An Axiometrix Solutions Brand

imc Software

Shared Components

Doc. Rev.: 2023 - 2023-01-24

imc Test & Measurement GmbH • Voltastr. 5 • 13355 Berlin • Germany

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.

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

Copyright

Open Source Software Licenses

Some components of imc products use software which is licensed under the GNU General Public License (GPL). Details are available in the About dialog.

If you wish to receive a copy of the GPL sources used, please contact our Hotline.

Notes regarding this document

This document is an excerpt from the documentation of several imc programs, like imc FAMOS, imc STUDIO or imc WAVE. The manual is available as PDF.

What is the best way to read the documents?

The manual serves as reference material. This document describes how to operate the cross-software components. However, it is still recommended that you observe the entire instructions in order to be able to use certain functions which are more interesting than obvious.

Special notes

Warning

Warnings contain information that must be observed to protect the user from harm or to prevent damage to property.

Note

Notes denote useful additional information on a particular topic.

Reference

A reference in this document is a reference in the text to another text passage.

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1 General introduction

1.1 Before you start

Dear user.

1. The software you have obtained, as well as the associated manual are directed toward competent and instructed users. If you notice any discrepancies, we request that you contact our Hotline 6.
2. Updates during software development can cause portions of the manual to become outdated. If you notice any discrepancies, we request that you contact our Hotline.
3. Please contact our Hotline if you find descriptions in the manual which you believe could be misunderstood and thereby lead to personal injury.
4. Read the enclosed license agreement 8. By using the software, you agree to the terms and conditions of the license agreement.

Note Notes on the descriptions and the screenshots

- The help may also contain parts **shared imc software components**. These parts may differ from the rest of the help in terms of style and structure. All help files are equipped with a full text search functionality and have an index.
- The screen shots appearing in this documentation were created with a **variety of Windows versions** and their appearance may thus differ from that of your installed program.

1.2 imc Customer Support / Hotline

If you have problems or questions, please contact our Customer Support/Hotline:

imc Test & Measurement GmbH

Hotline (Germany): **+49 30 467090-26**

E-Mail: hotline@imc-tm.de

Internet: https://www.imc-tm.com

International partners

For our international partners see https://www.imc-tm.com/distributors/.

Tip for ensuring quick processing of your questions:

If you contact us **you would help us**, if you know the **serial number of your devices** and the **version info of the software**. This documentation should also be on hand.

- The device's serial number appears on the nameplate.
- The program version designation is available in the About-Dialog.

Product Improvement and change requests

Please help us to improve our documentation and products:

- Have you found any errors in the software, or would you suggest any changes?
- Would any change to the mechanical structure improve the operation of the device?
- Are there any terms or explanations in the manual or the technical data which are confusing?
- What amendments or enhancements would you suggest?

Our Customer Support 6 will be happy to receive your feedback.

1.3 Legal notices

Quality Management

imc Test & Measurement GmbH holds DIN-EN-ISO-9001 certification since May 1995. You can download the CE Certification, current certificates and information about the imc quality system on our website: https://www.imc-tm.com/quality-assurance/.

imc Warranty

Subject to the general terms and conditions of imc Test & Measurement GmbH.

Liability restrictions

All specifications and notes in this document are subject to applicable standards and regulations, and reflect the state of the art well as accumulated years of knowledge and experience. The contents of this document have been carefully checked for consistency with the hardware and the software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity. We reserve the right to make technical modifications of the systems.

The manufacturer declines any liability for damage arising from:

- failure to comply with the provided documentation,
- inappropriate use of the equipment.

1.4 imc Software License Agreement

imc Test & Measurement GmbH
Voltastr. 5
13355 Berlin
Commercial register: Berlin-Charlottenburg HRB 28778
Managing director: Kai Gilbert, Michael John Flaherty

imc Test & Measurement GmbH
Terms and Conditions
Governing the Use of imc Test & Measurement GmbH Software
As of: June 9, 2022

§ 1 Objects of the Agreement

(1) In addition to the "General Terms and Conditions Governing imc Test & Measurement GmbH Deliveries and Services to Customers", these terms and conditions apply to all contracts concluded with imc Test & Measurement GmbH (hereinafter referred to as "imc") which involve the transfer of rights of use to any software developed by imc (standard software, software created or adjusted specifically for the Customer, which is recorded on the machine-decodable data carriers such as data files, databases and database material, updates, upgrades, releases, etc., including corresponding documentation, information and materials, hereinafter referred to as "Software").

(2) The Software is provided to the Customer as an executable object program on machine-decodable data carriers specified in the "Objects of the Agreement". The Software's product documentation is also supplied to the Customer either in print or on a machine-decodable data carrier. Unless otherwise expressly agreed in writing, the Customer is not issued the source code of the Software.

§ 2 Rights of Use, Scope

With regard to any transfer of rights of use to Software created by imc, the following provisions apply:

(1) Basic provisions

a) The Customer is granted a non-exclusive and – subject to the terms and conditions governing the use of Software by third parties, resale and leasing – non-transferrable right of use to the Software for its own purposes. "Use" signifies running the programs and editing the data records.

b) Until each due fee is paid in full, the Customer is entitled to use the Software solely on a revocable basis. If the Customer is in default with regard to the payment of fees, imc is entitled to revoke the use of the respective services for the duration of the default. The Customer is granted the permanent right to use copyright protected services, in particular the Software, only upon full payment of the agreed fee.

c) The Customer agrees to undertake appropriate precautionary measures to prevent unauthorized access by third parties to the Software. The original data carriers and the data carries used to make copies as per the agreement, as well as the documentation, are to be stored in a secure location. Employees are to be notified that the production of copies beyond the scope of the agreement is not permitted.

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b) The Customer may permanently sell or give the Software to third parties provided that the Customer is granted permanent use of the Software. In the context of its period of use, the Customer may temporarily transfer the Software to third parties for a fee or free of charge. The prohibition against multiple use remains unaffected. The Customer is expressly notified that transfer to third parties is not permitted and use by third parties is technically not possible if an individual license must be acquired or an individual activation is required for third party usage, such as in the case of runtime licenses.

c) With regard to the valid use of Software by a third party, the Customer is obliged to ensure that the third party acknowledges the provisions of this agreement governing the rights of use as binding for such third party. The Customer may not transfer Software and documentation to third parties if there are grounds to suspect that the third party may infringe upon the provisions of this agreement governing the rights of use, in particular with regard to the unauthorized production of copies.

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(4) Decompilation

The reverse translation of the provided program code into other code forms (decompilation), disassembling and other forms of reverse engineering of the various production phases of the Software is not permitted. If interface information is required to achieve the interoperability of a separately created computer program, such may be requested from imc, or a third party to be named by imc, for a minor fee. Section 69 e of the German Copyright Act ("UrhG") remains unaffected by this provision.

(5) Changes by imc

If imc conducts adjustments, changes or enhances the Software on behalf and on account of the Customer, the Customer thus acquires the corresponding rights of use to the changes or enhancements of the Software to which he is entitled according to the stipulations of this agreement.

(6) Exceptional Usage Requests by the Customer

If the Customer requests to use the Software according to terms which deviate from the requirements stipulated in Paragraphs 2 through 5, this exceptional use of the Software must be agreed in writing by imc. In such an instance, the Customer agrees to provide imc with information about the desired scope of use, the pertinent field of application, etc. If imc subsequently grants a license covering the Customer's special intended use, the parties agree that a new license fee is owed by the Customer, which is independent of payments made by the Customer for the previously existing license.

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(1) The intellectual property, in particular the copyright as well as all industrial property rights and trade secrets, are retained by imc and are not transferred to the Customer. The Customer's ownership of the machine-decodable data carries and data processing units remains unaffected.

(2) Copyright notices, serial numbers as well as designations and reservations of rights which serve as program identification or a protective right may not be removed or changed. The Customer is obliged to transfer the existing protective right notices to all copies. In particular, backup copies of the Software must be expressly designated as such.

§ 4 License Types, Multiple Use

(1) In the case of a Single-User License, the Software may be activated and run on only one data processing unit. "Activation" refers to the process of transferring the license to the data processing unit.

If the technical specifications for the Software permit a second activation, then the Customer may additionally activate the Software on a second data processing unit. However, the Software may only run on one data processing unit at any one time, not on both simultaneously.

(2) With a Network License, the Software may be run on as many data processing units as the amount of licenses obtained. In this case a central data processing unit acts as the license server for which the activation process is performed.

If the technical specifications for the Software permit a second activation, then the Customer may additionally activate and run the Software on as many data processing units as the amount of licenses obtained. However, these additional data processing units must be used by the same users who operate the Software via the license server.

(3) Subject to the provisions in Paragraphs 1 and 2 or a deviating express agreement in writing regarding network use, multiple use of the Software is not permitted.

(4) If the data processing unit is changed, the Customer is obliged to delete the Software from the hard disk drive of the previously used hardware.

§ 5 Software-Subscription

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(2) If the Customer wishes to continue using the Software after elapse of the specified time period, the subscription must be renewed.

§ 6 Trial Version

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(1) The trial version only entitles the user to test the Software. In particular, commercially productive utilization is not permitted.

(2) The rights of use granted expire after the elapse of a period stated in the product description.

§ 7 License Key

(1) Upon delivery of the Software the Customer receives a License Key. Using this License Key, the Customer is able to activate the Software purchased. By means of this License Key the Customer can also view his license status and order updates and upgrades.

(2) The License Key is to be protected against access by third parties in order to prevent misuse. If, however, a third party gains unlawful access to the Key, the Customer is obliged to notify imc immediately via telephone, as well as in writing, so that the previous License Key may be suspended and a new one issued.

§ 8 Conclusion

(1) The law of the Federal Republic of Germany shall apply under exclusion of private international law. The provisions of the UN Convention on Contracts for the International Sale of Goods (CISG) do not apply.

(2) The place of performance for all obligations arising from this agreement is imc's registered seat. Insofar as the Customer is a merchant as defined by the German Commercial Code (HGB), a legal entity under public law, or a special asset under public law, the exclusive place of jurisdiction for all disputes directly or indirectly arising from the contractual relationship is agreed as imc's registered seat. The same applies to persons who have no general place of jurisdiction in Germany, as well as to persons who have moved their place of residence or usual whereabouts abroad since conclusion of the contract, or whose place of residence or usual whereabouts is unknown at the time the action is filed. In addition, imc is entitled to file suit at the statutory venue.

(3) Oral side-agreements are not valid. Deviating or supplementary conditions as well as modifications of this contract, including this written requirement clause, are only valid if agreed in writing and expressly marked as a modification or supplement.

(4) If certain provisions of this contract are inoperative or unfeasible, this does not prejudice other provisions of the contract. The contracting parties agree to contractually substitute an operable provision which approximates the commercial intention of the contract as closely as possible for any inoperable one.

2 Overview

2.1 Shared Components

This manual contains a joint treatment of many imc software components used in common by various imc packages. All of the information presented is also available in the Online Help in dedicated files and/or chapters.

Curve Window

Curve Window shows the graphic representation of measurement signals and computed waveforms, in the simplest case as a labeled coordinate system and a curve.

The curve window has an extensive menu offering a multitude of options for display and graphical evaluation of waveforms. All curve windows display the most recent data at each time.

The curve window is used jointly by imc FAMOS and the imc STUDIO. The curve windows thus have a uniform appearance and operation style across all of these imc software packages.

Report Generator

The curve window presents information-rich graphical and numerical measurement data on the screen. But beyond this, the user also needs a printable documentation of the measurement results, or for transfer or storage as a file in PDF or other formats.

For this purpose, the Report Generator is provided, which enables the user to create personally designed spec sheets and reports. In contrast to the curve window's Print-function, which simply prints out the current curve graph, you can use the Report Generator to define one or more printable pages consisting of curve graphics, texts, tables and other graphics objects. Such reports can also be transferred into other (text editing or graphics) programs via the MS-Windows Clipboard..

File Assistant

When analyzing measured data, it is common to need to import special data formats. Using the File Assistant, you can establish these special file formats' structures for the imc applications (e.g. imc FAMOS) ("creating import filters"). Afterwards, these special file formats can be imported to imc applications in the same way as imc proprietary formats.

Remote Control

The curve window and Report Generator each have a "remote control facility", also called a Kit. This manual includes the documentation for the Curve Kit and the Report Generator Kit. The Kit functions enhance imc FAMOS with additional sequence commands for remote control.

Curve Kit

The curve window can also be remotely controlled by imc FAMOS via sequences. For this purpose, the Curve Kit enhances imc FAMOS sequences with appropriate commands.

Report Generator-Kit

In order to automate the analysis and subsequent documentation, you can use this Kit to control the Report Generator remotely by means of a imc FAMOS sequence.

Required reading!

This documentation is a reference work. We recommend first reading the documentation of the particular program (e.g. imc FAMOS help or imc DEVICES /imc STUDIO user's manual). There, it is worth giving special attention to the material on installation, and to the tutorial.

The user interfaces of the programs described here are usually intuitive to operate, without referring to the documentation. Nevertheless, the documentation will provide additional hints and insights on functions which are not readily apparent.

Installation

The curve window and the Report Generator are installed by means of the actual program (e.g. imc FAMOS). Separate installation is not required.

The File Assistant is also installed if it belongs to the respective program package. In the same way, proper installation already sets up and registers the Kits (see the imc FAMOS User's Manual/ Help, chapter "Registering Kits").

Upon new installation, the program icons for the Report Generator and the File Assistant are to the Windows Start-menu added under the group "imc".

2.2 Changing the Language Version

No matter which language is selected during the installation procedure, all available language versions will be installed.

By default, the imc software will start in the same language as the Windows version installed. If this language is not supported, then the English program version appears.

However, the language can be changed, irrespective of the Windows version. Therefore a program named "***imc Language Selector***" is provided, which is located in the following directory:

C:\Program Files\imc\shared

In rare cases of certain Windows installations, the "*C:\Program Files*" path might be different.
In such a case, use Windows Explorer to search the harddisk for "*imcLanguageSelector.exe*".

Note

Only the imc software's texts are converted. Components which depend on the operating system's language setting are not affected. Under some circumstances, there may be malfunctions if the operating system and the imc programs use differing languages.

3 Curve window

Curve Window shows the graphic representation of measurement signals and computed waveforms, in the simplest case as a labeled coordinate system and a curve. The curve window displays individual and independent objects, which can be positioned, enlarged and edited as desired.

The curve window has an extensive menu offering a multitude of options for display and graphical evaluation of waveforms. All curve windows always display the current values.

The following offers a short overview of the main features of the curve window:

Function	Description
scaling	**Automatic or manual scaling** of the x- and y-axes
Zoom	allows detailed viewing of a curve section
Unzoom	returns to entire curve window display
Measurement values	Two independent measurement cursors are available, which display the x- and y-values of the curves, as well as value differences and slopes. These cursors can be used to select sections of a curve for special processing. Measurement values can be transferred to a report.
Markers	markers can be set to display comments or indicate the coordinates of individual points of a curve in the curve window.
Overview Window	Shows the position within the entire curve of a zoomed curve section.
More Curves	Displays additional curves in the curve window to allow comparisons.
Print	Prints out the curve window's content with the resolution of the designated printer.
Report Generator	Enables the user to design measurement reports: text, curve graphs and other graphics can be combined and positioned as desired. The entire page can be printed as a data sheet.
Clipboard	Curve window graphs can be copied to the Windows Clipboard. These can be pasted to word processing and DTP applications and combined with text and additional graphics. Several options are available for copying curve graphics to the clipboard or the printer, including font type, line width and dimensions.
Export	The waveform displayed in the curve window can be exported to other imc applications. This is a fast and simple method of data transfer analogous to the Windows clipboard.
Transfer to imc FAMOS	Waveforms can be transferred directly from the curve window to imc FAMOS. A sequence in imc FAMOS can be automatically initiated with a transfer. Since the curve window is used by all imc products, it would be possible, for example, to send data from imc STUDIO to imc FAMOS in this way, and to process them there directly by means of a sequence.
Logarithmic, dB and linear axes	
XY, polar and locus plots	
Colors	The colors for graphics can be set as desired
Grid	The coordinate system can be overlaid with a grid.
Configurations	Curve window configurations can be saved in a file and loaded again.
1/3-octave or octave	The x-axis of a curve window can be set to normal scaling for a **1/3-octave** or **octave** analysis.

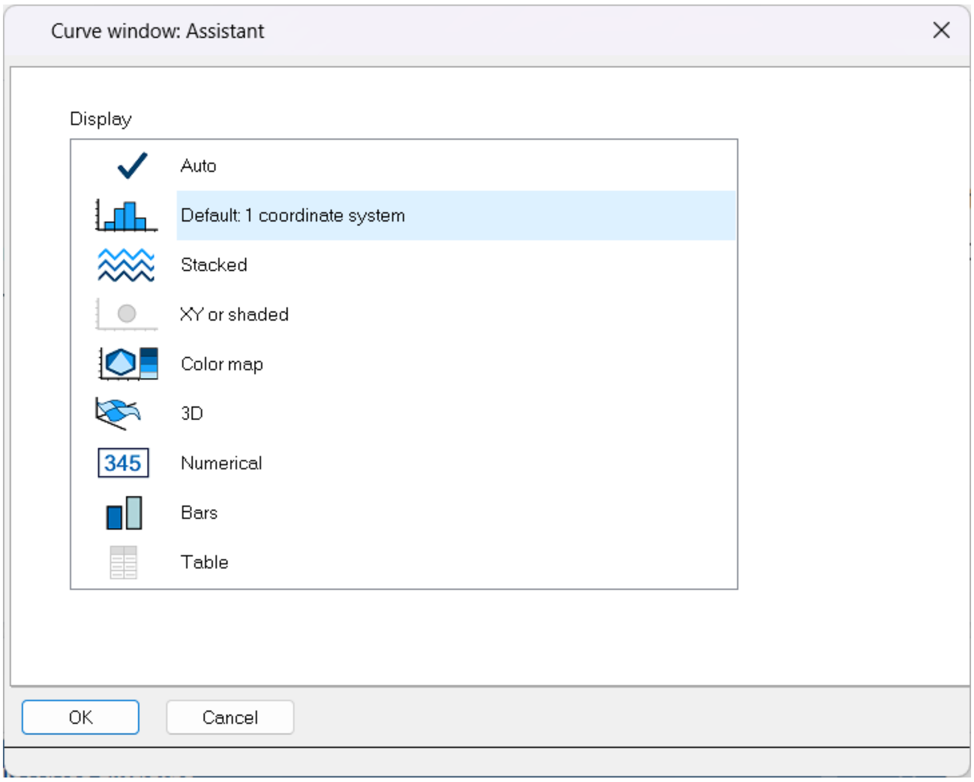
Function	Description
overlapping, stacked or waterfall diagram	Several curves can be displayed together for comparison: **overlapping, stacked** or in a **waterfall diagram**. Various options are available for **waterfall display**, e.g. the **angle of view**.
symbols	Curves can be **marked with symbols** to help differentiate between curves in a monochrome display.
periodic waveforms	An option is available for **periodic** waveforms in which all periods are compared with each other. This helps to identify trends and aberrations.
Color maps	A "bird's-eye view" of a colored 3D plot; color-coding indicates height.

Note

Some screen shots appearing in the text were adopted from older imc FAMOS versions.
Therefore, the appearance of the user interface as depicted in this manual may be slightly different from the actual appearance of the user interface of your system.

3.1 Curve Window Assistant

The curve window's display Assistant can optionally be used when **multiple** variables or data sets with **special properties** such as order spectra or matrices are displayed.



Curve window: Assistant

Automatic call

Information on how to **call** the Assistant is presented in the user's manuals for imc FAMOS (index: *Display-Assistant-> Curve window*) and imc STUDIO.

The following description is based on imc FAMOS. In imc FAMOS' **Options**, under *Display > Curve window* the option *Use display-Assistant automatically* has been activated. In this case, the Assistant opens automatically when multiple variables are selected in the Variables list. As well, when special data sets such as order spectra are involved, imc FAMOS recognizes that a special display such as a color map or 3D is expected.

Automatic call with CTRL key

Unless the option *Use Display Assistant automatically*, located among the options accessed via *Display > Curve Window*, is activated, the Assistant opens if the **CTRL**-key is held down when the curve window is displayed.

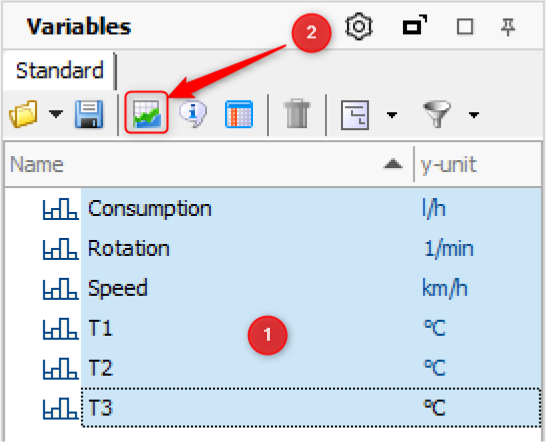
Display presets

- The Assistant offers appropriate display types for the **respective properties** of the data set. Any other type options appear grayed out, although they are actually available. Select the display type you desire and apply it by clicking on OK.

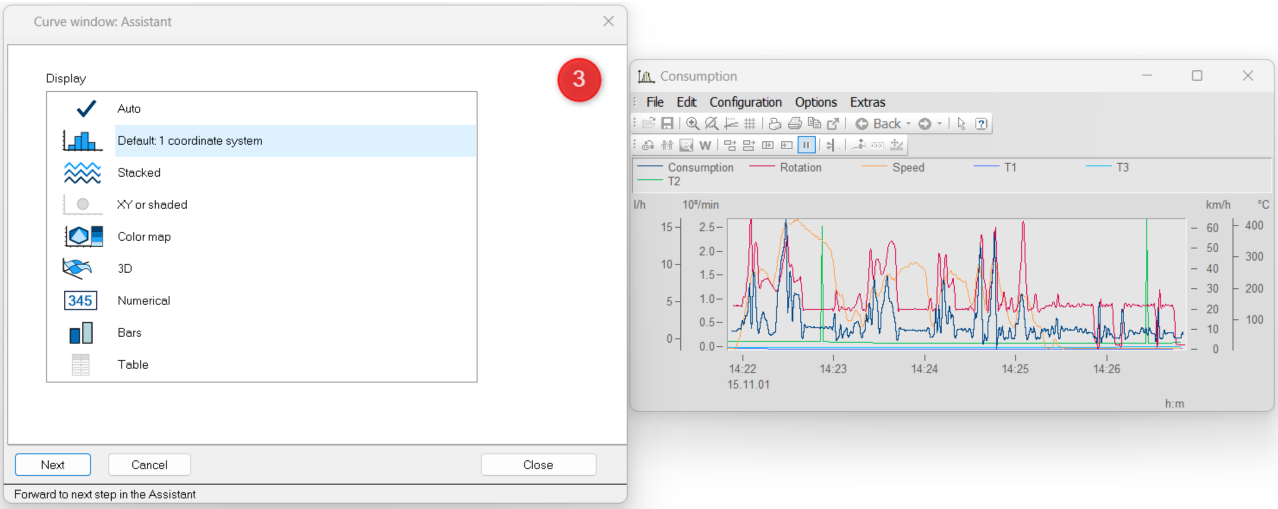
- Variables which take specific units govern the assignment of display type. For example, in an XY-representation, variables taking the unit "Hz", RPM or 1/min are assigned to the X-axis.
- Variables having the string ***Latitude*** or ***Longitude*** in their name cause display of an XY-representation with a **map**, if the the values and data lengths are appropriate.

Example: Multiple stacked channels

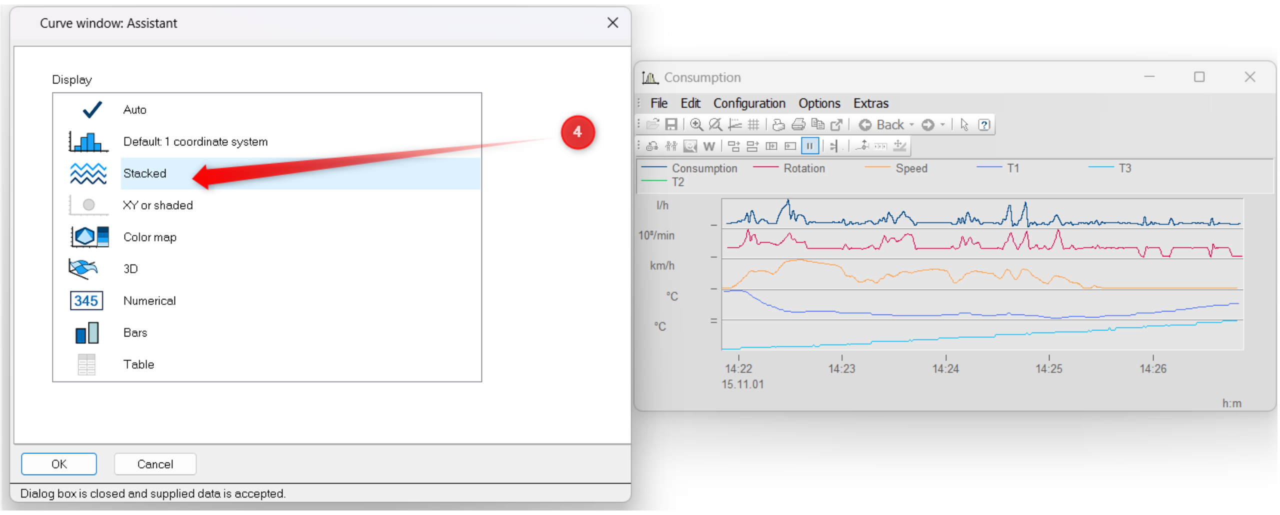
The channels below are to appear together in a curve window. First, the variables are selected ❶. Clicking on "*Show*" ❷ opens the assistant. In order for this to happen, in the imc FAMOS options accessed via *Display > Curve window*, the option *Use Display Assistant automatically* must be activated.



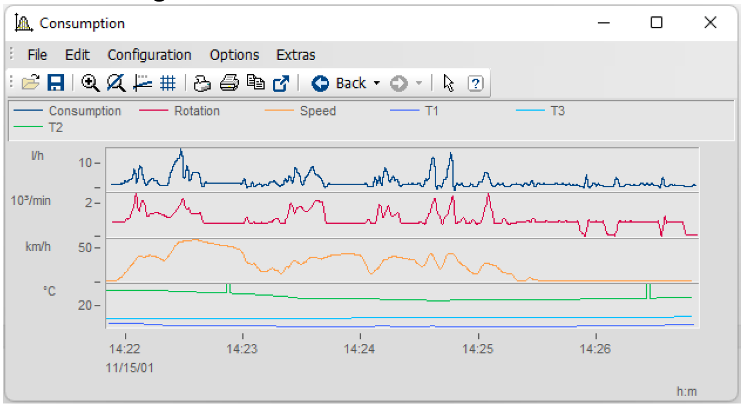
- The Assistant and a curve window are opened ❸:



- Changes are reflected immediately in the curve window ❹:

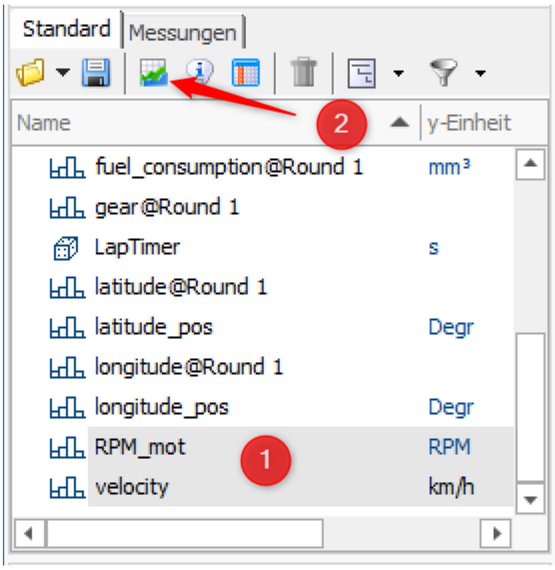


- Any additional changes, e.g. using Drag&Drop to add the temperature signals to the Y-axis, are made without using the assistant:

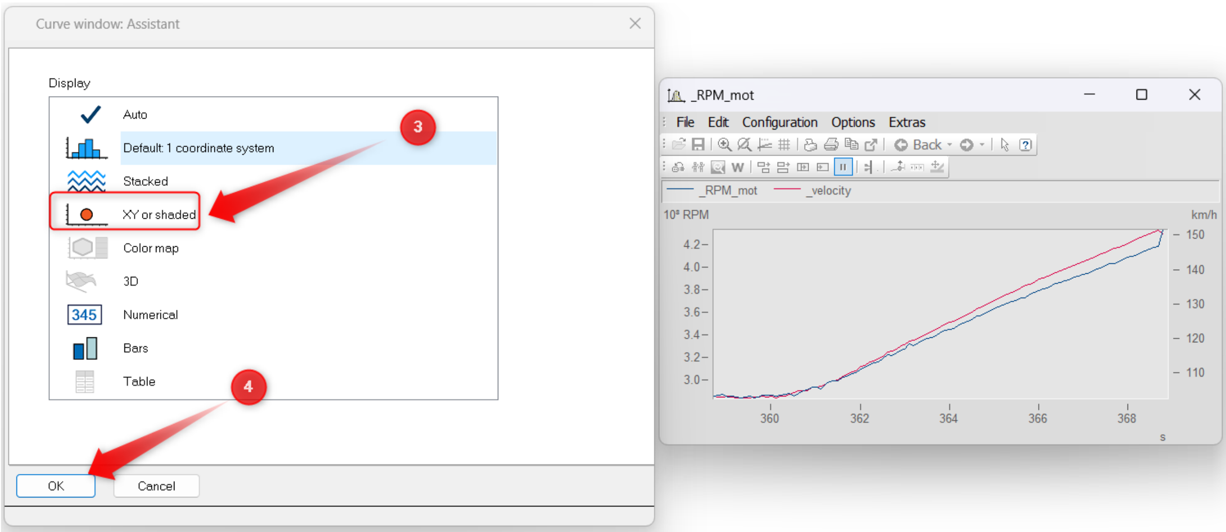


Example: XY-display

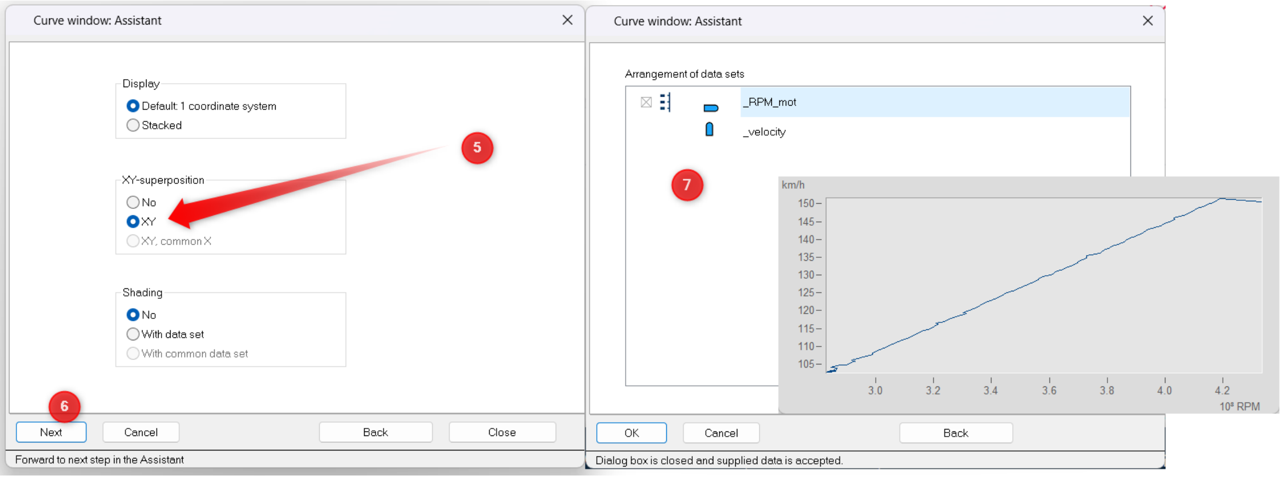
The variable Velocity is to be displayed over the RPMs. To do this, the two signals RPM and Velocity are selected ❶ and displayed ❷:



- In the Assistant, select "*XY or shaded*" ❸. The *OK* button then changes to *Next* ❹. Click on the *Next*-button:



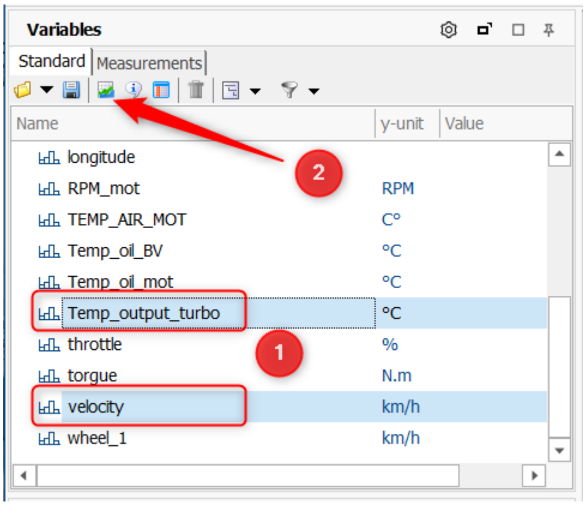
- Under *XY-superposition*, select the simple *XY* variant ❺. When you click *Next* ❻, a dialog appears in which to change the assignment of X and Y ❼. To do this, use Drag&Drop to move the variable to the desired position.



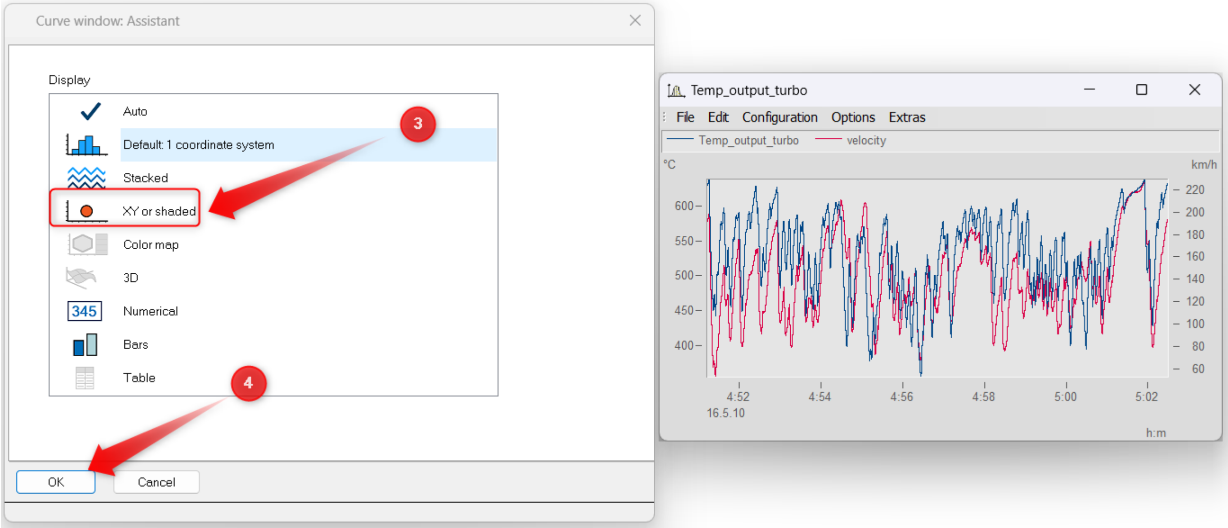
- Once the Assistant is closed, you can make any additional changes in the curve window manually, such as modifying the line thickness or color.

Example: Coloring

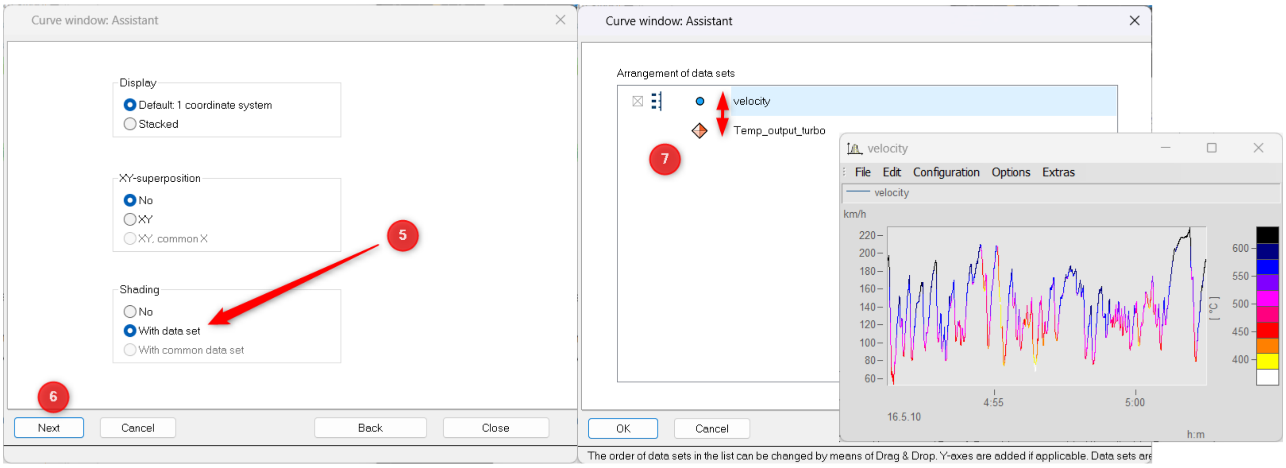
The variable Velocity is displayed. The associated temperature is represented by the coloring. The signals Temperature and Velocity are selected ❶ and displayed ❷:



- Select in the Assistant "*XY or shaded*" ❸. The *OK* button then changes to *Next* ❹. Click on the *Next*-button:



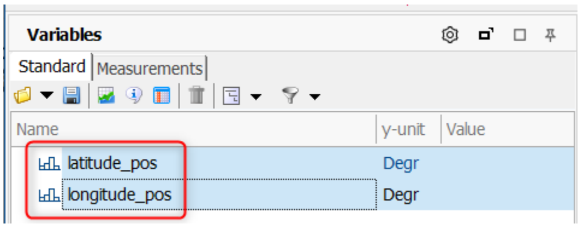
- Select *Shading > With data set* ❺. When you click *Next* ❻, a dialog appears in which to assign the signal which determines the color ❼. This signal is moved to the diamond symbol using *Drag&Drop*.



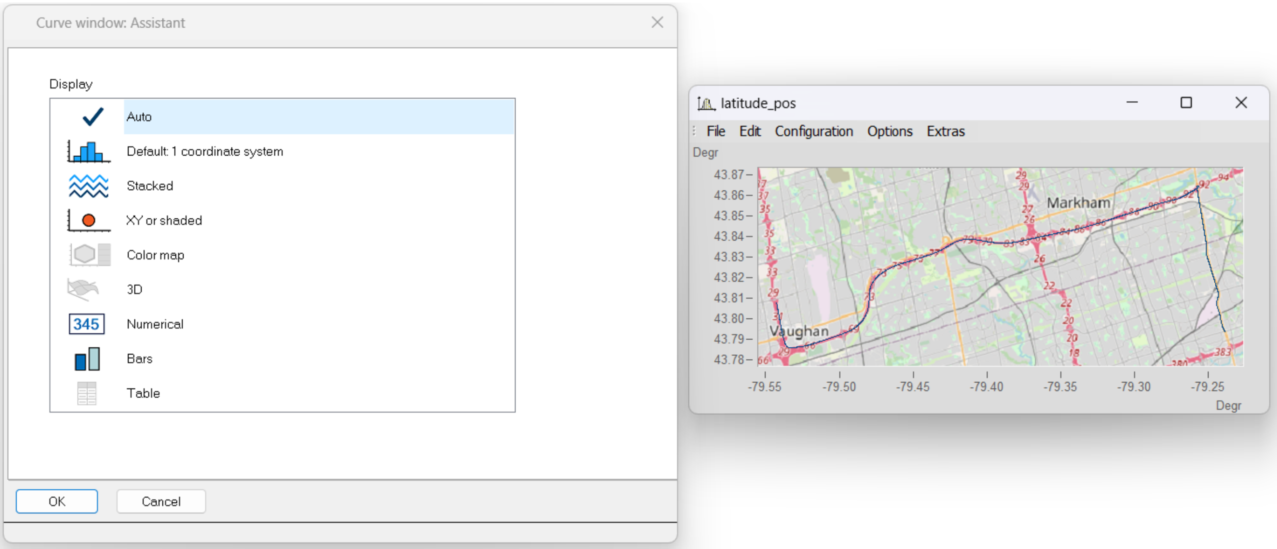
- Once the Assistant is closed, you can make any additional changes in the curve window manually, such as a different color assignment.

⊟ Example: Map

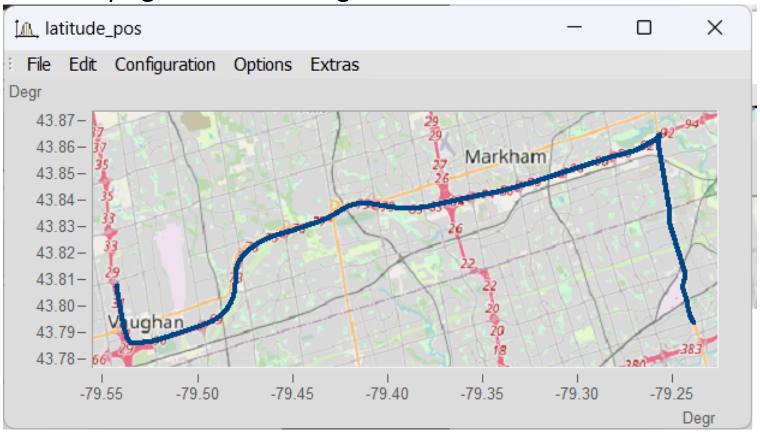
The variables contain the strings "**Longitude**" and "**Latitude**" in their names.



- The Assistant recognizes that position data are involved and directly generates a curve window with a map:



- Once the Assistant is closed, you can make any additional changes in the curve window manually, such as modifying the zoomed region or the line thickness.



3.2 Display variants of the curve window

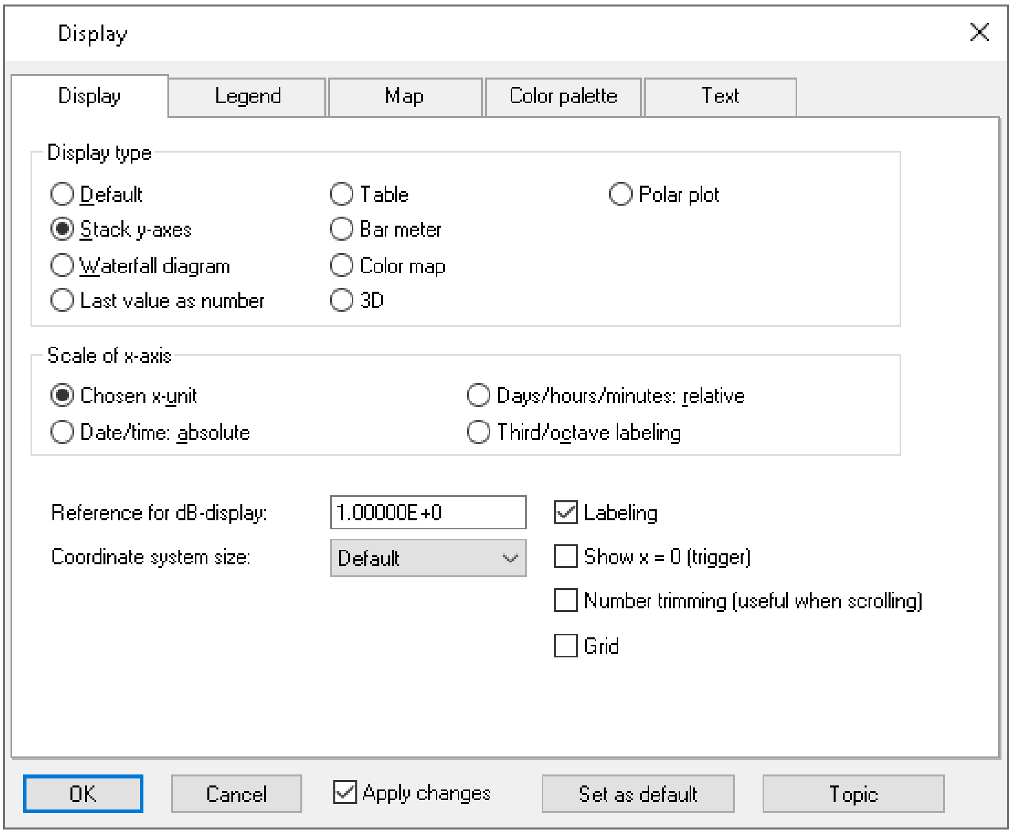
Function

The display mode of a curve window can be defined in a variety of ways. The display options include the appearance of the coordinate system, selection of date/time labeling or 1/3-octave labeling. Several special attributes are also available, including number of secondary ticks, period-comparison, marking of lines with symbols and definition of the reference value for dB displays.

Calling the dialog

Select menu option "*Configuration*" > "*Display*" in the curve window. A dialog appears in which the curve window display can be defined.

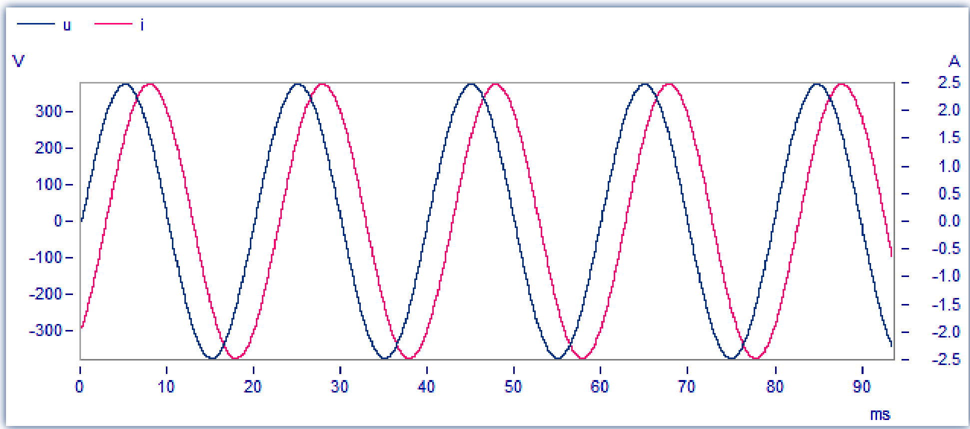
Tap	Description
Display 21	Display variants of the curve window
Legends 137	All curve windows can include a legend, with the channel (variable) name, line color etc.
Map 140	Map lets you place a picture in the background. It is additionally possible to layout the picture in specified coordinates.
Color palette 153	A channel's color can be governed by a reference signal's amplitude.



Display type

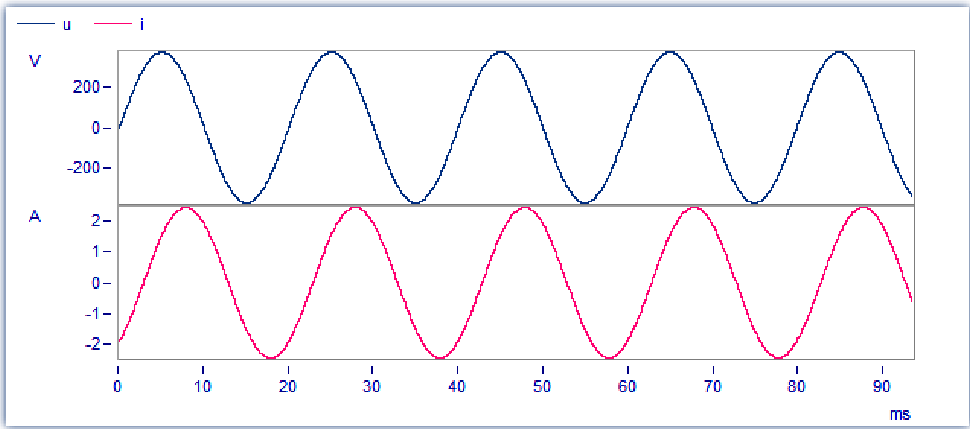
Default

In *Default* display, curve windows with more than one y-axis will show the different axes side-by-side. Several curves are then displayed in the same space.



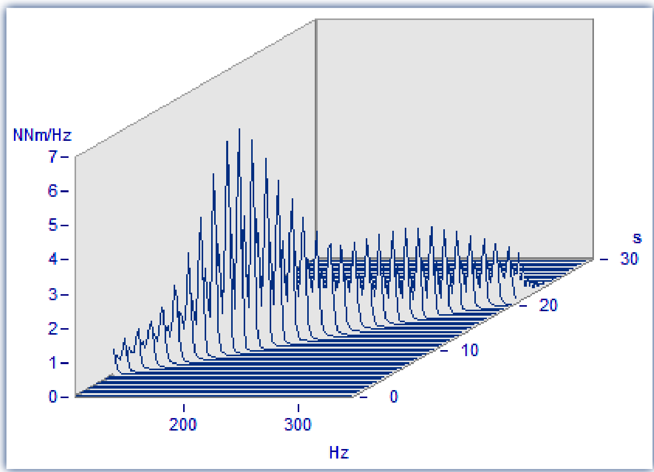
Y-axes stacked

An alternative to the *Default* setting is the *y-axes stacked*. Here, the y-axes are displayed stacked vertically, so that each curve is displayed in its own space, separated from the other curves in the window.



Waterfall Diagram

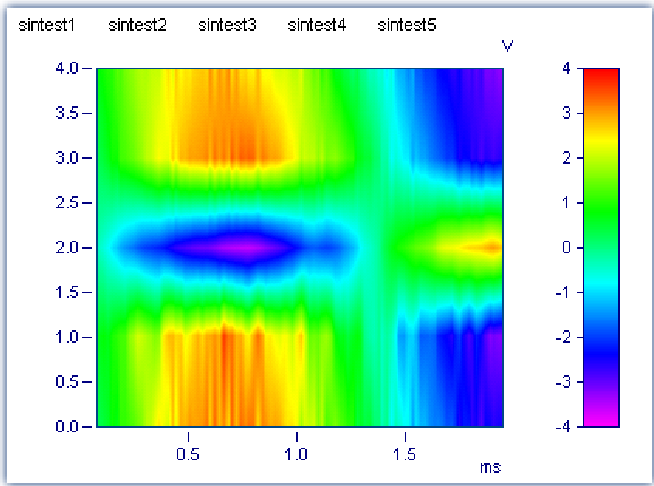
Another alternative is the waterfall diagram, which is especially suited to comparing similar curves. The curves are drawn in a diagonal procession from the front of the screen, with the curves at the back (partly) obscured by those at the front, creating the illusion of a three-dimensional perspective.



See "Waterfall Diagrams 31"

Color Map

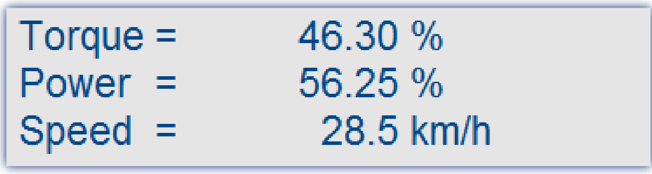
This is a bird's-eye-view of a colored, three-dimensional region. Multiple data sets are each plotted along the horizontal direction, stacked over each other along the y-direction, while their amplitude values are represented by different colors. This style of display is analogous to a geographical map where the landscape contours are indicated by shading or coloring.



See "Color Map Display 57".

Last value as number

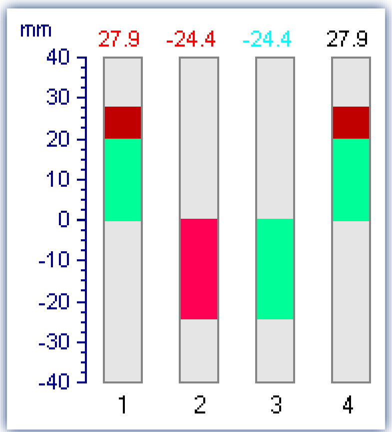
Particularly for online display of measured data, in this mode the last value is displayed as a number. The last value in a waveform is always the most recent measurement value in online display. This mode of display is particularly suited for slowly changing quantities. For example, the amplitude of a spectral line, effective power, or temperature can be monitored as a numerical value. The display of numerical values can be formatted. The corresponding numerical value is displayed for each curve in the curve window.



See "Last Value As Number 37".

Bar meter

Particularly for online display of measured data, in this mode the last value is displayed in a bar meter.



Section 'Bar gauge' 48

Table

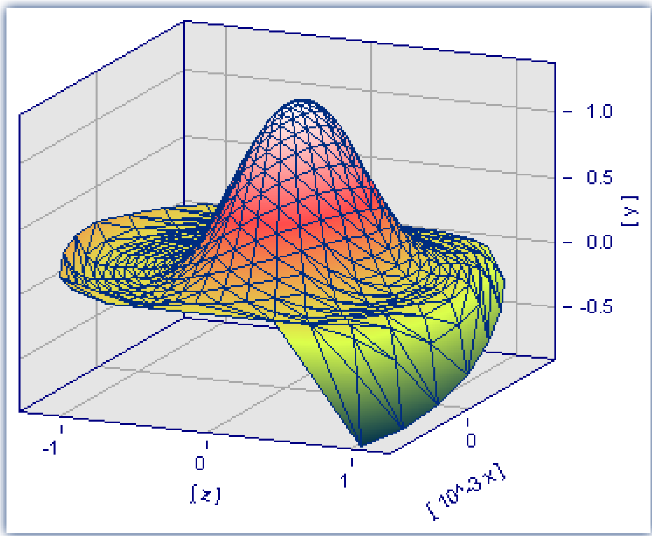
The readings are displayed in tabular form, in chronological order.

t [s]	sintest1 [V]
0.00000	-0.2544
0.00002	0.0349
0.00004	0.0259
0.00006	0.1652
0.00008	0.3037
0.00010	0.4410
0.00012	0.5766
0.00014	0.8592
0.00016	0.6923
0.00018	1.1185
0.00020	1.0945
0.00022	1.2168
0.00024	1.3388
0.00026	1.4670

Section "Tabular display 42"

3D

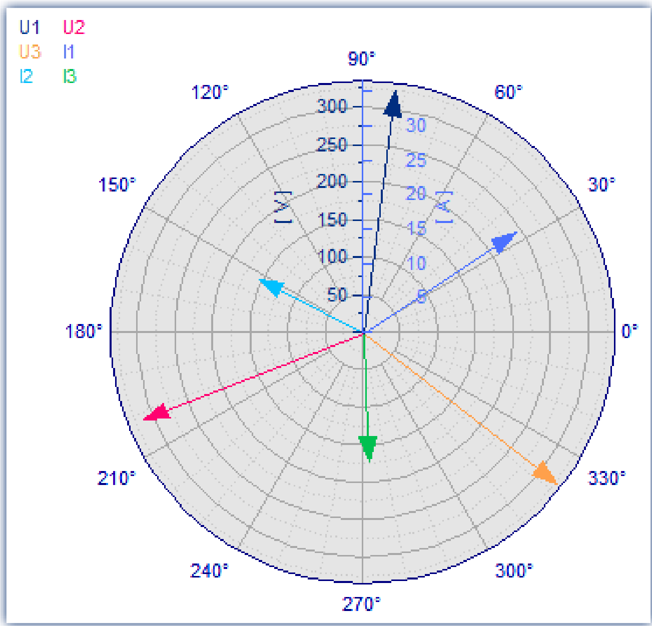
3-D display of waveforms having x,y,and z coordinates with various color map surface patterns, and rotating perspective in all dimensions.



Section on 3D display 69

Polar plot

Complex data sets can be displayed as a polar diagram.



Complex single values as vector diagram

Section on "Polar plot" 69

Scale of x-axis

The following settings for scaling the x-axis can also be made using the x-axis' own settings dialog; see the section "Axes 106".

Selected x-unit

The x-axis is labeled in the x-unit of the waveform, e.g. in "s" (seconds) for measurement over time, or in "A" (amperes) for a characteristic dependent on the current. If several curves are displayed in the window, all waveforms should have the same x-unit.

For example, if a normal waveform with x-offset = 10s, x-delta = 1s and 20 samples is displayed, the x-axis is displayed from 10s to 30s and labeled accordingly.

Date/time: Absolute

For data in the time domain, instead of labeling of the value expressed in seconds, a display of the absolute date and time can be selected. The absolute time is not determined exclusively from the measurement points, but also gives consideration to the generation time of each waveform. This time is recorded in files in the imc FAMOS format and can be inquired and changed with imc FAMOS functions.

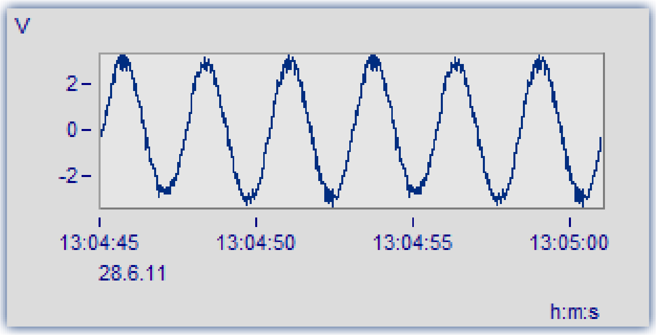
The generation time of a waveform along with the x-coordinate in "s" determines the resulting axis labels.

For example, if the generation time of a waveform is 1.1.92 at 12:00:00, and the waveform has an x-offset of 3600s and a sampling rate of 1800s for 48 measurement values, the range from

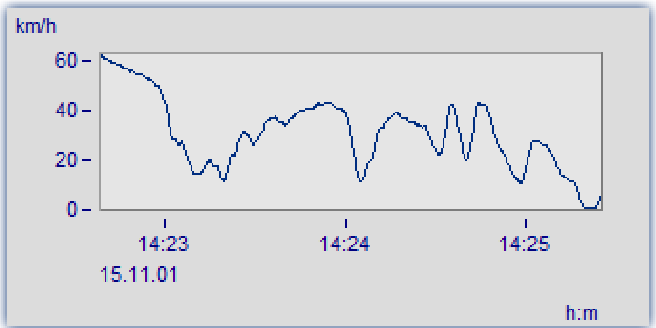
1.1.92, 13:00:00 to 2.1.92, 13:00:00

is displayed (3600s equals one hour). The waveform extends over 48 measurement values, each with a half-hour time difference, resulting in exactly one day of samples.

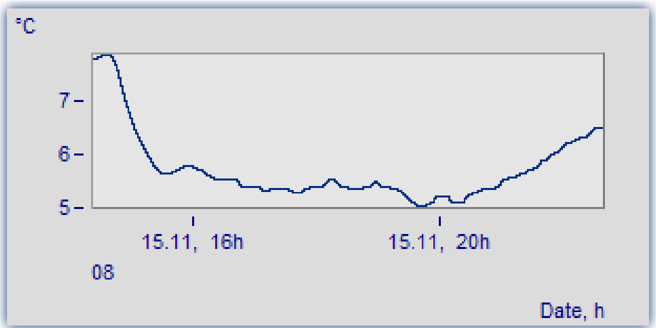
The labeling of the x-axis depends on the length of the displayed time interval, for example:



The segment between 13:04:45 and 13:05:00 encompasses several seconds.



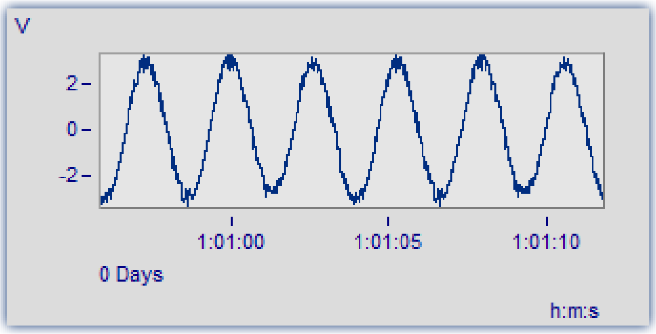
The segment between 14:23 and 14:25 comprises a few minutes.



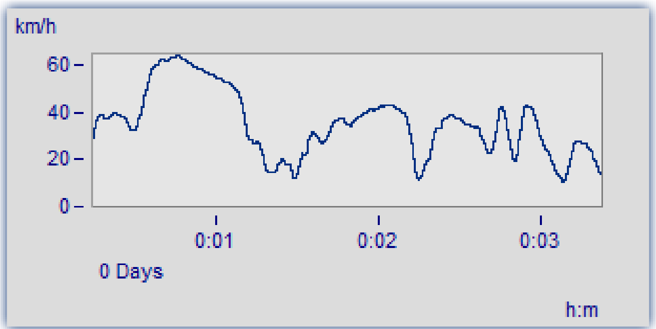
The segment between 4 am and 8 pm encompasses a few hours.

Days/hours/minutes: Relative

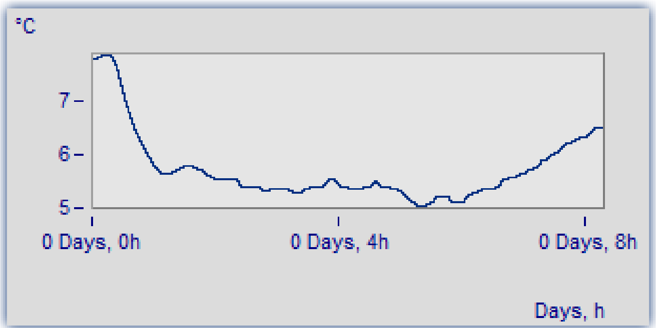
If you wish to view the whole duration of a long-term measurement, then display of relative time in days, hours, minutes and seconds is recommended. The selected unit depends on the interval. Possible variations of this labeling are as follows:



A very narrow section is shown, significantly less than one minute



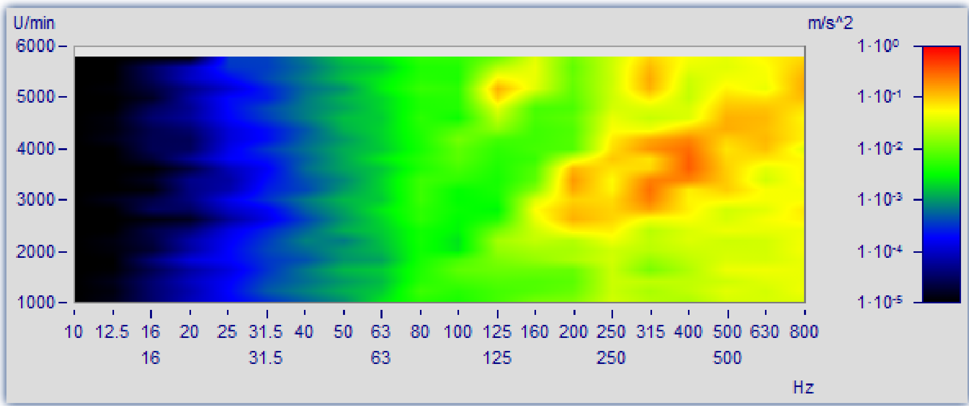
This section is 3 minutes long. The display no longer includes decimal places after the seconds.



The section from 0 to 8 hours is displayed without minutes

1/3-octave, octave labeling

When a waveform contains a 1/3-octave or an octave spectrum, and the x-axis of the waveform is scaled in 1/3-octave, the x-axis can be drawn with the numerical values of the 1/3-octave and octaves according to industry standards.



See "Third-Octave Display 75".

Further settings

Settings	Description
Axis labeling	Axis labels can be switched off completely, allowing the curve to be displayed in its maximal expanse. When curve windows are reduced significantly in size, the display automatically switches off display of the axis labels.
Show x=0 (trigger)	When this option is selected, a dotted vertical line is displayed in the curve window at x=0. The trigger is very often located at x=0.
Number trimming (useful when scrolling)	When this option is selected, the labeling at the ends of the axes are displayed partially, since the labeling box is too small to display it completely. When scrolling, the numbers "flow" into view. This option may also remain inactive if it is not needed.
Grid	Grid 159 as default setting.
Reference for dB value	All dB displays in a curve window have the same reference value. This value is "1" as a standard, but can be changed. Each number greater than zero in the valid range can be a reference value. For example, if a value of 10 is specified, all dB values on the axes become 20dB smaller. When decibels are calculated, values are first divided by this reference value. The displayed waveforms are not changed; only the axes labeling is adjusted.
Coordinate system size	Along with the *Default*-view, it is also possible to select a *Maximum*-view in which the axis labels are placed within the coordinate system and the coordinate system fills the entire curve window.

OK, Cancel, Set as default

For details on operation, see the chapter Confirmation bar 178

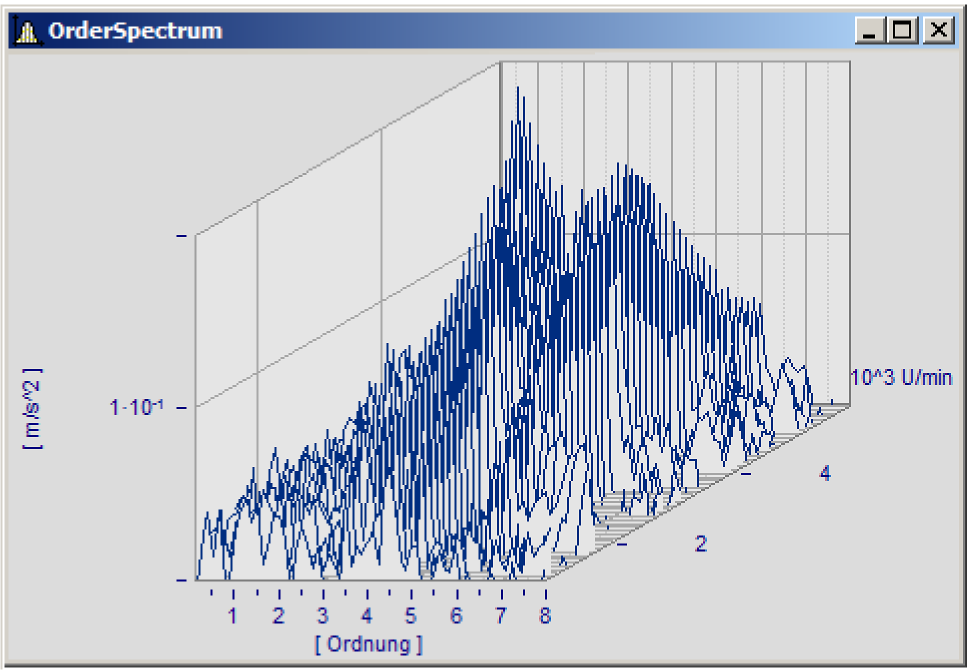
Remarks

Note

- If a waveform is not scaled in seconds, but is to be displayed in absolute or relative time, adjust the sampling time, the x-offset and the x-unit to provide the desired unit "s". For instance, if the waveform has a sampling time of 1h (1 hour), divide the sampling time by 3600 to set the x-unit to "s".
- The modes *Date/time: Absolute* and *Days/hours/minutes: Relative* cannot be implemented if an interval of less than 1ms is set for display of absolute or relative time. The program switches automatically to axis labeling in seconds.

3.2.1 Waterfall diagrams

The waterfall diagram serves as a simple tool for displaying a series of curves as arrayed one behind the other, and viewed from a vantage point that makes their line-up appear diagonal. This allows a close comparison of the individual curves, so that trends and deviations are easily recognized. Curves are drawn in a rectangular coordinate system with three axes (x, y, z). The z-axis has a directional component parallel to the angle of view. It is drawn diagonally toward the upper right of the screen at an angle specified by the user.



Not all curves are completely visible in waterfall display. The viewer sees a range of curves from above, with some valleys hidden by peaks. The relative angles and distances between the curves are not always apparent due to overlapping.

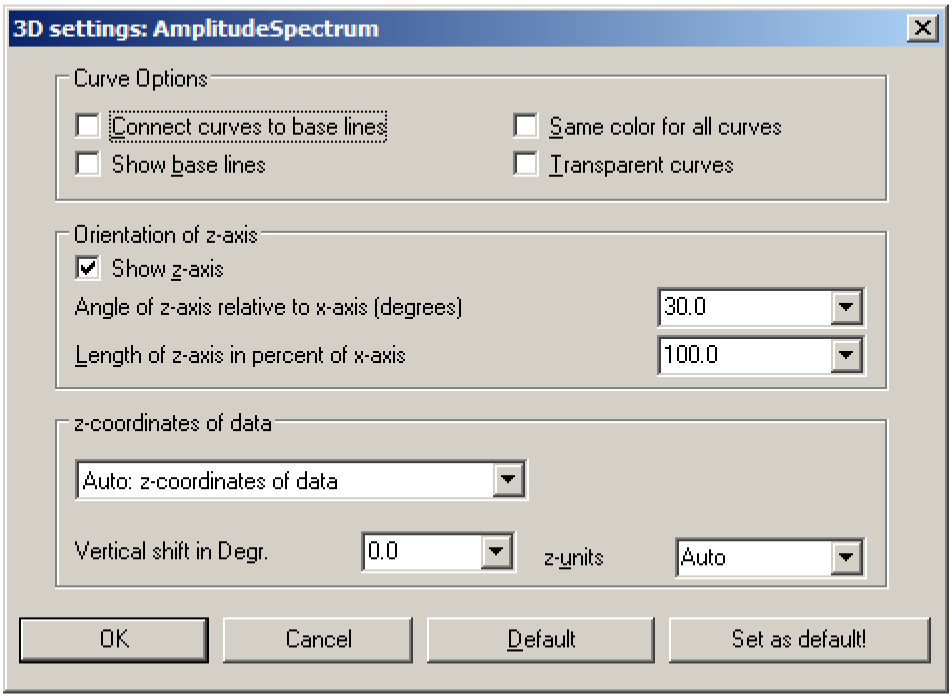
A waterfall display is drawn from back to front. When a new curve is drawn, the area under the curve is filled in with the color of the screen background, covering all lower parts of curves behind it.

The waterfall display is especially useful for comparing:

- multiple spectra; spectra are drawn at regular intervals, so that their development over time can be observed.
- multiple periods in a waveform.
- signals of several sensors on the same object, e.g. multiple temperature recorders arranged on a long pipe, delivering similar signals at different points in time.
- several consecutive measurements of a channel measured with the same trigger.

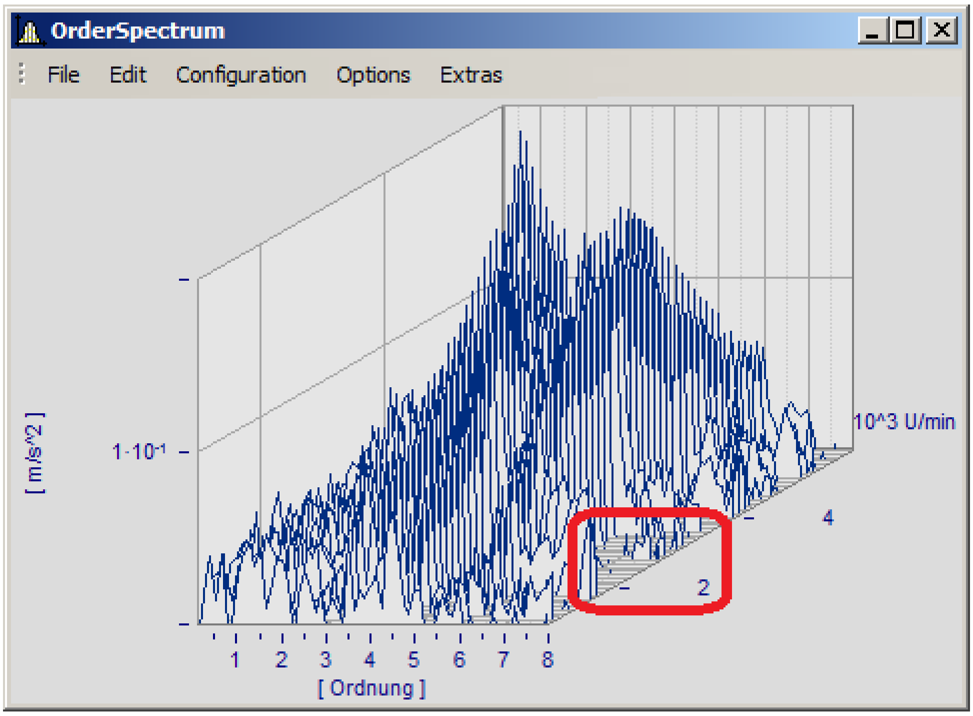
Mouse Operation

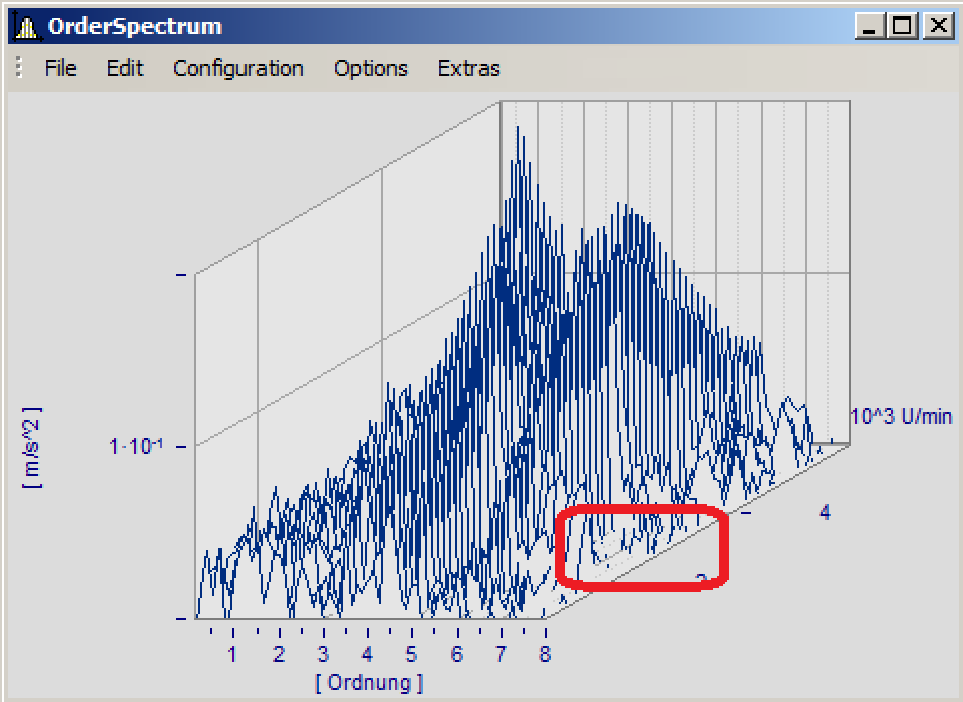
- Call the dialog for setting the type of display using the menu option *Configuration/ Display*.. Select *Waterfall* and end the dialog with *OK*.
- The curves displayed in the window are shown in a waterfall diagram with the effective presettings.
- A dialog is available to change the settings of the waterfall diagram. Select menu option *Configuration/ 3D...*. The following dialog appears:



Curve options

Enter here the settings for the appearance of the curves in the window.

Parameter - Curve options	Description
Connect curves to base lines	This option connects the ends of the curve plot to the base line. The base line runs under the curve, parallel to and in the height of the x-axis. It is the projection of the curve on the plane defined by the labeled x- and z-axes. This option is not active in the following illustration: 

<table>
<tr><th>Parameter - Curve options</th><th>Description</th></tr>
<tr><td>Show base lines</td><td>Base lines are drawn when this option is selected. A base line runs under the curve, parallel to and at the height of the x-axis. It is a projection of the curve on the plane defined by the labeled x- and z-axes. Base lines are also obscured by curves in front of them. Base lines are present in the above illustration; the illustration below shows no base lines:

</td></tr>
<tr><td>Same color for all curves</td><td>Select this option to draw all curves in the color of the first (foremost) curve. Otherwise the colors are assigned according to the selected color settings. The color composite is important for a three-dimensional appearance.</td></tr>
<tr><td>Transparent</td><td>When this option is selected, there are no hidden lines. However, the three-dimensional effect of the graph is reduced significantly. When this option is not selected, analog data sampled equidistantly are drawn in overwrite mode.</td></tr>
</table>

Orientation of z-axis

The options in this group refer to the display of the z-axis.

Parameter - Orientation of z-axis	Description
Show z-axis	Enter here whether the z-axis should be displayed.
Angle in degrees	The angle of the z-axis can be set to between 1 and 89 degrees. An angle of 30 degrees is recommended.
Length of z-axis in percentage of x-axis	The length of the z-axis is specified in percentage of the length of the x-axis. The minimum value is 10%

z-coordinate of curve

Select here between the options *Fixed values: 0,1,2,3,...* and *Fixed range z0, dz*,.... In the former case, the first (foremost) curve takes the z-coordinate 0, the next takes 1, etc. The following settings are available when the latter option is selected:

Parameter - z-coordinate of curve	Description
z0	Enter the z-value here; the foremost curve will be displayed at this value.
dz	Enter the z-distance of adjacent curves in this box.
z-unit	A unit for the z-axis can be specified here.

Other options are also provided

Options	Description
Auto: z-coordinates of data	This employs a waveform's z-coordinate. In the imc FAMOS-dialog *Properties* of variables you can assign a z-coordinate to a waveform. The default is "0" The waveforms thus displayed must have unique and increasing z-coordinates. When handling structured waveforms (segmented, events..), this is the best choice. No further settings are necessary; the matrix will automatically be plotted with correct z-scaling.
Ditto with events: relative to first event	Only for multishot waveforms. The z-coordinate is determined from the various trigger times. The first shot is assigned the time 0 and all subsequent ones are designated accordingly. The other, related options listed make reference to other shots (events). E.g., the last, the first displayed, or the last displayed. The z-coordinate of each waveform absolutely must be greater than the last. Otherwise the display will not include all waveforms!
z-axis scaling	To scale the z-axis, double click on this option. Settings for the x- and y-axes, as well as for ticks and marking of the range can be made here.

Reference	Scaling the x-axis

Section 'Scaling the x-axis' 106

Default

Clicking on this button sets all dialog elements to default values.

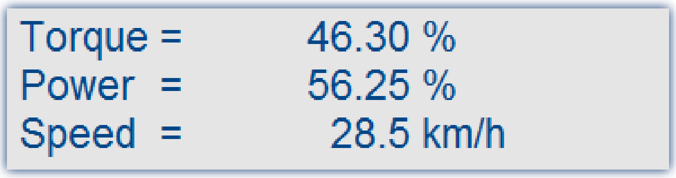
OK, Cancel, Set as default

For details on operation, see the chapter Confirmation bar 178

Remarks

- Select an appropriate viewing angle. An angle of 30 degrees is a good starting point.
- A distorted display results if the angle is very small or very large; often the axes can no longer be labeled.
- The axes are labeled only when the coordinate system is large enough in every direction, i.e. when each axis exceeds a certain length. Enlarge the curve window if no labels appear. If there are still no labels, make any necessary changes to the angle and then the length of the z-axis. If an extremely long z-axis results, the window often has no room left for the labels.
- The area below the curve is **NOT** filled for XY-plots, digital data and reduced data. These displays always use the *Transparent* mode.
- Waterfall diagrams are often more legible when the y-axis is scaled upward very generously. Assume that the curves displayed have a value range from 3 to 12, the y-axis could be scaled from 3 to 30 (or 20 or 40). The axes need not be extended downward, since this <Shift>s the curves upward. Depending on the kind of data, appropriate y-axis scaling can greatly improve legibility.
- Not all data can be represented in a waterfall diagram. For example, noisy data can produce a chaotic image of overlapping lines. Waveforms which are relatively smooth and similar are best for waterfall display.
- When several curves are displayed, the first curve is always drawn in the foreground of the window; all additional waveforms appear behind the first curve.
- Waveforms with different x-axis scaling can be displayed together (i.e. waveforms sampled at different speeds). All curves are displayed correctly with the respect to time on the x-axis, as in all other curve windows.
- Only one y-axis is used for all curves in a waterfall diagram.
- A line display is always implemented for waterfall diagram, even if data were represented with symbols. The symbols are not displayed. The selection of *representation with symbols* is recorded and will be reactivated whenever the waterfall mode is ended.
- Waveforms displayed with a dotted line are interpreted as transparent in the waterfall display.
- Curve display settings such as dots, bar graphs or stair-steps can be set for each waveform individually, or for all waveforms in a window with the option *Valid for all axes* selected in the dialog for scaling the y-axis.
- Only transparent graphics can be outputted to plotters. The algorithm used here, which draws lines and subsequently draws over them with the next plane of display, does not produce the desired effect with plotters.
- Drawing lines which are then covered by the next graphics takes considerably more time than drawing transparent graphics. First try to output transparent graphics before experimenting with various settings and scaling methods.

