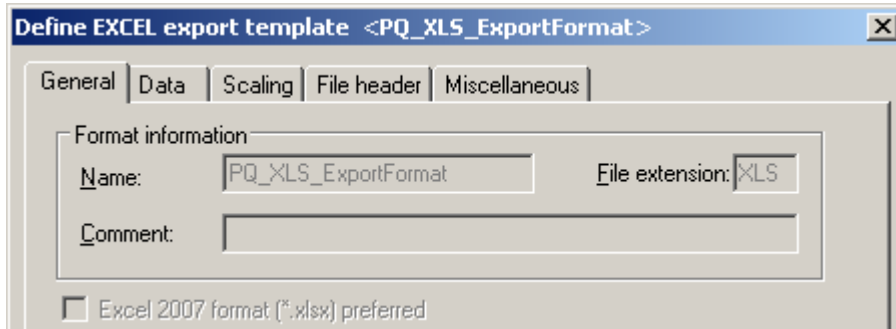
Dialog: Define Excel export template/ General

Defining EXCEL export templates/ Data

This index on this index card affect the format of the data readings columns.

Dialog: Define Excel export template/ Data

Column header

In this input box, you can set the title appearing above each individual column of readings. This can be a combination of fixed text and placeholders. Such placeholders represent specific characteristic values belonging to the data set written in the respective column, and are filled with the current texts (e.g. name, comment, units) or numerical values (e.g. sampling interval, length) upon saving. A placeholder can be recognized as a fixed designation surrounded by percent signs.

%NAME%, for instance, means the name, %YUNIT% the y-unit of the data set recorded. In the selection list at right, all placeholders defined are listed. Double-clicking on the desired entry (or selecting the entry and hitting the **[<<]**-button) copies the placeholder to the current cursor position in the input box.

You can also use the input box's context menu (called by right-clicking in the input box) to insert a placeholder. This also offers a list of available placeholders.

If no column header is needed, simply leave the input box empty (or completely delete its contents).

Defining EXCEL export templates/ Scaling

On this index card, you can find controls for positioning and formatting scaling columns.

Dialog: Define Excel export template/ Scaling

Scaling column

Here, you can set whether the file comes with any scaling column. In general, the scaling column states the x-position corresponding to a y-value (amplitude) in the data set; a frequent example is a time-axis. This is analogous to the portioning of the (horizontal) x-axis used in graphical data display. How the scaling column is created depends on the data type, according to the scheme below.

Normal data set (equidistantly sampled)	Generated from sampling interval/ pretrigger/ trigger time (or x-delta/x-offset)
XY-data set	The data set's X-component is used
Complex data sets	The frequency (for magnitude/ phase representation) or the independent parameter (for real/ imaginary part-representation)

[None]

No explicit scaling column is stored. This can be sensible if the information either isn't relevant or can be derived from other data in the file (e.g. if the sampling rate is specified in the column header of the data column). If this option is selected, all further input controls in this dialog are disabled.

[Common]

A common scaling column (at left) is created for all data sets stored. In consequence, it is possible that gaps can appear in the matrix of data columns if a certain data set has no value assigned to a particular x-position (in other words, there is no interpolation; the corresponding cell simply stays empty).

Thus, this display style is sensible only if all the data sets stored have the same scaling (because, for instance, they all are derived from the same measurement with a common time base) or at least all cover approximately the same x-range.

[Per waveform]

Each data set receives its own scaling column, which appears at the left of its respective data column.

Column header

In this input box, you define a title which appears above each individual scaling column. To do so, you can combine fixed text with placeholders. Such placeholders denote specific values belonging to the data set and are filled upon data saving with the current strings (e.g. name, comment, units) or numerical values (e.g. sampling interval, length). A placeholder can be recognized as a permanent name bracketed from both sides by the "percent" character.

%NAME%, for example, denotes the name, and %YUNIT% the y-unit of the particular data set. In the list box at right, all placeholders already defined are listed. Double-clicking on the entry of the desired placeholder (or selecting the entry and hitting the button **[<<])** copies the placeholder to the current input position in the input box.

You can also use the context menu (right mouse click) of the input box to insert a placeholder. This also presents a list of all available placeholders.

If no column header is needed, just leave the input box empty (or delete all the contents).

Scaling in: x-Unit

The scaling corresponds to the data set's x-unit.

Scaling in: Time

The scaling output is expressed as absolute time and date. This option, of course, only makes sense if data sets recorded over time and having "s" (seconds) as the x-unit are actually involved.

The time values are converted to EXCEL time format and transferred. Then the EXCEL-column's numerical format us set as time (see EXCEL menu item "Format/ Format cells/ Numbers").

Be aware that time statements in EXCEL only have a resolution of approx. 10ms. If your time axis has a finer resolution, the precision will be reduced upon saving.

Seconds

Here you specify the resolution for the time display. "None" means display of the time of day in terms of "Hours: Minutes", for instance "23:11". For the setting "1 s", the seconds are also indicated ("23:11:59"), "100ms" also indicates tenths of seconds 1/10 ("23:11:59,4"), etc.

Date

If this is selected, the date (in abbreviated form, e.g. "11.12.01") is output together with the time of day.

The two specifications Seconds and Date, then, only determine the numerical format displayed initially. The display in EXCEL can be edited later (menu item "Format/ Cell").

Defining EXCEL export templates / File header

Here you can configure a file header to be entered at the beginning of the file to be saved.

Dialog: Define Excel export template/ File header

File header

Enter in this input box the text you wish to have at the beginning of the file. To do so, you can combine fixed text with placeholders. Such placeholders denote specific values belonging to the data set and are filled upon data saving with the current strings (e.g. name, comment, units) or numerical values (e.g. sampling interval, length). In the case of placeholders referenced to data-sets, the first data set's characteristic values are used in the file, if multiple data sets are stored.

A placeholder can be recognized as a permanent name bracketed from both sides by the "percent" character.

%NAME%, for example, denotes the name, and %YUNIT% the y-unit of the particular data set. In the list box at right, all placeholders already defined are listed. Double-clicking on the entry of the desired placeholder (or selecting the entry and hitting the button **[<<])** copies the placeholder to the current input position in the input box.
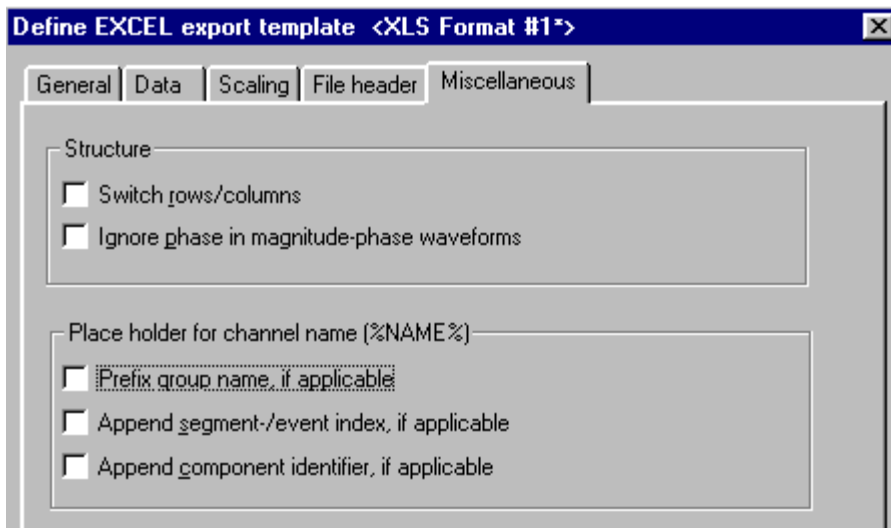
You can also use the context menu (right mouse click) of the input box to insert a placeholder. This also presents a list of all available placeholders.

If no file header is needed, just leave the input box empty (or delete all the contents).

You can also divide the file header into multiple columns. To do this, use the arrow buttons associated with the "Current column" control, in order to add a column or to switch to another column. Empty columns are "optimized" away upon saving and therefore do not need to be explicitly deleted.

Defining EXCEL export templates / Miscellaneous

This index card offers additional options mainly interesting only for special data types.

Switch rows/ columns

The rows of the data matrix are switched with its columns, including the column header, which means that what once was the first row becomes the first column. This option makes most sense in the case of segmented waveforms (matrices), for instance. If the option is deactivated, then for a segmented waveform, each segment is written to its own column, but if this option is activated, the values belonging to a single segment are written side by side in a row.

Ignore phase in magnitude-phase waveforms

If this option is selected, then only the magnitude component of complex data sets in magnitude/phase representation is saved.

Placeholder for channel name

These options affect how the placeholder for the channel name %NAME% is interpreted in file or column headers.

Prefix group name

In data sets belonging to groups, the group name is placed before the channel name (and is separated from it by a colon).

Append segment/ event index

In the case of segmented or event-based waveforms, each column contains one event or segment. If this option is active, the index of the current segment/event is appended (in square brackets). The setting is ignored if the placeholder is positioned in the file header or in the header for a common scaling column.

Append component identifier

In the case of complex or XY-data sets, one component per column is stored. If this option is active, the standard component tag in FAMOS is appended, e.g. ".M" for a complex data set's magnitude or ".X" for the X-component of an

data set. The setting is ignored if the placeholder is positioned in the file header or in the header for a common scaling column.

8.3.4   Extras menu
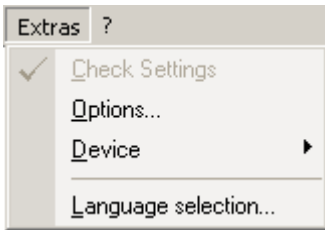
Check Settings:

> Plausibility check of the current fill-out form's settings. All parameters are checked. Faulty entries are indicated in a messaged. Mainly used in configuring a measurement.
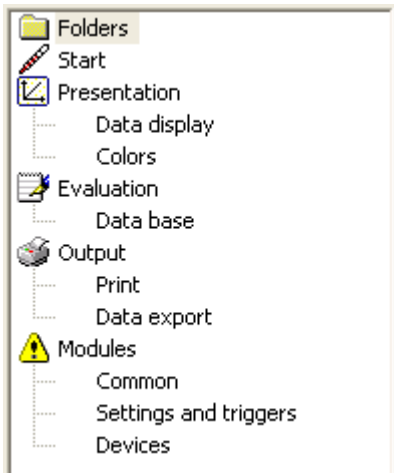
8.3.4.1 Options

Dialog for setting a variety of basic options which need not be set for each measurement separately. Total overview of the parameter ranges which are explained in detail further below.

All settings changed are applied in the configuration when the dialog is closed or after pressing the button *Apply*.

Folders:

> All folders required for the program.

Measured data path:

> Storage area for measured data.

Analysis database:

> Database to which the analysis results are saved.
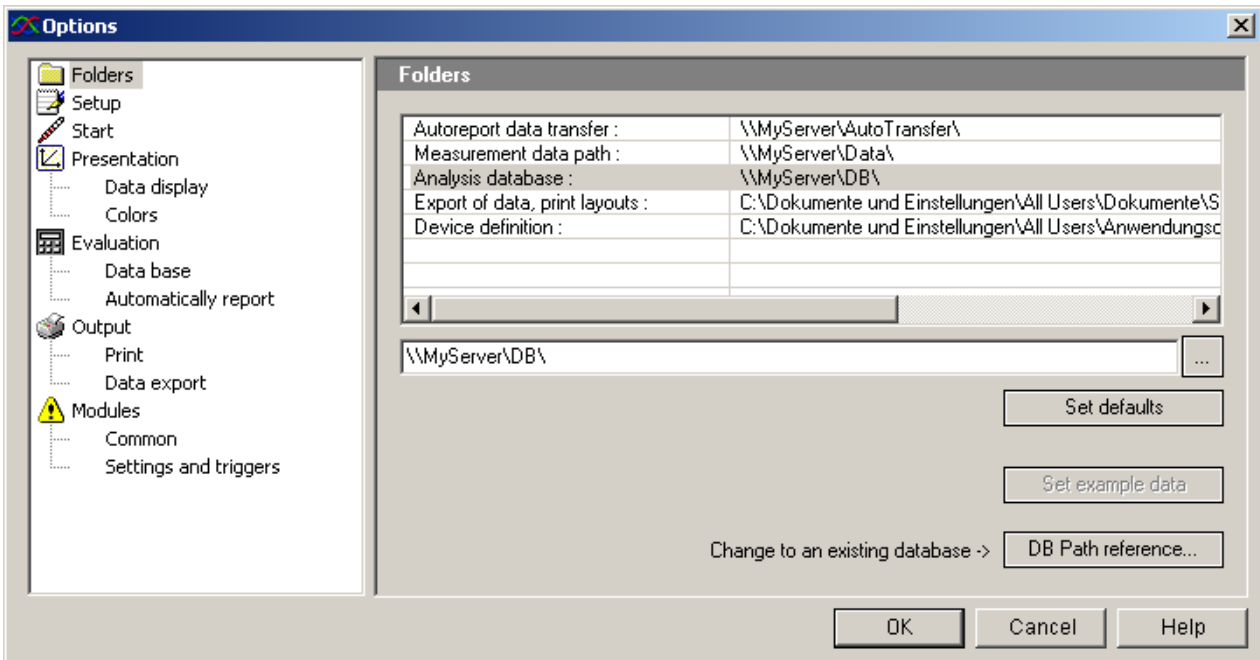
Inrush data path:

> Storage area for the test measurement data.

Export of data, reports to:

> Storage area for reports and exported data.

> For the purpose of gaining familiarity with the program, a sample measurement was included with the installation, which can be accessed by means of the button *Set example data*.

8.3.4.1.1 Options - Folders

- *Measurement data path:* Folder for storing the measured data. This path can also be changed when setting up a new measurement task. If many measurement devices are connected, ensure that there is adequate free memory on this drive, for instance by selecting a data server.


Important Note

Always provide a unique name for a measurement assignment. If a device's measurement assignment is copied to another device, the folder path is identical for both devices. In the analysis of all devices, any measured results with the same designation would overwrite each other.

- *Analysis database:* Folder for storing the database for administering the measurements and analyses performed. The maximum file size for a database is currently 2 GByte. For instance, if test measurements with many triggers are carried out, it may be necessary to change databases (more than 1 000 000 events).

- *Inrush data path:* Folder for the storage of the measurement description and of measured data for the inrush analysis

- *Export of data, print layouts to:* Folder for the storage of various temporary files. (Storage of reports, export of curve windows)

- *Device definition*: Folder in which the device definitions are saved. If multiple devices are being controlled by different PCs, iit is advantageous for all PCs to access one single list of the device pool.
Note: Newly added devices are displayed on the other PCs only after restarting the software *POLARES operating software*.

- *Path reference*: The database contains the base directory path for the measured data. When you access this database, then from the standpoint of your PC the data are on a different drive. Using this dialog, you can set up a link between these paths. Example:

    PC1:   Database path: *"C:\Documents\DB"*
                Data path: *"C:\Documents\Data"*
                In the database there is a reference to the current data path "C:\Documents\Data"

    PC 2:   DB path, new: *//Common_PC1/DB"*
              Data path, new: *"//Common_PC1/Data"*
              Since the database is still referring to the original path "C:\Documents\Data", you must make a line of the following type:
              Original path: *"C:\Documents\Data"*
              New path: *//Common_PC1/Data"*
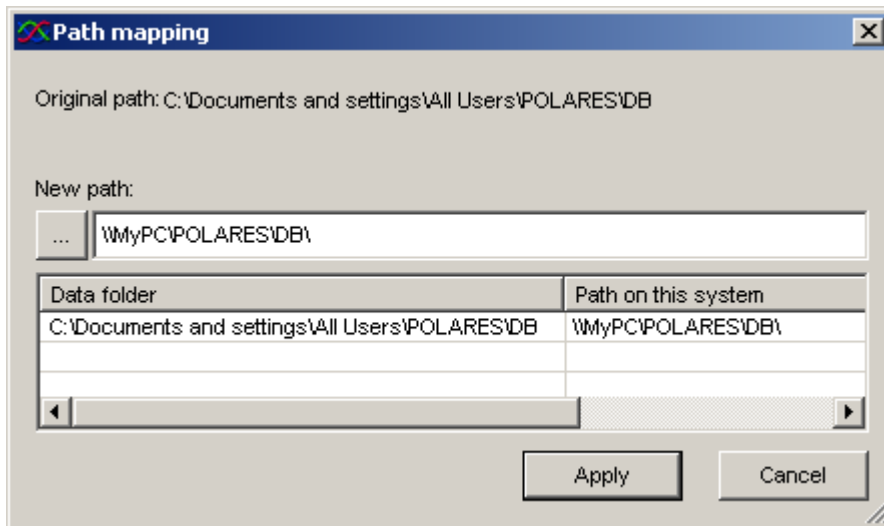
All data having a database reference to "C:\Doc..\All Users\Documents\imcPOLARES\Test\Data" are searched for in \\MyServer\MyCompany\\Saving\Data".

Changing to a different folder

- Select the folder to change

- Enter a new path. The change once applied will be displayed in the list. When the dialog is closed with *OK*, the existence of the folders is verified.

- By clicking on the button *Browse....* In the folder dialog which then appears, it's possible to set up a new path.
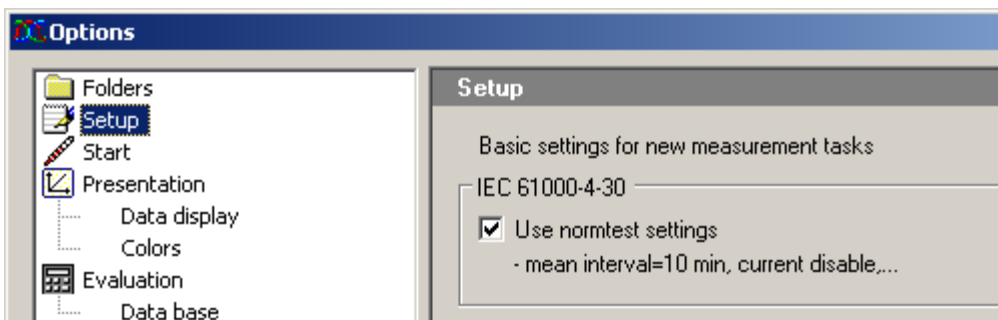

Other commands:

- *Set defaults:* Sets the default paths.

- *Set example data:* Sets the default paths for installation of the sample data.

Note

- The path for measured data can be changed independently of the database folder.
- Comparisons of measured data saved in different databases are not possible.<u>Start</u>: Global option upon starting the program.

8.3.4.1.2 Options - Setup

Options - Setup

If the option *Use normtest settings* is active, the measurement is only used in compliance with the standard IEC 61000-4-30. Other measurement quantities are not investigated.
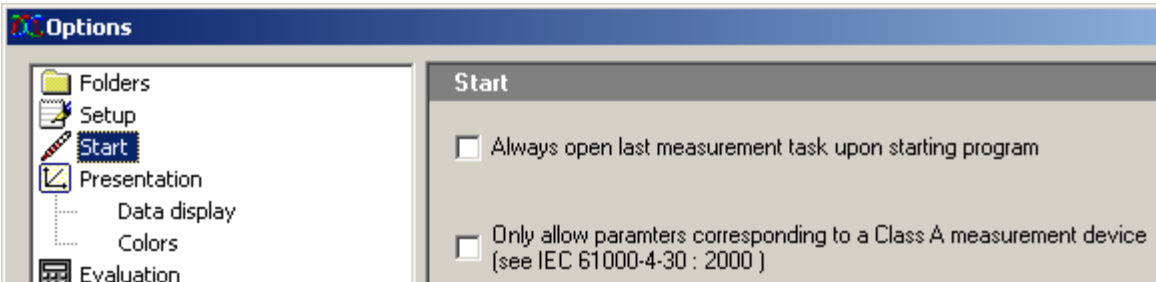
For instance, in this case, no current measurement is performed. The aggregation interval is set permanently to 10 min. Additionally, the aggregation over 3s, 10min and 2h are displayed.

Note

If this option was selected during installation of the software, additional <u>online displays</u> ⌐70⌐ are available.

8.3.4.1.3 Options - Start

Global option upon starting the program.

Program start settings

- Upon starting *POLARES operating software*, the configuration last used is loaded automatically.