3.2.2 Last value as number

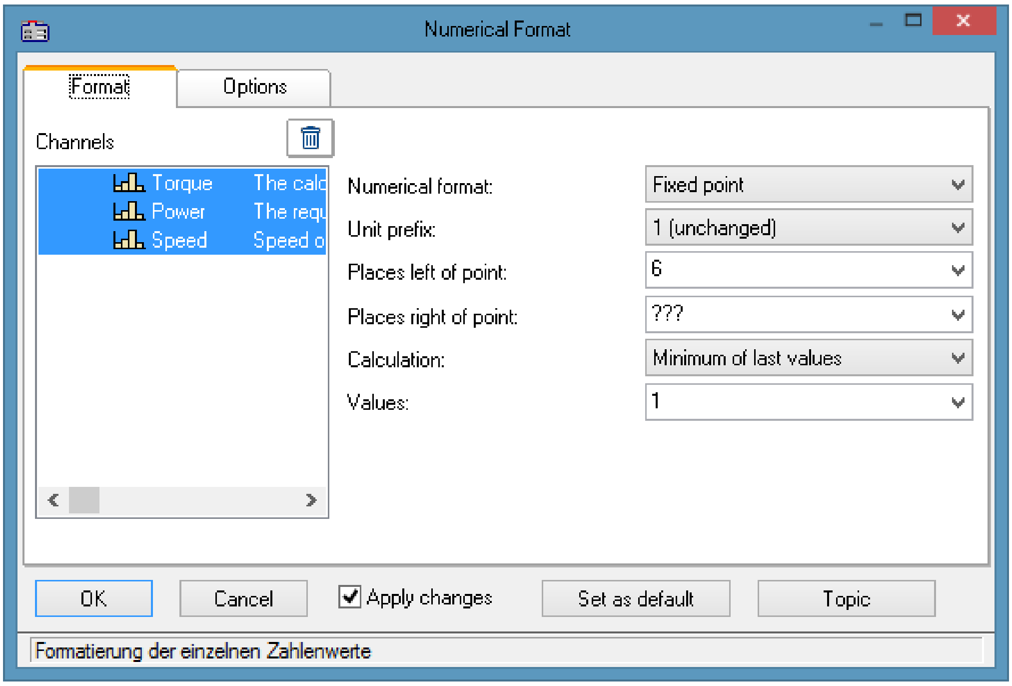


This mode, displaying the last value in a waveform as a numerical value, is especially suited for use of the curve manager in data acquisition and on-line display of these data. The last value in a waveform is always the most recent measurement value in on-line display. This mode is especially convenient for display of slowly changing quantities, allowing the user to monitor the amplitude of a spectral line, the effective power or a temperature as a numerical value. The display of the numerical value can be formatted and several channels can be compared with each other.

Mouse Operation

- Select *Configuration/ Display*...
- Select the option *Last value as number* and end the dialog with *OK*
- The curve window now shows the variable's name along with a numerical value. If you display more curves in the window, multiple numerical values appear stacked one above the other:

The format of this display can be changed by double-clicking on the curve window or selecting *Configuration/ Numerical Format...*. The following dialog appears for defining the number format:



Waveforms

A list of all waveforms displayed in the window is found on the left side of the dialog. Select waveforms from this list by moving the mouse to the desired waveform's listing while holding the mouse button. Multiple waveforms can be selected by holding down the <Ctrl> button and clicking on the desired waveforms.

Format (For all selected waveforms)

All settings made here only affect waveforms in the *Waveforms* list.

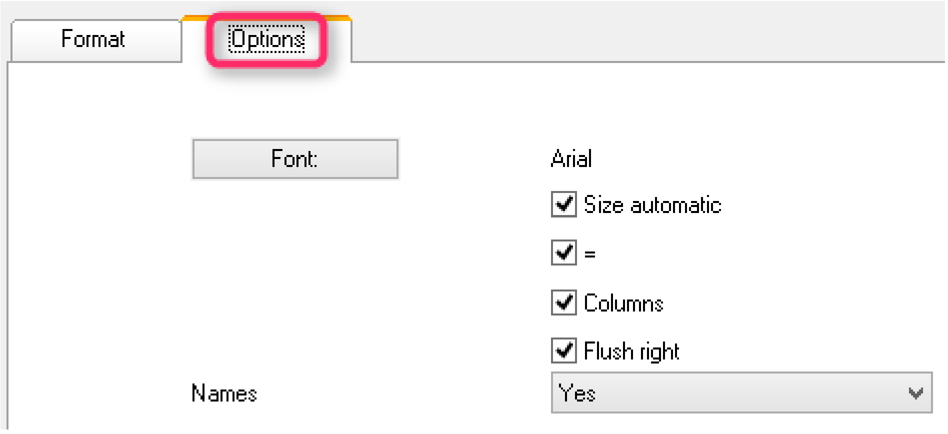
If the the waveforms selected have differing format settings, question marks appear in the associated boxes. Any settings you enter to replace the question marks will be applied to all waveforms selected.

Settings - Format	Description
Numerical format	Representation as *fixed point* is customary. But the numerical values can also be formatted as *Floating point*, in *Hex*-format, or as *Date/Time*. **Numerical format** / **Description**: Floating point: *Floating point*-representation uses the E-character to express the exponent, followed by the sign and a two-digit exponent. Hex (1, 2, 4 Byte): Hex always displays the lowest selected Bytes, thus for example, the 1027 and 1 Byte is represented as 03h. Time relative-, Date/time auto: The point in time when the last sample was recorded is formatted in accordance with the display option applicable to the x-axis 21. Time relative-, Date/time fixed: The formatting of the time and date is specified by means of placeholders, see the chapter "*Scale* 107".
Magnitude	Numerical values can be associated with a fixed order of magnitude. Take as an example a current of 0.1A. To display the current in mA, select *milli*. The numerical value is then multiplied by 1000 and the prefix milli (m) is set in front of the unit, if it is not empty. Selectable prefixes range from pico (p) to giga (G). Select 1 if numerical values and unit should be displayed unchanged. Selecting a fixed order of magnitude is recommended for fixed-comma notation; if numbers vary greatly in their order, it is recommended to use floating-point notation with unchanged order.
Fixed-point, floating-point notation	Floating point notation uses the exponential notation, "e" and a two-digit signed power of 10. Fixed-point example: 0.123, -123, 888.987 Floating-point example: 1.45E+03, -1E-01, 1.4444E+00 Select Yes for Fixed-point or no for Floating point. With floating point, one digit always appears before the decimal.
Places left of point	The amount of digits before the decimal point, max. 15. With Fixed-point notation, sufficient digits must always be specified, otherwise a black bar appears. With floating-point format, one digit before the decimal point is sufficient.
Places right of point	The amount of digits after the decimal point, between 0 and 20. If no digits (0) appear after the decimal point, it is omitted.

<table>
<tr><th>Settings - Format</th><th>Description</th></tr>
<tr><td>Calculation</td><td>The numerical value displayed can be calculated from the most recent values:
<table>
<tr><th>Calculation</th><th>Description</th></tr>
<tr><td>Maximum of the last values</td><td>The maximum is calculated from the last n values in the waveform. This function can be interpreted in on-line-display as peak hold.</td></tr>
<tr><td>Minimum of the last values</td><td>The minimum is calculated from the last n values in the waveform.</td></tr>
<tr><td>Average of last values</td><td>The arithmetic mean is calculated from the last n values in the waveform. The reduces possible noise in display of the measurement data.</td></tr>
</table></td></tr>
<tr><td>Values</td><td>Specify here the number of values from which the average, minimum or maximum is calculated. Any number from 1 to 30000 can be specified. If the waveform has fewer values than specified here, all values in the waveform are used for the calculation. Note that with larger numbers, the calculation must be performed for display of the curves.

When 1 is specified, the result of calculating the minimum, maximum and mean value is always the last value in the waveform.</td></tr>
</table>

Options (Curve Window Defaults)



Settings made in this group of elements are effective for the entire curve window and are not made individually for each waveform. The font and several other basic display types can be set here.

Settings - Options	Description
Font	For selecting the font, font size and style. The size set here is ignored if the option Size: auto is activated.
Size automatic	The font size is automatically selected to be as large as will fit. However, only the size is adjusted.
Columns	The name, equals sign, numerical values, and units are displayed in columns for a clearer presentation. Without the option *Columns*, the entries are separated by spaces.
"=" (equal sign)	An equal sign appears after the variable's name, or else a colon. The colon appears directly with the name, but the equal sign appears in its own column.
Flush right	All numerical values appear flush along the right margin, independently of the format set. Without *Flush right*, all decimal periods are aligned one above the other. The condition for the aligned writing is that the *Columns* option is selected!
Names	Variables names and or comments which appear before the numerical value. If only one variable is in the window, the designator can be switched off since it is already in the title bar.

Set as default

The settings made initially only apply to the current window. If you click on the button *Set as Default*, any new curve windows created apply these settings whenever the display stye *Last value as number* is selected. You should only click on this button if no question marks are showing in the dialog.

The defaults for the format are **NOT** saved for each data set individually.

OK, Cancel

For details on operation, see the chapter Confirmation bar 178.

Remarks

- Several menu items in the curve window, such as Measure, Scale and Overview Window cannot be selected when the numerical value display option is selected.
- Displaying numbers in fixed-point notation may have two effects in connection with the range of numbers. If the size of a number is too small, only zeros are displayed. On the other hand, when a number is too large to be displayed in the available space, a symbol appears which indicates an overflow. In this case, select more digits left of the decimal point or floating-point notation.
- With numerical display of online measurement data at high sampling rates, it can occur that the numbers change so fast that they are no longer visible. In that case, select a calculation and control the update rate for the values by making the appropriate setting under Values. Then select an appropriately small number of places right of the decimal. Usually only the digits to the right of the decimal point change strongly because the measurement signal changes only slightly.
- When time-stamped data are subjected to data reduction, the amount of values on which the calculation is performed is the same as the amount of measured points before the data reduction. Thus, specifying the amount of values to which the calculation is applied always fixes the time segment on which the calculation is performed, independently of how much the measured data are reduced.
- The color of the texts and the background in numerical display can be changed uniformly for all curve windows in the dialog *Options/ Colors...*. The following elements are available for selection:
  - *Numbers: foreground* or *background*

3.2.2.1 Single value display

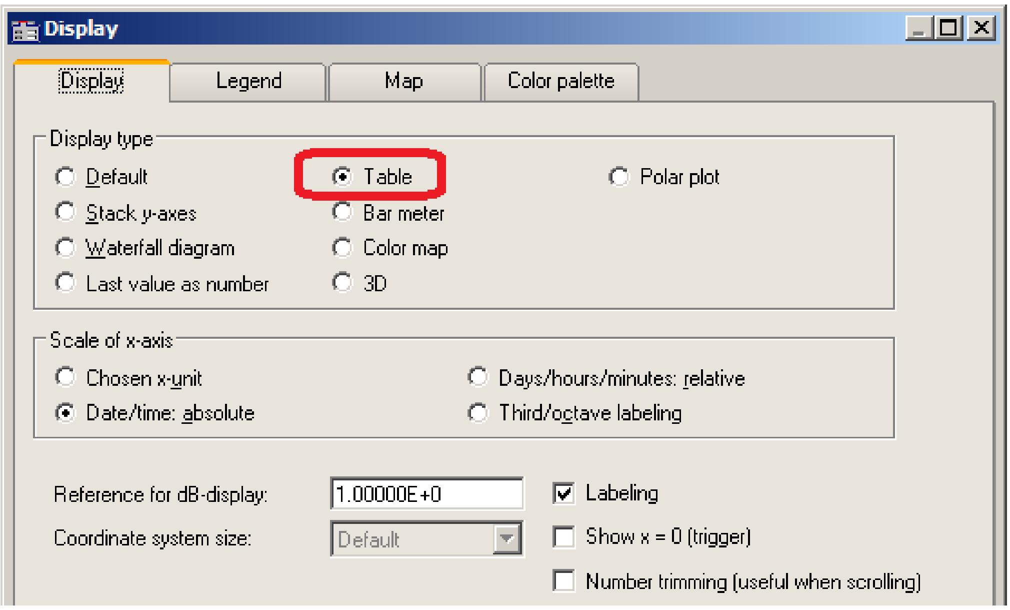
The display mode *Last value as number* is automatically activated if real waveforms with a length of 1 are displayed.

3.2.3 Tabular representation

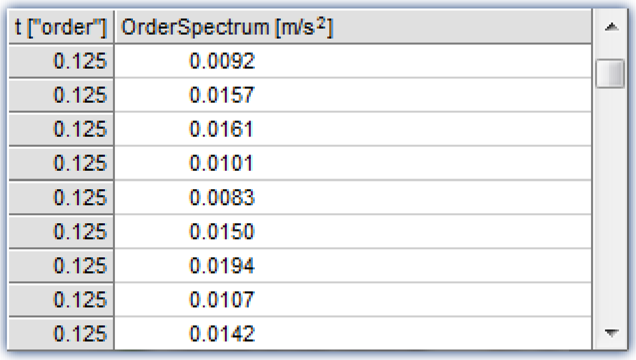
Measurement readings can also be displayed in a table, where the readings are listed in chronological order. This can appear as a protocol readout or as a log book.

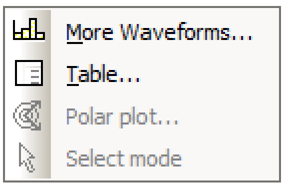
Operation

Select the curve window menu item *Configuration / Display...*. This calls a dialog for defining the curve window's display style. Select the entry, *Table*. Even the time display types *Chosen x-unit* and *Date/time absolute*, are applied in a tabular display.



The curve window then appears as shown below:

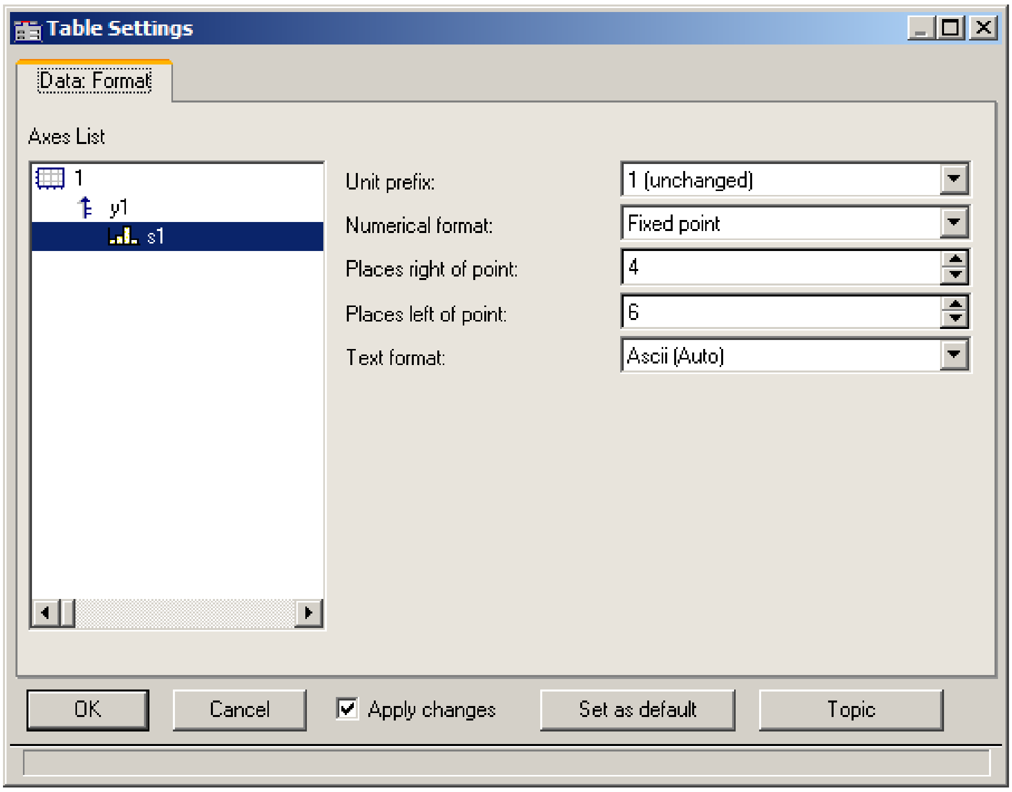




It's possible to move through the list using the scrollbar at right.

Right-clicking the mouse on the curve window calls the context menu which now looks like this.

The menu item *Table...* calls the dialog offering controls as shown below:



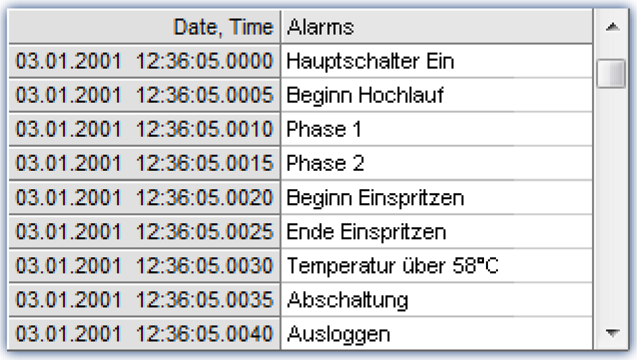
The left portion of the dialog indicates all the channels displayed in the curve window. How these channel listings are arranged in terms of axes and coordinate systems doesn't matter here. On the right side of the dialog, the controls are located, which are for making settings for the channels selected in the left part.

3.2.3.1 Settings

If the curve window displays channels with measurement readings (default), then you need to deal with the settings for the *numerical format*, *namely Unit prefix*, *Numerical format*, *Places*, *right/left of point*. If texts are displayed (time stamp-ASCII data), then the text format becomes relevant.

<table>
<tr><th>Settings</th><th>Description</th></tr>
<tr><td>Unit prefix</td><td>This consists of the order of magnitude and, if appropriate, a prefix such as kilo, milli, Mega or even just 1 (default, use of unit without prefix), which appears after the number before the unit. If the reading is 10 and takes the unit V (Volts), then for a selection of "m" (milli), a value of 10000mV is returned.</td></tr>
<tr><td>Numerical format</td><td>Fixed point can be selected for readout with a fixed number of decimal places and without an exponent; e.g. 17, 17.35, -0.0017.

Floating point can be selected for readout with fixed relative precision and an exponent, e.g. -1.28E-7 or 3.4E+0</td></tr>
<tr><td>Places right of point</td><td>This is the number of decimal places to show. 0..15 places are possible.</td></tr>
<tr><td>Places left of point</td><td>Only for fixed point format, a specified amount of places before (to the left of) the decimal point. The number should be large enough to ensure that the numerical value is indicated with all its digits.</td></tr>
<tr><td>Text format</td><td>This setting only pertains to channels with information presented as strings, in other words on the case of time stamp-Ascii data. Such data are, for instance, generated by imc Online FAMOS (by imc STUDIO), but also by functions belonging to the Time Stamp Ascii Kit (TSA-Kit). This data type contains texts, where each text has a time stamp, e.g. log-book entry representation with absolute time selected:


<table>
<tr><th>Date, Time</th><th>Alarms</th></tr>
<tr><td>03.01.2001 12:36:05.0000</td><td>Hauptschalter Ein</td></tr>
<tr><td>03.01.2001 12:36:05.0005</td><td>Beginn Hochlauf</td></tr>
<tr><td>03.01.2001 12:36:05.0010</td><td>Phase 1</td></tr>
<tr><td>03.01.2001 12:36:05.0015</td><td>Phase 2</td></tr>
<tr><td>03.01.2001 12:36:05.0020</td><td>Beginn Einspritzen</td></tr>
<tr><td>03.01.2001 12:36:05.0025</td><td>Ende Einspritzen</td></tr>
<tr><td>03.01.2001 12:36:05.0030</td><td>Temperatur über 58°C</td></tr>
<tr><td>03.01.2001 12:36:05.0035</td><td>Abschaltung</td></tr>
<tr><td>03.01.2001 12:36:05.0040</td><td>Ausloggen</td></tr>
</table></td></tr>
</table>

Text format

The following options are available:

Text format	Description
Ascii (Auto)	Display of ASCII characters in legible form (see above.).

Text format	Description
Hex	Display of hexadecimal values 00H .. FFH.

t [s]	Alarms
-4.8	48 61 75 70 74 73 63 68 61 6c 74 65 72 20 45 69 6e
-4.1	42 65 67 69 6e 6e 20 48 6f 63 68 6c 61 75 66
-4.1	50 68 61 73 65 20 31
-1.1	50 68 61 73 65 20 32
2.3	42 65 67 69 6e 6e 20 45 69 6e 73 70 72 69 74 7a 65 6
4.6	45 6e 64 65 20 45 69 6e 73 70 72 69 74 7a 65 6e
6.7	54 65 6d 70 65 72 61 74 75 72 20 fc 62 65 72 20 35 3
10.3	41 62 73 63 68 61 6c 74 75 6e 67
12.4	41 75 73 6c 6f 67 67 65 6e

Text format	Description
CAN, LIN message	For all devices with a CAN/LIN-connection: display with identifier and contents of the CAN/LIN-messages. The identifier (appearing before the colon) and the bytes belonging to the message are displayed as hexadecimal values. Only for data from the imc STUDIO software.

t [s]	CanBus_Messages
1.3	034: 00 00 00
2.9	034: 78 88 0F
3.4	129: 00 00 00 00 11 11 00 00
3.5	001: 01
4.4	034: 90 90 00
4.9	034: 78 88 0F
5.4	129: 00 00 00 00 11 11 00 00
6.5	001: 01

Note **Messages with extended identifier**

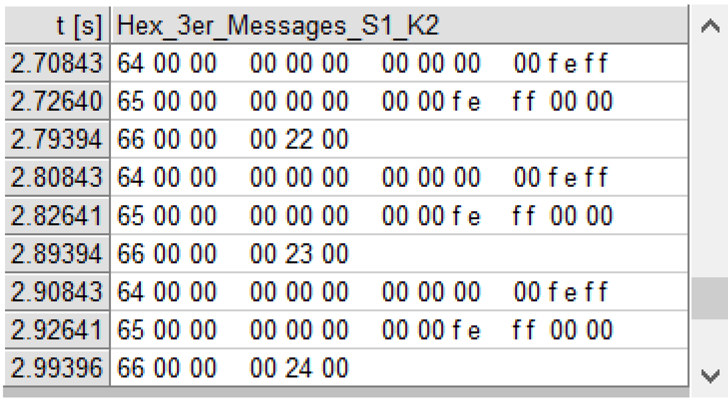
In Hex 45 representation of the content of a message, the extended bit is always visible.

In case of CAN, LIN message format, the bit is taken into account to output 4 or 8 hex characters for the identifier. But in the output table the bit is hidden.

Text format	Description
4 byte abs. time	For all devices which can read in 4 Byte time stamp data (seconds since 1.1.1980), there is a specialized display style. Only for data from the imc STUDIO software.

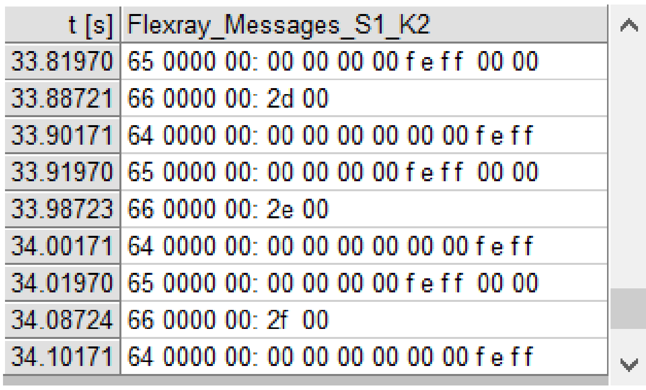
t [s]	TimeStampUmsx4Byte
6.0	14.04.2001 19:41:55
7.0	14.04.2001 19:41:55
8.0	14.04.2001 19:41:55
9.0	14.04.2001 19:41:55
10.0	14.04.2001 19:41:55
11.0	14.04.2001 19:41:55
12.0	14.04.2001 19:41:55
13.0	14.04.2001 19:41:55

Text format	Description
3-number sets (hex)	Display of hexadecimal values in 3-number sets.



t [s]	Hex_3er_Messages_S1_K2
2.70843	64 00 00 00 00 00 00 00 00 00 f e f f
2.72640	65 00 00 00 00 00 00 00 f e f f 00 00
2.79394	66 00 00 00 22 00
2.80843	64 00 00 00 00 00 00 00 00 00 f e f f
2.82641	65 00 00 00 00 00 00 00 f e f f 00 00
2.89394	66 00 00 00 23 00
2.90843	64 00 00 00 00 00 00 00 00 00 f e f f
2.92641	65 00 00 00 00 00 00 00 f e f f 00 00
2.99396	66 00 00 00 24 00

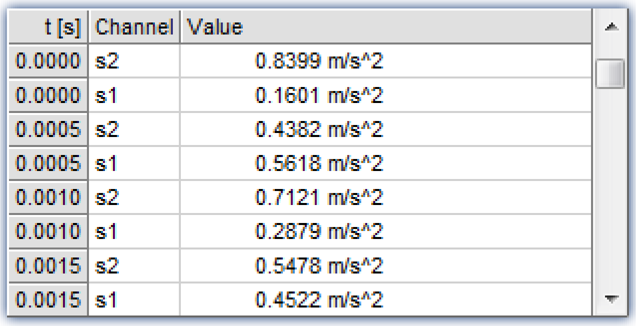
Text format	Description
Flexray-message	For all devices with a Flexray-connection: display with identifier and contents of the Flexray-messages. The identifier (appearing before the colon) and the bytes belonging to the message are displayed as hexadecimal values. Only for data from the imc STUDIO software.



t [s]	Flexray_Messages_S1_K2
33.81970	65 0000 00: 00 00 00 00 f e f f 00 00
33.88721	66 0000 00: 2d 00
33.90171	64 0000 00: 00 00 00 00 00 00 f e f f
33.91970	65 0000 00: 00 00 00 00 f e f f 00 00
33.98723	66 0000 00: 2e 00
34.00171	64 0000 00: 00 00 00 00 00 00 f e f f
34.01970	65 0000 00: 00 00 00 00 f e f f 00 00
34.08724	66 0000 00: 2f 00
34.10171	64 0000 00: 00 00 00 00 00 00 f e f f

Multi-channel displays

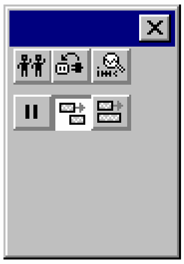
Display of multiple channels at once also uses correctly synchronized ordering. For every measurement reading, the source channel is indicated:



t [s]	Channel	Value
0.0000	s2	0.8399 m/s^2
0.0000	s1	0.1601 m/s^2
0.0005	s2	0.4382 m/s^2
0.0005	s1	0.5618 m/s^2
0.0010	s2	0.7121 m/s^2
0.0010	s1	0.2879 m/s^2
0.0015	s2	0.5478 m/s^2
0.0015	s1	0.4522 m/s^2

Online-Display

If a table is displayed during a running measurement, it may be advantageous to have a readout of the current readings, at the bottom of the table. For this purpose, the roll-mode is provided, just like for time-based displays in coordinate systems.



OK, Cancel, Set as default

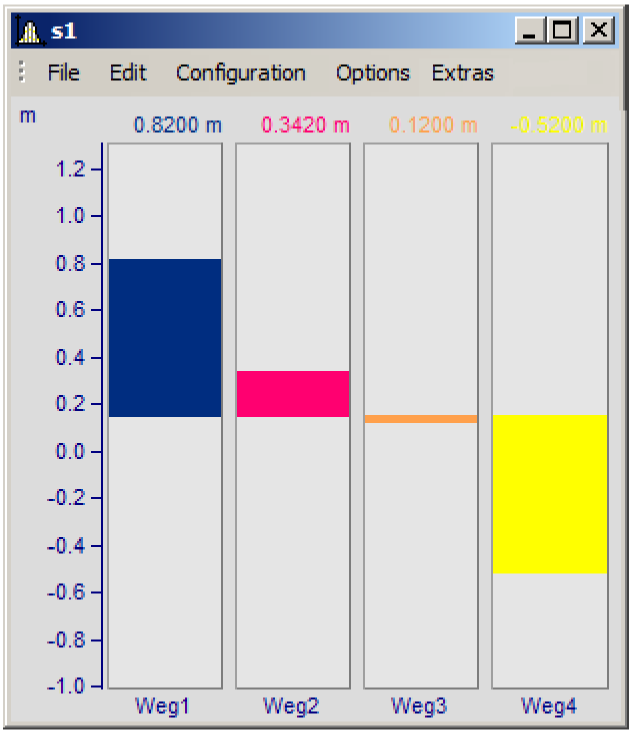
For details on operation, see the chapter Confirmation bar 178

Remarks

- The entries are always ordered chronologically.
- The condition for using this display type is that the time coordinate in each channel behaves like time, in other words, increases continuously.
- If the time coordinate decreases in a data set, for example, in the case of a characteristic curve which is an XY-waveform, this display type cannot be used.
- For information on the buttons *Ok*, *Cancel* and *Set as default*, refer to the chapter on Confirmation bar 178.

3.2.4 Bar meter

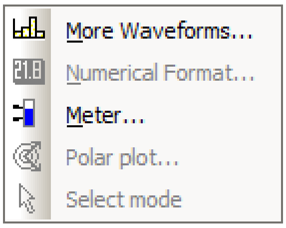
In addition to the numerical data display *Last value as number*, there is also a data display style having the form of a vertical meter bar. The height of the bar is determined from the last value in the waveform. This representation style is particularly useful for online viewing, as it offers a convenient overview of signal developments in multiple channels. The representation style incorporates graphical features such as different colors, slave pointers, margin checking etc.



Settings

Select menu item *Configuration/ Display* in the curve window. Select the *Bar Meter* radio button.

It is possible to display several channels together using a common y-axis. Select the channels to be displayed in the curve window.



To configure the bar meter itself, right-click on the curve window to open the context menu:

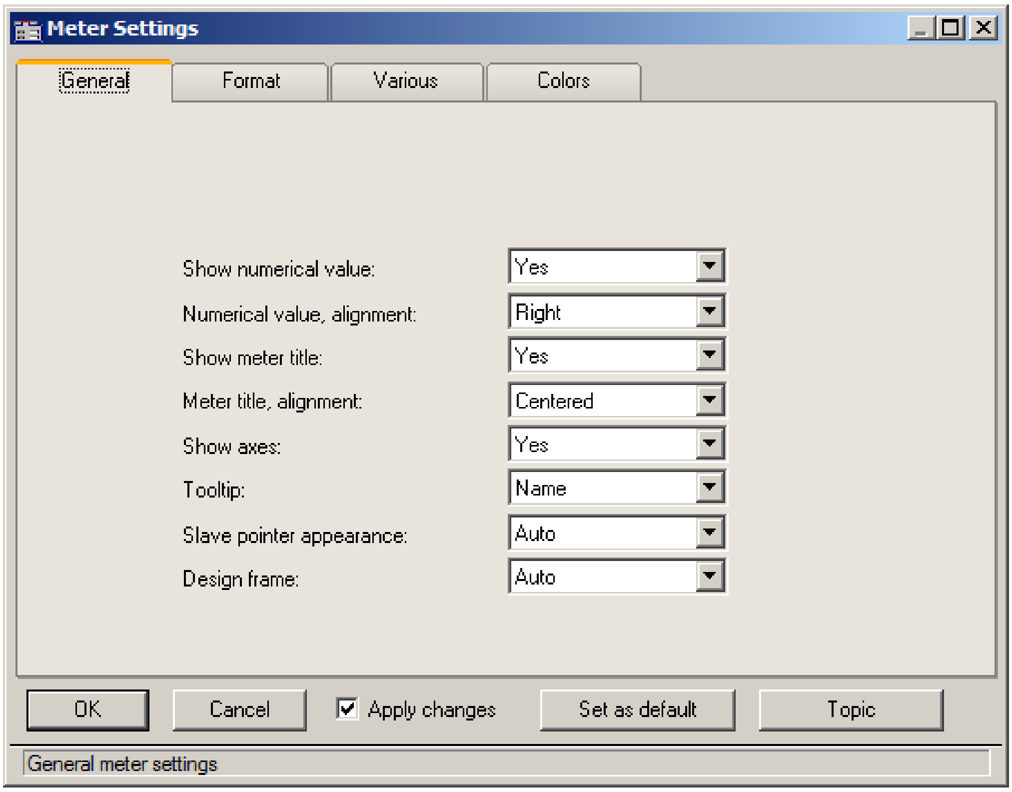
Select *Meter...* to open the *Meter Settings* dialog. This dialog consists of several sub-dialogs, each of which contains controls for different settings.

If you have preferences for certain settings, use the *Set as default* button. These settings will be implemented automatically each time bar meter display mode is used.

The following is a description of each sub-dialog in the *Bar Meter Settings* dialog.

Settings: General

This is where settings are made which affect all bars in the curve window alike.



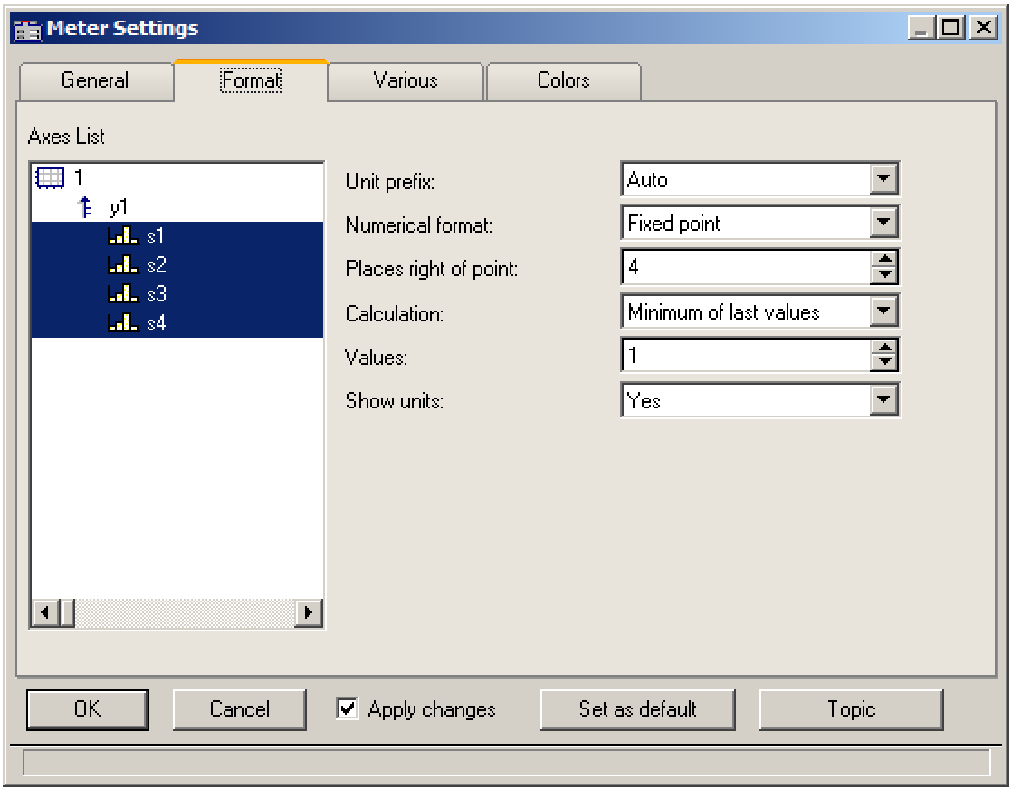
Settings	Description
Show numerical value	This setting governs whether to display the numerical value of a signal together with its bar meter representation. The numerical value is written above the bar.
Numerical value, alignment	This controls the horizontal alignment of the numerical value (in case it is specified to appear). The recommended setting is *right*, but *left* and *centered* are offered.
Show meter title	This determines whether to display the corresponding channel name under the bar meter of a signal. This is particularly useful when multiple channels' signals are being shown.
Meter title, alignment	The horizontal alignment of the title text, which is always written in one line. Choices offered are *left*, *right* and *center*.
Show axes	A y-axis can be specified to appear adjacent to the bar meter at left. The scaling of the axis can be set by the usual method for curve windows. This axis determines the value range of the bar (lower-limit physical value at the bottom edge, upper-limit physical value at the top edge). This is also where to specify whether the scale is indicated or not. Even if the scale is not depicted, it is still applied to the bar's value range. The settings in the curve window's menu item Configuration/ Axes must be made afterwards.
Tooltip	For *Name*, the channel name is displayed; for *no*, it is not.
Slave pointer appearance	*Line*, or a clamp for *auto*.

Settings	Description
Design frame	With *auto*, each channel has its own frame; with *Common frame*, not. 

Settings: Format

This filecard mainly concerns the settings for the numerical format and for computing the numerical value. The numerical value is used for the readout above the bar and for determining the height of the bar.

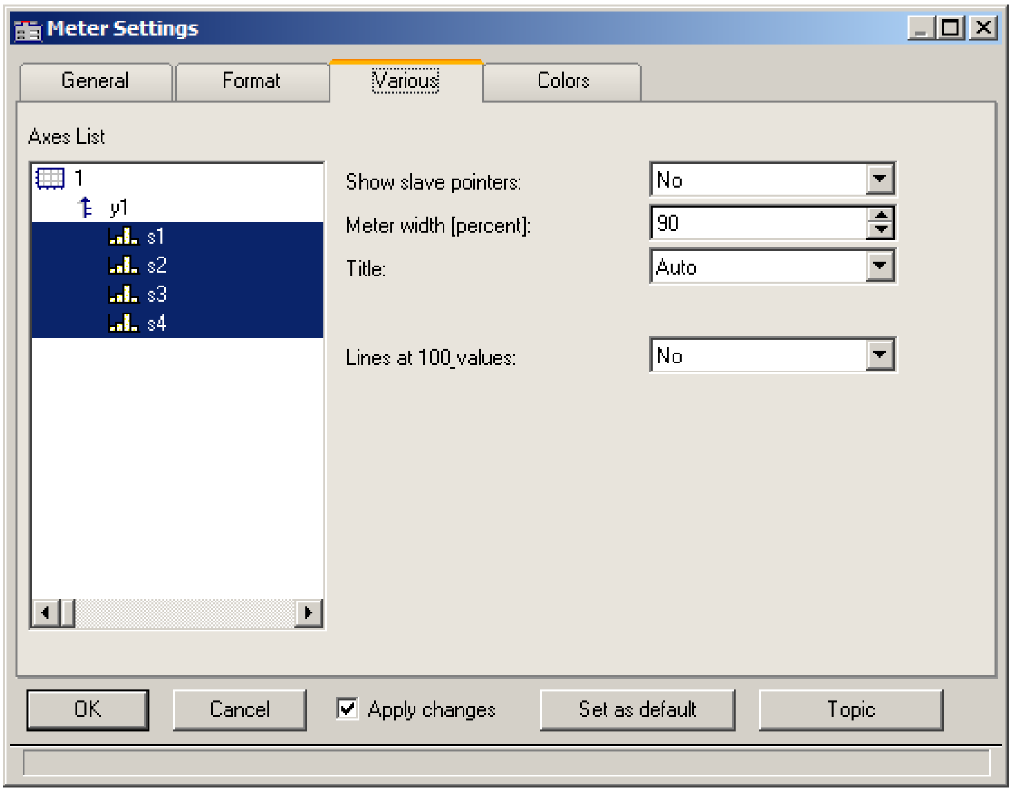
On this and the following sub-dialogs, the first step is to select all the channels to which the settings made should apply in common. Multi-selection can be performed as described in the instructions for the *axes list* 96. If multiple, selected channels have mutually different settings for a property, the setting indicated for that property will be "???".



Settings	Description
Unit prefix	You can specify a unit prefix, reflecting the 10-based exponent of the signal value, to accompany the displayed numerical value. Prefixes from piko (p) to Giga (G) are supplied. When *auto* is set, the exponent is oriented to the exponent of the y-axis scaling, which is the recommended setting. For fixed point notation, a fixed exponent is recommendable, as well as for the y-axis scaling - see the description of the y-axis. Example: the waveform involved is a power measurement taking units of Watts and extending in range from 1e4 to 1e6 W. As the fixed unit prefix we choose "kilo" (k), resulting in values of 10kW to 1000kW. This setting is unnecessary if the numerical value of the signal isn't set to be displayed.
Numerical format	Fixed point (e.g., 0.01, 100, 365.25) or floating point notation (e.g., 3.5E-3) are available. If the value range of the signal is known, fixed point notation is better. This setting is unnecessary if the numerical value of the signal isn't set to be displayed.
Places right of point	Zero to fifteen places after the decimal point can be specified. This setting is unnecessary if the numerical value of the signal isn't set to be displayed.
Calculation	The displayed numerical value can be the most recently measured value, or can be a function of the N most recent values. The functions of N values offered are mean, minimum and maximum. If the waveform has fewer than N values, all available values are used in the calculation. If N = 1, the particular function used is irrelevant. The height of the meter bars, as well, is derived from the setting made here.
Values	Enter the number N of values, from which the mean, minimum, or maximum is to be calculated. Only integers >= 1 are permitted. A large value for N needs much time for computation, but 100 values is an amount the system can comfortably and quickly handle.
Show units	This determines whether the physical unit, together with the exponential prefix (p, n, µ, m, ...) is to be displayed with the numerical measurement value. It is sometimes necessary to include an indication of the physical unit, in order to identify the value's order of magnitude. The unit should be omitted only if it is already accurately reflected by the y-axis scaling.

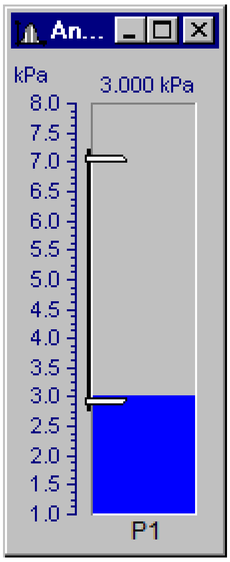
Settings: Various

This sub-dialog contains an assortment of setting controls, such as the width of the meter bars, or settings concerning the slave pointer.



Settings	Description
Show slave pointers	Specify here whether a meter bar should be equipped with slave pointers. These are markings appearing along a bar, which at any given time are situated where the signal's minimum and maximum encountered values were.
Meter width (percent)	Specify here the width of the meter bar relative to the width of the bar's "cell", which is the approximate width of the curve window divided by the number of bars in the window. Any fraction of the cell width, from 0% to 100% can be entered; a setting of 100% causes the bars to touch each other and thus 90% is recommended for greatest clarity.
Title	The title of the bar meter can be the channel to which its signal belongs (setting: *auto*), or any arbitrary name (*Fixed title*). If you select *Fixed title* from the list box, the entry box of the same name will appear below. Fixed title: Enter here an arbitrary designation for a bar meter. Up to 20 characters are allowed.

Slave Pointers



Slave pointers display the largest and smallest levels of a channel. At the beginning of a measurement, they lie together. They generally move away from each other during a measurement - the top one follows the largest values while the bottom one follows the smallest values. The slave pointers may also lie outside of the currently visible region.

The bar's slave pointers are represented by a graphic resembling a bar clamp. The slave pointers may also be located outside of the visible range.

Whenever a curve window is first opened or a new curve configuration is loaded, the slave pointers in that window are reset. The slave pointers are also not displayed when no data is present.

Slave Pointer: Computation

The slave pointers are rapidly computed by simply tracking the minimum and maximum values in a waveform. Therefore, slave pointers can be updated quickly even with large amounts of data. In typical online measurement applications, where the incoming data is simply appended to the data record, the use of slave pointers is appropriate. In off-line data analysis, however, they are not particularly useful because the entire data record is loaded at once.

Starting a new measurement on a channel with slave pointers does not reset them. They retain their former value until new data forces them to a new position.

Slave pointers are computed from the actual measurement data and not from a value computed from the channel for the bar meter. For example, consider a bar meter which is configured to display the average of the last 10 values. Although the meter is unlikely to show transient maximum values, these will affect the position of the slave pointers.

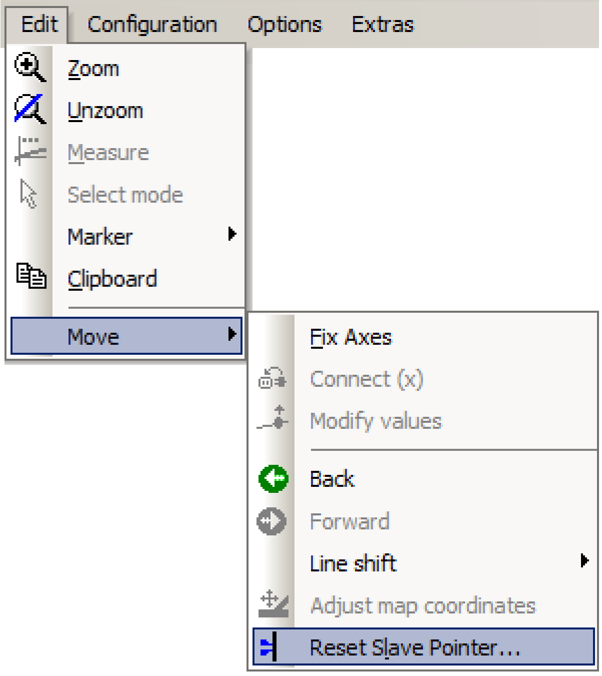
To avoid this effect from occurring, compute the average *online* and then display the resulting *virtual channel* in a bar meter. The slave pointers will then agree with the displayed maximum and minimum values.

Slave pointers are accurate to 6 significant figures, i.e. they use 4 Byte representation.

Slave Pointer: Reset

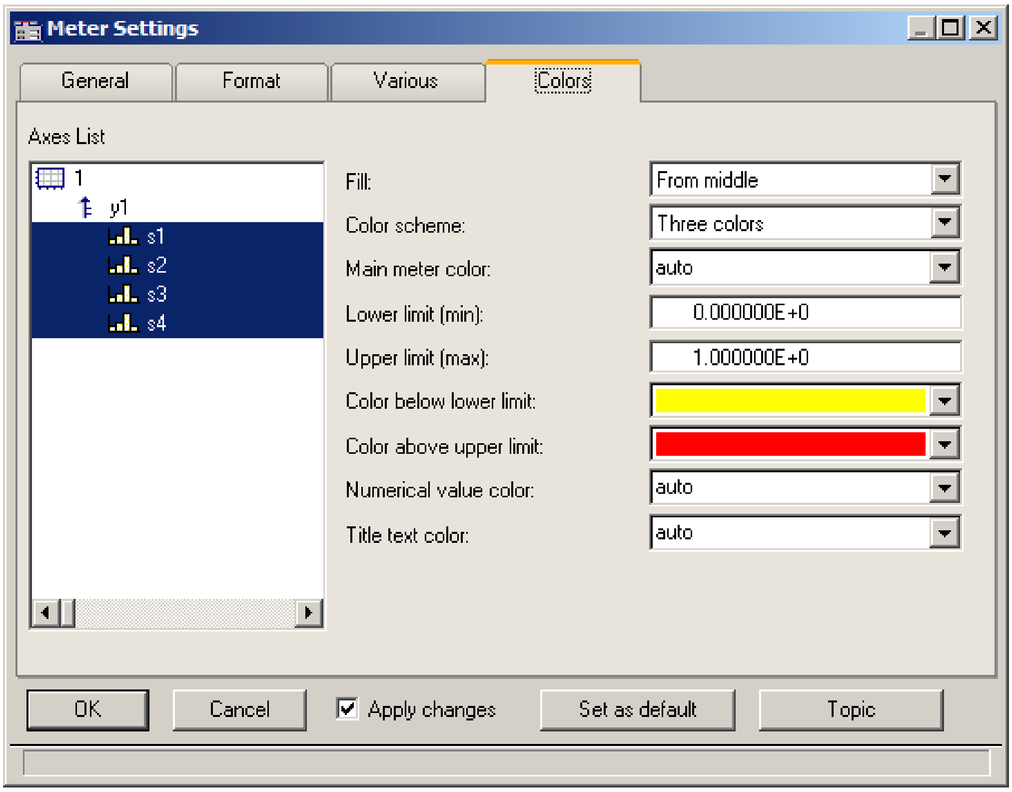
Resetting a slave pointer causes *all* slave pointers in that curve window to be reset. When you reset a slave pointer, it slides back to the current measurement value. Slave pointers have to be reset manually in each window. When a new measurement is started, this does *not* automatically reset the slave pointers!

To reset the slave pointers in a curve window, select *Edit / Move / Reset Slave Pointer...*.



Settings: Colors

This sub-dialog lets you decide on colors for the bars.

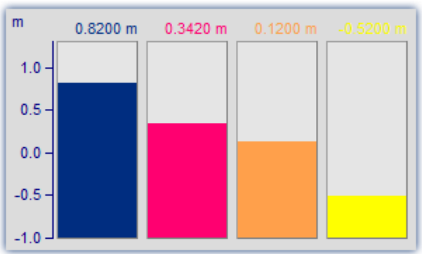


Fill

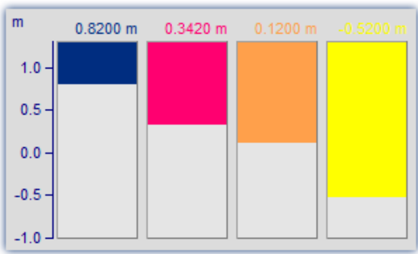
This setting determines from where the meter bars grow with increasing signal measurement values, as represented visually by a column filling with color.

The available options are from the top, from the bottom, from the center, and from y = 0 (the height along the bar, where the y-axis is equal 0.0).

From below



From above



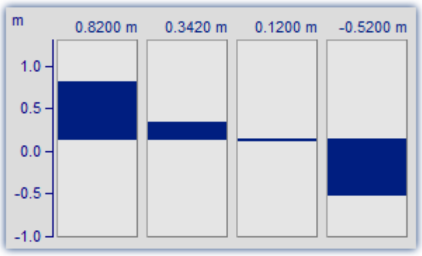
From y = zero

Alternating up and down from the 0 line of the axis

Color scheme

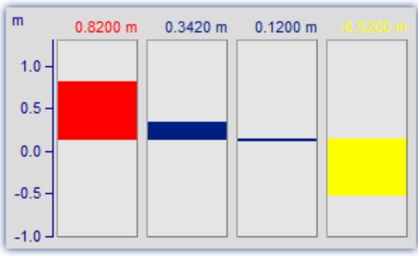
The bar can have only one color, three colors in succession or up to three colors at once. Three colored bars are used to indicate whether the measurement signal is currently within a tolerance range, which can be specified by the user in terms of an upper and a lower threshold value.

One color



A one-colored bar has the same color at all times.

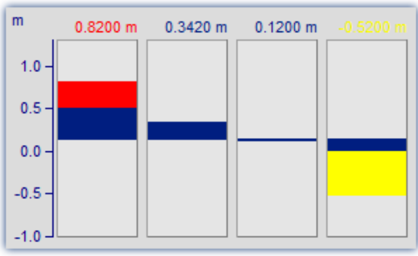
Three colors



The three color bar (*one color at a time*) shows the whole filled area in one color, which depends on whether the signal is below range, within range, or above range.

- The 1st color, if: Value <= Lower limit
- The 2nd color, if: Lower limit < Value < Upper limit
- The 3rd color, if: Value <=Upper limit

Three colors



Where a bar has *Three colors together*, each of its colors is shown only within a certain range of the bar's height, as outlined below:

- The 1st color, in the range: fill height <= Lower limit
- The 2nd color, in the range: Lower limit < fill height < Upper limit
- The 3rd color, in the range: Upper limit <= fill height

Depending on the circumstances, therefore, up to all three of the colors can be visible in a bar.

Settings	Description
Main meter color	This is the only color of the meter bar if only one color style is specified; for three color style it is the middle color (the color of the bar indicating a signal within the limits set by the user). When the valid setting is *auto*, the automatic selection which would have been made for a waveform in the curve window is applied to the bar. The background color of the bar is the background color of the coordinate system, which is set via dialog Options/ Colors 249 of the curve window. If a waveform doesn't contain any values, the bar meter remains empty as well.
Lower limit (Minimum)	For three-color display modes, a lower limit must be specified in this entry box. If there shouldn't be any lower limit, it is possible to enter -1e30, which is generally lower than any signal which will ever be measured.
Upper limit (Maximum)	For three-color display modes, an upper limit must be specified in this entry box. If there shouldn't be any upper limit, it is possible to enter 1e30, which is generally higher than any signal which will ever be measured. The upper limit must be greater than the lower limit.
Color below lower limit	In three-colored bars, this is the first color.
Color above upper limit	In three-colored bars, this is the last color.

Settings	Description
Numerical value color	The numerical value, if it is specified to be displayed above the bar meter, can be assigned a fixed color. Or, if set to *auto*, the color is the same as of the bar itself.
Title text color	The title below the bar can be assigned a fixed color. Or, if set to *auto*, the color is the same as of the bar itself.

Note

- **Reducing flicker:** If flickering occurs in a bar meter during a measurement, then you should use averaging (Meter Settings dialog: *Format/ Calculation/ Average of last values*). Be sure to set the numerical format to floating point. Restrict the decimal places right of the comma to just a few and use right alignment.
- **Appearance:** In general, tall, slim meters appear better than short, wide ones. If necessary, the curve window should be resized.

Limitations

- With data containing events or segments, the structure is ignored. If results are being computed from the last N values, the data set is simply considered a long waveform. Thus, computations can be performed on more than one event. IMPORTANT: Because this behavior may be changed in upcoming versions, we do not recommend that you use it.
- Only one y-axis is possible. All bar meters in a curve window have to use the same y-scaling. If you wish to use different y-scaling, than use separate curve windows.
- Slave pointers are only appropriate for online measurements. If data is processed off-line (e.g. with imc FAMOS), the slave pointers will not always function properly, i.e. they will not display the maximum / minimum values. However, if values have only been appended to a data record, the slave pointers will function properly. At the beginning of a new measurement, the data record has to be emptied before appending new data. This allows the slave pointers to correctly interpret the new data.
- With XY-data as well as with data reduced using Transitional Recording, computations over the last N values always use a different time interval. This behavior may be changed in upcoming versions.
- The slave pointers can only properly interpret data which has been correctly appended to a data record. For example, data which has not been recorded via the measurement device and therefore has not passed through the Data Manager is not properly interpreted.

3.2.5 Color map display

This style of data representation is analogous to a geographical map with color-coding of surface relief.

Multiple waveforms are arranged in a stacked layout (in the y-direction), where each one's values are plotted from left to right (in the x-direction). The amplitude is plotted in the z-direction, in other words, extending vertically out from the screen. The result is a contoured surface extending out from the xy-plane, onto which the observed looks with a bird's-eye view. The hight of the surface is indicated by color coding, where different ranges of height correspond to specific colors.

There is additionally the possibility of superimpose x-y waveforms over the color map, and to have the map bordered by the waveforms. For more on this topic, see the section *Lines / Extras* 132.

Prerequisites

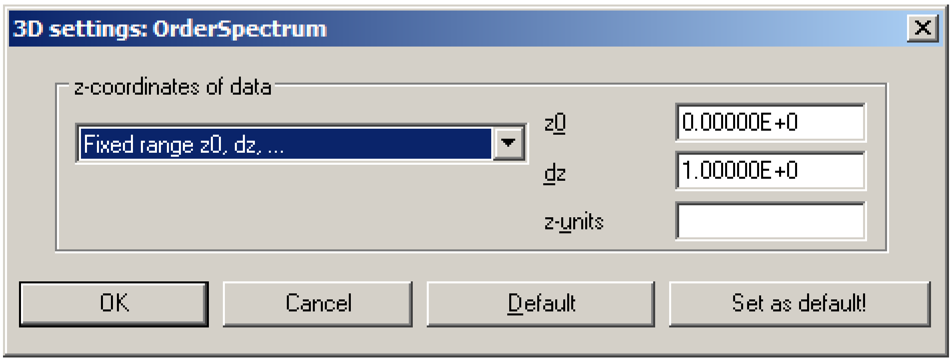
- Color video card with more than 256 colors, in other words 16 bit or 24 bit colors.
- Color printer of DIN A4 format.
- A fast PC (>= 586, 100MHz) with plenty of RAM (>= 32MB)
- Since the graphics display is based on large bitmaps (pixel graphics), large displays in particular require much storage space and computation
- With a DIN A4 color printer having 300dpi, one has about 2000 by 3000 pixels and with 24 bits per pixel one already arrives at about 18Mbytes!

Operation

First display all desired channels in the curve window. Then select the menu option *Color Map* in the dialog *Configuration / Display...*.

Setting the Z-coordinate

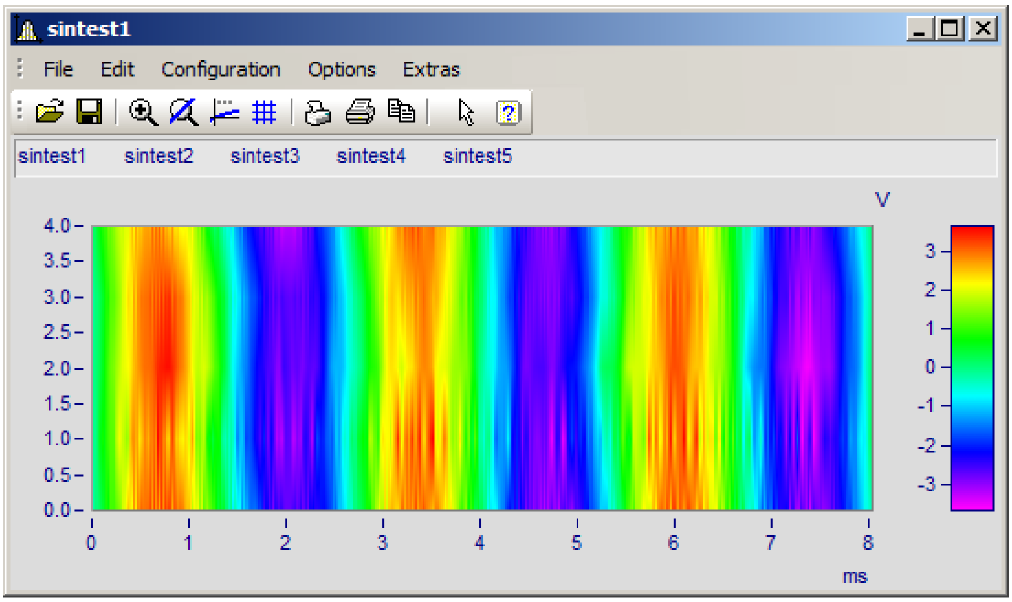
In the dialog: *Configuration / 3D* 69 of the curve window, select an appropriate z-coordinate (see below):



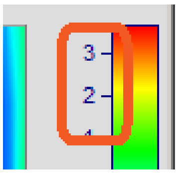
Reference	Waterfall diagrams z-coordinate

More on the topic of Waterfall diagrams z-coordinate 31

Result



Z-Axis Scaling



To adjust the color axis, double click on the scaling of the colored legend. The color axis is the same thing as the z-axis and is scaled as such.

Color Selection

The colors are set by means of the Color Map dialog: *Configuration/Color Map Display* 60.

Interpreting the Z-coordinate

The z-coordinate of the data (an otherwise undefined coordinate in imc FAMOS) is to be set via the dialog Configuration/ 3D in the curve window (see above). For example, The z-coordinate of the first waveform (channel) in a group could be set to z-min, the next to z-min + dz, the next to z-min + 2dz etc.

Orientation of the Coordinates

The component waveforms in the map are represented as multicolored horizontal lines, whose x-range is plotted from the x-minimum on the left edge of the graph to the x-maximum on the right edge. The height on the screen of a waveform's line or strip is determined by that waveform's specified z-coordinate; a waveform's z-coordinate is thus plotted along the y-axis, in a manner of speaking. Conversely, a waveform's y-coordinate, being its measurement value, is represented by a color; thus one can say a waveform's y-coordinate is plotted along the color axis, which for these purposes is also referred to as the z-axis. The scaling of the y-axis, then, serves to landmark regions of the pictorial representation, without pinpointing the location of any physical value in that representation.

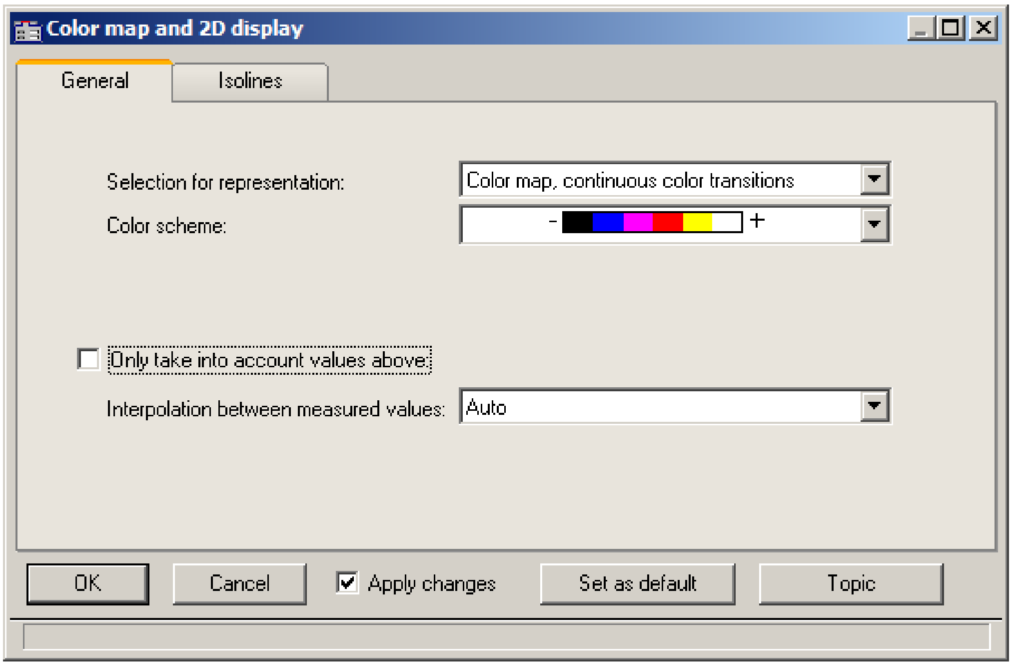
We thus achieve the illusion of a colorful landscape depicted on a map with green signifying valleys, the mountains brown and the snowy peaks white (in our case the colors follow the order of the physical spectrum).

Limits

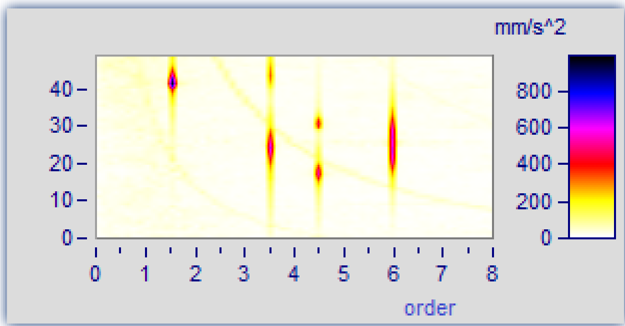
- With locus and XY plots a measurement cursor is not available for the z-coordinate.
- The colored map representation is somewhat slow by comparison with other representation styles. Printing in particular requires large amounts of storage capacity. This may also require patience, therefore.
- The interpolation between two neighboring waveforms is fixed.
- The data's z-coordinate must increase strictly monotonically.

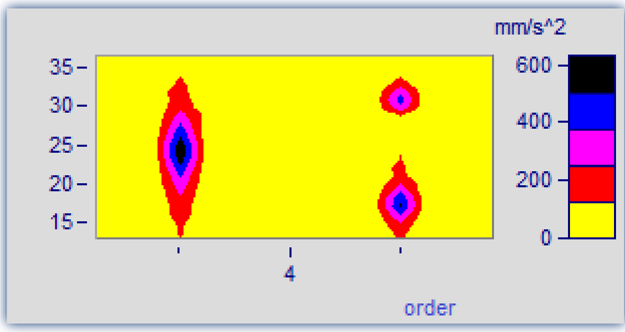
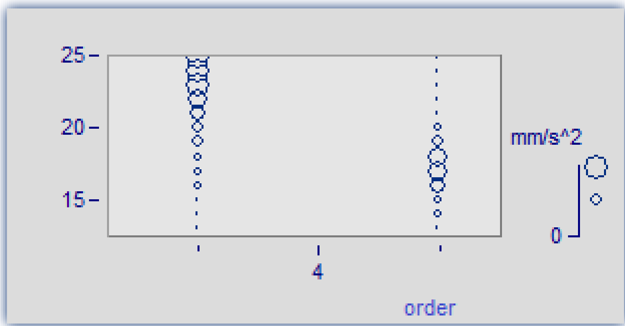
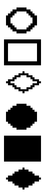
3.2.5.1 Color map dialog, "General"

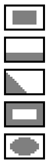
The options for color map display are set in the dialog called by means of the menu item *Configuration/Color Map*:



Selection for representation

Representation	Description
auto	Default colors from magenta to red, or from white to black for B/W display. No other options.
Color map, continuous color transitions	Interpolated color transitions. For each amplitude to represent, an appropriate color is calculated. The color scheme can be selected. 

Representation	Description
Color map, graduated colors	Specified fixed number of colors without interpolation. The color scheme can be selected. **Number of different colors:** The amount of different colors must be between 2 and 1000. The suggested values in the list can be overwritten. 
Symbols, size corresponds to filling (Campbell)	Each measured value is represented by a symbol, e.g. a circle. The **size** of the symbol represents the respective amplitude. The minimum symbol size represents a value of zero, while the maximum represents the maximum value. The intermediate transitions are linear. The symbol is centered around the measured value.   The *Color of the symbol* corresponds to that of the first curve and can not be changed here. Under *Symbol selections*, ellipses, rectangles and diamonds, either drawn as outlines or filled, are available.
Remarks on display as symbols	• With symbol display, the appearance of the symbol's size in the legend is as true to reality as is possible, however, in consideration of how much space in the curve window is taken up by the legend, there are limits to the size. • With symbol display, the readings must increase in the x-direction strictly monotonously. Otherwise, no display is possible. • If XY-data having varying dx increments, or data with varying distance in the z-direction are graphed, then there is no determined size for symbols with (actually constant) size but variable filling. In the legend, an automatically determined value is used for the size.

Representation	Description
Symbols, filling corresponds to amplitude	Each reading is represented by a symbol, e.g. a box. The degree of the symbol's **filling** depends on the signal's amplitude, where an empty symbol (box) corresponds to the minimum and the maximum is represented by the largest size symbol available. The scaling between these extremes is linear. The *Fill color* and *Frame color* can be adjusted. For the frame, the setting *auto* is available, which represents the color of the first curve. For *transparent*, the frame is omitted.   The filling increases, depending on the style chosen, either from the outside to the inside, or vice-versa, or from one side or corner to the other. The measurement value is located at the symbol's lower left corner. For the display with symbols of varying size, the maximum symbol size can be set. The size then depends on the font size (of text appearing as labels in the curve window): The value is specified in percent. The size denotes the maximum diameter of the symbols. A size of 50% .. 200% is usually best.

Color scheme

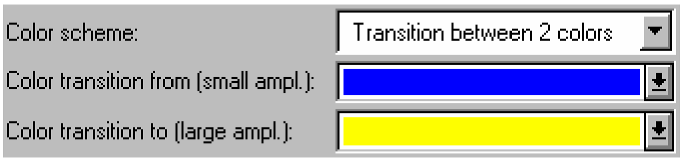
The options depend on what display type is selected.

The color scheme can be set for color map display with graduated or continuous color transition.

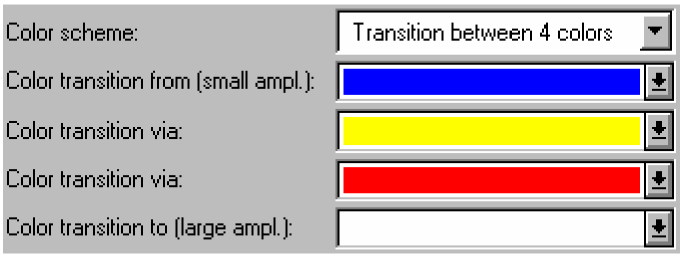
All color schemes (except *auto*) are independent of the capabilities of the output device.

Color scheme	Description
auto	For color output devices, the colors Magenta to Red are used; for b&w printers, the shades from White to Black.

<table>
<tr><th>Color scheme</th><th>Description</th></tr>
<tr><td>Transition between 2, 3 or 4 colors</td><td>
Here you have a choice of using 2, 3 or 4 fixed colors. Then additional controls appear to let you select the particular colors.



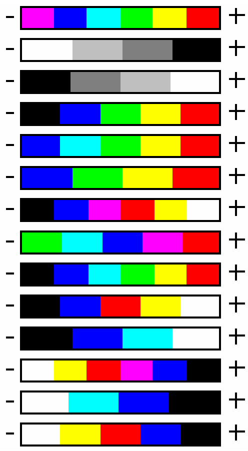
Dialog with 2 colors.



Dialog with 4 colors.

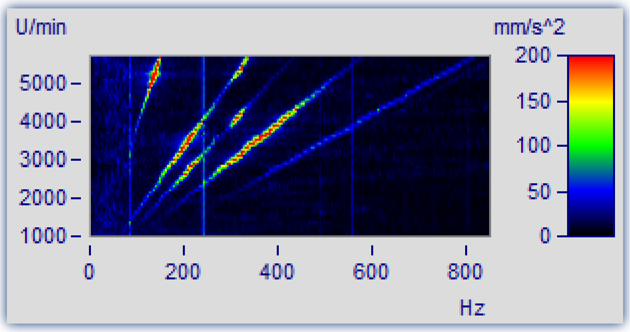
Between the fixed colors, any intermediate colors are generated by linear interpolation of the fixed colors. For instance, if color map display with 5 graduated colors is chosen, and a transition between two fixed colors is also set, the two colors at the ends of the scale are fixed and the other 3 are determined by interpolation.

In the dialog, the color for the smallest amplitude is indicated first (above), and the color for the highest amplitude in the lowest position.
</td></tr>
<tr><td>Fixed color schemes</td><td>
These color schemes are available for direct selection. At left (where "-" appears), the color for the smallest amplitude is shown, at right ("+") the color for the highest.


</td></tr>
</table>

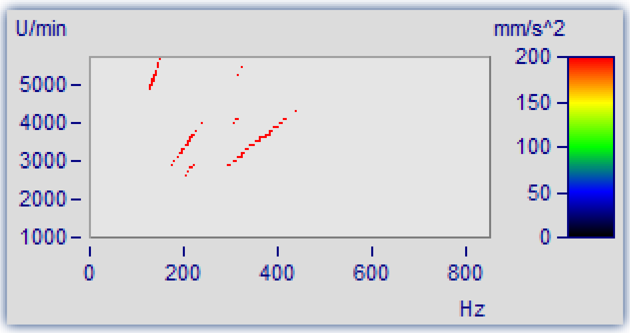
Only take into account values above

The options depend on what display type is selected.

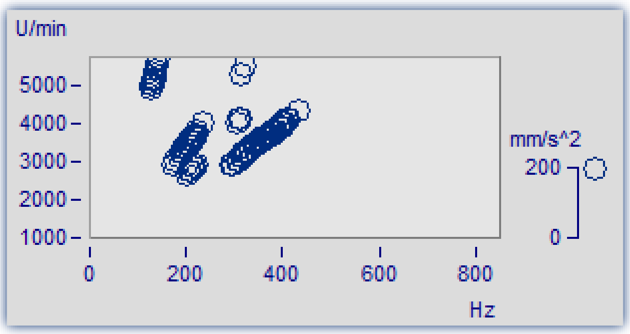


If this option box is not check-marked, all readings are taken into account (default).

If the checkbox is marked, then a lower limit for the amplitudes to be displayed can be specified.



Only relatively large reading values are given consideration. All others merge into the background.



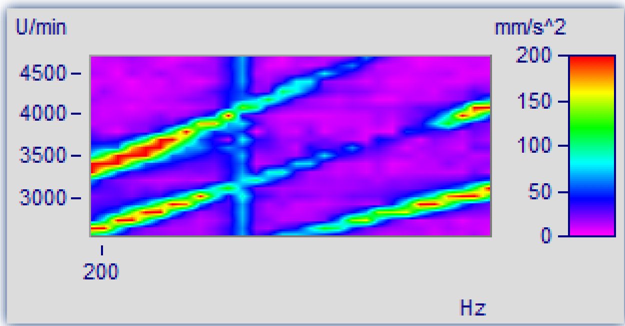
The same graph in the mode *Symbols*, *size corresponding to amplitude (Campbell)*

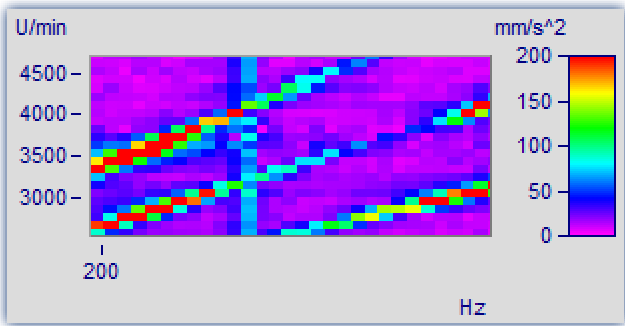
Interpolation between measured values

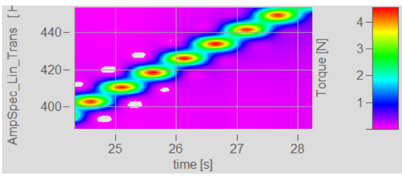
The options depend on what display type is selected.

This refers to interpolation in xy-plane between readings. Not to be confused with interpolation in the z-direction (interpolation of colors).

<table>
<tr><th>Interpolation</th><th>Description</th></tr>
<tr><td>auto, linear</td><td>In the x- and y-directions (horizontal and vertical on-screen, respectively) interpolated values between the specific readings are determined. This corresponds to linear interpolated lines between plotted points.

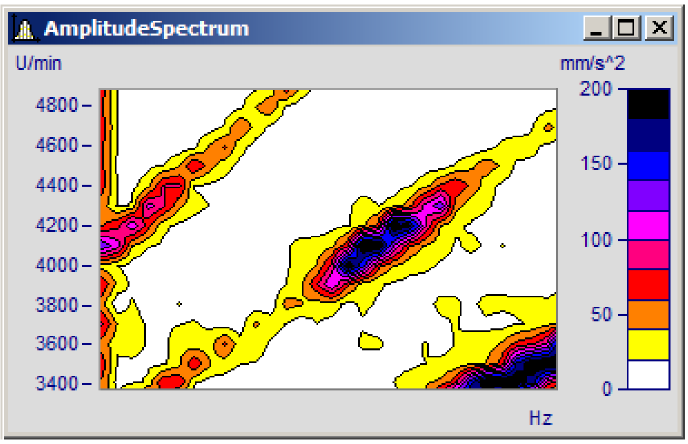

</td></tr>
<tr><td>Constant extension to upper right</td><td>In the x- or respectively, the y-direction, all measured values are extended at constant magnitude until the next measured value. This corresponds to stair-step or bar meter display of measured values.


</td></tr>
<tr><td>Interpolation, cubic polynomials</td><td>In x- and y-direction (horizontal and vertical on the screen respectively) interpolation is done between all measured values with cubic splines.


</td></tr>
</table>

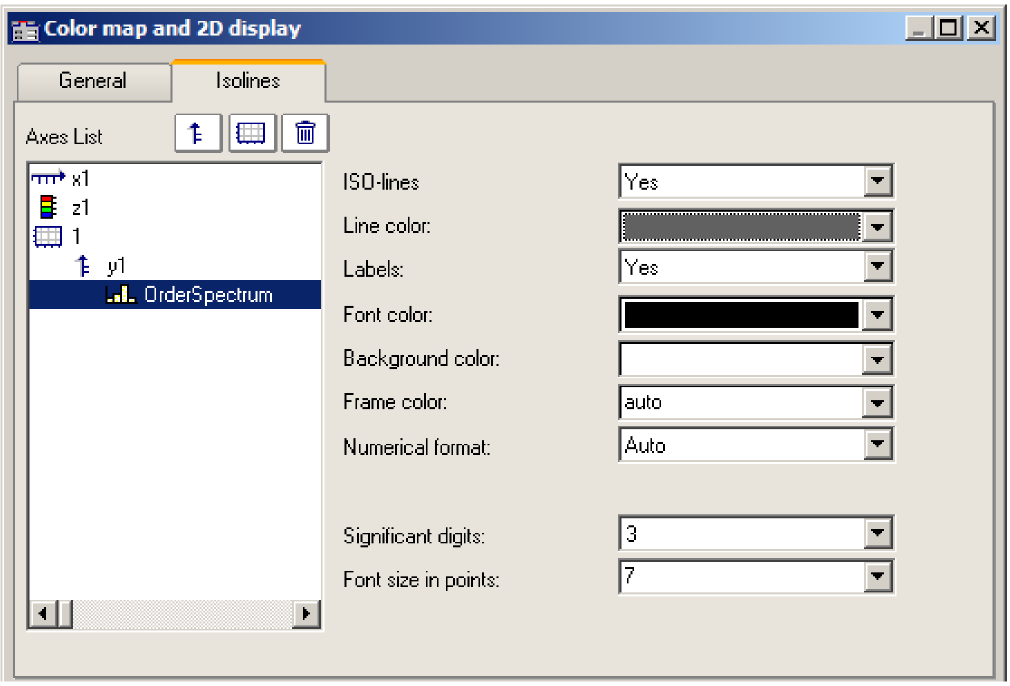
3.2.5.2 Color map dialog, ISO-lines

ISO-lines are contours, in other words, lines joining coordinates of equal height. They are used here in the same way as in maps. Since the lines appear in conjunction with graduated colors, they mark the boundaries between the colors.



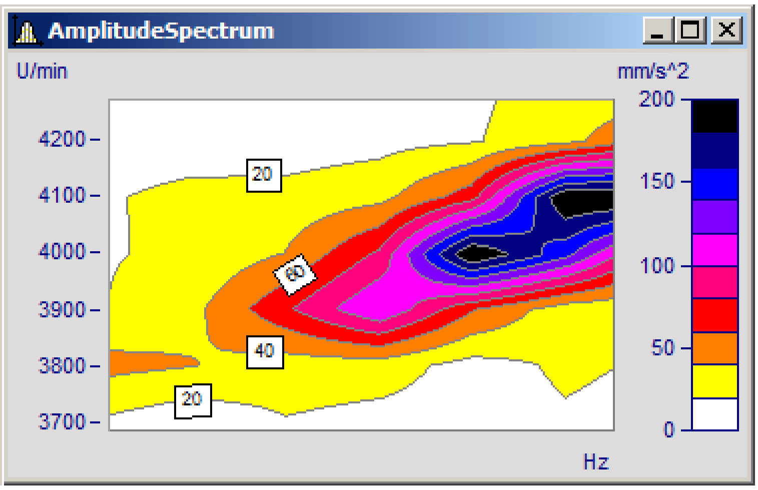
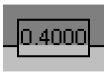
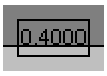
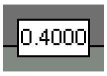
ISO-lines can only be set for *color map display with graduated colors* 61.

The "*Isolines*" index card of the Color map settings dialog



The following options can be selected:

Options	Description
ISO-Line	Display of the isolines. This option is only available for the display types *Color maps, graduated colors*.
Line color	The color of the isolines is set here.

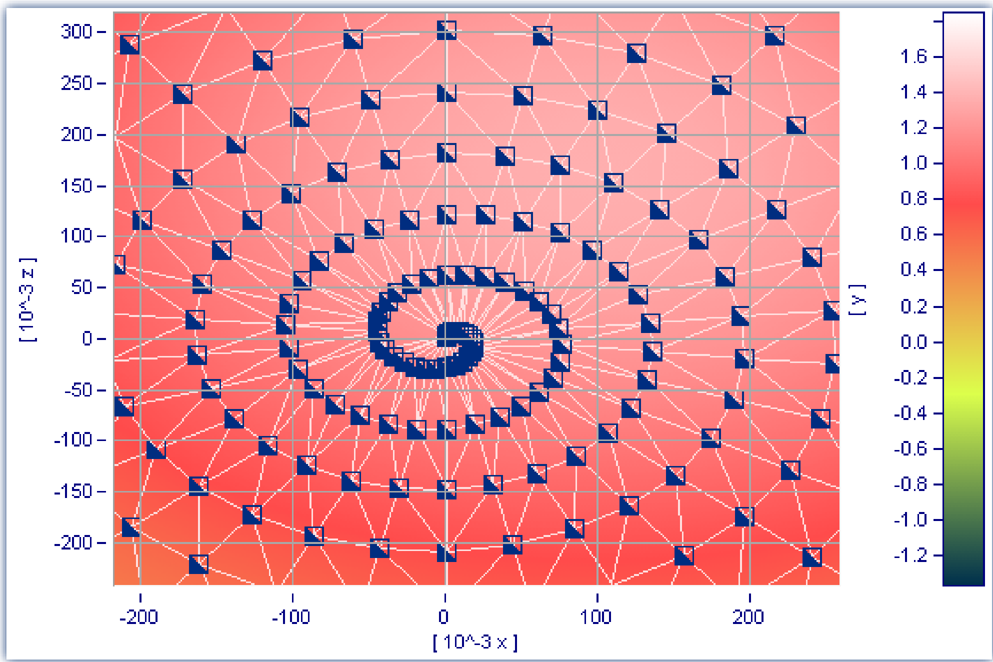
Options	Description
Labels	• *auto*, *no*: The isolines are not labeled. • *yes*: The isolines are labeled; small tags are attached to the lines, as space allows.  All further options only pertain to the labeling of the isolines.
Font color	Determines the color of the label text.
Background color	Determines the color of the label background.  • *auto*: Transparent background, but covering the contour line.  • *transparent*: The label background is totally transparent. The contour line between the colors is visible as well.  • *Fixed color*: The label background is given a fixed color and is thus not transparent.
Numerical format	• *Fixed point*: Fixed point with a fixed number of decimal places to the right of the point e.g. 17, 17.35, -0.0017. • *Floating point*: Floating point with a fixed relative precision and exponent, e.g. -1.28E-7 or 3.4E+0. • *auto*: Automatic selection, partially dependent on the numerical representation of the z-axis.
Unit prefix	This consists of the order of magnitude and, if appropriate, a prefix such as kilo, milli, Mega or even just 1 (default, use of unit without prefix), which appears after the number before the unit. If the reading is 10 and takes the unit V (Volts), then for a selection of "m" (milli), a value of 10000mV is returned. For *automatic numerical format*, the same order of magnitude is set as for the labeling of the z-axis.
Places right of point	Number of decimal places for *Numerical format Fixed point* or *Floating point*: 0 to 15.
Valid digits	For *numerical format auto* the number of decimal places cannot be set, instead, the number of significant digits. Thus, the numbers 3.4, 3.4E-4 and 0.034 each have 2 significant digits.
Font size in points	The font size in points (pt): 4pt to 10pt. Typical values are 6 and 8 points.

Reference Waterfall Diagrams

See chapter Waterfall Diagrams 31

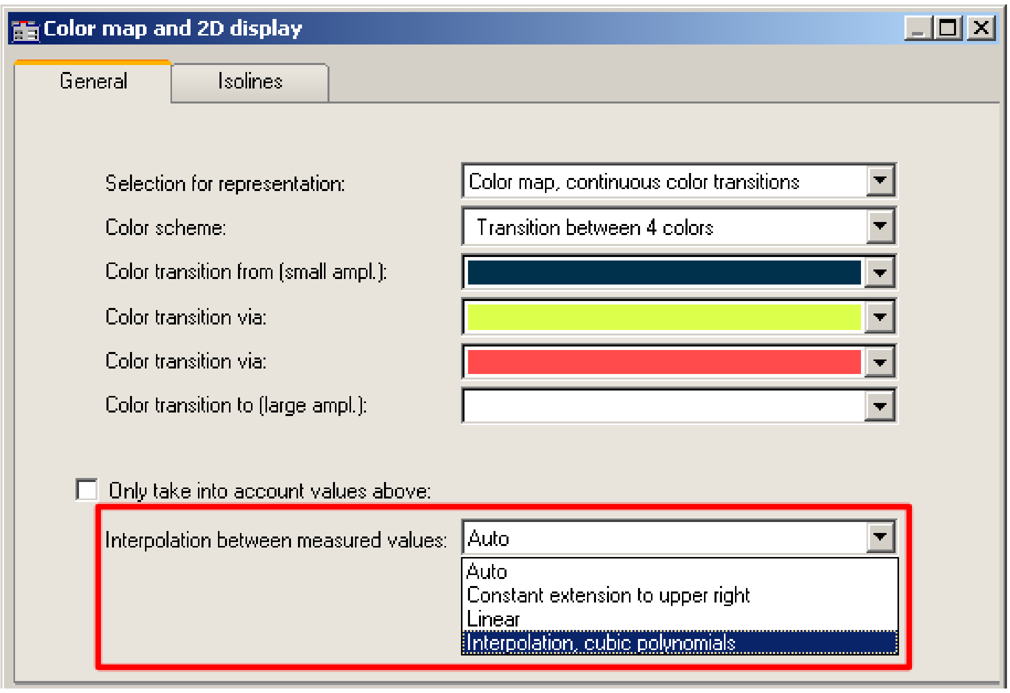
3.2.5.3 Waveforms with associated x-,y-,z-variables

A an alternative to 3D-display, waveforms with associated variables can also be displayed in a color map.



Color map display of a data set with multiple dimensions

It is also possible to specify interpolation between measured data points for this display style. To do this, open the color map's Properties dialog and on the *General* page select an interpolation type from the dropdown-list.



Interpolation between measured values in a color map

3.2.6 3D display

Another display style for datasets with associations of x, y, and z variables 102, for segmented waveforms is *3D* display.

In this display style, the perspective can be freely rotated, and the Axis Navigation Bar 271 can be used to change the view. It is possible to display more than one dataset with associations of x, y and z variables. This makes **comparison** of multiple superimposed 3D data sets possible.

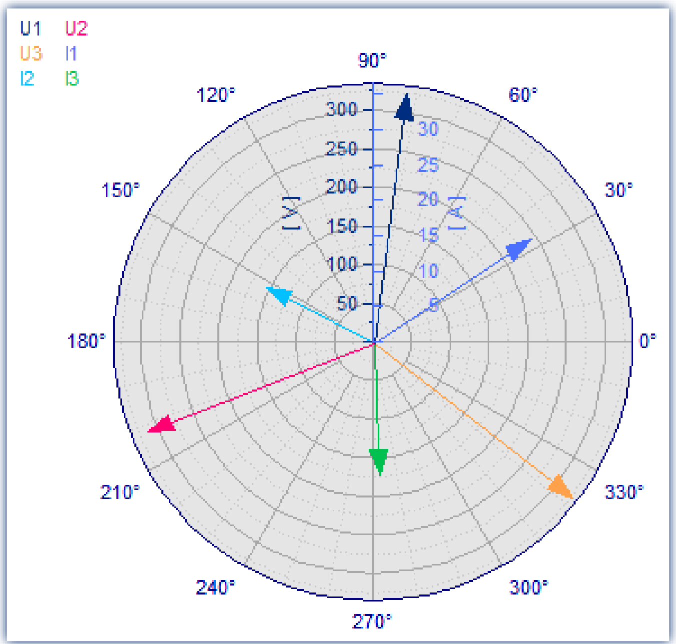
Other curve window functions such as *zooming*, *setting markers* or *line-shifting* are not available here.

For more on using 3D-display, see the section on *Configuration / 3D* 160.

3.2.7 Polar plot

Complex data sets can be displayed as a polar diagram. To do this, select from the menu *Configuration\Display* the the display type *Polar plot*.

Example: Pointer diagram



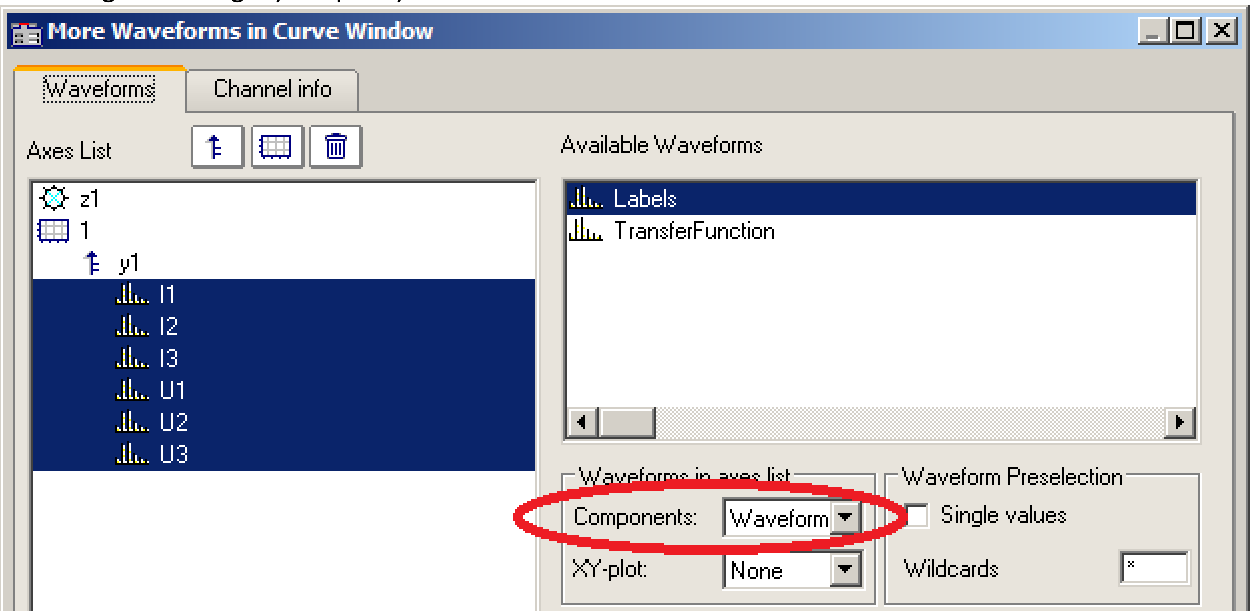
Complex single values as vector diagram

In imc FAMOS you can create a complex single value using the function Cmpl().

The pointer graph above is created as follows:

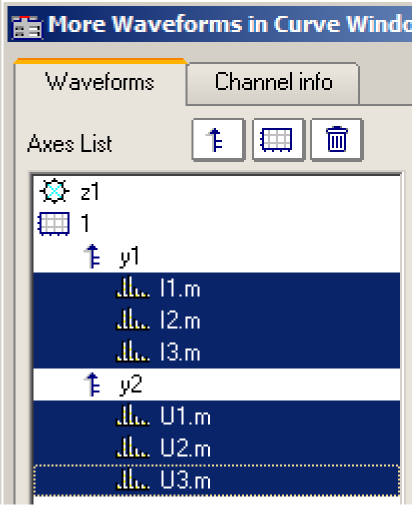
1. Create the desired single values:
   I1= Compl (27'A', 33'Degr')
   I2= Compl (17'A', 153'Degr')
   I3= Compl (19'A', 273'Degr')
   U1= Compl (327'V', 82'Degr')
   U2= Compl (315'V', 202'Degr')
   U3= Compl (331'V', 322'Degr')
2. Display the single values in a curve window and select the display style *Polar diagram* in the menu *Configuration\Display.*

3. By default, the curve window only shows the magnitude component of a variable. For this reason, all arrows point upward. With the right mouse button, open the context menu and there select *More Channels...*. Select the variables and select *Waveforms in axes list\Components: Waveform.* The arrows will then be drawn according to the angle you specify.

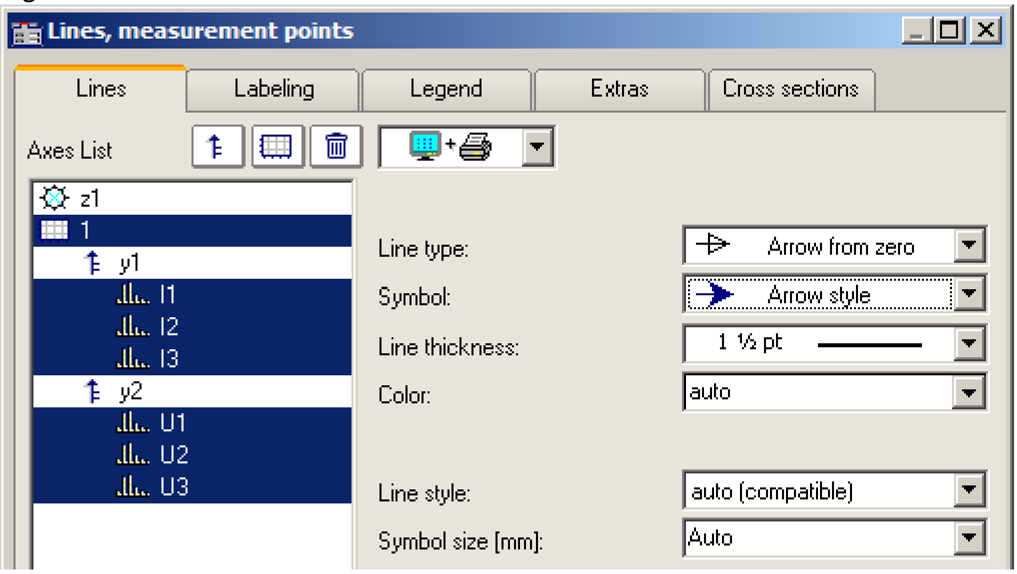


Observing each component of a complex waveform

4. As in a normal curve window, all variables are assigned to an axis. The current which are comparatively low in magnitude therefore appear in the zero point. Create one axis each for current and voltage: right mouse button for context menu -> "*More Channels*"

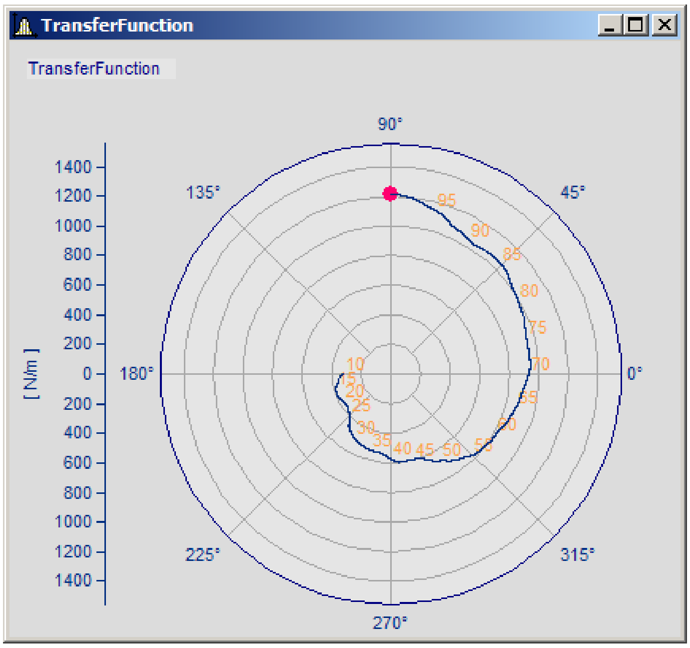


5. Using the Lines dialog, you can now adapt the display of the arrows.
   Right mouse button: "*Lines*"



Dialog lines: Display with arrows

Example: Transfer function



Example transfer function

There are further possibilities for displaying a complex data set:

1. Use imc FAMOS to create a complex data set:

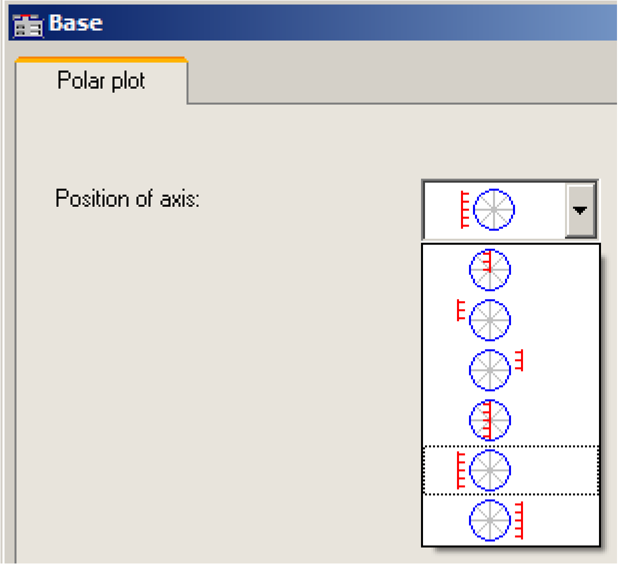
```
; transfer function diagram
t = ramp ( 0, 1, 11000 )
m = t * 0.1 + 200 + 1000*smo ( Random(leng?(t), 2, 0, 0, 3), 1000 )
p = t * 0.03 +  150
m = xoff ( xdel ( CutIndex ( m, 1001, 10000 ), 0.01 ), 10 )
p = xoff ( xdel ( CutIndex ( p, 1001, 10000 ), 0.01 ), 10 )
yUnit p Degr
yUnit m N/m
xUnit p Hz
xUnit m Hz
TransferFunction = compl ( m, p )
Labels = red ( TransferFunction, 500 )
```

   Important Note: The angle specification distinguishes between degrees and RAD as the unit. If no unit is specified, then RAD is applied, meaning 2PI instead of 360°. For this reason, it is important to use yUnit to set the unit as Degr, as shown in the example.

2. Display the data set *TransferFunction* in a curve window and select the display style *Polar plot* in the menu*Configuration\Display.*

3. Right-click the mouse to open the context menu and there select *More Channels...*. Select the variable and under *Waveforms in axes list\Components: Waveform.* The angle data is now reflected in the display.

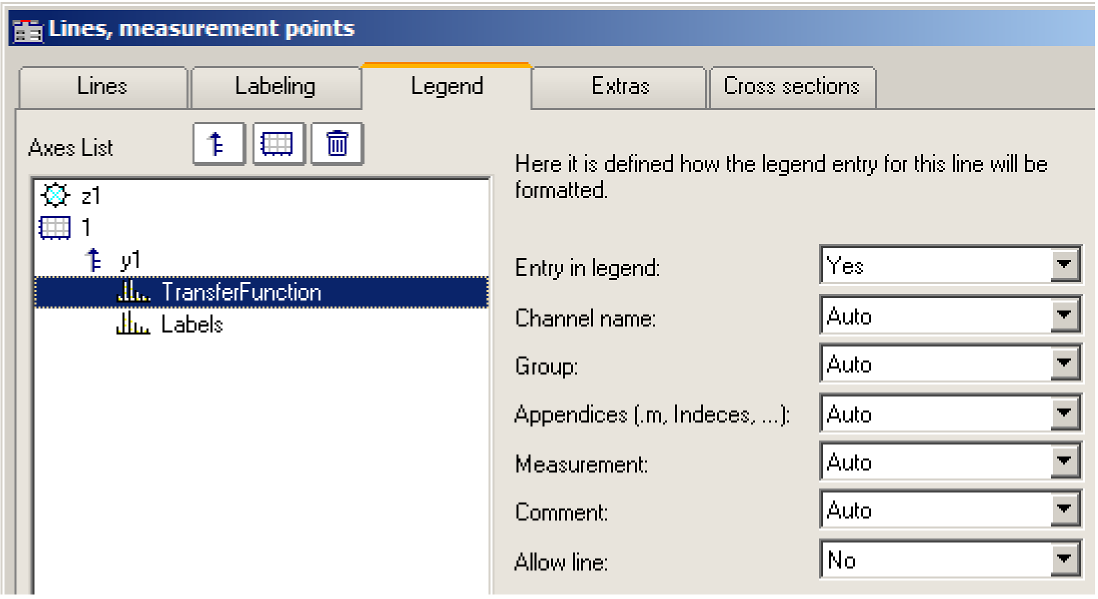
4. **Axes position:** By default, the Y-axis is displayed only in the positive direction. You can change both the axis' position and its range: Right mouse click: *Polar plot*.



Position of axis

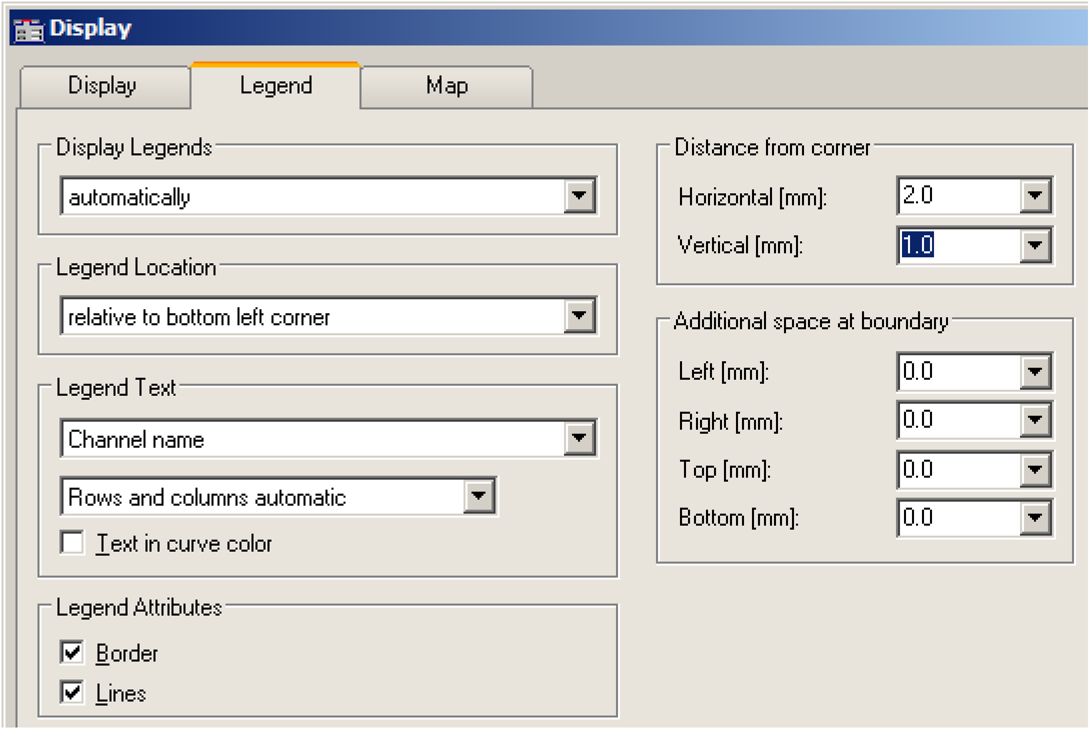
5. **Labeling the values:** The individual values could be labeled in any curve window with their values. However, in this example the amount of data would make that impossible to read. For this reason, the data set *Labels* was created, which is an image of *TransferFunction* reduced by a factor of 500.
Select the right mouse button: *More Channels...* and assign *Labels* to the same axis.
Click the button *Topic* and select *Lines*.
Go to the page *Labeling* and activate it.
By default, *Labeling* displays the magnitude. In our example we wish to display the frequency. For this reason, select for *Value selection* the entry *Parameter*.

6. **Legend:** The legend's position can be moved. First of all, the data set *Labels* is not to appear in the legend. For this reason, in the *Lines dialog* on the page *Legend* we select the data set *Labels* and select *Entry in legend: no.* For the data set *TransferFunction* we select *Allow line: no.* Close the dialog.



Legend display on/off for each channel separately

7. Open the dialog *Configuration \ Legend.* Position the legend in the upper left corner at some distance from the edge.

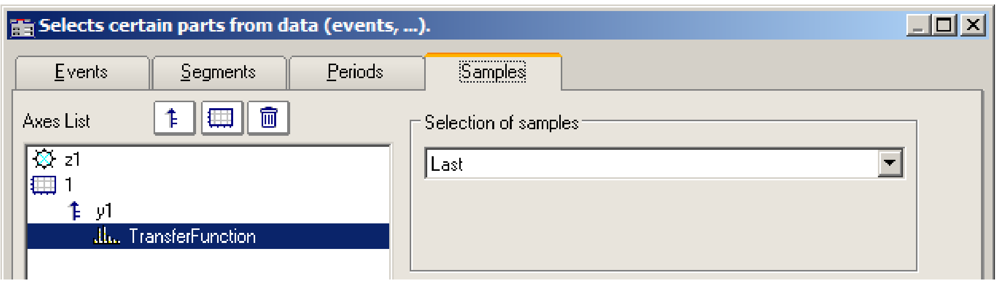


Position of legend

Note — Notes on online display

For measurements with imc CANSAS, the measurement device does not generate complex data sets. For instance, with an online FFT, the magnitude and phase are each transferred as separate channels. These can be combined to form complex data sets in the curve window under *More Channels...* 102.

If one wishes to display the complex data as a pointer diagram 69 like above, then besides the procedure outlined above the following step is also necessary: Since only the channel's current value, in other words, the last one, is to be displayed, select *Configuration \ Events, segments periods*...Go to the page *Samples* and select *Last* under *Selection of samples*.



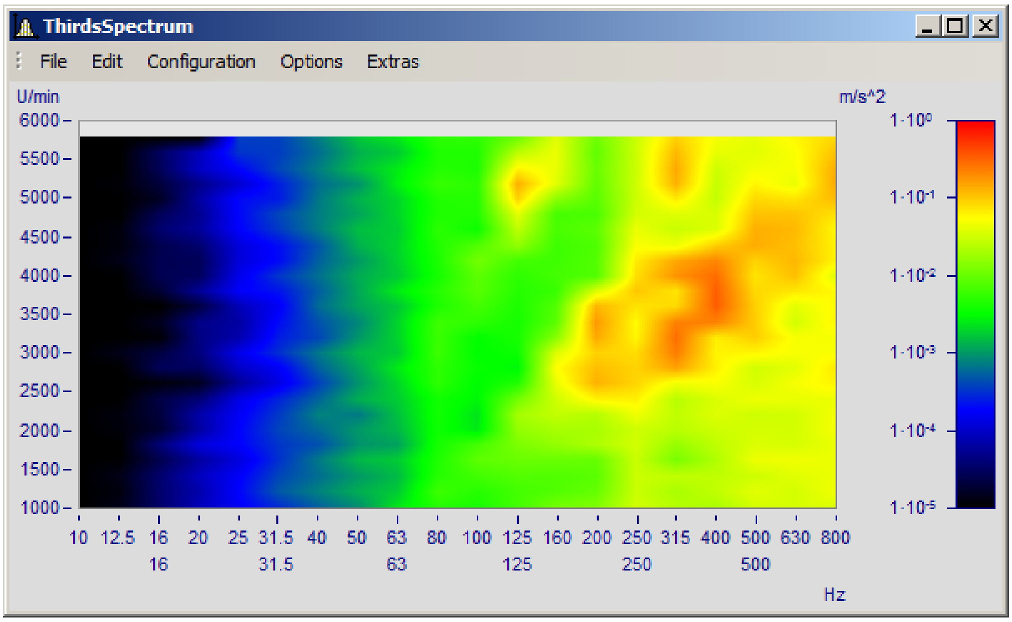
Displaying only the last sample

3.2.8 Third-octave display

Certain methods and forms of representation in the analysis of sounds and vibrations have gained widespread acceptance in industry. 1/3-octave, octave and narrow-band analysis require mathematical operations to be performed, in which the spectra in question are computed from the time signals of vibration pick-ups. The x-axis of the coordinate system is labeled according to the selected frequency bands; the frequencies themselves are determined by industry standards.

Example

Using the mathematical functions in imc FAMOS, the 1/3-octave spectrum was calculated over time. The following color map diagram displays the result, with the x-axis labeled in 1/3-octaves and octaves.



Description

The following nominal pass ranges apply to octave filters. Higher and lower values can be computed by taking the first ten values from the list and multiplying them by ten-to-the-power-of any multiple of three.

Octaves

Center frequency (Hz)	Lower limit (Hz)	Upper limit (Hz)
16	11.2	22.4
31.5	22.4	45
63	45	90
125	90	180
250	180	355
500	355	710
1000	710	1400
2000	1400	2800
4000	2800	5600
8000	5600	11200
16000	11200	22400

The following frequencies apply to 1/3-octaves. Higher and lower values can be computed by taking the first ten values from the list and multiplying them by ten raised to an integer exponent.

1/3-octaves

Center frequency (Hz)	Lower limit (Hz)	Upper limit (Hz)
1000	900	1120
1250	1120	1400
1600	1400	1800
2000	1800	2240
2500	2240	2800
3150	2800	3550
4000	3550	4500
5000	4500	5600
6300	5600	7100
8000	7100	9000
10000	9000	11200

The center frequencies of 1/12- and 1/24-octave bands are located at the center frequencies of the 1/3-octaves and at the intermediate values located at logarithmically equal distances. Here the edges of the 1/3-octave range are used as additional frequency check points.

1/12 octaves

Center frequency (Hz)	Lower limit (Hz)	Upper limit (Hz)
1000	974	1029
1058	1029	1089
1120	1089	1151
1183	1151	1216
1250	1216	1286
1323	1286	1361
1400	1361	1448
1497	1448	1547
..	..	..

1/24 octaves

Center frequency (Hz)	Lower limit (Hz)	Upper limit (Hz)
1000	987	1014
1029	1014	1043
1058	1043	1073
1089	1073	1104
1120	1104	1135
1151	1135	1167
1183	1167	1200
1216	1200	1233
1250	1233	1268
1286	1268	1304
1323	1304	1342
..	..	..

When waveforms in the frequency range are displayed as the result of a frequency-band analysis, the program expects the x-axis to have a certain kind of scaling. Since the frequency bands are spaced logarithmically, the x-axis is labeled with the logarithm of the frequency to correspond to the mathematical functions. The logarithm is then expanded again for display, and the frequencies are marked along the axis, according to the German industry standard. The following table illustrates by a few examples the relation between the x-scaling of the data and the frequency bands, based on the following rule: the $\log_{10}$ of the center frequency is multiplied by ten and then this value is rounded.

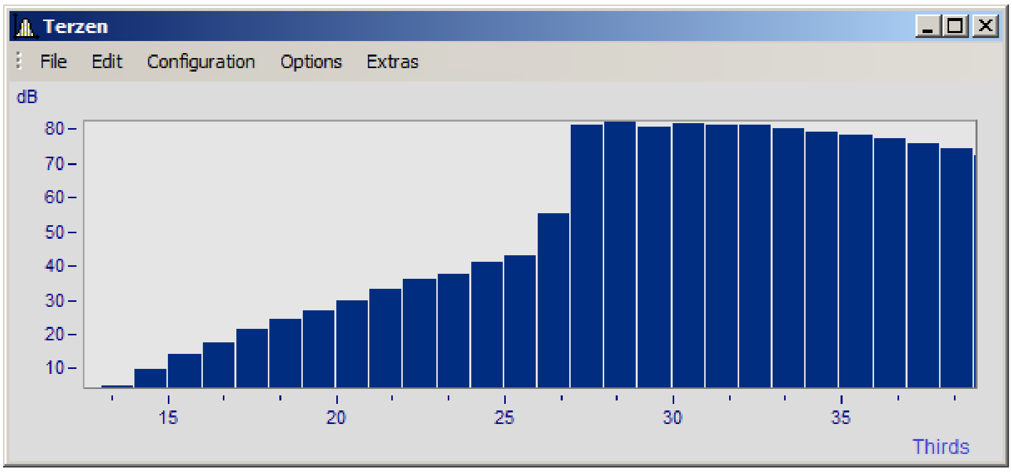
x-scaling	Center frequency (Hz)
..	..
-3	0.5
-2	0.63
-1	0.8
0	1
1	1.25
2	1.6
3	2
4	2.5
5	3.15
6	4
7	5
8	6.3
9	8
10	10
11	12.5
..	..
20	100
30	1000
40	10000
41	12500
43	20000
..	..

The 1/3-octaves are found at the x-positions 0, 1, 2..., the octaves at the positions 0, 3, 6, 9, 12..., 1/12-octaves at the positions 0, 0.25, 0.5, 0.75, 1, 1.25..., and 1/24-octaves are found at all multiples of 1/8.

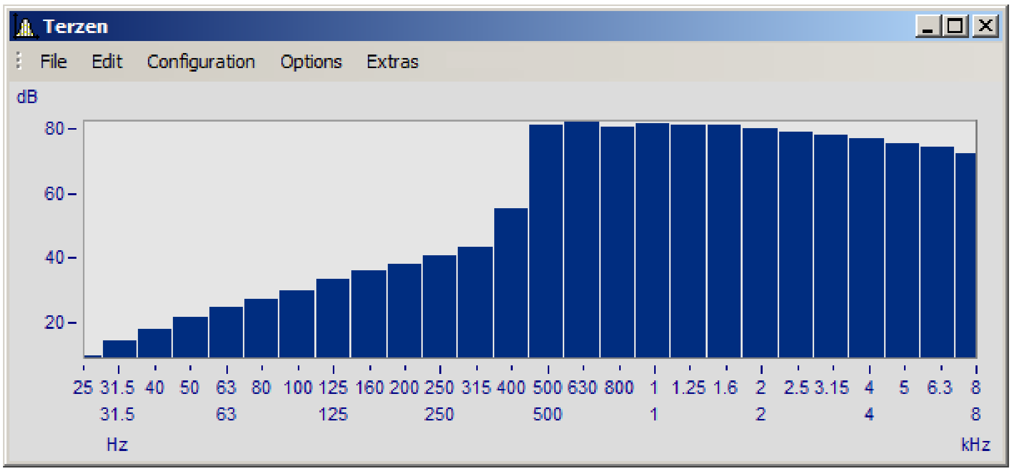
This means that the various bandwidths are expressed as a multiple of a 1/3-octave. Therefore, the delta-x of the x-axis is set to the following values for frequency scaling:

Bandwidth	Delta-X
Octave	3
1/3-octave	1
1/12 octave	0.25
1/24 octave	0.125

Example



A curve window with standard labeling

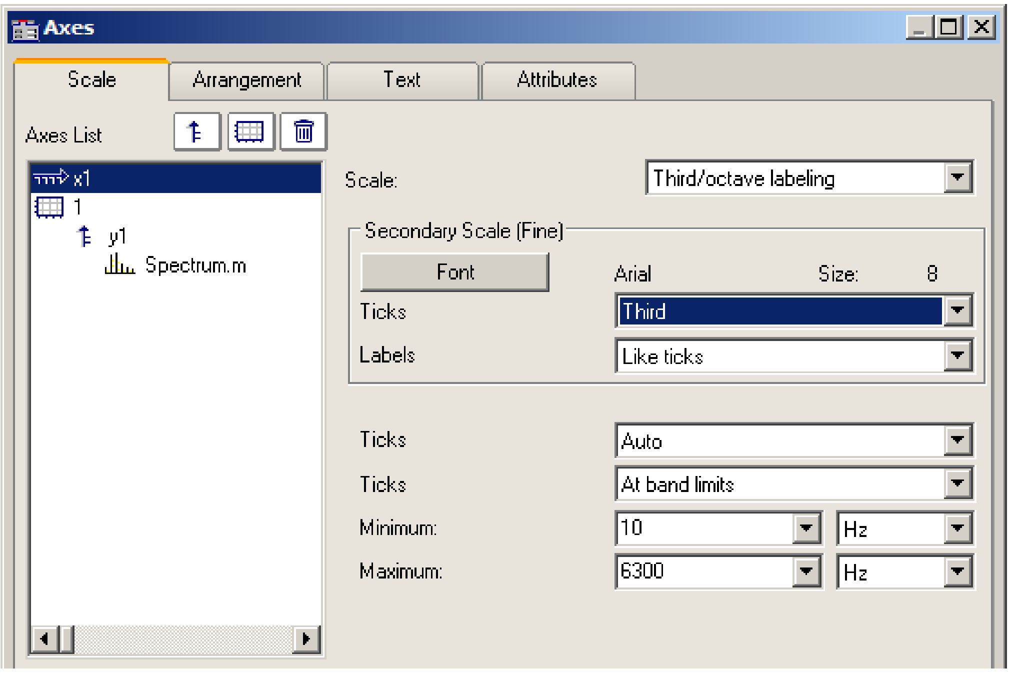


In 1/3-octave / octave labeling

Here, the connection between labeling with the logarithm and the expanded 1/3-octave scaling is apparent.

Mouse Operation

- Set the labeling of the x-axis in 1/3-octave / octaves in the *Axes* dialog called via the menu item *Configuration/ Axes*... menu. Alternatively, you can double-click on the x-axis labeling.



- In the list at left, select the x-axis. Then select under the control *Scale* the option *Third/ octave labeling*

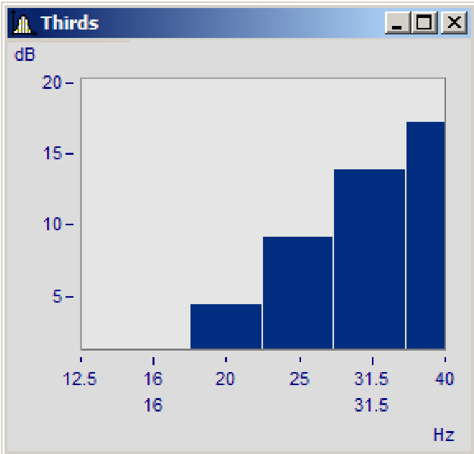
General information

The x-axis scaling is organized into three horizontal layers. The upper layer consists of small ticks and labels (e.g. 1/3-octaves). The middle layer consists of large ticks and the standard font type for the curve window (large labels). The units (Hz, kHz...) are found in the lowest line.

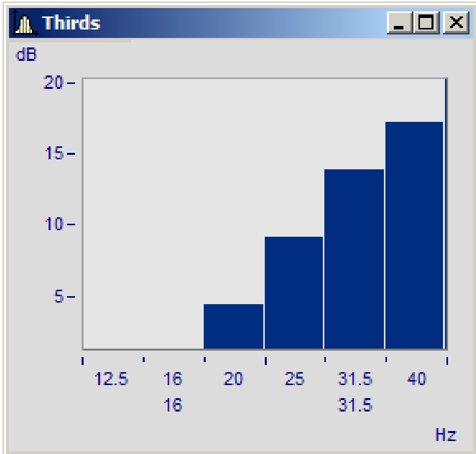
Settings	Description
Secondary Scale (Fine): Font	Establish the font type for the small labels. For true-type fonts, the six-point size is generally quite legible for numbers on the screen.
Ticks	For the small and the large labels, the user can specify the interval between ticks on the axis. Choose from the following options: • Auto: Depending on the domain and the window size, one of the following options can be chosen. • Octaves • 1/3-octaves • 1/12-octaves • 1/24-octaves

<table>
<tr><th>Settings</th><th>Description</th></tr>
<tr><td>Ticks</td><td>

Options for centering or aligning ticks. *Centered ticks* are placed exactly at the *center* frequency of the corresponding band, with labeling centered under the tick. The edges of the frequency bands are not visible. In the option *Ticks to edge*, the ticks are located exactly at the edges of the frequency bands, with labels centered between the ticks and at the center frequency.



Ticks centered



At band limits

</td></tr>
<tr><td>Minimum, Maximum</td><td>

The limits of the frequency range to be displayed are set using the combobox *Minimum* and *Maximum*. The contents of the list with numerical values are based on the previous selection of ticks for small labeling, which the program assumes is the highest resolution.

The entries in the list boxes for *Minimum* and *Maximum* are always center frequencies of the band. If numerical values are entered using the keyboard, the precise center frequency will be automatically selected.

The range of selectable numbers extends from 10µHz to 400THz, ensuring that the significant physical ranges are covered. Conventional applications will always lie within the range from 10Hz to 20kHz.

</td></tr>
</table>

Remarks

- **Curves:** When a curve is displayed in a stair-step or bar graph display, the curve is <Shift>ed in the x-direction so that the center of the bars or steps are centered over the labels of the center frequency. The curve is moved to the left by one-half of the sampling time. This applies only to data sampled equidistantly, not to XY-displays.
- Note that in a "steps"-representation of a waveform, the sample-points of the conventional linear display would normally coincide with the corners of the steps. This is not the case for an x-axis labeled with frequency bands, where the sample point coincides with the center frequency, i.e. the midpoint of the step!
- When a small window is scaled over several decades, it is generally not possible to label the axis in 1/24 octaves. Select a coarser resolution in labeling, e.g. octaves.

3.2.9 XY-plots

Normally, curve windows display waveforms as time functions. This means the signal's values are indicated as y-coordinates plotted over time represented by the x-axis.

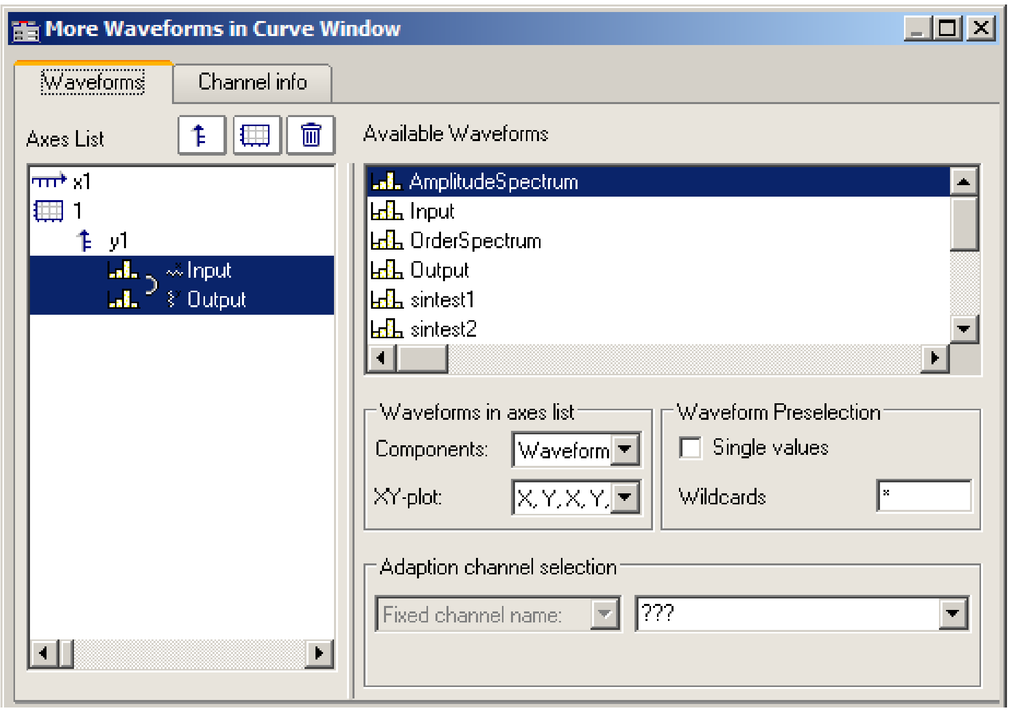
The curve window is also able to display XY-plots, meaning plotting one waveform's values in correlation to another waveform's values.

Examples of XY-plots include **Lissajous figures**, which consist of an XY-plot of sine shaped waveforms of differing frequencies and phases. **Hysteresis curves** for magnetic materials display the correlation between magnetic flux density and magnetic field intensity. **Characteristic curves** enable the assignment of an output variable value to a corresponding input variable value.

Polar plots are another type of XY data. Polar plots are used to display complex waveforms. This type of display can be used for a complex waveform in rectangular coordinates (real and imaginary part) or polar coordinates (magnitude and phase).

Operation

Select "*More Channels in Curve Window* 94" (by right-clicking the mouse in the curve window). Stack the XY-plots vertically. Select the two waveforms and then in the box *Waveforms in axes list* Select the entry *x,y,x,y* from the drop-down list for *XY-plot:*. If you wish to change the axes, select instead the other order: *y,x,y,x.*



Remarks

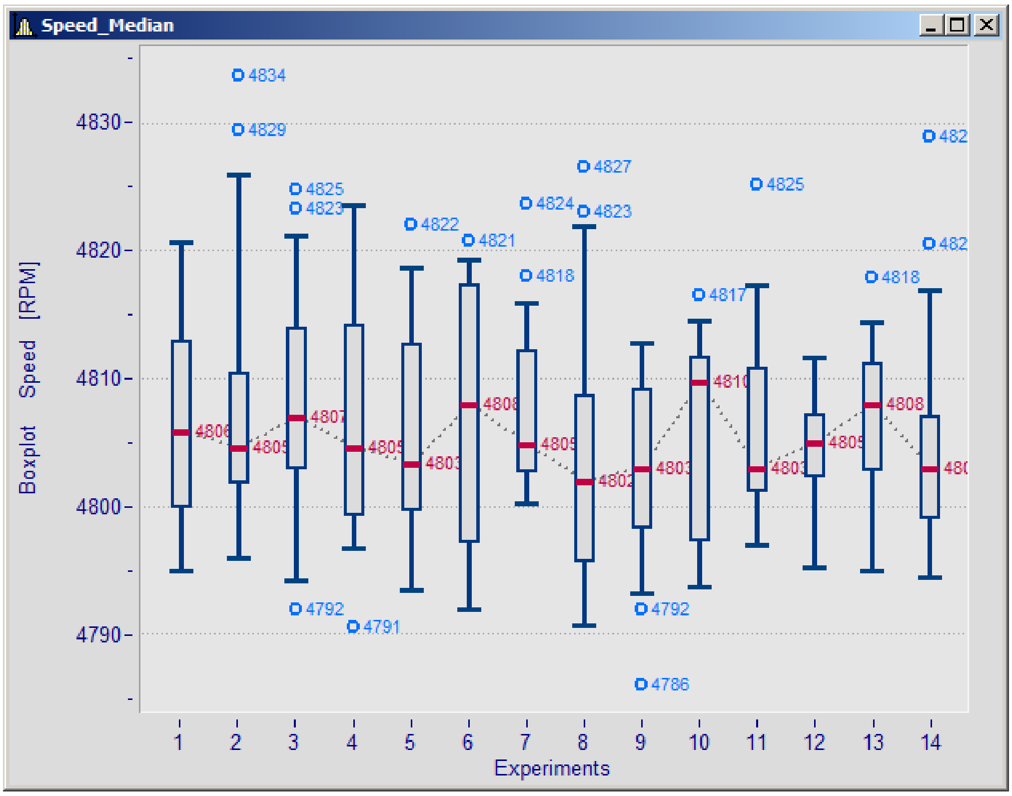
- In all XY-plots, the measurement cursors follow the parameters during operation in "Measure" mode. See chapter section 'Measure 182'.
- Computing a polar plot requires less computation if the complex waveform is provided in rectangular coordinates. To increase the speed of the graphic display for a waveform in polar coordinates, transfer it into rectangular coordinates.
- The x- and y-values in an XY plot are paired *correctly* with respect to time, *not* point by point! Thus, the two waveforms used for an XY-plot do not have to have the same x-scale! Therefore x-offset and x-delta (sampling rate) are considered, but not the trigger time.
- If a waveform is already defined as complex or of XY-type, simply click on the curve window icon to display it.

3.2.10 Boxplot

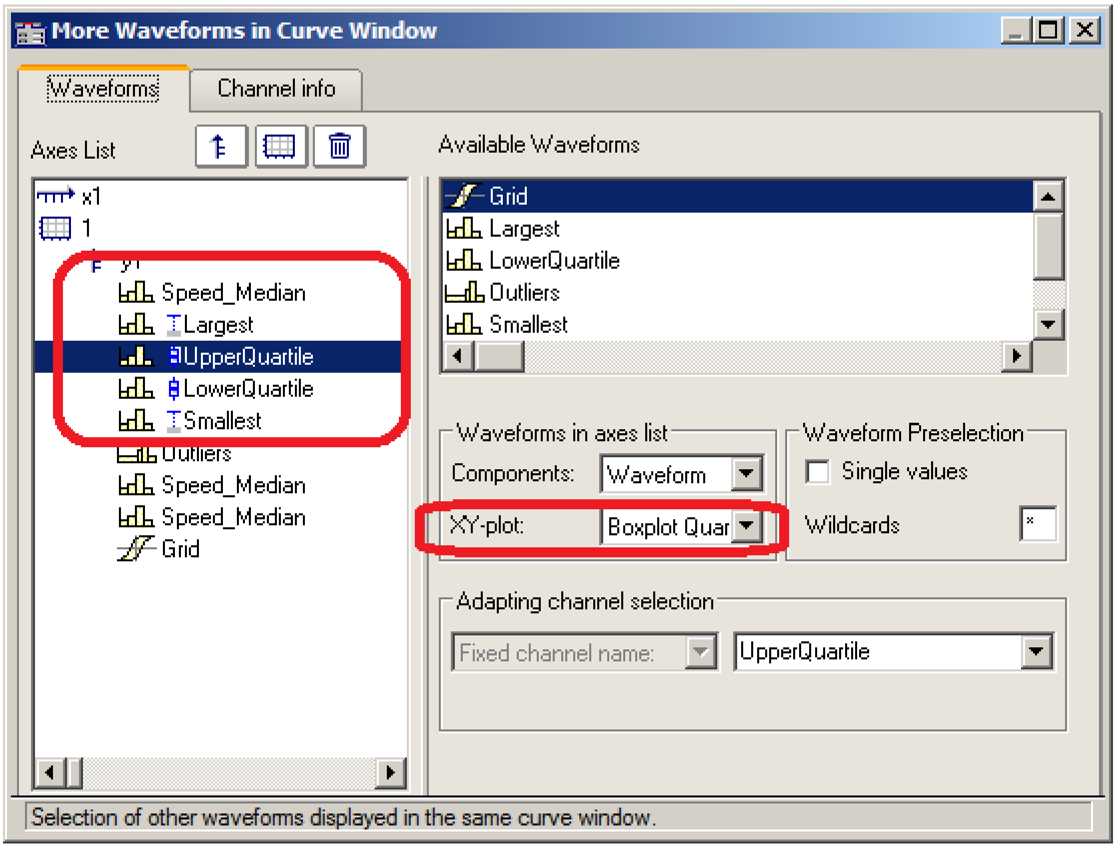
The Boxplot (also called Box Whisker Diagram) depicts a statistical distribution by displaying the minimum value, the maximum value, bottom quartile, top quartile and the median.

In this display, the minimum and maximum values are represented by whiskers, the quartile boundaries as a box, the median as a line.

For a curve window display, each of these statistics is saved in a separate channel, e.g. one channel with the median values, another channel of maximum values...

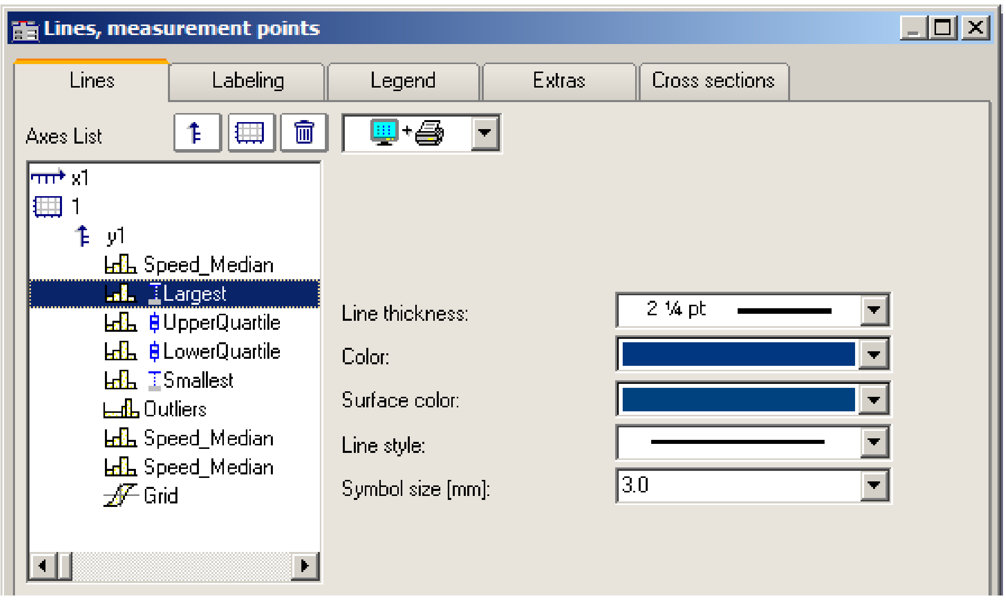


Making the settings:



In the dialog "*More Channels... in Curve Window*", the channel with the median value is initially added. For this channel, no special settings need to be made. Next, the channels for the whiskers and the quartiles are added. For each of these channels, the property *XY-plot* is set to "*Boxplot Whisker*" or "*Boxplot Quartile*", where it does not matter in this case whether a whisker is the top or bottom one; the curve window finds out on the basis of the numerical value. The order of the channels below is arbitrary. They do not even need to be complete, however, the median must always be the first channel.

Subsequently, the line properties are defined:



Depending on the line selected, different properties are available for selection on the right side. The line structure is only applied to the vertical whisker line. The surface color is used for filling the box representing the quartiles and for filling the whiskers' horizontal bar. Automatic color selection for the surface results in transparent fill of the quartiles' box. The color (line color) is used for connecting- and borderlines. Automatic color selection causes this color to be same as the median. Most properties can be set separately, however, for the 2nd quartile defined, only the fill color needs to be selected, since the rest has already been determined by the 1st quartile defined.

The display is performed point by data set point. All data sets must have the same sampling rate. The median itself may be an XY-channel, but all others may only be normal, equidistant data sets (it may be necessary to display the .y-component alone). In the case of an XY-channel, the sampling time of the y-component must match that of the other channels.

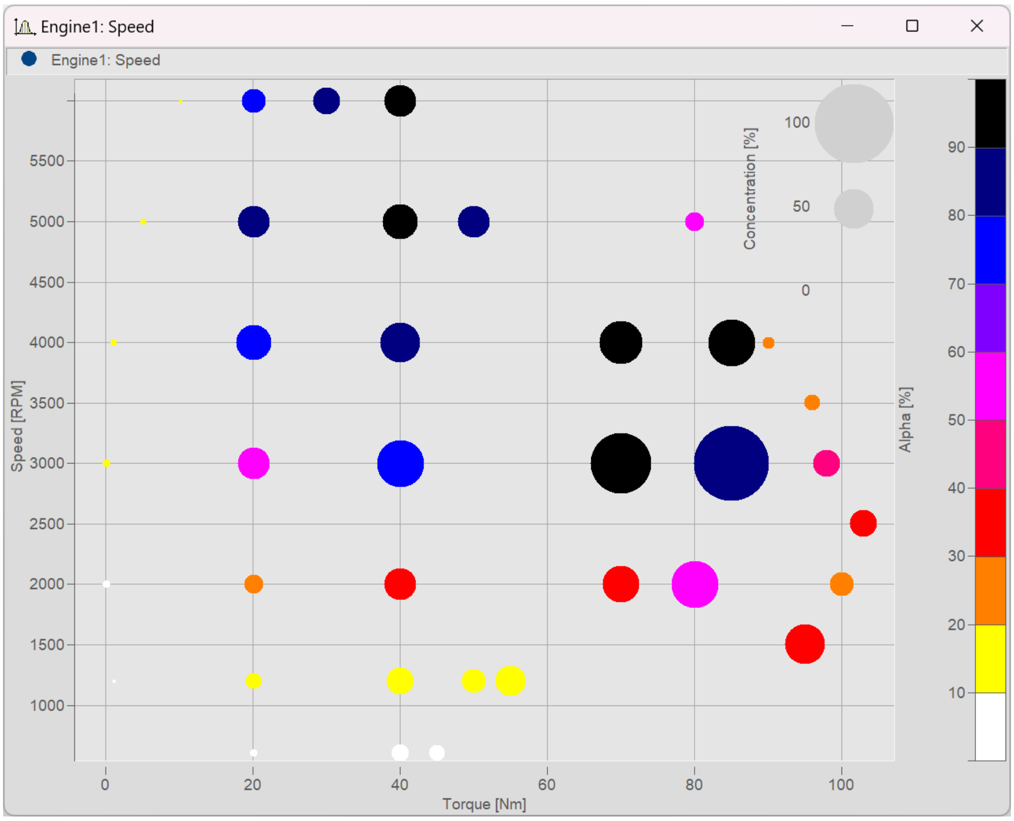
Remarks

- A combination with a color-determining channel is not possible.
- Measurement cursors and other curve window functions have only restricted functionality.
- To display any outliers, supplemental channels are used, for which the legend entry can be suppressed, for instance.

3.2.11 Bubble Plot

In a **Bubble Plot** (also called "Bubble Chart"), symbols are displayed which represent three (or optionally four) numerical values. Each point in the diagram is symbolized by a disk shape (bubble) in a typically Cartesian coordinate system. One data set (or in the case of XY, two data sets) determines the **position** of the bubble's center point. One data set determines its **size**, and optionally an additional data set, which could represent a kind of categorization of the data points, determines the **color** of the bubble.

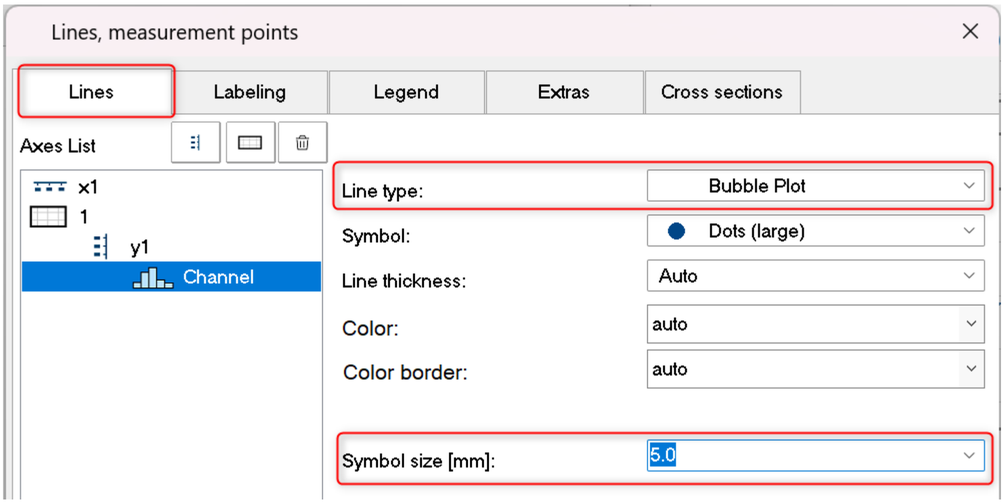
The **necessary condition** is that the **sampling rate** of all the data sets be identical.



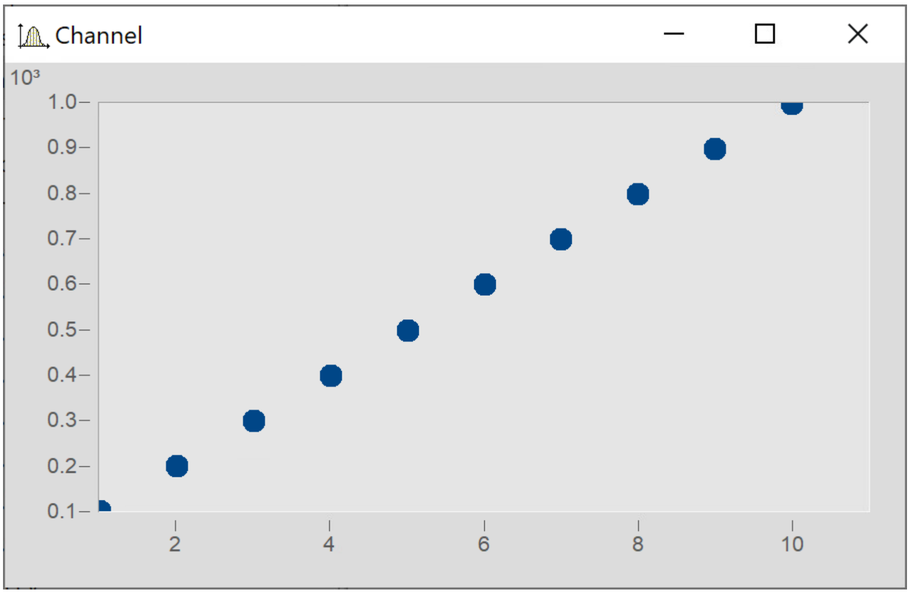
Bubble-plot example

Settings:

Within the **Display type** "*Default*", begin by setting the *Line type* to "*Bubble Plot*" in the settings under **Lines**. The initial size can be modified using *Symbol size [mm]*:

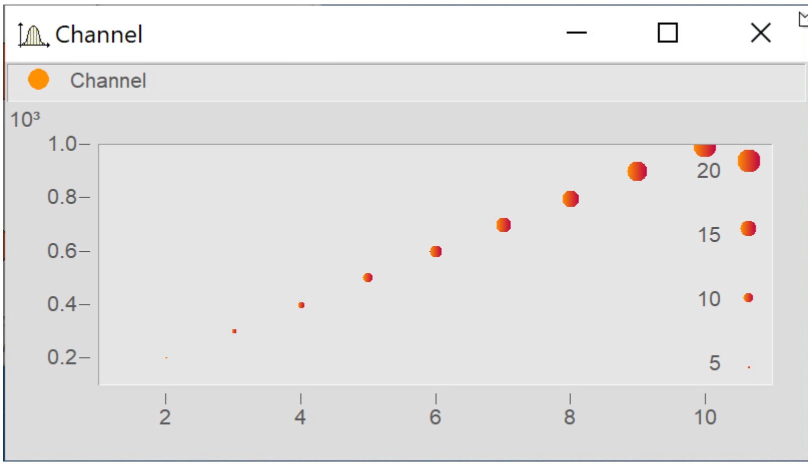


Depending on the *Symbol* selected, all values are displayed as *Dots (large)* etc. in the same size.

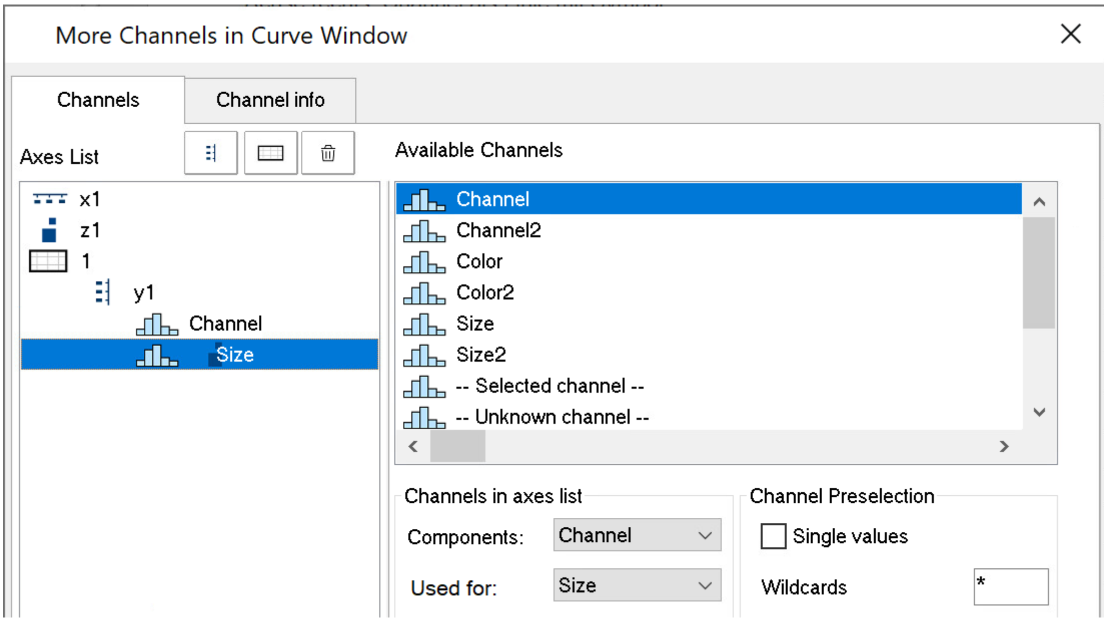


Size of bubbles corresponding to values of another data set

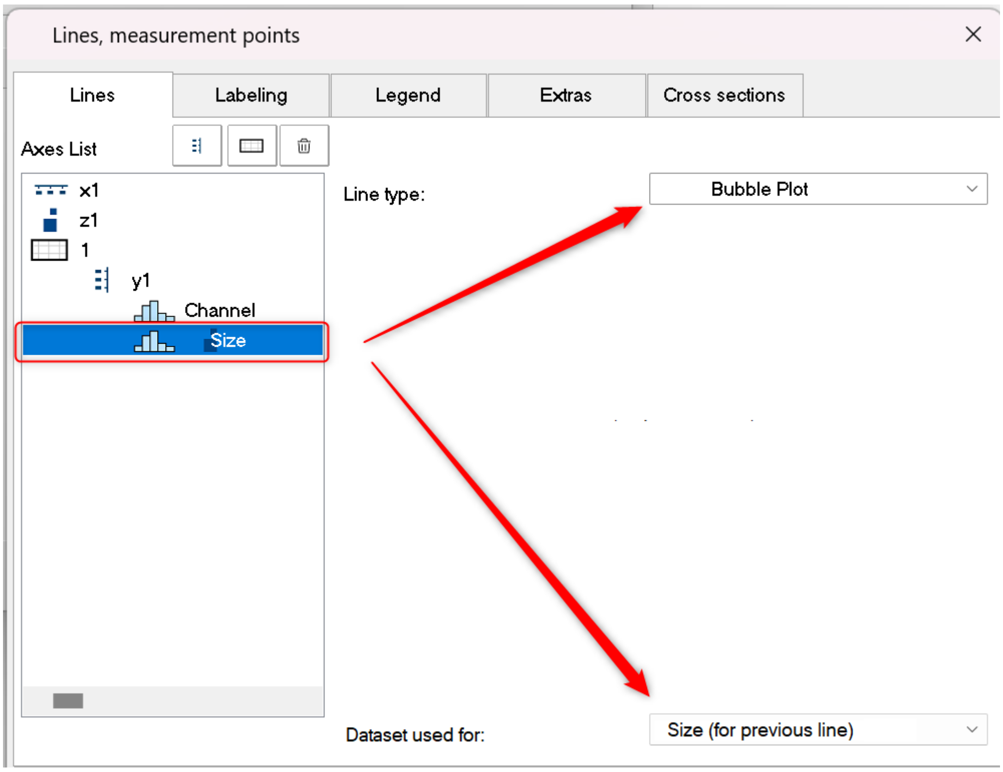
Next, the variable "Size" is intended to determine the size of the bubbles, as illustrated below:



In the dialog **More Channels in Curve Window...** add the variable "Size".



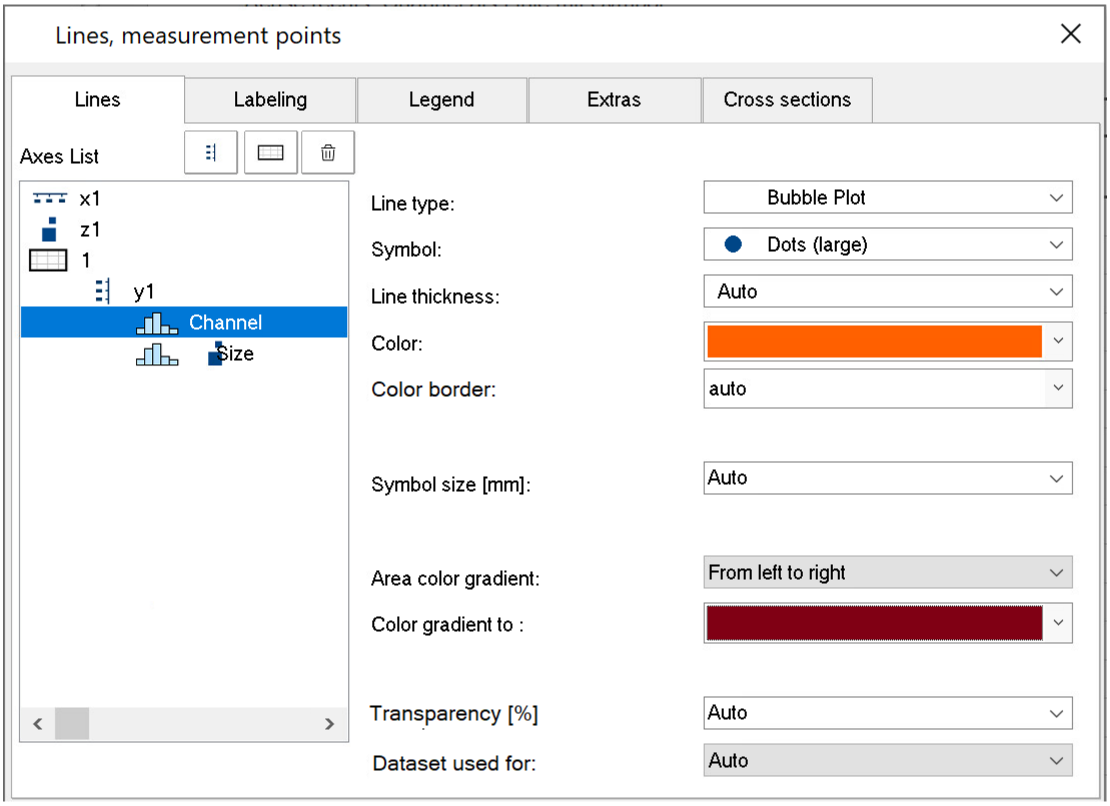
Go to the dialog **Lines** by clicking on the button *Topic* and set the *Line type* for the variable "Size" also to *Bubble Plot.*
Next, under *Dataset used for:* select *Size (for previous line)*:



Next, in the dialog **More Channels...** set *Used for:* to *Size*

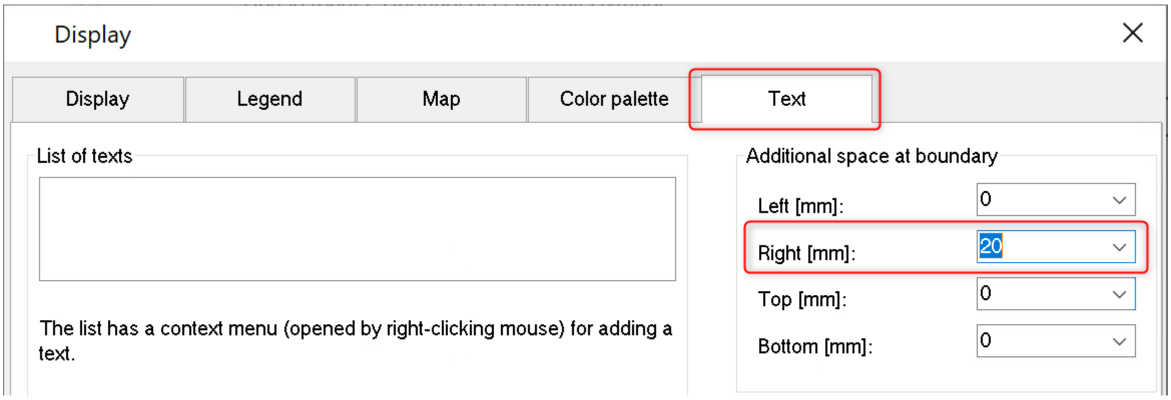
Bubbles with color gradient

Coloring the symbols with a color gradient:

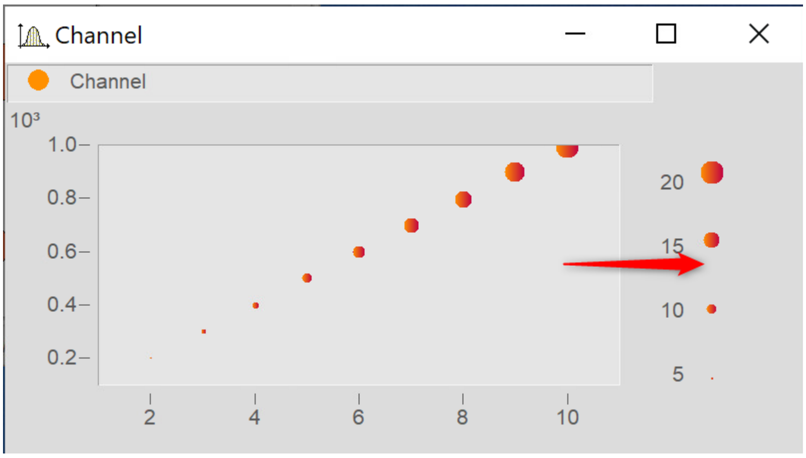


Adjusting the boundary

By default, the scaling axis for the variable is located within the curve window. In order to position it on the outside, it is necessary to first expand the boundary. On the tab *Text* in the dialog for the menu item **Display**, enter a right-side boundary:

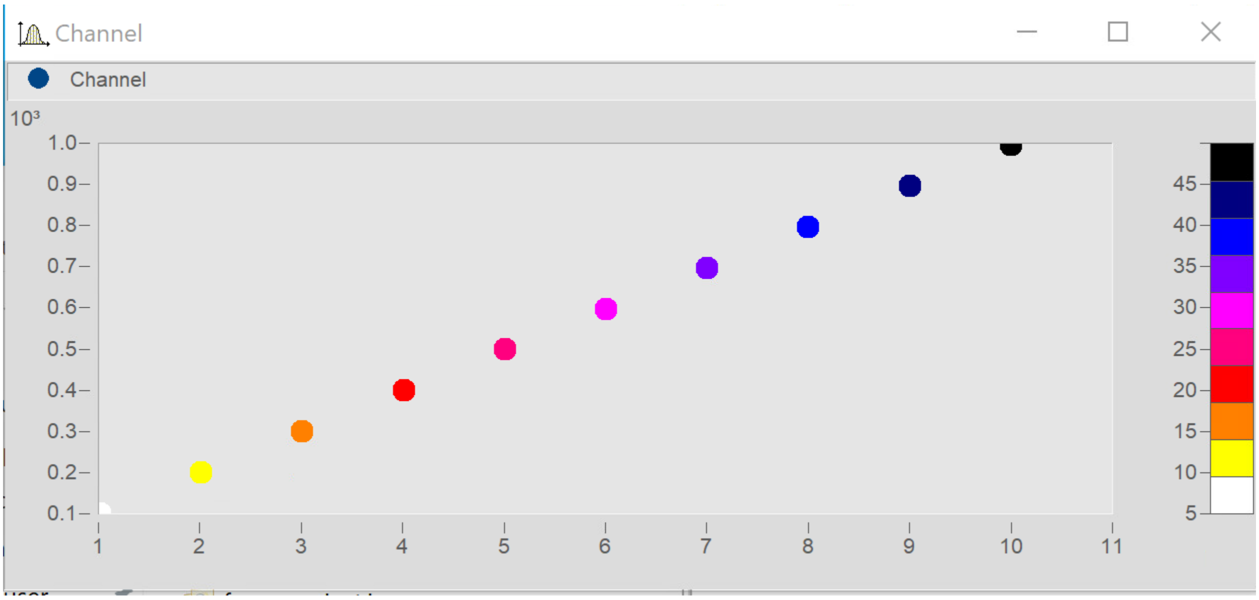


Subsequently, use the mouse to move the axis to the edge:



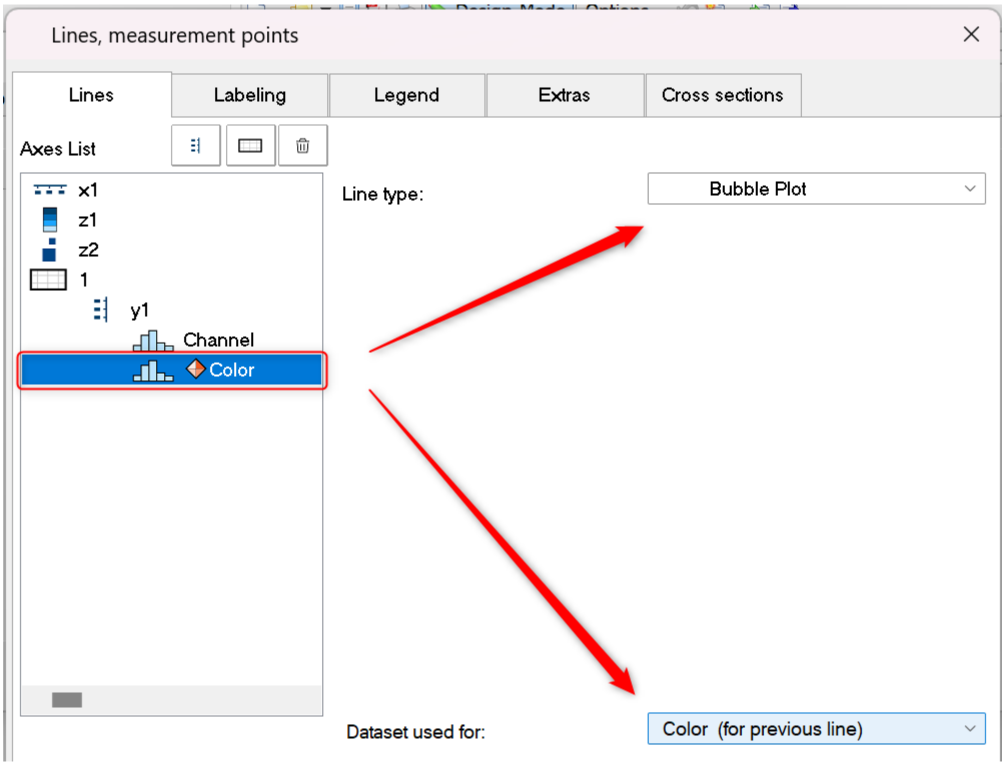
3.2.11.1 Additional Bubble Plot displays

Bubble Plot with color palette

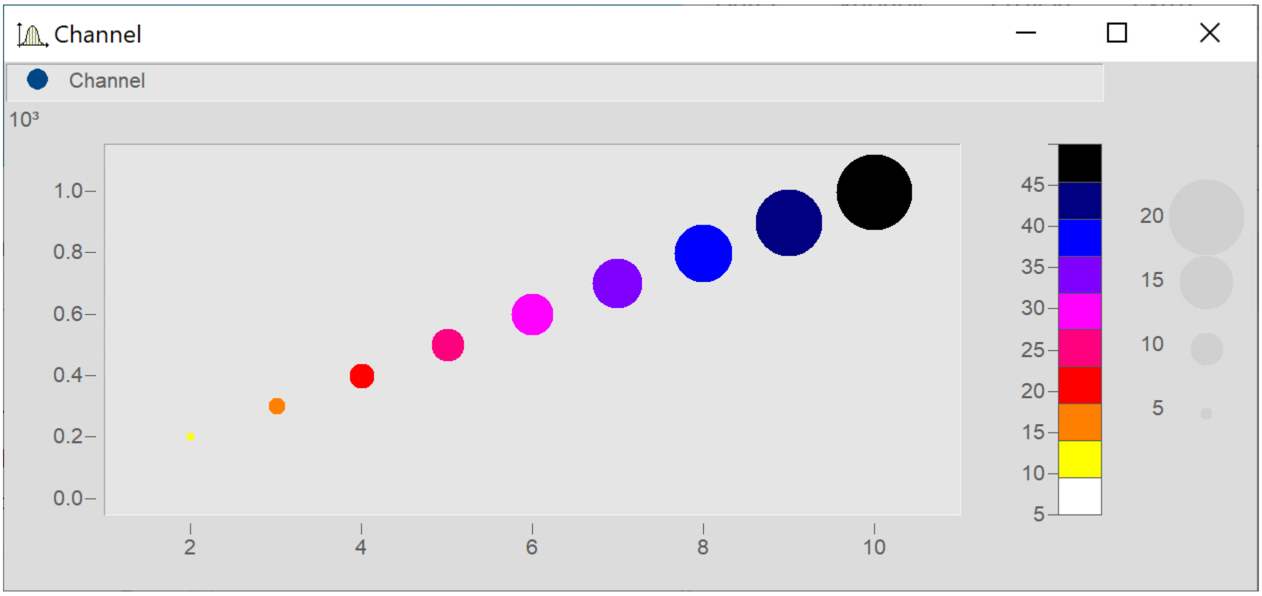


Matches "Size of bubbles corresponding to values of another data set 88, except that the second data set is used for the color palette.