- Class A measurement device as per the standard 61000-4-30 (Among other things: measurement start only at multiples of 10 minutes. If a radio clock is used, data originating from different measurement devices can be compared sample-by sample.)
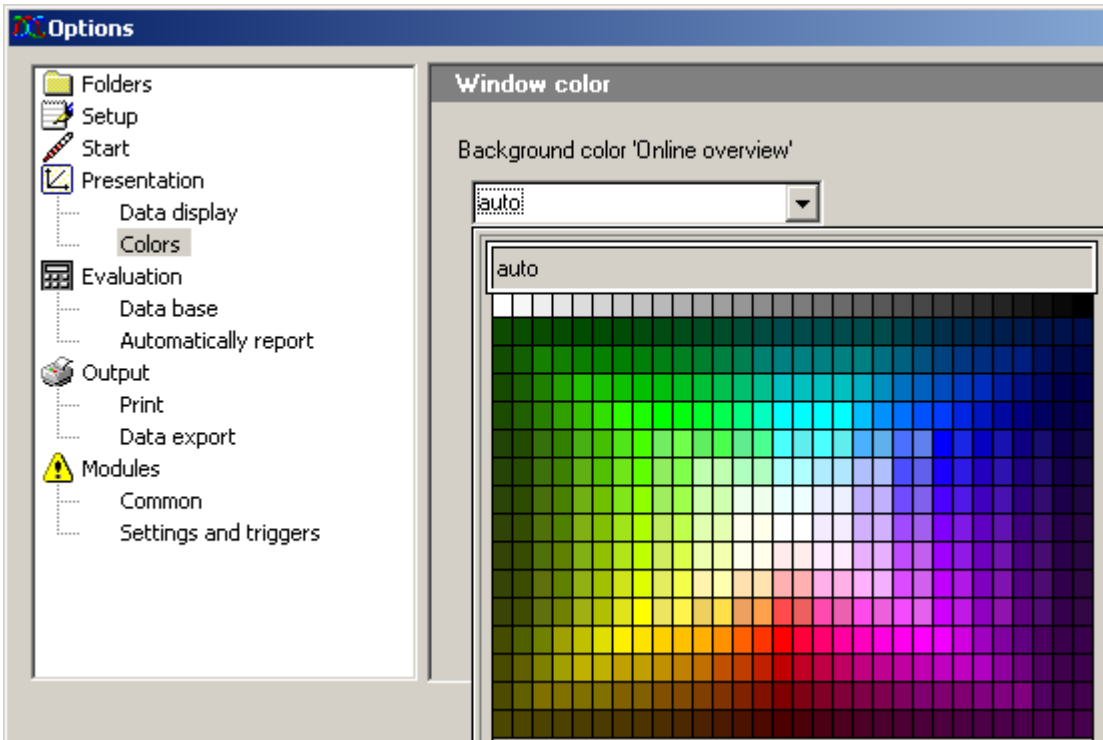
8.3.4.1.4 Options - Presentation

Presentation / Data display: Settings for the data display
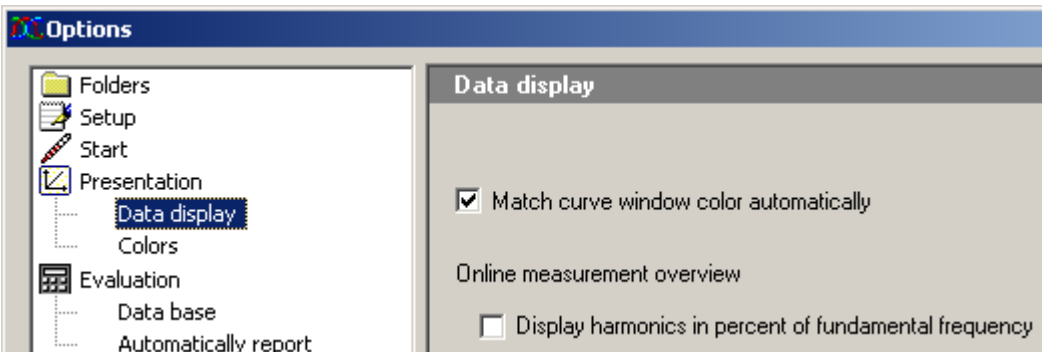
Online Measurement overview: the upper harmonics can be displayed with their measurement unit (V or A) or in relation (as percent) to the fundamental harmonic.

*Presentation / Data colors:* Settings for the window color

Background of Online view: Colors from the palette are available for selection as the Online view background.

8.3.4.1.5 Options - Evaluation

Settings for evaluation and measurement data comparison.

Data base

To avoid an overflow in the tree diagram, you can specify a maximum amount of *retained search results*. The option *Maximum number of entries per result* refers to table entries per search result. The default setting is the display of the results of the last three searches having up to 100 data sets each.
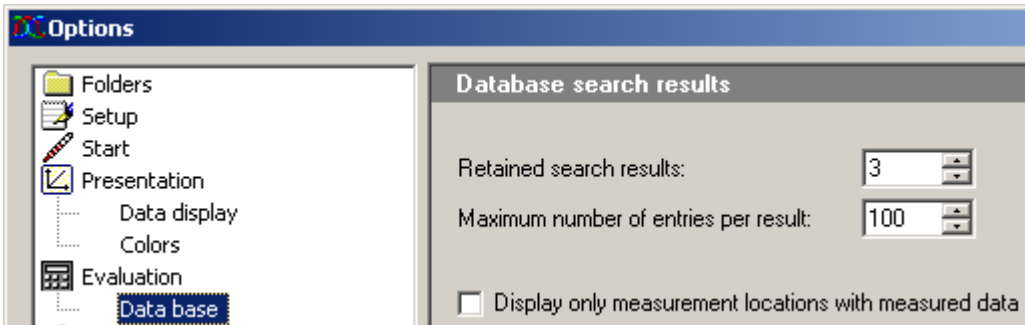
Database search results

  Retained search results:

- Number of results lists to remember/ display.

- In the left window, the measurement channels of the last n searches are displayed. The respective oldest result is deleted when the maximum amount has been reached.

Maximum number of entries per result

- Maximum number of search results to list. If more than m channels are found, the search for m results is aborted.

- Often, a high amount of results is caused by a search question which is too general, and not a desirable outcome. Additionally, the processing time is increased along with the demands on system resources.

Display only measurement locations with measured data: Measurement locations without measured data will not be listed.

Automated report

The *Automated report* enables cyclical evaluation of the data from the measurement device connected.
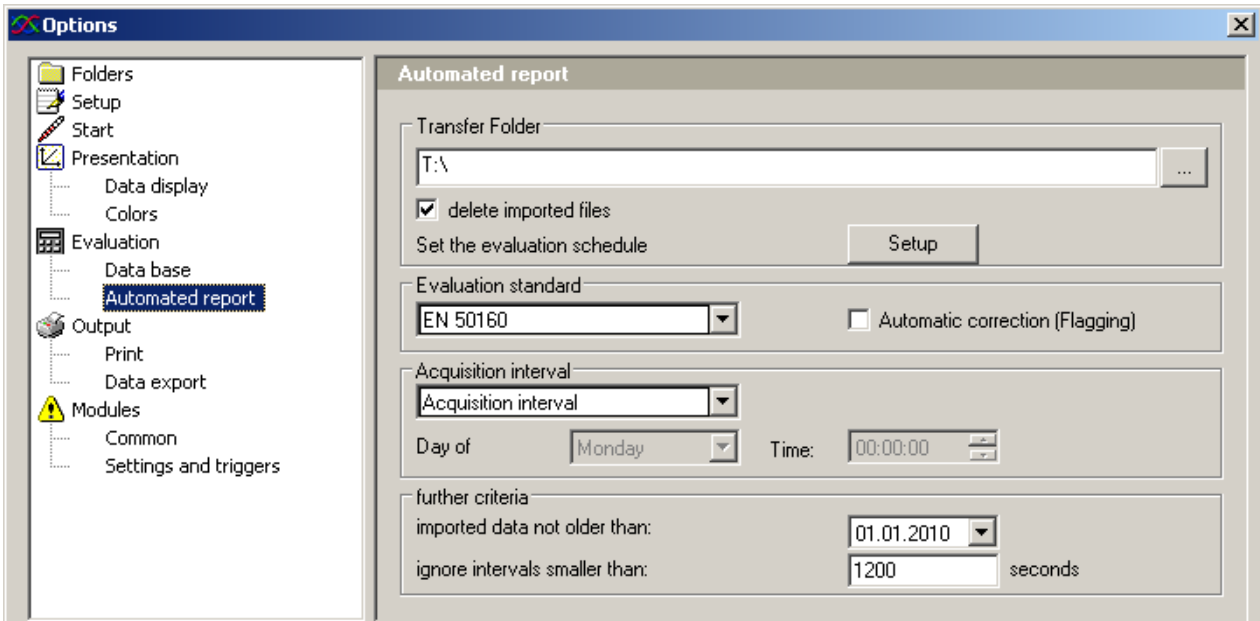
Transfer folder

- Temporary folder for measured data. This folder can also be a network folder. After processing, measured data and the report composed are saved in the measurement database 100. Note that the user must possess writing authorization for this folder!

- With *delete imported files*, the data are deleted from the Transfer folder as soon as they are saved to the measurement database.

Evaluation standard: Selects the standard used in making the calculation. In the selection box, the same templates are listed as the ones created for the normal evaluation 80.

Automatic correction (Flagging): Automatic correction according n 82orm IEC 61000-4-30.

Set the evaluation schedule: Starts the WINDOWS Task-Planner. Add the call for the Automated Report here: InstallationPath\imcPOLARES.exe /R, e.g. "C:\imc\imcPOLARES\imcPOLARES.exe /R". A detailed description is provided in the appendix under Autoreport.

*Acquisition interval*: =Available options include *Acquisition interval* (according to measurement cycles 59 set), *weekly* which includes the day of the weenk and the clock time and finally *daily* with the clock time.

further criteria: Here you can limit the evaluation to recently captured measurements. Additionally, *ignore intervals smaller than* enables short test measurements to be disregarded.

8.3.4.1.6 Options - Output

8.3.4.1.6.1 Print

This dialog is for setting parameters for the printout process. *POLARES operating software* uses the device defined as the standard printer in the Windows system. Thus, the printer's settings can be made directly as part of the Windows settings.
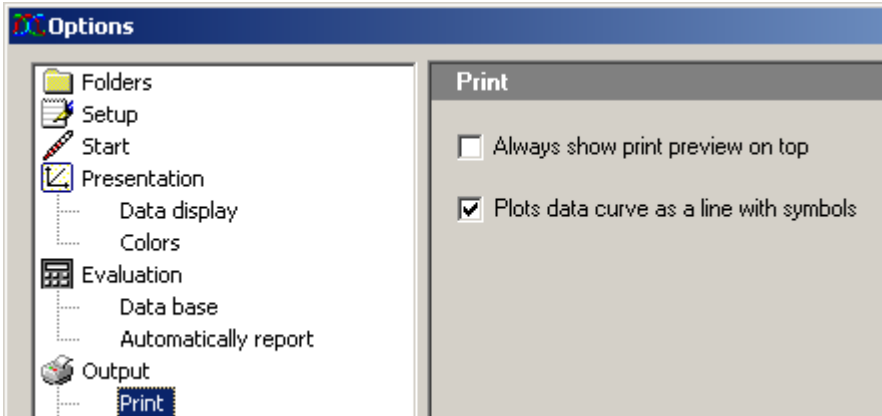
Special settings for printout of the measured data by *POLARES operating software*:

Always show print preview on top

- With the help of the imc POLARES Report Generator, you can compose printed reports incorporating data curves, texts and other external data and images.

- For ease of using Drag & Drop to deposit the measured data on the printout, the Report Generator can be kept in the foreground without being covered over and over again by the *POLARES operating software* application (e.g. in the maximized mode).

Plots data curve as a line with symbols

- If multiple measurement curves are to be printed on one page, different symbols can be used to differentiate the curves' data.

- Alternatively to using symbols, it's possible to use a color printer.

8.3.4.1.6.2 Data export

The print layouts generated using *POLARES operating software* can be exported and subsequently imported to another document. On this dialog page, the export format to use is set.
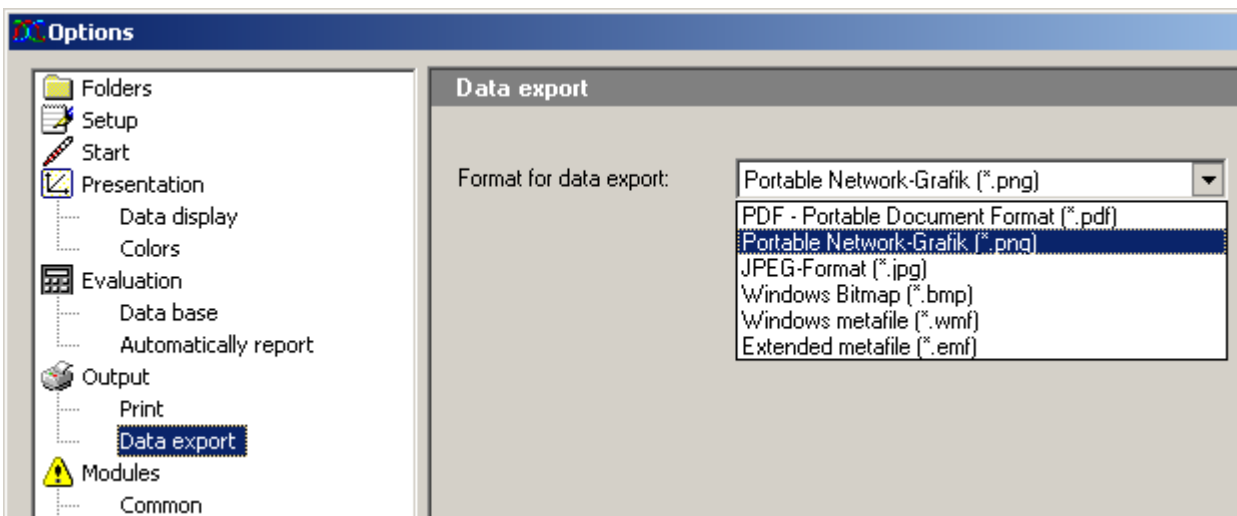
8.3.4.1.7 Options - Modules

8.3.4.1.7.1 Common

*POLARES operating software'*s user interface can be adapted to a variety of user profiles. This dialog is used to show/ hide the parameter setting pages.
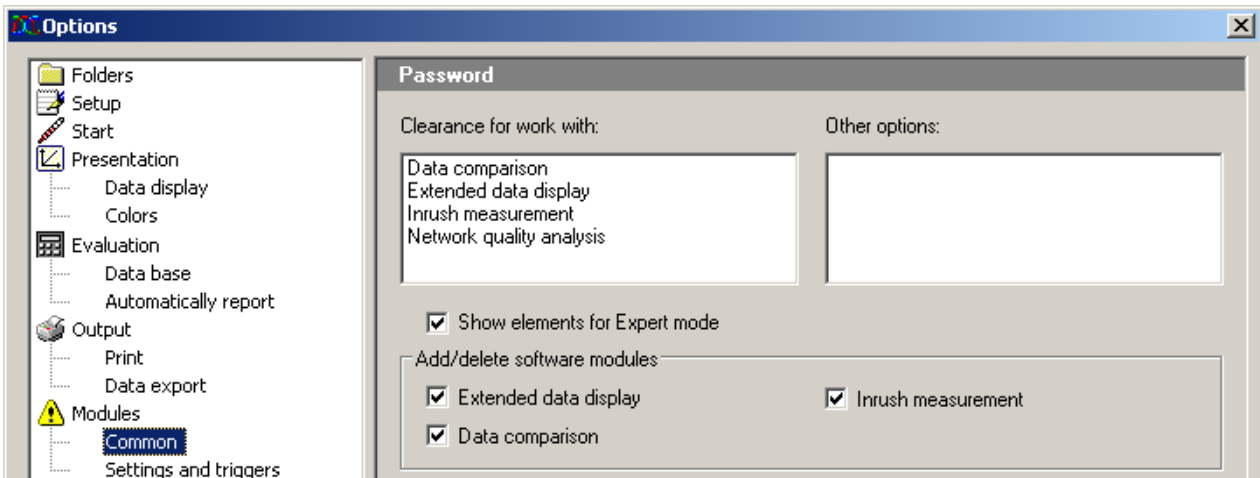
By changing this page's settings, entries in the task tree diagram (left side of the *POLARES operating software* program interface) are deleted/ added.

Extended data display: If the box is not checkmarked, only the most important controls required for operation are displayed.

The following optional elements are not part of the standard configuration of *POLARES operating software* and may therefore either be missing or not enabled.

- *Data comparison*

- *Inrush measurement*

8.3.4.1.7.2 Settings and triggers

In *POLARES operating software*, various settings dialogs can be disabled.
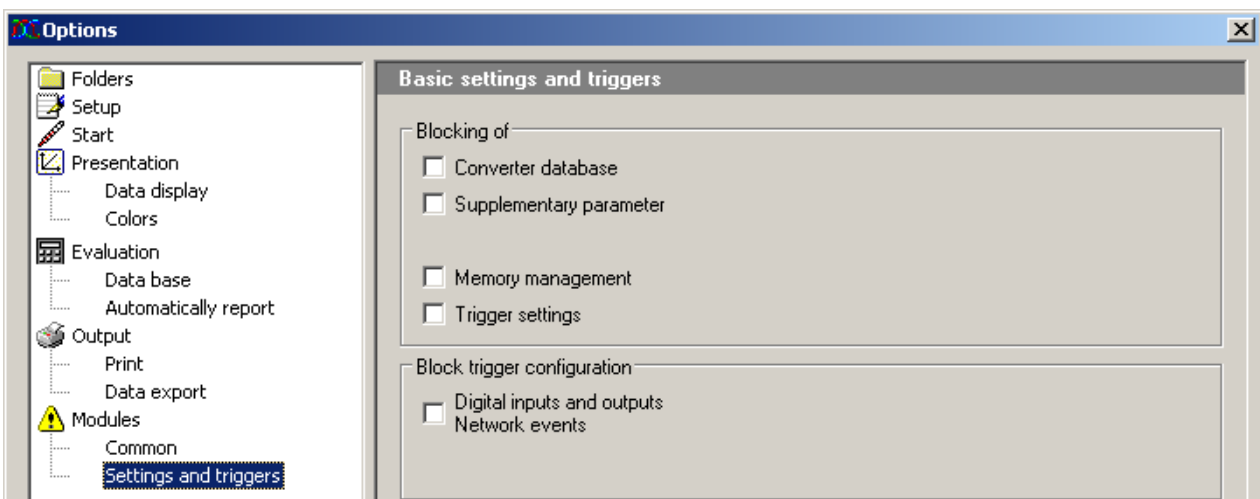
By making changes made on this page, basic settings and triggers in the task tree diagram (left side of the *POLARES operating software* program interface) can be enabled/ disabled. If any pages are disabled in the Options dialog, they are omitted from the work procedure. If the disabling of certain pages is later cancelled, the pages only appear again once *POLARES operating software* is restarted*.*

8.3.4.1.7.3 Devices
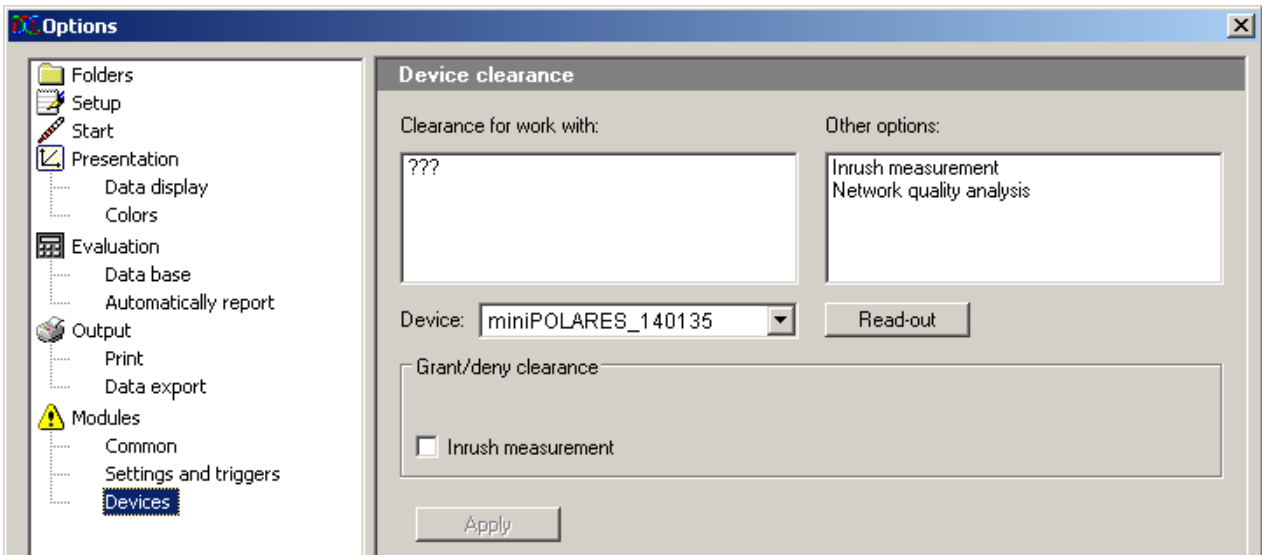
This dialog serves the purpose of displaying the measurement options which are enabled. For instance, the inrush analysis can be enable by means of a password.

Once a clearance (enabling) state has been changed, the program must be restarted!

8.3.4.2 Device

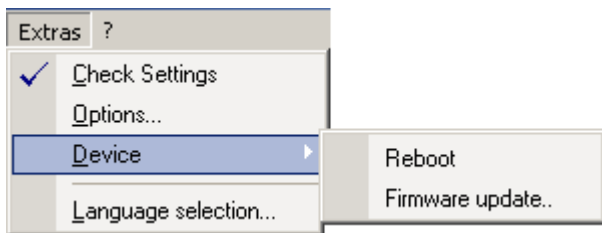**Reboot** (warm start): Restarts the device.

Firmware Update: The dialog for performing the firmware update is opened; also see the section of the operating instruction section: *Assembly, Commissioning, Parameterization \ Commissioning \ Firmware-Update*

8.3.5 ?-menu

Information dialog for displaying the current software versions.

Using the links (assuming an existing Internet connection), it's possible to jump to the *imc POLARES* homepage, or send and email to the *imc POLARES* Customer Support.

The link "*imc-Hotline problem report*" automatically appends a file generated by *POLARES operating software* to the email which aids Customer Support in processing issues. The file notes the *POLARES operating software* software version, the version of the operating system used as well as the errors which occurred.

8.4 Toolbar

The main dialog's toolbar can be shown or hidden via the *View* menu.
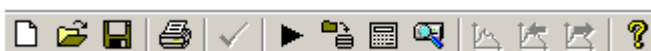
In addition to this toolbar, many display dialogs for individual process steps, such as *Measure* or *Analysis,* come with an extra toolbar offering functions pertaining to the respective process step.