In the dialog **Lines**, set the color-determining channel to *Line type: Bubble Plot* and *Dataset used for* to *Color (for previous line).*



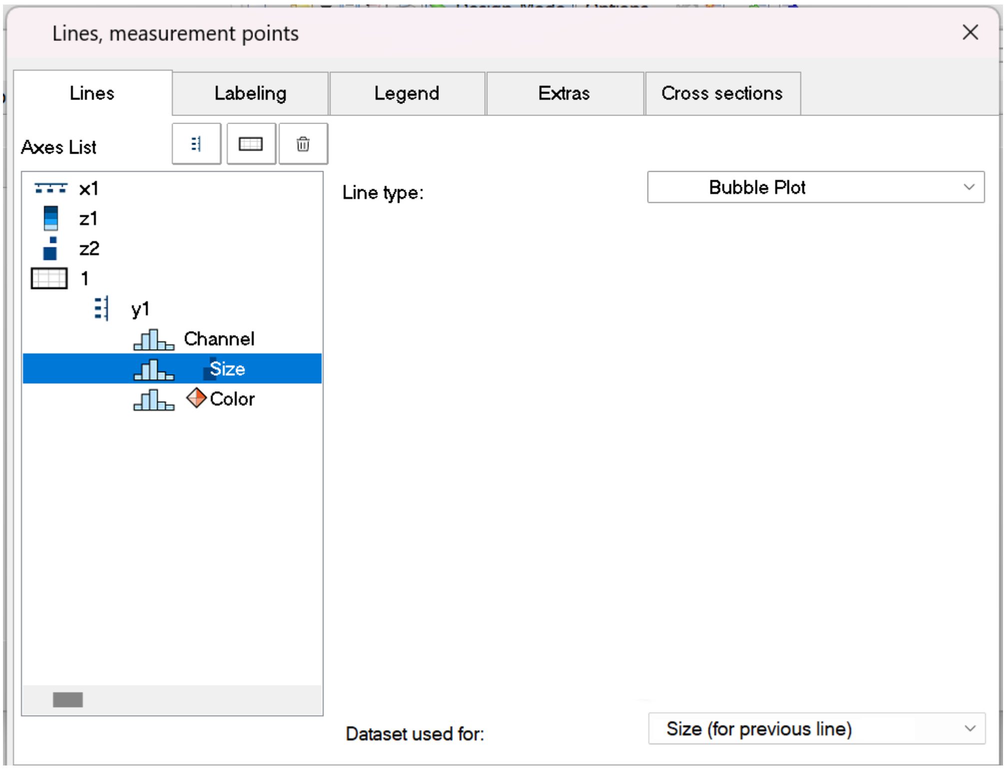
⊟ Bubble Plot with size channel and color palette



Matches "Size of bubbles corresponding to values of another data set 88" except for the following:

A third data set is used for the color palette.

Add the data set for the color and set it in accordance with Bubble Plot with color palette 91.



In the dialog **Lines**, set all three data sets to *Line type: Bubble Plot*.

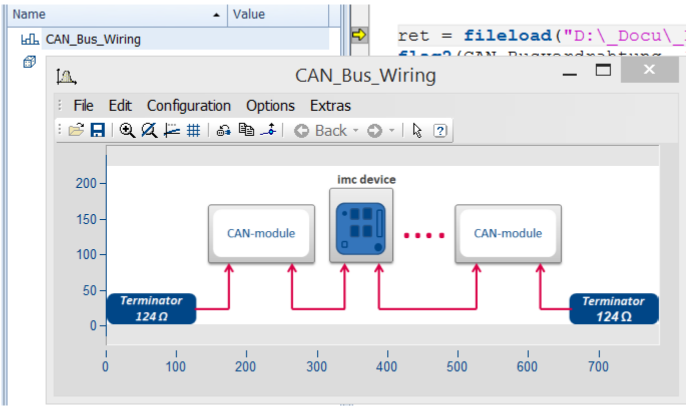
Make the following settings for the respective channels: *Datset used for: Color (for previous line)* and *Size (for previous line)*.

Expand the edge (see here 90) and use the mouse to arrange the scaling axes for the variables Color and Size.

3.2.12 RGB-image

An RGB-image variable consists of a segmented data set in which each sample represents a pixel's RGB-code. When loading an image using **FileLoad**(..."#Picture.dll|Picture Format"...), a color-flag is set in the properties of the variable, which can be queried by means of **Flag?**(Variable, 1). If the RGB-flag is set, when the curve window is opened, the property *Image from RGB-values* 132 is automatically set under *Effect* in the dialog *Lines\Extras*.

The y-axis and x-axis must both have the same scaling so that the image will be displayed without distortion. This is ensured by means of the property *Resolution* in the dialog *Axes\Arrangement* 117.



The color stages of the pixels are displayed exactly for the Line type setting 126 "Steps". For the line type "Lines", the color gradients are interpolated.

If a data set has **multiple events** 170 each having one image, these can also be displayed when the events have appropriate coordinates. With overlapping coordinates, only the last event may be visible.
The **X-offset** determines the offset in the graph, the event's trigger time is not taken into account.

If any settings are made which the system does not support, the image is not displayed. Settings which are not supported include invalid data formats (XY-data, TSA), XY-overlays over the curve window, selections of individual samples, skipping of segments, and period comparisons.

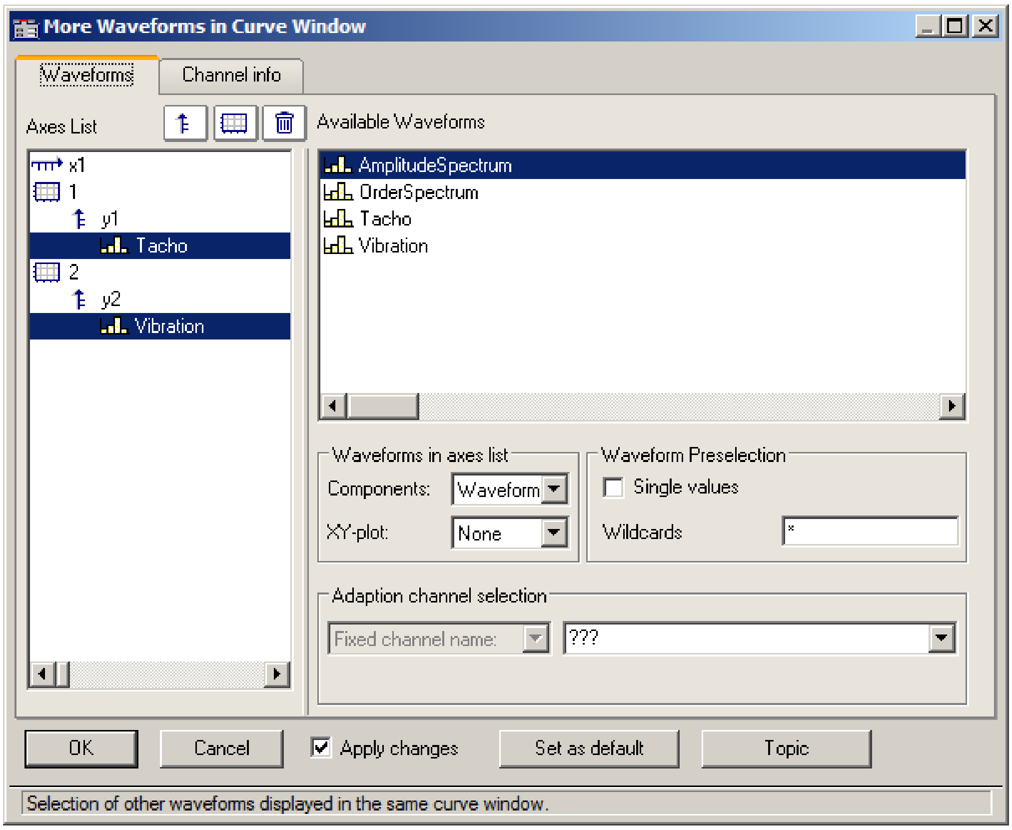
3.3 Showing data in curve window

A dialog is available for setting the waveforms to be displayed, the coordinate system and the y-axes in the curve window.

Up to 40 coordinate systems can be represented in a stacked display in the curve window, and each coordinate system can have y- and z-axes with different scaling. A coordinate system and a y-axis (and possibly a z-axis) from this coordinate system must be assigned to each waveform displayed in the window.

Open the dialog by right-clicking the mouse in the curve window and selecting *More Channels*.......

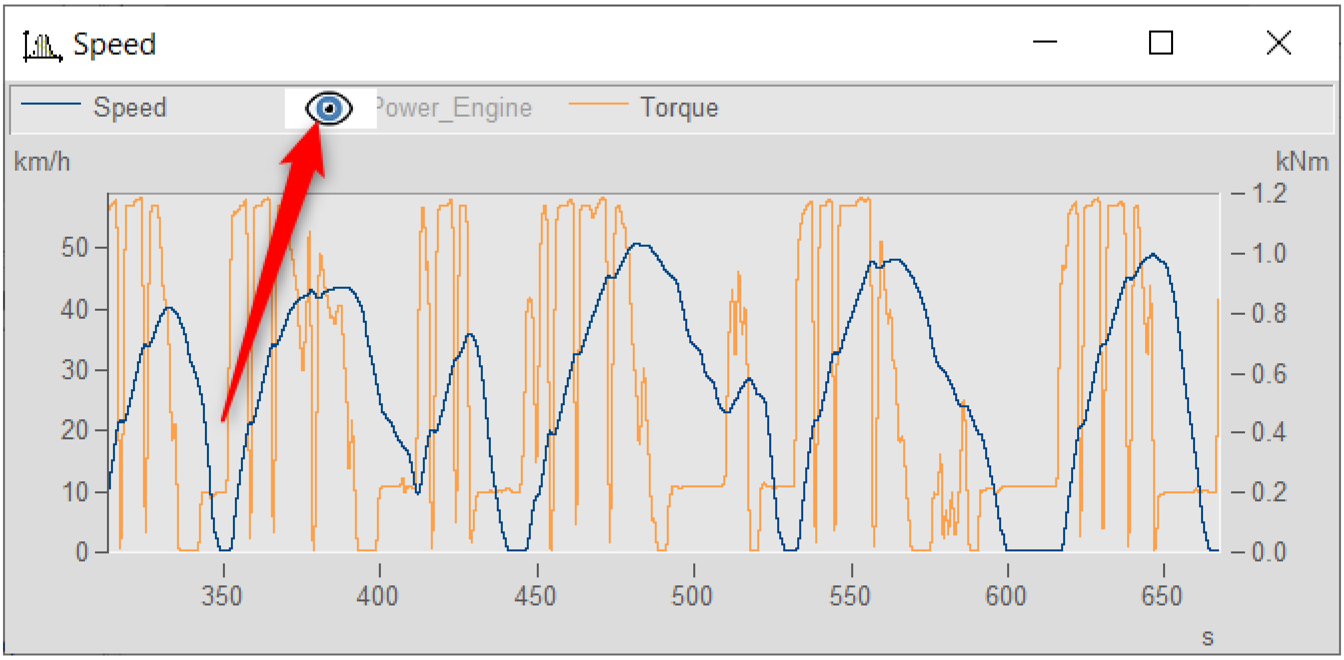
A short help message appears when the mouse pointer is held for a few seconds over a dialog object (provided the curve window help options are enabled.

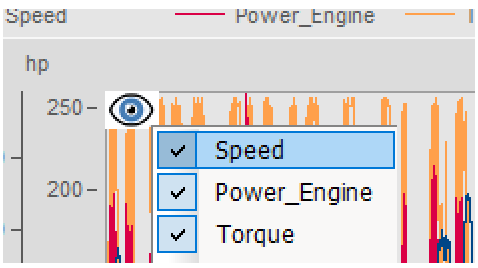


The space allocated in the layout to the Axes list and the Available Channels respectively can be altered by dragging the border between them using the mouse.

The subsections below respectively describe the individual dialog elements.

Showing/hiding channels at the click of the mouse





In the curve window, it is possible to show or hide individual channels at the click of a mouse button. To do this, you move the mouse pointer over the line ample of the a channel in the legende. Click on the eye-icon which then appears there to toggle the channel's display on/off .

Alternatively, use the pop-up menu that appears in the upper left corner of the curve window.

3.3.1 Axes list

This *Axes list* reflects the current structure of the curve window. The symbols for the individual coordinate systems are found in the first column. The y-axes displayed in a coordinate system are indicated underneath, somewhat indented. Waveforms assigned to a y-axis are listed after the y-axis. Each waveform is specified by a symbol and its name.

Waveforms can be **added to *Axes list*** from the list of *Available Channels* using drag&drop.

Drag&drop applied to one or more selected entries **moves** these. When you hold down the CTRL key, a copy of the respective item is moved.

Buttons for editing the axes list

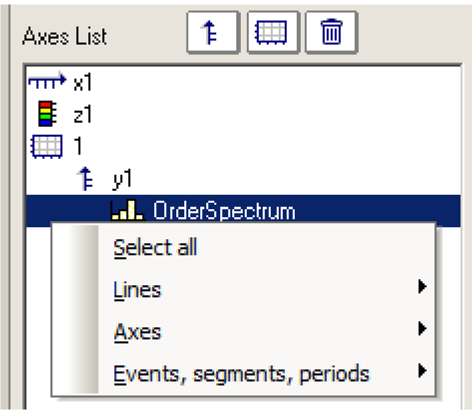
Icon	Description
	A new y-axis is created. To do this, click briefly on this button, which changes the mouse pointer to a suitcase symbol. Click on the target position desired. The new y-axis is inserted above the row over which the mouse pointer is located.
	A new coordinate system is created.
	The lines selected in the axes list (coordinate systems, axes, waveforms) are deleted. Use the <Del> button as an alternative.

Symbols used in the axes list

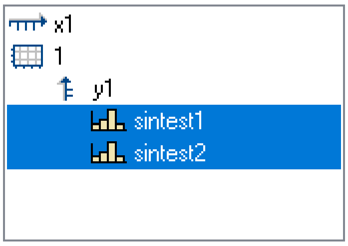
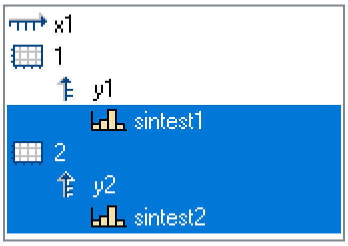
Icon	Description
	x-axis; always at beginning of axes list. All following coordinate systems are scaled on the same x-axis
	z-axis; only in *3D, color map and waterfall diagram*. The z-axis can be scaled only with a fixed z0 and delta-z .
	Indicates an independent **coordinate system**. All further axes and waveforms listed until the next such symbol appears or until the end of the list belong to this coordinate system.
	Indicates a **y-axis**. All further waveforms listed until the next y-axis belong to this Y-axis.
	Two consecutive waveforms in the list are superposed
	XY-Display: Two consecutive waveforms in the list are superposed; the data of the waveform denoted by a "y" are plotted over the values of the waveform denoted by a "x"
	3D-Display: Three consecutive waveforms in the list are joined in a multi-dimensional relationship. The data of a waveform designated y and the data of a waveform designated z are associated with the data of a waveform designated as x. This relationship is for the purpose of 3D display, but can also be used for a color map.
	Variable not present: The original waveform at this position has been deleted. Or: a loaded curve configuration expects a waveform at this position
	Second component missing: The waveform is already designated as one component of an XY-waveform, the other component is missing
	A **normal waveform** with equidistant x-scaling
	Empty waveform: A normal waveform with a length of 0
	Single value, normal waveform with a length of 1
	XY-waveform with monotonous x-track (time waveform)
	XY-waveform with **NON-monotonous** x-track (characteristic curve)

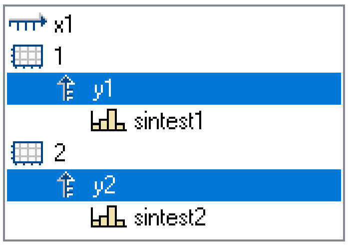
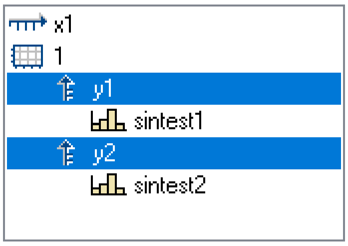
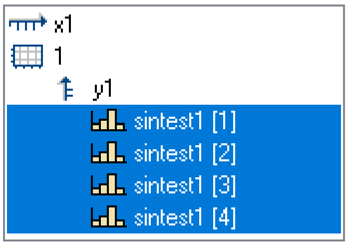
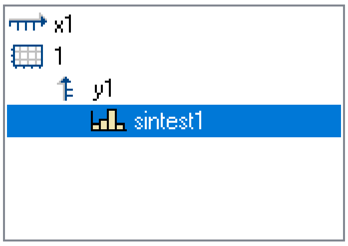
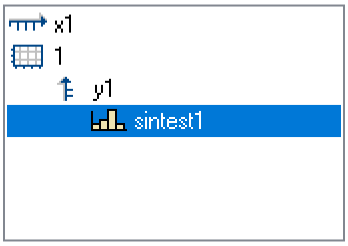
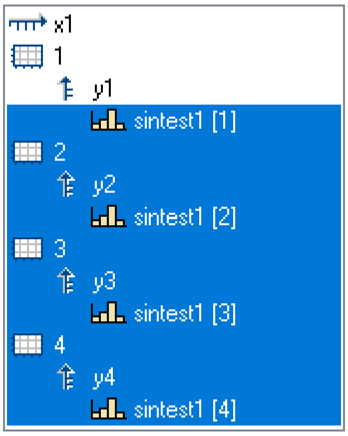
Icon	Description
	A **digital** waveform
	A **complex waveform** in magnitude/phase- or real/imaginary display

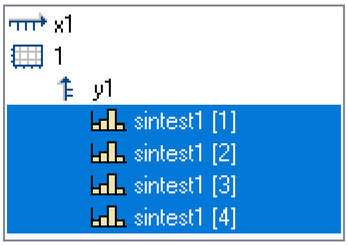
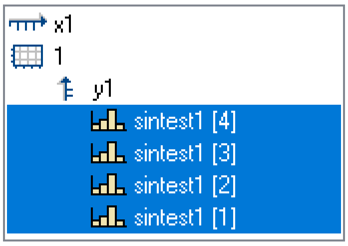
Context menu in Axes List



The following menu items are available:

Menu item	Description
Select all	Selects all lines in the list.
Lines	A *line* is the graphical representation of one or more data sets, in other words a *waveform*. Normally an entry in the axes list will indicate the simple representation of one data set as a line. The following items affect the selected lines.
Individual coordinate systems	This produces a *stacked* representation of curves.  *before*  *after*
All on 1 axis	All selected lines are displayed with only one axis. Any obsolete axes and coordinate systems are deleted.
Individual axes	A separate axis is displayed for each line.
Axes	The following items affect the selected axes.

Menu item	Description
All in 1 coordinate system	All axes are incorporated into only one coordinate system. Obsolete coordinate systems are deleted.  *before*  *after*
Individual coordinate systems	A separate coordinate system is displayed for every (y-) axis.
Events, Segments, Periods	The following items are relevant only to special data types (segmented and multi-shot waveforms)
Combine	Various lines are attached to each other, if the numbering permits. The range of possibilities is dictated by the exigencies of the corresponding dialogs for selecting structural elements.  *before*  *after*
Separate with same layout	One line consisting of several structural elements is dissolved into its components. The order of the elements is retained. If the original line was provided with, say, a coordinate system, then all the new lines will each receive one as well.  *before*  *after*
Separate into individual lines	This is the contrary of *Combine*. Multiple lines, which each amount to a structural element, are created.
Separate into individual coord. systems	Each structural element receives its own coordinate system.

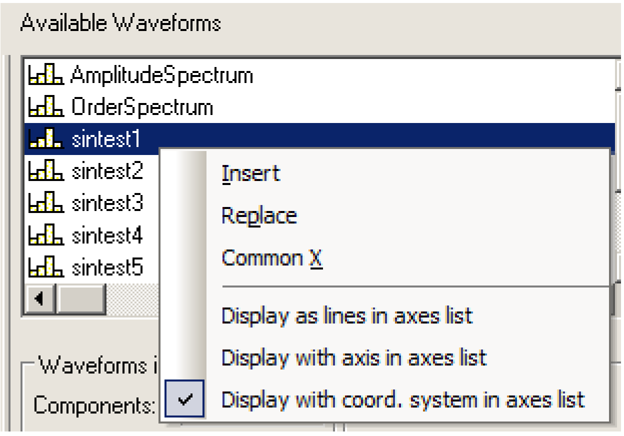
Menu item	Description
Reverse order	Reverses the order in which the lines appear.  *before*  *after*

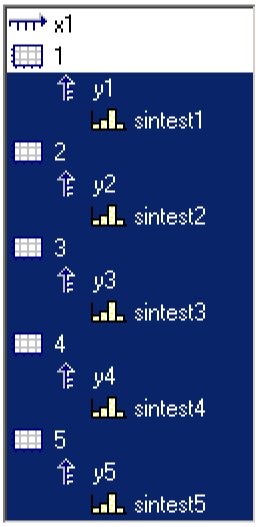
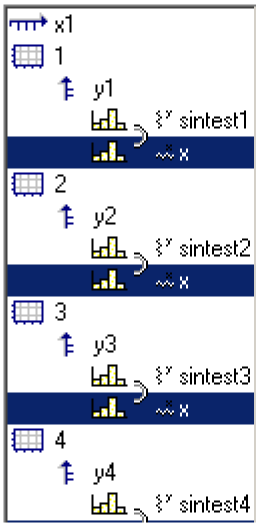
3.3.2 Available channels

This list contains the waveforms which can be displayed in the curve window. Waveforms selected from this list can be fetched into the axes list using drag&drop (starting from the left edge of the list, the mouse pointer has the shape of a hand).

Context menu in available channels

Right-clicking mouse in the *Available Channels* list to open the context menu:



Menu item	Description
Insert	The waveform selected is added to the axes list. Depending on how the controls below are set, the waveforms are automatically created along with y-axes or coordinate systems: • Display as lines in axes list, Display as axis in axes list, Display with coord. system in axes list
Replace	The waveforms in the axes list are replaces with the waveform selected under *Available Channels*. If more than one waveform is selected under *Available Channels*, this menu item is not enabled.
Common X	The waveforms selected in the axes list contain an x-component.  *before*  *after*

3.3.3 Waveform preselection

Waveform Preselection: Single values

Single values are only indicated in the list of Available Channels if this option is selected. Frequently, single values are generated in FRAME programs or imc FAMOS sequences, for example, as control variables, parameters for functions or indexed variables in loops. The single values are not of interest for display in a curve window.

This name only

The user can specify here a filter for the name of the waveforms to be indicated in the list. Only those waveforms whose names match the specified filters are included. The program does **not differentiate** between **upper** and **lower case letters**. Use the wildcards '*' and '?' when specifying the filter.

The wildcard '*' indicates any number of any given characters, '?' indicates any one given character. The wildcard can also be placed at the beginning or end of the filter.

Examples for wildcards

*	All waveforms
a*	All waveforms whose names begin with 'a'
Channel?	All waveforms whose names consist of 'Channel', followed by any character
Channel	All waveforms in whose names the string 'Channel' appears
a*;t*	different filters are separated by ";"

3.3.4 Waveforms in axes list

Waveforms in axes list: Components

What components are selected affects the current selection in the axes list. For two-component waveforms, specify whether the complete waveform should be indicated (XY, polar plot) or only a particular component of the waveform.

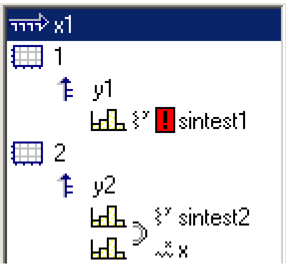
Component	Description
???	The settings for the selected waveforms do not match.
Waveform	Complete display of variables according to type. XY-Waveform: the entire waveform "Y over X" Complex data: polar plot
.x .y	The specified components of XY-waveforms are displayed
.r .i	Real or imaginary part of a complex waveform in real/imaginary display
.m .p	Magnitude or phase of a complex waveform in magnitude/phase or decibel/phase display

Waveforms in axes list: XY-plots

Superposition of normal single-component waveforms.

XY-plots	Description
???	The settings for the selected waveforms do not match
None	No XY-plot has been determined
x of XY	In an XY-plot, this waveform is the x-component
y of XY	In a XY-plot, this waveform is the y-component
x, y, x, y ..	The selected waveforms become x- and y-components in this order
y, x, y, x ..	The selected waveforms become y- and x-components in this order
z	In multi-dimensional displays, this waveform is the z-component.

An XY-plot always involves two or three consecutive waveforms in the axes list, which must both belong to the same y-axis. All must be single-component waveforms (a normal waveform or a specified component of a 2- or 3-component waveform). The two waveforms in an XY-plot are marked by a parenthesis in front of their names.



A small symbol indicates whether a waveform acts as the x-, y- or z-component in an XY-plot.

If a waveform has already been designated as part of an XY-plot, but it's counterpart is missing, this is indicated by a red exclamation mark in front of its name.

Dimensions for 3D displays

If you select the display type *3D*, the available dimensioning options for 3-component waveforms are presented here. Three waveforms as associated spatial dimensions are denoted by a parenthesis in front of the name.

XY-plots	Description
???	this means the waveforms selected have different settings
None	no multi-dimensional relationship defined
x	this waveform is the x-component in a multi-dimensional relationship
y	this waveform is the y-component in a multi-dimensional relationship
z	this waveform is the z-component in a multi-dimensional relationship
y, x, z	The selected waveforms are respectively the x-, y- and z-component of a 3D display

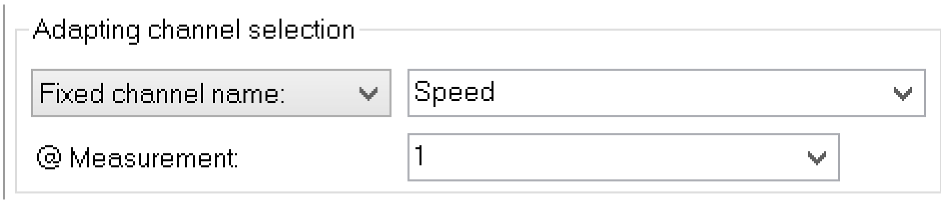
The multi-dimensional relationship always applies to three consecutive waveforms belonging to the same y-axis. All waveforms must be one-dimensional (so either normal waveforms or defined as one component of a 3-component waveform).

Also, there is a small symbol indicating whether a waveform is acting as the x-, y- or z-component. If a waveform is already defined as a dimension in a multi-dimensional relationship, but the complementing dimensions are still missing, a red exclamation mark will appear in front of the waveform's name.

The z component of the display is always the 3rd component. X, y or y, x come first. Please note that the purpose is to display a surface. This is a function y = f (x, z). Compare this with the display of with normal time domain data, where y = f (x). The difference is the same as with waterfall display. Y is the amplitude. X and Z are the independent coordinates. This corresponds to segmented waveforms where you have dx and dz for the two dimensions of the matrix. The values contained are y values. So a segmented waveform is a function as well: y = f (x, z). Thus, a surface will be plotted like with segmented waveforms, but with segmented waveforms all x and z values are equidistant. With xyz display you can chose any pairs of x and z values.

3.3.5 Adapting channel selection

The dialog portion *Adapting channel selection* is needed in conjunction with the Panel.



Fixed channel name

Lets one specify that only a waveform having the channel name entered in the edit box at the right is displayed. Toward this end, "Unknown channel" from the window *Available Channels*: is added to the axes list and configured accordingly.

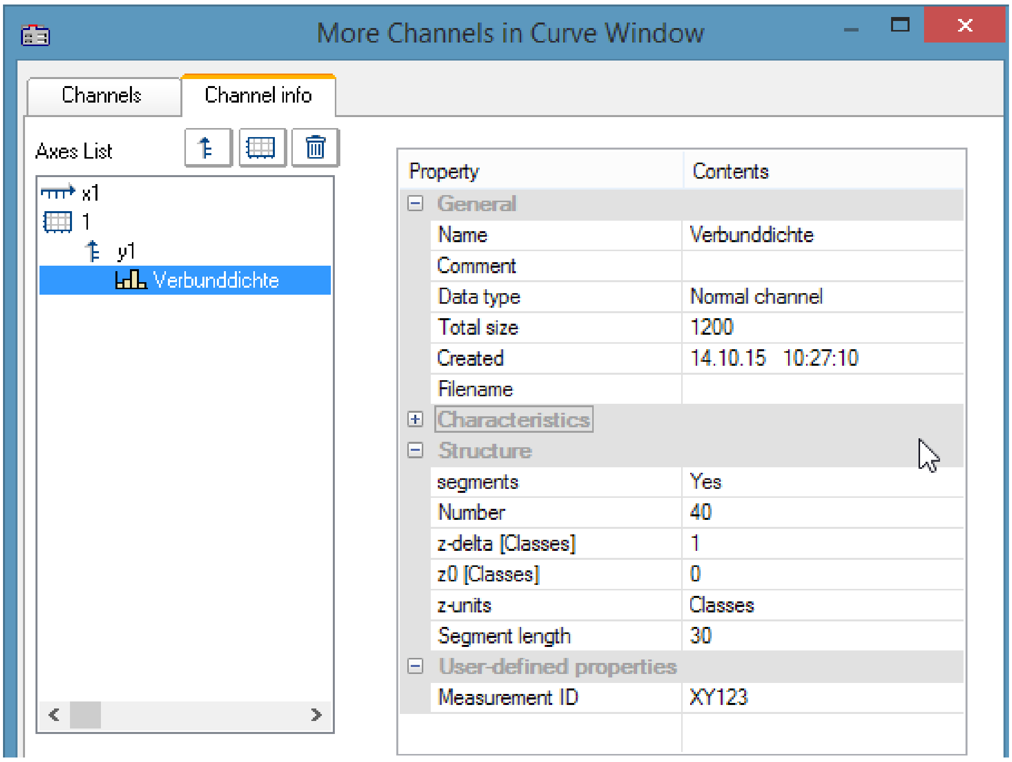
Selected channel

The curve window can be configured so that the waveform having the corresponding number in the Data-Browser is displayed at the this location. The pertinent number for the selected channel can be set in the dropdown list. Toward this end, "Unknown channel" from the window *Available Channels*: is added to the axes list and configured accordingly.

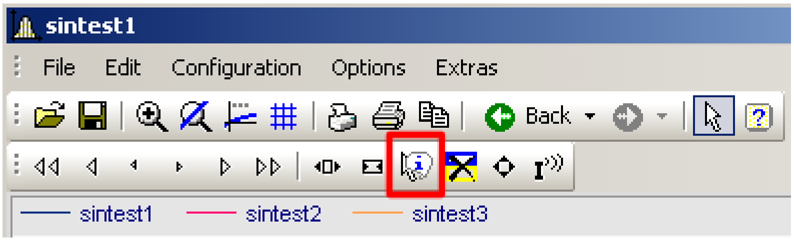
Additionally, the measurement selected in the Data-Browser can be set as a further display criterion in the dropdown-list *@Measurement*.

3.3.6 Channel info

The dialog "*More Channels in Curve Window*" contains a second page, *Channel Info*. Here you will find information about the properties or contents of any selected waveforms. The user-defined properties are also listed here.



In Select-mode, the dialog can also be reached via a line's context menu under the heading *Channel properties*, or in the menu ender *Configuration / Arrangement / Channel properties* 177 or via the corresponding symbol in the *Navigation Toolbar*.

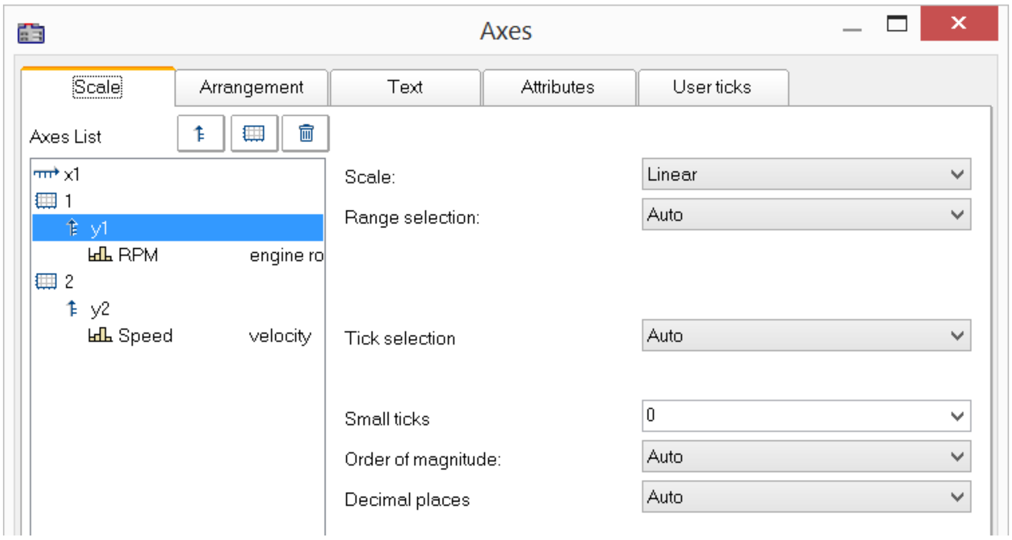


3.4 Axis configuration

Each axis (x, y, z) can be scaled manually, with a linear, logarithmic or dB scale. Linear scaling is useful for all time functions, whereas logarithmic scaling is appropriate for spectra. In logarithmic scaling, the waveform is stretched in small coordinate range and compressed at higher x-values.

Mouse Operation

- In the curve window's menu *Configuration*, select the item *Axes*... or to double-click in the region of the axis' scale labels. A dialog for scaling the axes then appears.



The Axes list shows the curve window's structure. Here, select the axis, which you wish to edit on the right side of the dialog. Selecting multiple axes is also possible.

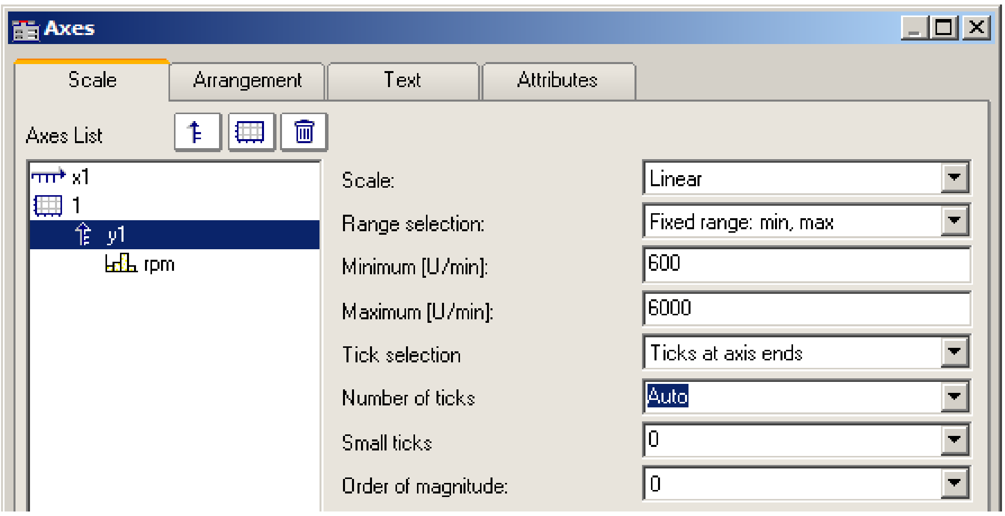
3.4.1 Scale

Scaling of the axes. An axis' domain can be defined in a number of ways.

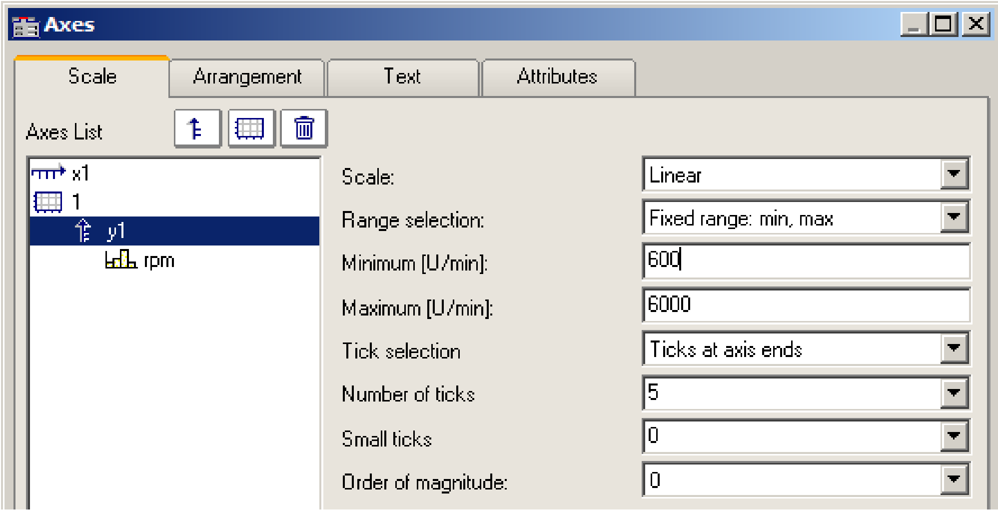
Scale

The axis can be scaled as *linear*, *logarithmic* or in *dB*. In Date/time display, the scaling is always linear. When the mode *Rounding* is selected for logarithmic labeling, powers-of-ten will be written to the axis as long as the range displayed is large enough.

Range selection

Range selection	Description
Rounding: min, max	Specify the axis' domain by specifying the minimum and maximum. The specified values of the waveform are then rounded off in such a way that, taken together with the set number of markings on the x-axis, that axis appears labeled with nice, round numbers. Note that the maximum must always be greater than the minimum.  This menu option is not enabled when the option *Tick selection* is set to *Ticks at fixed distances*.

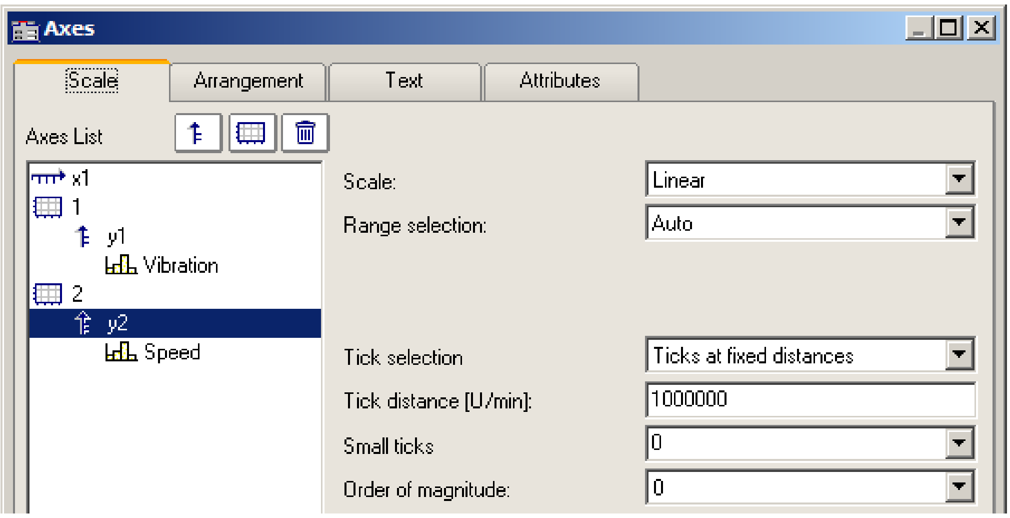
<table>
<tr><th>Range selection</th><th>Description</th></tr>
<tr><td>Fixed range: min, max</td><td>Here, the range limits and the number of markings are defined. For instance, a minimum specified as 10.0, a maximum of 40.0 and four markings on the axis result in the values 10.0, 20.0, 30 and 40.0 being marked along the axis.



In logarithmic display, the factor with which to multiply the individual tick points must be stated, and it must be more than 1. If you set the first value to 10, the factor to 2 and the number of ticks to 3, then the values 10, 20 and 40 are marked on the axis.</td></tr>
<tr><td>Auto</td><td>Determining the range is automatic. The entire curve is displayed in the curve window.</td></tr>
<tr><td>Automatic with zero</td><td>With this setting, the zero point is always visible. If the signal values lie within the range 2.0 ... 2.5, the range displayed is 0.0 ... 2.5. This corresponds to an oscilloscope's DC-setting. If the function values are distributed at only a small distance around the mean value, the deviations from the mean value will be interpreted as interference or noise. In that case, a display with visible zero intercept is always set automatically.</td></tr>
<tr><td>Like previous axis</td><td>This option is only available if more than one y-axis is displayed in the curve window and an axis other than the first one is selected. If you select this display style, the axis concerned appears in the same style as the preceding axis in the list. In this way you can make multiple curves be displayed with the same axis, and have this one axis state the scaling for all curves correctly.</td></tr>
</table>

Tick selection

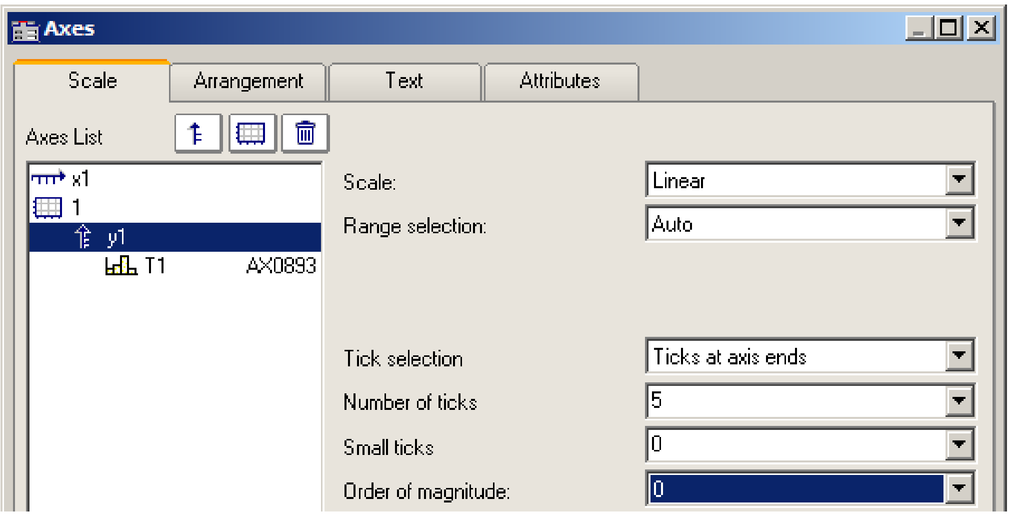
The main ticks, along with which the axes labeling appears in the curve window, can be placed anywhere on the axis. If you select the option *Ticks at fixed distances* in the *Tick selection* control, the additional control *Tick distance* becomes available. Here you have the ability to set the amount of ticks per unit. For instance, when the unit is ms, the ticks appear every 3ms, if 3 was entered in the text box *Ticks distance*.



Select the option *Automatic Labels*, if the ticks should be placed at the ends of the axis. The increment between ticks then depends on the total amount of ticks set.

Automatic tick spacing is recommended; for this, simply select *Auto* under *Tick selection*.

If the option *Automatic Labels* was selected in the *Tick selection* control, the number of ticks can be entered in a text box. The number must be greater than or equal to 2.



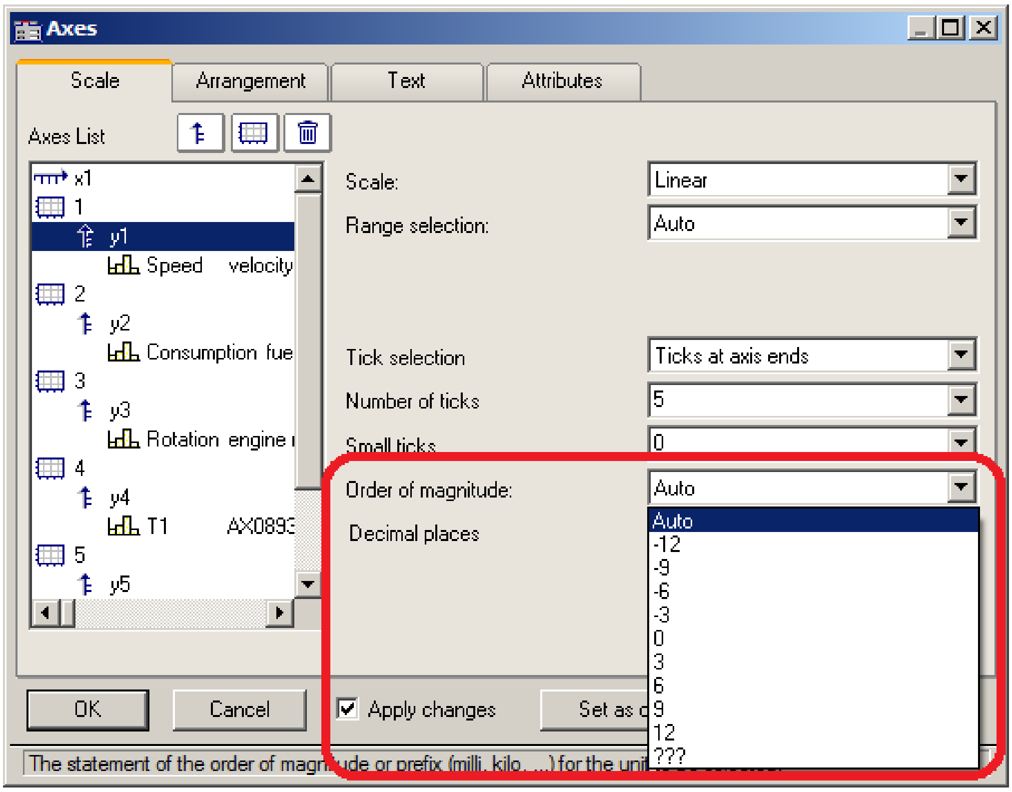
The number of ticks per unit is calculated by subtracting one (1) from the number of markings and dividing the difference by the displayed interval in units. For example, with an interval of 3ms and seven markings specified, two ticks per unit (ms) will be placed on the axis.

Remarks

- An error message is generated when clicking on *OK* if inapplicable values were entered in the text boxes. Error messages occur on account of inapplicable values (too large) or ranges (no positive values in logarithmic display, minimum not smaller than maximum, or inapplicable number of markings). Correct the relevant text boxes and then click on *OK* again.
- The distance (difference) between xmin and xmax may not be too small in relation to the maximum magnitude of xmin and xmax. For example, a range of
  1.0000000000000001 ..... 1.0000000000000002
  CANNOT be displayed. The maximum permissible factor between difference and maximum magnitude is 1E-13.
- When the display mode *1/3-octave/octave* labeling is selected, then the scaling of the x-axis is accomplished as detailed in the appropriate chapter. A different dialog appears for scaling the x-axis.

Order of magnitude

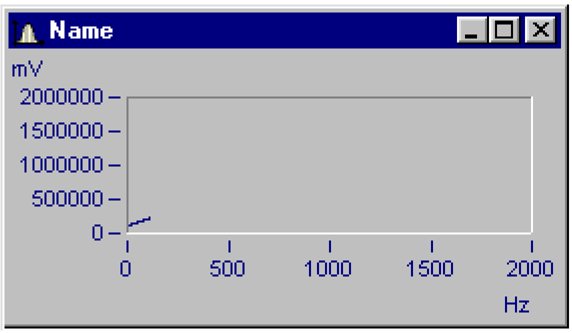
It is possible to arbitrarily determine the power-of-ten of the axis-scaling. If the axis is labeled with a unit, and appropriate prefix will be appended to the unit symbol, if applicable (e.g., mV or MV).



Example x-axis with a fixed

For an x-axis with a fixed scaling range of 0...2000V:

Order of magnitude	Display
Auto:	0..2 kV
+6	0..0.002 MV
0	0..2000 V
-	0..2000000 mV

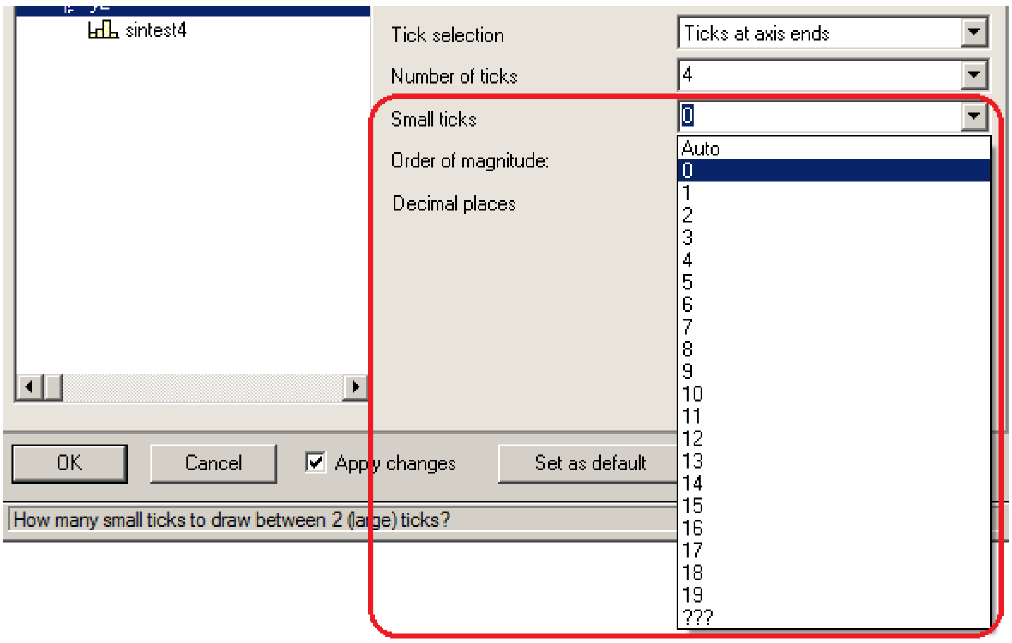


Curve window with inappropriate scaling

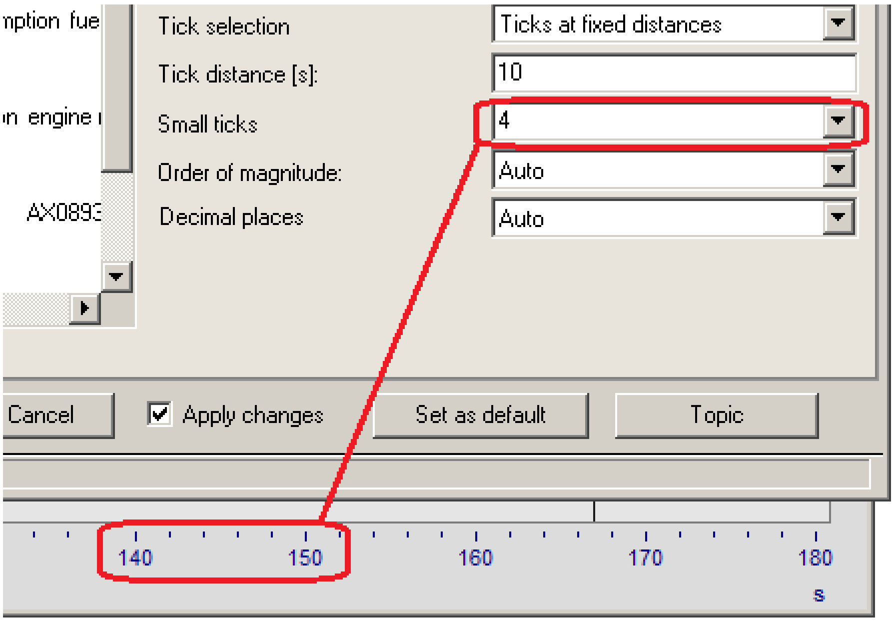
x-axis scaled with exponent 0, y-axis with exponent -3.

Small ticks

Small ticks can be positioned along the axis between the big ticks (main ticks):



To do this, select the amount desired from the pop-down list. If you don't want any, select 0.



The small ticks are not labeled. If the curve window featured a grid, then supplementary grid lines (which may appear thin in a printout) will appear at the small tick coordinates. For details, see the discussion of the menu item *Configuration/ Grid* 159.

Decimal places

With linear axes, the number of decimal digits can be set here.

Format (for Date/time absolute)

If the scaling of the x-axis is in abs./rel time, the format of the labeling can be specified:

- *Auto ,Auto 1 line, Auto 2 lines*
- *fix 1 line or fix 2 lines.*

The display of time and date makes use of placeholders.

Placeholders in absolute time:

Time: h, hh for hours; m, mm for minutes; s through ss.ssssss for seconds
Date: D, DD for day, M, MM for month; YY, YYYY for year
Names: DDD for abbreviated weekday, DDDD weekday, MMM abbreviated month, MMMM month
A.M., a.m., AM, am for AM/PM format

The placeholders and special characters appear in angle brackets. Furthermore, other characters can be added.

Duplications << or >> for one < or > character in the output

Example

<hh:mm:ss.ss>

<hh:mm a.m.>

<DD.MM.YYYY, hh:mm>

<DDD, DD.MMM.YYYY>

date=<DD>.<MM>.<YY>

Placeholders with relative time:

h, hh for hours; m, mm for minutes; s to ss.ssssss for seconds

D to DDDDDD for days; o to oooooo for hours without days

The placeholders and special characters are expressed in angle brackets. Furthermore, other characters can be added.

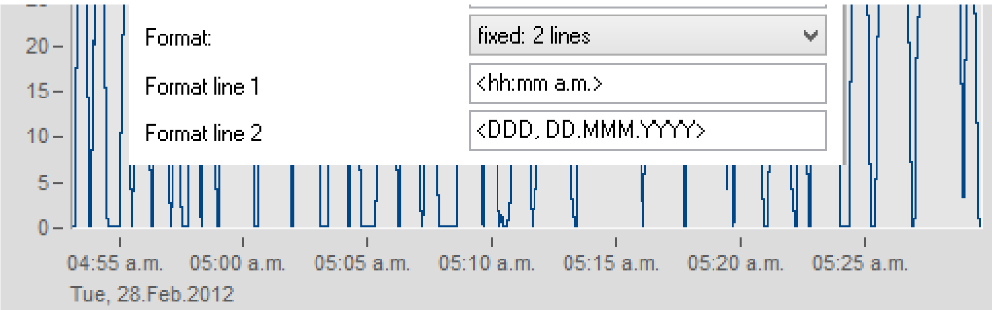
Example

<hh:mm:ss.ss>

<D> Tage

<o:mm:ss>

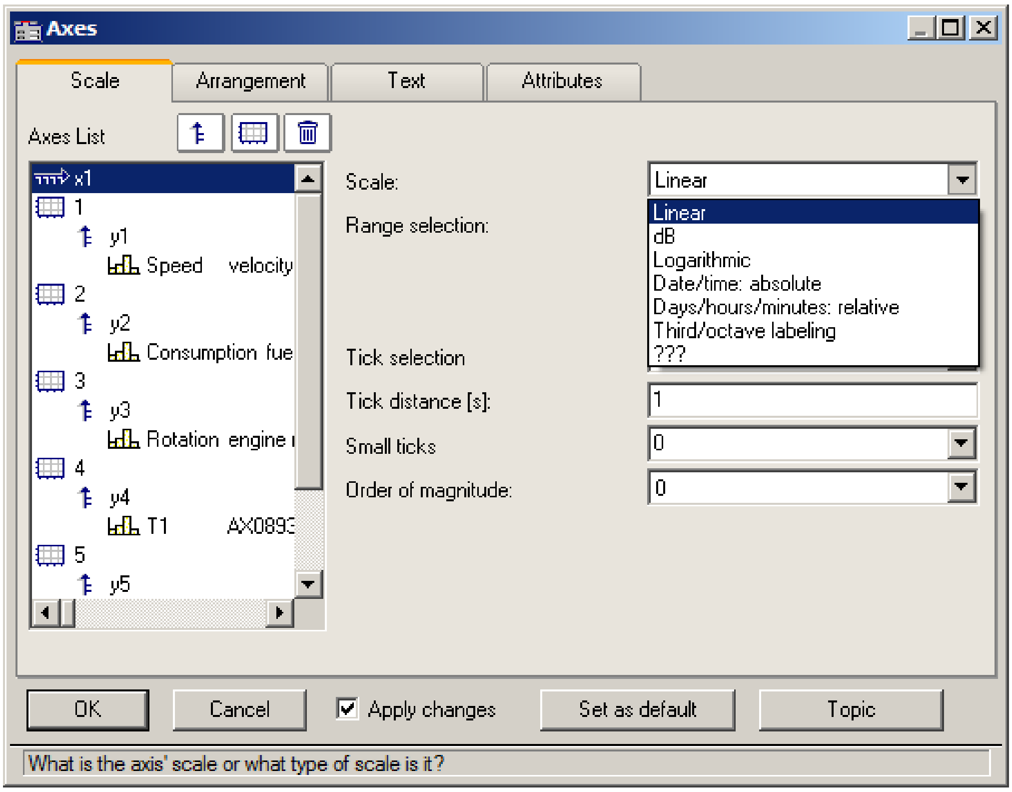
<o> Std, <mm:ss>



Example: line 1: <hh:mm a.m.> line 2: <DDD, DD.MMM.YYYY>

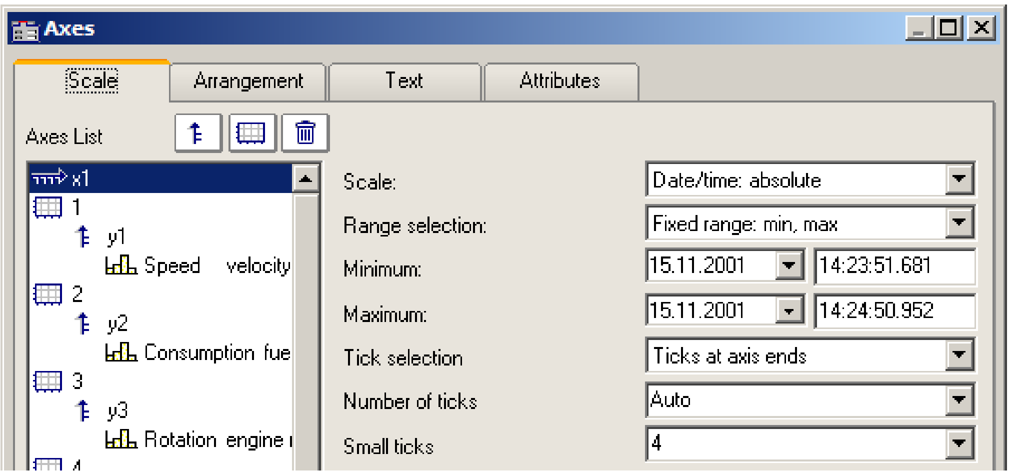
3.4.1.1 Particularities of the x-axes

The following concerns special display types only available for x-axes. The x-axis alone must be selected in order for these options to be enabled.



Scale

Absolute date, time: The minimum and maximum are each specified separately in terms of the time and date. Selection of the date is accomplished by means of a calendar. The time is entered into a text box in compact form. The seconds in the time can have decimal places.

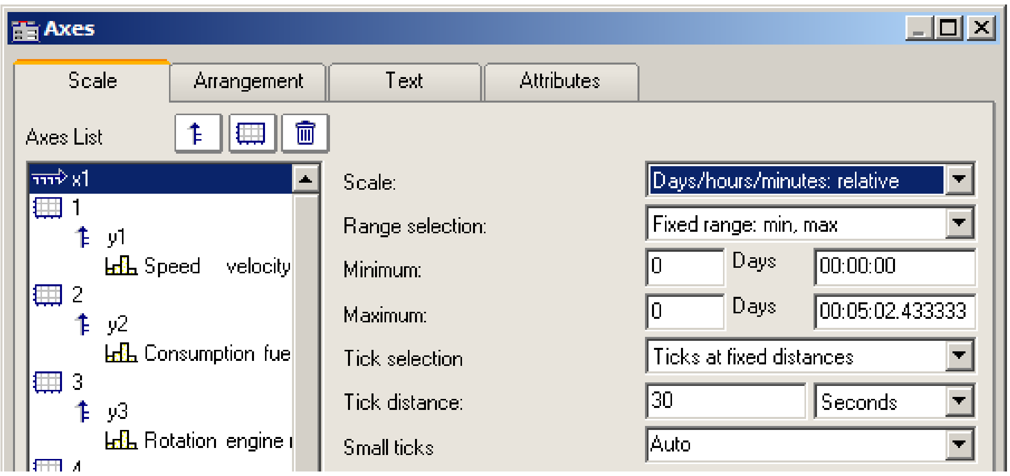


The distance between ticks can be set to be determined automatically or to be fixed. With a fixed setting, the unit can be anything from seconds to days.

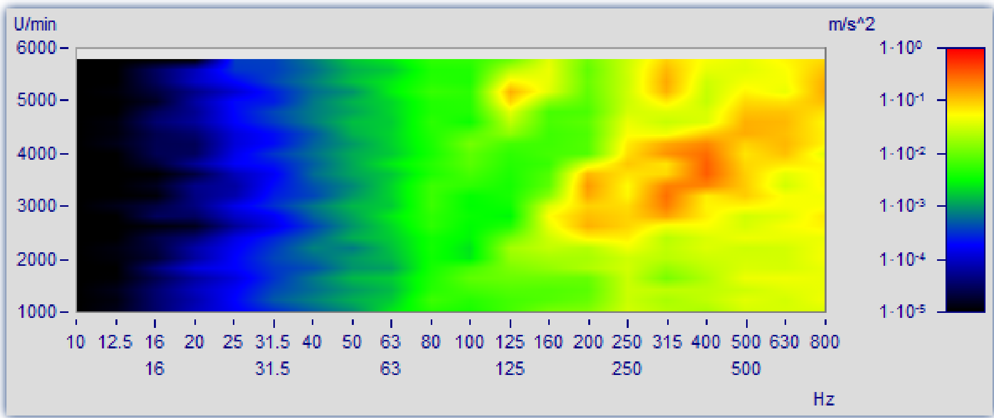
The channels are displayed in reference to absolute time. The absolute time of the measured points is usually derived from the sum of the specified absolute trigger time and the relative time for a point measured after the measurement's start.

Days, hours, minutes: relative: The amount of day and of hours, minutes and seconds (the latter may have decimal places) can be specified. As in linear display mode, the display of the measured data doesn't refer to the absolute triggering time. Thus, only the time intervals between the measured points and the trigger time are indicated.

It is also possible to specify a negative amount of days, in order to indicate points in time preceding the trigger.



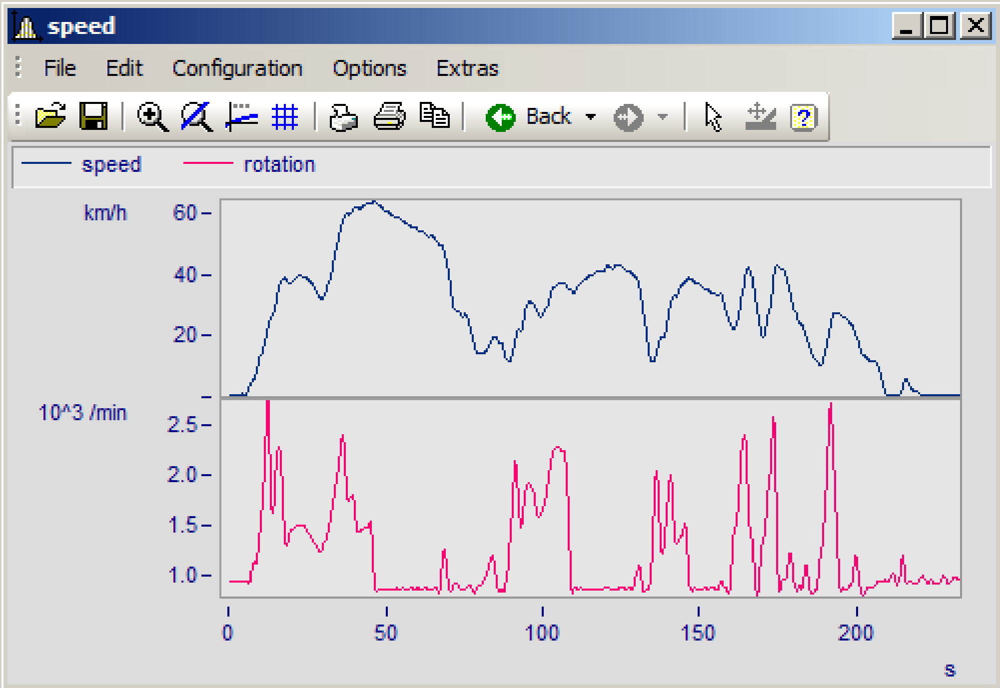
Third/ octave labeling: If a waveform contains a 1/3-octave or octave spectrum and the waveform's x-axis is scaled in 1/3-octaves, then the x-axis can be drawn with numerical values of the 1/3-octaves and octaves, in accordance with DIN.



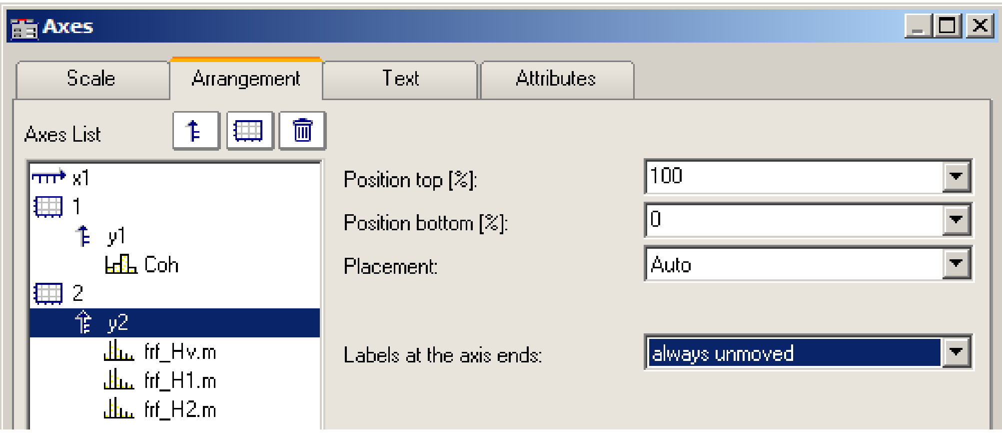
For details, see the dedicated section on "Third / octave labeling 75".

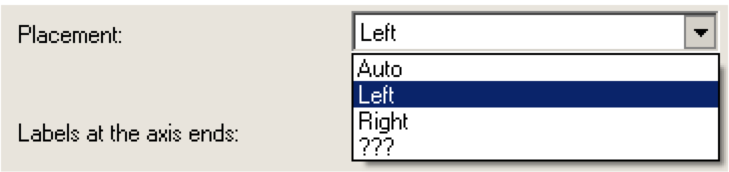
3.4.2 Arrangement

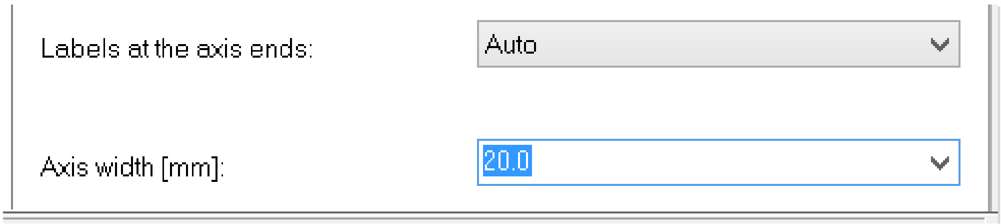
It is possible to stack multiple y-axes in a single coordinate system. It is also possible to set whether to layout the axes a the left or right of the coordinate system.



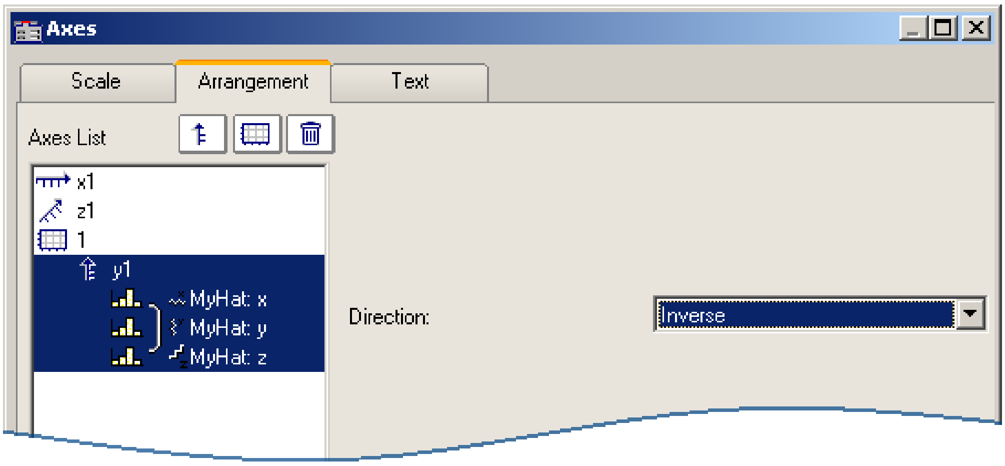
To do this, select the page *Arrangement* in the dialog *Axes*.

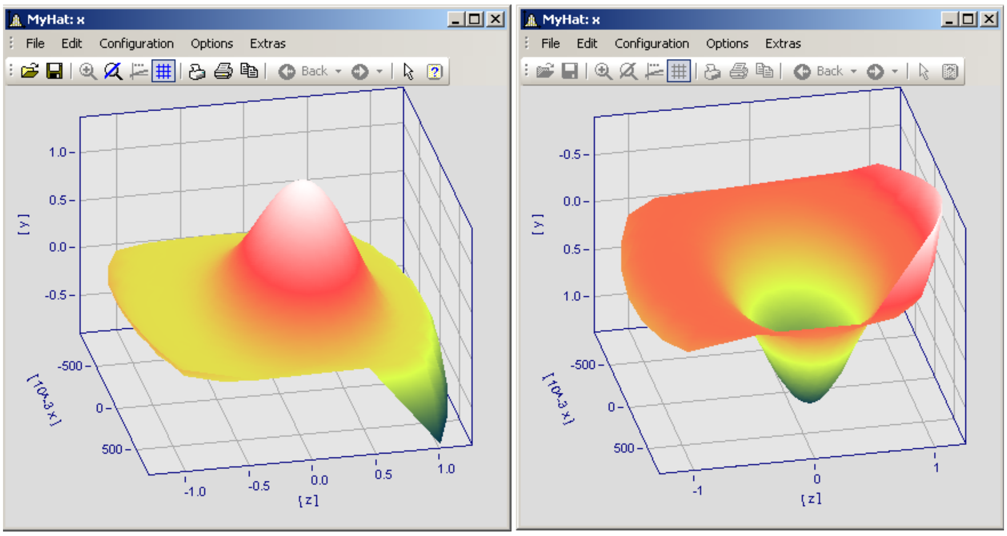


Settings	Description
Position	The relative position along the full height of the coordinate system can be specified for each axis. The setting 100% represents the position all the way at the top, 0% the very bottom. If the axes overlap each other, new "columns" are automatically set up.
Placement	The control *placement* sets whether to position the axis at the left or right of the coordinate system. 

Settings	Description
Labels at the axis ends:	Alongside automatic orientation of the labeling, this control also offers ***always unmoved*** and ***move if necessary***. 
Axis width	The width of the Y- and X-axis can be specified manually. In particular when using "User Ticks 120", this helps in providing sufficient room for the labeling.
Resolution	Setting the scaling of the y-axis *auto*: individually *same resolution as x-axis*: Generates a constant aspect ratio. In consequence, the ensures among other things that for an RGB-image 93 the image is displayed without distortion.  This setting only works when the same setting (linear or logarithmic) applies to both the x-axis and y-axis, and only for either standard display or Y-axes stacked. Not available for abs./rel time, and 1/3-octaves.

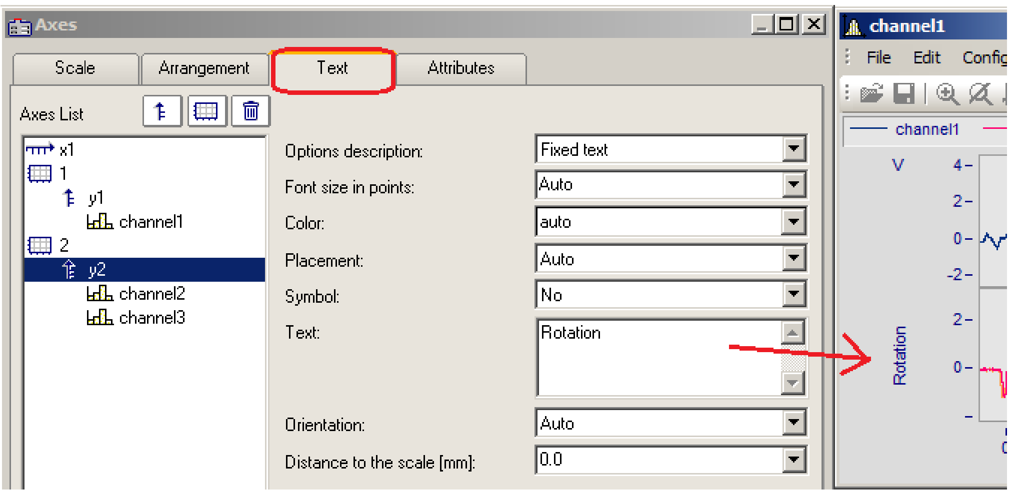
Settings	Description
Inverting the axis direction	With 3D display, you can invert the direction of the Y-axis. Use the menu: *Configuration\Axes* and select the page *Arrangement*. In the dropdown list you will find the entry *Inverse*.





Example: Invert the axis direction
At left the normal orientation, at right the inverted Y-axis

3.4.3 Text



Along with the normal axis labeling in the respective units, there is also the possibility to use the page "Text" to personally define the axis labels and to set their parameters. If there is text for a y-axis, it will be printed in vertical alignment in the curve window. Text for the x-axis is aligned horizontally and placed in the center. The following settings are available for the text:

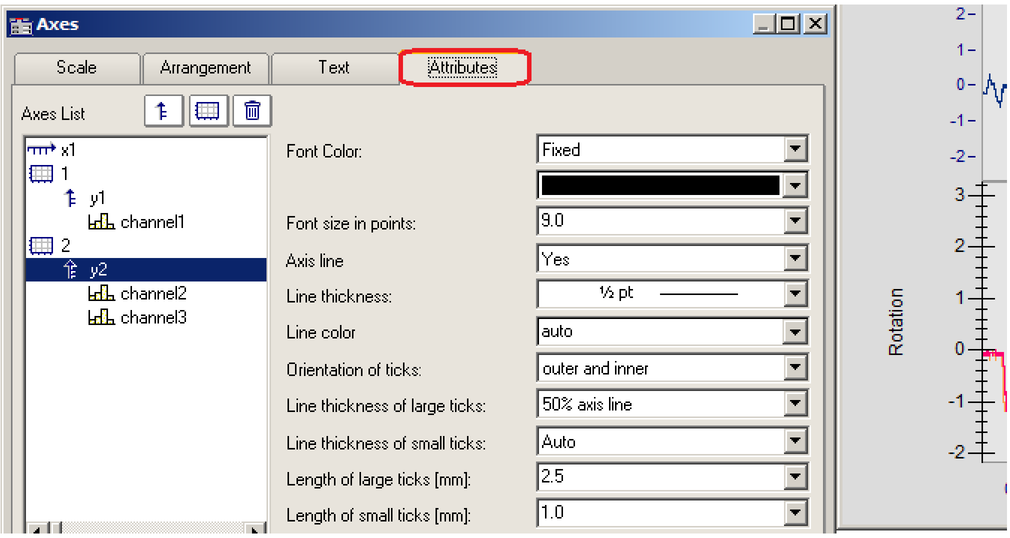
Settings - Options description	Description
No text	The default setting, in which the unit associated with the waveform is displayed horizontally at the upper end of the axis. For "No text", the additional option "*Unit indication*" is shown. This can also be hidden, for instance when using "User Ticks 120".
Fixed text	Here you can enter any desired text, such as "Length [m]", as a permanent feature. Seed also the notes on Greek letters 267.
Unit	The unit saved with the waveform is displayed.
[Unit]	The unit saved with the waveform is displayed in angular brackets.
Name, Unit	The channel name is displayed in the first line of the coordinate system and the associated unit saved with the waveform are displayed.
Definable with placeholders and formatting instructions	The text can be given along with fixed components and placeholders. Available placeholders are: • <name> for the channel name • <unit> for the unit • <comment> for a comment on the channel • <e>exponent</e> for an exponent, as an alternative to a^b. • <s>index</s> formats the text as small index. Nesting of the index or exponent is no allowed. • <g*b> for Greek letters. Also in the exponent: A<e>-<g*a>t</e> => $A^{\alpha t.}$ • x<s>i</s><e>e</e> for exponent together with index.

Additionally, it is possible to set the ***font size***, font ***color***, ***placement*** along the axis, and whether the ***symbol*** for the first line appears in front of the signal name, as it does in the legend. The symbol can only be set in the dialog for y-axes. The ***Orientation*** determines whether the text is displayed across the axis or parallel to it. Further, using ***Distance to the scale***, it is possible to specify a minimum distance to the text.

Reference **Further texts**

Further texts can be added on the tap *Display/Text* 157 and in chapter *User ticks* 120.

3.4.4 Attributes



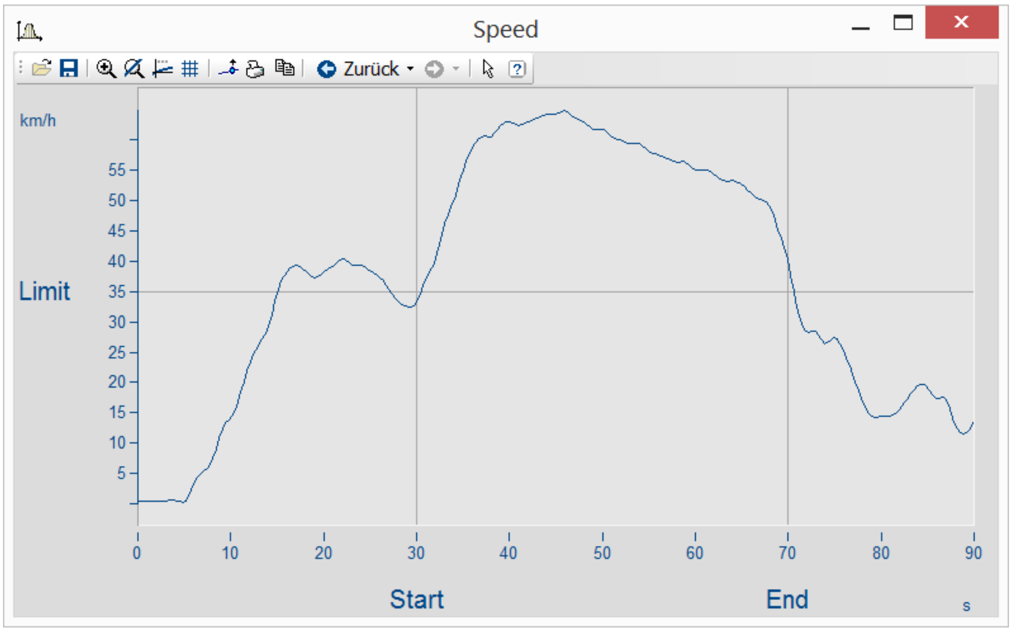
Settings for the axis

The control ***Font Color*** allows the color of the first data set to be applied, or a freely selected color to be set.

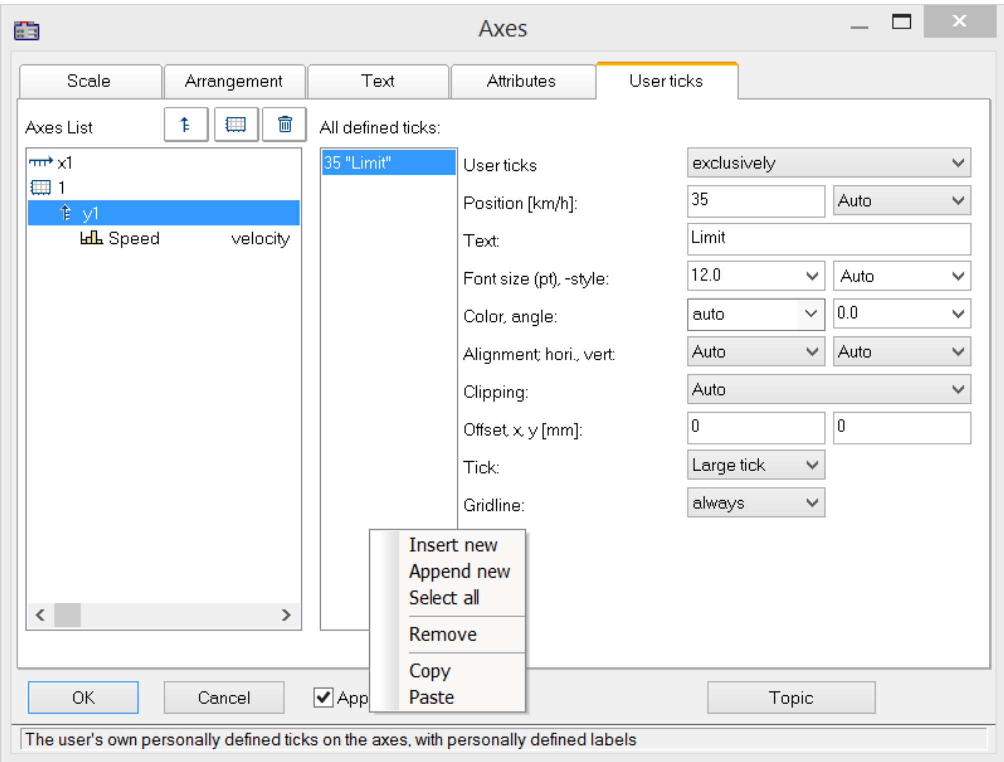
Additionally, it is possible to add an ***Axis line*** while specifying its ***Line thickness*** and individual ***Line color***.

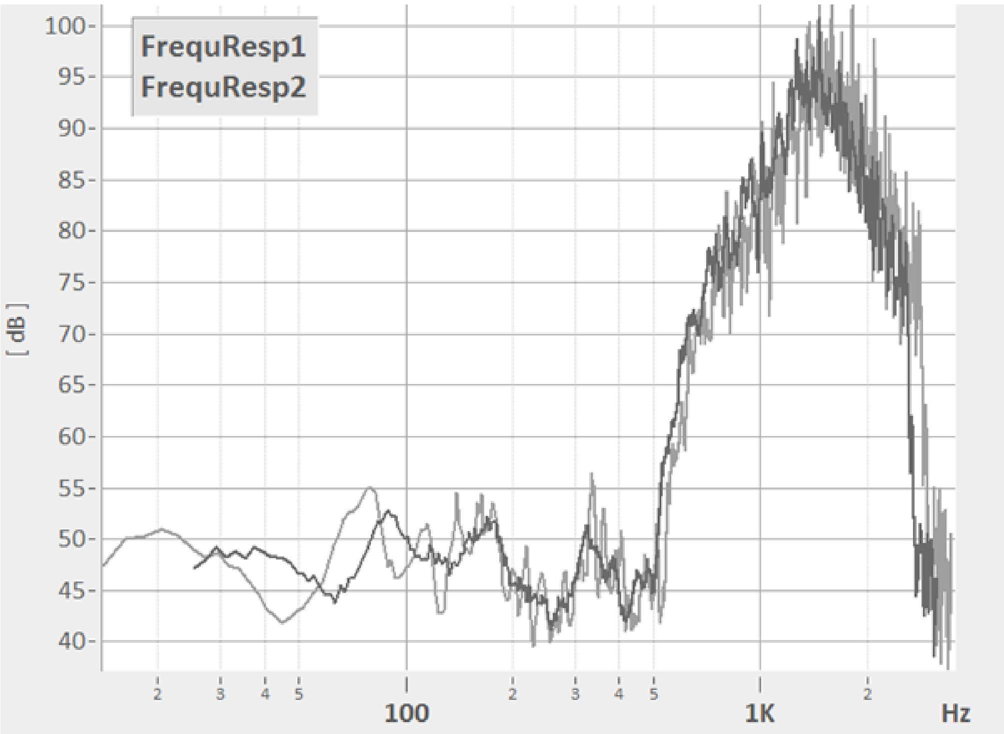
The ***Line thickness*** and ***length*** of the ***ticks*** can be set separately for both the small ticks (between numbers) and large ticks.

3.4.5 User ticks

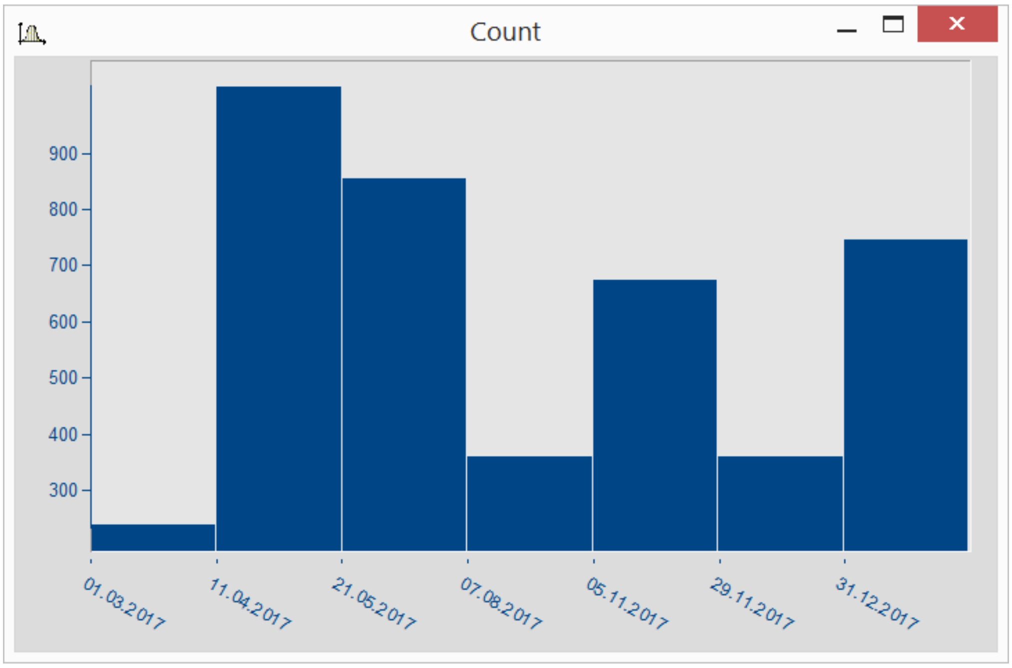


On the page "*User Ticks*", there are controls for inserting extra ticks. Using the context menu for "*All defined ticks*", you can insert, copy and delete ticks.





Any formatting, e.g. for log. Display



Date display independent of x-delta

The properties of the respective ticks assigned are listed according to the axis selected.

Settings	Description
User ticks	Replaces(*exclusively*) or complements(*additionally*) the existing scaling.
Position	Determines the position on the axis.
Font -size, -color, -alignment etc.	determine the appearance of the text. The necessary width can be set on the page "*Arrangement* 117".
Restriction	With *Restriction* active, the text is no longer displayed if it is moved out of the visible area by scrolling the axis. Without *Restriction* active, the text is still displayed.
Shift	Moves the user ticks to the left (<0) or to the right, for instance in order to avoid overlapping with the scaling in cases of additional ticks.
Tick	Selection of the tick representation, according to the settings on the tab *Attributes* 120.
Gridline	Shows a line corresponding to the tick. There is a choice of whether or not to make its appearance depend on the presence of a grid.
Exclusively	Custom settings for the selected tick: *Yes*= only the user tick; *No*= in addition to the scaling
From "Label for raw data"	Only visible if *Insert from "Label for raw data*" was activated with the context menu. User-defined properties of the type imc30 are imported automatically.

Reference Further texts

Free texts can be set at *Display/Text* 157 and on the tab *Axes/Text* 118.

3.4.5.1 Label for raw data

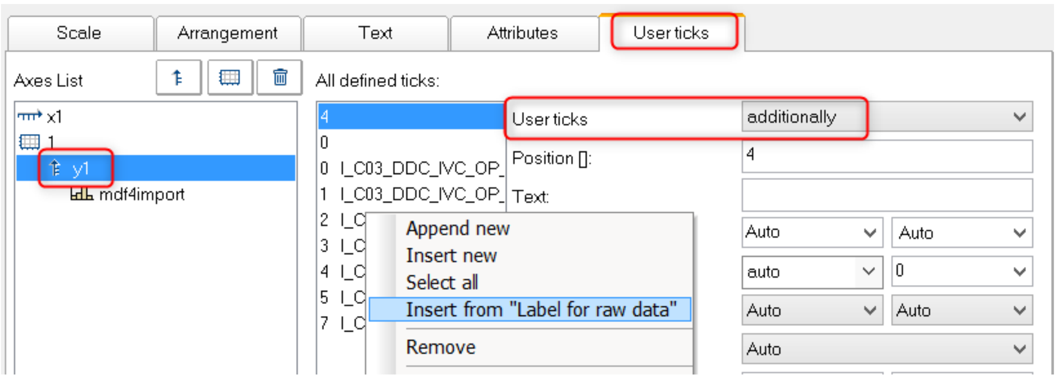
Some signals contain integers representing certain states or error codes. For instance, such a number can denote the gear in an automatic transmission (0=N, 1=D, 2=R, 3=P, etc.). Such information is typically recorded as an integer value.

imc's data format makes it possible to save such supplemental information along with the variable. One category of these "*user-defined properties*" is called *imc30* and lists texts which are provided by certain sources (MDF, CAN, etc.) as "Label for raw data[]".

When a data set contains such imc30-information, the values can be used as User Ticks.

Activating "Label for raw data"

- To import the data, open the dialog *Axes* -> Tab: *User ticks*.
- Select *additionally* or *exclusively* under *User ticks.*
- Select the affected Y-axis and right-click the mouse over the middle list, *All defined ticks.* Only when the signals has properties of the type *imc30*, the entry "*Insert from Label for raw data"* is visible.
- All *"Labels for raw data"* are imported.



Editing the presets for user ticks

As soon as *Insert from "Label for raw Data"* has been activated, the property *"Label for raw data"* is available with the following options:

no: as previously

yes: this tick is derived from a *Label for raw data[integer]*.

Template: Template, if new properties are associated with the channel.

FAMOS generates a tick without a text, at the position 0. This is used as a template. When new positions are added, new ticks are generated in accordance with these settings.

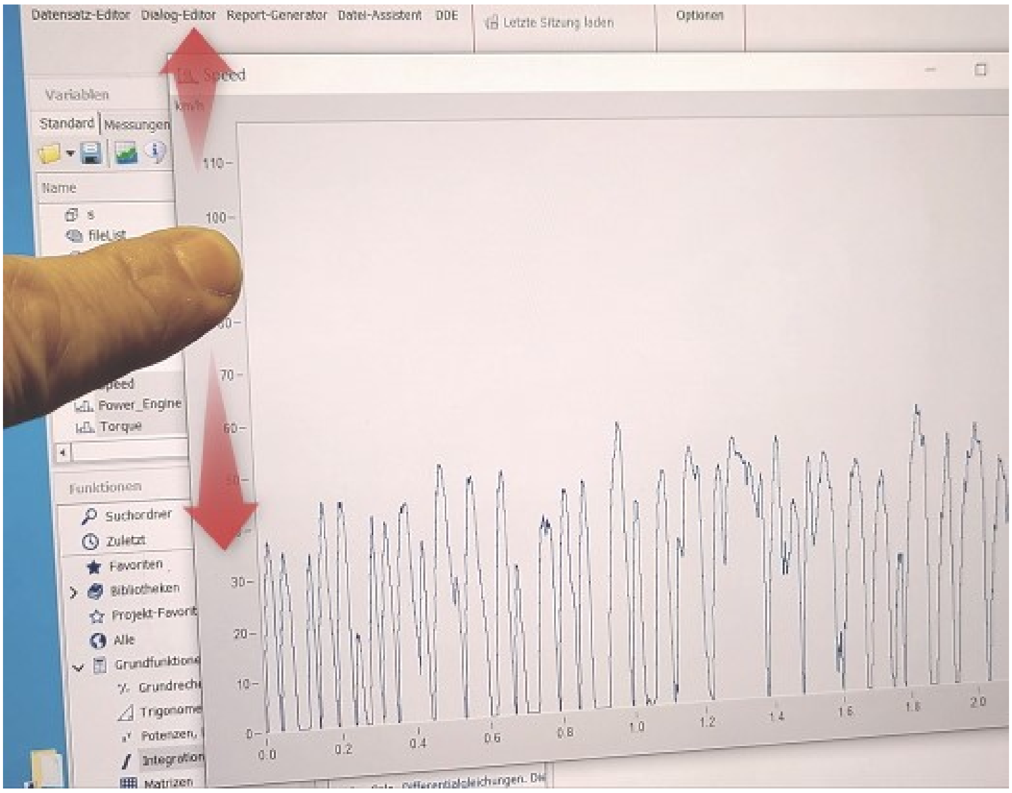
Remarks:

- When positions are discarded, the associated ticks are deleted.
- When you do not desire automatic updates, set the property *From "Label for raw data"* to *"no"*.
- *Label for raw data[integer]*: The value in brackets is a whole number in the channel's raw data, which means unscaled (whole numbers). If there are real numbers, only whole numbers are given consideration.
- *Label for raw data[integer]* always only pertain to a channel's y-values and is only suitable for the y-axis. XY-display is the exception, in which the x-axis represents the y-values of an XY superposition.

3.4.6 Touchscreen operation

Enhanced touchscreen operation for the curve window

For the purpose of operating the curve window by touchscreen, certain regions of the curve window are designated for performing certain actions. Thus for instance, in the upper or lower region of the curve window, you can slide the curve in the y-direction, and in the left or right margins you can slide the curve in the x-direction.



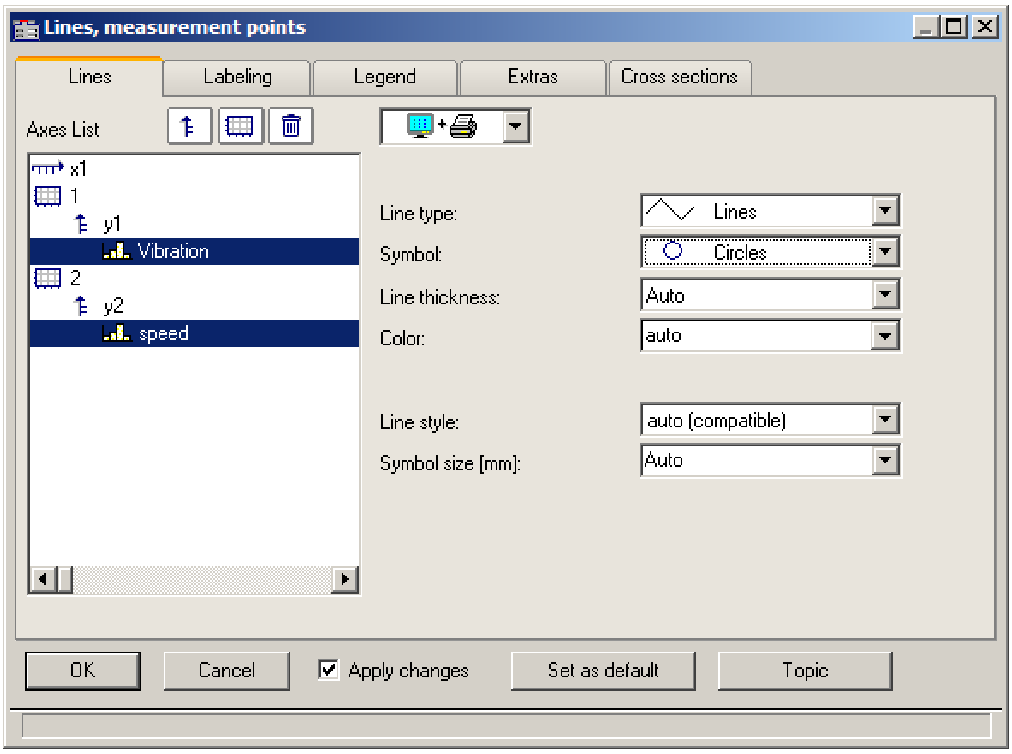
3.5 Line configuration

Function

Here, the type of line used to draw the curve and the symbols used to identify the sample values can be specified.

To make the settings for the lines, call the menu item *Configuration / Lines...*. Alternatively, you can switch directly from the dialog *Axes...* to the dialog *Lines* by using the button *Topic*.

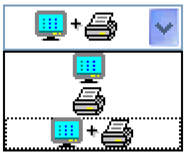
The dialog for setting line properties then appears:



3.5.1 Lines

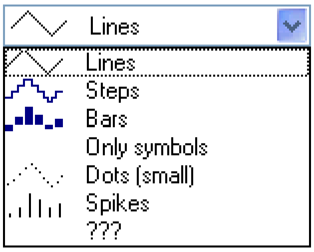
Appearance of lines in the screen display and in printouts

Effect on the printer and/or monitor screen



By making this selection, you determine whether the properties you set apply to the screen view and/or to the printer (or Clipboard). By this means, it is of course possible to make separate settings for the printer and for the screen. Not all properties can be set separately for the printer and the screen each.

Line type



Display of the samples. Normally, the samples are displayed by linearly interpolated solid *lines*. Alternatively you can select other display options from the list appearing further below.

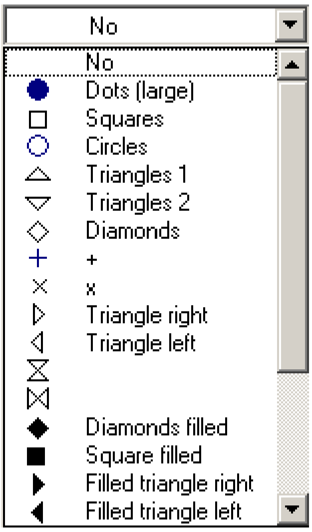
When displaying an RGB-image 93, there is a distinction between *Lines* and *Steps*. For *Lines*, the pixels are interpolated between the samples (original image points) with color gradients. With *Steps*, the interpolated pixels remain constant. With any RGB-image, all line types other than *Lines* are treated as *Steps*. If multiple samples fall on one and the same pixel on the screen, the system takes an average.

The line type is always the same for the printer and the screen.

Line type	Description
Lines	The "*Lines*" style displays the curve as a polygon, i.e. as straight lines connecting the points of the waveform. In an RGB-image, the pixels are linearly interpolated between the original image points.
Dots	When the option "*Dots*" is selected, only the points of the waveform are displayed as dots of one pixel each.
Bars	The "*Bars*" display shows every point of the waveform as a bar rising from the horizontal axis.
Steps	When "*Steps*" is selected, all points of the waveform are connected with stair-steps, i.e. each sample value of the waveform is held until the next sample ('sample and hold' effect). In an RGB-image, the pixels are interpolated by a constant value between the original image points.
Only symbols	With the setting "*Only symbols*", there is no continuous line. At each measured point, a symbol (e.g. a square) is drawn. The particular symbol desired must then be selected under the *Symbol* control.
Spikes	"*Spikes*" are vertical lines extending from the x-axis to the height of the measured value.

Symbol

Every measured point is indicated with a symbol.



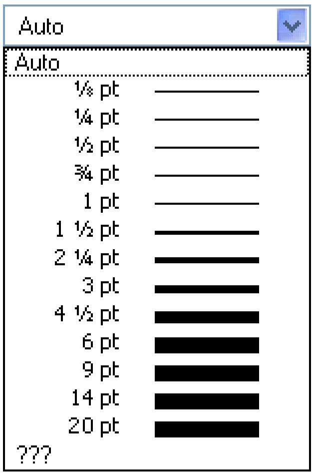
The symbol type desired is selected form this pop-down list. Symbols can be displayed either together with a line or all alone.

In special cases, not every measured point is represented by its own symbol, but rather the symbols are distributed evenly along the plot, for example, in order to differentiate between the plot lines of different channels. See the section on the menu item *Configuration/ Display* 21, in connection with the property *Number of symbols*.

The symbol always appears the same on screen or printed out.

A fixed number of symbols can be specified on the "*Extras* 134" tab.

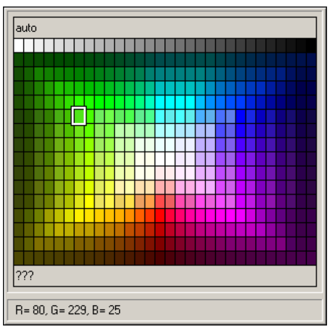
Line thickness



The thickness of lines can also be selected. It pertains no only to continuous plot lines, but also to other line types and certain symbols.

The line thickness can be different for the printout and for the screen display.

Color

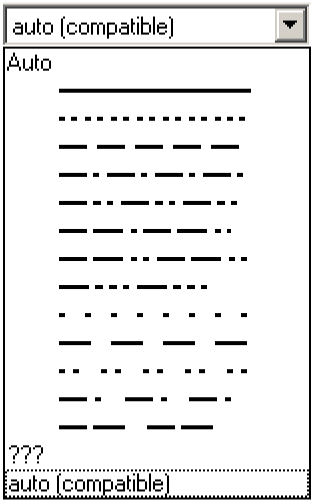


Here, the color of the line or symbol can be specified. If the color is set to *auto*, it is selected automatically by the system. In that case, a line's color depends on its order of appearance among the lines, and on the corresponding global settings for color assignments in the curve window; see the discussion of the menu item "Options / Colors 249".

It is also possible to select a fixed color from the palette provided, which cancels all automatic settings.

The color can be different for the printout and for the on-screen view.

Line structure



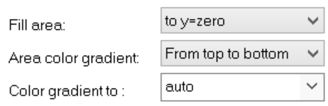
This determines the line's structure. If the structure is set to *auto*, then different line structures are assigned in succession, i.e.the first line is solid, the second dotted, the third dashed etc. For *auto (compatible)*, the global setting *Curves in structure* is observed. This mode is compatible with imc FAMOS 5.0, where the line structure was set globally in the *Colors*-dialog.

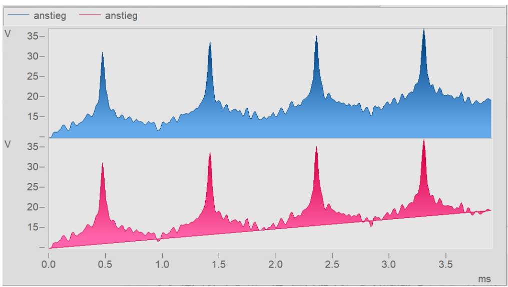
Symbol size [mm]

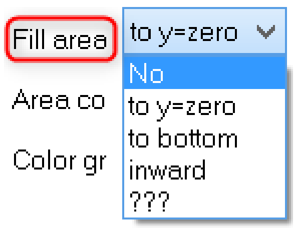
If symbols were selected for display of the measured points, the diameter in mm can be defined here. For *auto*, the global setting *Symbol diameter* is observed.

Fill area

Fills the area below a line.





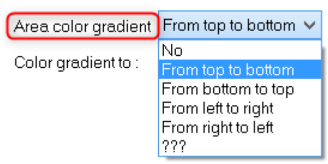


no: as previously

to y=zero: Fills area below the graph up to the zero line.

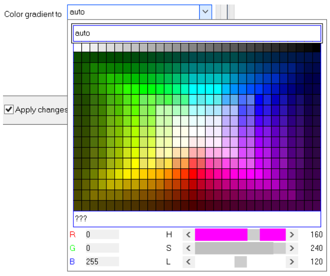
to bottom: Fills area to the bottom edge of coordinate system.

inward: encircled area. The last sample of the data set displayed is connected to the first sample. An closed line results, and the area it encloses is filled.

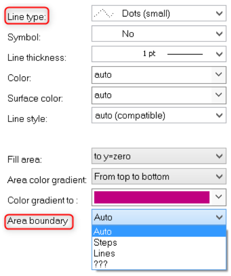


If ***Fill area*** is not ***no***:

Area color gradient: Specifies the color gradient for the filled area. without color gradients, only the one color is applied evenly. Otherwise, the color transitions from one line color to another. The second color is specified under ***Color gradient to***.



Color gradient to: auto (like the line itself) or permanently selected. For ***auto*** and color gradient, a lighter variant of the line color is drawn.



If ***Line type*** = ***Dots*** or ***only symbols***, there is the additional option

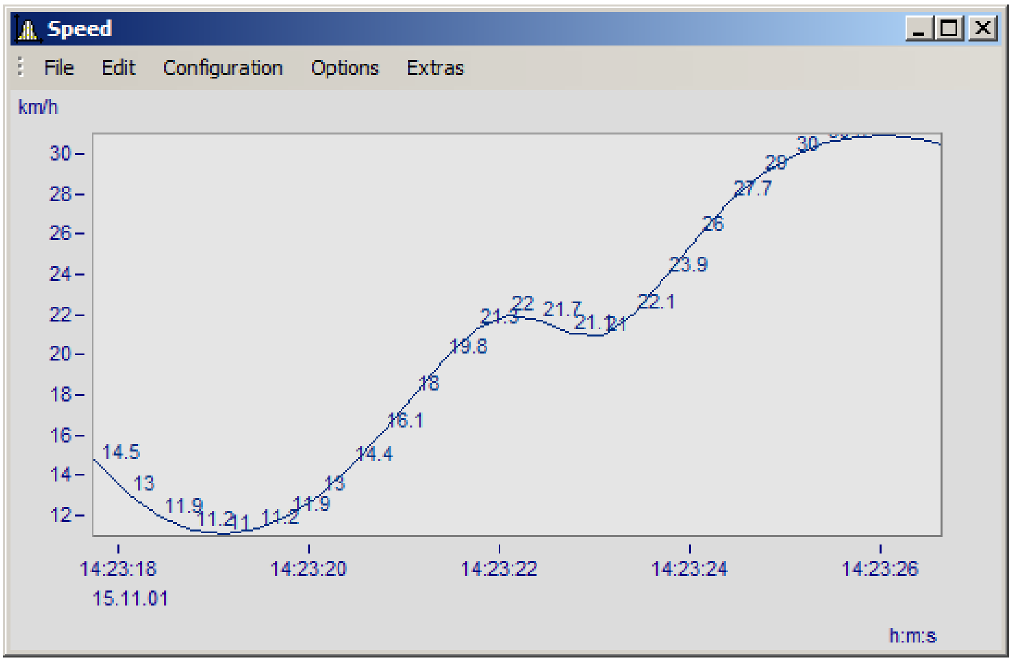
Area boundary: This determines whether the edge of the area is interpolated linearly or appears in discrete steps.

If multiple curves are displayed with overlap, the order for each curve is:

1. first the area
2. then measurement uncertainty
3. then lines

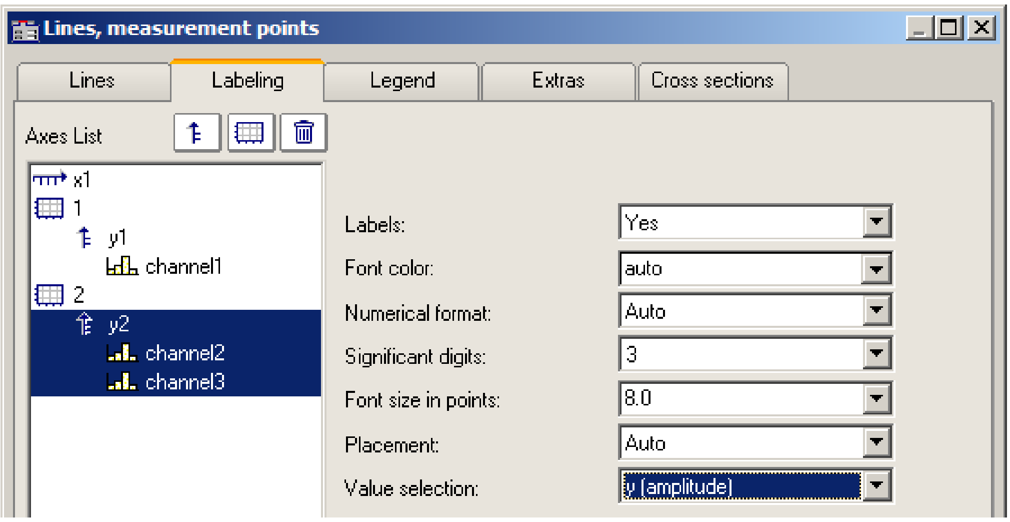
It is possible to generate a **pure** area without any borderline by setting ***Line type*** = ***Only symbols*** and ***Symbol = empty***.

3.5.2 Labeling



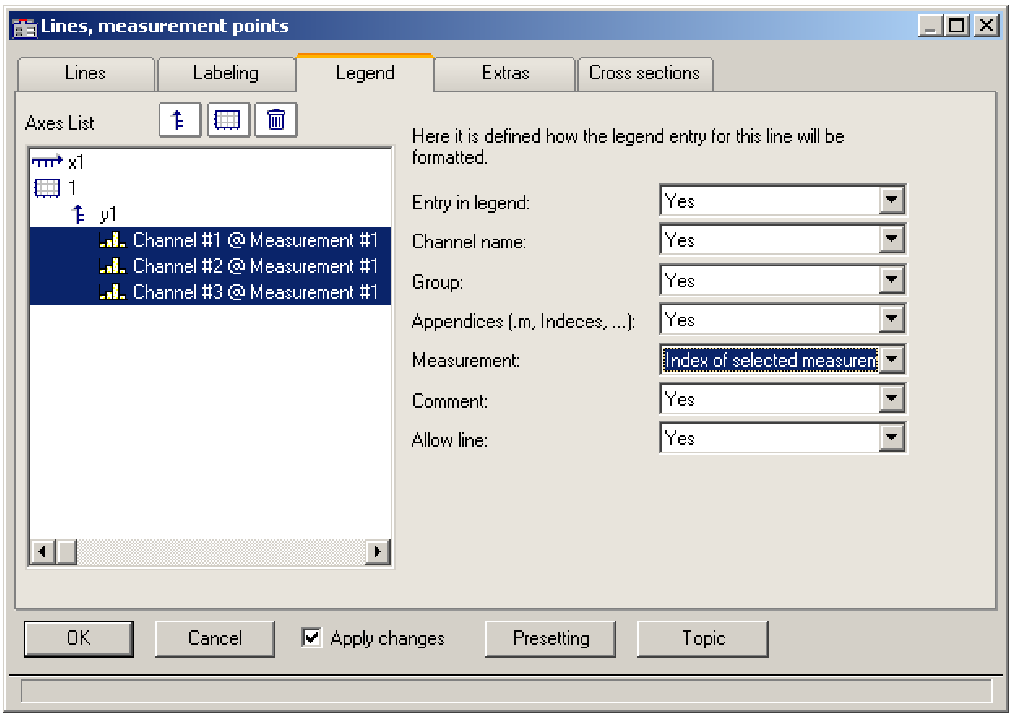
Here you can set whether or not the measurement points are labeled with text stating their numerical values.

For the ***labeling*** of the numerical values, the ***color***, ***format***, ***number of valid digits***, ***font size*** and ***position*** can be set.



Using ***Value selection***, you can set which values are displayed: y, x, parameter, magnitude and phase

3.5.3 Legends



Options for displaying the legend

By selecting this tab, you can select various options for displaying the legend pertaining to the line selected.

Note

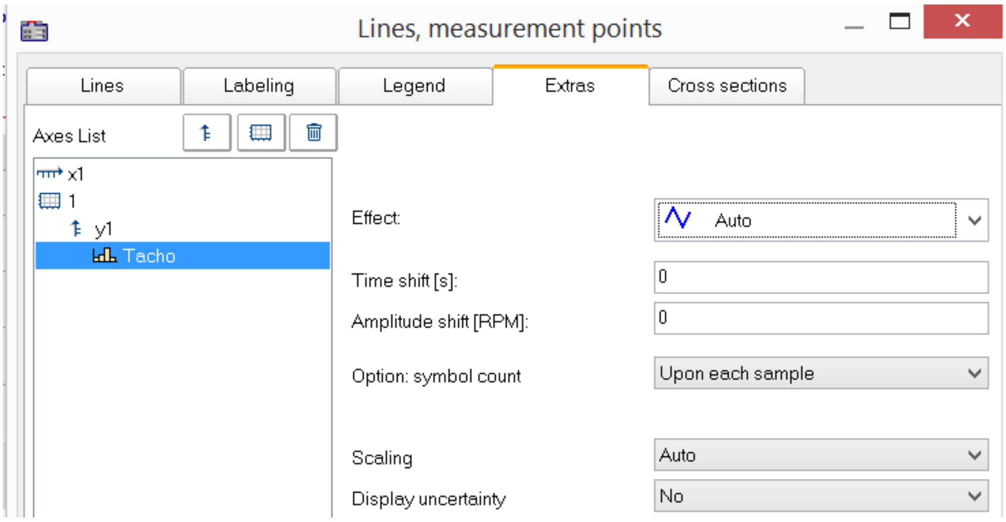
If you display only one data set in the curve window, the legend is only displayed if you have set the control for *Display\Legends\Display Legends* 137 to *always*.

Settings	Description
Entry in legend	The option *No* means that no legend is displayed at all. Selecting *Yes* means all options are shown.
Channel name	Determines whether the channel name is displayed.
Group	Specifies the group for grouped data sets, e.g. Measurement1:Channel_01
Appendices (m, Indices, ..)	Indication of component or event number, e.g. Spectrum.b
Measurement	Here, the option *Number of the selected measurement* is especially interesting, which enables display of the measurement number instead of the measurement name.
Comment	This is the channel comment as described in the imc FAMOS manual, in the chapter Properties/ Charact. Dialog (Waveforms). For channels recorded using imc STUDIO, the comment can be entered as a channel property.
Allow line	This determines whether an example of the line's appearance is displayed to the left of the label.

Additional general legend settings are described here: *Menu Configuration / Legends* 137.

3.5.4 Extras

On the page *Lines\Extras*, special display options are available:

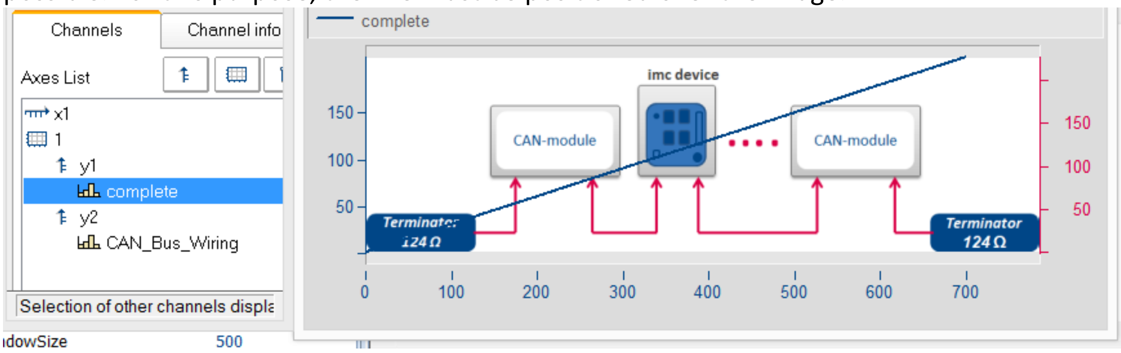


- Time-/Amplitude-Shift 133: Shifts the line in the curve window without changing the values of the variable.
- RGB-image 132: Display of an image made of segmented data.
- Special color map display 133
- Reduction of the symbol display 134
- Measurement uncertainty 135

Effect: Image from RGB-values

When the color-flag is set, for RGB variables, the parameter ***Effect*** in the *Extras* dialog is automatically set to "*Image from RGB-values*". Otherwise, it can be set manually here.

The property applies to each line separately, which means that superpositioning of an image with a curve is possible. For this purpose, the line must be positioned over the image.

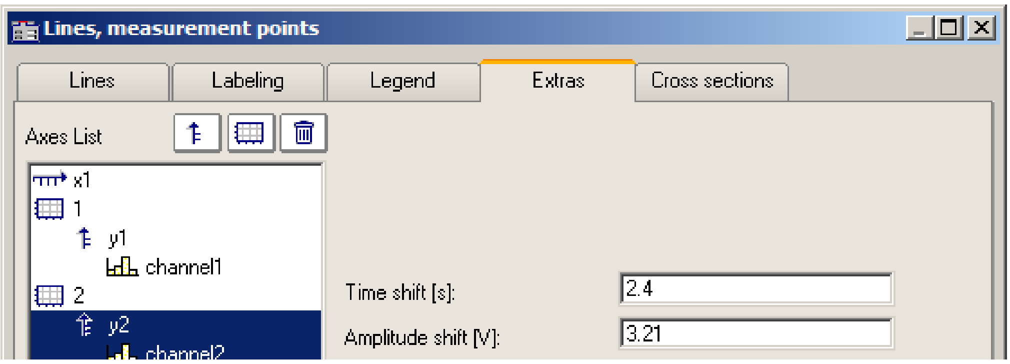


References

General info on RGB-images is presented in the chapter Display variants of the curve window 93

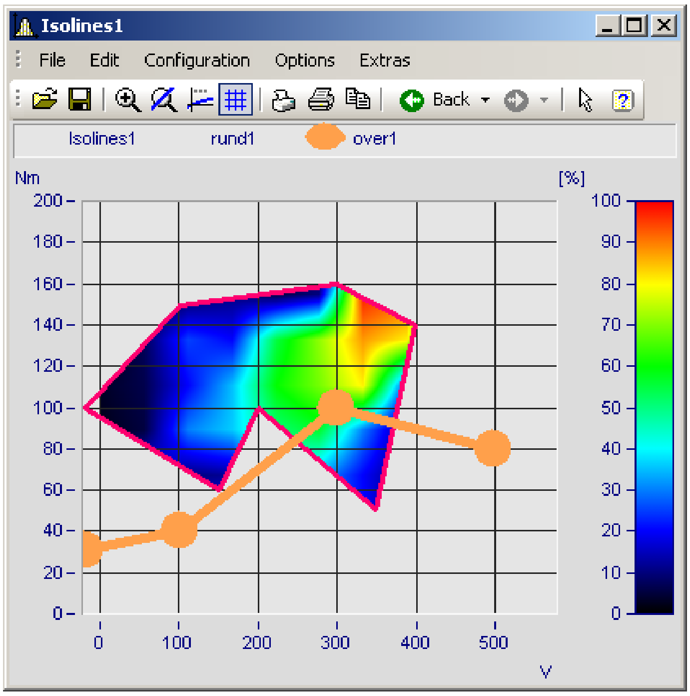
Info on aspect ratio and resolution is in the chapter Axes configuration/Arrangement 117

In display mode *Default*, you can manually specify the parameters of the Line-Shift function here. For more info, see the section Line-Shift 232.

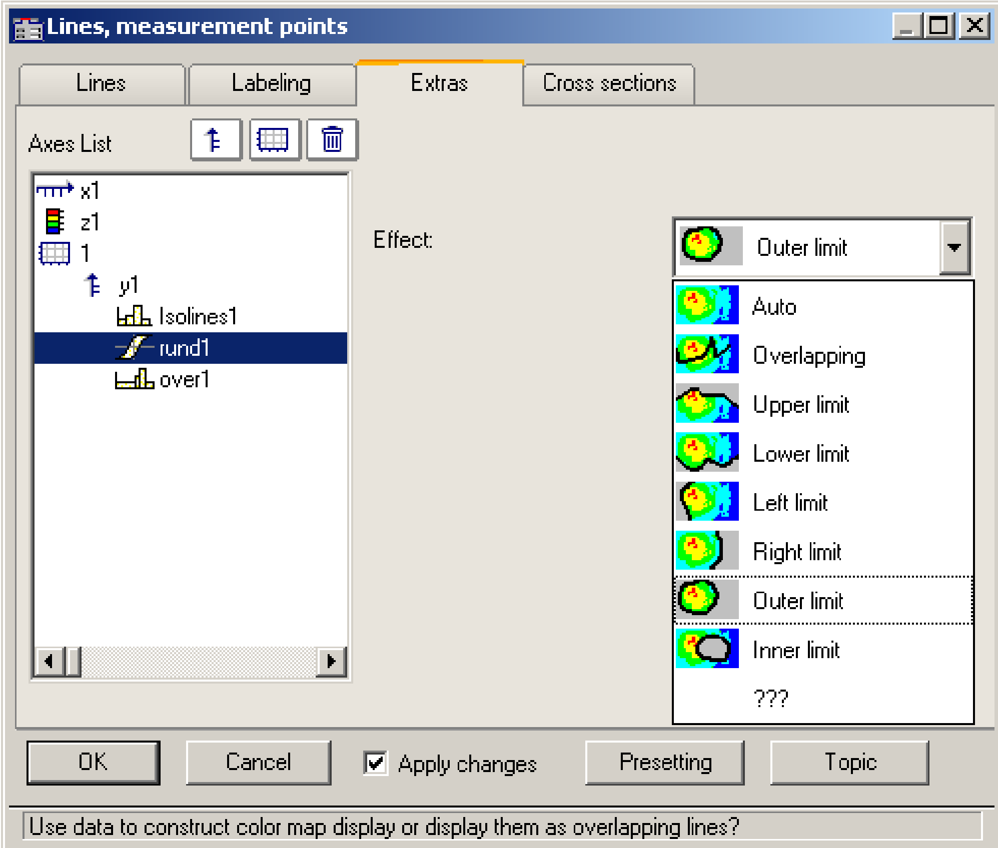


Data are moved in the picture in terms of the X- and Y-coordinates.

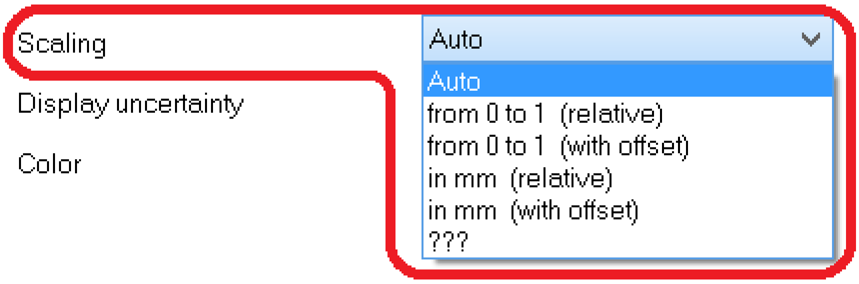
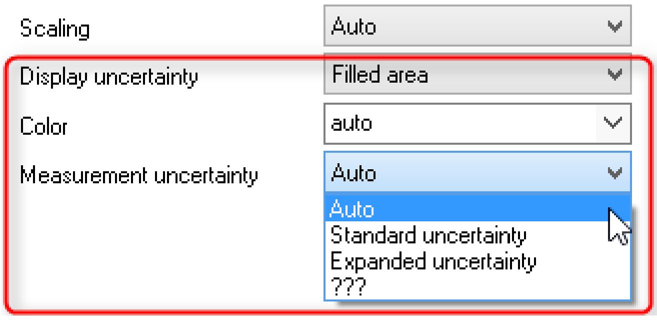
In the display style *Color map*, this menu contains the function *Effect*, with which you can use XY-data to construct the color map, or to superimpose as actual lines on the color map. This makes such displays as shown below possible.



In this picture you see a function for constructing the color map, and a function for superimposing a line over the color map.

<table>
<tr><th>Settings</th><th>Description</th></tr>
<tr><td>Effect</td><td>The available Effects are 1) Overlapping for superimposing a line over the color map, and 2) various margin functions affecting the construction of the color map.
<table>
<tr><th>Effect</th><th>Description</th></tr>
<tr><td>Overlapping</td><td>An XY-waveform is superimposed as a line over the color map. For the purpose, the usual line properties are available.</td></tr>
<tr><td>... limit</td><td>An XY-waveform is inserted into the color map as a real line and frames the color map view as either the upper, lower, left, right, outer or inner margin, according to the setting for Effect.</td></tr>
</table>


</td></tr>
<tr><td>Symbol</td><td>The number of symbols can be defined with "Option: symbol count" and "Number of symbols". Symbols are activated on the line tab 127.</td></tr>
</table>

Settings	Description
Scaling	 Independently of the coordinate system, the data can be scaled in millimeters. By this means, it is possible to use a data set to define a graphical object, which retains a constant size regardless of the current zoom level. Alternatively, the data can be displayed in a value rage from 0 to 1 across the entire coordinate system. The position of the data can be set to a particular coordinate by means of an offset. This is accomplished using the user-defined property *Offset X display* or *Offset Y display*
Display uncertainty (tolerance range)	 The data set's measurement uncertainty can be indicated either as a *Line* or *Filled area*. The value of the measurement uncertainty is entered as a property of the variable already when the data are captured, and it appears in imc FAMOS as a *user defined channel property*. Alternatively, it can also be set in imc FAMOS as a *user defined property* in the *channel property* dialog, or by means of the function "UserProSet(Data, "Uncertainty"...). Example: UserPropSet(Data, "imc33", 0.3, 0, 0) or UserPropSet(Data, "Uncertainty", 0.3, 0, 0) *Measurement uncertainty:* • *Expanded uncertainty*: In accordance with GUM, the expanded measurement uncertainty is a symmetrical interval around the measurement value. • *Standard uncertainty*: Measurement uncertainty expressed as standard deviation.

3.5.5 Cross sections

Here you can set the default appearance of cross-sections for x-, y-, and z-data sets or segmented waveforms or segmented waveforms with the respective position. For more info see the section Connect with 3D 230.

3.6 Additional display options

3.6.1 Display

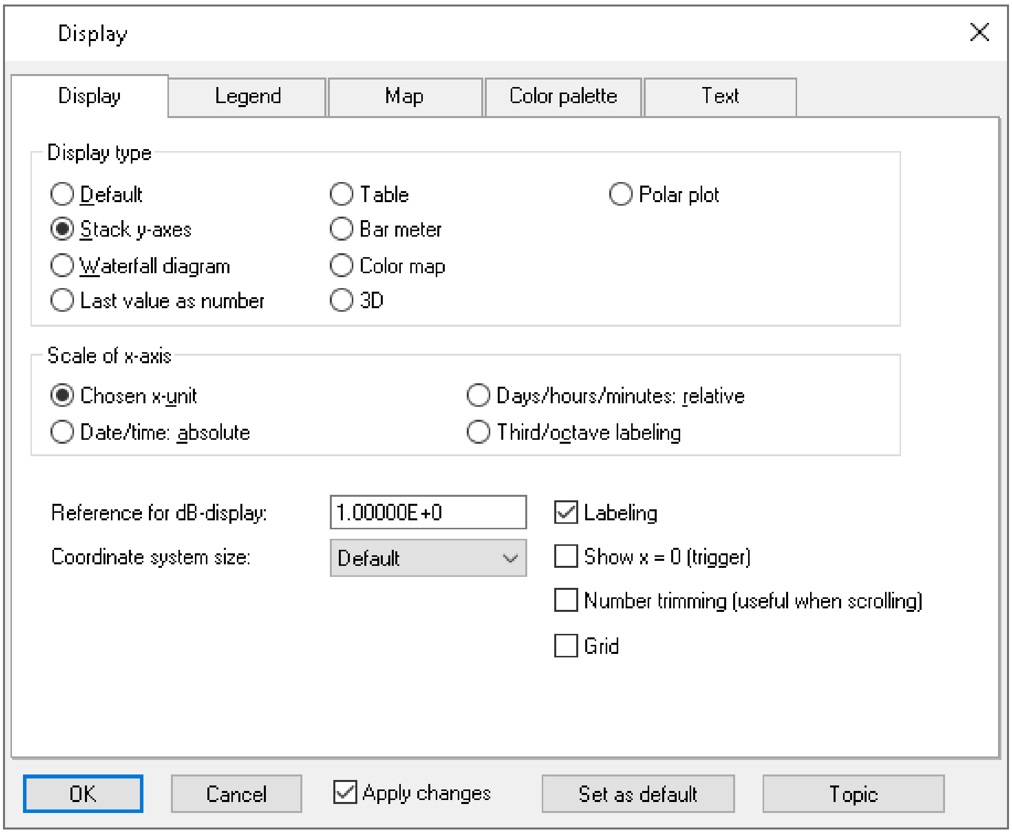
Function

The display mode of a curve window can be defined in a variety of ways.

Calling the dialog

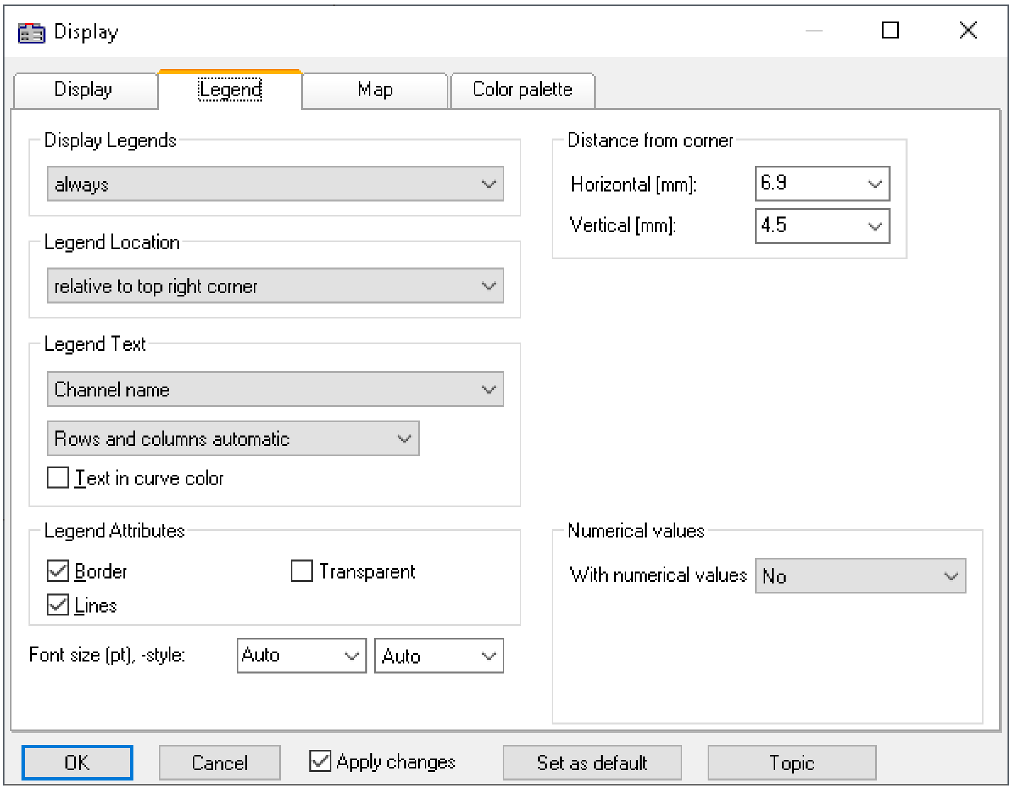
Select menu option "*Configuration*" > "*Display*" in the curve window. A dialog appears in which the curve window display can be defined.

Tap	Description
Display 21	Display variants of the curve window
Legends 137	All curve windows can include a legend, with the channel (variable) name, line color etc.
Map 140	Map lets you place a picture in the background. It is additionally possible to layout the picture in specified coordinates.
Color palette 153	A channel's color can be governed by a reference signal's amplitude.



3.6.1.1 Legends

All curve windows can include a legend, with the channel (variable) name, line color etc. Select "*Configuration*" > "*Legends*" in order to make the desired settings.



Display Legends

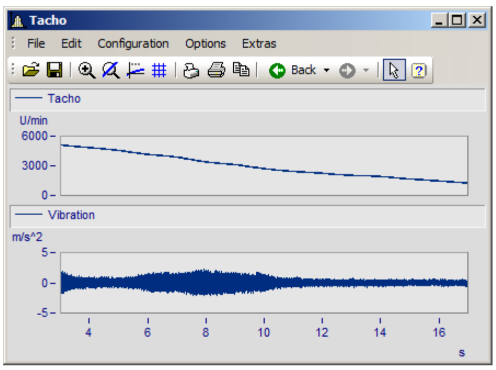
Specify here the conditions under which a legend is to appear. The following options are available:

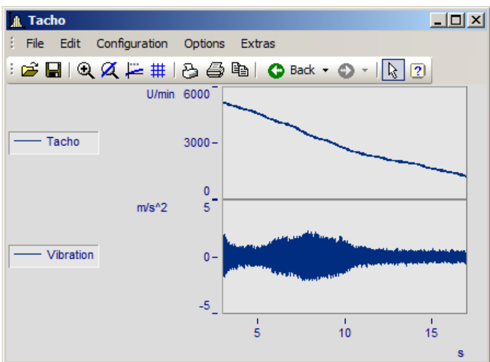
- *Automatically*
- *Always*
- *Never*
- Only if more than one curve is present

Legend Location

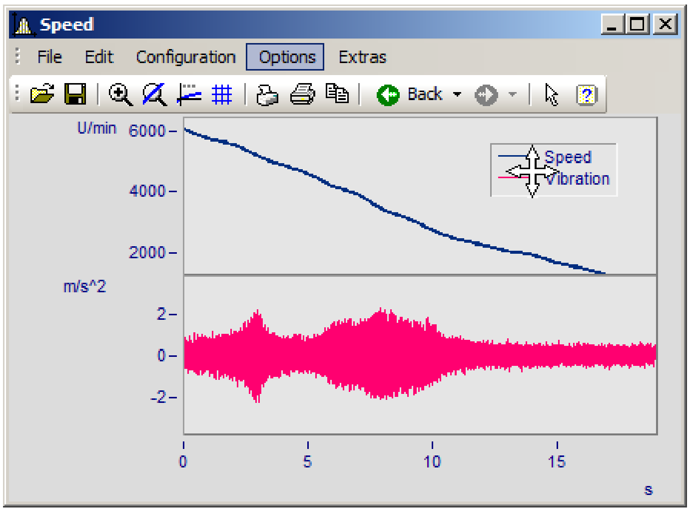
By default, the legend for all variables appears above the curve.

Alternatively, the combobox control *Legend Location* allows the legend to be placed above or to the left next to each coordinate system.





For making placements **within** the coordinate system, additional entries are available. It is possible to move the legend to anywhere within the coordinate system by means of the mouse.



Legend Text

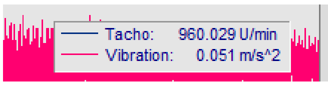
Specify here the text which is to appear in the legend, as well as the format and color of the text. The following options are available:

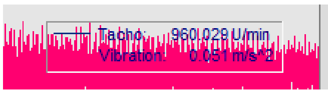
Settings	Description
Channel name	the variable name, with group name if available, is displayed. In the Data-Browser, affiliation to a membership is indicated by *Channel @ Measurement*; if there is no such affiliation, only the channel name is displayed.
Channel name (without group name)	only the variable name is displayed.
Channel comment	the comment entered for the channel on the "Characteristics"-file card in the imc FAMOS dialog *Variable/Properties* is displayed. See also the notes on Greek letters 267.
Channel name and comment	the variable name, with group name and corresponding comment are displayed.
Channel name (without group name) and comment	only the variable name and the corresponding comment are displayed.
Channel name without measurement	only the channel name will be displayed. Even if the channel belongs to a measurement, the name of the measurement will not be displayed. - Only relevant in the Data-Browser.
Channel name with index of selected measurement	if the channel belongs to a measurement and if that measurement is currently selected, then the index (number) of the selected measurement will be displayed instead of the name of the measurement. If no index is available, then the name of the measurement will be used. If no measurement is available, then only the channel name itself will be displayed. - Only relevant in the Data-Browser.

The legend text can be ordered in any of the following ways:

- Rows, columns automatic
- Always row
- Always 1 column
- Fixed number of rows (enter the number)
- Fixed number of columns (enter the number)

Legend Attributes





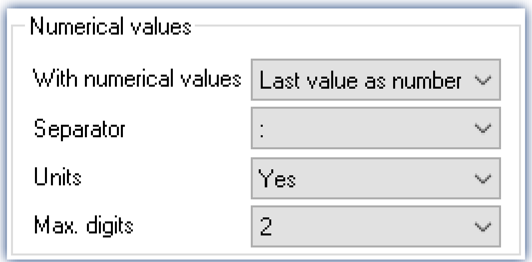
The option *Border* places the legend in a frame, which provides a 3D-effect.

Lines draws a line behind the variable's name in the color of the associated curve.

Transparent makes the curves visible behind the legend.

Numerical values

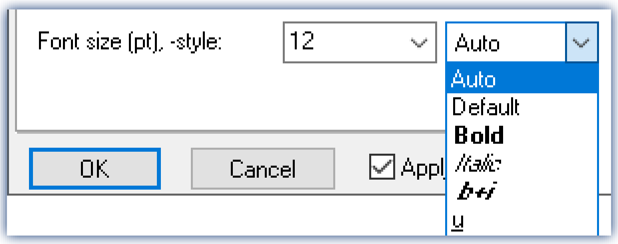
With running measurements, it is possible to display the updated values in the legend. To do this, in the box of controls "*Numerical values*", select the list box entry "*Last value as number*" for the control "*With numerical values*".



Settings	Description
Separator	*Separator* inserts a colon or equal sign.
Units	*Units* controls whether or not the units are indicated: *yes* or *no*
Max. digits	Maximum amount of digits possible. This determines the distance between the variable's name and the numerical value.

Font size (pt), -style

The font size and font style for the legend can be set manually here.



OK, Cancel, Set as default

For details on operation, see the chapter Confirmation bar 178

3.6.1.2 Map

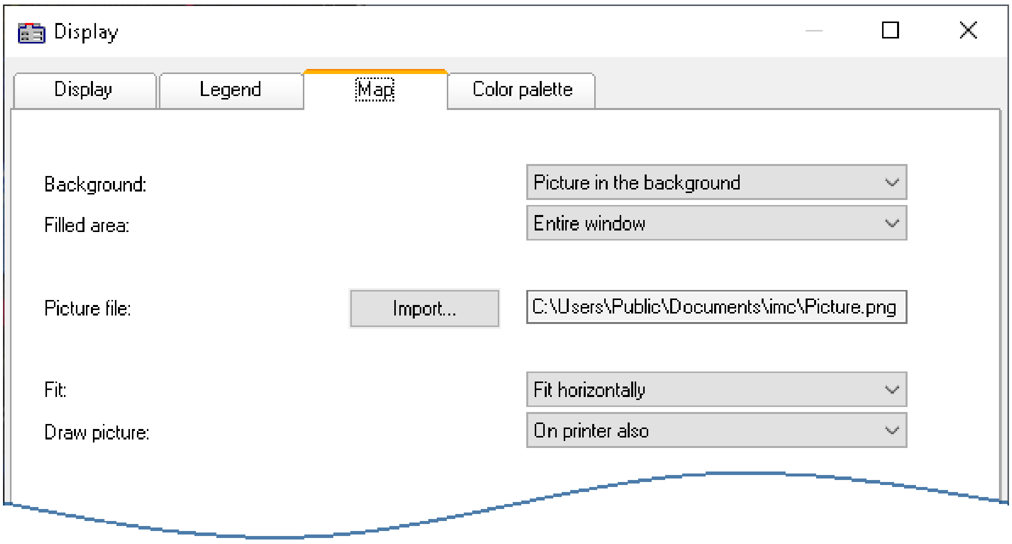
Function

Map lets you place a picture in the background. It is additionally possible to layout the picture in specified coordinates.

Mouse Operation

In the dialog called by the menu item *Configuration / Display*, select the option *Map*.

3.6.1.2.1 Background picture



Settings	Description
Background	Select Background to place a picture in the "*Background*"
Filled area	"*Coordinate system*" or "*entire curve window*"
Fit	"*auto*" adjusts both the picture's horizontal and vertical dimensions. "*Retain size*" does not adjust the size but centers the picture. "*Fit horizontally*" and "*Fit vertically*" each adjust the picture's respective dimension.
Draw picture	The option *Only on screen* is used to prevent the printer from printing the picture out.

Constraints

- *Background*: Only for *Default display*, *Stack Y-axes*, *Last value as number*, and *Table*. Applicable with limits to *Color map* and *Bar meter*, since the largest part is hidden. Not possible for *Waterfall* or *3D* display.
- The button *As presetting* is available in either the *Background picture* or *auto* modes. In the presettings, the filename and directory path of the picture are recorded. For any new curve window, the system first looks for this picture there.
- The background picture or the map is saved with a curve configuration file (CCV).
- .BMP files are very large, but can be adapted well to the display. JPG files normally are smaller, but are less capable of being adapted to the display.

3.6.1.2.2 Map

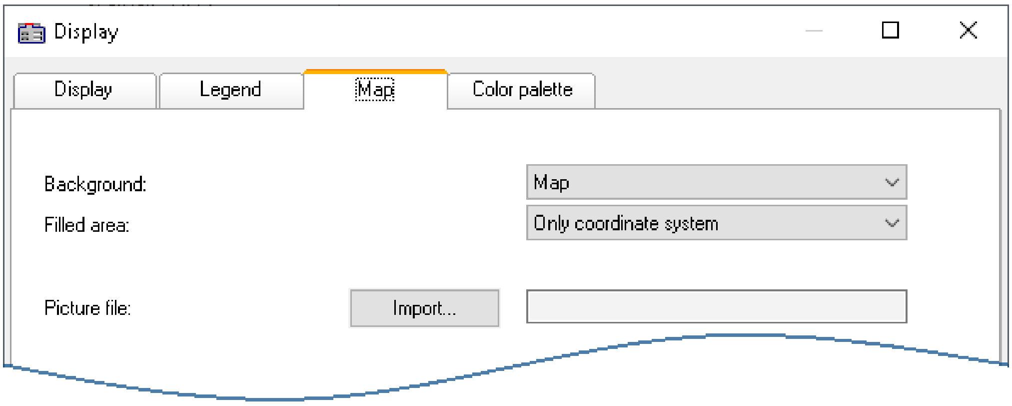
Positioning a map as the background picture

On the following conditions, a picture can be correctly displayed as a map:

- selected curve window configuration: *Display \ Default*
- linear axes
- only one coordinate system

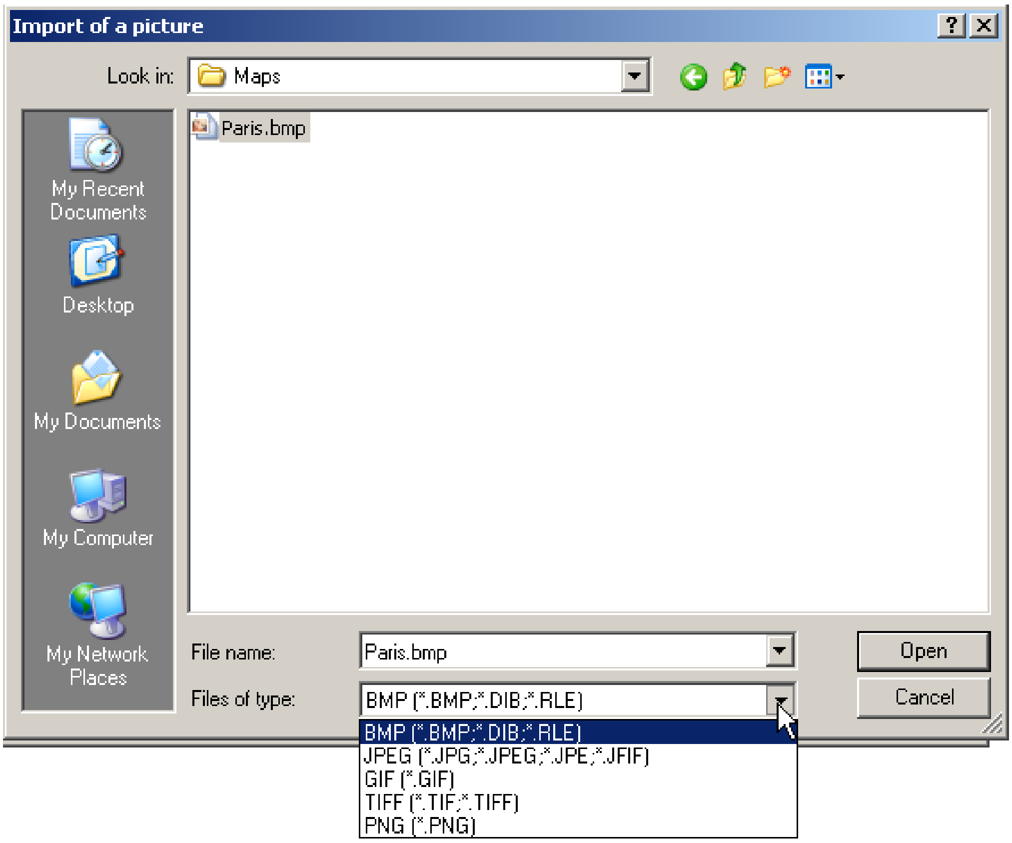
The following example illustrates how GPS data are linked with a map.

Import of a picture



Select the "Map" page and set the background to "Map"

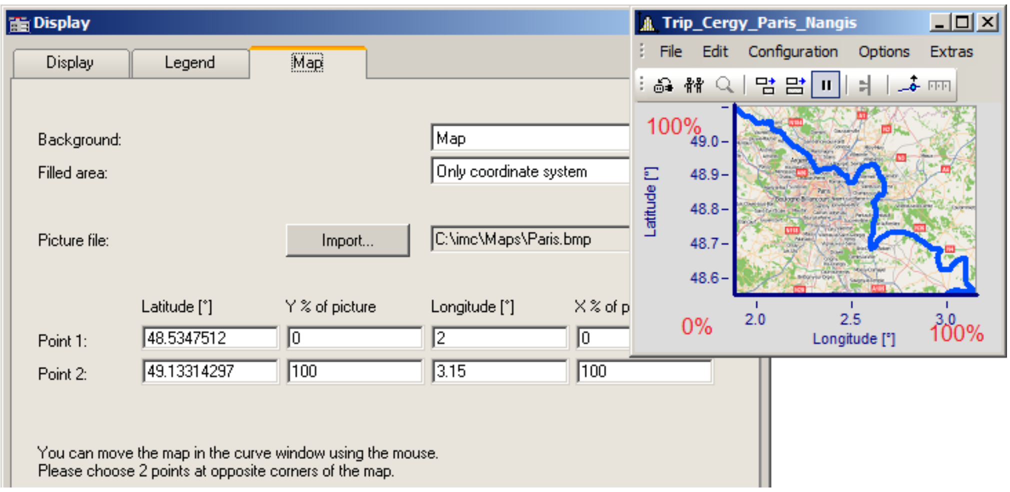
Click on the button *Import* and select a *picture file*. Specify its format.



Selecting a picture file. All customary graphics formats are available.

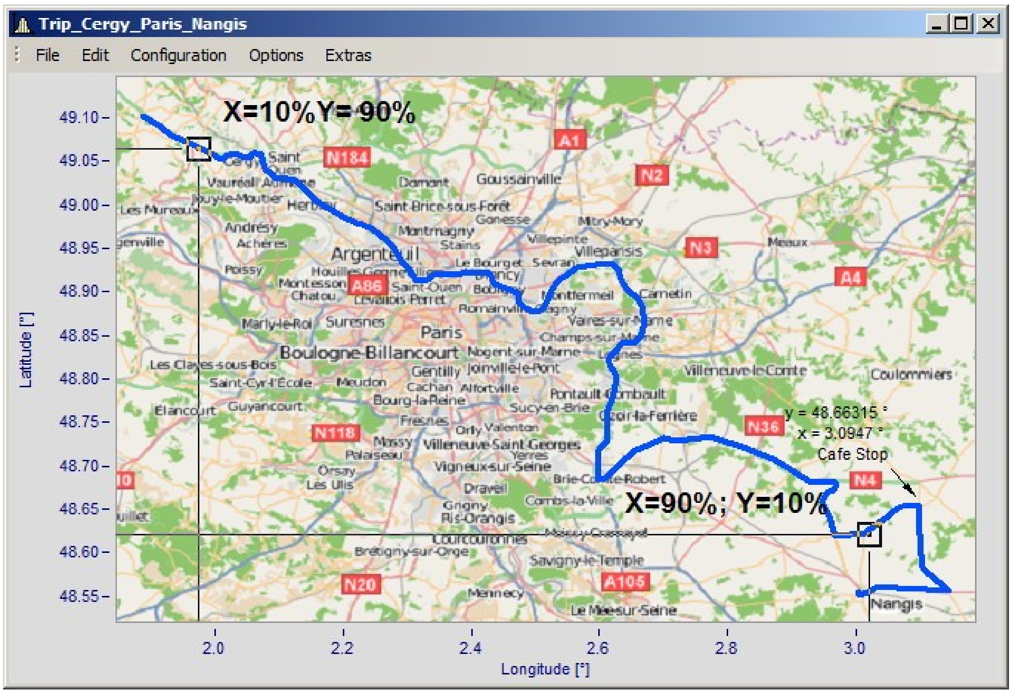
Adapting maps and Map Mode

To position a map, you must specify two points. This accomplished by making entries in the input boxes. The curve window is then in Map Mode.



Specifying points: Point 1 at bottom left, Point 2 at top right

The points are entered into the curve window while the Map dialog is open. Move the points by clicking within the squares and dragging the points using to the mouse to the correct positions.



By moving, the points' X- and Y-positions are updated.

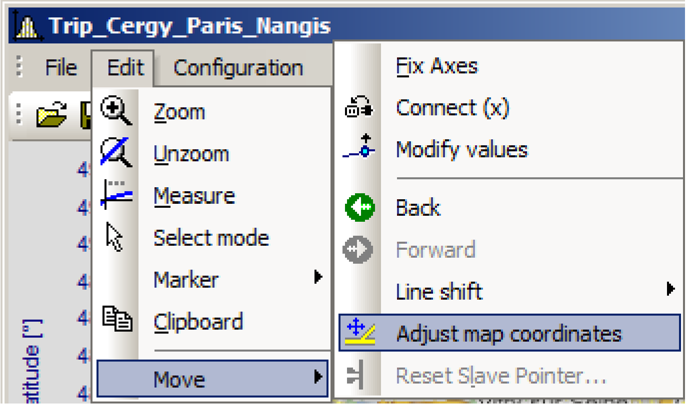
The mouse pointer changes appearance in response to the position in the curve window.

- Drag the entire map by clicking in the center of it.
- Stretch the map by clicking either at the right, left, top or bottom of the map.
- Move the position points by clicking within the squares.

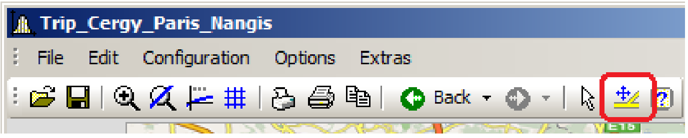
Adjusting the map and points in response to the mouse position

Activating Map mode retroactively

Once the map dialog has been closed, you can use menu commands to adjust the map: *Edit\Move\Map*.



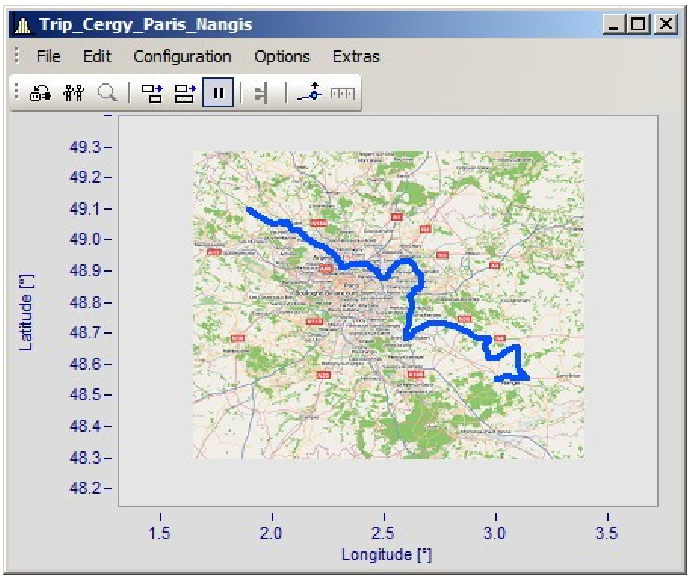
Alternatively, activate the mode by means of the toolbar. To do this, adapt the Toolbar 260.



You can also drag this function into the toolbar.

Curve window and map

The map is dependent on the axis' coordinates:



This shows the effects of magnifying the axis width

Not that the picture is magnified, stretched or trimmed. Only the details of the original picture can be displayed. The maps used must have an appropriate projection. Constant latitude and longitude lines must be displayed as straight lines. The distances must be equidistant.

Naturally, a map extending from the north to the south pole cannot meet this requirement. The same applies to map material near the poles and the dateline.

Alternatively, you can use a static picture in the background 140.

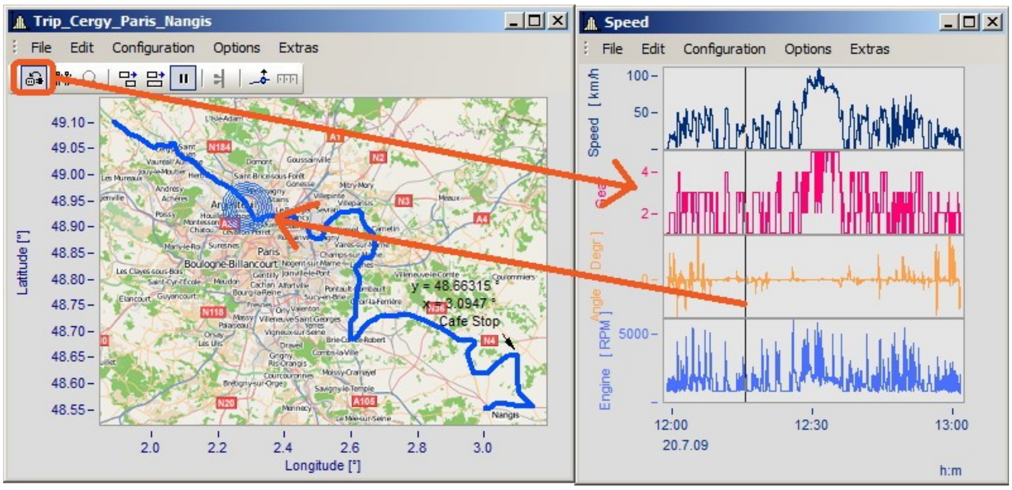
Constraints:

- *Map*: Only for Default display and Stacked Y-axes, but only for the first coordinate system and first Y-axis. All axes must be set to linear (no 1/3-octaves or absolute time).
- The button "*As presetting*" is not available in Map mode.
- The background picture or map is saved with a curve configuration file (CCV).
- .BMP files are very large, but can be adapted well in a display. JPG files are smaller but are not able to be adapted as well.

Linking a map with time data

It is possible to link a curve window displaying time data with a map display.

If the map contains an XY-channel, it is possible to link this channel with time data from a different curve window. To do this, drag the linking tool icon from the Communication toolbar to the desired curve window.



Linking the map with time data from a different curve window

You can move the position on the map in concert with the time marker line in the second curve window.

3.6.1.2.3 Map (from Internet)

Automatic loading of a map from the Internet

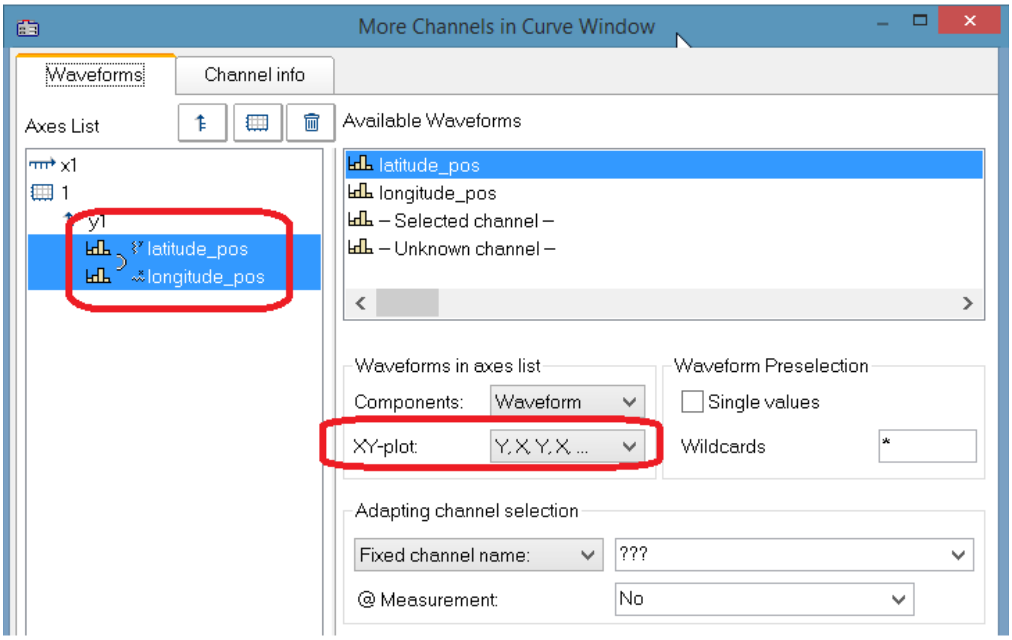
On the following conditions, a picture can be correctly displayed as a map:

- selected curve window configuration: *Display \ Default*
- linear axes
- only one coordinate system
- a data set with plausible position data is displayed.

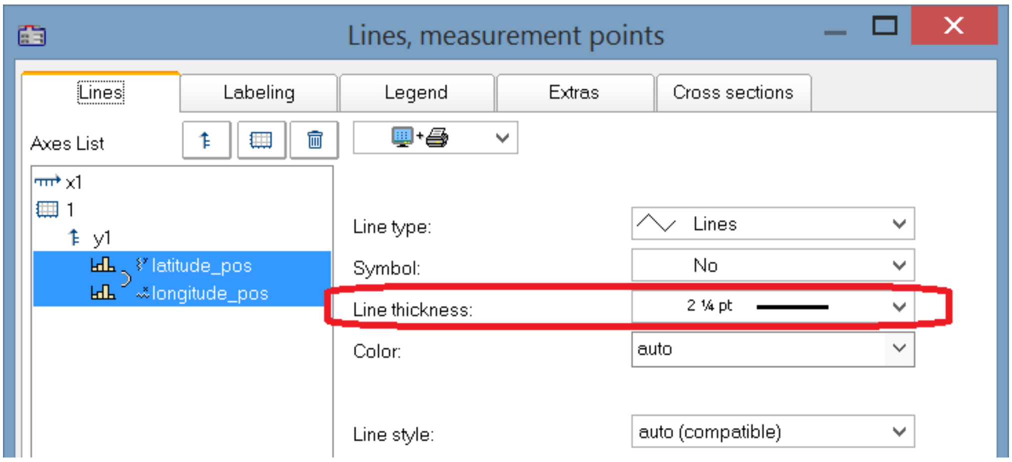
The following example shows how GPS data are automatically superimposed on a map from the Internet.