The toolbars contain both functions for direct access (e.g. Load, Save, Print), as well as functions which only work in conjunction with an object (e.g. a curve).

Moving the mouse cursor over a toolbar icon causes a tool tip to be displayed, in which the tool's function is briefly described.

A new feature is the ability to **drag an object to a tool icon with the mouse** in order to apply the corresponding function.

8.4.1   Mouse operation

In an *imc POLARES* network analysis, the mouse is practically a virtual hand. All operations can be performed using the mouse. This is as easy as can be; the workings of most functions can be logically guessed based on the particular situation faced. What you are most likely to expect is what your actions actually accomplish:

For instance, move the mouse to a box in the input form in order to fill it in. Grab a curve with the mouse and place it in the curve window. Take a curve out of the curve window and drop it in the waste bin.

8.4.2   Forms

Setting parameters is accomplished by filling out forms which are later printed out.

Numbers or texts

Clicking on the text causes the box to either expand into a list of several options or to an input box with a cursor, into which you can write directly

Click inside the input field opens a combo box

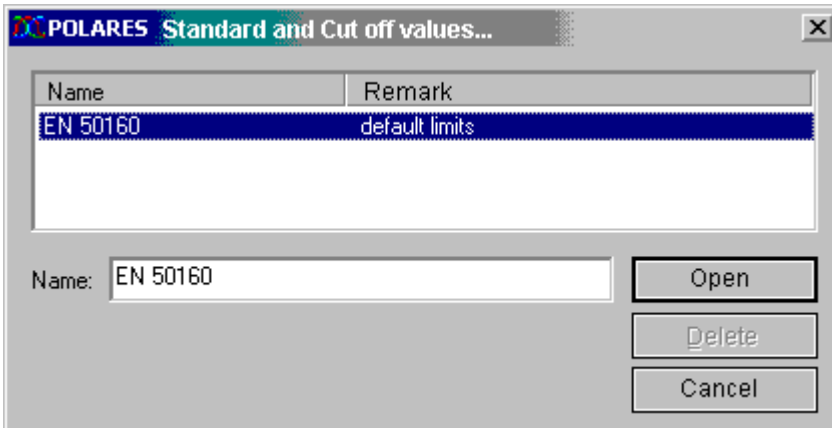### Checkboxes

De/activate a checkbox by clicking the mouse on it.

Saving/Loading entries

Forms can be saved or loaded via the menu item *View ⇒ Page contents*. A corresponding selection dialog appears. Alternatively for some form pages, there is a Load/Save button in the toolbar on the right side.

Example of a selection dialog for loading nominal and cutoff values in the evaluation

8.4.3   Printouts

All functions of the user interface which involve document printout are handled by the *imc POLARES Report Generator*.
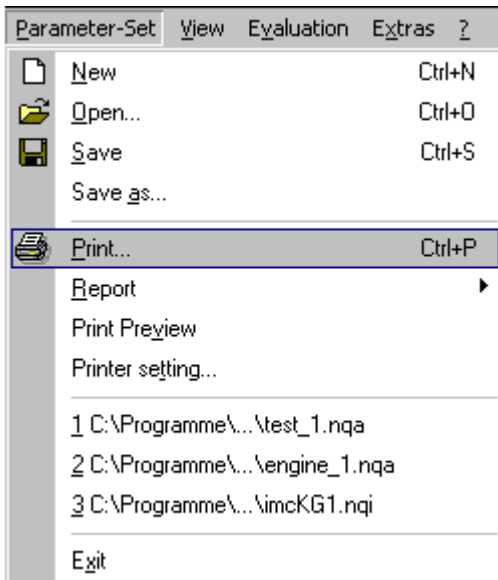
🖨 **Print**

Click on the printer icon in the toolbar or on the menu item *Parameter-Set/Print*. All curve windows are printed in the same arrangement and layout as shown in the editor.

Printable views of the forms (e.g. measurement task description, network quality report, setpoint and limit values) are printed out as displayed on screen.

Print preview

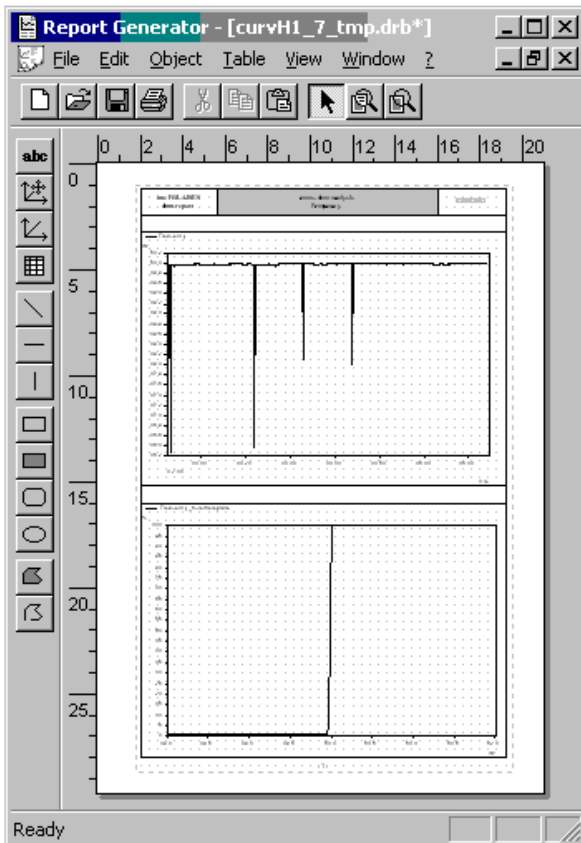Click in the menu *Parameter-Set* on *Print preview*. The *Report Generator*, an additional, powerful tool, opens.

Here you can not only **view** the page, but also move curves, edit texts or add new elements.

To *print*, use the Report Generator's menu. There you will find a "real" page preview.

8.4.4   Working with curve windows

The desired channels can be taken from the list of measurement channels into the curve window by means of Drag&Drop.

Releasing the data over:

- a Y-axis → displays the data with this Y-axis

- the curve window → generates a new Y-axis (recommended if voltage and current are to be displayed simultaneously)

- the X-axis → generates a new X-axis (recommended if very many data are already displayed in a window)

Active curve window

Click the mouse on the desired curve window. That curve window then seems to "float" above the others. Any actions taken then affect this window.
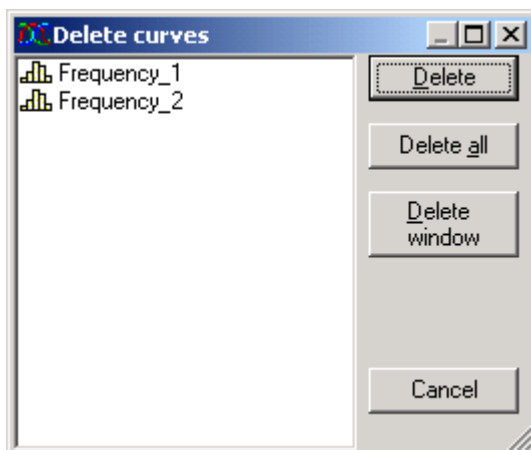
🗑 Delete curve window

Click on the trash bin icon in the toolbar. The following actions then happen to the *active* curve window:

- *No signals in curve window* →Curve window is deleted

- *Exactly one signal in the curve window* → Data set is removed from curve window

- *Multiple signals in curve window* → A selection dialog showing all signals contained in the curve window is shown.
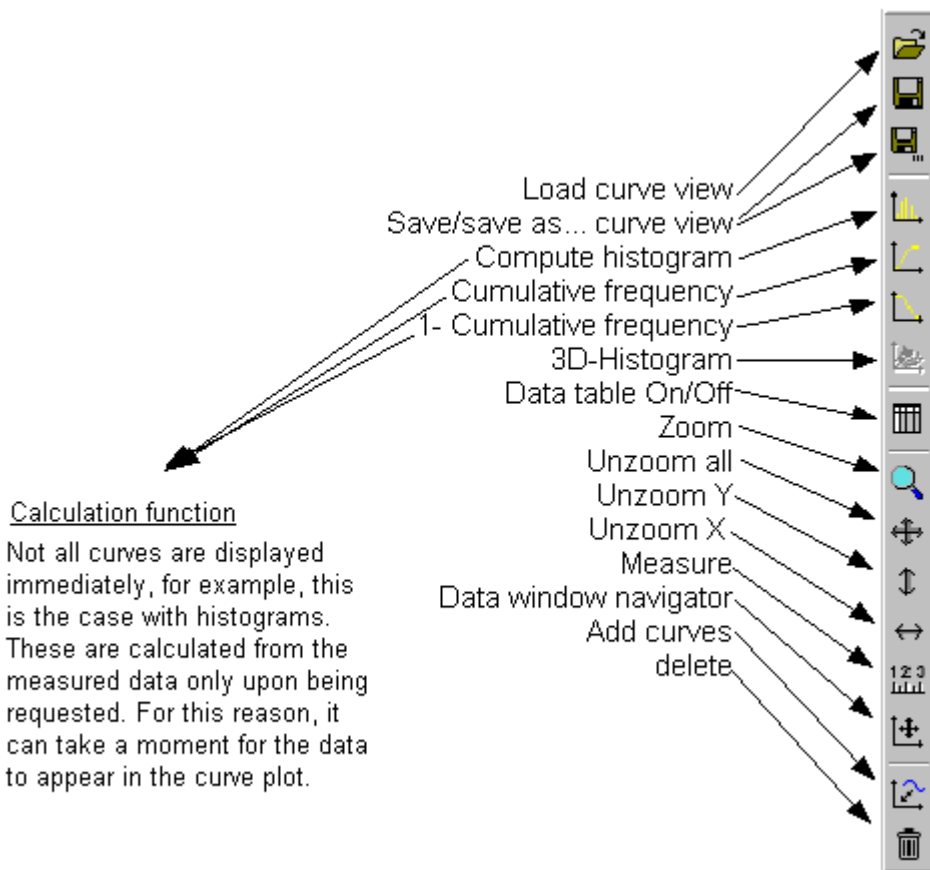
Multiple pages

The evaluation is organized into multiple *pages*. Each page has a maximum of four curve windows. If you open a fifth curve window, the software will create a new page. All prior curves are positioned in the background.

To turn a page, click on the *toolbar* or the menu item *Evaluation/ Previous/Next curve view.*

Toolbar along the curve window

Depending on the type of data, the function range may vary.

Load curve view
Save/save as... curve view
Compute histogram
Cumulative frequency
1- Cumulative frequency
3D-Histogram
Data table On/Off
Zoom
Unzoom all
Unzoom Y
Unzoom X
Measure
Data window navigator
Add curves
delete

Calculation function

Not all curves are displayed immediately, for example, this is the case with histograms. These are calculated from the measured data only upon being requested. For this reason, it can take a moment for the data to appear in the curve plot.

	Function	**Significance**	**Output curve**
	Histogram	What percentage of all measured values are within a certain class?	equidistant time-domain curve
	Cumulative frequency	What percentage of all measured values are within the value limit? (Sum over histogram)	equidistant time-domain curve
	Inverse cumulative frequency	What percentage of all measured values are outside of the value limits? (100% - cum. freq.)	equidistant time-domain curve

8.4.4.1 Basic options

8.4.4.1.1 Display

Select the menu item *Configuration ⇒ Display...* in the curve window.
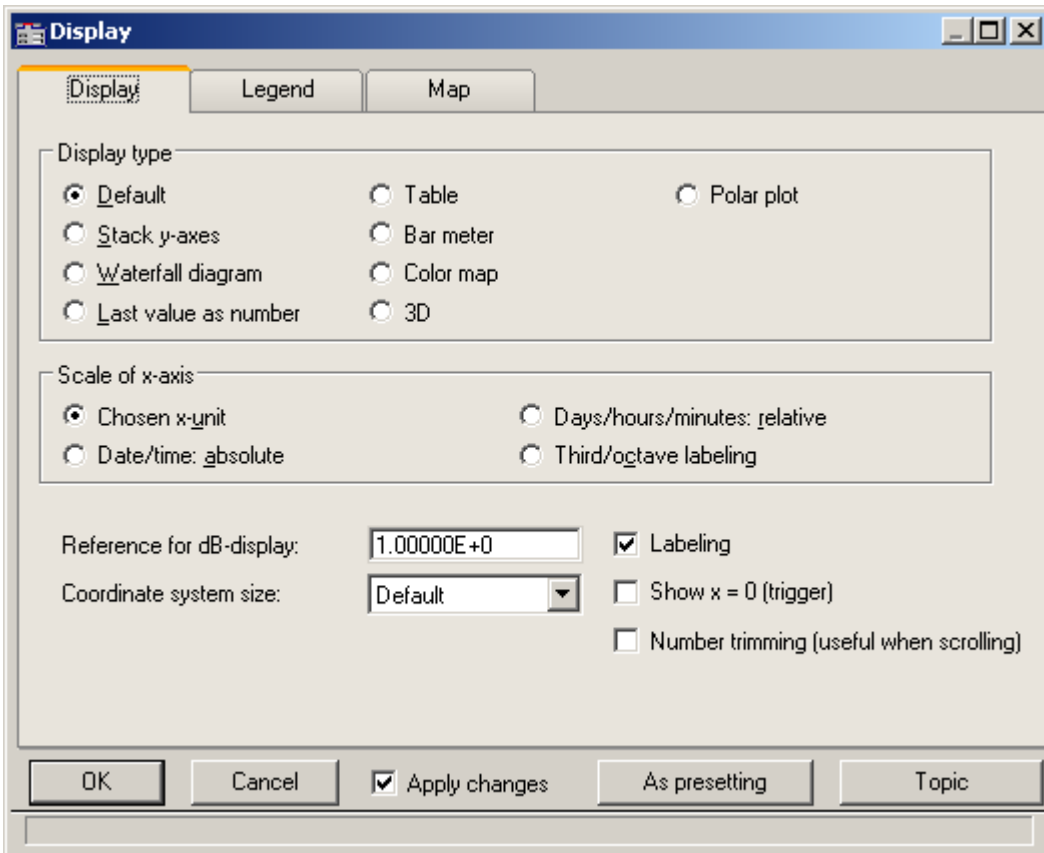
This is where you determine the appearance of your curve window.

For windows which have a time-axis, you can specify whether the time is represented in relative or absolute terms. Especially with triggered channels, absolute representation is necessary for obtaining "real" time-relationships. Otherwise, the curve window will stack all the triggering times.

If you need to change basic settings, it is possible to do this under *Presetting!*. A button of that name is located in a number of dialogs (see picture below). You can use it, for example, to specify the desired numerical format for *Last value as number*, without needing to make the same setting each time.

8.4.4.1.2 Axis settings

Double-clicking on either the X- or Y-axis opens the respective settings dialog.
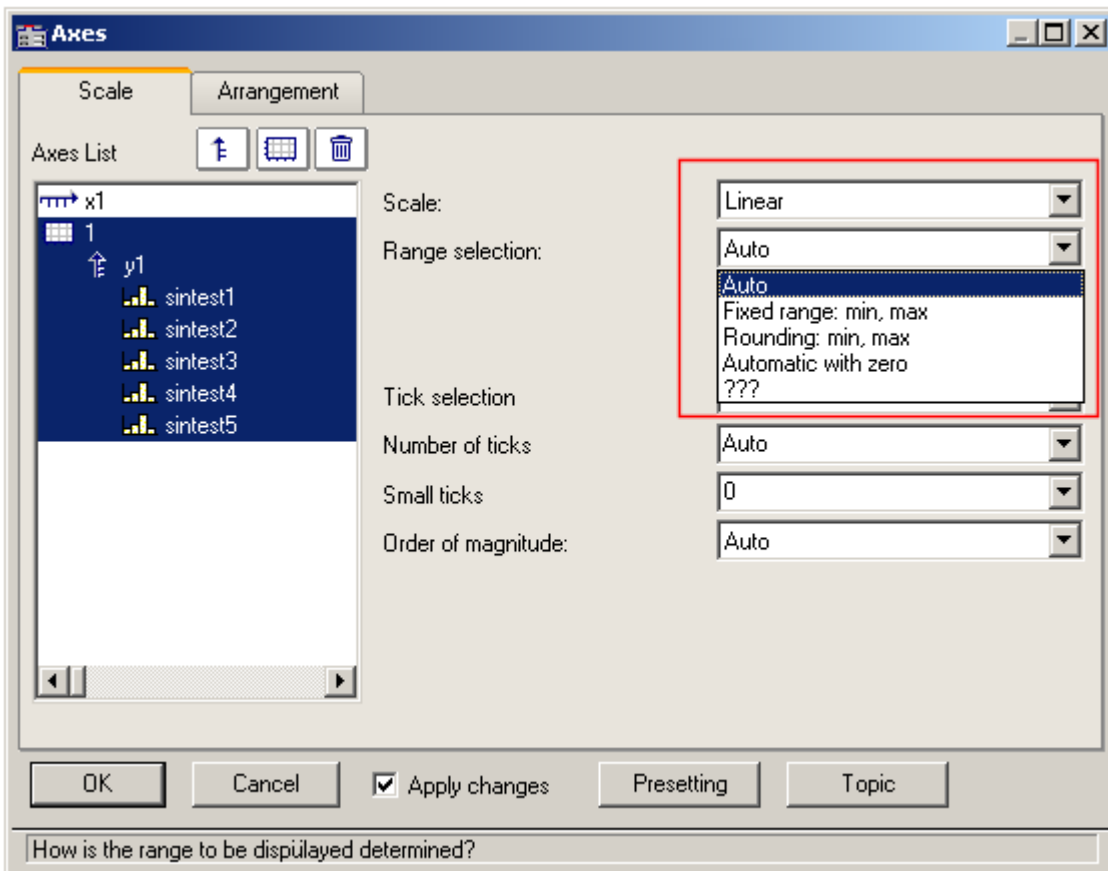
The default setting is *Auto*. The curve window tries to fit the signal curve into the whole curve window. If the signal doesn't change much, for instance, in the case of a shorted input, the signal has a very noisy appearance. But if you look at the Y-axis scaling you notice that the noise is very minimal. To avoid this effect, scale the Y-axis to a fixed range.

8.4.4.1.3 Measure

With *Edit* ⇒ *Measure* the *Measure* window is opened. The cursor positions are determined by using the left and right mouse keys. Note the context menu, which is opened by right clicking in the *Measure* window. It offers the possibility to display a list of all signals in the curve window.
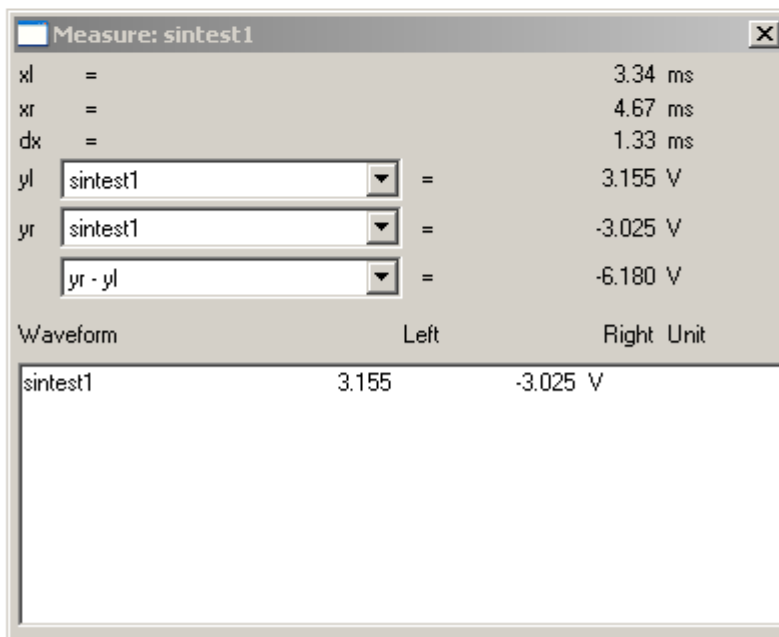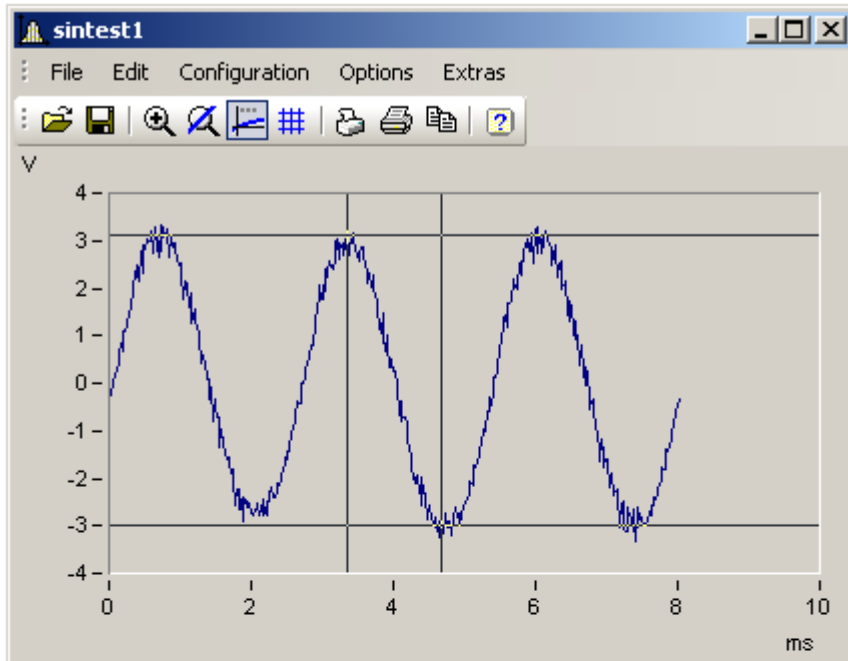
8.4.4.1.4 Zoom / Unzoom

When you select the menu item *Edit ⇒ Zoom*, the mouse pointer changes to an arrow which can be used to choose a region within the curve window to zoom in on. This action can be repeated as often as desired.
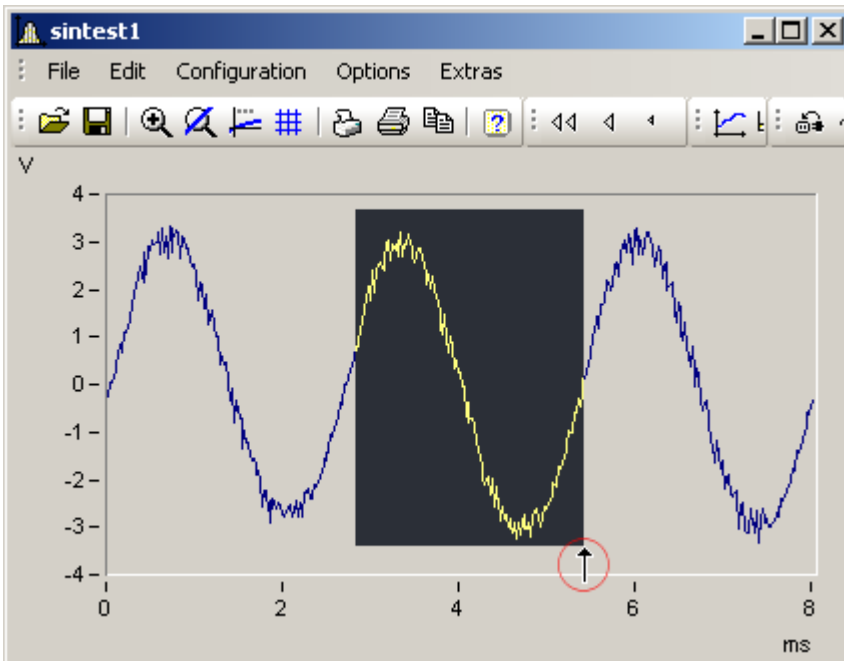
Zoom (encircled in red: the zoomcursor)
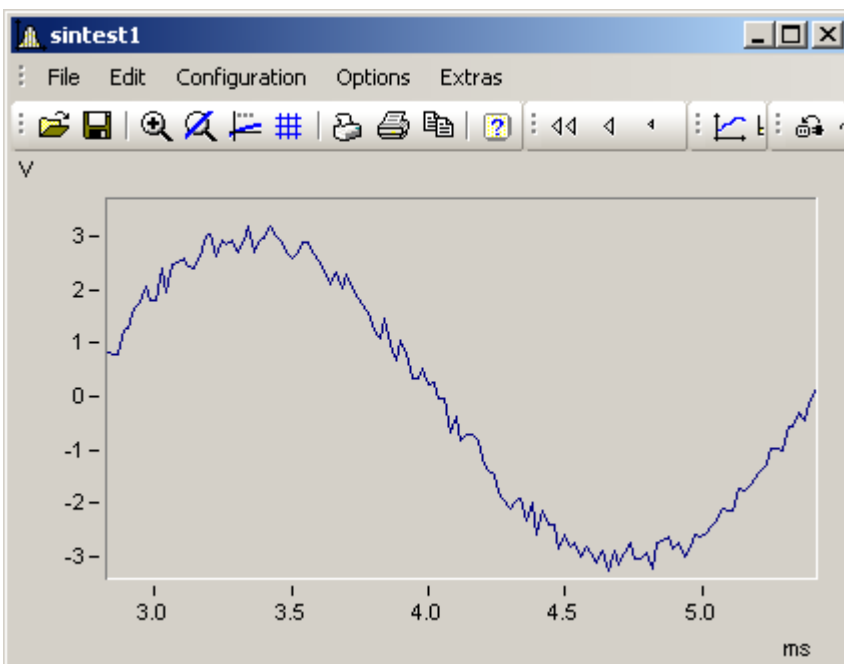
After zooming

Unzoom restores the curve to its complete representation. This cancels fixed axis settings. To prevent this consequence, use the command *Undo Zoom!* instead.

8.4.4.1.5 Colors

The menu item *Options ⇒ Colors* offers the ability to set al the colors used in the curve window. There is one set of colors each for the two display formats, screen display and printout .

The context menu lets you save a color set individually. There, you also have the option to copy the *Monitor (color scheme)* to *Printer (color scheme)* and vice-versa.
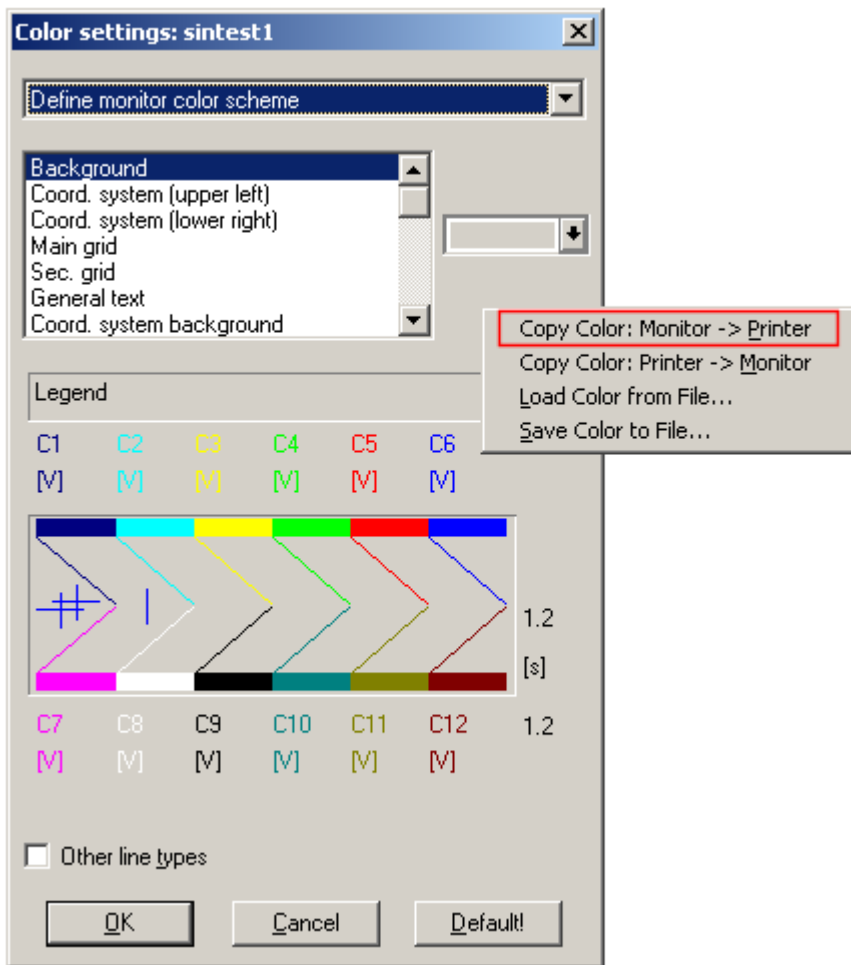

8.4.4.1.6 Drag and Drop

Function

The drag & drop function can be used to move and/or copy waveforms between curve windows. The following cases illustrate situations where drag & drop can be helpful:

- Moving measurement data from the channel list to a curve window. The data is then displayed in that window.
- Moving measurement data to a new axis or coordinate system within a single curve window.
- Moving measurement data to a different curve window.

Mouse Operation

- Press and hold the left mouse button on the desired Y-axis, coordinate system or open area in a curve window.
- Moving the mouse a short way causes the pointer to change. This commences the "drag".
- Drag the mouse to the desired target and release the left mouse button. This constitutes the "drop".
- Pressing the right button while dragging aborts the process.

8.4.4.2 Context menu

Function

Clicking the right mouse button in a curve window calls up the following context menu, offering immediate access to further curve window functions:
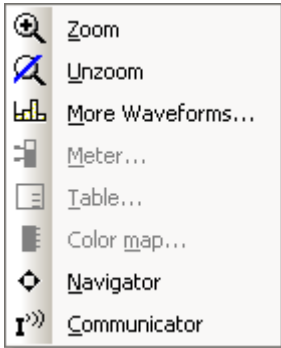
8.4.4.2.1 Navigator

 This contains various navigation buttons for scrolling and zooming in a curve window.

8.4.4.2.2 Communicator

 This tool box is used to specify settings controlling data exchange with other curve windows/tables as well as the window behavior during running measurements.

8.4.4.2.3 Scroll / Stretch

Here, you can toggle between curve window display which either scrolls through the curve plot (like a strip chart recorder) or where the window stretches as the curve grows.

8.4.4.2.4 More Waveforms in Curve Window ...

This is a dialog where you can select additional waveforms for display in the curve window.
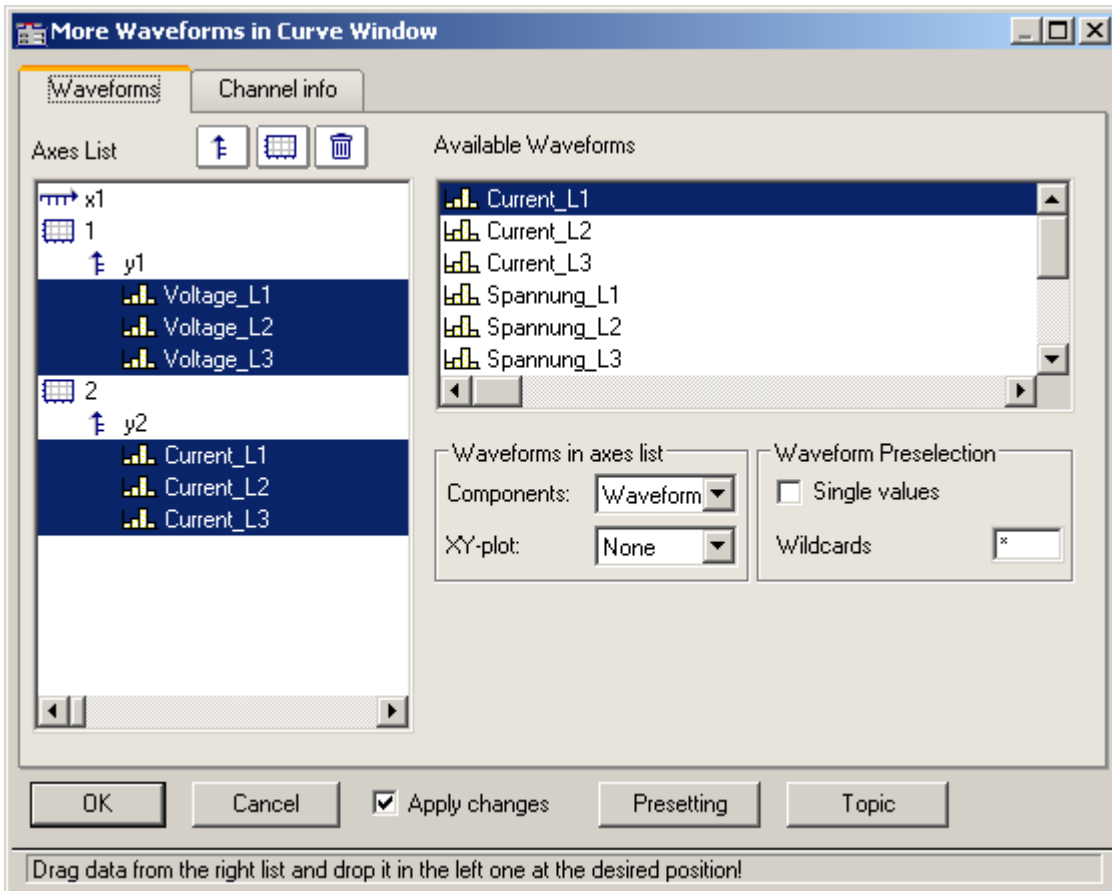
8.4.4.2.5 Window Configuration ...
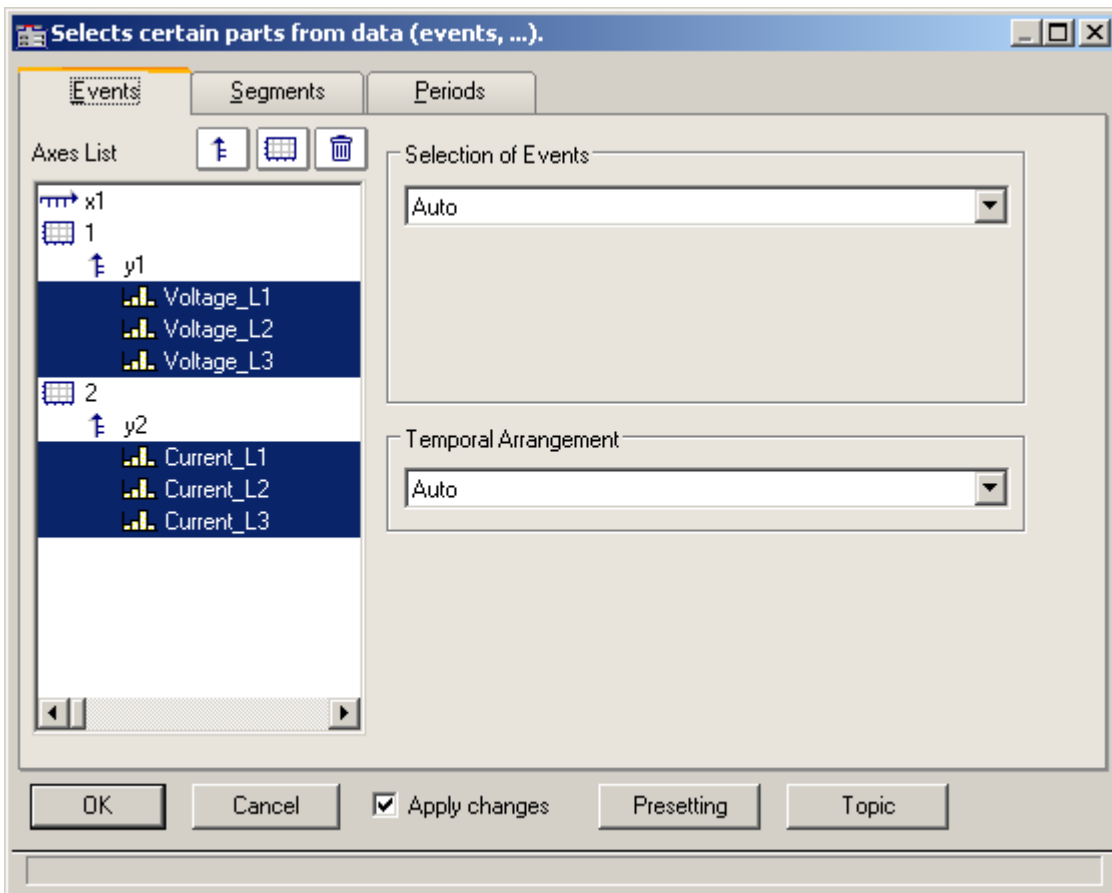
Selection of events: The window supports display of events belonging to triggered waveforms.

Right-click in the curve window and select "Window Configuration" from the context menu:
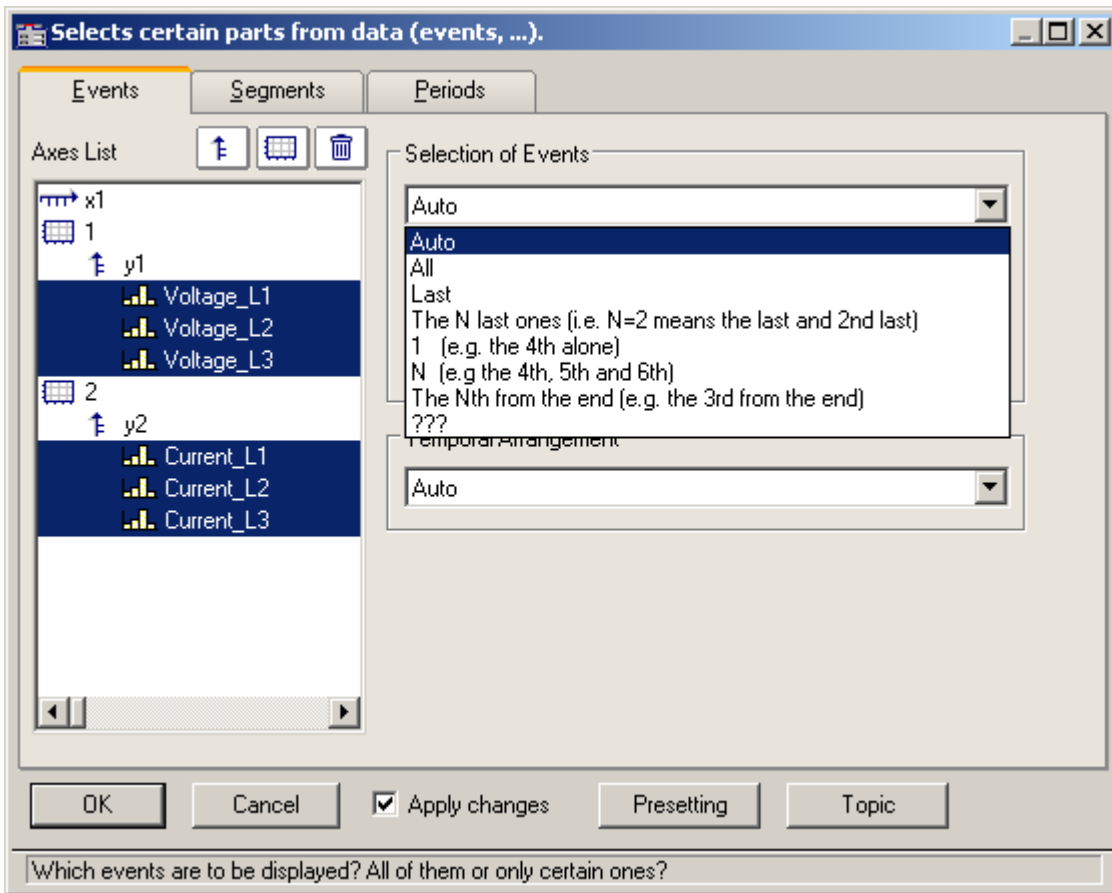
Temporal arrangement: Here you can set how different events are arranged to provide a comparison of their positions in time.
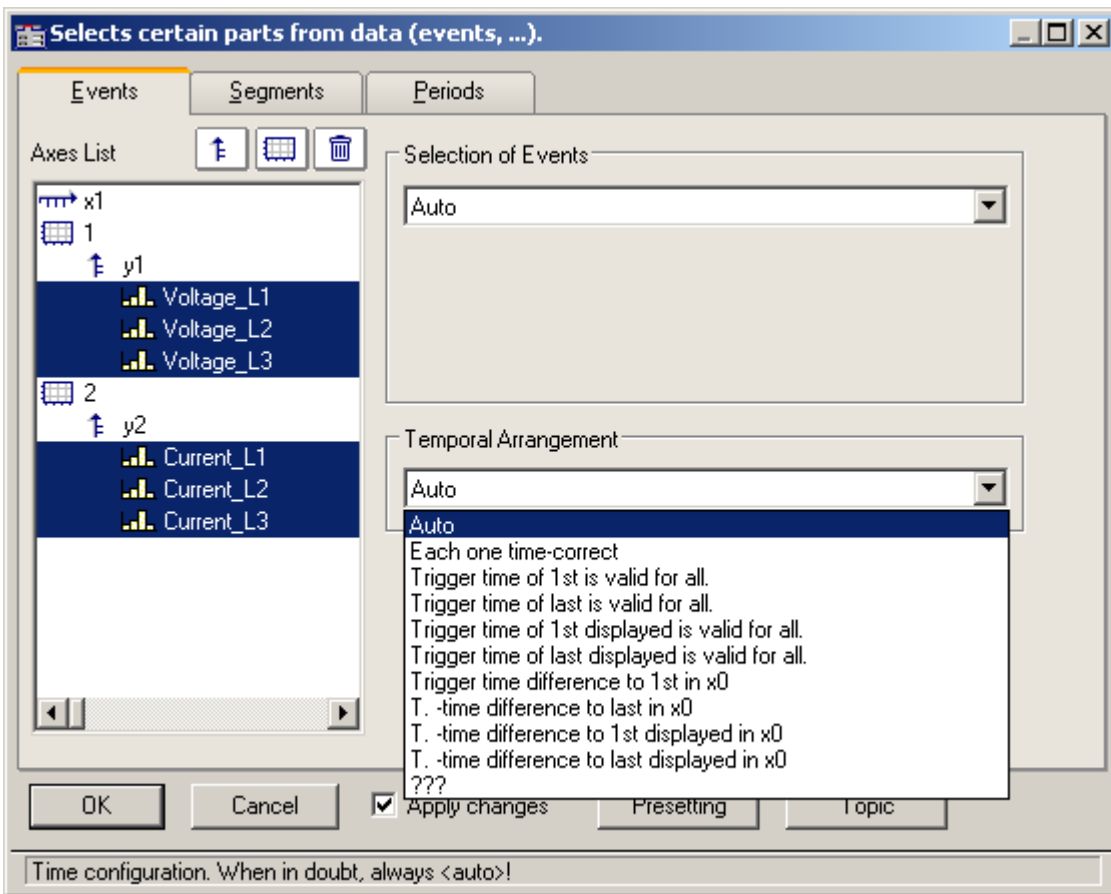
8.4.4.2.6 Meter...