Selection and display of the GPS data as an XY-plot

Load the data sets for Longitude and Latitude and display them as an XY-plot. To do this, open a curve window with the two components and superimpose them by means of the dialog "*More Channels in Curve Window*":

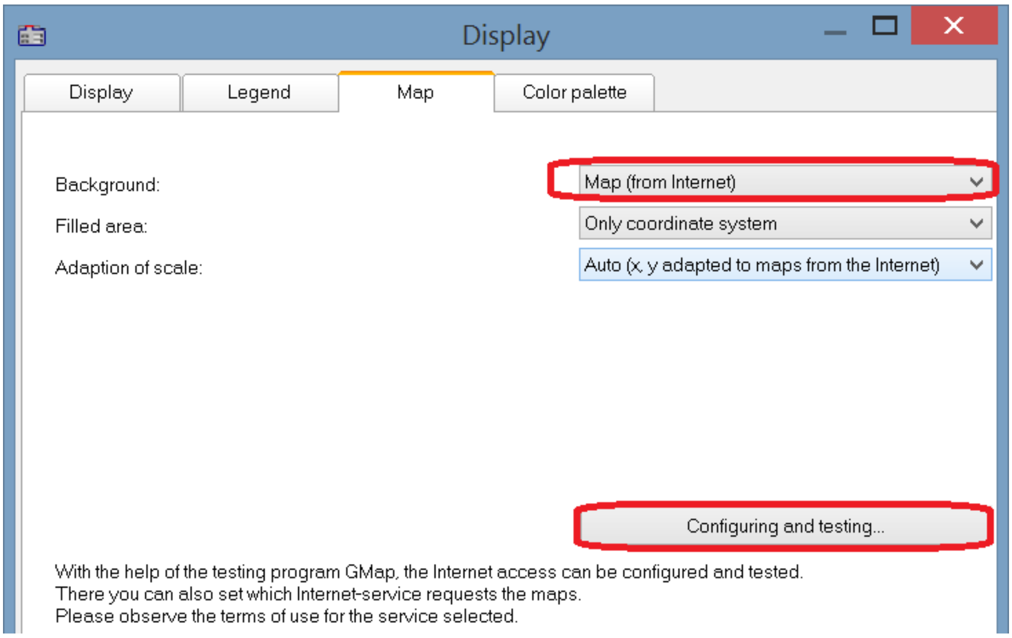


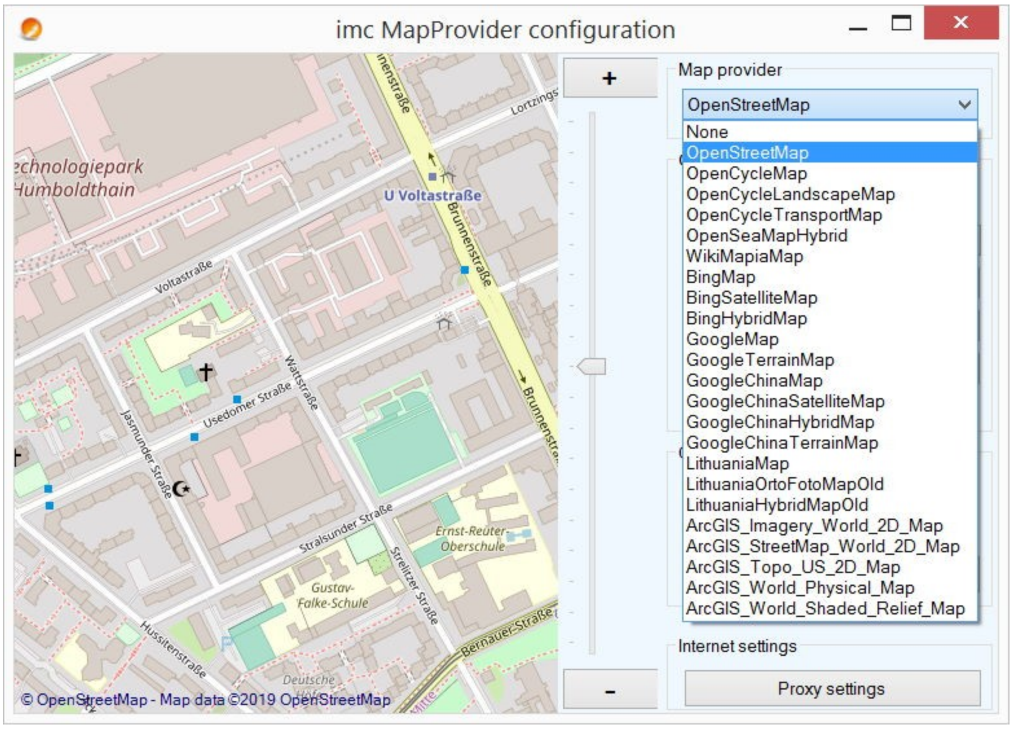
It is advisable to draw the lines more thickly:



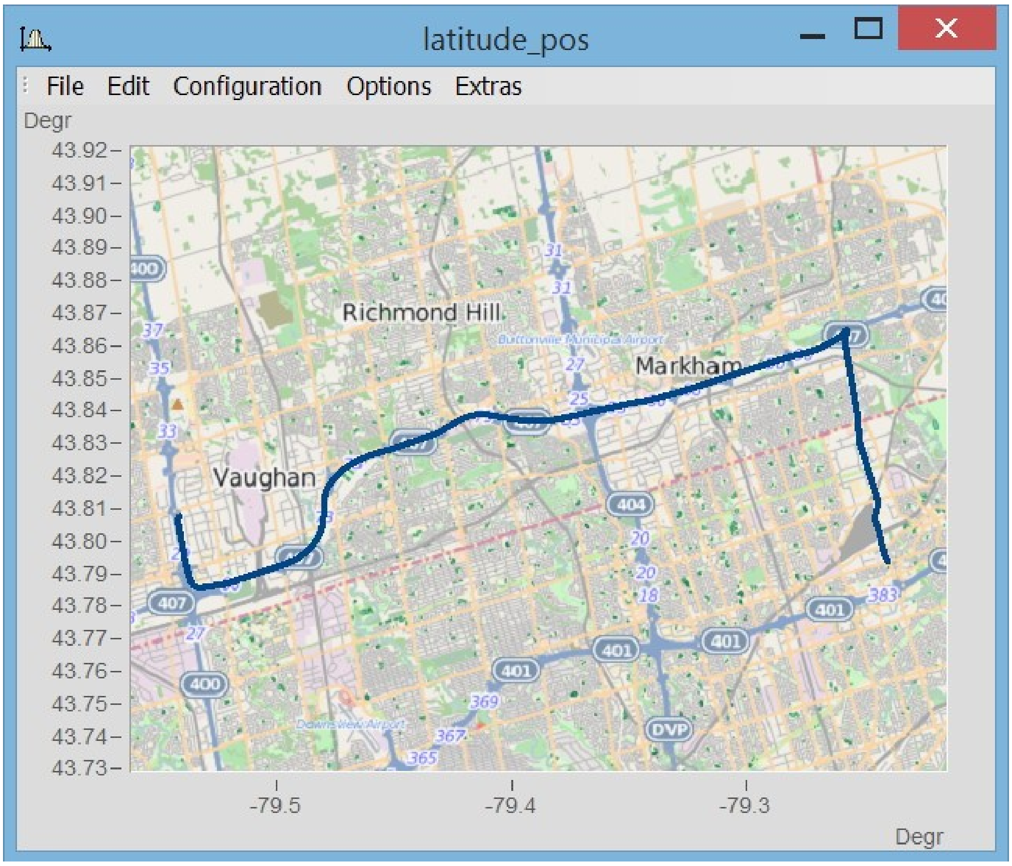
Selecting the map service

Select "*Map (from Internet)*" on the page "*Map*" in the dialog "*Display*". The setting "*Configuring and testing*" selects the Internet-service:





After selecting the map service, the map section loads immediately if an Internet connection already exists. In the curve window, this may appear as shown below, for example:



Note 注意 Changing the map-provider

After changing the map-provider, the provider's maps are not automatically reloaded. To do this, the axes of the curve window must be actively changed, e.g. by changing the zoom factor with the mouse wheel or moving the image section.

Adding a map provider

The selection of map-providers can be supplemented with the file "*AdditionalMapProvider.config*" in the folder "*C:\ProgramData\imc\Common\Settings*". If this file doesn't exist on your system, create a text file having this name.

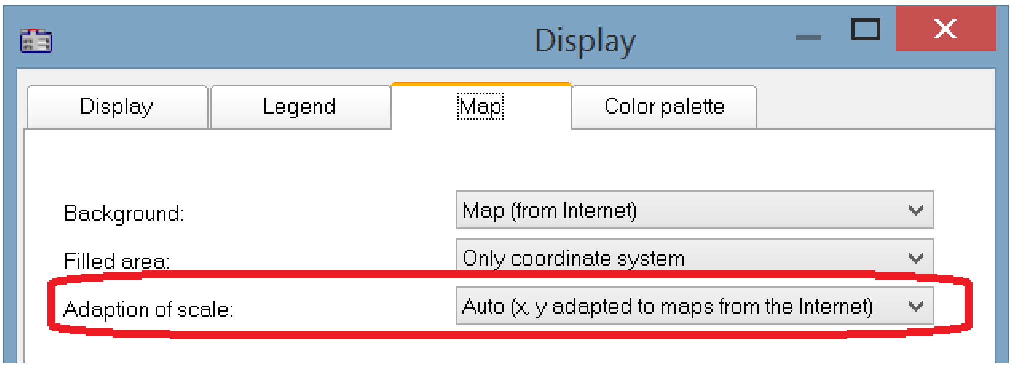
1. Open the folder. By means of *%programdata%*, Windows opens the folder *ProgramData* and then go to *imc\Common\Settings*.
2. The file *AdditionalMapProvider.config* is an XML file with the following structure:

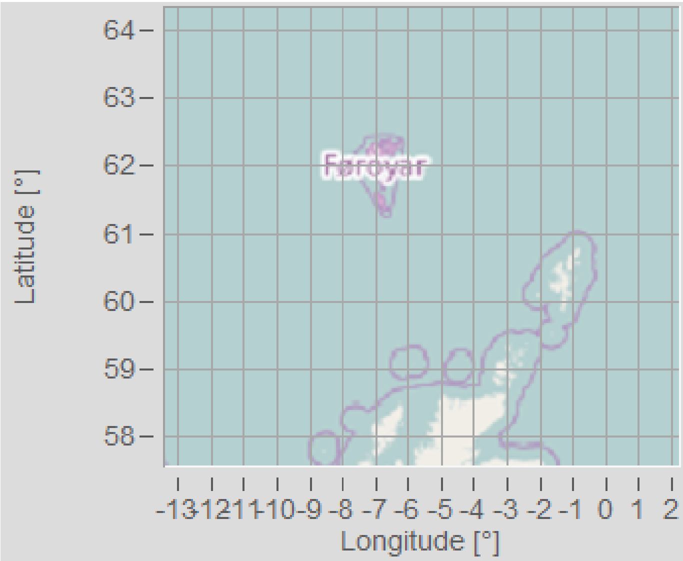
```
<?xml version="1.0" encoding="utf-8"?>
<MapProviders>
  <MapProvider Name="OpenRailwayMap-Standard" Url="http://a.tiles.openrailwaymap.org/standard/{z}/{x}/{y}.png" User="" Pwd="" TileThreads="2"/>
  <MapProvider Name="OpenRailwayMap-Signals" Url="http://a.tiles.openrailwaymap.org/signals/{z}/{x}/{y}.png" User="" Pwd="" TileThreads="2"/>
  <MapProvider Name="OpenRailwayMap-MaxSpeed" Url="http://a.tiles.openrailwaymap.org/maxspeed/{z}/{x}/{y}.png" User="" Pwd=""
TileThreads="2"/>
</MapProviders>
```

Replace the lines *<MapProvider Name="... TileThreads="2"/>* with the information pertaining to your map provider.

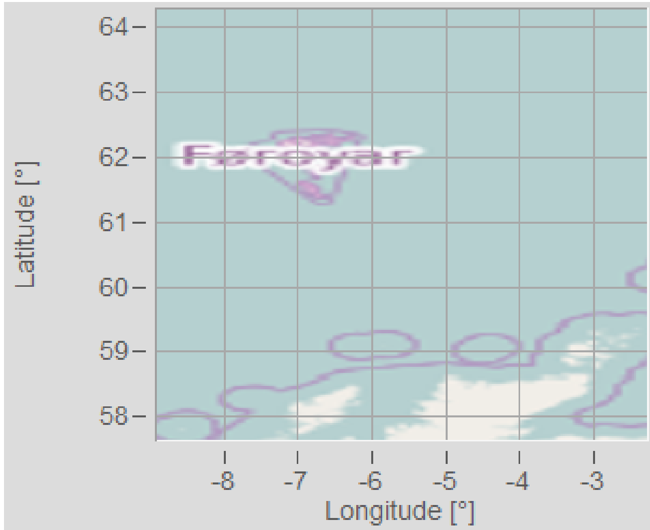
Adaptation of scale

Compensation of distortion due to Mercator projection. Maps typically display the coordinates with a distortion in the direction of the cylinder axis, in order to achieve correct depiction of angles between features on the Earth's surface. In the mode "*Auto (x,y adapted to maps from the Internet)*", the axis are stretched in proportion to the Mercator projection distortion.





Undistorted map accounting for the Mercator projection



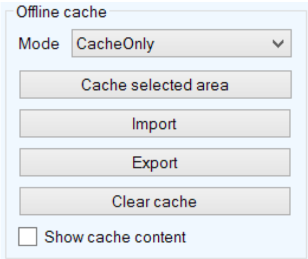
Coordinates equidistantly scaled -> Map distorted

Note

This projection named after Gerhard Mercator (1512-1592) causes imprecision in the curve window, since the coordinates are displayed equidistantly in it. The imprecision increases with the distance from the Equator and the size of the map.

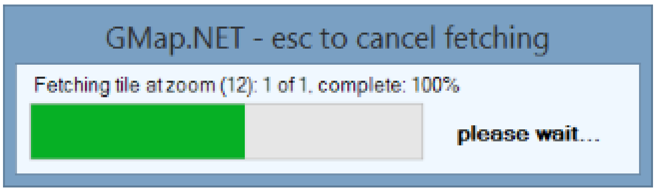
More map service option

Offline cache

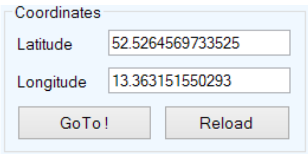


You can export, import, or save a map section locally. To do this, select "*Mode*" *ServerAndCache*" or "*Cache only*".

To make the selection, drag open a rectangular region while holding down the mouse button. When you click on "Cache selected area", the region is downloaded and saved in various zoom levels.

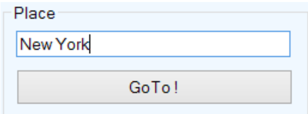


Coordinates



Select the map section by its coordinates and zoom to the desired section.

Place



Select the map section by entering a location.

Internet Settings

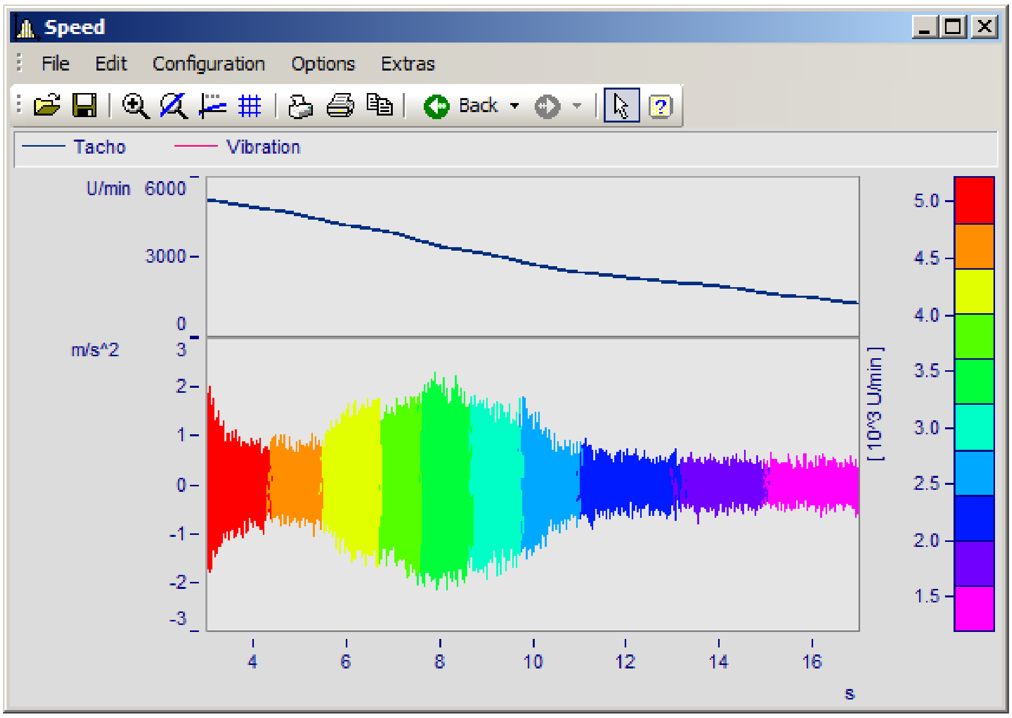
Here you can specify a proxy-server.

3.6.1.3 Color palette

A channel's color can be governed by a reference signal's amplitude.

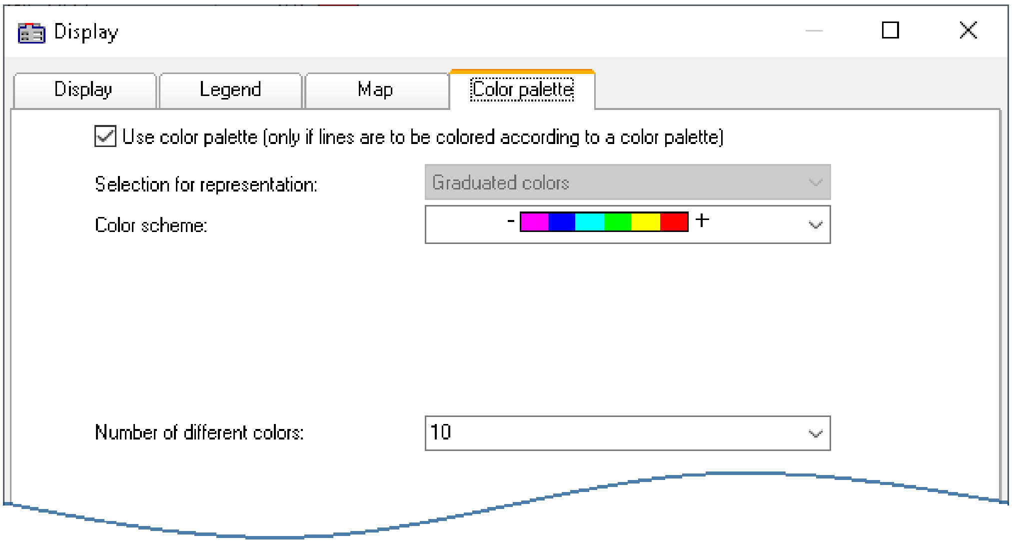
Note

This function is working only for channels using the same sampling rate (x-delta).



Line color of a graph of vibrations as a function of the RPMs

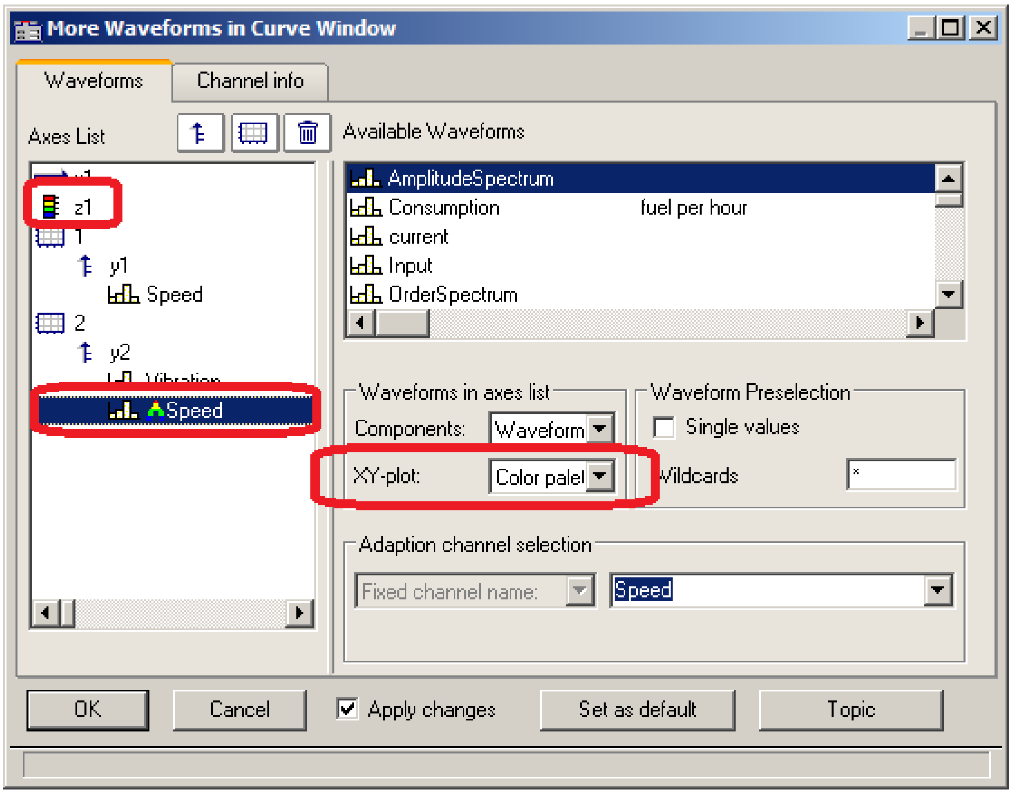
Select the page *Color palette* (not *Display type Color map*) in the dialog called by *Configuration\Display*.



First, activate the color palette by setting a check in its checkbox. In consequence, the controls for *Color scheme* and *Number of different colors*. The control *Selection for representation* is disabled, since at this moment only graduated colors are available.

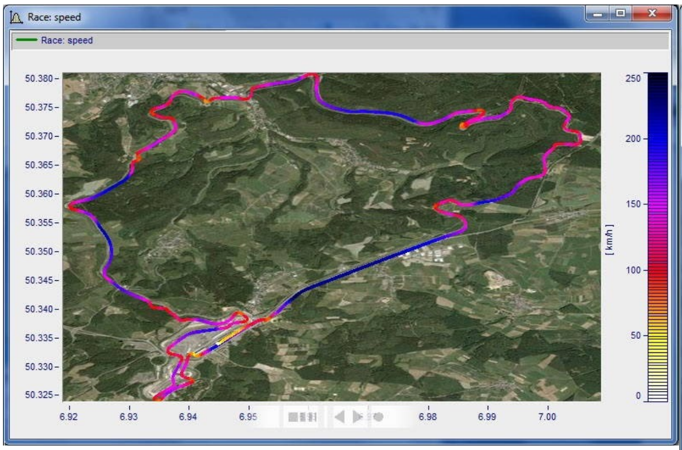
The same settings options for the color scheme and amount of colors are available as for Color map 60.

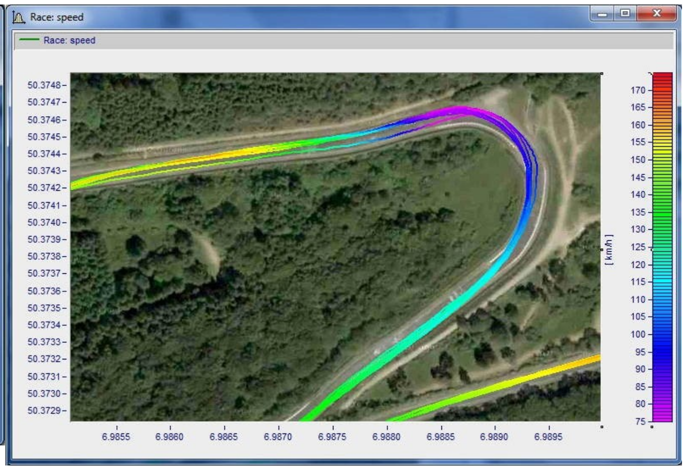
The assignment is performed in the dialog *More Channels...,* which is called from the curve window's context menu.



The reference channel is assigned to the same y-axis as the channel to be colored. Select a reference channel and set the *XY-plot* to *Color palette*.

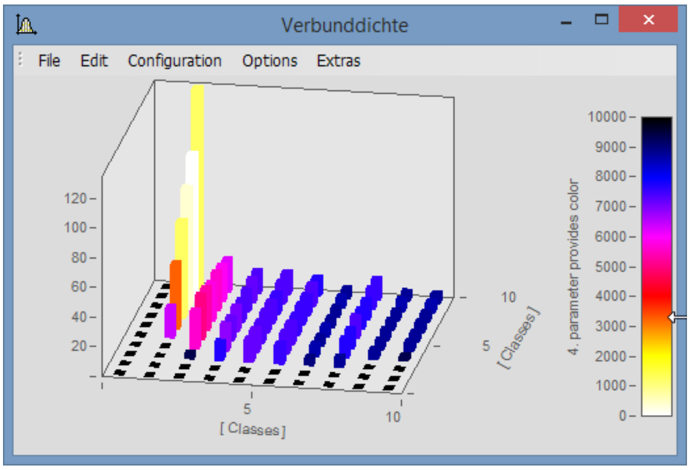
Example:





Color palette as 4th parameter in 3D

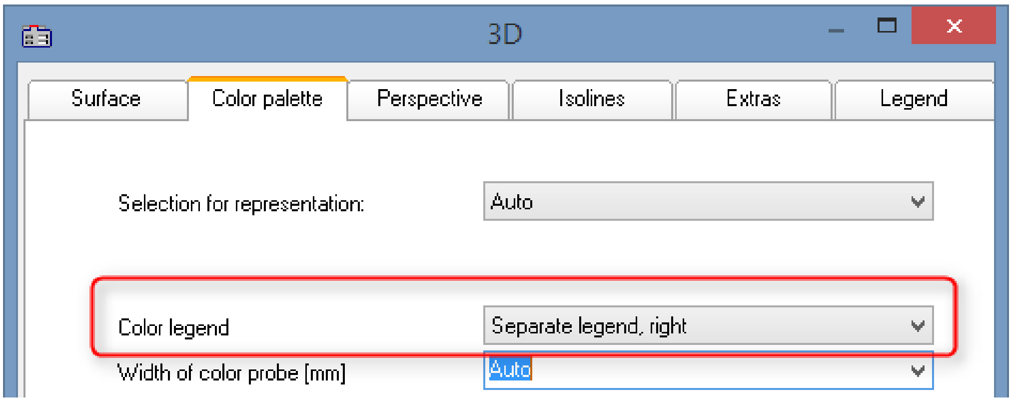
A 3D display can be colored according to a fourth parameter. Thus, 4 dimensions (4D= 3D + color) can be displayed. See also here 164.



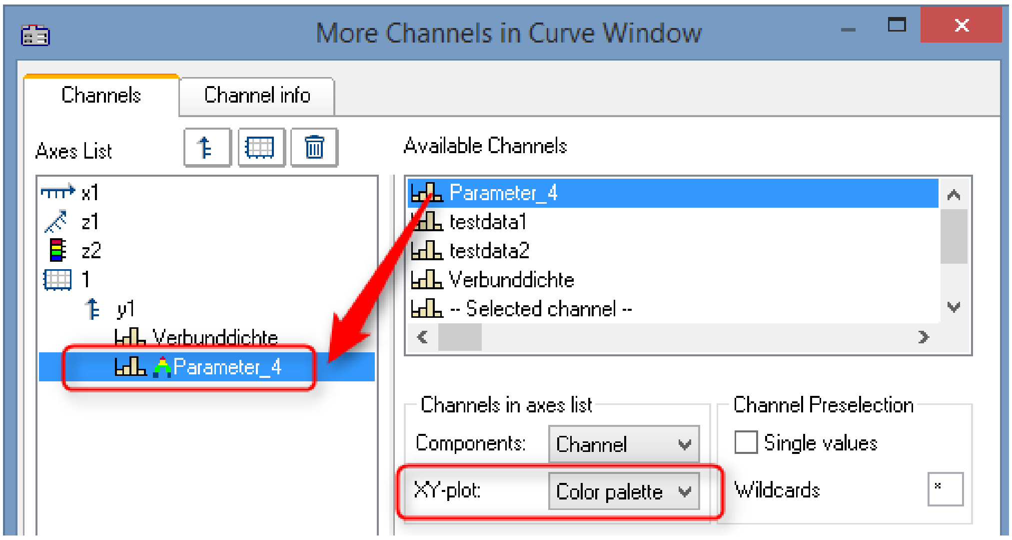
3D display with colors governed by a fourth data set

Procedure:

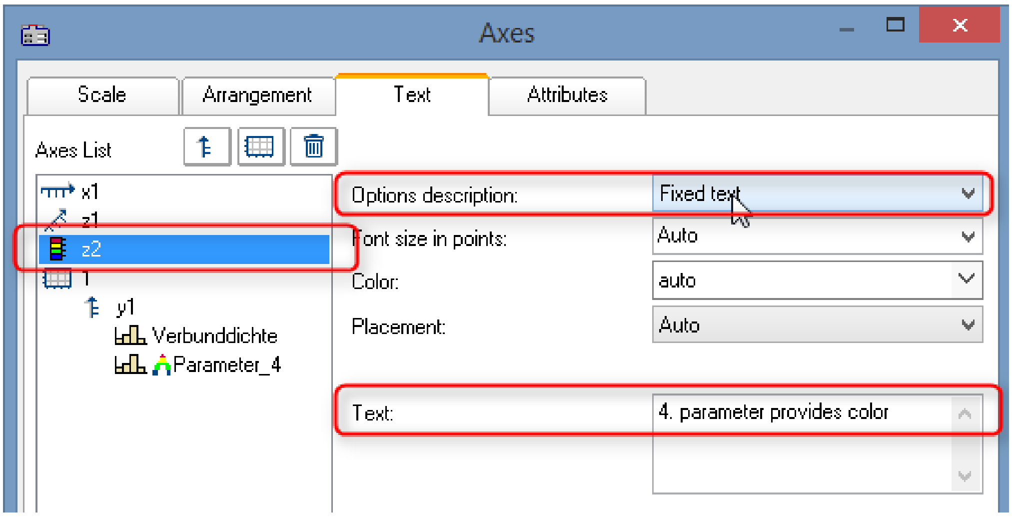
1. Set *3D* display with ***Separate legend right*** or **left** in ***Color plaette*** 163. With the settings *Auto, No* and *Integrated into y-Axis*, it is not possible to generate a colored overlay.
2. Under *More Channels...*, place the fourth variable directly below the 3D data set.
3. Under *XY-plot*, select *Color palette*.
4. Labeling of the color palette by means of *Axes\Text.* This is necessary since the legend does not provide an indication of the color scale's origin.



Activate Separate color legend at "Configuration\3D\Color palette"



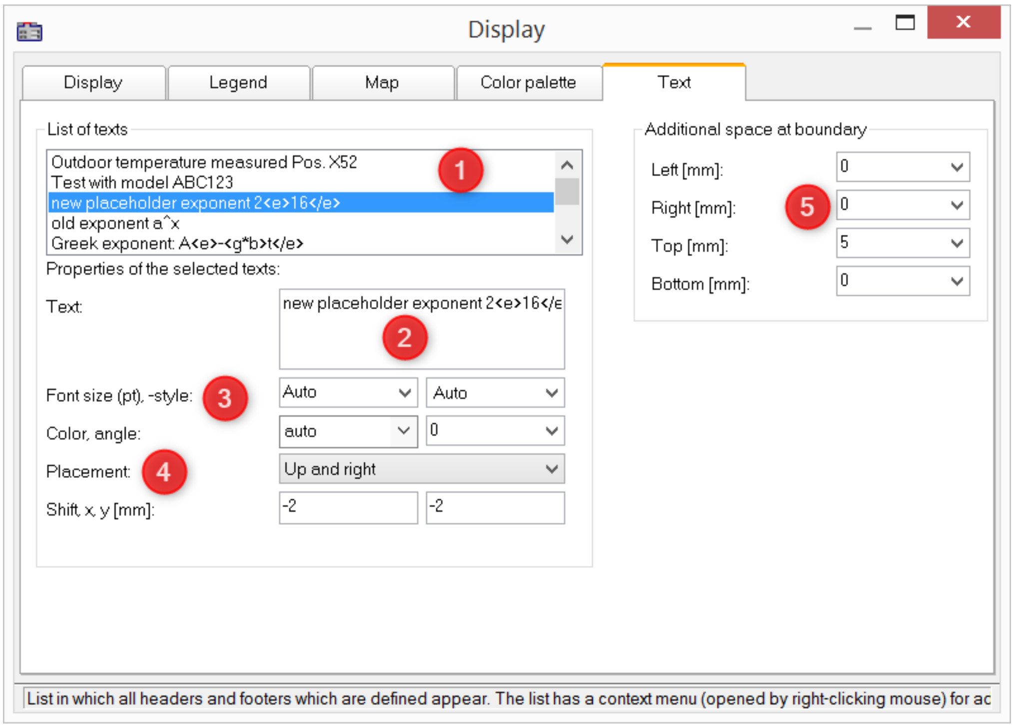
Under "Configuration\More Channels...", assign the color-coded variable

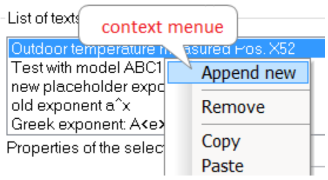


Under "Configuration\Axes\Text" with "Fixed text", state the origin of the coloring.

3.6.1.4 Text

The Text page of the Display dialog enables any desired texts to be positioned, for example as titles, headers, footers, or general comments.



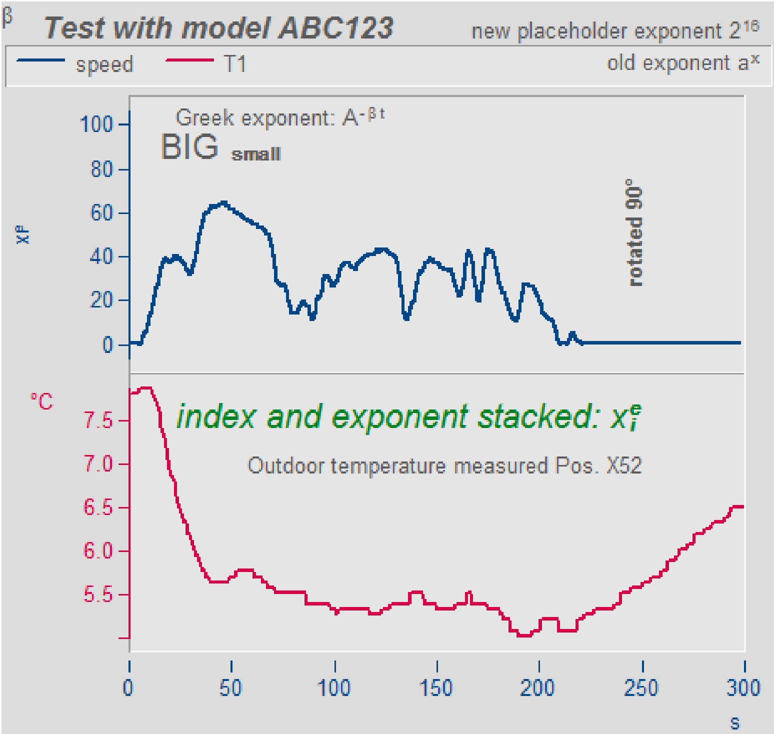


By **right-clicking** in the *List of texts* (1), you open a context menu for managing the entries.

In the *Text box* (2), up to 256 characters are allowed. Line breaks are placed by pressing the CRTL+ENTER keys.

The placeholders supported are described in the chapter *Axes configuration/Text* 118.

The *Font, font size, -color,* and alignment (3) can be set for each entry.



The *placement* (4) is initially determined from a list and subsequently fine tuned by means of the parameters for *Shifting* in the *x* and *y* directions. When a position is selected which references a **coordinate system**, an additional parameter for specifying the number of the Y-axis appears.

Beyond the space occupied by the actual curve graph, it is possible to make room for additional texts (5).

Remote control via sequences:

The function CwDisplaySet offers some functions "*header.x*" with which to texts can be placed.

```
CwDisplaySet("header.count", 5 )
CwSelectByIndex( "header", 1 )
CwDisplaySet("header.text", "TEXTMITTE" )
CwDisplaySet("header.position", 8 )
CwDisplaySet("header.text.color", 255 )
```

The additional space at the edge is adjusted using the "*legend.x*" functions.

```
CwDisplaySet("legend.space.left", 10.4 )
CwDisplaySet("legend.space.right", 4.7 )
CwDisplaySet("legend.space.top", 10 )
CwDisplaySet("legend.space.bottom", 10 )
```

Reference | Further texts

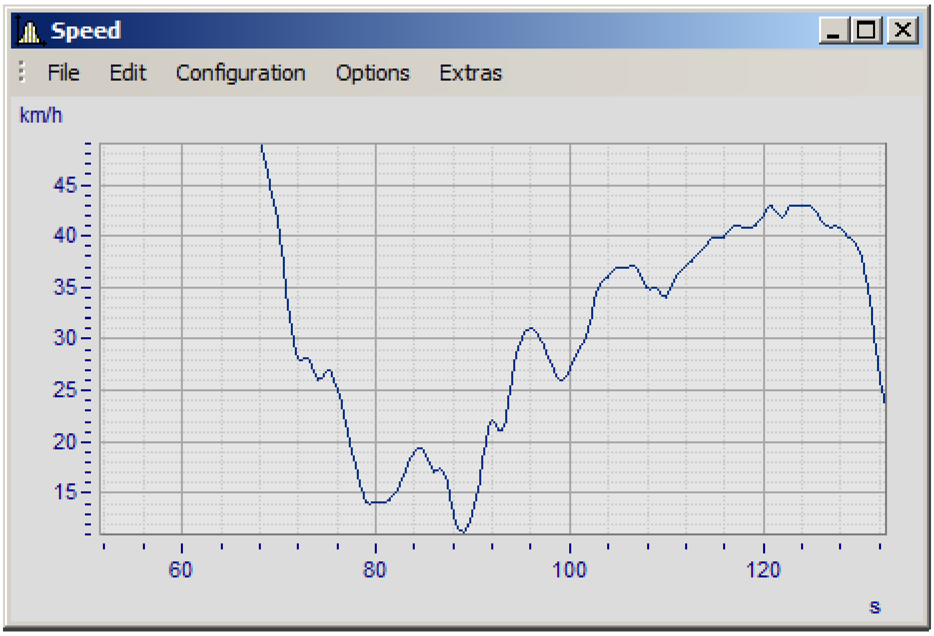
Further texts can be added via the axis dialog 118 .
Texts can also be defined as *user ticks* 120. Here you can also find the function "*Label for raw data* 123".

3.6.2 Grid

Function

A grid may be added to the coordinate system in the curve window. The grid is composed of vertical and horizontal lines running through the ticks on the axis, with additional lines between them.

The grid consists of a main and secondary grid. The main grid lines end at the main ticks of the coordinate system axes, where the axes are labeled. The secondary grid lines end at the secondary ticks, optionally inserted between the main ticks (see menu option *Configuration/ Display* 21). Settings for the secondary grid are made in the Axes dialog by means of the control *Small ticks* 111.



Various line widths and types can be specified for the clipboard or print-out, see menu *Opt./ Clipboard Settings* 245.

A grid is drawn for a logarithmically represented axis (but not in dB) so that eight lines appear between each set of markings on the axis. The eight lines are easy to interpret, since a factor of ten lies between each set of axis markings. The lines designate equidistant points, i.e. between the markings 1 and 10, the points 2, 3, 4, 5, 6, 7, 8, 9 and between the markings 10 and 100, the points 20, 30, 40,... . The lines are then spaced as on logarithmic graph paper.

Mouse Operation

- Select menu option *Grid* from the *Configuration* menu in the curve window.

Remarks

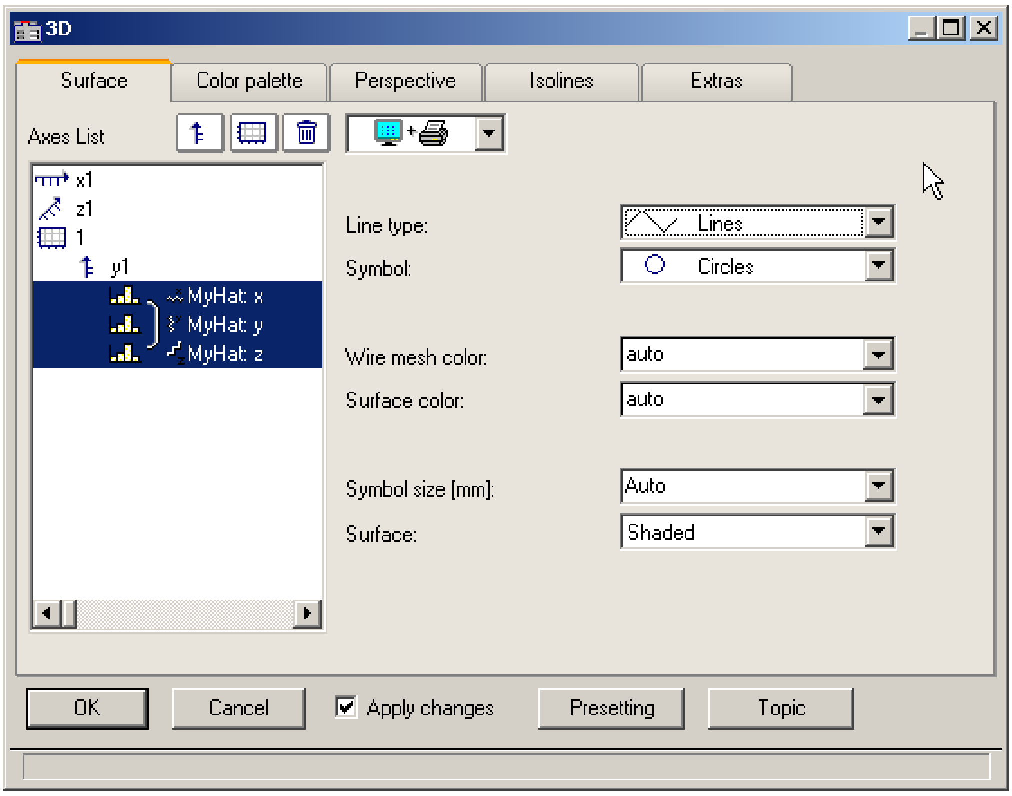
- The color of the grid lines can be determined in the *Colors...* dialog.
- A grid is not drawn if labeling is not visible.
- The menu option *Grid* is marked with a checkmark when grid display is selected.

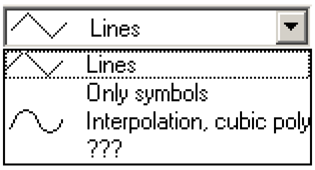
3.6.3 3D

You have various options in the *3D* display, to modify and optimize the display of surfaces. If you have selected the *3D* option, you achieve the setting dialog for the 3D design *Configuration / 3D*. You can also achieve this setting dialog with the corresponding button in the toolbar.

3.6.3.1 Surface

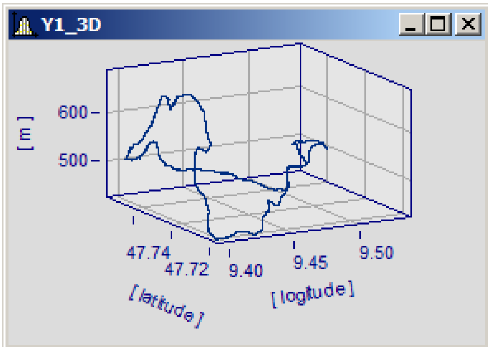
In the dialog page *Surface* there are additional settings for 3D-display besides the settings described under Lines 126.



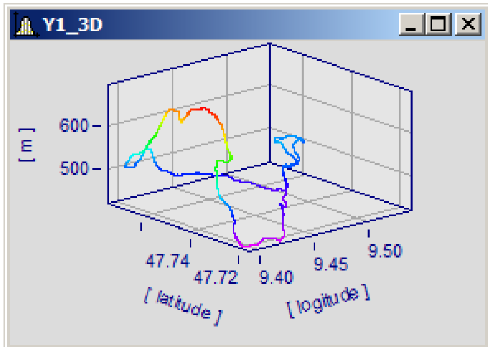
Settings	Description
Line type	In 3D-display, the only available line types are straight lines, no lines, or interpolated lines connecting measured points. For bars, see here 162. 
Symbol and Symbol size	See the section on lines 126.
Wire mesh color	Here you can set the color of the grid, or of the connecting lines between measured points. If you set *auto*, then the color will be set according to the global color setting (color palette 163).
Surface color	Here you can set the color of the surface. If you set *auto*, then the color will be set according to the global color setting (color palette 163).

Settings	Description
Surface	

Surface	Description
Wire mesh shaded	The individual measured points are connected with lines to a grid and are additionally displayed as a surface with the color/color palette set.
Shaded	The individual measured points are displayed as a surface with the corresponding selected color/color palette.
Wire mesh	The individual measured points are connected to lines in a grid.
Wire grid with color tones	The individual measured points are connected with lines to a grid and this grid is additionally displayed as a surface with the color/color palette set.
Samples	The individual measured points are displayed as points or, if selected, as symbols.
Space curve	The individual measured points are all connected in sequence with lines.
Space curve with color tones	In addition to the space curve, the line can be colored with different colors to correspond to different y-component value ranges.



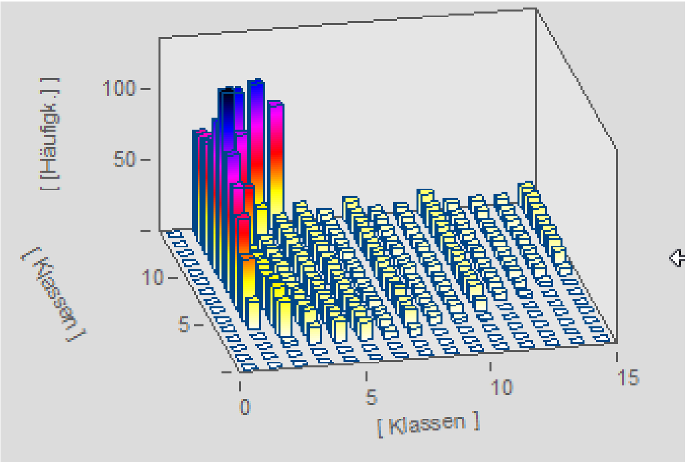
Monocolor space curve



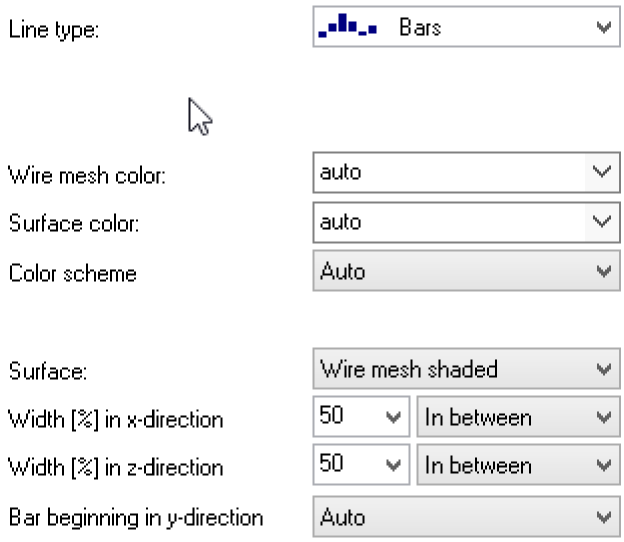
Space curve with color palette

Options for 3D bars

With *Line type: Bars*, three-dimensional bars are displayed, for which additional display parameters are shown.



3D bars



Settings for 3D-bars

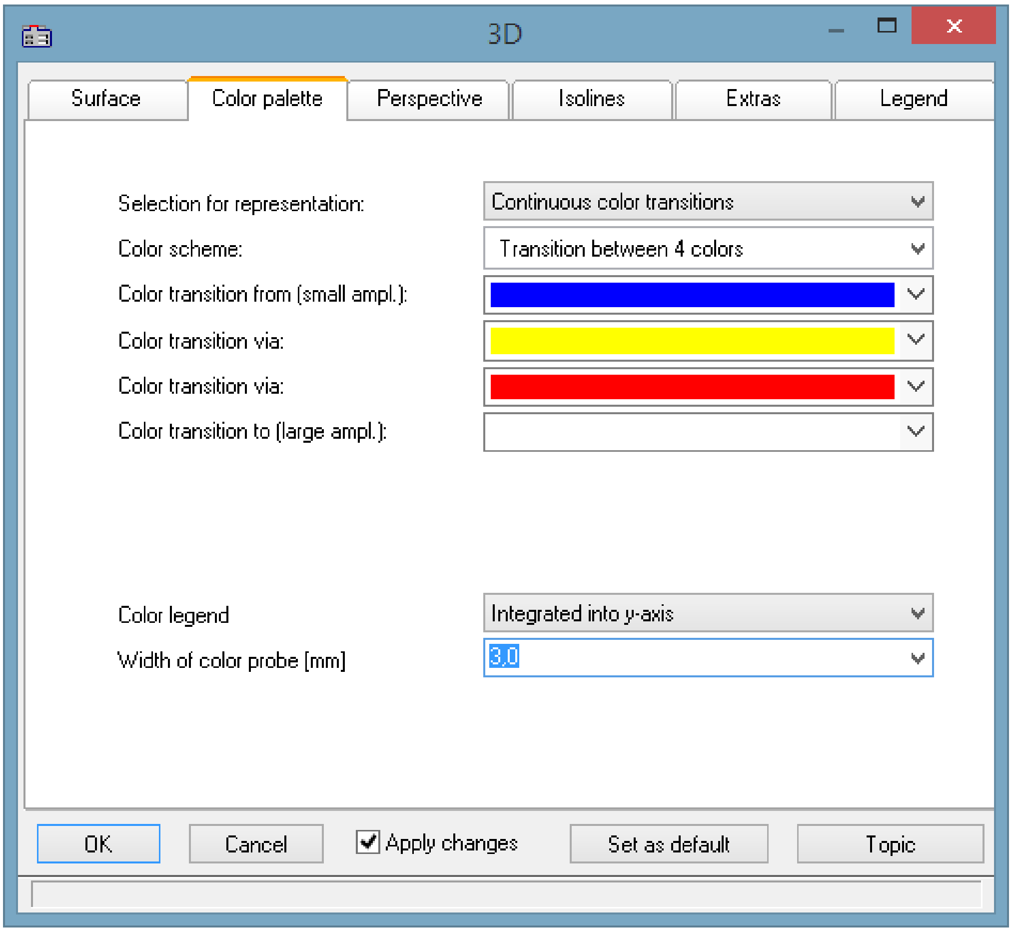
Note

3D-bars can only be set for segmented data. XYZ-plots are not supported.

Settings	Description
Color scheme	The color of the column and the color of the wire mesh (edges) can be given fixed settings. With *Surface color* set to *auto* , a color gradient is drawn if the *Color scheme* is set to *auto* or *With color gradient* is set. With *Color scheme: One color*, the complete column is colored according to its peak value.
Surface	The surfaces of the columns can be displayed in the following ways: • *Wire mesh shaded* or *auto*: colored columns, with edges • *Shaded*: colored columns without edges • *Wire mesh*: only edges • *Wire mesh with color tones*: only colored edges
Width (%) in x/y-direction	The width and depth of the bars can be set in terms of a percentage. The position may be arranged as *In between, Centered* or *Aligned*.
Bar beginning in y-direction	This sets the height of the bottom surface.

3.6.3.2 Color palette

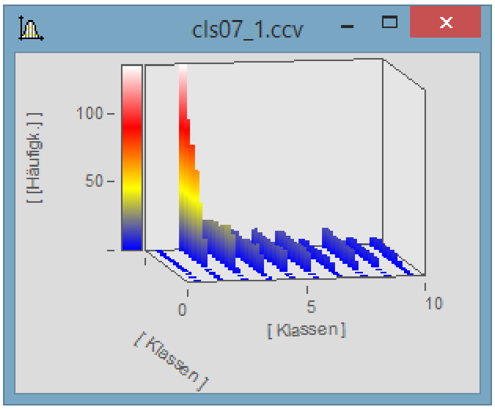
You can make a choice in the *color palette* tab to select a color for the surface. There are two illustration facilities like the continuous color transitions. You can find more information in the chapter Color map dialog, "General" 60



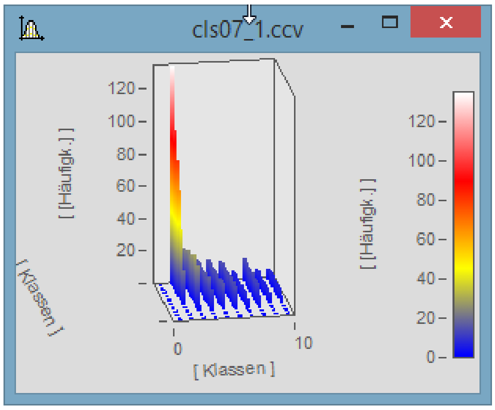
Color legend

The scaling of the colors can be indicated with a *color legend*. The following options are available:

Settings	Description
Auto, No	No color legend
Integrated into y-axis	The Y-axis is supplemented with color columns. Their width can be set.
Separate legend left, right	Separate color column to left or right of the data.



Color legend in y-axis

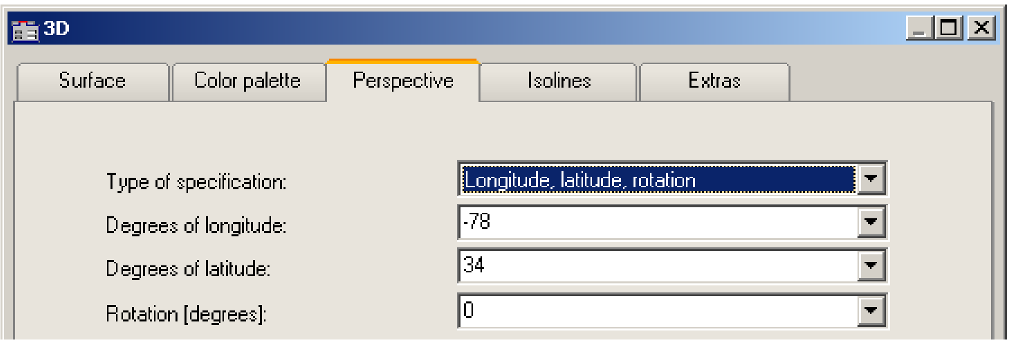


Color legend separate right

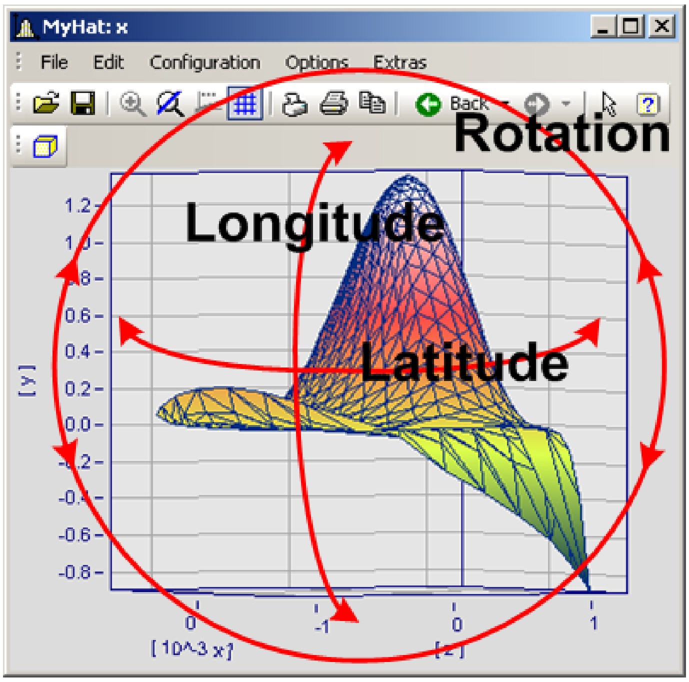
Reference

One way to color the 3D display according to a fourth variable is presented here 155.

3.6.3.3 Perspective



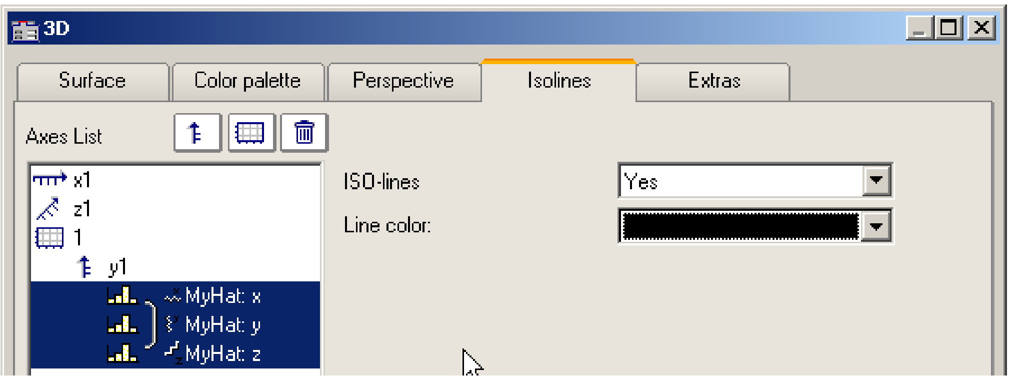
In the dialog page *Perspective*, you can set the viewing perspective as an angle between -180° and +360°. There are three ways to make the specification: *Angle of z-axis*, *Longitude* and *latitude* and *Longitude*, *latitude* and *rotation*.



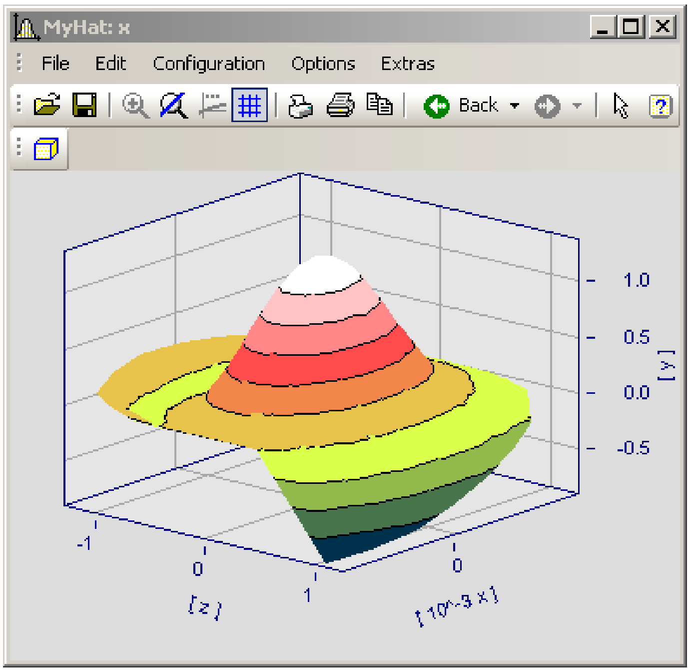
The perspective *Longitude* and *latitude* offers the best mouse control. This view behaves like a survey of the earth from outer space. This is the recommended perspective. If you wish you can additionally specify the rotation.

The three perspective parameters are related as shown below.

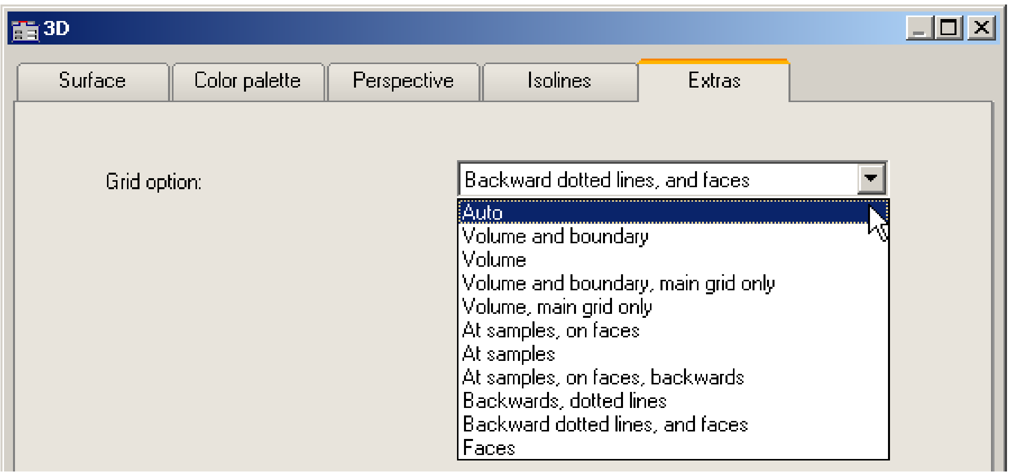
3.6.3.4 Isolines



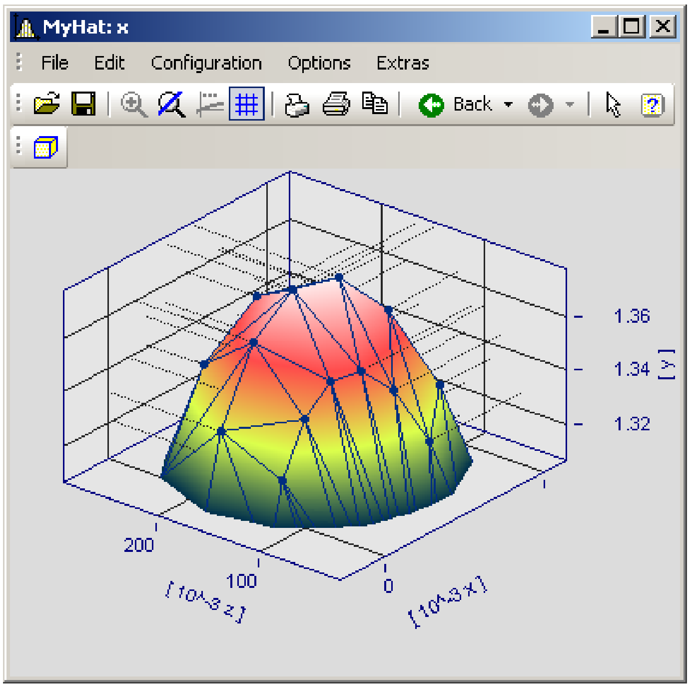
In the dialog page *Isolines* you can select whether to have isolines superimposed on the toned surface, like in color map display. This function can only be activated if graduated colors are set on the color palette 163 page.



3.6.3.5 Extras

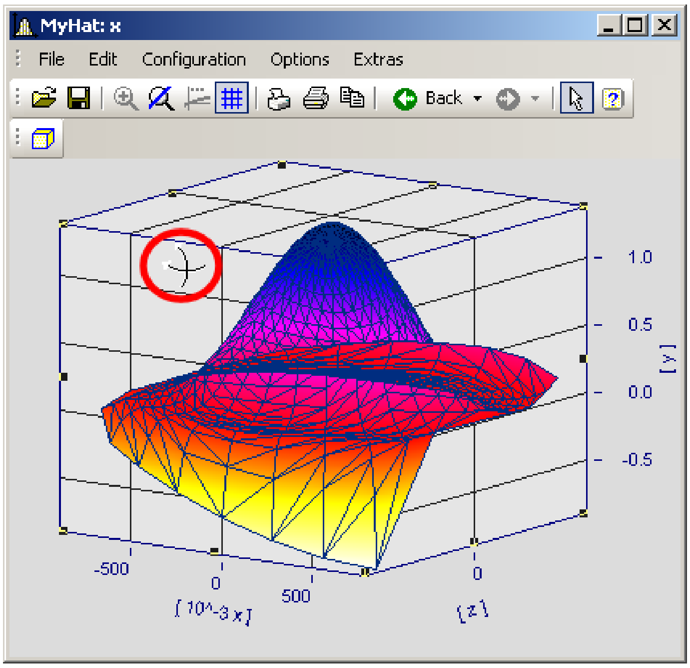


The dialog page *Extras* offers access to various grid options. This grid is then displayed in the space, in addition to the standard coordinate grid, for better legibility of a measurement point's axis values.



3.6.3.6 Rotate

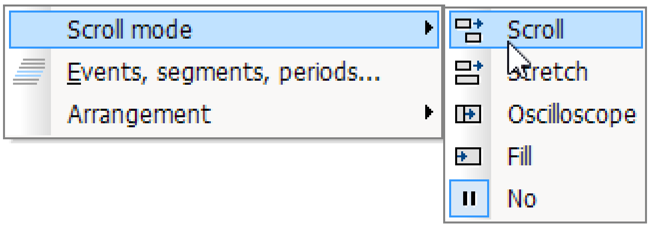
For spatial manipulation of a 3D-display, bring the mouse cursor in the coordinate system, which makes its shape change. If you then click on the mouse and start moving it, the cursor shape changes, as shown in the picture, and the 3D-display can be freely rotated by moving the mouse around.



Cursor for free rotation of a 3D-display

3.6.4 Scroll mode

This function is used during a running measurement, when the curve window is continually receiving new measured data to display.



Using the scroll mode, a particular segment of time-domain data can either (*scroll across*) the screen, or the segment itself, beginning from the measurement start, can continually (*grow)* or be stopped for purposes of performing analysis (*No*).

Menu item	Description
Scroll Mode	The *Scroll mode* is set for the curve window for a running measurement. The extent of the displayed x-range remains constant; the offset of the x-axis is shifted with each new measurement value.
Stretch Mode	Click on this button to have the curve window *stretch* during a measurement. The minimum value on the x-axis remains in effect, while the maximum is automatically set to the end of the waveform. Thus, the extent of the domain displayed increases with each new measured value.
Oscilloscope-Mode	During a running measurement, the curve window displays a static image which, like an oscilloscope, is redrawn at intervals. The zoom width remains intact.
Fill	Here, the curve window is filled similarly to Scroll mode. When the right edge is reached, the x-axis skips back by 75%, however. In consequence, the x-axis remains at rest most of the time, giving the user the opportunity to use a measure window 184 during a running measurement.
No: End Online mode	Click on this button to halt the *Scroll* or *Stretch* mode in a curve window in running measurement; this means the x-axis is frozen in its current state and the signal can then be viewed at rest as long as needed.

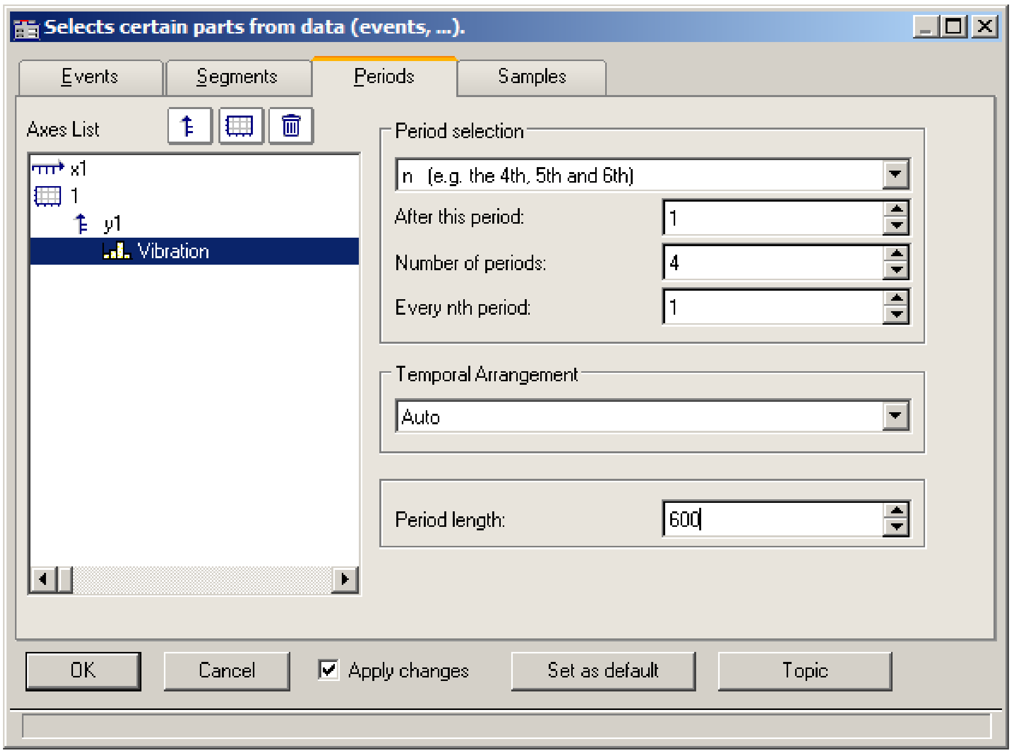
3.6.5 Events, segments, periods

Function

With normal waveforms, it is possible to perform a comparison of signal periods 175 in a general way where an individual period is selected and compared with others. With **segmented** and **event-based** data, comparison of any desired portions of the data can also be carried out.

Operation

The dialog is called by selecting the menu item *Configuration / Events, Segments, Periods*.



Periods

First select the file card *Periods* from the stack (of three). Then select the channels, which are to be displayed in the period comparison, from the axes list on the left.

Next enter the *Period length* in the box on the bottom right; it is a amount of measurement values >=1.

Under **Period selection**, you specify in what way the periods are identified. The default entry is *No period comparison*. The option Auto shows all periods. Further options enable targeted display of specific periods. Select "N" periods from the list box, for example, then enter a starting period, an amount of periods, and the increment between successive periods to be compared. The first period in the waveform is denoted by the index 1.

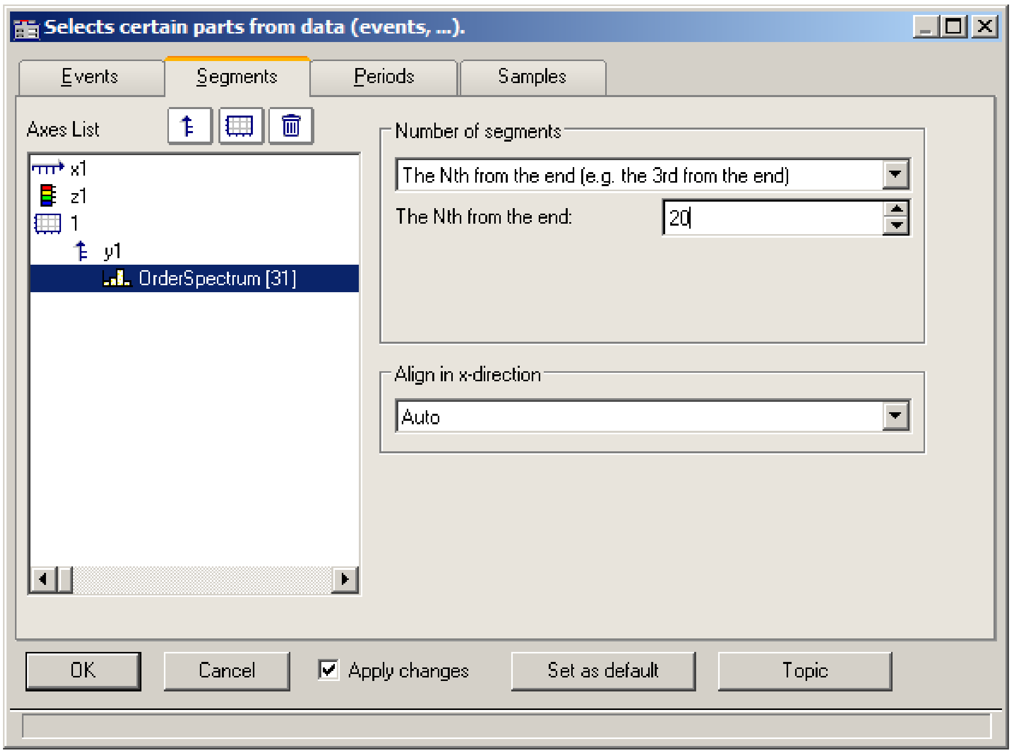
When you have specified the amount, then proceed to the ***Temporal Arrangement***:

Settings	Description
Auto	The curve window determines the temporal arrangement. When in doubt, then, use this option.
x0 set to zero	The waveforms' property x0 (their relative trigger time) is set to 0 for the display.
x0 of the first period	The period comparison representation's initial x-coordinate is defined as the x-coordinate of the first measurement value belonging to the first period in the original data set.
x0 of the last period	The period comparison representation's initial x-coordinate is defined as the x-coordinate of the first measurement value belonging to the last period in the original data set.
Each period contains a unique x0	Each period has its own individual x0, which is identical to the x-coordinate of the first measurement value belonging to that period in the original data set.

Segmente

For the display of segmented data. Segmented waveforms are matrices, as generated, for example, by imc STUDIO spectral calculations or class-counting.

Select the *Segments* file card:



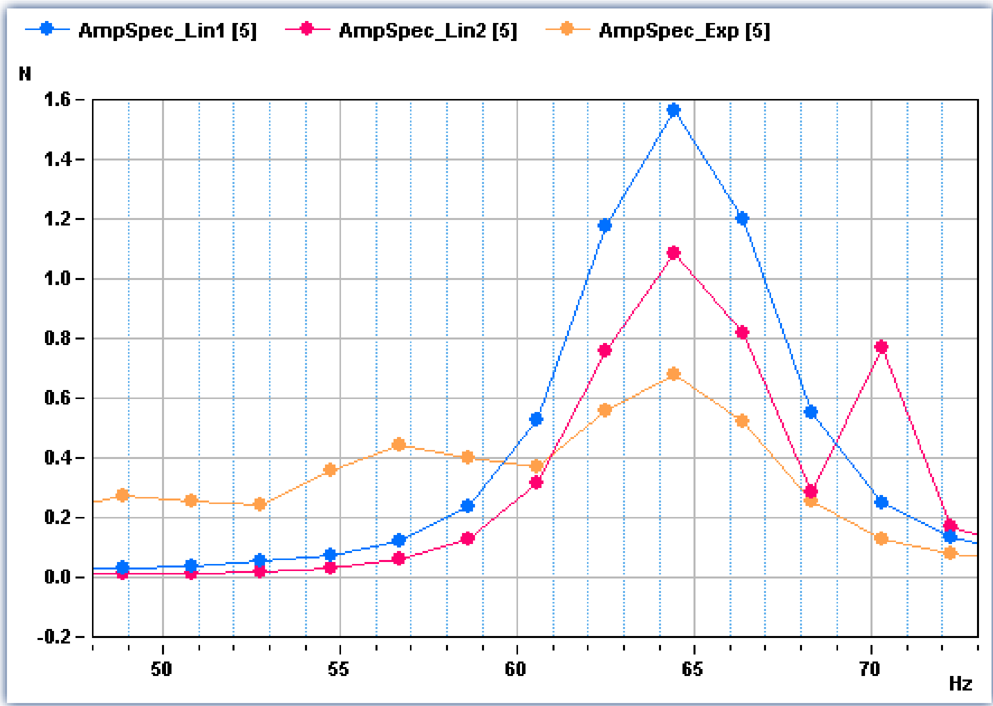
First you must make your selections in the Axes list on the left, as only the selected data indicated there are affected by settings performed with the instruments on the right.

As with *Number of segments*, select the segments to be displayed.

Then select ***Align in x-direction***:

Settings	Description
Auto	When in doubt, choose this option to at least get a view of the segments.
Retain x-coordinate	Each segment receives the same initial x-coordinate, namely, the x0 of the original data set. This is the most appropriate option for handling matrices (Rainflow,...) and multiple FFT's.
Add z to the x-coordinate	Segmented waveforms are provided with z-coordinates, which is determined from z0, dz, and a segment's index. The x-coordinate of a segment's first measurement value is in this mode the sum of x0 and the segment's z-coordinate

Example of segment indices:

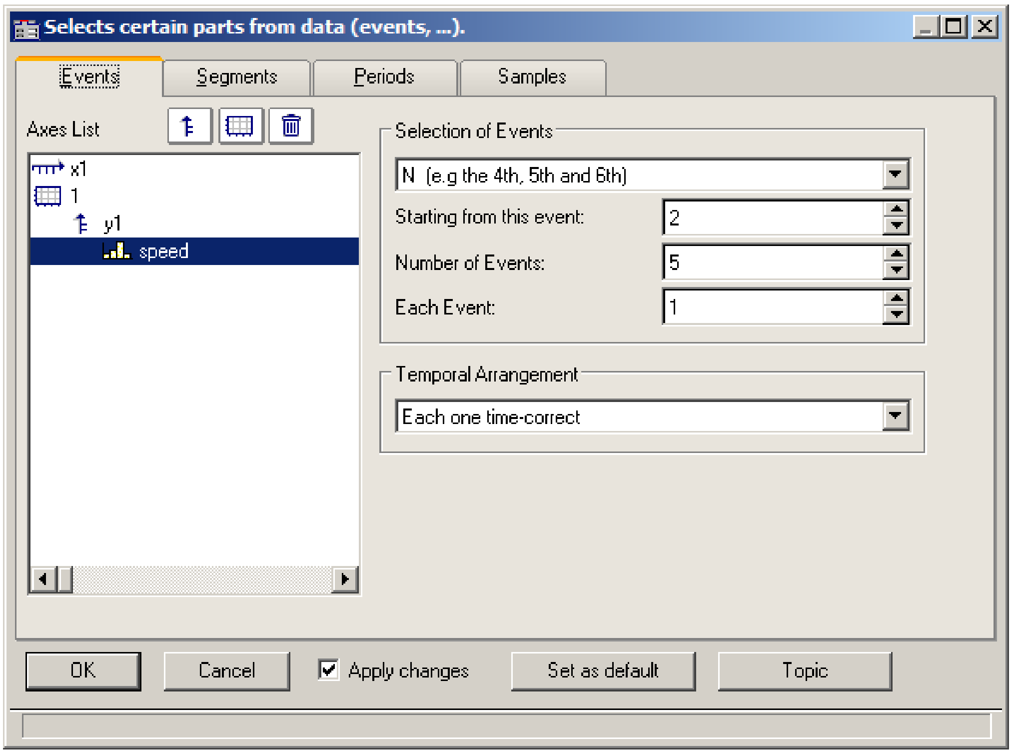


Legend with segment indices

Events

If you have recorded triggered waveforms, make the settings on the Events page. Events are triggered signal segments.

Select the page *Events*:



As before, the desired data sets are to be selected from the *Axes list* at left and the *Selection of Events* from the list box on the upper right.

Select the appropriate ***Temporal Arrangement***:

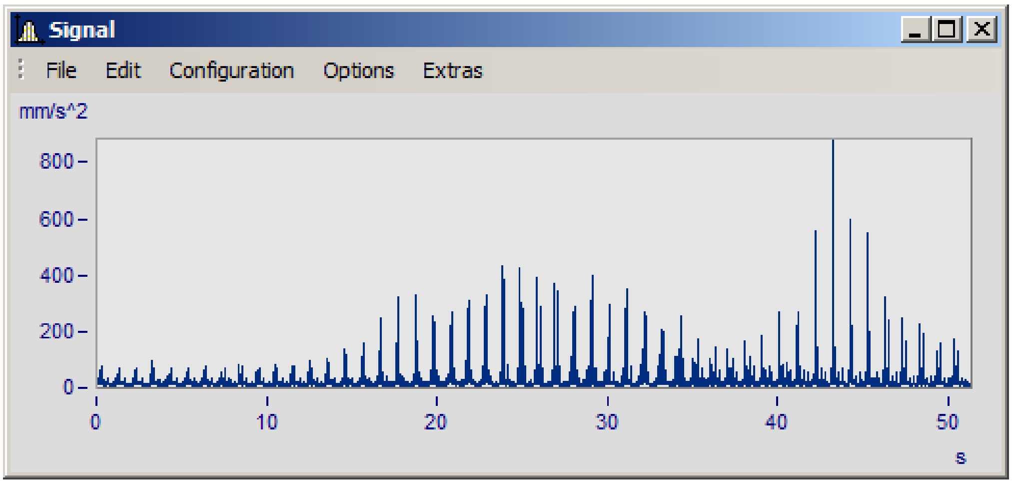
Settings	Description
Auto	This delivers an automatic representation, and is certain to achieve some result. When in doubt, then, use this option.
Each one time-correct	Each event is represented with its genuine time-coordinates. With the curve window's time representation set to "relative", the individual events receive time coordinates which correctly correlate to each other; in the "absolute" time representation the actual trigger instant for each event is indicated in absolute terms. This option is generally the most appropriate for multishot waveforms.
Trigger time of 1st is valid for all	Caution! Options which rearrange the trigger time can lead to an incorrect temporal representation. The representation may, nonetheless, be of interest for purposes of comparison. This option places the initial time coordinate of every shot at the absolute trigger time of the first event. In relative time representation there is no effect (the time-accuracy is retained); but in absolute-time mode all events are <Shift>ed to reflect the first event's trigger instant.
Trigger time of last is valid for all	As above, but based on the last event's trigger instant.
Trigger time of 1st displayed is valid for all	As above, but with reference to the first specifically selected event.
Trigger time of last displayed is valid for all	As above, but with reference to the last specifically selected event.
Trigger time difference to 1st in x0	Caution! Options which rearrange the trigger time can lead to an incorrect temporal representation. The representation may, nonetheless, be of interest for purposes of comparison. This function uses the time difference between the trigger instant of the original data set and the trigger instant of the first selected event as the x0, the initial time coordinate of the period comparison representation. This affects a representation which is made in relative time mode. The event coordinates are <Shift>ed by their genuine trigger times. In absolute time representation no effect is achieved.
Trigger time difference to last in x0	As above, but based on the last event.
Trigger time difference to 1st displayed in x0	As above, but based on the first specifically selected event.
Trigger time difference to last displayed in x0	As above, but based on the last specifically selected event.

3.6.5.1 Period comparison

Periodic signals occur in a variety of applications, such as rotating machinery, where the measured signal almost repeats itself at each revolution.

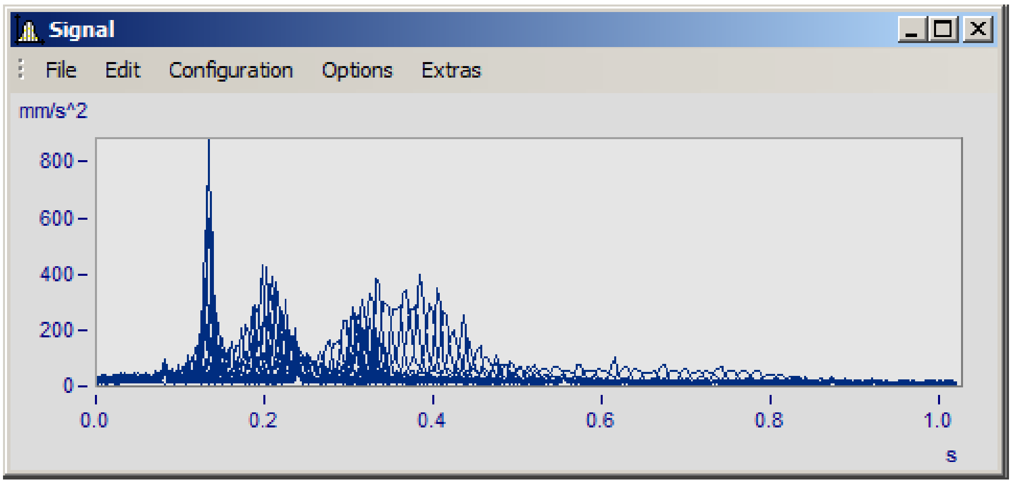
In the curve window's default display mode, entire waveforms appear plotted over time. This means that all periods are drawn in a series. In such a display, it is not always possible to compare individual periods in terms of their maximum values, for instance, or even other properties.

Example:

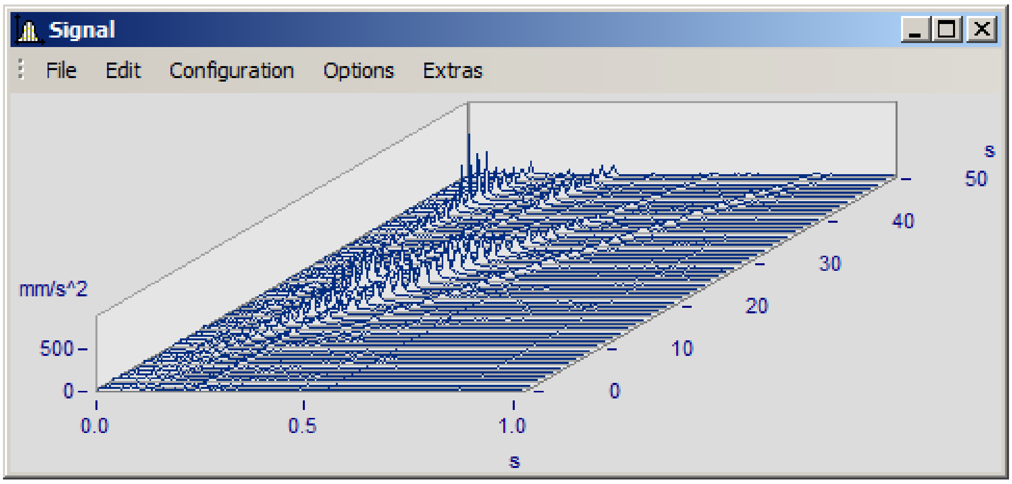


A waveform with 50 periods of 1s duration each is shown

In the period comparison mode, the waveform is divided into its individual periods. The periods are stacked over each other, enabling direct comparison. There are three ways of performing a period comparison:



Default mode. The curve plots of all the periods are drawn superimposed over each other. A dense region of coinciding signal points is visible.

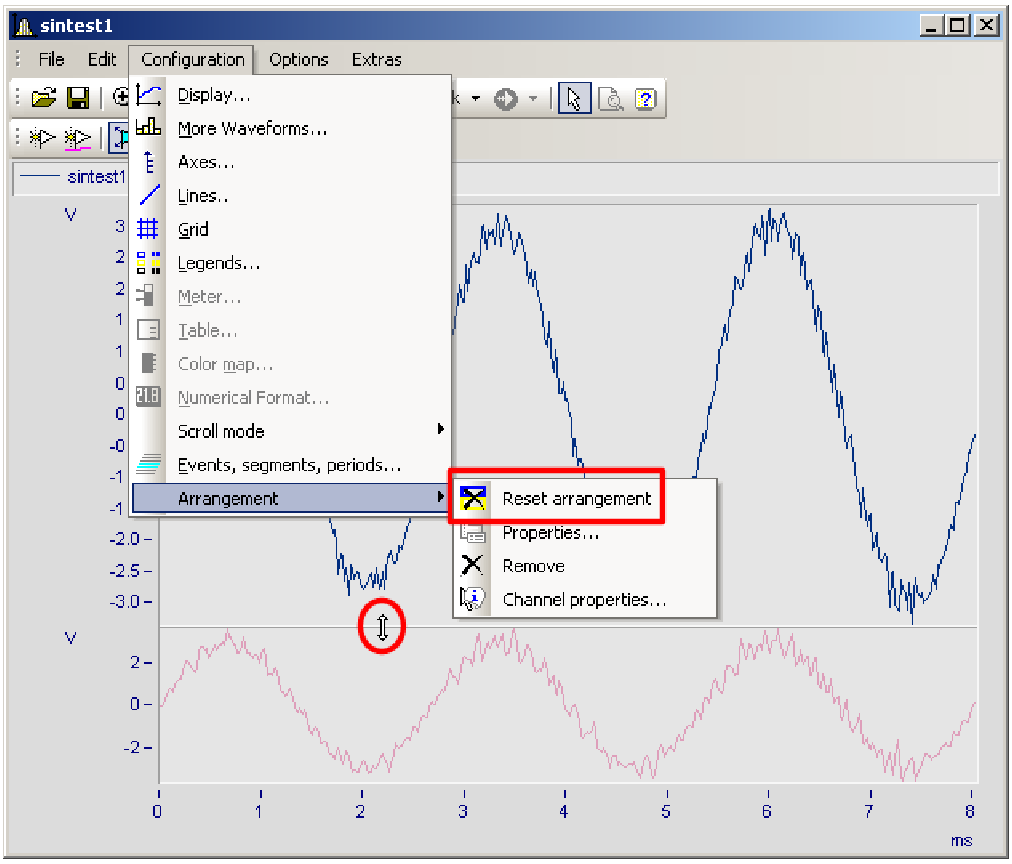


Waterfall diagram: the mountain-range-shaped surfaces clearly illustrate trends emerging across the accumulating signal periods.

In the period comparison mode, the length of a period -in data points- must be known. The amount of points reflect the amount of measured values in each period.

3.6.6 Arrangement

This function affects how the coordinate systems are laid out, in terms of the height of the y-axes.



In the menu *Configuration*, you have access to the same items as in the Select-mode's 196 context menu. Additionally, there is the function *Reset arrangement*, which lets you totally undo any previous changes to the coordinate system arrangement. The relative heights of coordinate systems within a curve window can be changed using the mouse. To do this, move the mouse cursor to the separator between two coordinate systems, so that its shape changes to a vertical double-arrow. Then drag the separator, by holding down the mouse button, up or down as desired to rearrange the coordinate systems' heights.

3.6.7 Confirmation bar

Apply changes

When this option is selected, all changes made in the axes list are displayed immediately in the curve window. Thus, the user is always informed about the current appearance of the curve window as resulting from the settings made in the axes list. On the other hand, redrawing the curve window, especially for long waveforms and several curves, can have an adverse effect due to delays.

OK

Click on this button to close the dialog. The current settings are implemented automatically. The same effect can be achieved by closing the window, as is customary in WINDOWS.

Cancel

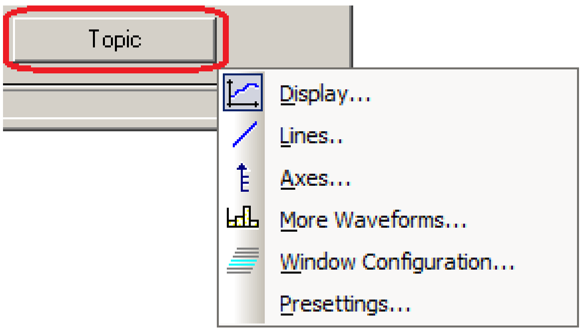
The dialog is closed and any changes made are discarded. This also applies to changes made and displayed in the curve window using the option *Apply changes*.

As presettings or Set as default

This saves the currently effective settings as default settings for future curve windows. The settings are saved to the Windows Registry. If you wish to transfer the default settings to a different computer, use the program XConfig, which is located in imc FAMOS' BIN folder.

Topic

From here, you can go directly to the properties dialogs for other objects.



3.7 Working with the curve window

Menu item		Description
	Zoom 180	Enlarges a section of the curve window.
	Unzoom 181	Displays the entire curve.
	Measure 182	A measurement value window and measurement cursors for measuring curves are displayed.
	Select-mode 196	In this mode, it is possible to select and edit legends, coordinate systems, axes, curves and markers.
	Marker 198	Proceeds to the list of marker functions.
	Clipboard 222	Copies the graphics in the curve window into the Windows clipboard.
	Graphic-export... 222	The graphic of the curve window is saved as image or as a PDF file.
	Move 227	Proceeds to a submenu listing various curve viewing functions.

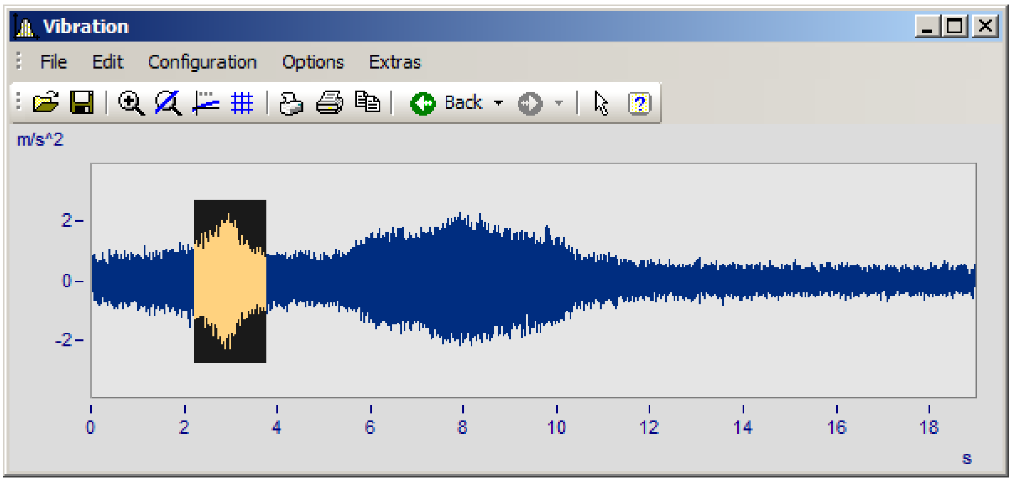
3.7.1 Zoom

Function

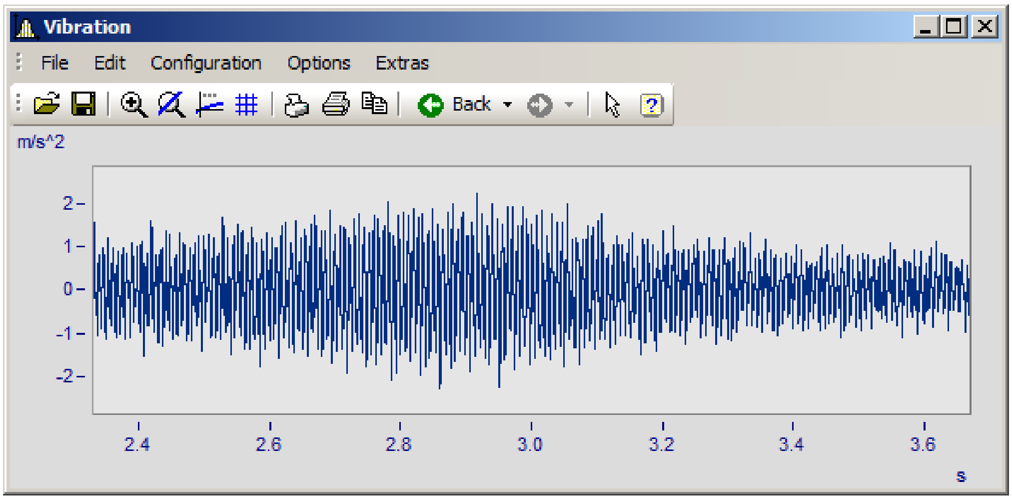
Any region of a displayed curve can be enlarged for viewing (zoomed). Zooming can be done in both x- and y-directions at the same time. The zoomed region is a rectangular area within the coordinate system, with size and position determined by the user.

Mouse Operation

- Select menu option *Edit / Zoom* from the *Scales* menu. The mouse pointer changes its shape to a vertical arrow.
- Draw a rectangle with the mouse around the area you want to see. The selected area is displayed with inverted colors.



- Release the mouse button to enlarge the area displayed in negative and end the zoom mode



Remarks

- The *Zoom* mode can be ended at any time by pressing ESCAPE.
- The mouse pointer must not necessarily be within the coordinate system when selecting the corners of the zoom range.
- A zoomed region can be zoomed further for greater detail.
- Use menu option *Unzoom* to view the entire curve.

- The zoom function can also be used when the *overview* or *measurement value windows* are active.
- After completed zooming, the axes can optionally be labeled with rounded values. In that case, a slightly larger region is usually displayed than was selected.
- Note that the option *use rounding* 251 can be switched off in the *Presettings* menu.
- The zoom function can be regarded as a short-cut for a series of manual axis scaling operations (see menu option *Axes* 106). If the result is not satisfactory, scale the axes manually (without rounded values).
- Note that zooming in the x-direction often does not produce the desired results, especially for x-axes displayed logarithmically. In rounding, the values on the x-axis will be shown in powers-of-ten as long as the x-range is large enough. Try zooming even more in the x-direction or scaling the x-axis manually. Then you must give consideration to the presettings for the curve window.
- When several curves are displayed in a window, all are zoomed at the same time.
- The measurement value- and overview windows are updated automatically; the positions of the measurement cursors are kept, if feasible.
- Unlimited zooming is not possible:
  - The relative resolution is 10^{-13}.
  - Note that unlimited zooming doesn't make sense, since the representation of the numbers is only precise to approximately 15 decimal places.
  - The zoom region is determined by the resolution of the monitor screen. Enlarge the curve window to make zooming more precise.
  - When the display mode *y-axes stacked* 21 is selected, you can spread the color-negative rectangle of the zoom mode onto one single or several curves. If the rectangle covers only one curve, this curve is zoomed in the x- and y-directions; while for the other curves in the window, the y-range remains intact and the x-range is adapted to the zoomed region. If the rectangle extends over more than one curve, only the x-direction is zoomed; the y-range for each curve remains the same.
  - In waterfall diagrams, only the XY-level can be zoomed.

3.7.2 Unzoom

Function

Select the *Unzoom* function to return to the display of the entire waveform after having zoomed. If the curve window had customized scaling and parameters before zooming, those settings are lost after unzooming, since the scaling is then performed automatically.

Mouse Operation

Select menu option *Unzoom* in the *Edit* menu to restore the previous curve window settings.

Remarks

All y-axes present when the function *Unzoom* is selected are scaled automatically, except when they are scaled like the next axis to the left. The x-axis is scaled automatically so that the first curve in the window is displayed completely. Additional curves may extend beyond this range due to a different x-scaling.

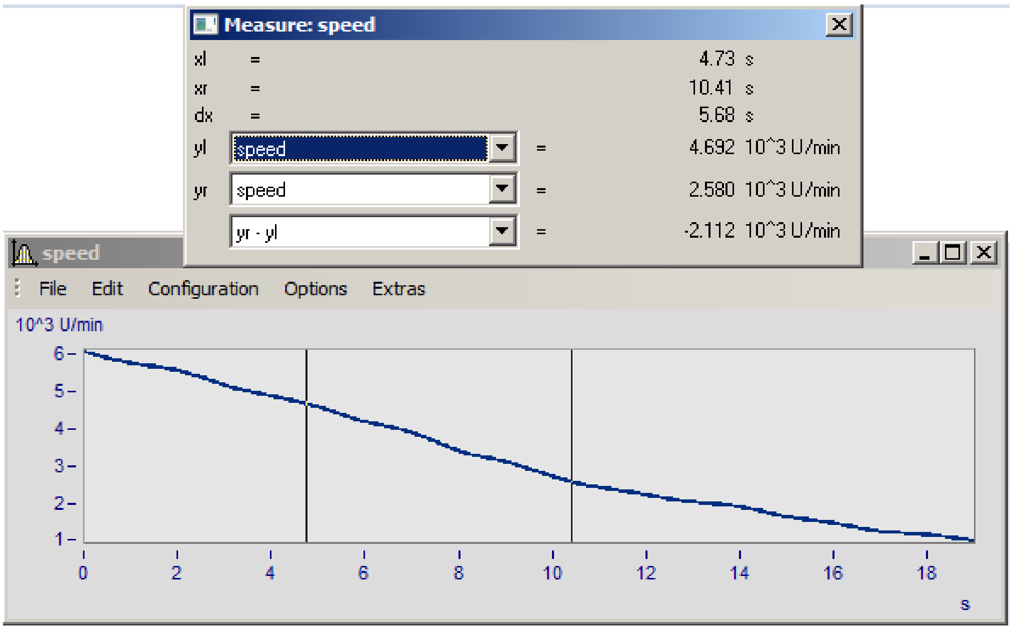
3.7.3 Measure

Function

Two independent measurement cursors are available for performing measurements. The x- and y-values of the intersections with the vertical cursor lines are displayed together with the curves in a measurement value window.

Mouse Operation

- Select *Edit/ Measure* and the *Measure* window appears. A measurement value window appears and two measurement cursors are set up in the curve window.
- Move the mouse pointer to over the coordinate system and hold down the left or the right mouse button. The mouse pointer then jumps to the measurement cursor. On the other hand, if you wish to place the measurement cursor at the mouse pointer's position, hold down the keys CTRL or SHIFT while clicking on the mouse button.
- The **left mouse button** controls the **left measurement cursor;** the **right mouse button** the **right measurement cursor**. If you hold down both mouse buttons at the same time, you move both measurement cursors simultaneously.
- When you click in the curve while holding down the SHIFT key, the measurement cursor jumps to the mouse pointer's current x-coordinate.
- In order to place the measurement cursor at any desired location in XY-displays, click one of the mouse buttons while holding down the SHIFT key. The measurement cursor then jumps to the closest point on the curve to the current position.



Remarks

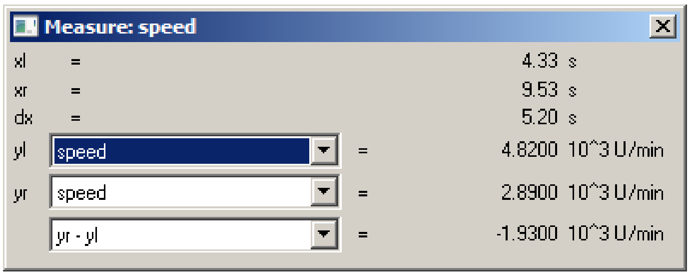
- The crosshairs may cross each other.
- In normal time displays, the horizontal line of a measurement cursor is visible only as long as the curve lies within the coordinate system and is defined for the x-coordinate of the measurement cursor.
- Zooming in XY or locus plots may result in the measurement cursors no longer being visible.
- If linear interpolation between the actual points of a curve is used to draw a graph (points connected by lines), the measurement cursors follow this path.

- To measure the actual points of the curve, select the display mode *Steps* in the *Style* submenu of the *Lines* 125 menu.
- The horizontal measurement cursor can be switched off in the *Options/ Presettings* 251 menu. This is sometimes useful when displaying slowly changing data or digital data consisting of steps.
- If no mouse is connected, the mouse pointer only appears whenever the curve window is active at the moment.

3.7.3.1 Measure window

Function

The measurement value window appears once menu option *Measure* has been activated in the curve window. Its position can be changed as desired. However, the measurement value window is always in front of the curve window to which it is assigned. The measurement value window shows the x- and y-values for both measurement points and those values' mutual differences; the display of other characteristic values is optional.

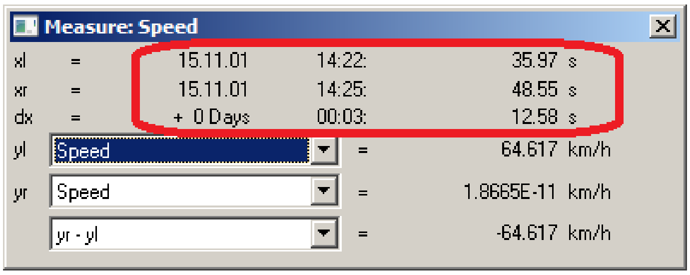


In the selection lists *yl* and *yr*", a waveform displayed in the curve window can be selected for measurement, which is accomplished using the measurement cursors. The list box at the bottom of the dialog contains the following entries as available choices of calculated values:

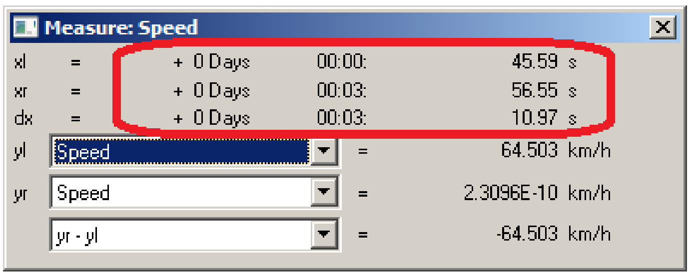
Symbol	Description
xl	x-coordinate of left measurement cursor
xr	x-coordinate of right measurement cursor
dx	Difference between the x-coordinates, xr-xl
xr/xl	Quotient of the x-coordinates of the measurement cursors
yl	y-coordinate of the specified curve at the intersection with the left measurement cursor
yr	y-coordinate of the specified curve at the intersection with the right measurement cursor

Calculations	Description
yr-yl	Difference between the y-coordinates
yr/yl	Quotient of the y-coordinates
Slope	Slope between the two measurement points, dy/dx
Slope per decade	Slope is defined in units per decade, dy/lg(xr/xl); especially useful for logarithmic display. For example, the slope of a filter is often measured in dB/dec.
1/dx (frequency)	Difference between x-coordinates (xr-xl) in frequency units, e.g. 1/ms
Surface	Integral of the data between the measurement cursors = Sum(Yn*xdelta) Available only for equidistantly sample waveforms.
y-Min	Minimum between the measurement cursors. Available only for equidistantly sample waveforms.
y-Max	Maximum between the measurement cursors. Available only for equidistantly sample waveforms.
RMS	The root of the mean value of the squares of each value between the cursors ("root-mean-square") is calculated. Available only for equidistantly sample waveforms.
Standard deviation	For the data between the measurement cursors, the deviation of each value from the arithmetical mean is squared and then all of these squared values are summed. This value is then divided by the number of these values minus 1; finally, the square root is calculated. Available only for equidistantly sample waveforms.
x-coordinate of inflection point	Inflection point according to the following formula: yl > yr -> x-position of **minimum** slope yl < yr -> x-position of **maximum** slope Available only for equidistantly sample waveforms.

When using one of the display modes *Date/ time* or *Days/ hours/ minutes*, the time data appears as follows:



Measure window with date and time view



Measure window with relative time

A negative sign before data in *days/hours/minutes* and *seconds* pertains to the entire time declaration, not only to the days.

Positioning the measurement cursors

The left measurement cursor is positioned while holding down the left mouse button, and the right cursor while holding down the right mouse button.

In normal cases the cursors move along the data line; for this reason, the *line type* 126 applies to it.

By means of the contextmenu command "*Cursors freely movable* 186", it is possible to cancel the linkage.

Wen you click in the curve window while holding down the Shift key, the cursor jumps to the selected x-position. Depending on the setting "*Cursors freely movable* 186",the horizontal measurement line jumps either to the associated amplitude or to the selected position.

3.7.3.2 Context menu in Measure window

Move the mouse cursor to the measurement value window and right-click the mouse to prompt the following context menu:

Cursors unrestrictedly movable

If you select this function, both measurement cursors can be moved freely in the curve window without any linkage to particular curves.

Send Curve Segment to imc FAMOS!

This option sends the curve section located between the vertical lines of the measurement cursors to imc FAMOS. This new waveform receives a name which appears in the variable list and by which it is designated as per the transfer options set using the menu Options/ Transfer options. 257.. in the curve window.

When multiple curves are displayed in the window, the section between the measurement cursors of each of them will be transferred to imc FAMOS if the pertinent transfer option is currently activated.

Note that the original data sets are overwritten if you do not specify a new name when using Transfer Options.

Note that this export function duplicates the waveform in the course of the export procedure, unlike other export functions. Shifting the position of the measurement cursors after exporting a curve section will not affect the exported waveform.

Reference

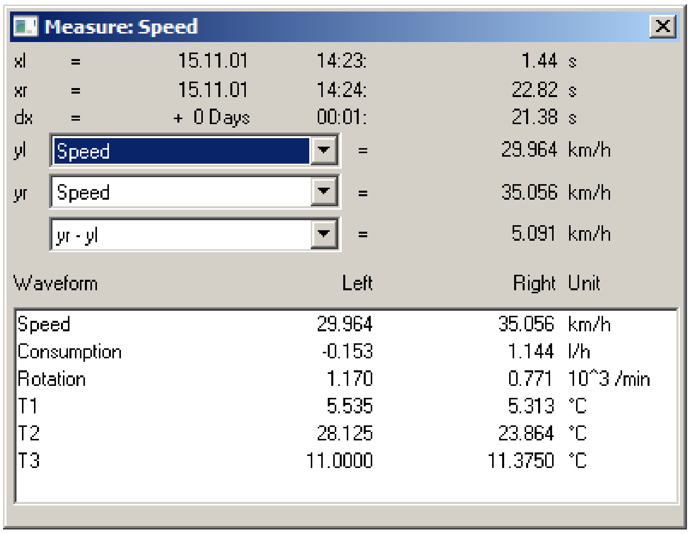
More about Transfer options 257

Clipboard

All measurement values displayed in the measurement value window are copied to the clipboard in text format. This text is then available for use by other applications.

Channels List

When several curves in one window are compared with each other, it can be helpful to see simultaneously the measurement values of as many curves as possible. Do this by selecting the option Channels List, which displays a list of all channels. The measurement value window is enlarged and a list of all y-coordinates at each of both measurement cursors appears, irrespective of which curve the cursors are currently set to move along.



When *List of all channels* is active, the menu item is marked with a check. If you wish to close the list mode, select the same menu item again. The last state remains in operation the next time the measurement window is opened. The channel list's size can be changed. You can highlight list entries to distinguish then visually.

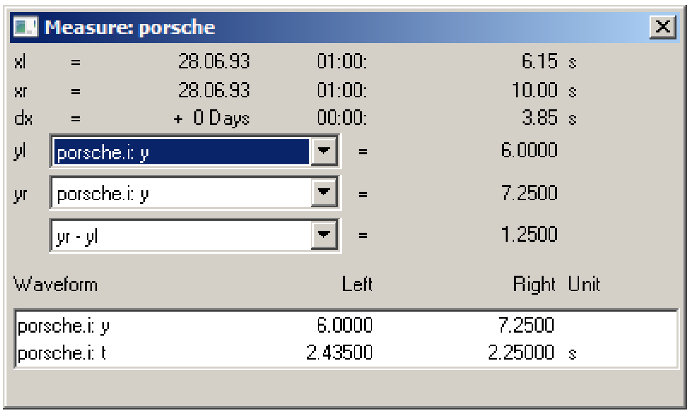
Remarks

The column *right* and *left* above the list is assigned to the measurement cursor which is controlled by the corresponding mouse button.

Expand List

When *List of all channels* is active, the menu item *Expand the list* appears. By selecting this option, separate measurement values for all XY-waveform components -if any such waveforms are present- are displayed in the list. In polar plots, the measurement values of the magnitude and phase are displayed. This option can also be activated by double-clicking on the pertinent entry in the list.

Double-clicking on a component of the waveform also deactivates the option; and only the selected component is retained as a separate entry in the list.



Reproccessing signals...

This menu item allows signals to be reprocessed, for example, to undergo smoothing or peak clipping. For a detailed description, see the separate chapter Reprocessing signals 190.

Place marker with left click; Place marker with right click

Set a marker at the measurement cursor positions. Subsequently, a dialog for marker settings 209 appears.

Reference

More about "Markers" 198 and "Marker Definition" 209

Append to measurement value file

This menu item appends the measurement values to the file of measurement values as text. The name (along with the directory path) is set in the menu under *Measurement value file name*.

The file is a normal, text file in ASCII without formatting, so that it can be edited by any word processing program. By repeatedly calling this menu item for a variety of cursor positions, it is possible to generate a list of landmark points. If the file doesn't exist, it is first created.

Note that MS-Windows applications misread *umlauts* in these files. The OEM format is used for writing to these files. For this reason, use programs (such as word processors) not running under MS-Windows to analyze these files.

Note

As of imc FAMOS 7.0 / imc STUDIO 5.0R3, this function is no longer shown.

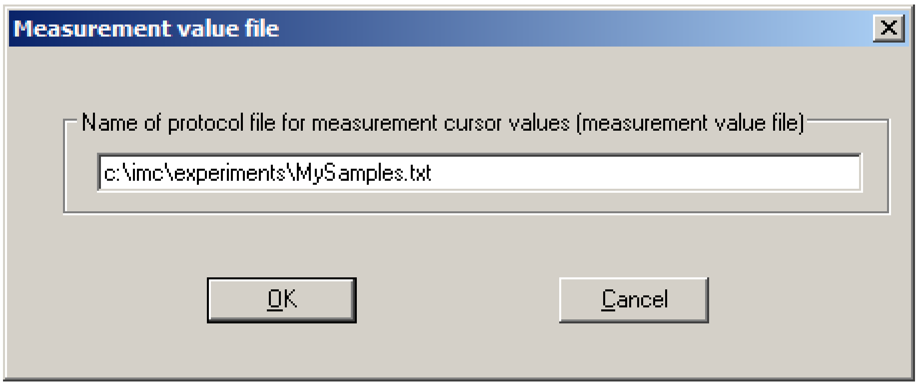
By means of an entry in the Registry, it can be made visible again:

Computer\HKEY_CURRENT_USER\Software\imc Measurement and Control\Default\CurveDataManager\Curves

If it is not already present, enter as a *New String* the text "*EnableMeasFile*". Set its content to *1*.

Measurement value filename

This menu item calls a little dialog in which the name of the measurement data file can be edited. The setting for this filename is valid globally for all measurement value windows.

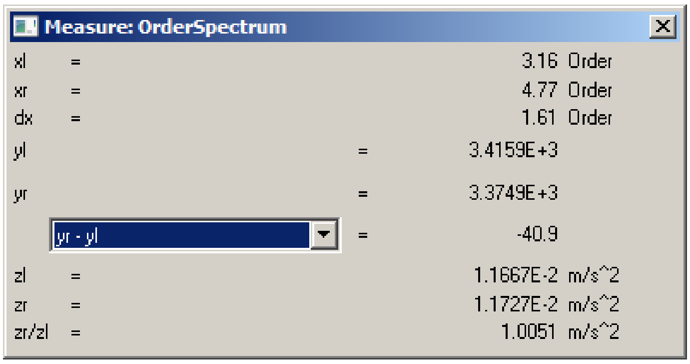


Remarks

- The *Measure* mode (i. e. Measure window is open) is ended whenever a major change in the display of the curve window is made, e.g. when numerical value display mode is selected.
- The menu option *Measure* in the curve window is checkmarked if the curve window is in the *Measure* mode. If the checkmark is removed, the measurement value window is closed.
- Each curve window can be in the *Measure* mode, regardless of the status of all other opened curve windows. It is thus possible to conduct measurements with multiple measurement value windows independently of each other. The title bars in the *Measure* windows contain the names of the corresponding curve windows.
- When measuring in all XY-representations (or polar plot), the measurement cursors move somewhat differently than in normal time-dependent representation. The movement of the measurement cursors always follows the parameter of the XY-display. Moving the mouse to the right or upward moves the corresponding measurement cursor in the direction of the increasing parameter.
- The measurement cursor speed in XY and locus plots caries depending on the point density of the curve. The measurement cursors cannot be moved in arbitrarily fine increments between samples. Zooming too strongly, therefore, can cause the measurement cursors to jump between points.

3.7.3.3 Performing measurements on color maps

In this display mode, the measurement cursor can be moved freely over the entire plane of the coordinate system. x- and y-coordinates are arranged horizontally or vertically. The z-coordinate is indicated along the "color axis", which extends outwards from the plane of the monitor.



3.7.3.4 Reprocessing signals

Function

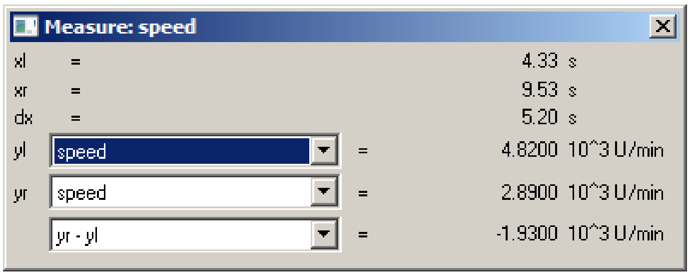
Here it is possible to edit, for instance, to smooth clip peaks from, simple signals. Thus, invalid readings can be removed from a signal and replaced with plausible ones, or distorted readings can be corrected, for example, by eliminating offsets or drifts.

These functionalities are only available off-line (in imc FAMOS).

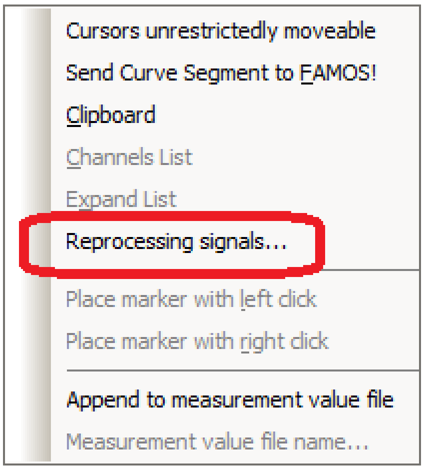
Mouse Operation

A channel is displayed in a curve window. A region is staked out using the measurement cursors, e.g. the region around a signal peak representing interference to be deleted. In the dialog called from the menu item *Reprocessing signals...*, a mathematics function is selected for applying to the staked-out region. When this function is performed, the channel's measured value are replaced by newly calculated values.

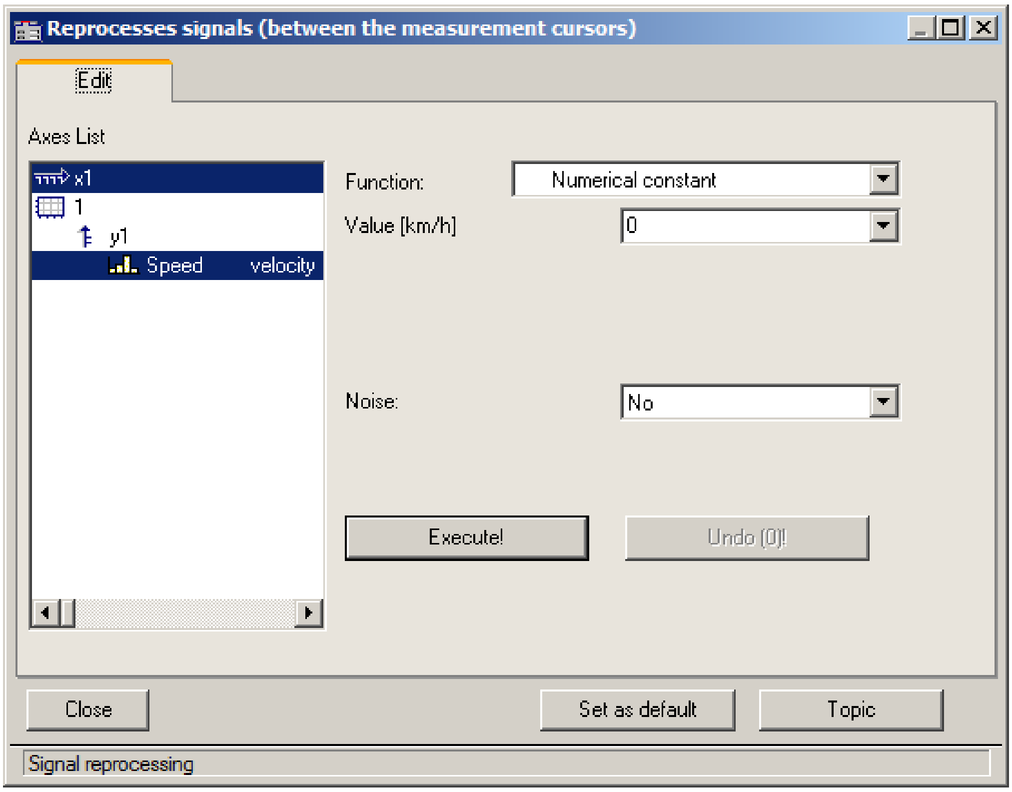
First, the Measurement value window is opened:



Next, this window's context menu is opened: move the mouse pointer over the measurement value window and right-click the mouse; the menu illustrated below then appears:



Select *Reprocessing signals*.... The following dialog is called:



Select in the left portion of the dialog the channels in the curve window to which the function is to be applied. On the right side, select the calculational function and the function parameter.

Use the measurement cursors to carefully delineate the desired signal segment.

When the *Execute!* button is pressed, the function is applied to the respective signal segment of the selected channels, which is delineated by the cursors.

The button *Undo* lets you reverse the last action taken.

Remarks

- Only simple data types can be handled in this way. These are equidistant data (constant sampling time, dx = constant) no having any additional structural pattern. In particular, it is not possible to process segmented waveforms, data with events, XY-data, data already subjected to Transitional Recording, Time-stamp-ASCII data, texts, and complex data.
- The data's original format is retained. This can mean that the value range is limited and stays that way, and that the math function can thus only be performed in approximation. For instance, if a channel's value range is -10V .. +10V with 2 Byte integer format, no value >10V can be displayed. Thus, an overdriven spline can be truncated at 10V. And it isn't possible to set the signal to 11V, instead it stays limited to 10.0V.
- Undo: Up to 30 actions can be reversed (undone).
- If invalid function parameters are specified, the function cannot be carried out. Instead, an error message appears.
- **The interval for determining boundary values may not be less than 0!**
- The dialog for reprocessing signals can only be opened for one curve window at a time. So if you wish to reprocess another curve window's signal also, first close the *Reprocessing signal* dialog in the first window.
- The dialog for reprocessing signals has no *Cancel* button. If the dialog is exited, changes made to the channels are retained. The *Undo* button is the only way to reverse changes that have been made.

- See the discussion of "Confirmation bar 178" for more information on the operation of the *Set as default* button.
- If data in imc FAMOS are edited by means of the *Reprocessing signals*.. dialog, the display in imc FAMOS' data editor is not updated. The Data Editor should be closed during this time; it can be called again afterwards.

Description of the functions

The following is a description of all functions in the list *Function*. The functions are ordered by subject.

The subjects appear aligned to the left edge, e.g. *Adapts curve*. The functions themselves appear in the list with an indent, e.g. *Constant level based on right boundary*. Only functions can be selected.

Subjects

- *Adapt curve*: A connecting line, either a straight line or a spline, is inserted.
- *Re-define curve*: The curve is re-defined; for instance, as a specified constant level.
- *Smoothing*: e.g. low-pass filtering
- *Edit signal*: e.g. value range limiting
- *Edit trend*: e.g. add offset, eliminate trends, high-pass filtering
- *Noise*: Add noise to produce readings which "look convincing".

Please note also the description of the parameters *Noise* 193 and *Boundary interval* 194.

Adapt curve	Description
Constant level based on right boundary	The mean value of the right boundary interval (which see below) is taken. This value replaces all original readings in the delineated region. If desired, noise (which see below) can be added.
Constant level based on left boundary	The mean value of the left boundary interval (which see below) is taken. This value replaces all original readings in the delineated region. If desired, noise (which see below) can be added.
Connecting line	The respective mean values of the right and left boundary intervals are taken. These mean values are used as the boundary values for a straight line replacing the signal curve between the cursors (linear interpolation). If desired, noise (which see below) can be added.
Cubic spline	The respective mean values and average slopes of the right and left boundary intervals are taken. The mean values are used as the boundary values of a replacement curve between the cursors, and the slopes are used to form a cubic spline, which is a polynomial whose slope at the boundaries matches the slope of the original curve.

Re-define curve	Description
Constant numerical value	The delimited region can be replaced with a fixed numerical value to be specified. If desired, noise (which see below) can be added.

Smoothing	Description
Low-pass	Smoothing: A digital filter is applied to the readings within the delimited region, a low-pass filter of Butterworth characteristic. The filter order and cutoff frequency can be specified. The order can be set to between 1 and 10. The pop-down list presents suggestions for the cutoff frequency. The cutoff frequency must be substantially less than half of the sampling frequency for the data. The function works in a manner similar to imc FAMOS' FILTTP() function. Note that the filter has a transient oscillation and always produces a delay.

Edit signal	Description
Clip signal above	All readings in the region delineated are clipped to keep the curve below a specified maximum value.
Clip signal below	All readings in the region delineated are clipped to keep the curve above a specified maximum value.

Edit trend	Description
Add a numerical constant	Adds an offset. A fixed numerical value is added to all readings in the delineated region. This means adding an offset. To subtract, enter a negative value.
Multiplication	A fixed numerical value is multiplied to all the measured values within the staked-out interval.
High-pass	Eliminates offsets and slow drifts: a digital filter is applied to the readings within the delineated region, a high-pass filter of Butterworth-characteristic. The order can be set to between 1 and 10. The pop-down list presents suggestions for the cutoff frequency. The cutoff frequency must be substantially less than half of the sampling frequency for the data. The function works in a manner similar to imc FAMOS' FILTHP() function. Note that the filter has a transient oscillation.
Add a slope	Trend correction: a slope is added to all readings within the delineated region. The slope is a linearly increasing function. To define the slope, and amplitude is specified for the initial point (y-coordinate at left boundary of delineated region) and the amplitude at the end (y-coordinate at right boundary of delineated region). The values specified define the slope, which is then added to the readings.
Subtract linear approximation	Trend correction: a linear approximation is formed from all the readings in the delineated region. The least-squares method is used for this. The approximation The approximation is later subtracted from the curve in the delineated region.
Fade in/out	The signal can be faded in to or out from zero within the delineated region. For this purpose, the signal is multiplied with a ramp. Fading in is the typical case, from 0% to 100%. Fading out from 100% to 0% is another typical action which is possible. Both percentages can be specified. An entry of 100% corresponds to a factor of 1.0. These parameters appear in the dialog as Start, component [%] and End, component [%] as the values at the left and right boundaries, respectively. In between, the values are interpolated linearly. The two percentages supplied may not be either 0.0 or 100.0, but can take any other real value in between.

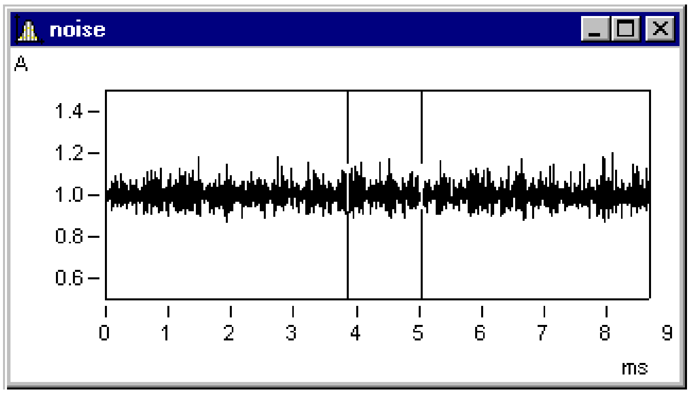
Noise	Description
Add boundary noise	The respective trend is eliminated from each of the boundary interval's signals. This is accomplished by subtracting the linear approximation calculated. What remains is interpreted as noise. This noise, cyclically repeated, is added to the readings in the delineated region. In the process, the noise at both ends merges by means of linear weighting over the width of the delineated region. The values within the boundary interval naturally remain unchanged.
Add equally distributed noise	Equally distributed noise of specified amplitude is added to the readings within the delineated region. If the amplitude is 1.0, random numbers in the range -1.0 ... +1.0 are generated and added.
Add Gaussian-distributed noise	A noise signal with Gaussian distribution (normal distribution), having a specified RMS-value, is added to the readings within the delineated region.

Boundary interval

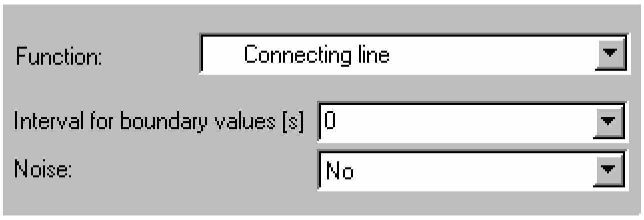
Many functions use the boundary values at the edges of the delineated region; for instance, all values within the delineated region are bridged by a connecting line or spline.

Now, it would be possible to simply use the boundary value itself for this purpose. However, this would not take the noise, which frequently is present, into consideration. The result of the function would be dependent on the noisy value at the region's particular edge, and this is largely a matter of chance. Therefore it would seem reasonable to take the mean of a small interval around the boundary, in order to reduce the influence of random noise. This interval should be, on the one hand, relatively small, but on the other hand still large enough to suppress the noise.

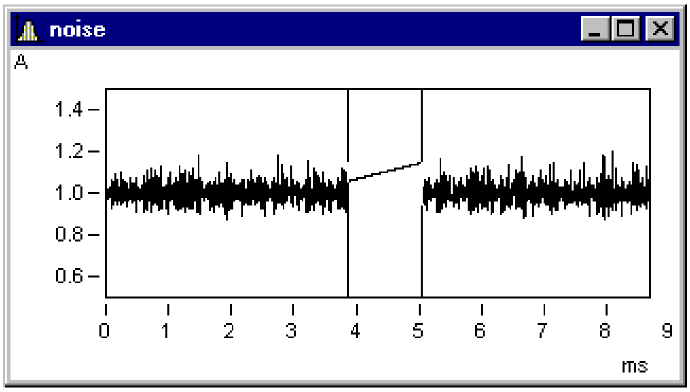
In the example below, the delineated region is to be replace by a straight line (between the boundary values):



In the dialog *Reprocessing signals*..., the following settings are made.

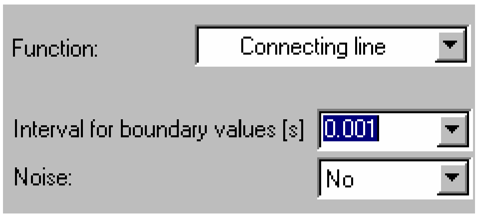


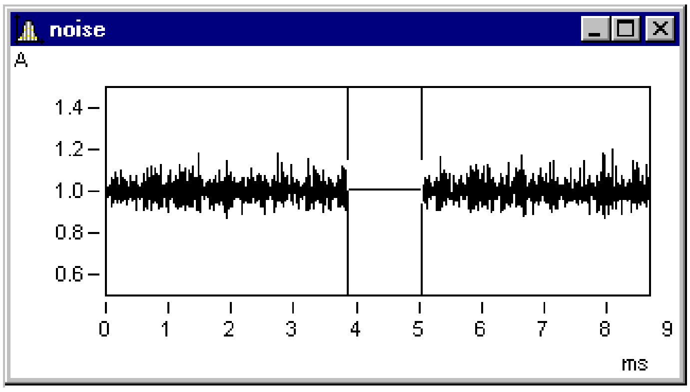
The following connecting line results:



This isn't what one would expect. By chance, the values at the edges (under the cursors) are random peaks.

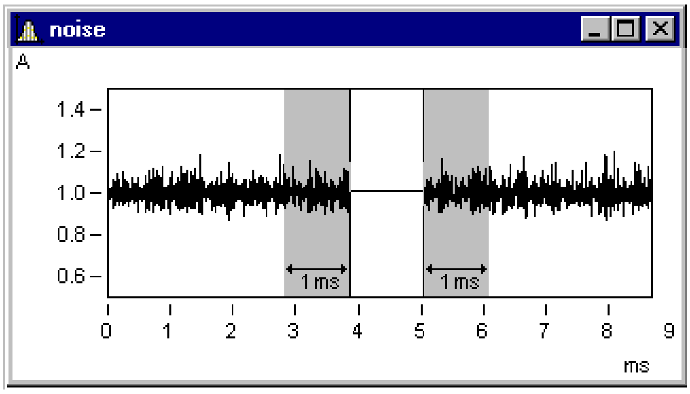
Setting a boundary interval of 1ms (0.001s !) produces proper results:





The boundary interval always is located outside of the delineated region:

Here, the boundary intervals are shaded in grey.



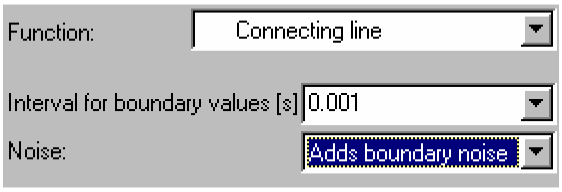
Remarks

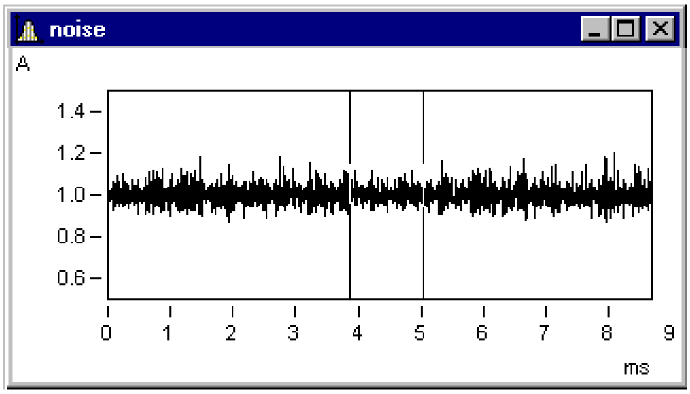
If 0.0 is taken as the boundary interval width, the value at the exact edge is used. Thus, the minimum width of the boundary interval is 1 reading.

Adding noise

To the sample signal above, it is now possible to add noise. Toward this end, the noise in each of the boundary intervals is determined. This noise, cyclically repeated, is then added to the delineated region. Between the noise signal on the left and that on the right side, a smooth transition is accomplished by linearly increasing weighting along the width of the region.

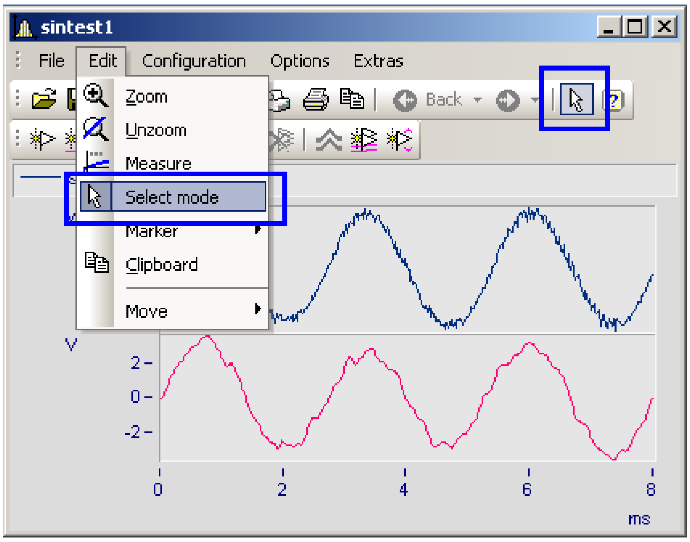
With the following setting, noise from the boundary intervals is added to the delineated region. This produces a realistic signal appearance:





3.7.4 Select mode

The *Select mode* enables the user to select legends, coordinate systems, axes, lines and markers by means of the mouse. *Select mode* can be activated/deactivated either via the *Edit* menu or the toolbar. Alternatively, it is possible to activate/deactivate Select mode by double-clicking over a region where there are no objects, for instance in the middle of a coordinate system.



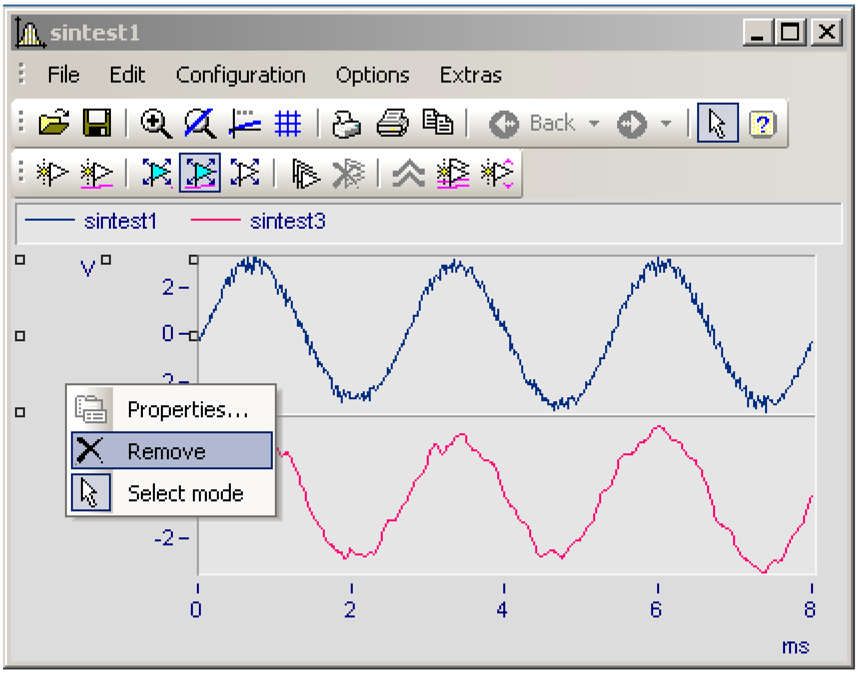
If you are in *Select mode*, the current object is highlighted. This is indicated by the presence of small empty squares at the object's edges. Any lines not selected appear dulled in color.

Multiple selection is possible by making a selection using the left mouse button while holding down the CTRL-key. However it is only possible to join up objects all of the same type (lines or axes) in multiple selection.

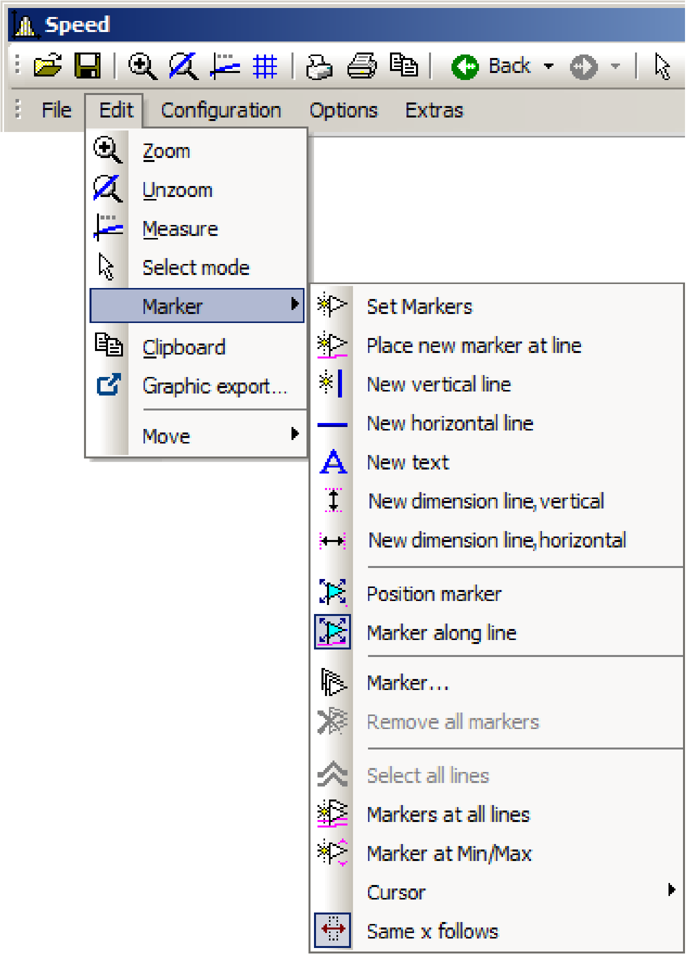
Among other things, the context menu contains the function *Delete*. This is only available if objects which can be deleted are available, such as a second y-axis. If such an object is deleted, any associated objects are also deleted. In the example, the lines in the deleted y-axis would also be deleted.

Example

You select the upper y-axis and deleted it. In the process, the sintest1 lines with which it is associated are also deleted.



3.7.5 Markers



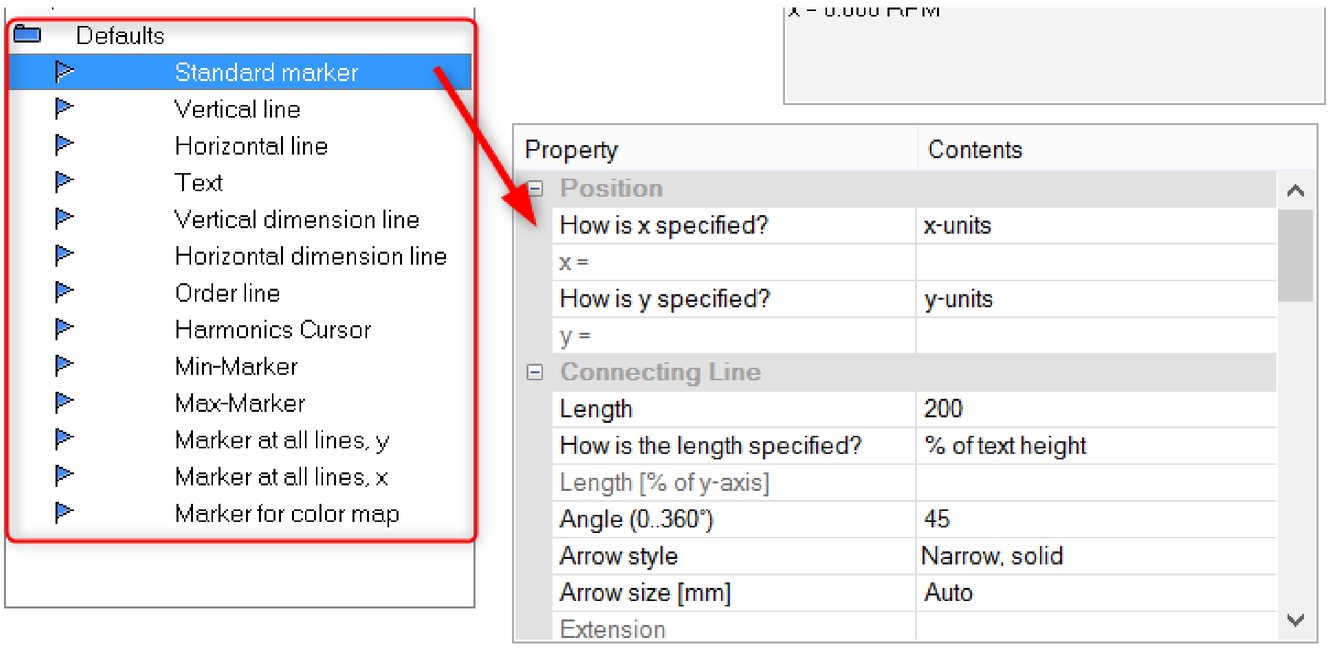
Function

A marker is a designated point in a curve window, to which a text can be assigned. The point itself is not visible, but a line with an arrow may point from the text to the point. The text can be enclosed in a frame; various characteristics can be established for the lines and font for each marker, such as color and size.

Defaults

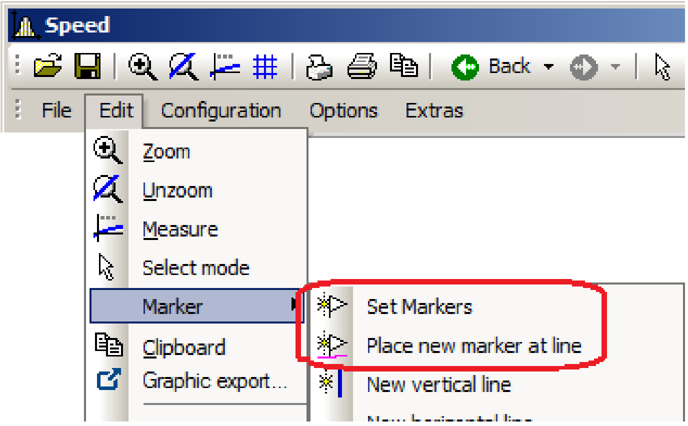
All marker types are described below. Each type has particular default settings which are applied when the marker is inserted.

You can customize these individually by modifying the parameters for the selected marker type.


Defaults
Standard marker
Vertical line
Horizontal line
Text
Vertical dimension line
Horizontal dimension line
Order line
Harmonics Cursor
Min-Marker
Max-Marker
Marker at all lines, y
Marker at all lines, x
Marker for color map
Property
Contents
Position
How is x specified?
x-units
x =
How is y specified?
y-units
y =
Connecting Line
Length
200
How is the length specified?
% of text height
Length [% of y-axis]
Angle (0..360°)
45
Arrow style
Narrow, solid
Arrow size [mm]
Auto
Extension

3.7.5.1 Set markers

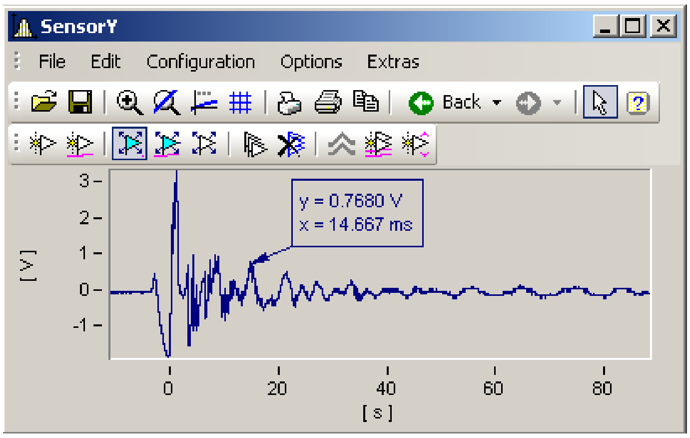
There are two ways of setting a marker, which are accessed either from the Marker toolbar or via the menu item *Edit/ Marker*.



Set Markers ( )

This function lets you generate markers at any desired position. If the function is selected, the cursor is represented by this symbol ( ), which disappears again after the marker is set.

Click to the point in the curve window to be marked. A dialog box is promted in which marker characteristics can be established. If no settings are made and the dialog is ended with <OK>, the x- and y-values of the marked point are used as the marker text. More about Marker Definition 209.



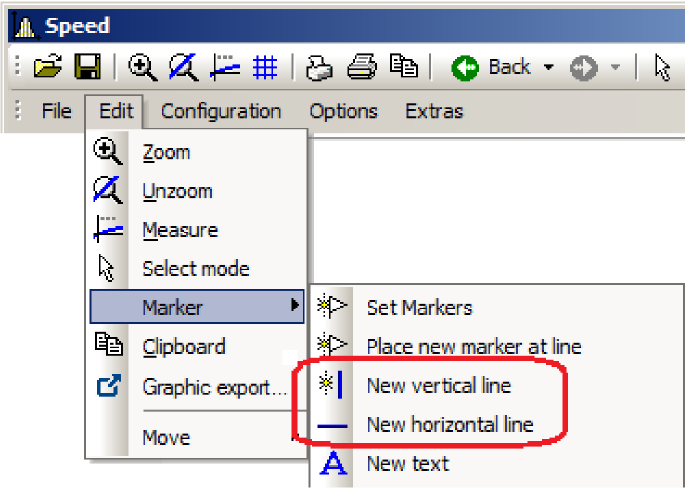
Markers can be placed anywhere in the curve window. Zoom more intensely if a marker should be placed near a line. Accuracy depends on the resolution. To place a marker exactly at a certain point in the curve, select the function *Place new marker at line*.

Place new marker at line ( )

This function only helps to generate markers at lines. If the function is selected, the cursor is represented by this symbol ( ), which disappears again after the marker is set. The marker automatically snaps to the next closest line and then moves in response to cursor movements only along the line, until the cursor approaches another line.

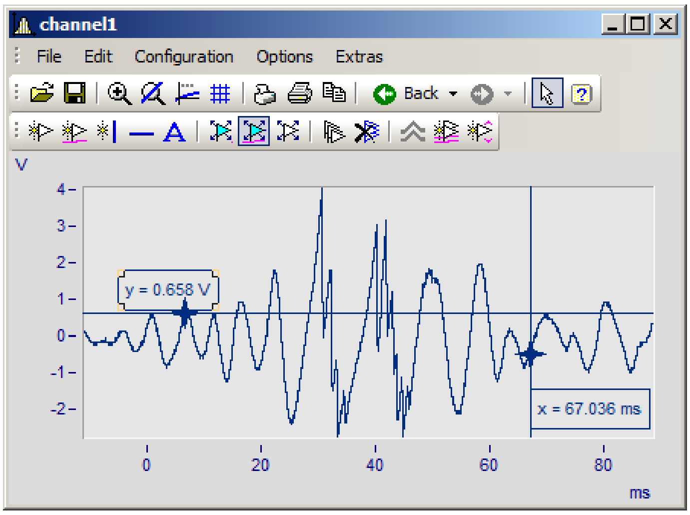
Both modes can be exited by a click of the right mouse button.

3.7.5.2 New line

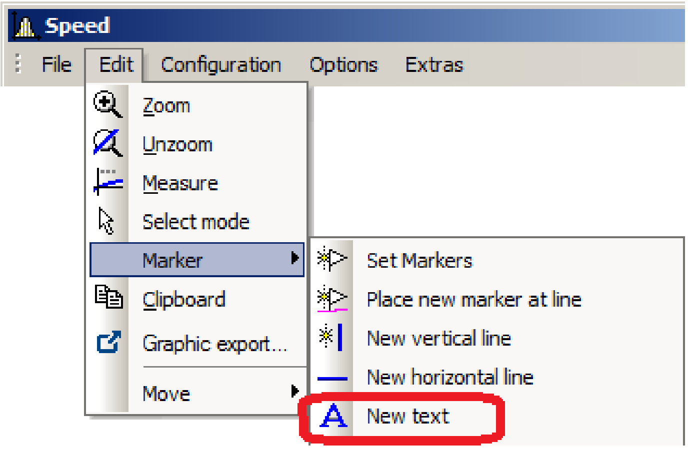


Vertical line new and Horizontal line new

Use these to create vertical or horizontal lines. The location is displayed as an amplitude or x-position in the text box. If the text box attaches directly to the line, it can be moved along the line. Drag the box further away from the line, it can be placed freely at any location.



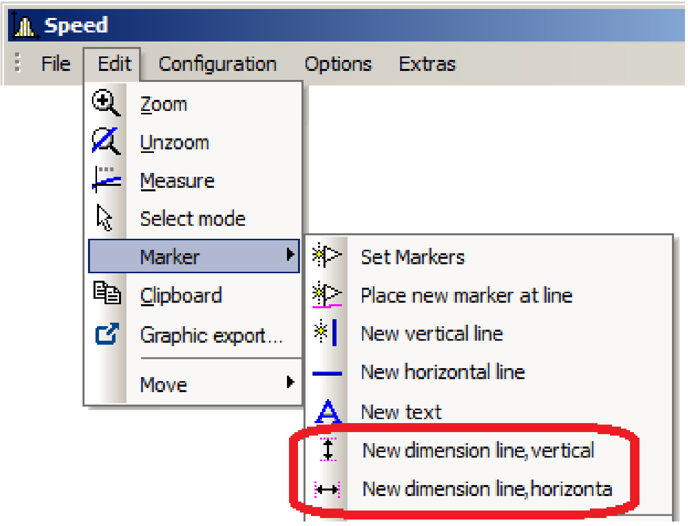
3.7.5.3 New text



New text

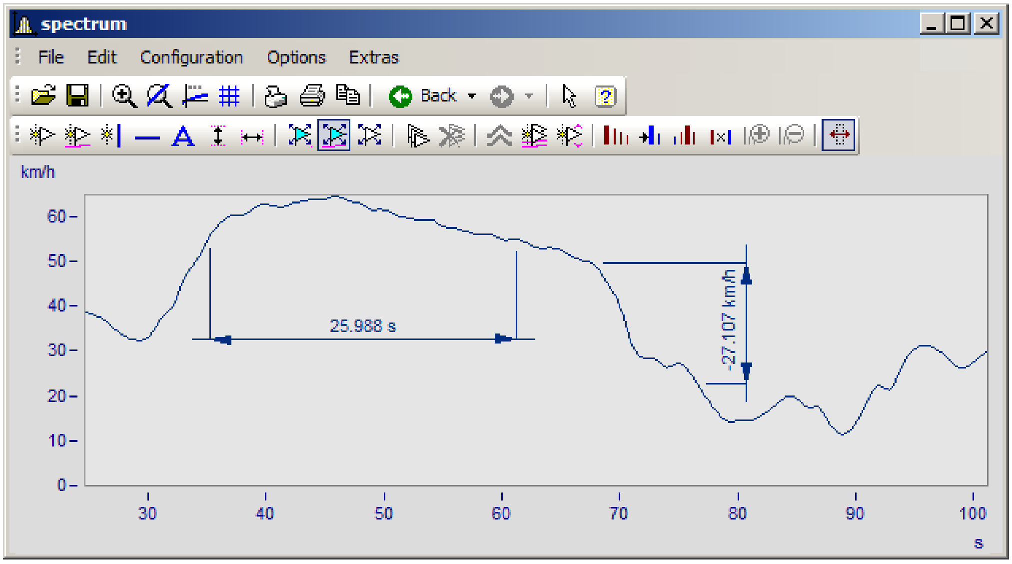
A text box without an arrow can be placed freely. Otherwise, the same settings are available as for markers.

3.7.5.4 New dimension lines

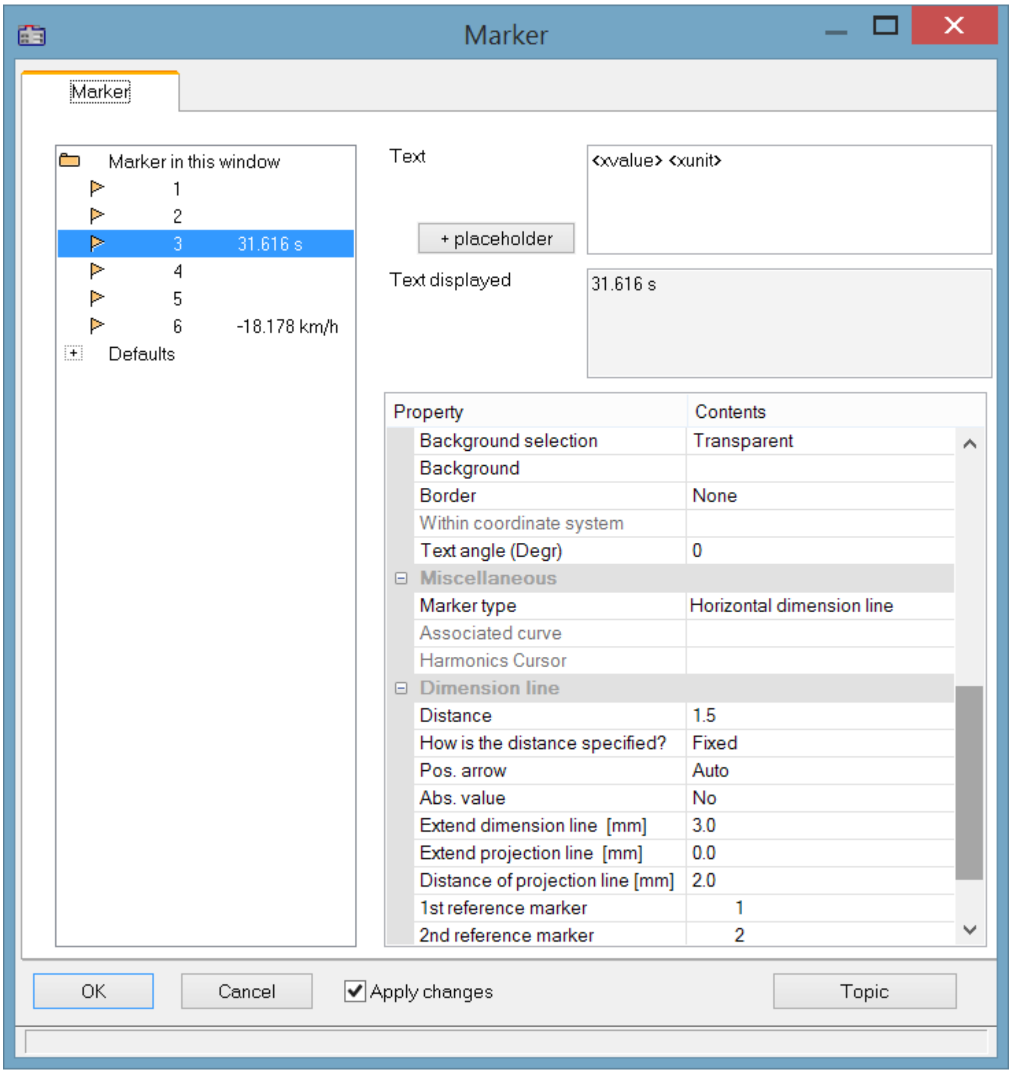


New Dimension Line: vertical and New Dimension Line: horizontal

Select this entry to create a vertical or horizontal dimension line between two points in the curve window where you click the mouse.



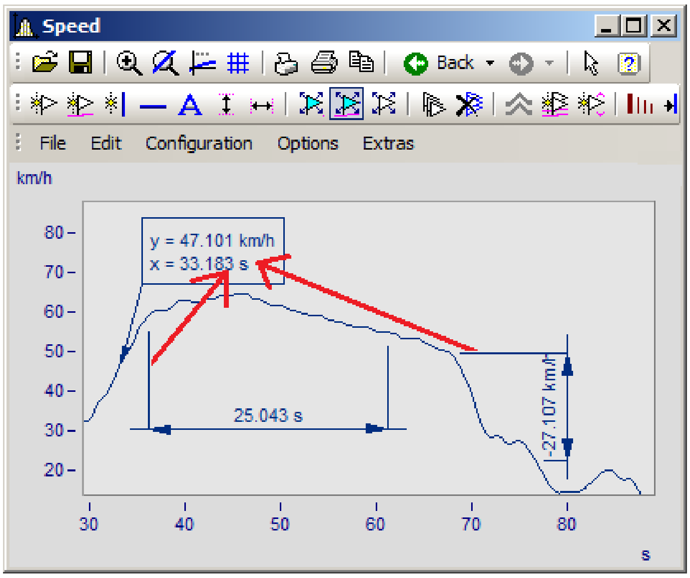
You can change the width of the dimension lines using drag&drop. The placement of the legend as well as of the line is positioned by drag&drop. Making settings for the markers is done as shown below:



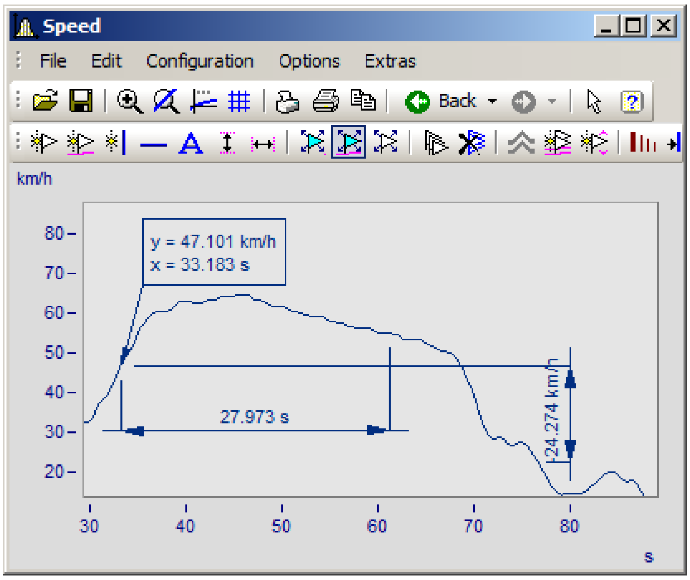
Position

Reference marker: A dimension line is defined by three entries for the marker: two reference markers (1, 2) and the actual line arrow and legend. If other markers are already in the curve window, these can also be used. Assignment of the markers is made by means of the list boxes for the 1st and 2nd reference markers. Alternatively, use drag&drop in the curve window to move a dimension line's extension lines to the existing marker.

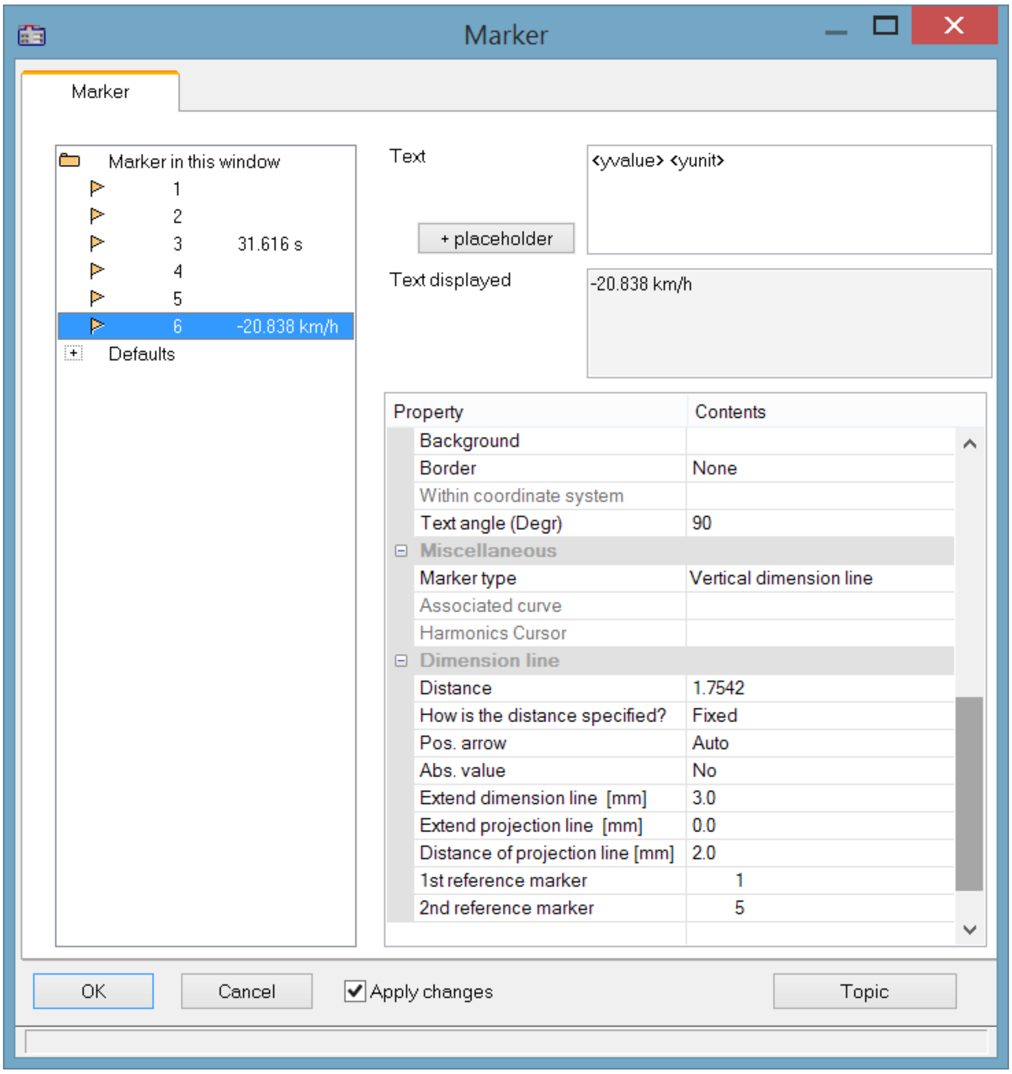
The example below shows how two dimension lines are linked to a marker. When the marker is subsequently moved, the dimension lines are adapted automatically.



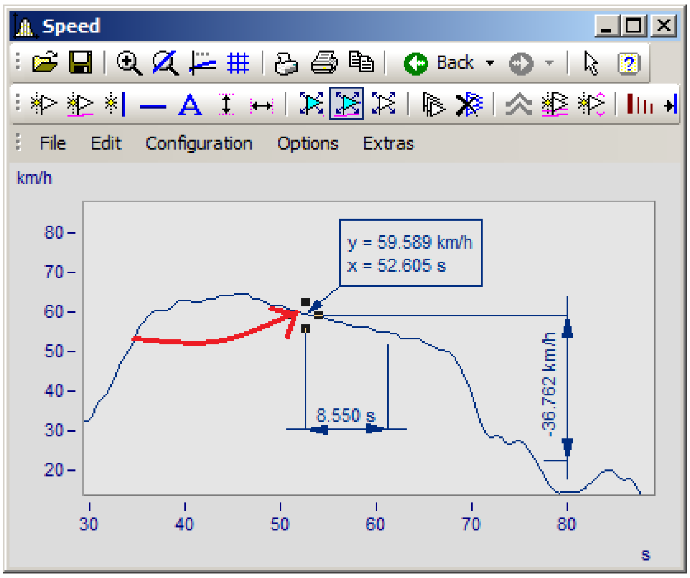
The marker and dimension lines are not yet linked. The extension lines are dragged to the marker.