This dialog is available if the curve window is configured as a bar meter.
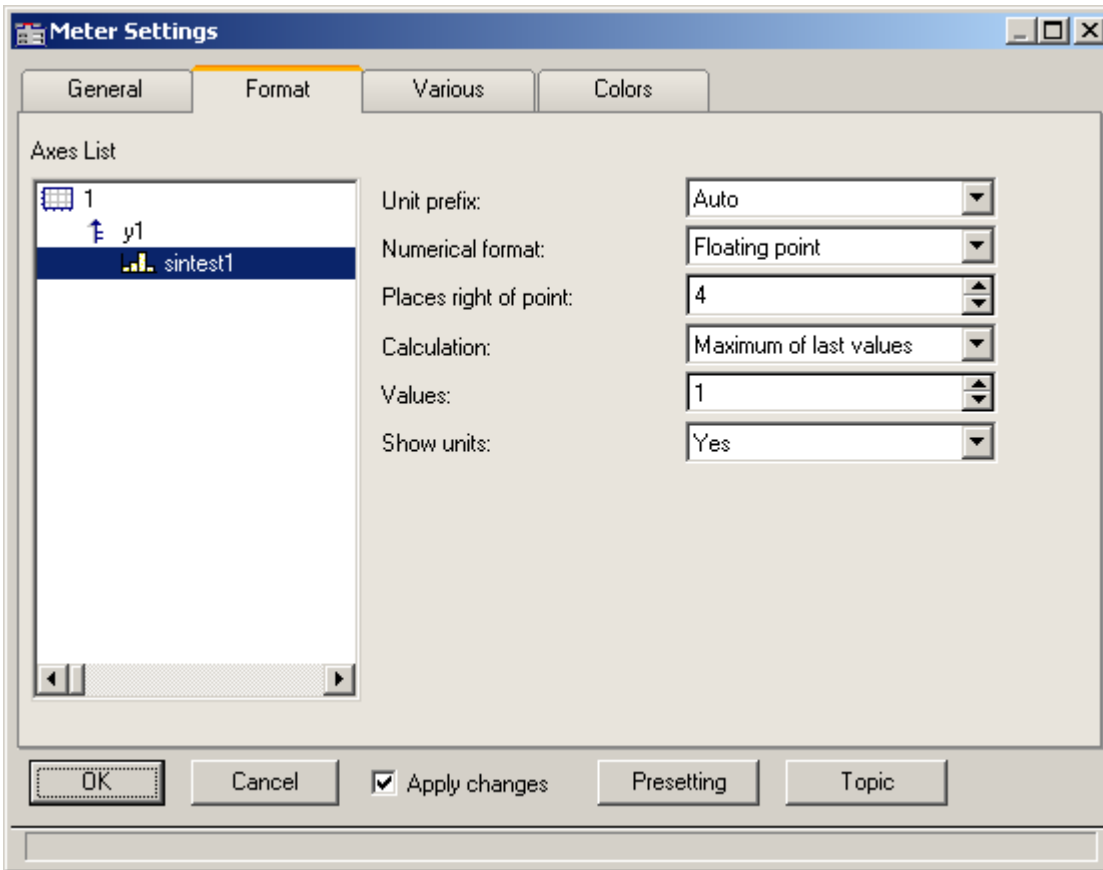
8.4.4.3 Tables

Some data sets, for instance, events, are displayed as tables. Tables don't have their own menu.

Name	Time	Maxima
U1_THD_mean	20.10.06 15:55:00.0	3.03 %
U2_THD_mean	20.10.06 15:55:00.0	3.03 %
U3_THD_mean	20.10.06 15:55:00.0	3.03 %
U4_THD_mean	20.10.06 11:05:00.0	23.36 %
I1_THD_mean	23.10.06 06:25:00.0	172.33 %
I2_THD_mean	23.10.06 22:25:00.0	2236.72 %
I3_THD_mean	20.10.06 21:05:00.0	2765.49 %
I4_THD_mean	21.10.06 23:15:00.0	1230.33 %

8.4.4.4 Toolbox

To **magnify or shrink** the curve segment, to scroll through the view and to move the measurement cursor, there is a toolbox which is opened as a separate dialog and which always refers to the active curve window.
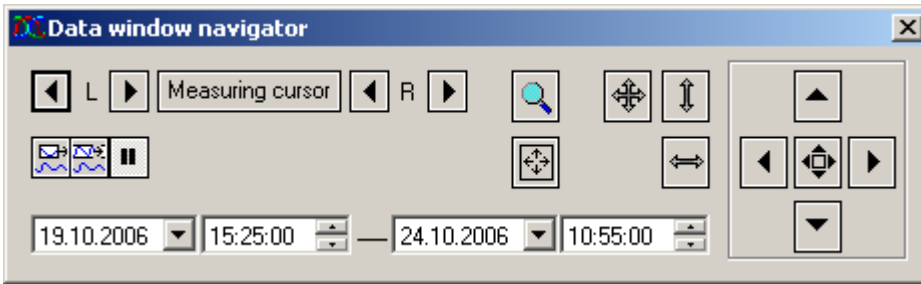
Data window navigator

Activation

To activate the toolbox, use the main window menu item **View/Data window navigation** or the button

 in the toolbar.

8.4.4.5 Navigating
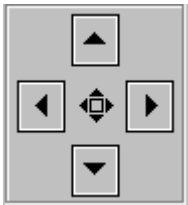
 To change which region of a curve the curve window segment shows, you can use either the **toolbox** or the curve window functions. The following description refers to the toolbox.

In the set of controls on the right side of the toolbox, push the button in the center to switch the functionality between **scroll** and **zoom.** As a result, the function of the arrow buttons changes.

 Scroll

 Arrow buttons
- **Short clicks** on the arrow button scroll the displayed section slowly (step).
- **Holding down** or double-clicking the buttons cause rapid movement.

 *Magnify /Shrink **Zoom range***

 Arrow buttons
- **Short clicks** on the arrow button scroll the displayed section slowly (step).
- **Holding down** or double-clicking the buttons cause rapid movement.

 Magnifying glass: The magnifying glass magnifies a specified segment. Click on the magnifying glass and drag the cursor while holding down the mouse button to outline the rectangular segment of the curve window which you wish to zoom into.

Unzoom
- The **Unzoom** button restores the complete curve.
- Unzoom X-axis
- Unzoom Y-axis

 Maximize curve window: Displays the active curve window in maximize format

 Curve window display mode during measurement

- Scroll mode – The currently visible rang is automatically moved to the end of the waveform.

- Stretch mode – The left side of the curve window remains fixed while the right side moves with the extending edge of the waveform. The domain thus grows as the measurement progresses.

- Pause – The displayed region is frozen. The measurement continues in the background, meanwhile. This is helpful for inspecting the signal while the measurement is still running.

8.4.4.6 Measuring

The pinpointing of individual values from the curve can be controlled either via the toolbox or the curve window. the following description refers to the toolbox.
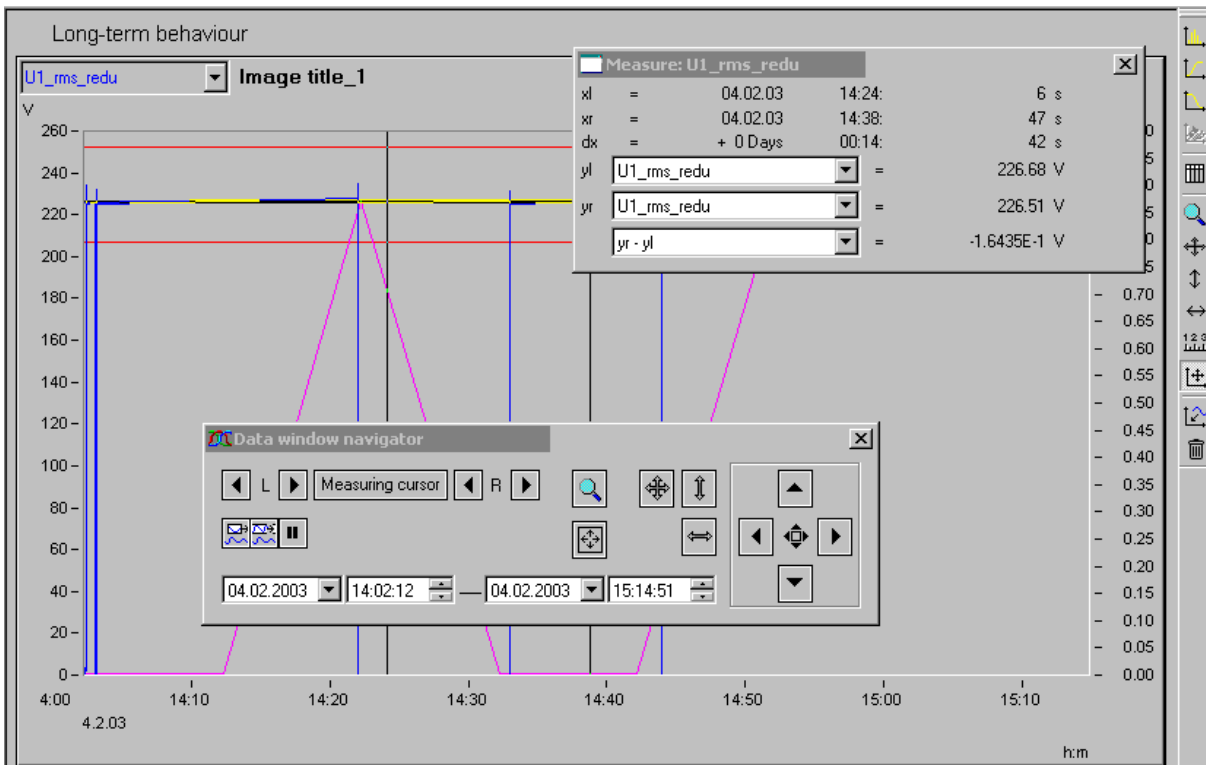
If you click on *Measuring cursor*, a *measurement value window* opens. It displays the amplitude and time values for both measurement cursors and the difference between the left and right values.

With the *toolbox's arrow buttons*, it's possible to move the two measuring cursors. You can also move the pointer in the window directly by means of the *mouse*. The left and right mouse buttons move the left and right cursors, respectively. To do this, hold down the respective mouse button while moving the mouse.

Note

The functions for navigating and measuring are available in a more extensive form via the **curve window menus**.

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9   Extras

9.1   Special options for connecting to the device

Additional ways to connect with the device are presented below. For other special cases, please see the section on LAN connection.

9.1.1   Devices and TCP/IP

It is absolutely necessary to carry out the instructions below in the sequence given. But first read through the whole section in order to get a preview of the needed measures.

9.1.1.1   General preparations

An *imc POLARES* device with TCP/IP supports a classic network interface (LAN).

For a device having a *LAN*-interface, the following parameters must be set appropriately:

- IP-address
- Subnet-mask
- DNS-server-address (optional)
- Domain (optional)
- Router-address (optional)

If your network is equipped with a DHCP-Server, these data can be accessed automatically by the device upon switch-on. Have your network administrator make the necessary configuration of the DHCP-server and the DNS-server. You can skip the rest of this section, in that case, and proceed with "Preparing the PC 164".

Note

Notes for the Administrator:

We recommend using a fixed assignment of IP-addresses to the devices and to set an unlimited lease-time. A device's host name cannot be changed. It is comprised of a prefix and the device serial number, e.g. " imc POLARES_99030143".

For a device with a PPP-interface, it makes sense to set the following parameters:

- local and remote IP-address
- Baudrate and protocol of the serial interface to modem or cable
- DNS-server address (optional)
- user name and password (optional)
- Scripts for connecting and disconnecting (optional)

If there is no DHCP-server, the necessary device settings must be made as described further below. Have your administrator issue IP-addresses for your device units and make note of the address assignments. Have the administrator enter the device units in the DNS-server if there is one. In this case, also make note of the DNS-server's IP-address and the name of your network domain.

Find out which subnets the device units are to be operated in and make note of the corresponding subnet-masks. You will also need the IP-addresses of any routers present which your device units are to use.

Once you have gathered all the above information, you can proceed with the next section.

9.1.1.2 Preparing the PC

To operate TCP/IP devices you need a PC on which the TCP/IP-protocol is installed and ready. We assume here that your PC is already set up correspondingly. If this isn't the case, follow the instructions in your network card's documentation and in the WINDOWS help texts in order to install TCP/IP on your PC.

"Devices and TCP/IP with PPP 173", contains hints on preparing your PC for operation of PPP-devices.

Once your network administrator has entered your *imc POLARES* in a DNS-server, your PC's configuration is already complete and you can proceed with the next section. Otherwise, you must enable your PC to translate your device units' hostnames into the corresponding IP-addresses.

To do this, you must create a new file with the name *Hosts* (without file extension). Create the file in the folder "C:\Windows\System32\drivers\etc\". If this file exists already, you can simply add the necessary entries. Use an ASCII-Editor such as Notepad.

You must enter one line for each of your device units; it must contain the device IP-address, followed by its hostname (divided by any number of spaces). Use the addresses assigned to the devices by your administrator. Note that only the last 8 digits of the serial number are used for the hostname. The entries should look about like this:

```
192.168.10.23   imcPOLARES_99030143
192.168.10.24   imcPOLARES_03021747
192.168.10.25   imcPOLARES_03021748
```

Note

- If the above mentioned entries are not present in the Hosts file, the POLARES operating software-software is trying to simulate the data (by "poll"). This procedure cannot be used for every network constellation!

9.1.1.3 Use of TCP/IP devices in a variety of network situations

In some cases it's necessary to operate the PC and the device in one network (e.g. the company network), and also be able to connect them point-to-point for mobile operation. In order to ensure as convenient and reliable operation as possible in both situations, the following procedure is advised.

In larger networks, the IP-address for PCs in the network are mostly assigned automatically (My *Network places* ⇒ *LAN* ⇒ *Properties* ⇒ *Internet protocol (TCP/IP)* ⇒ *Properties* ⇒ *Obtain an IP-address automatically*). For this purpose, there is a DHCP-server (DHCP: **D**ynamic **H**ost **C**onfiguration **P**rotocol) in the network.

If, within such a network, the Windows operating system is started on the PC (the physical connection between PC and the network (EtherNet cable) must be present!), then the PC is automatically assigned an appropriate IP-address, and the value is set for the subnet mask. The measurement devices can obtain an appropriate IP-address and subnet mask in the same way if use of DHCP is activated for the device. Thus, in a network with a DHCP-server, there are no address conflicts and no problems finding the devices in the network.

If the same PC is later started outside of the network environment (there is no DHCP-server; e.g. inside a vehicle), then the IP-address is assigned according to the APIPA-protocol (**A**utomatic **P**rivate **IP A**ddressing). Here, the Windows operating system assigns an IP-address from a reserved IP-address range (169.254.0.1 ... 169.254.255.254). The subnet mask is set to the value 255.255.0.0. See also AutoIP 167.

In this case, the measurement devices use the IP-address set in the device. Then, if an address from the range reserved for the APIPA is selected as the IP-address in the device, and the subnet mask is set to the value 255.255.0.0 (use of DHCP for the device remains activated!), then there are no problems establishing a connection between the PC and the device outside of the company network.

Note

- The IP-address currently used for the PC and the value for the subnet mask can be found with the help of a program:

  Windows 2000/XP/Vista: `ipconfig /all`

- If an IP-address from the range reserved for the APIPA is to be set for a device, it is necessary to check first which IP-address is assigned for the PC, if no automatic IP-address assignment is performed. To do this, deactivate the PC. Instead of to the network (with the DCHP Server), the PC is connected with a destination device, e.g. a measurement device. Then, after activating the PC, determine the IP-address currently used as described above. Make note of this IP-address!

- Be sure that a separate IP-address is assigned for every device. This also goes for assignment of IP-addresses from the range reserved for the APIPA! This ensures that there aren't any address conflicts even in a network without a DCHP-server.

- In principle, the physical connection (EtherNet cable) between the device and the network should be established prior to activating the device, so that the automatic IP-address assignment can take place. If automatic obtainment of the IP-address fails, the IP-address set for the device is used up until it is switched off. However, this address usually doesn't match the IP-addresses used in the network and address conflicts can arise, or the device won't be found in the network!

9.1.1.3.1 Computers with multiple TCP/IP connections

If you have set up multiple TCP/IP interfaces in your computer, be sure to enter different subnets! Otherwise, random conflicts will occur. Reasons for having multiple TCP/IP interfaces include:

- you separate your company network and the connection to the measurement device with two network cards

- you sometimes connect your measurement device via modem (PPP)

- you have added a Bluetooth connection.

The settings for the addresses may look like this, for example:

	Measurement device	*Router-company*	*Network Card 1*	*Network Card 2*
IP-address	192.168.1.3	192.168.0.1	192.168.1.26	192.168.0.13
Subnet-mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0

In this example, your PC communicates with your measurement device via Network Card 1, and with the company network via Card 2.

## 9.1.2   LAN-Configuring of the imc POLARES units

Connect the units to your PC and switch them on. To make the network settings for your devices, start the program *IF-Config* from the *POLARES operating software* program group.

The program checks all entries for plausibility and thus prevents a multitude of incorrect entries. Nevertheless, use of the program requires some knowledge of the system.

There are two sides to the program. One side is the *Device search* which serves to locate TCP/IP-devices via user-specified network interfaces. The list *Usable hosts* should contain an entry for each network adapter in your PC for which you have installed TCP/IP. This includes adapters for the Dial-Up-network.

By double-clicking on the desired adapter, a network search is initiated to find all devices to which it is connected. If you don't find any devices, check whether your PC and the devices are correctly connected to the network and activated.

If the search was successful, double-click to expand the branches to locate your device's name. If you're not sure what your device's name is, then also pay attention to the status bar. Clicking in this once causes the active device's network name, which contains the device's serial number, to be displayed. The serial number provides unique identification for the device and is indicated on its plaque.
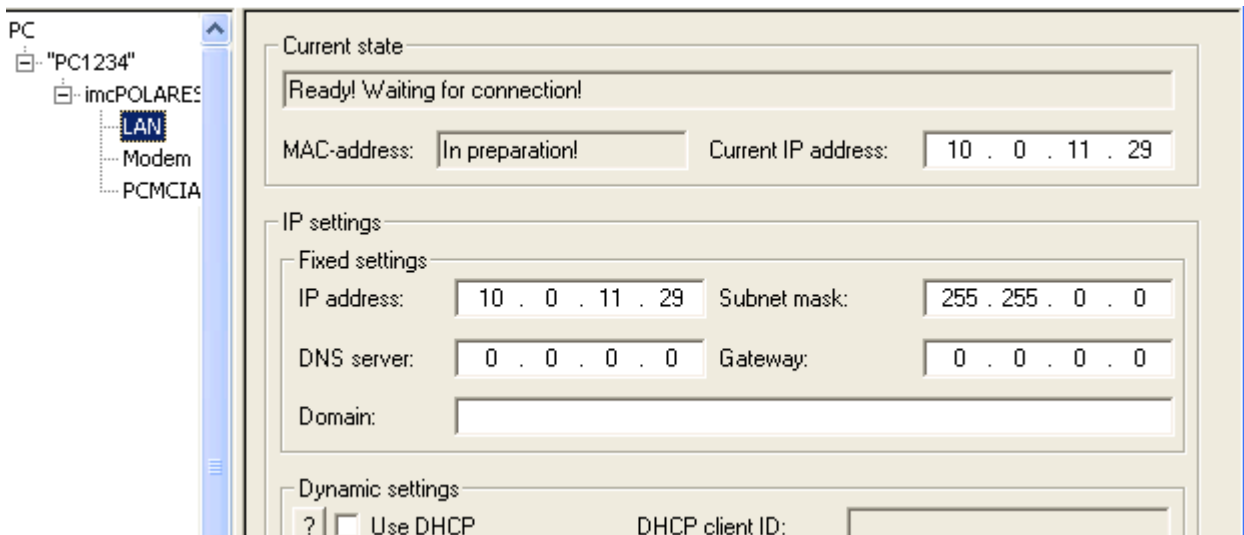
Click on the entry LAN in the tree diagram in order to make network settings there. On the right side of the screen, make the desired configuration entries in the control panel *IP-settings* or activate *Use DHCP*.

In the control panel right above that, Current state, the current IP- addresses of the *imc POLARES* units are indicated.

In this way, you can make settings for all devices you wish to configure. However, the configuration is only then written to the device once you click the button Accept, which is only available when the device is selected, not its branches. To do this, click on the entry for the desired device on the left side of the screen. In the box above the button, Settings to be applied, on the right side, you can choose whether or not to apply all the changes you have made for device adapters. By double-clicking on the desired device, you reach a message offering you the chance to reject all changes for this device.

Note

- If you respond to the message Reject all changes? with No, only your entries on the right side remain intact. They are not yet written to the device, this only happens when you click on the button Accept.

- Once the configuration has been written to the device, a warm start is carried out so that the new settings take effect. This process lasts about 1-2min. If the text Settings have been applied is displayed in the box *Messages*, your device has been successfully configured and you can proceed with the next device.

- To change the *Device name*, click upon starting the *POLARES operating software* software and open under *Setup* the window *Device definition*. Select the desired device and click the button Edit.... In the upper right portion of the window which then opens, you can change the device name. This name is purely for the user's convenience and has no effect on the actual network functionality.

- After confirmation, IF-Config allows the Subnet mask to have a format which is not customary for this network class.
  Example: Networks who's addresses start with 192 are so-called Class C networks. They always use a Subnet mask of the format 255.255.255.X. In special situations it is necessary to change this format to 255.255.X.X.

9.1.2.1 Alternative IP-addresses

- **Use DHCP:** (Dynamic Host Configuration Protocol) The device tries to get its settings from a DHCP server. If the server is not available, the fixed settings are used! This corresponds to the alternative configuration in Windows XP or Vista PC.

- **DHCP ClientID:** The *DHCP ClientID* can be entered if the DHCP server requires a special DHCP ClientID for IP assignment. If there is no entry, the MAC-address [180] is used. Supposing measurement devices are to be assigned IP by the DHCP server from a particular range. In that case, 'MeasDev 1' etc. could be entered, for example.

- **Auto-IP (DHCP + APIPA):** (*Automatic Private IP Addressing*) *Use DHCP is* automatically activated along with this option. If the DHCP server cannot be reached, the fixed configuration for the address is not used. Instead, the device uses a random number generator to get an address in the range from 169.254.1.0 to 169.254.254.255. Afterwards it tests whether the address generated is available. If it is already used for another device, the search is repeated until a free address is found.

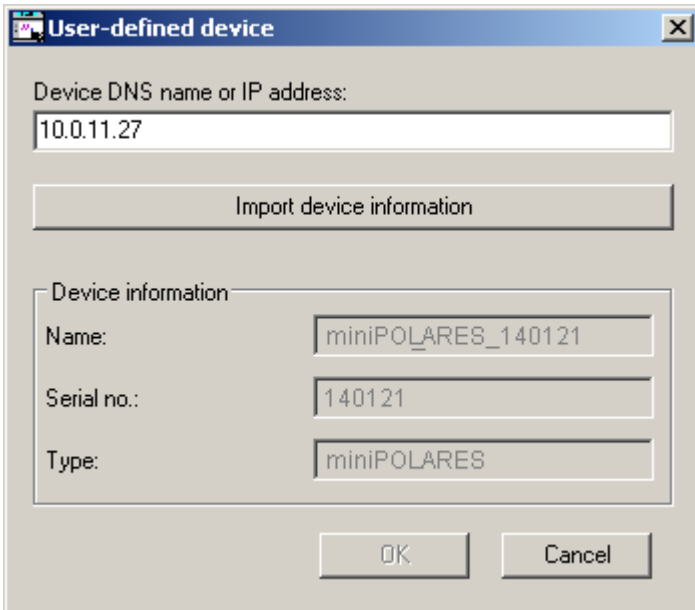### 9.1.2.2 TCP/IP, PPP via a router

If there is a router between your PC and a device operating with TCP/IP or PPP, this device can't be found by means of a network search. In that case you must enter the device as a *User-defined device*.

In order to integrate a device, which is accessed via a router, into the user interface system software, proceed as follows:

1. Open the dialog *Add device interface* and select *Network settings....*

2. **Activate the option *Enable advanced settings for user-defined interfaces*** and exit the dialog with *OK*.

3. The dialog *Add device interface* then features a new button labeled *User-defined....*
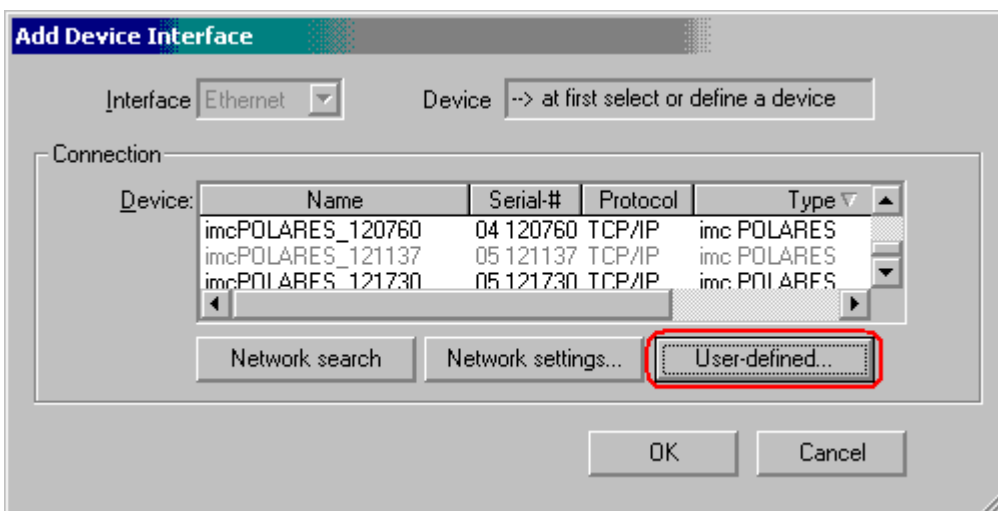
4. Clicking on the button *User-defined* calls the following dialog, after first posting a confirmation prompt. Enter the IP or the DNS name.

5. Clicking on the button *Import device information* causes the system to try to set up a connection. If this succeeds, the device's (user-defined) name, its serial number and the product type are displayed and the device can be integrated into the system.


Note

If you wish to define a device which is connected to the PC via the Dial-Up network, you must first set up the Dial-Up connection


9.1.2.3 Firewall and Ports

The following ports are used: UDP 1200, TCP 1200 through 1202. For UDP, the port selected under <u>UDP-messages</u> 57 must be taken into account.

If you use the Windows Firewall, it may be necessary to enable the ports. The easiest way to do this is by enabling the program from within *POLARES operating software.*
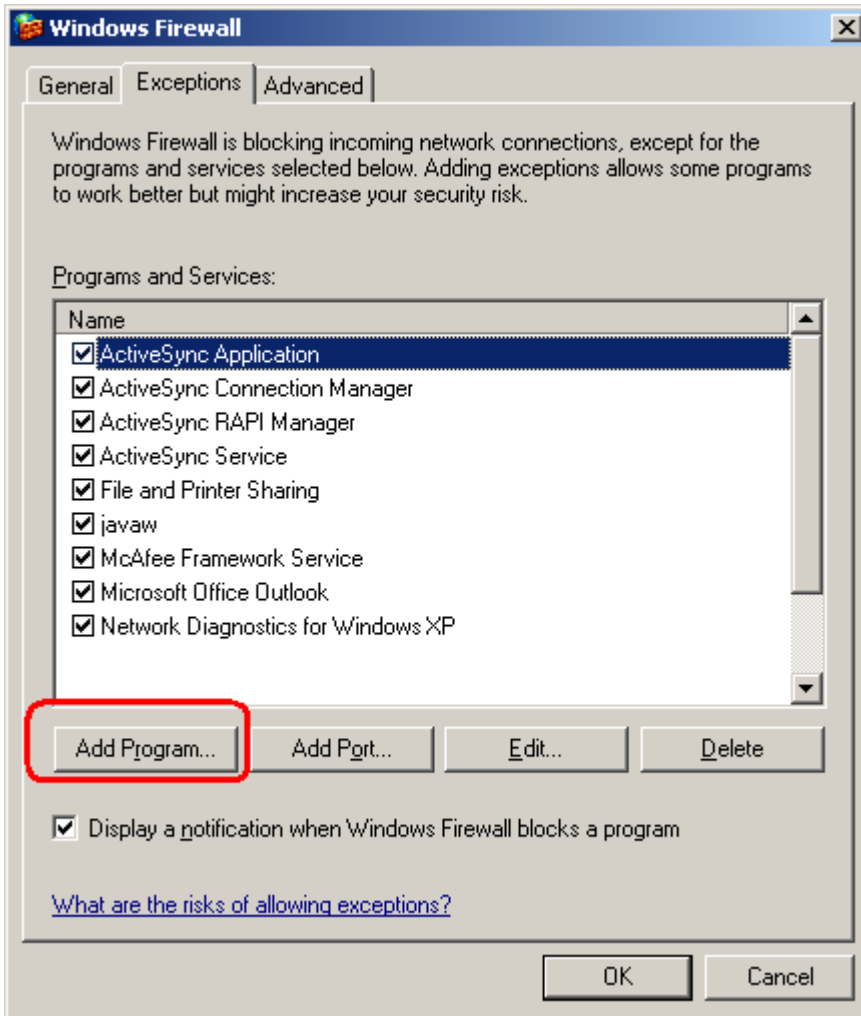
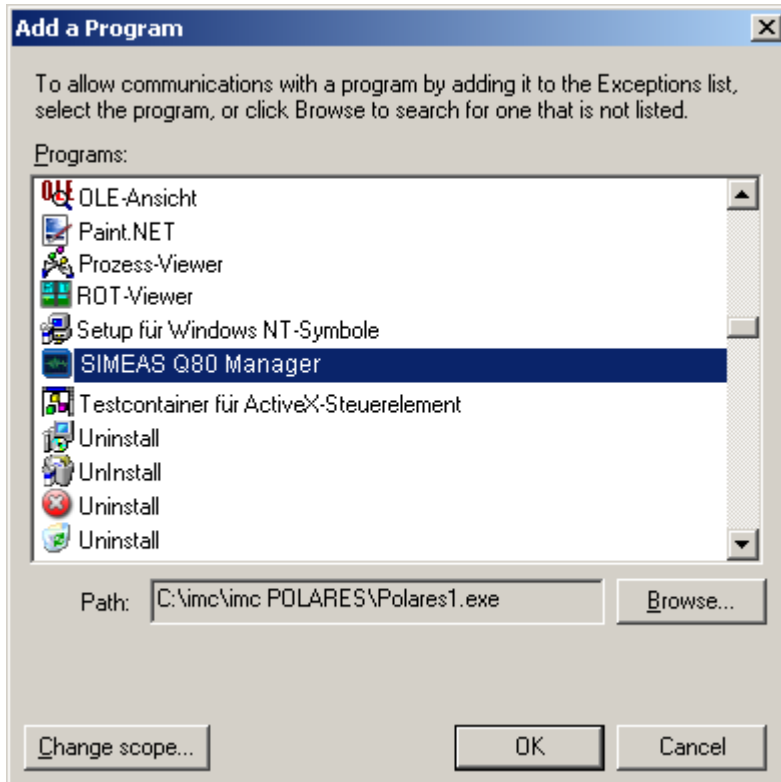1.Click on the Windows Start button and open the Control Panel. Select *Security Center*.
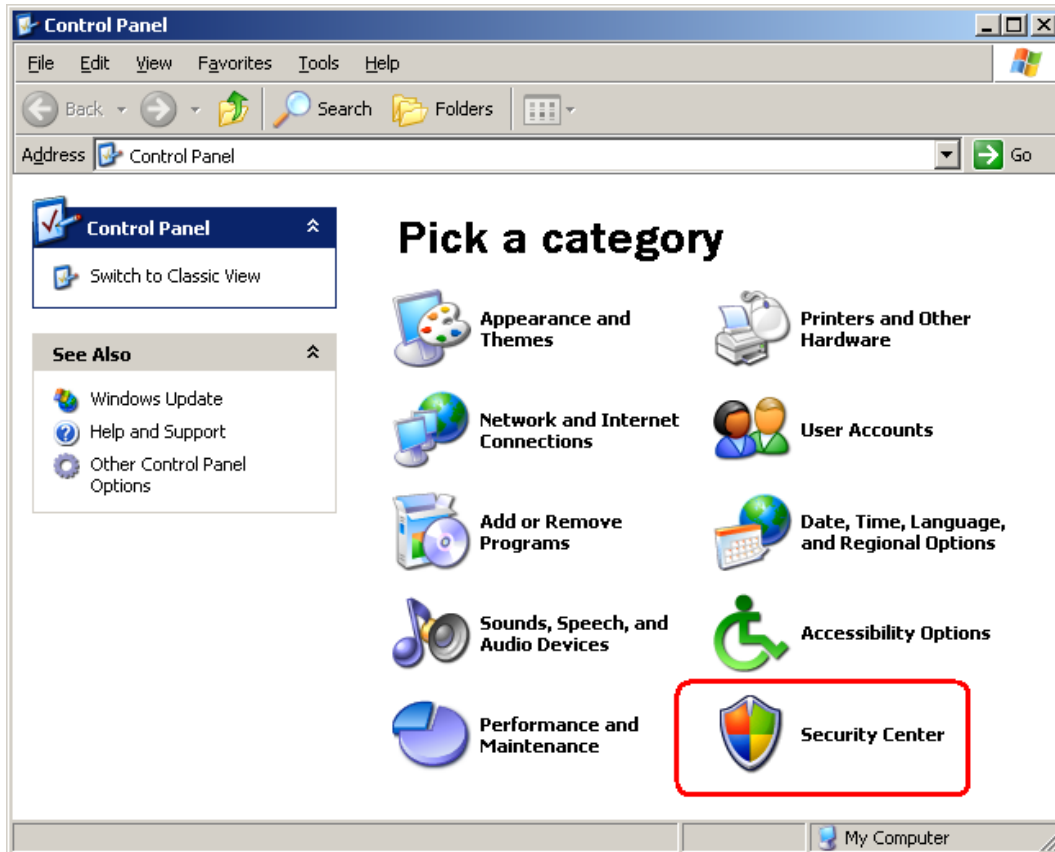
2.Select *Windows Firewall* and go to the dialog page *Exceptions.*
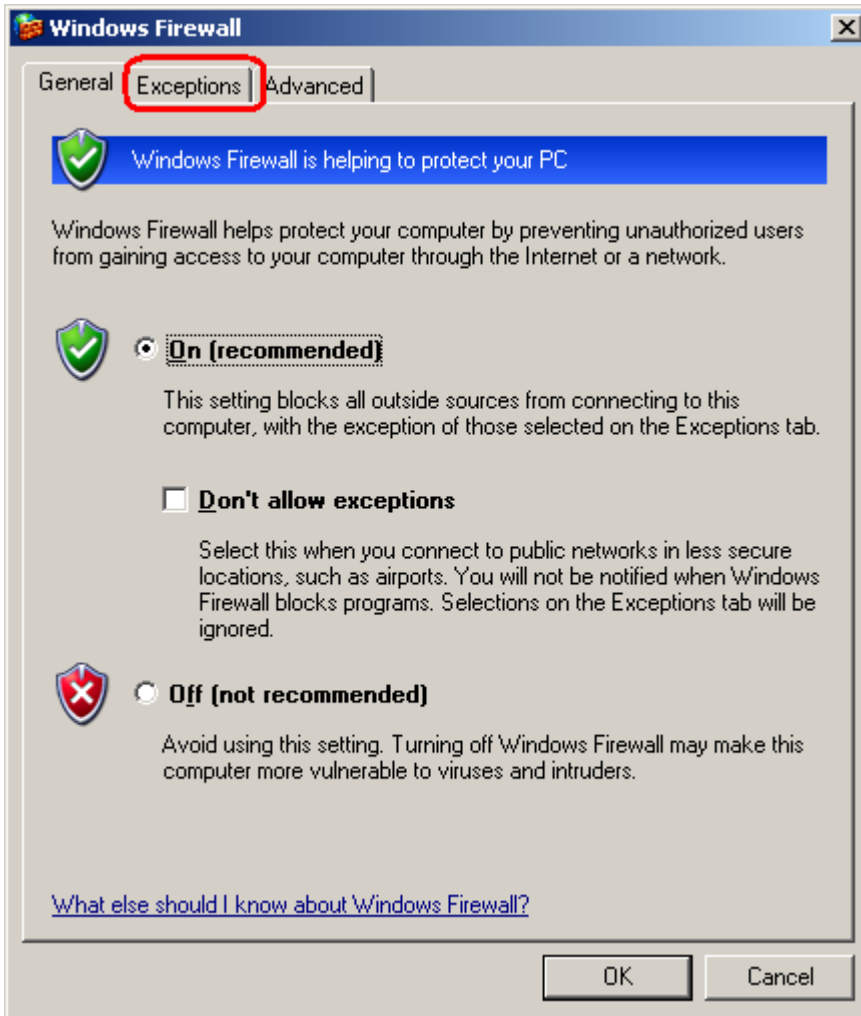
3. Click on the button *Add Program...*

4. Find the program *POLARES operating software* and click *OK.*

Close the dialog with *OK.*

Alternatively, you can enable the ports. To do this, each port must be entered for UDP and TCP.

9.1.3   Modem connection (TCP/IP with PPP)

What is a PPP connection?

The abbreviation PPP means Point–to–Point Protocol. As the name indicates, this protocol concerns single point to single point connection (i.e., one client and one server) as opposed to Ethernet, where any amount of subscribers are connected together via the Ethernet-bus. The client is always the one to set up the connection and to register with the server. The server checks the client's authorization and transfers to the client all information necessary for participating in network communication. After this, both parties configure their network interface; a connection then exists between the two. The PPP-protocol manages this preliminary procedure; it does not handle the actual communication! Instead, the PPP-protocol can be viewed as building a sort of "tunnel" between the parties and packaging the actual network communication protocol, for instance TCP/IP.

In a TCP/IP-based network, the individual subscribers are distinguished by their personal IP address. Strictly speaking, the address is not assigned to the PC or device, but to the network interface. After all, if a PC has two Ethernet connections, it can have two IP-addresses.

IP addresses, then, can be assigned not only to Ethernet interfaces but to any network interface which is able to transfer data according to the IP protocol. In this sense, even the WINDOWS *Dial-up Network* (with PPP-option activated) represents an IP interface. Consequently, *the Dial-up Network* is also indicated in the *Control Panel* under the icon *Network* as a *Dial-up adapter*. And that is where it must be configured as an IP-interface. The fact that a PPP-connection is what is meant by the *Dial-up Network* is not relevant at this point. The *Dial-up Network* and thus the actual PPP connection is administered under the icon *My computer* on the WINDOWS Desktop.

Physically, such point-to-point connections are serial connections. In the simplest case, the two PPP-subscribers are connected via a zero modem cable. However, *imc POLARES* is not designed for this; instead, PPP is used exclusively to set up a connection via modem[2] (and the telephone network).

> In summary, PPP in conjunction with TCP/IP serves to connect two PC/devices or networks via a serial modem line. The PPP-connection remains transparent for the network subscribers. The PPP connection is a property of the *Dial-up Network*.

[2]*The modem, e.g. INSYS Modem 336 /56k /56k UL is optional (not standard included).*

9.1.3.1 imc POLARES via PPP

For connection via PPP, the device needs a serial interface in addition to the Ethernet connection. This serial interface can be connected to a modem. The measurment device is in this case the PPP server, the control-PC the PPP client. That means that the PC calls the device to establish a connection. TCP/IP is used as the network data transfer protocol.
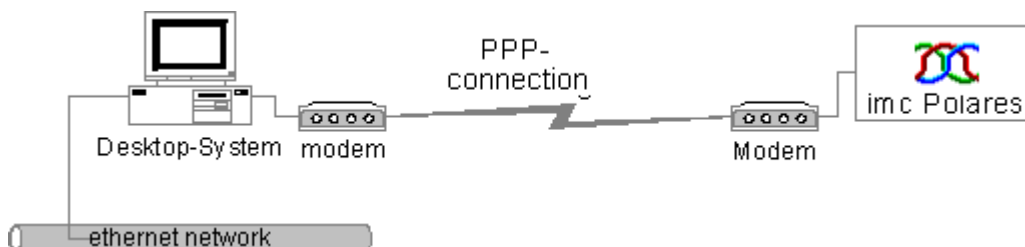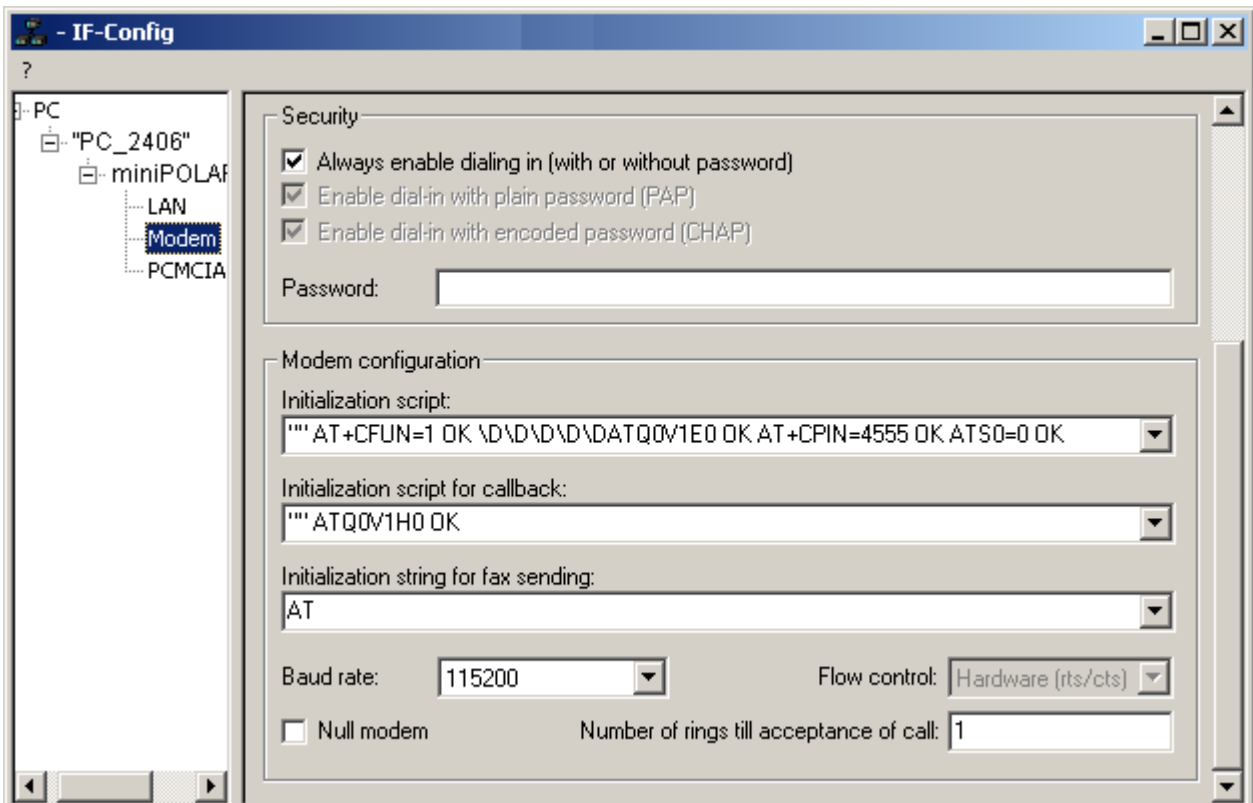
9.1.3.2 imc POLARES configuration as PPP-Server

Your device can be configured as a PPP server. The program *IF-Config*, which is installed along with the *POLARES operating software* software and is located in the *imc POLARES* program group, is provided for the purpose of making this configuration.

For the PPP-configuration, the device must be connected with the PC via Ethernet. Start the program *IF-Config*. Select your device in the tree diagram on the left side in the manner customary for working with the MS-Explorer. When the diagram expands, a network search is automatically carried out via the respective adapter. Among the entries under the expanded branch for your device, click on *Modem*.

On the dialog's right side, you can then make all the PPP-setting necessary for running the device as a PPP-server. You can read more on this in the next segment:

To write the settings to the measurement device unit, simply click on the device's entry on the left side of the dialog and then on the button *Apply* on the right side. But first check the settings in the controls above and activate/deactivate them as appropriate.

Once the configuration has been written to the device, it performs a warm start and applies the new settings. This procedure lasts approx. 1-2 min. When the text "Settings applied" appears in the box *Messages*, configuration of your device is complete and you can proceed with the next device.

9.1.3.3 Modem settings for TCP/IP devices (PPP)

To set the PPP-parameters, click on the button *PPP-settings* in the main dialog.

IP-address: since Windows isn't able to assign an IP-address to *imc POLARES*, an IP-address must be entered in the box *Local IP-address (device)*. The second box, *Remote IP-address (caller)* can be left on 0.0.0.0. In this case, an IP-address must be assigned to the caller (PC) by means of the Dial-Up network settings. This IP-address must be located in the same subnet as the address assigned to *imc POLARES*. Observe the notes under .

Maximum packet size: This option enables reduction of the maximum package size in order to improve data throughput if the connection is poor. The default value of "1500" should only be reduced if the telephone connection is very poor, having many CRC-errors. Depending on the version of Windows, CRC-errors are indicated either in the status of the Dial-up connection or in the system monitor.

Security: These options govern the protection against unauthorized access to the *imc POLARES* unit.

- *Always enable dialing in (…)* means that password protection is deactivated! Anyone knowing the telephone number can dial, with or without any password.

- *Enable dial-in with plain password (PAP)* means that PAP is allowed. With this procedure, the password is transferred in plain text. Thus, it could be intercepted. Using the intercepted password, it would be possible for an invader to access the device.

- *Enable dial-in with encoded password (CHAP)* means that CHAP is allowed. With this procedure, no information is passed from which the password could be deduced. Even if an invader were able to read an authorized user's code prompt, he would still not be able to dial into the device, because the next code prompt would require a completely different response deducible only with knowledge of the password.

- It is possible to allow PAP and CHAP simultaneously.

- The code may have a maximum of 32 characters.

Modem configuration: This is where the PPP-interface's *Baud rate* as well as the *Scripts* are set which govern the process of setting up and terminating a connection.

The PPP-interface constitutes a serial connection whose maximum Baud rate setting is 115200 Bd. The flow control for the serial interface is accomplished exclusively by hardware protocol. These settings are the same for both subscribers.

The two initialization scripts consist of a sequence of "answer-command pairs", where the first step is always to wait for the modem's response. Since a command would normally need to be sent first, the empty quotation marks at the beginning indicate that there is nothing to wait for. Then the next command follows, e.g. "ATZ", upon which the system waits for the response, e.g. "OK" etc.

- The *Initialization script* can have a maximum of 128 characters. Its serves to perform the basic initialization of the modem. If the modem requires special initialization, the pertinent commands should be entered at this point. The combo box already contains examples of the most common cases, which should normally be sufficient. However, with a GSM-modem, the PIN must be entered.

- The *initialization script for callback* normally shouldn't be changed. A maximum of 64 characters can be entered. The callback function makes it possible to call the device and to be called back by it.

- The *initialization string for fax-sending* is a single AT-string with a maximum length of 64 characters. Thus it isn't a script like those in the other controls! This is where to enter special AT-commands necessary for putting the modem in the FAX mode. Normally, this setting shouldn't need to be changed!

In order for your device to be able to accept an incoming call, the modem must be activated. for example this would be, if the measurement device is sending a message using the modems interface.(see chapter *Messaging*).

Furthermore, there may not be any active connection between the *POLARES operating software* software and the device via the Ethernet. (see section *Switching between Ethernet and PPP*).

9.1.3.4 Configuring a PC as a PPP-client

In order to use the Windows PC as a PPP-client, the following conditions must be met:

- a modem is connected to the PC,
- it is installed under Windows,
- the Dial-Up network under Windows was installed.
- *Messaging* is not activated in *imc POLARES*

Refer to the modem manufacturer's documentation and that of Microsoft Windows for information about installing the modem and the Dial-Up network. The following will restrict itself to a few explanations and points on the general procedure which is recommended.

On the Windows Desktop under the icon *My computer* there is the icon *Dial-up Network.* Create a new connection. Enter the telephone number of the *imc POLARES'* modem. Then the Dial-up Network's properties can be edited. The following illustrations show the recommended default configuration, which should always work. Only the IP-address must be entered according to the user's own needs. The dialogs shown come from Windows98. Under other Windows versions, these dialogs appear differently, but are operated in the same way.

Some additional notes on configuration:
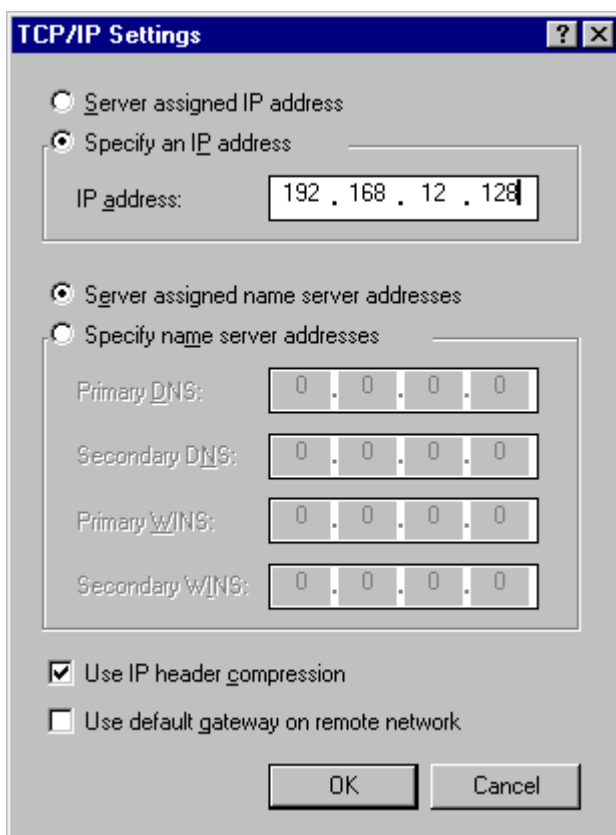
- *Protocol*: Select only TCP/IP! Deselect all other protocols.
- *IP-address:* The instructions above configure *imc POLARES* as a PPP server in such a way that the PPP interface on the PC has a fixed address. For this reason, an unambiguous address which identifies the Dial-up Network as a TCP/IP network interface on the local PC must be specified. If the computer has an Ethernet adapter, this IP-address may not belong to the same Subnet.
- *Name-Server:* not needed if there is a direct modem connection between the PC and *imc POLARES* unit.
- *Standard-Gateway:* must be deactivated, since *imc POLARES* is neither an Internet provider nor router. Otherwise there is a danger that the network will not work on the PC involved!
- *Compression:* can be activated. But it is recommended to deactivate it when starting out.
- **LCP Expansion**: Not supported by *imc POLARES*.

9.1.3.5 Establishing a PPP connection

As already explained in the introductory passages, a PPP connection actually remains transparent for its subscribers. That means that the *operating* software makes no reference to the PPP connection; as far as it is concerned, the connection is of the usual TCP/IP type. In consequence, the PPP connection must first be set up by Windows, before starting the *POLARES operating software* software.

To establish the PPP connection, select the icon with the link *imc POLARES* in the Dial-Up Network which was set up as per the instructions in the last section.

After the connection has been successfully established, a TCP/IP connection is ready for the *POLARES operating software* software. Now a network search can be carried out in the manner usual under TCP/IP. For the network search, the TCP/IP protocol is selected and the corresponding network interface (network adapter). The PPP connection appears in the list of the network adapters with the TCP/IP address of the PC's Dial-Up Network. After the network search the *imc POLARES* unit should appear in the list of hardware and can be selected.

Note

- In order to use *imc POLARES* via the PPP connection, first set up the connection via the Dial-Up Network, then start the software.

9.1.3.6 Disconnecting a PPP-connection

First disconnect from the device on the software level. Only after this is done, close the modem connection by selecting *Disconnect* in the Dial-Up network. The device then returns to a standby state.

Note

- Never break up a PPP-connection before having disconnected from the device. Otherwise it takes a few minutes before the device can be addressed again.

9.1.3.7 Switching between Ethernet and PPP

Although the device has both a serial PPP and an Ethernet interface, only one interface can be used at a time. Switching between the interfaces is accomplished by means of the modem control lines *Data Set Ready* (DSR) and *Data Carrier Detect* (DCD). As a rule, it is sufficient to connect a modem to a serial interface. If the modem is switched on, the device goes into standby. If the modem is switched off, or if no modem is connected, the Ethernet interface is activated.

While communication is taking place, it isn't possible to switch. If you activated the modem while the device is exchanging data with a PC via the Ethernet interface, this connection is not interrupted. Only after the PC has completed its communication with the device is the modem's activation status checked.

Notes

- When the device is switched from Ethernet to PPP, it takes about 40 seconds for a call to be able to be received!

- Never break up a PPP-connection before having disconnected from the device. Otherwise it takes a few minutes before the device can be addressed again.

9.1.3.8 Commissioning a radio modem with TCP/IP (PPP)

9.1.3.8.1 Falcom A1, A2D-1, A2D-2

Prerequisites:

1. Modem set to 9600Baud (factory setting).
2. HyperTerminal connection settings: 9600, 8bits, no parity, 1 stop bit, no protocol.
3. HyperTerminal connection settings: 115200, 8bits, no parity, 1 stop bit, no protocol.

Preparing the modem:

1. Connect modem to PC via serial cable.
2. Start HyperTerminal connection at 9600Baud.
3. Input: "at" then *ENTER*. Modem must respond with "OK".
4. Change transfer speed to 115200Baud by entering "at+ipr=115200", then *ENTER*. Modem must respond with "OK".
5. Start HyperTerminal connection at 115200Baud.
6. Input: "at&f", then *ENTER*, "at&s0", *ENTER*, "at+ipr=115200", *ENTER*, "at&w", *ENTER*. Modem must respond each time with "OK".

Preparing the device:

The program "TCPIP-Config" is used to make the following changes in the device:

1. The IP-address is set to match the PC's Dial-up entry.
2. For the initialization script, the combobox entry for the GSM-modem is selected.
3. In the command "AT+CPIN=XXXX", XXXX is replaced by the SIM-card's PIN. If the SIM-card doesn't require a PIN, "AT+CPIN=XXXX O AT OK" is deleted.
4. The Baud rate is set to 115200.

9.1.3.8.2 WaveCom Fastrack

Prerequisites:

1. Modem set to 115200Baud (factory setting).
2. HyperTerminal connection settings: 115200, 8bits, no parity, 1 stop bit, no protocol.

Preparing the modem:

1. Connect modem to PC via serial cable.
2. Start HyperTerminal connection at 115200Baud.
3. Input: "at" then *ENTER*. Modem must respond with "OK".
4. Input: "at&f", then *ENTER*, "at&s0", *ENTER*, "at+ipr=115200", *ENTER*, "at&w", *ENTER*. Modem must respond each time with "OK".

Preparing the device:

The program "TCPIP-Config" is used to make the following changes in the device:

1. The IP-address is set to match the PC's Dial-up entry.
2. For the initialization script, the combobox entry for the GSM-modem is selected.
3. In the command "AT+CPIN=XXXX", XXXX is replaced by the SIM-card's PIN. If the SIM-card doesn't require a PIN, "AT+CPIN=XXXX O AT OK" is deleted.
4. The Baud rate is set to 115200.

9.1.3.9 Instructions for setting up a PPP-device

1. PC Control panel -> call network
   a. install TCP/IP Dial-Up adapter
   b. set IP-address properties if no DNS-server is available
      i.   IP   192.168.12.1
      ii. Sub   255.255.255.0
   c. otherwise, configure DNS (normally, this has already been done)
      i.   Host name: name; domain: imc.imc-berlin.de
      ii. search order: add 192.168.11.1 to list
      iii. Domain imc.imc-berlin.de

2. Creating a Dial-Up network (My Computer $\Rightarrow$ Dial-Up network)
   a. General
      i.   phone number
      ii. select modem
            1. General
               a. configuration of COM connection
               b. maximum speed 115200
            2. Settings: Standard
            3. Options: Standard
   b. Server types (win9x)
      i.   Type: PPP
      ii. Options TCP/IP
            1. TCP/IP settings
               a. permanently set 192.168.12.12
      iii. Script: Standard
      iv. Multilink: Standard

3. Call TCPIP-Config (from the *imc POLARES* program group)
   a. Search
   b. Choose device and call PPP settings
   c. IP-Address
      i.   Set local address e.g. 192.168.12.13
      ii. Remote IP doesn't matter
      iii. Username & password if necessary
      iv. Script
            1. Default $\Rightarrow$ don't change anything
            2. GSM
               ```
               Send ATZ\r
               Pause 1
               Send AT+CPIN=XXXX\r
               Pause 20
               Send ATS0=1 \r
               Pause 1
               Signal lcp open
               ```
      v.   Hardware: Default: 38400; Hardware
   d. Write to device
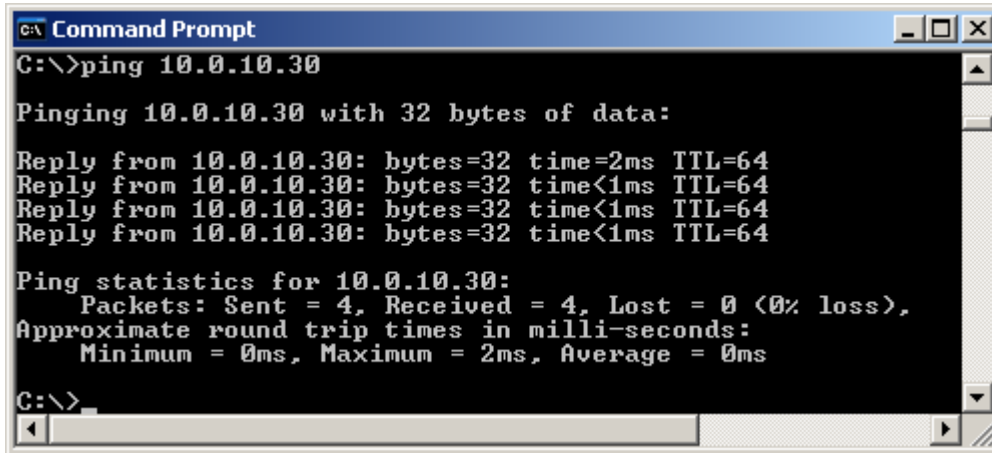
4. Physically construct modem line

5. Set up Dial-Up connection

6. If the connection is established, start *POLARES operating software*-software
   a. Choose device 27 $\Rightarrow$ edit
   b. Choose network settings
   c. Click TCP/IP
   d. Activate host address (in this example: 192.168.12.12)
   e. Let's go...

9.1.4   Determining the MAC-address of the measurement device

In order to find your *imc POLARES* device's MAC-address, start the "input prompt" under Programs\Accessories.

- There, begin by accessing the device with a ping and the IP-address.
  The IP-address can be found with the help of the program IF-Config under Programs*imc POLARES.*

  Example for the ping command: ping 10.0.9.159
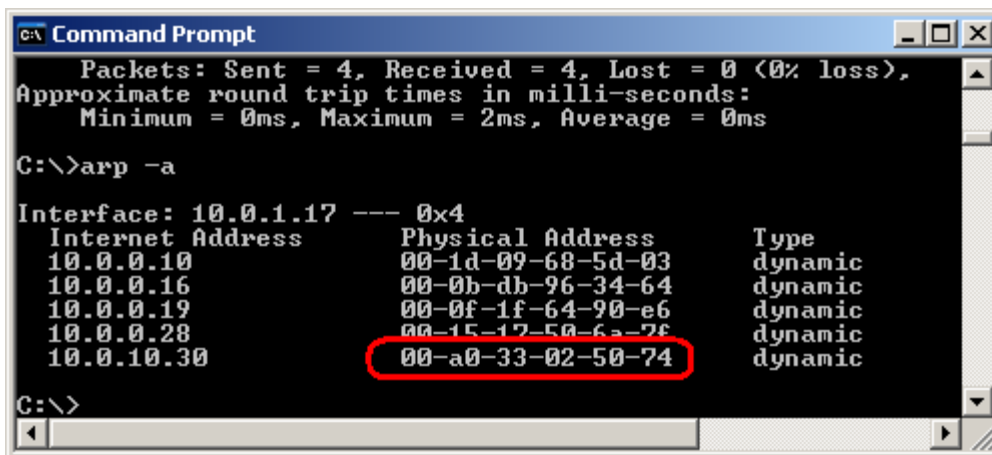
- Next, enter the following command: arp –a

- In the second column ("Physical Address" in english) you will find the MAC-address.

9.2   Messaging

9.2.1   Fundamentals

9.2.1.1   What is Messaging?

imc POLARES supports the transmission of text messages in response to specific events. The available events are any signal changes of the virtual bits and network bits. In any bit, the transitions both from 0 to 1 and from 1 to 0 can be linked with one or more message texts.

Each such message can have its own target defined for it. The available message types include email, SMS and FAX in any combinations.

Along with obligatory text components, the message texts can also contain the current values of the network bits, virtual bits and Display variables from the device. Other available text components include the date, time, device name and certain Messaging variables, which can be filled with the currently valid values at the moment the message is generated. The information for Messaging is comprised of these specifications:

On this event:

- this message's frequency
- loss of this message

On all messages generated:

- The count of all messages generated
- The count of messages rejected as undeliverable or due to lack of resources
- The count of all events which could not be processed because they occurred in too rapid succession

9.2.1.2   What can Messaging be used for?

Practically any event occurring during a measurement can release messages.

In the simplest case, this can be used to alert a service technician by means of an SMS when a threshold is exceeded or a similar event occurs.

The ability to place the current values of the network bits, virtual bits and Display variables from the device in the message makes it possible to generate simple reports as well as malfunction messages. With appropriate programming, time-controlled messages, for example, can be sent, which could contain the most important data on processes current state.

Note, however, that Messaging is conceived exclusively for occasional sending of messages. It should generate only a few messages per hour or even per day! For more information, refer to the section on reliability 184, and the technical specs 191.

9.2.1.3   How does Messaging work?

The devices cyclically examine the virtual bits and network bits for changes. If a change is detected, a check is made of whether there are any message configurations defined for that event.

If there are, then in addition to the virtual bits and network bits already read in, the Display variables, the date and the time are saved. This ensures that the values are as up-to-date as possible for any later generating of messages.

The detected events and all their data are entered into an event queue. All of this queue's entries are later evaluated and all necessary message texts are generated. In the process, the variables in the message texts are replaced with the stored values.

The messages thus generated are saved in a sending queue, from where they can be sent via the respective suitable interface. WARNING! Under certain circumstances, the messages may not be sent in the order in which they were generated (see Delivery of the messages 184)!

Messaging begins its activities already after preparation for measurement. Be aware, therefore, that messages could be sent even before a measurement starts if a bit for which a message is configured changes. Messaging remains active even after stopping the measurement. In particular, it continues to try sending messages generated during the measurement! Also, Messaging's counter variables are not affected by the measurement's start or stopping. Only upon preparing the next measurement are the counter variables reset and any unsent messages discarded!

In order to deactivate Messaging, a measurement must be sent which contains no message configurations.

9.2.1.4 How to configure Messaging

The messages are configured on the page *Supplementary parameter*. *POLARES operating software* uses these to produce an ASCII file which is saved in the measurement task folder. This files lists a description for each message, which states not only the actual text but also the triggering event and the message's destination.

Welche Angaben im Einzelnen notwendig sind, ist vom jeweiligen Nachrichtentyp abhängig. Im Kapitel *Konfiguration* 186 wird darauf näher eingegangen.

9.2.1.5 Preconditions

Only devices having an appropriate interface are able to send messages. For the *imc POLARES* a modem is optionally .

In order to send a FAX, a modem which supports G3-Fax Version 2 or 2.0 is needed. The fax machine must also be compatible with one of the two standards. This shouldn't present any problem for most current machines.

Sending an SMS also requires a modem; even a land-line modem is able to send an SMS!

Email can be sent either via modem, or via a network interface, if an appropriate server can be reached via the network.

If either a GSM-modem or a GSM mobile phone is used, then it's not necessary to enable data transfer.

There are no further requirements.

9.2.2   Message types

The message types Email, SMS and FAX come with different strengths and weaknesses which can be considered when making a selection.

9.2.2.1 SMS

An SMS can contain only a small amount of text while offering the advantage of being able to alert a service-technician or responsible engineer directly via mobile. Transmission via the network operator usually takes place within a few seconds, although this is not guaranteed!

For electronic re-processing and archiving, an SMS is rather inappropriate. To send and SMS, a modem is absolutely necessary.

9.2.2.2 FAX

A fax can transmit significantly more text than an SMS and is the most direct message form since it doesn't have an intermediary provider. The device dials the fax machine's number directly.

There is also no time delay between the device's sending of the message and the arrival of the message at its destination. However, the fax machine would have to be permanently watched in order to use this advantage.

Since a fax is transmitted as a bitmap graphic, the data volume transferred is much greater than that of an email or SMS. Therefore, transmitting a fax can take several minutes when using a GSM modem.

A fax is only very conditionally suited to archiving, and re-processing is practically not possible at all. With Messaging, the size of a fax message is limited to one page. A modem is absolutely necessary for sending a FAX.

9.2.2.3 Email

An email can contain almost any amount of text; only the size of the configuration file set certain constraints. Transmission of email by the provider usually occurs after a few seconds, though there is no guarantee for this. By contrast, the email-client may be set to retrieve messages only at longer intervals.

In terms of archiving and re-processing, emails are best suited. In addition, sending an email doesn't require a modem if a mail server is accessible via the LAN interface. In this way, the slow process of dialing via modem is also omitted, so that the emails are sent much more quickly.

If, for instance, the modem is occupied by a PC dialing in, it is still possible to send emails via the LAN. On the other hand, all messages which rely on the modem are detained until the modem is available again.

However, to send an email, an account with a mail server is necessary so that the device can be identified by the server by means of a login name and password.

9.2.3   Reliability

9.2.3.1 Recognizing events (time response)

There is a limit to how many events for which messages are configured can appear in rapid succession. While one message is being sent, any other events occurring can only be stored. However, the event queue responsible for this purpose is of limited size. Once this is used up, all subsequent events are discarded. These lost events are counted in the Messaging variable "`EventOverruns`".

It isn't possible, however, to reconstruct afterwards which messages were lost due to discarded events!

As soon as Messaging is no longer occupied with sending a message, the accumulated events are translated to message texts and entered into the sending queue. This queue's volume is also limited, so that messages can be lost if they are generated more rapidly than they can be sent.

How long a message can be kept in the queue depends on the one hand on the actual sending duration (from a few seconds to approx. 5 min), and on the other hand on the receiver's capacity to be reached, since, in the case of an error the message will be repeated over and over.

If the modem is busy because a PC has dialed in, then all messages which require that modem will be delayed until it's free. Thus in this case, the messages could stay in the queue indefinitely!

In this way, the transmitting is delayed and the queue's available space can be exhausted, for which reason no new messages may be able to be accommodated.

All lost messages are counted in the Messaging variable "`AllMessageLosses`". In addition, the variable "`ThisMessageLosses`" records for each individual message configuration how often a message stemming from this configuration was lost.

Every message has the following addendum to provide a total overview (the numerical values are examples):

```
(This event :2  Unable to send: 0 )
(All messages: 23 Unable to send: 3 Overflow: 0 )

This conforms to the template:
```
```
(This event : "ThisMessageCounter" Unable to send: "ThisMessageLosses")
(All messages: "AllMessageCounter"  Unable to send: "AllMessageLosses" Overflow: "Event
Overruns")
```

9.2.3.2 Delivery of the messages

As soon as there is a message in the queue ready to be sent, an attempt is made to send it. If an attempt fails, the message is returned to the queue for a repeat attempt later following a pause. There is a specifiable delay before the next attempt to send the message.

This process is repeated several times, each time increasing the pause between delivery attempts. Only after a certain amount of repetitions has failed, the message is considered unable to be sent, and is deleted. The Messaging variable "`AllMessageLosses`" and the corresponding instance of "`ThisMessageLosses`" are updated accordingly.

If the modem is busy, for instance due to a PC dialing in, all messages to be sent via modem must be held back until it's once again available. Therefore, an occupied modem won't lead to failed delivery!

Emails which can be sent via the LAN are delivered even if the modem is busy. If appropriate, they can be bumped up in the sending queue. Thus, the messages aren't necessarily sent in the order they were created!

If a message can't be delivered due to configuration errors such as a wrong telephone number or password, then multiple attempts to deliver it may come at (substantial) monetary cost. **Therefore it is strongly recommended to test every message configuration under authentic conditions. The producer of *imc POLARES* is not liable for any costs resulting from the use of Messaging!**

9.2.3.3 Storing unsent messages

If a message must be discarded because there's no more room in the sending queue or because it can't be delivered, it is stored on a data carrier in the device, if possible. Even if the device is deactivated or if messages must be discarded due to preparation of a new measurement, storage in the device should still take place if at all feasible. Towards that end, the messages are saved even upon generating the message text and only deleted from the backup folder after being successfully sent.

If the device has an internal hard drive, it will be used for storage. Otherwise the system will check the device for the presence of a removable storage drive to which to save the messages.

For storage of the messages, a folder with the name "UnsentMessages" is created in the data carrier's main directory. All unsent messages are saved in this folder under filenames which provide indication of when and how the message was generated.

The filenames take the following form:

Date	Time	Number	Event	Event count	Type
2004-07-05	09-31-46	#4	Virt_Bit03=1	#2	EMAIL

Examples

2004-07-05 09-31-46 #4 Virt_Bit03=1 #2.EMAIL

The first number corresponds to "AllMessageCounter". It represents the incremental counter of messages since a measurement was last prepared. The second number is the message's "ThisMessageCounter". It states how often the event occurred.

The filename extension indicates whether the message is an email, an SMS or a FAX.

9.2.4   Configuration

9.2.4.1 General

Configuration of messages is performed with the help of the *Supplementary parameter* page.

The available message types are:

      FAX   SMS   Email

Events which can trigger a message:

1. voltage event,

2. free memory on a hard drive falls below a certain amount,

3. sending of a message within an interval set to between 1..24 hours.
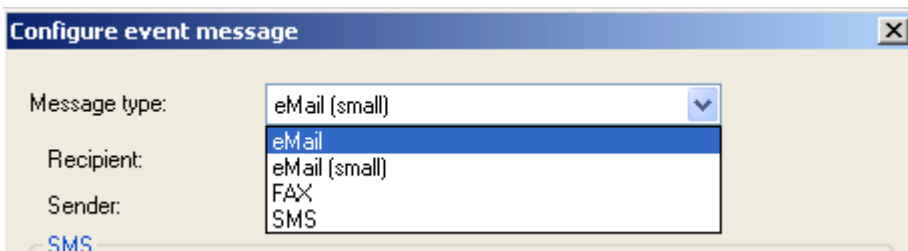
First a definition must be made of when *imc POLARES* is to transmit a message. Transmission may be desired at regular intervals, or in response to specific conditions. To determine this, the corresponding checkmarks must be set under the heading *Events ⁄ Messages* on the page *Supplementary parameter*. There is a button for the respective message transmission triggering option which becomes active when the option is selected. Clicking on this button calls the dialog *Configure event message* for the respective transmission option used to configure the messages.

9.2.4.2 FAX

With a fax, just the fax machine's telephone number provides all data necessary for actually sending the message. You must only be sure to include any digits necessary to obtain a dialing tone, or any area codes.

Example:
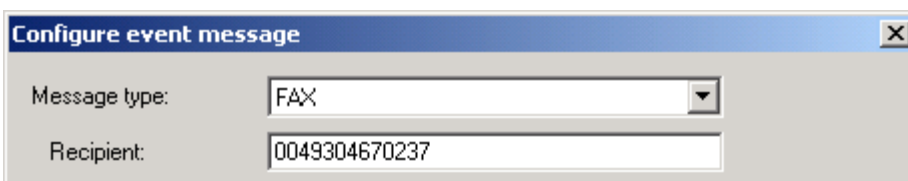
Note that both your modem and your fax machine must support the standard G3-Fax Version 2 or 2.0. However, this is usually the case anyway.

9.2.4.3 Email

Emails are the only form of messages for which no modem may be necessary. If a mail server is available in the LAN, then only a few data are sufficient for sending an email.

The sender address is specified in the box *Sender*.

In order to display a preferred (or more specific) designation for the sender, it is possible to prefix the actual sender address with a string denoting the alternative designation. In this case, the sender address must be bracketed in "<>" characters.

Be sure to check which characters are accepted by the servers involved! For instance, German umlauts are not accepted and thus may not be used.

Certain PC programs resort to replacing the umlauts with a string which causes the email client to display the respective umlauts. However, Messaging does not support this technique!

In the *Recipient* box, the address of the email receiver is stated. In contrast to all other messages, emails can be sent to multiple receivers simultaneously. For this purpose, all target addresses are simply separated by commas.

As with the sender address, a string can be prefixed to the receiver address which then appears in the email client as the receiver. The actual receiver address must then be address must be bracketed in "<>" characters.

For umlauts and special characters, the same limitations apply as for *Sender*.

However, if the email is to be sent by modem, a number of different parameters must be entered.

Note

- Ask your network administrator whether the measurement devices are permitted to send messages. If they don't have this right, you will not receive any messages even if the configuration is correct.

- When an email is sent, a **sender address must always be specified**, otherwise delivery of the mail will be refused. Some servers additionally check whether the email address is even valid. In extreme cases, the server only allows senders which are in the same domain as the server itself, or which belong to a registered account. These steps are intended to combat abuse of mail servers.

The device must log itself in with an Internet provider. The provider's dial-up number is entered in the box *Provider / Number.*

Internet access also requires a login name and password. These values are entered in the boxes *Provider / Login Name* and *Provider / Password*.

If an email is sent via the LAN interface, then the entries pertaining to the Internet provider are omitted, of course.

However, the mail server by which the email is to be sent must always be specified. The mail server can be specified either by its IP-address or by its host name. These are entered in the boxes *SMPT / Server name* or *SMPT / Server Address*.

To prevent abuse (spam), almost every mail server requires logging in user name and password. The servers carry out an ID check according to a variety of protocols, of which one supported by the server used must be selected in the box *SMTP / Authentication: login* or *cram-md5* (password encrypted).

If the mail server demands a login, the login name and password are entered in the boxes *SMTP / Login Name* and *SMT / Password* respectively. Otherwise, these entries are omitted.

9.2.4.3.1 Example for eMail in response to a power outage:

```
04.04.2005 11:21:42
Device: imc POLARES_121166

A voltage event has occurred!

Type:  3 (1=overvoltage, 2=sag, 3=outage)
Channels:  2
F      = 50.072 Hz

U1_rms = 227.63 V
U2_rms = 0.00 V
U3_rms = 227.62 V

THD U1 = 1.664 %

Free memory: 487156.00 kB

(This event :2 Unable to send:0 )
(All messages:23 Unable to send:0 Overflow:0)
```

9.2.4.3.2 Example for received cyclical eMail

```
08.03.2005 17:30:12
Device: imc POLARES_120760

Cyclical message (life sign signal)

Interval = 4 h
F        = 50.020 Hz

U1_rms = 228.42 V
U2_rms = 228.91 V
U3_rms = 227.81 V

Free memory: 15515.00 kB

(This event :56 Unable to send:11 )
(All messages:65 Unable to send:11 Overflow:0)
```

As subject, Messaging creates automatically a text according this template:

Message from imc POLARES <device name>

Example:

```
Message from imc POLARES <Devices_121137>
```

9.2.4.4 SMS

Messaging supports sending of SMS via both GSM modems as well as via land line modems. This ability is made possible by the fact that practically every network possesses servers into which one can dial in either from a land line or via a GSM-modem.

To send an SMS, information enabling communication with the SMS-server is required.

To send an SMS, information is required which enables communication with the SMS server, namely the server's dial-up number and the protocols for transmission of the SMS.

Since there are a variety of protocols for transmitting an SMS, the appropriate protocol for the respective server must be selected. This is done in the box *SMS / Protocol*. The available choices are Tap, Tap-Old, Ucp, Ucp-Extend.

The server's dial-up number must be entered in the box *Provider / Number*.

9.2.5   Potential error source

In order to avoid experiencing problems during actual use, you should test your message configuration in advance!

Once you have verified your access data for an Internet provider, mail server or SMS provider, you should next copy and paste them to the configuration file, which avoids typing errors. The same applies to the receivers' telephone numbers and email addresses.

Below is a list of some problems with their possible causes and the corresponding remedies:

Problem: The device does not send a message for every event. Messages are generated only sporadically or not at all.

Cause: The sending queue is full.

Solution: Try not to generate too many messages in quick succession and ensure that the messages can be sent without any problems.

Problem: The device sends each fax multiple times over a long period of time.

Cause: Your fax machine is not entirely compatible with the modem used, which causes the machine to think that the fax was lost. The device repeats the message until it finally gives up.

Solution: Replace the fax machine with a different model or contact Customer Service about replacing the device's internal modem!

Problem: I use Messaging and also automatic callback. The device sometimes takes much longer than normal to call me back.

Cause: The device may be sending a message between your call and the callback. This can delay your callback by up to approx. 5min.

Solution: Not available.

9.2.6   Messaging Technical specs

Parameter	min. / max.
Delay between occurrence of an event and saving the variable's value	min. 20ms, max. approx. 200ms
Line length in configuration file	max. 512 characters
Size of a configuration file	max. 300000 characters
Number of message configurations	max. 3 per device
Depth of event queue	128 entries
Depth of sending queue	128 messages
Number of sending attempts before loss of message	30
Time between two sending attempts	1,4,9,16,25,36,49,60,60, ... 60min
Duration of attempt to dial into Internet	Maximum permitted: 60s
Email transmission duration	Maximum permitted: 80s
Number of characters in an Email Typical character count in text box:	Limited only by the size of the configuration file approx. 250
SMS transmission duration	Maximum permitted: 80s

Number of characters in an SMS
    Typical character count in text box
	Maximum: 160 characters
	    0

Fax transmission duration	Maximum permitted: 280s
Fax string length	Maximum: 75 characters
Fax line count:	Maximum: 75 characters

Input ranges
    Binary states
    Counter variables
    Display variables
	0 or 1
	32 bits unsigned (0 to 4294967295)
	32Bit floating point (-3.4e+38 to +3.4e+38)

9.2.7   Templates

Hinweis

For the purpose of making the configuration of Messaging as easy as possible, the examples below present the access data for certain service providers. For the currently valid access data, contact the respective service provider. **No guarantee for the correctness of the access data is offered or implied!**

9.2.7.1 Internet providers

Here are some examples of Internet providers.

9.2.7.1.1 Call by Call Internet access from land lines (ISDN and analog)

Example MSN (Easysurfer power)

ProviderPhoneNumber=0193670

ProviderLoginName=msn@easysurfer-power.de

ProviderPassword=msn

9.2.7.1.2 Call by Call Internet access via GSM

Example D1 T-Com Inland (Registration required!)

ProviderPhoneNumber=4122

ProviderLoginName= (assigned upon registration)

ProviderPassword= (assigned upon registration)

Example D1 and D2 Domestic (Germany): Freenet Call by Call

Per-minute price: 20 Cent + any fees for special numbers (debitel)

ProviderPhoneNumber=22243

ProviderLoginName=freenet

ProviderPassword=mobil

9.2.7.2 Free mail servers

You must apply for an email address with a provider, in order to obtain a login name. This can be done via the provider's website.

Example GMX

SMTPServer=pop.gmx.net

SMTPAuthentication=cram-md5

SMTPLoginName=your login name with this provider)

SMTPPassword=(your password with this provider)

SenderAddress=(your email address with this provider)

9.2.7.3 Freely accessed SMS servers

The cost of sending an SMS depends on which network you call the provider from and into which network the SMS is sent. The numbers stated here are applicable to analog, ISDN and GSM modems, unless otherwise indicated!

Example D1

ProviderPhoneNumber=01712521001

      or 01712092522 (not applicable to ISDN AL5064S)

SMSProtocol=Tap

Convert=Ä [Ö \ Ü] ä { ö | ü } ß B \n \s \t \s

9.3   Update from version 1.x to version 2

The old version's measured data continue in use unconditionally. In the analysis, it doesn't matter with which version the data were measured. In the *POLARES operating software* you can have the measurement's properties displayed on the Evaluation ⌐78⌐ page, including the *POLARES operating software* and firmware versions.

1. Uninstalling the old version

    a) The configurations, measured data and the database are NOT uninstalled automatically.

    b) In order that the changes are carried out reliably, the PC must be restarted.

2. Installation of the new version

    a) Adopt the existing measurements if you are prompted whether to delete the old data.

    b) After starting the new software, you are able to access the data adopted just as previously.

3. Backward compatibility

    a) In this direction, there is NO compatibility, since the old software is unable to know the new functions.

    b) For this reason, a downgrade should only be performed in emergency cases, because it does not enable existing data to be accessed any longer! They must either be deleted upon installation or be archived at a different location by previously changing the folder to which to save, or similar steps.

    c) With measurement devices which were assigned a time zone setting (see Start – Type of device time ⌐65⌐), this must be reset BEFORE uninstalling.

    d) Confer beforehand with our Hotline on compatibility with smaller version update steps.

10   Appendix

10.1   imc FAQ, Hotline

10.1.1 Hotline

Support, see [foreword](#) ⌐6⌐.

10.1.2 Network

Question: Why does it take so long to start the *POLARES operating software* software on my laptop?

Answer: A laptop normally operated within a company network is usually set to DNS. In standalone operation with *imc POLARES*, this leads to considerable delays until Windows gives up looking for the DNS in the network which is no longer present.

Solution: switch off DNS

Question: My laptop sometimes can't find *imc POLARES* after having been rebooted.

Answer: Windows assigns a new adapter address to laptops with PCMCIA network cards at each booting. This adapter number can't be seen from outside.

Remedy: New network search and enter the device as new.

10.2   File Extensions

Extension	Definition
BAK	backup file
BMP	bitmap
CCV	curve configuration for one window
CCP	curve configuration for serveral windows
NQA	imc POLARES configuration
CLB	Settings clipboard
DAT	*imc POLARES* waveform (computed data)
DEF	DLL header
DLL	Program library (dynamically linked library)
DOC	Microsoft Word document
DRB	Report Generator (German version)
DRX	Backup of last report
DSP	Digital Signal processor
EDB	temporary database
EXE	Executable program
HLP	WINHELP help file
INI	Initial settings file
MDB	database
PRT	Report Generator (English)
RAW	*imc POLARES* waveform ("raw data")
RTF	Protocol file readable by WINWORD or Wordpad
SET	Curve Manager: settings
TMP	Temporary file
TXT	Text file
UMC	Device-configuration file for *imc POLARES*, containing all measurement task settings
UME UMF, UMS	Device file for *imc POLARES*, created upon preparation for Autostart or Disk start.
UMI	Device-configuration file for *imc POLARES*, updated upon each time software connected to the PC
UMT	Device file for *imc POLARES*, created upon disconnection of the PC.
XLS	Excel waveform

10.3   Glossary

application	A program which runs under MS-Windows.
data set	A group of related numerical values, e.g. a series of temperature measurements in sequence.
DSP	Abbreviation for digital signal processor. The designation DSP C32, for instance, refers to a signal processing board.
events	An event is a particular state of the measured signal or of the device. An event can be true or false, either 0 or 1, in other words. Thus, an event is a digital unit of information. An event can be computed from analog and digital quantities.
Hot-Plug	The hot plug feature enables you to remove a Compact Flashcard from the device while a measurement is in progress. Data are buffered in the unit's internal RAM until the new card is inserted.
POLARES operating software	Designation of the user software, as well as of the mobile device version.
imc POLARES	Designation of the device version for stationary operation in a switching cabinet.
measurement	A complete measurement run which may consist of several multi-shot measurements on several channels. A measurement is not complete until all of its parts are finished. All captured data which are saved to the hard drive as belonging to a measurement are placed in a common folder.
measurement duration	The duration of a measurement can be determined by multiplying the number of samples with the of sampling interval.
Parameters	Known in mathematics as "arguments", parameters are inputs needed by a function to produce its results.
pretrigger	When a pretrigger > 0 is defined, the data from the time preceding the release of a trigger is recorded along with the triggered data. The instant of triggering is the Time 0; pretrigger times take values < 0.
Report Generator	The Report-Generator provides a fast and easy way to personally layout a document, which may include graphics and text arranged in any pattern.
Unzoom	Reverses the zoom function, displaying the entire picture.
sample	Digital data point belonging to a measurement signal. A sample fills 2 Byte (16 bits).
ScanDisk	ScanDisk is a routine for checking your device's µDisk for flaws and correcting the problem, if applicable.
sum sampling rate	The product of the sampling rate times the number of active channels.
time base	Internal clock of device. The time difference between devices can add up to several seconds per day. A remedy to this problem are radio clocks such as the DCF77 or GPS (both options). See also synchronous start.
Zoom	Command to enlarge a portion of a window; the opposite is Unzoom.

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