Now the marker and the dimension lines are linked with the marker.

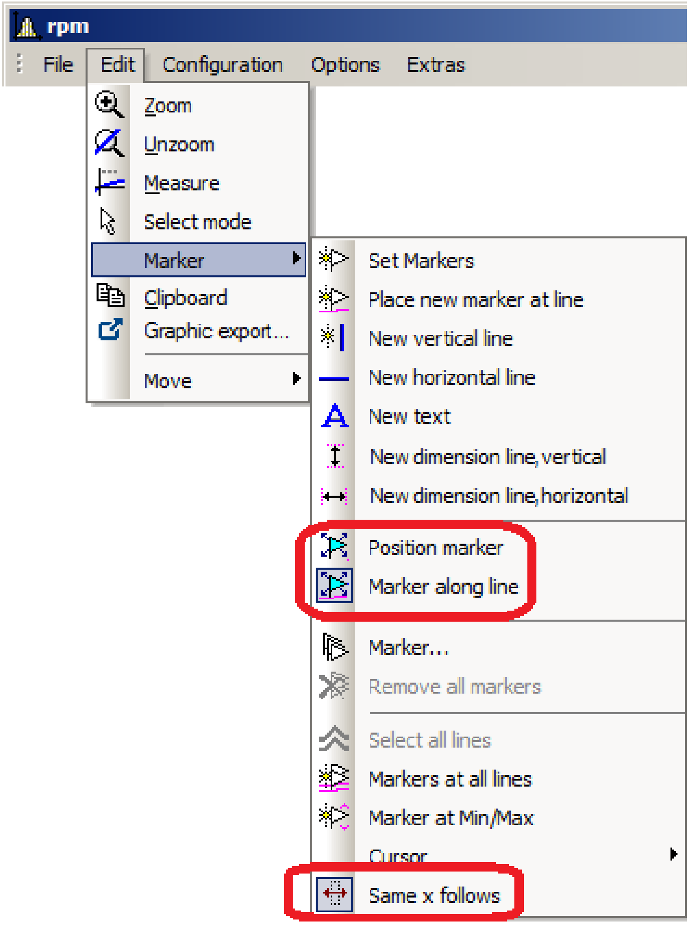


In the definitions dialog, the reference marker for the dimension lines is now linked with the marker.

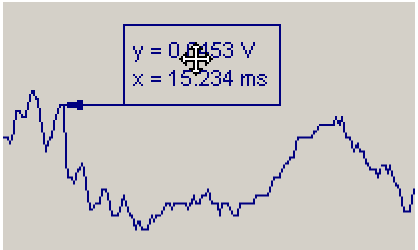
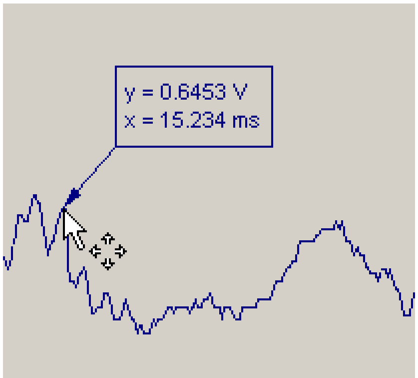


Now, when the marker is moved, the dimension lines are updated.

3.7.5.5 Move markers



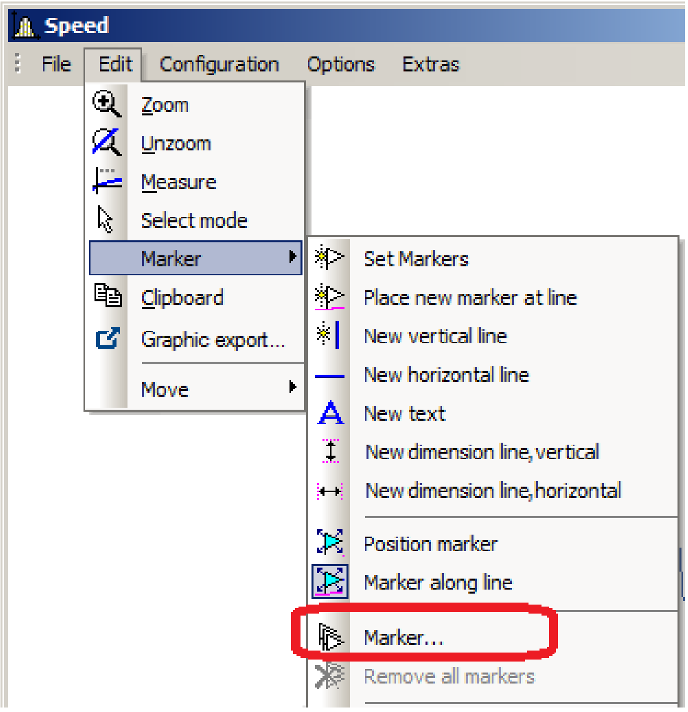
There are different ways to change the marker position:

Action	Description
Position Marker	This function lets you move a marker freely, while the marker text is automatically updated to reflect the respective new position.
Marker along line	This function lets you move a marker along a line, while the marker text is automatically updated to reflect the respective new position. If there are multiple lines in a curve window, the marker snaps to the line closes to the cursor's location.
Move label	In order to move a marker's label, bring the cursor near the label or the arrow, so that the cursor changes shape as shown below. 
Move marker	Existing markers can be moved subsequently. To do this, use Drag&Drop to move the arrowhead point. 
Same x follows	Markers assigned to the same x-position can be moved jointly by means of this function. To do this, move a marker. The markers having the same x-position are moved along with it automatically.

Remarks

- Markers are assigned only to the curve windows, not the waveforms.
- In order to save markers, the curve configuration must be stored as a CCV file.
- Markers already established for a curve window may become meaningless if additional curves are modified or the XY-display is redefined. These markers can be deleted

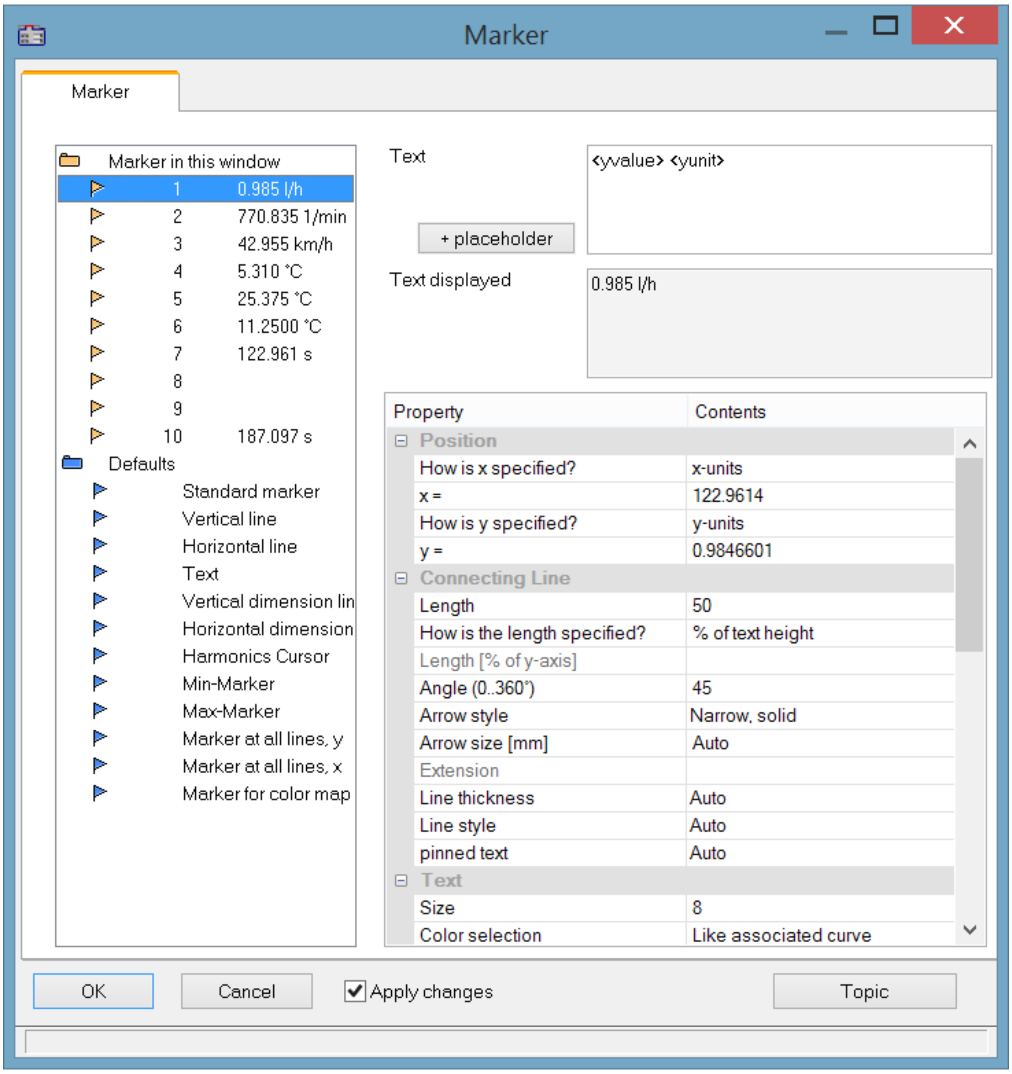
3.7.5.6 Marker definition



Function

Displays the properties of the markers created.

The following dialog appears if a marker was set in a curve window:



The list of markers, in which all markers in the curve window are listed, is found in the upper left box in the dialog.

Select an entry from the list to change the settings for the corresponding marker. Several markers can be selected by dragging the mouse across the entry or clicking several times on the entry while holding down the <CTRL> button.

The Marker-**properties** are listed at right in a table and are set using the column at right.

Marker type

Along with the usual markers having arrows and a text box, the following marker types are available:

- Vertical and horizontal lines
- Text
- Vertical and horizontal dimension lines

Normally, the type is determined already when the marker is set. By means of this combo-box, it can be changed subsequently.

Position

Determines the marker's position. By default, the position is specified in the coordinates of the curve to which the marker is assigned. In addition, the numerical value can also be specified in x- or y- units, or in percentage of the x- or y-axis. Select the corresponding entry in the combo box to the right of the number boxes. When specifying the numerical value in percentage of the axis, 0% is at the lower left, 100% at the upper right of the coordinate system. This allows markers to be defined so they are always visible in the curve window, regardless of the scaling. This is useful for comments, which needn't necessarily be assigned to a certain line in the coordinate system.

When changing from dB display to linear display, the axis coordinates change and the markers slip from their position. The scaling should be determined before the markers are specified.

Connecting line

The connecting line between text and marker is arranged in this group.

Settings	Description
Length	The length of the connecting line between the text and the marker. It is specified either in x-units, y-units, in percent of axis length or in percent of the text height. The last option is recommended. All value specifications should be in scientific notation with units, meaning that the exponent must be indicated. For a length of 0, no line is drawn. If an arrow is set, the length of the line is the entire length for line and arrow. If the line is shorter than the arrow, the arrow is drawn completely.
Angle: (0...360°)	The angle of the connecting line can be set between 0° and 180°. The line is horizontal if an angle of 0° is specified. This means that the line can be set to run in any direction.
Arrow	The line between marker and text may have an arrowhead at the end of the marker. The size and type can be selected: • none • wide • narrow • wide, solid • narrow, solid • large • large, solid • circle • Point • Diagonal dash • Star • Default The size of the arrow is oriented to the size of the symbol, see also "Clipboard settings 245".
Line thickness, Line style	Settings like for Lines 126. At printout, the line appears in the thickness of the cursor-line, see Clipboard Settings 245.
Text corner	Position of the text box (upper right, upper left, lower right, lower left)

Text

The text specified in the text window is assigned to the marker, and can consist of several lines. Press <CTRL> and ENTER to enter a new line. If a marker is created, this text is already defined as the x- and y-measurement values. This text can be overwritten.

Placeholder

The edit box initially contains the placeholder *<auto>*, which by default represents the y and x-value. This entry can be supplemented/replaced with the following placeholders:

Placeholder	Description
<xunit>, <yunit>, <zunit>	Display of the x-, y, or z-unit
<xvalue>, <yvalue>, <zvalue>	Display of the marker's x-, y, or z- component. For xvalue, mostly the time value in the x-axis' formatting.
<name>	Display of the variable's/channel's name
<comment>	Comment on the variable
<xtimeofday>"	Display of the marker's time. For this purpose, the x-axis must represent absolute time.
<xdate>	Display of the marker's date. For this purpose, the x-axis must represent absolute time.

Placeholders for values, with specified precision level

Placeholder	Description
value:**fx** e.g. <yvalue:f2>	Num#ber of digital positions (0..15); in the example 5.34211 -> `5.34`
value:**fxpy** e.g. <yvalue:f2p3> <yunit>	Specified number of decimal places and order of magnitude as exponent of 10. The exponent of 10 is only displayed along with the unit. In this example, 3556.23 becomes `3.55 10^3 RPM`.

Note

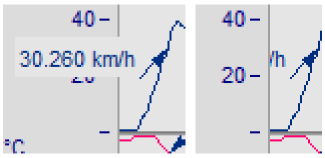
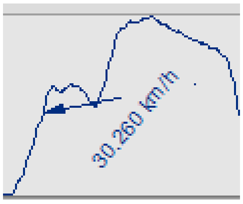
- Greek letters 267 can also be displayed.
- Numbers without a unit sometimes come to a misleading representation:

Example:

31.000.000 represented with <yvalue: f0p6><yunit> is displayed as 3110^6

A multiplication sign or blank space creates clarity:

<yvalue: f0p6>*<yunit> -> $31*10^6$

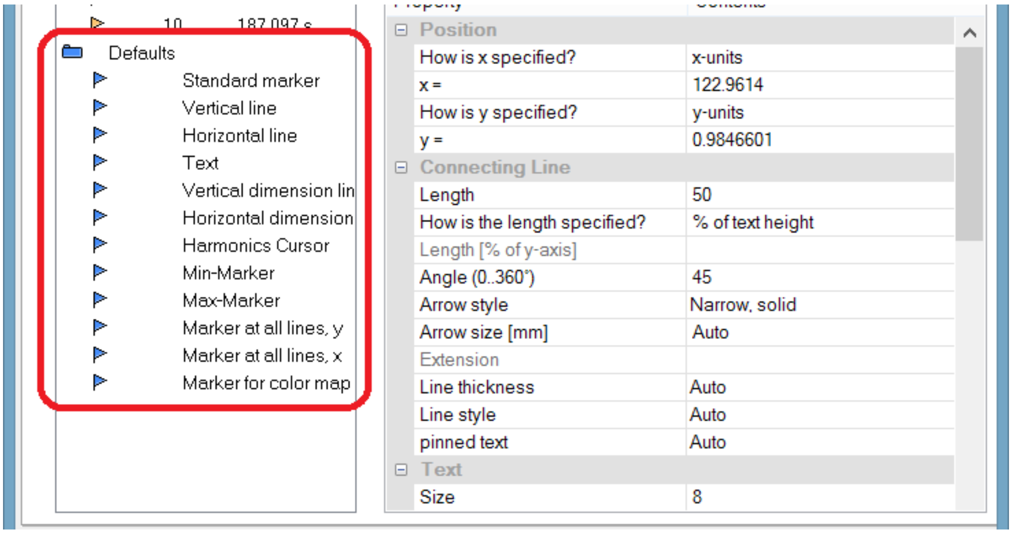
Settings	Description
Size	The size of the text can be defined in points. In general, a 12-point font can be read quite easily. The font specified in "Clipboard settings..." is the font used for printing. A true-type font should be selected. The standard font set for the curve window is also used for the monitor screen (see "Presettings 251").
Color	The color can be selected as absolute (e.g. red) or relative. A relative color definition refers to a color already defined for the curve window. For example, if the color of the first curve in the window is selected, it is possible to select another color for the printout and the screen.
Background	The background of the text can be in the same manner as the text color. A transparent background is also possible, so that lines behind the background are not completely hidden.
Border	The text may have a border around it. Various options are available for the border joining the connecting line with the marker: • *none, simple, pointed (trapezoid-shaped), double border*
Within coordinate system	When the text box is located at the edge of the coordinate system, you can decide whether it overlaps the edge or whether it is clipped. 
Angle text (Degr)	Angle of the text box up to ±90 degrees. 

Delete

All lines selected in the marker list are deleted.

Edit defaults

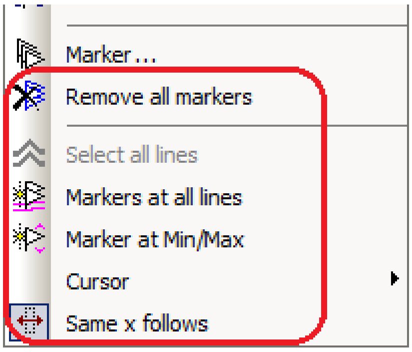
The ***Defaults*** for the *Marker types* are listed at left links and can be edited at any time using the Properties table.



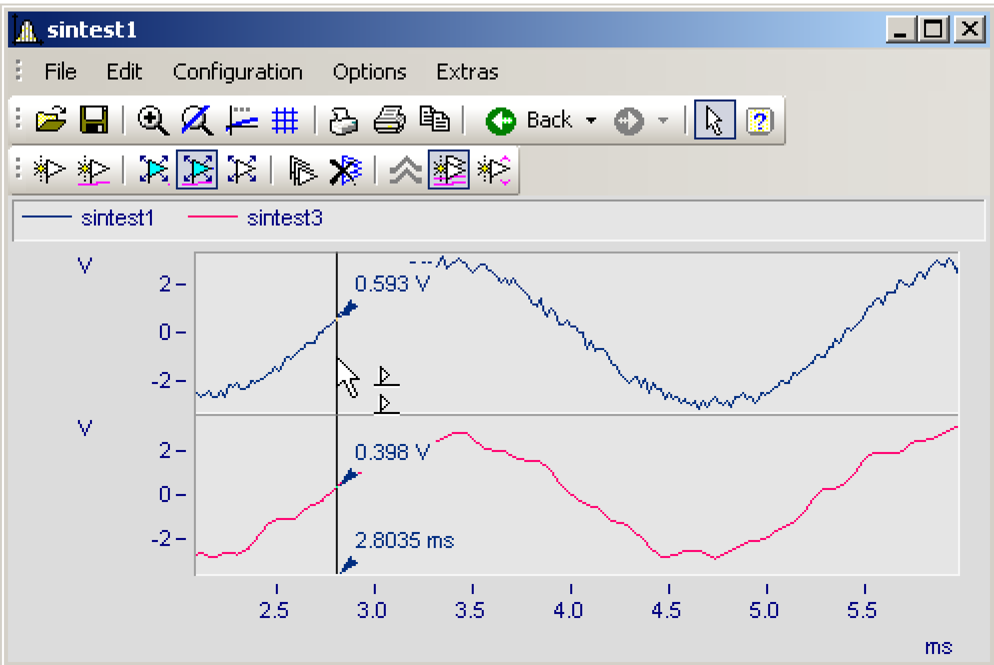
Remarks

- If several markers are selected in the list, the characteristics for all of the selected markers are indicated. If a characteristic differs among the separate markers, this is indicated by "???" in the corresponding box. If a characteristic is changed, this change is effective for all selected markers.
- An inapplicable entry in a text box is ignored.
- When changes are being made in a dialog, they are implemented immediately and displayed. They can be seen immediately when the dialog is <Shift>ed next to the curve window. If the curves are very long and the on line-update is too slow, the curve window should be placed so that the graphics can no longer be seen when working in the dialog. It is recommended to use a transparent display for the representation in a waterfall diagram.
- Markers already defined for the curve window may lose their meaning if the curves are modified or XY-plots are redefined. These markers should then be deleted.
- The definition of markers is recorded when the curve window configuration is saved. The markers are also reloaded when a configuration is loaded. However, the markers may not be visible in the window because the settings do not fit the window or the curves.
- To design markers which are not device-specific, the colors should not be specified as absolute. Use instead a default or a color in the curve window (e.g. the color of the first curve). The default itself can be dependent on the device. The same is true of the font size and the line characteristics.

3.7.5.7 Extra marker functions



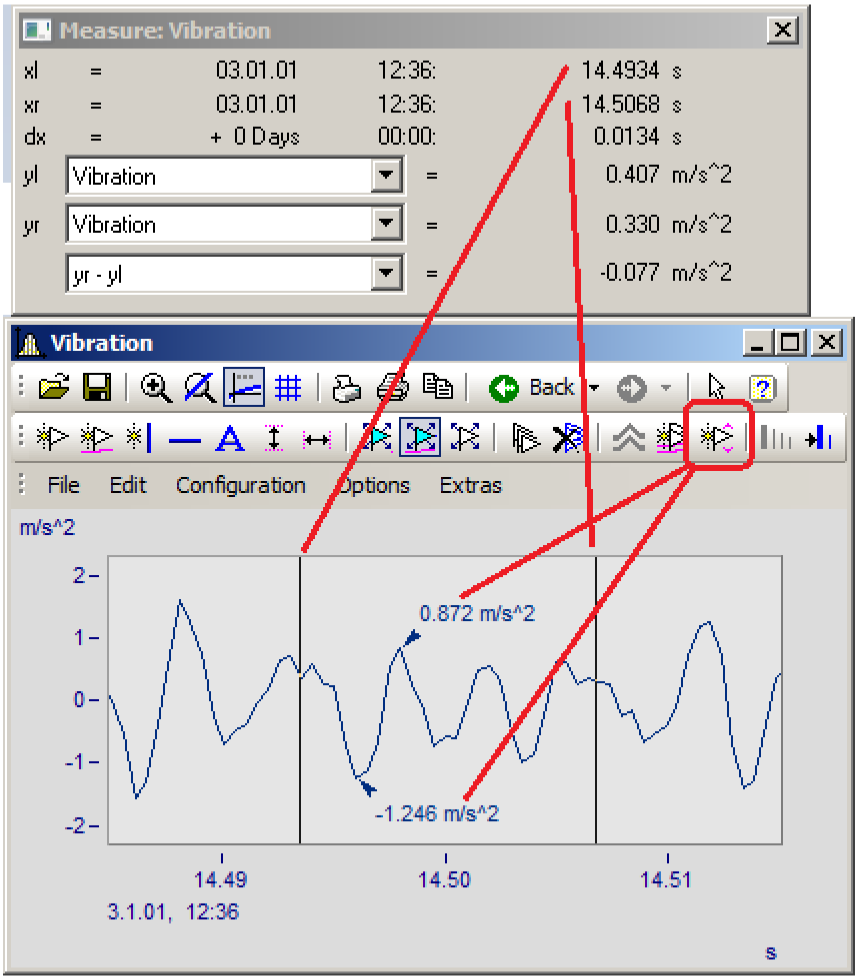
There are four additional marker functions available:

Menu item	Description
Delete all markers	With this function, all markers set in the curve window can be deleted at once.
Select al lines	With the Select mode active, this function selects all lines in the curve window.
Markers on all lines	Set markers at all lines or at all lines selected in the Select-mode. Select the lines desired an click on the symbol in the toolbar. A vertical line appears which extends across the entire curve window, even when multiple y-axes are stacked one above the other. The line denotes the y-value and the x-value on the y-axis. Simply move the line with the mouse and confirm setting of the marker at the desired position by clicking the mouse. The position of the markers as well as their labels can be moved as desired, just as described in the section "Set Markers 207".  **Note** Markers on all lines If two lines are close together so that the positions of the markers almost match, only one marker is created for this position.

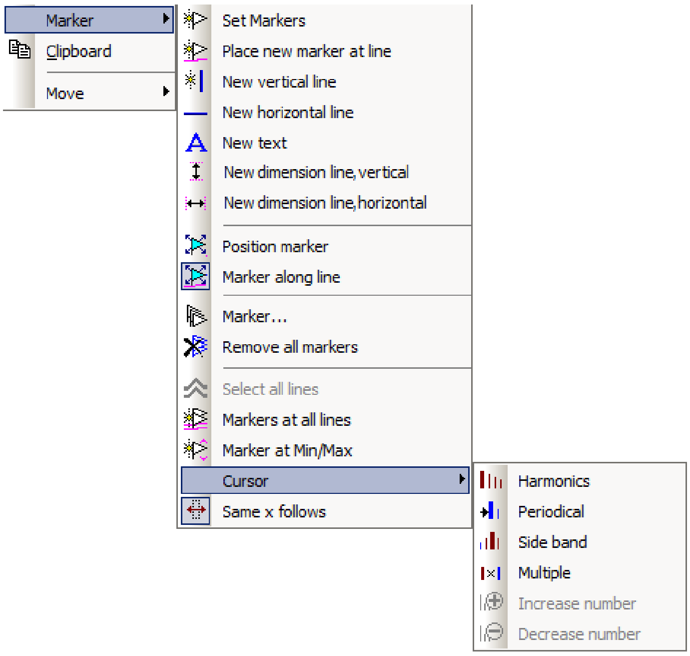
<table>
<tr><th>Menu item</th><th>Description</th></tr>
<tr><td> Markers at Min/Max</td><td>Markers are set for the maximum and the minimum of the line selected. If multiple curves are in a curve window, the function only applies to the line selected. As described in the section "Move Markers 207", the marker's position and its label can be moved as desired.

The function only affects the selected time segment. For this reason, zoom on to the region before setting the marker.

If the "Measure" function is also active, the system finds and denotes with markers the minimum and maximum just between the two measurement cursors.

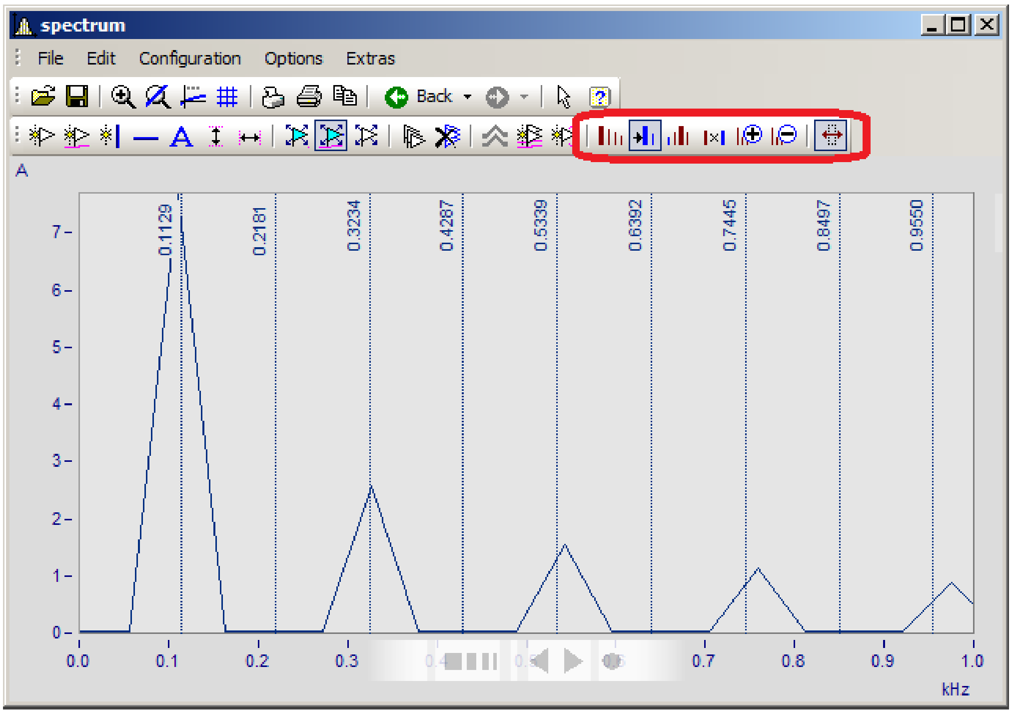

</td></tr>
</table>

3.7.5.8 Harmonics cursor



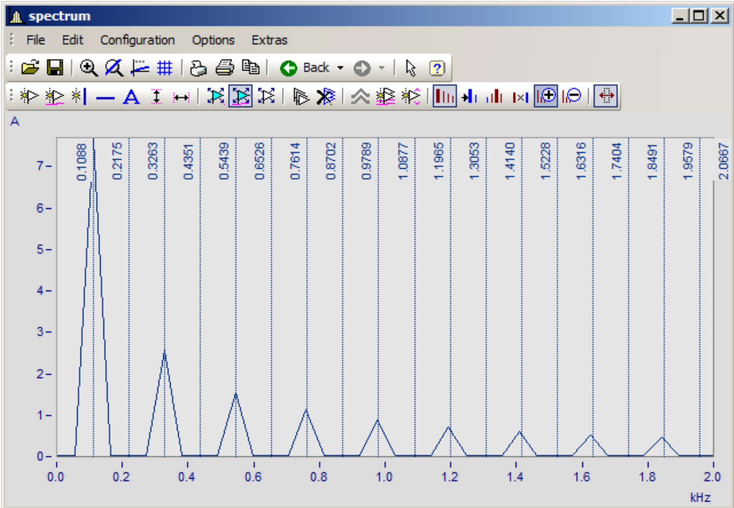
Function

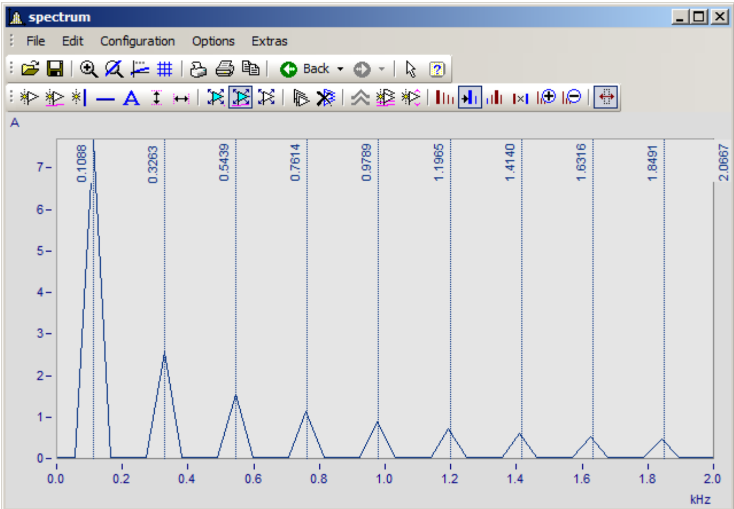
Harmonic cursors indicate periodic multiples of a fundamental frequency. Set the marker at the position of the fundamental oscillation. The position can be readjusted subsequently, if desired.

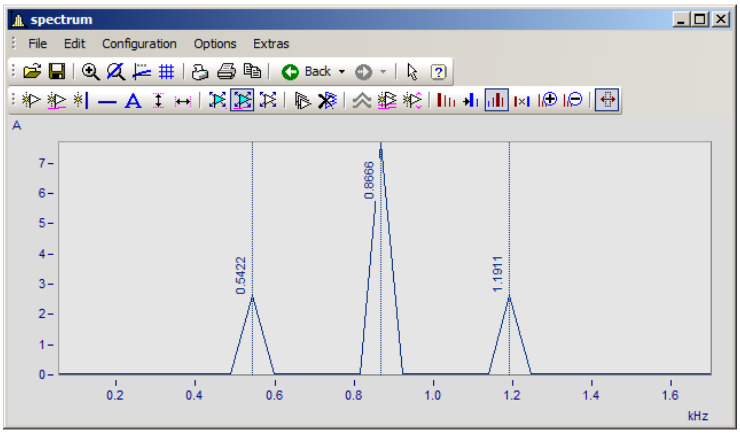
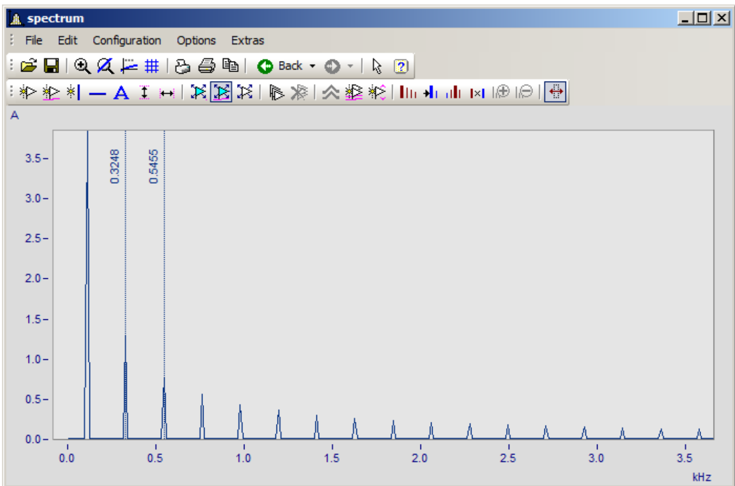


The following types are available:

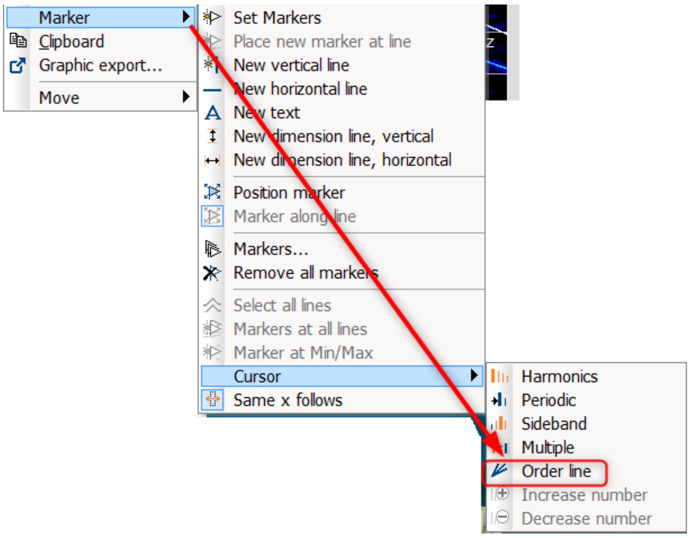
<table>
<tr><th>Menu item</th><th>Description</th></tr>
<tr><td>Harmonics</td><td>Fundamental oscillations with harmonics. 10 equally spaced markers are inserted. Place the fundamental oscillation. The subsequent harmonics follow the fundamental oscillation by the respective multiple. The fine adjustment is performed by moving the upper harmonics.


</td></tr>
<tr><td>Periodic</td><td>Periodic processes with arbitrary start time. The fundamental frequency can be freely placed. The distance between the harmonics is independent of the fundamental oscillation.


</td></tr>
</table>

Menu item	Description
Side band	Fundamental oscillation with side bands. 10 equally spaced markers are inserted. Position the fundamental oscillation. The harmonics which follow the fundamental oscillation by the respective multiple. Fine adjustment is performed by moving the upper harmonics. 
Multiple	Distances at a fixed ratio. Two frequency lines which can be freely positioned. 

3.7.5.9 Order lines



Calling the Marker dialog for order lines

Function

The amplitudes of RPM-dependent vibrations can be displayed by means of various color diagrams.

When the amplitudes are plotted over the RPMs, the correlation becomes visible as straight **order lines**, which begin in the origin of the coordinate system. Frequencies which are independent of the RPMs appear in this diagram as horizontal lines of constant frequency.

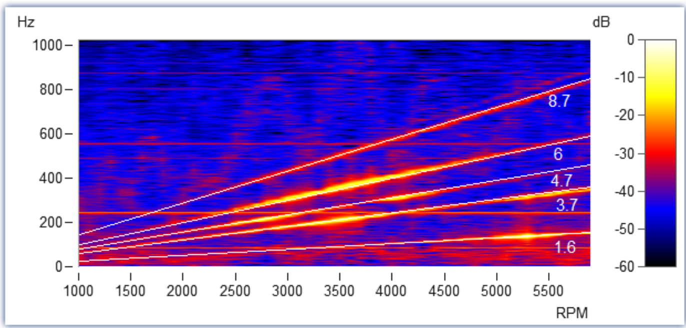
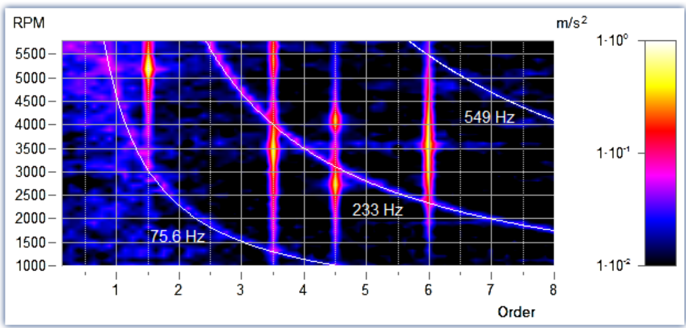


Fig. Amplitude spectrum with frequency over RPMs

In the Markers dialog, these order lines can be highlighted and labeled. Clicking on the marker symbol "*Order line*" creates the first marker, applying the presets for calculating "*Order line in the RPM-spectrum*". Subsequently, you open the marker definition dialog by double-clicking and you can design the display.

Calculating the diagram over these orders, they appear as vertical lines. Fixed frequencies are distorted to **hyperbolas** by these conversions.

For the example shown here, setting for the calculation in the marker definitions must be "*RPM and Order*".



RPM and order with hyperbolas

As with all markers, the text belonging to the line can be designed with placeholders, freely defined texts and custom formatting.

The line's position can be moved manually using the mouse. As a snap grid, the parameter *Multiple of* in the section *Order line* is used.

New hyperbola markers get the value of the highest frequency line x120% as initial frequency - and this to the next grid *Multiple of.*

The most important properties of this *Marker-type: Order line* are:

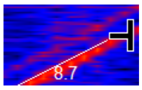
Property	Contents
⊟ Miscellaneous	
Marker type	Order line
Associated curve	At the first y-axis
Harmonics Cursor	
⊞ Dimension line	
⊟ Order line	
Parameter	6
Calculation	Order line in the RPM-spectrum
Start of the line [%]	0
End of line [%]	100
Labeling position [%]	95.079
Multiple of	0.1

Order line

Calculation with unit over unit

- *Order line in the RPM-spectrum*
  - *RPM over frequency*
  - *Frequency over RPM* (=default)
  - *Angular frequency over frequency*
  - *Frequency over angular frequency*
- *Hyperbola in the order spectrum*
  - *RPM and order* (=default)
  - *Angular frequency and frequency*

Parameter is the value of the order or of the constant frequency which appears as a hyperbola. This value determines the position and is represented by the placeholder *<yvalue>* and formatted accordingly, e.g. *<yvalue:f1p0> Hz*



Start/End of line [%]: Determines whether the line is to be drawn up to the edge of the coordinate system (0-100%) or should keep some distance from it (e.g. 5-95%). The ends of the line can also be edited graphically using the mouse.

Labeling position [%]: This value specifies the position in percent of the visible order line length. The text can also be positioned manually using the mouse.

Multiple of: When the order line/hyperbola is moved, the position snaps to multiples of this value. When changing *Multiple of*, the parameter in the curve window is updated immediately, but not in the properties table. This allows further editing of the value in the properties. With Ok of the properties or click on the marker list the parameter is accepted.

Additionally, the section *Text* offers the usual formatting properties for texts, and in the section *Connecting Line* there are parameters such as *Line thickness, -style* and *Text angle*.

Note **Order lines**

- The first order line applies the presettings for the marker-type Order Line 198. You are able to format these according to your wishes. If any order lines are added, the settings for the previous order line are applied.
- It is possible for a marker to be inserted in the range which is not visible, e.g. if an order spectrum was calculated only for a range of 2000-4000 RPM. In this case, the marker must be given a parameter value in the visible range by means of the marker definition.

3.7.6 Export

3.7.6.1 Clipboard and Graphic export

The graph displayed in the curve window can be sent to the Windows clipboard. The clipboard is a Windows tool which allows applications to exchange data in any form, e.g. text or graphics.

With the menu item *Edit\Graphic-export..* 243. the graphic can be saved as a file in an image or PDF format. The default settings 256 are taken into account here. For example, it is possible not to overwrite an existing PDF file, but to add the new graphic to the document.

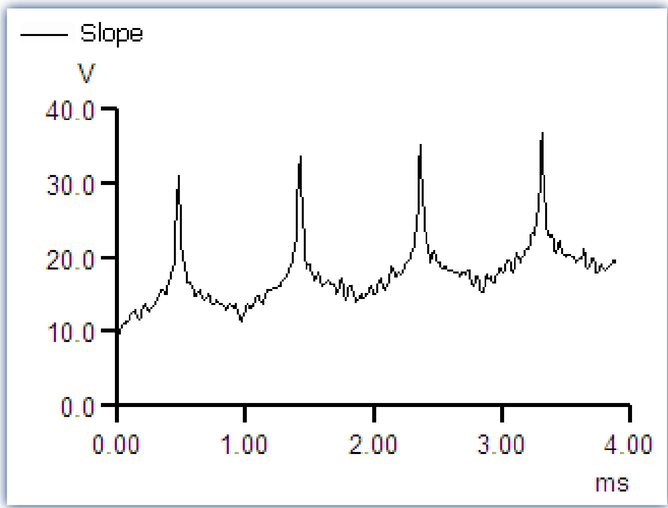
When one application sends graphics to the clipboard, another application can read and retrieve these graphics from the clipboard. In general, data are not damaged when they are read from the clipboard, which means that applications can retrieve the same graph as often as desired. Existing graphics are replaced when an application sends new graphics or text to the clipboard. Only the last information sent to the clipboard can be read.

In the case of curve windows, graphics are sent to the clipboard in the form of a memory-resident metafile. A meta file is a standard format defined in Windows and is supported by many applications. The meta file does not contain screen pixels; instead it describes the graphics using a multitude of vectors. This creates a high-resolution graphic display which can be arbitrarily scaled up or down.

Graphics sent to the clipboard can be read by text processing or desktop publishing programs. In that environment the graphics can be combined with text and other graphics to create documents to be printed by any printer or plotter supported by Windows. Graphics are printed in the best resolution possible for the output device.

Graphics are created in the fashion specified in the menu option "Options/ Clipboard settings...". The specified size, font and line width are used to format the graphics.

Graphics can be output to the clipboard in color or in black and white. Have regard for the color setting possibilities, especially the printer's. The curve window copied to the clipboard can, for example, have the following layout:

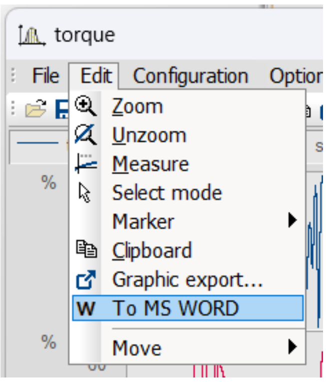


Remarks

- Letters may look distorted, lines may intersect and overlap and details may disappear when a meta file created from the curve when another program is loaded. The image can be improved by enlarging the display on the screen. Meta files are designed to optimize the image output by printers or plotters, and not for ideal display on the monitor.
- The fonts used for the meta files are selected from the available fonts for the printer (see "Printer Setup 240 "). Not all of these fonts are easily legible on the screen or available in the necessary size.
- A meta file can only be created when sufficient memory is available. The clipboard remains empty or is emptied if the available memory is insufficient.
- In some extreme cases, it may not be possible to create a suitable meta file. Such situations can occur when several curves are displayed, or in connection with dotted, bar-graph or XY-representations. It is often helpful to display a smaller section of the waveform, to change the display mode, to cut out a section of the waveform or reduce data using mathematical functions.
- When axes scaling is set to automatic, the axes labeling on the screen and on the printer will be calculated differently for the current dimensions. Specify a set scaling and a set number of markings to achieve clearly defined proportionality.
- In printing, texts may overlap if the selected font is too large.
- If a waveform does not have a "created.."- time, the current time is automatically designated as such.
- Images of curves sent to the clipboard can also be incorporated in reports using the imc Report Generator. However, a direct transfer of the curve window is recommended, whereby objects pose as curves. See chapter 'Report Generator 238' in this document.
- The time format (time and date) can be changed using menu item "Country settings..." in the Windows Control Panel.
- Even the best and most popular text processing and desktop publishing programs contain minor flaws. Although the graphics in most programs appear to be correct, one of these programs does not correctly interpret the offset of the curves, which is present as a command in the meta file. As a result, when graphics are inserted in this program, the curve lies next to the coordinate system. In another program, the clipping (fading-out) of curve sections extending beyond the coordinate system is ignored. Thus, the curve may extend well into the labeling or generally beyond the coordinate system. It is recommended to transfer the graphics to the Report Generator or to a text processing program directly, without modifying the graphics.

Reference	Clipboard Settings
Section 'Clipboard Settings 245'	

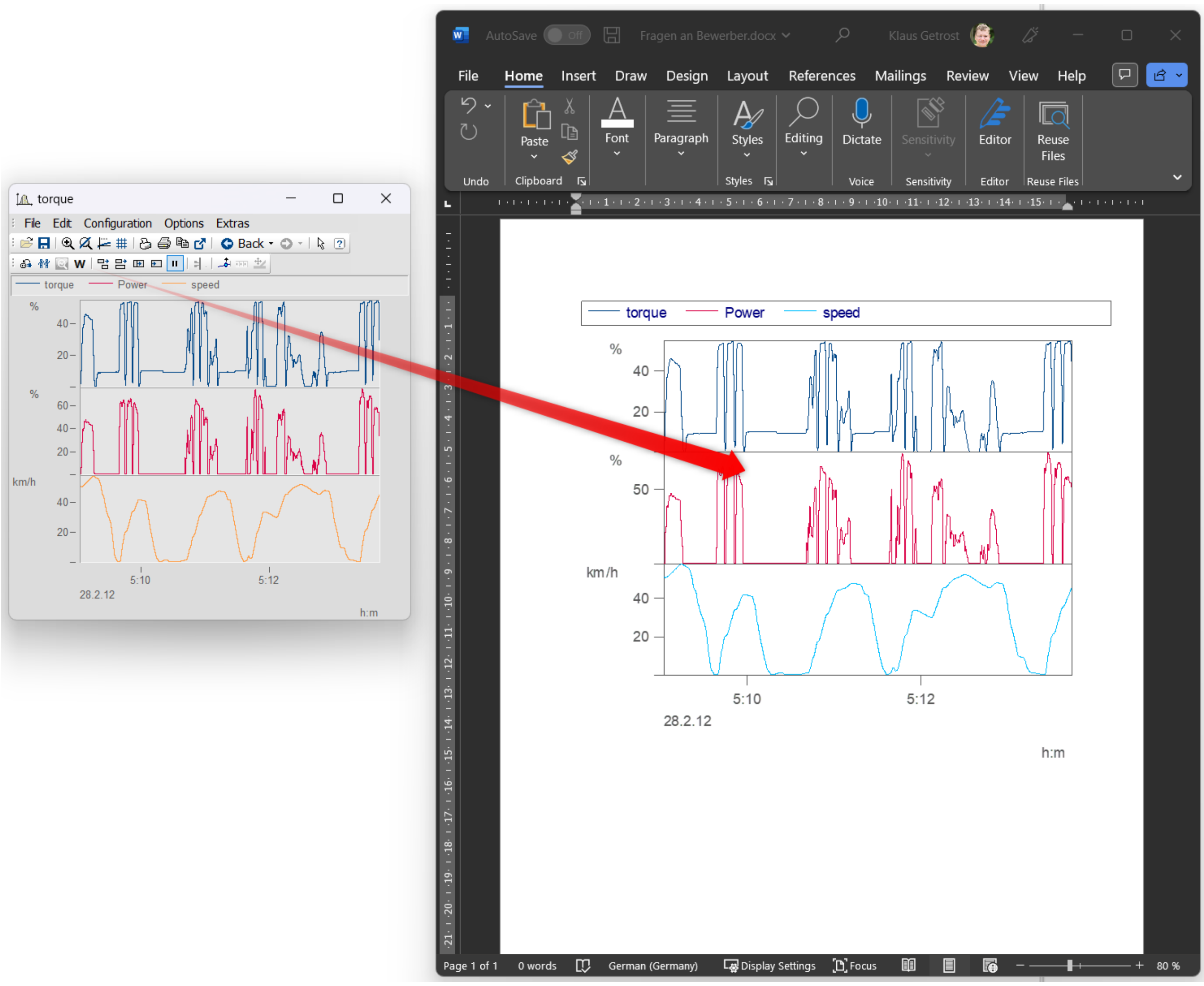
3.7.6.2 To MS WORD (OLE)



With the menu function *Edit\To MS WORD* the curve window can be embedded in an open Microsoft WORD document by drag&drop. In this case, the curve window retains its full functionality, independent of imc FAMOS.

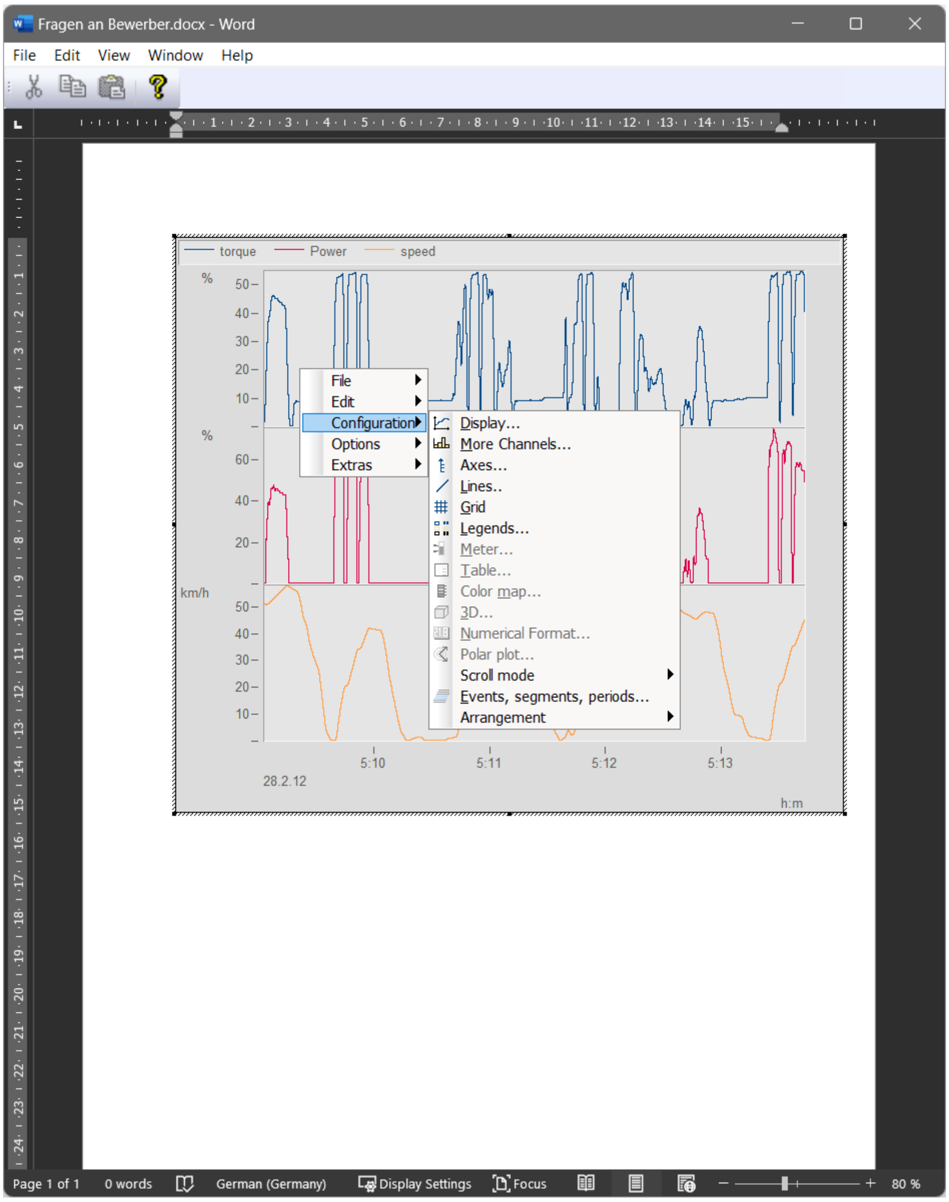
Transfer

The curve window is transferred to the WORD document by holding down the mouse button and dragging and dropping from the menu *Edit\To MS WORD* or via the communication toolbar:



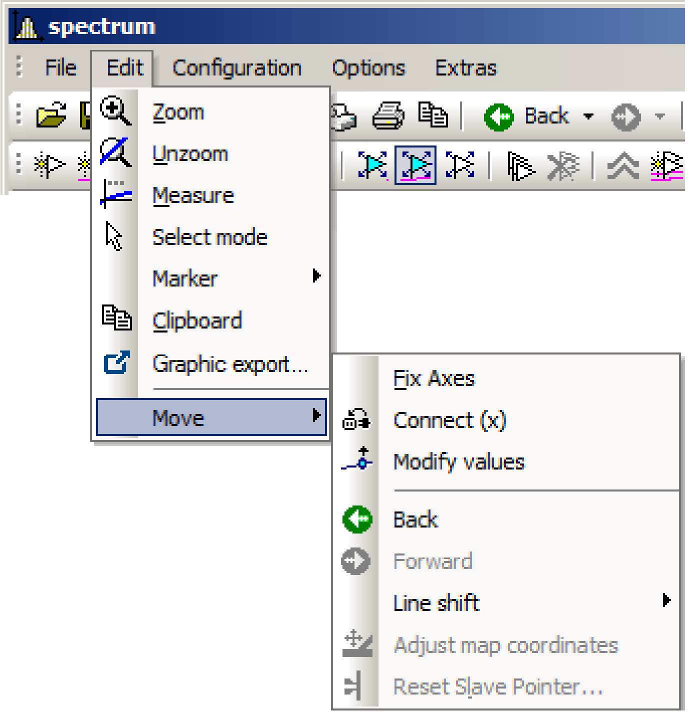
Edit

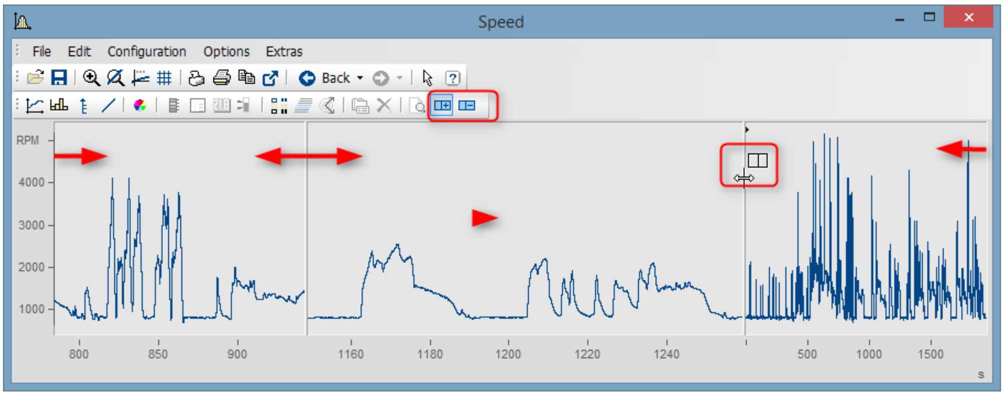
With a double click the curve window is set into the editing mode. This is closed again by clicking in the area outside the curve window.



3.7.7 Move

The menu item *Move* contains various curve window functions for working in the curve window:

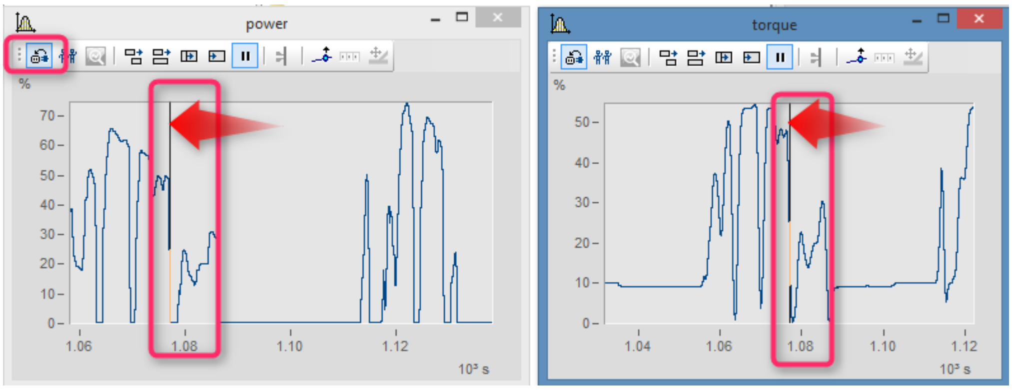


Menu item	Description
Fix Axes	This lets you fix the current axes so that the curve window does not automatically adapt to any newly added waveform, but rather keeps the previously existing axis scaling.
Connect	For connecting curve windows. For more on this topic, see the section Connect 228.
Modify values	This function lets individual measured points from a data set be moved in the y-direction, thus changing their values. These changes are applied directly in the data set and stored. Caution: These changes can no longer be reversed by means of the *Back*-function. There will also not be any prompt for confirmation of the changes to the data set.
Back and Forwards	Step-by-step reversal of the most recent changes, or conversely repetition of the most recently reversed changes. With these two functions, changes in the curve window view can be reversed, or reversed changes can be restored. In the toolbar, the *Back*-function is additionally provided with a dropdown history, so that every change to the curve window view can be reversed separately. The exception is the function *Modify values*, since it directly changes the data set and not the curve window view.
Line-Shift	For moving selected lines in horizontal and vertical direction. More on this topic is presented in the section Line-Shift 232.
Reset Slave Pointer...	For resetting the slave pointer. For more on this topic, see the section Bar meter 48.
Split-Mode	*Split-Mode* subdivides the curve window's X-axis. This makes it possible to observe the same data at different points in time and at different zoom levels. With *Split-Mode+*, the curve window can be split an arbitrary amount of times. With *Split-Mode-*, the subdivision is canceled.  *Split-Mode*

3.7.7.1 Connect (Link)

Use this button to create a link between a curve window and either another curve window or a imc FAMOS table window. The connection is a x- (or scroll-) connection. Two windows connected in this manner have the same x-value at a defined position in their display ranges. Scrolling in one curve window prompts synchronous scrolling in the connected window. Several windows can be connected to form a linkage chain. No matter in which window the displayed x-range is changed, all connected table or curve windows are automatically updated to reflect the change.

To create a connection, click on the designated button and hold down the mouse button. The mouse pointer changes to a "blocked" symbol. If the mouse pointer is now moved over a curve or table window, it changes its shape back to a cursor. As soon as the mouse button is released, the windows are connected. The button appears to remain pressed and thus indicates the connection.



The x-axes of both curve windows are linked.

A vertical (curve window) or horizontal (table window) reference line indicating the x-position of the linkage is shown in the window. The connected windows each have the same scaling value in the x-direction at this line. The behavior desired can be specified using the *Options* dialog opened via Options\Presettings*Settings > What is influenced in the Link and This window follows* 251.

This reference line first appears in curve windows in the middle of the x-axis, but can be moved to any position desired using the mouse. Move the mouse to this line; when the mouse pointer then changes its shape, hold down the mouse button and the line shifts as you move the mouse.

All connected windows should have the same x-axis mode (relative x-axis or display with absolute time).

To undo an x-linkage, simply click on the button again.

Reference

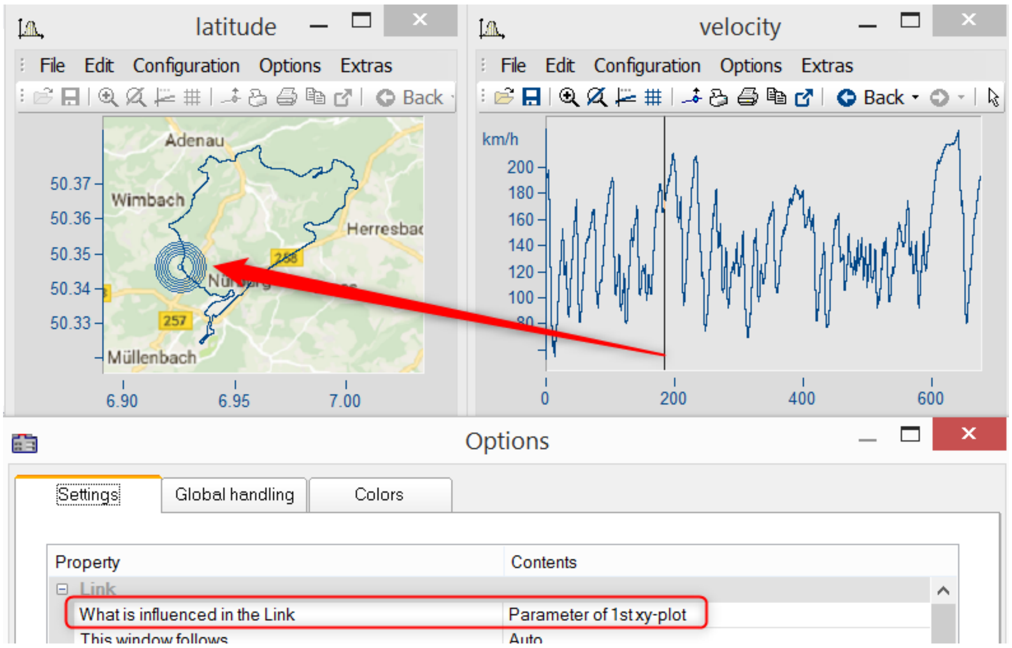
A scroll link can also be created in the imc FAMOS Data Editor. This is described in the chapter "Waveform Editor" in the imc FAMOS User's Manual.

Connect with XY

When linking XY and normal data sets, it may be necessary to specify which component of the XY data is to be linked.

This is configured under "*Options*"/"*Presettings*"/"*Link*"->"*What is influenced in the link*". In the following example the GPS channels Longitude and Latitude are used to display the speed with the position on a map.

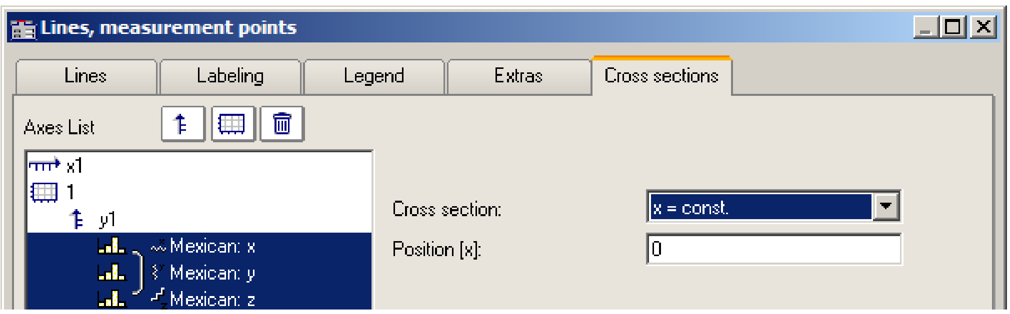
For this you have to set "*What is influenced in the link" -> "Parameter of 1st xy-plot* 252".



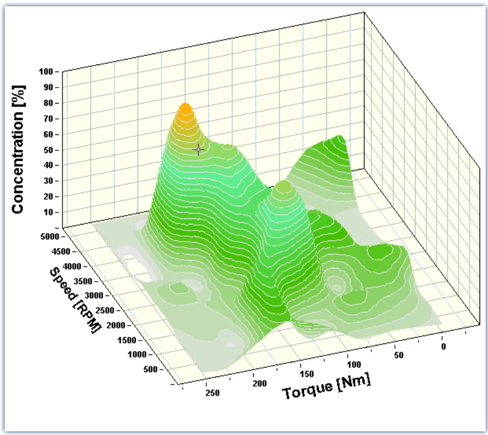
Connect with 3D

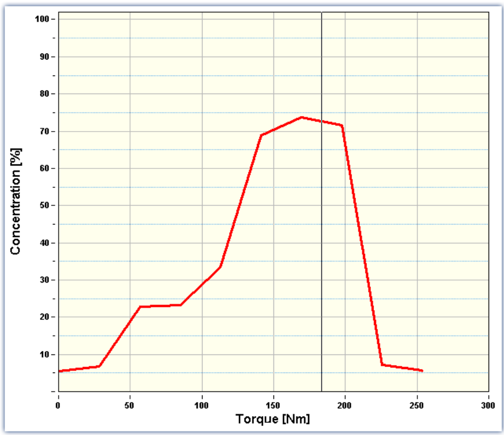
The ability to link curve windows together is also provided for 3D-displays. In this case, a 3D data set can be simultaneously displayed in 3D-display and as a cross-section with x or z as the constant, and both curve windows can be linked together.

To do this, load the 3D data set in a curve window with standard display style, parallel to the curve window with the 3D-display, and then open the *Lines*-dialog either from the coordinate system's context menu or as the menu item *Configuration / Lines*. On the page *Cross sections*, you can select from the dropdown-list whether to keep the x- or the z-coordinate constant. Then confirm by clicking *OK*.



In one of the two curve windows, activate the *Connect*-function, so that the cursor changes shape. Then move the changed cursor into the other curve window's coordinate system and click on the left mouse button. In the curve window with the 3D-display, a crosshairs appears at the upper left edge. Move the cursor to the crosshairs, click the mouse on it and move the mouse while holding down its button. In the curve window with the standard display and the cross section, there is a vertical line. The position of the vertical line changes in response to the position in the 3D-display.

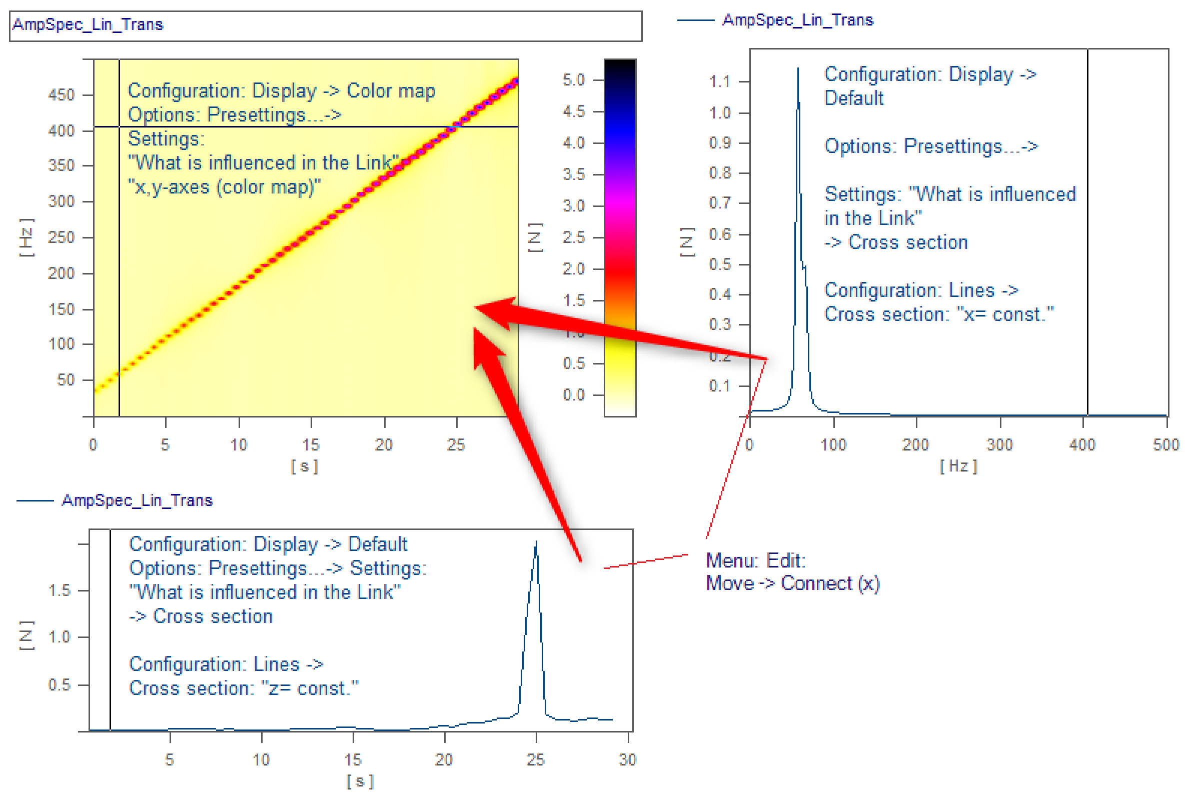




Example — Example with two cross sections

Color maps can also be linked in the y-direction. For this purpose, in the Options for the curve window 251, under *Settings*, it is necessary to set the *Link*-property "*What is influenced in the Link*" accordingly:

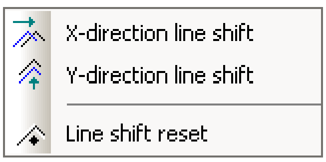
- On the color map: "*x-, y-axis (color map)*"
- On the right and bottom curve window*: "Cross section"*
- All curve windows show the same amplitude spectrum from example project "FA70 Spectral analysis"



The linkage is made by means of Edit> Move> Connect (x)" by using Drag&Drop in succession from the lower right window into the color map.

3.7.7.2 Line Shift

Using this function, any lines selected in the Select-mode, or all lines at once can be moved in the either the x- or y-direction.

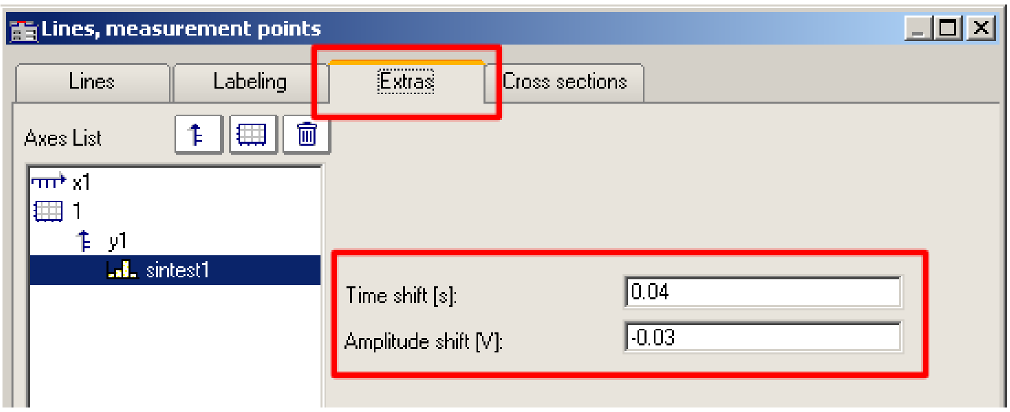


To do this, select one of the two functions either using the menu *Edit/Move/Line-Shift* or from the *Line-Shift toolbar.´*

With the cursor in the pertinent coordinate system, and its shape changed to a double arrow, the lines can be moved either horizontally or vertically, depending on the function, by moving the mouse while holding down its button. With this function, only the view changes, i.e. the data set remains unchanged and any changes made with *Line-Shift* can be changed back either using the *Back* function or using *Line-Shift Reset*. With *Line-Shift Reset*, all changes are reversed at once, while *Back* reverses the actions one step at a time.

Line-Shift of a selected line in x-direction

The parameters for Line-Shift can also be changed directly in the Properties dialog for the lines, under *Extras*. There, too, the changes can apply either to individual lines or to all of them. With linear scaling display, the parameters are simply added. By contrast, with logarithmic scaling display, the parameter's value is interpreted as a factor, where the value 1.0 stands for no shift, a value of 10.0 stands shifting by tenfold, and a value of 0.1 shifts the lines downwards one-tenth.



Changing the Line-Shift parameters

Reference

The Time-Shift settings can be saved with the ccv file, if the curve window option"*Time-Shift in der CCV* 253" has been set to "*yes*".

3.8 Ribbon

3.8.1 "File" menu

Menu item		Description
	Load 235	Loads a curve window configuration from a file.
	Save as 237	The curve window configuration (e.g. the axis scaling) is saved in a file.
	Transfer to imc FAMOS! 238	The waveform in the curve window is transferred to imc FAMOS.
	Report Generator 238	Calls the Report Generator. The report's layout can have your own personal, creative design.
	Print 238	Prints out the curve window.
	Printer setup 240	Sets up the printer used for printing out the curve window's contents.
	Overview Window 241	Displays an overview window.
	Twin Window 242	Generates a new curve window with the same appearance.

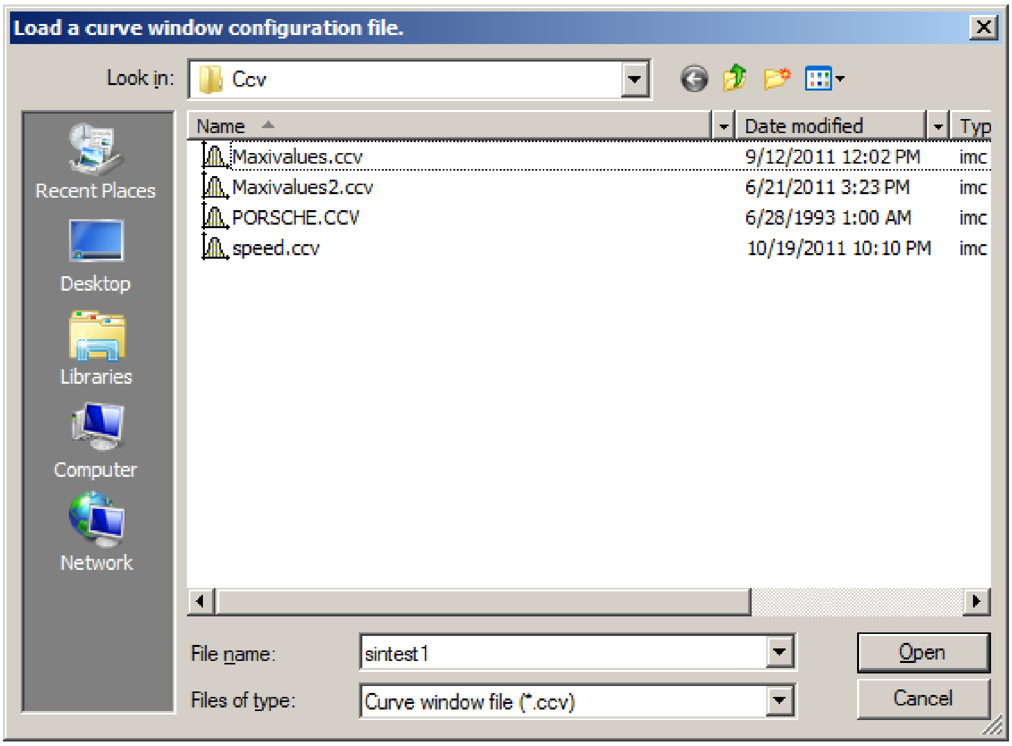
3.8.1.1 Load configuration

Function

You can a curve window configuration directly from a file. A curve window configuration includes various attributes of the window such as size, axes scaling and names of additional curves in the window.

Mouse Operation

- Select *File/ Load*...
- A dialog appears in which the file can be specified whose configuration should be loaded.

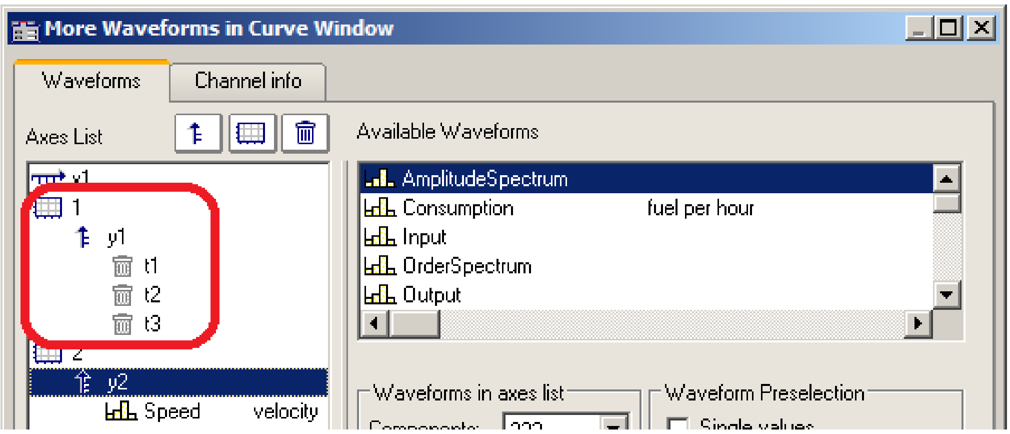


- Select file format "CCV".
- Select the desired file and end the dialog by clicking on *Open*.

Remarks

- The standard file name extension is "CCV".
- The directory used for loading configurations is read from the Windows System Registry when the program is started. In imc FAMOS, the folder can be handled via the menu item Extra / Options... .
- Once a file has been saved or loaded successfully, the directory involved is used for any subsequent loading or saving operation.
- The curves displayed in the window and their corresponding data sets are not contained in the configuration.

- When a curve configuration is loaded, an attempt is made to find all of the waveforms which were saved to the configuration. Any of these which are not found are marked as invalid:



- The names provide an indication of what waveforms are expected for the display. (When loading configurations from imc FAMOS 2.0, the system behavior of that time is reproduced and the waveform is deleted.) Configurations having multiple curves should be used only for stock tasks, where the names of the waveforms stay the same. For making changes, see Chapter 4, kit function *CvReplaceChannel()*.
- The name of the "basis waveform" (i.e. the first data set to be opened in the window) of a configuration is also saved.
- The position of the window does not change when a configuration is loaded manually. In automatic loading using a program or a sequence, the window is moved to the position saved in the configuration file. This does not apply to curve windows in dialogs.

Note

By means of Copy & Paste 270, you can directly transfer a configuration from one curve window to another.

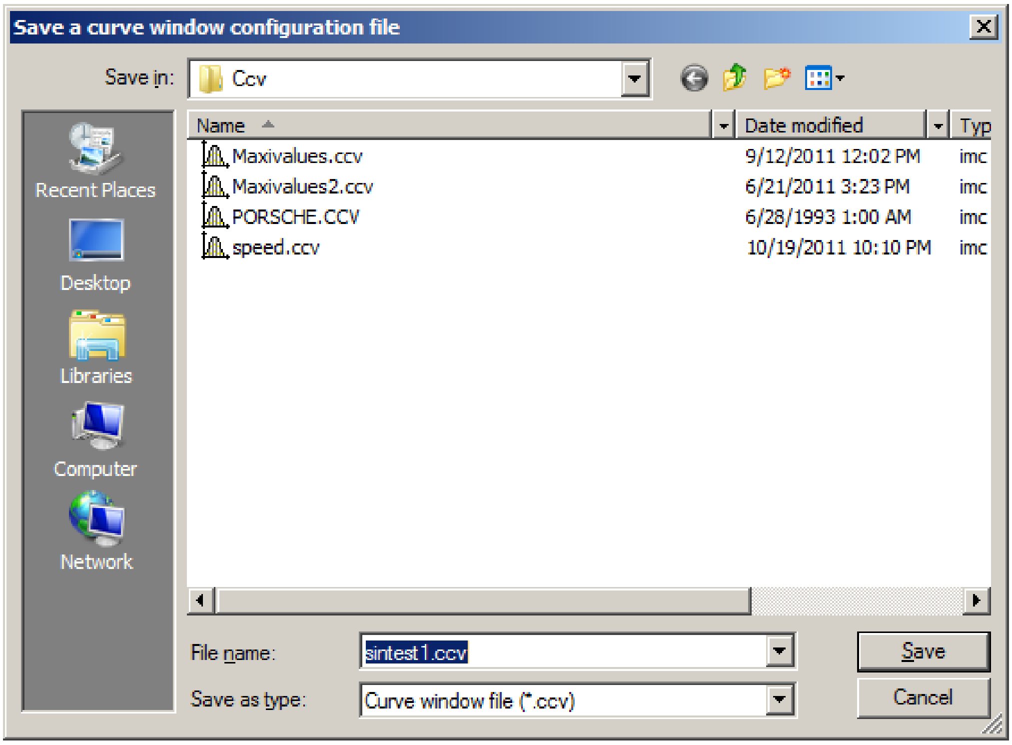
3.8.1.2 Save configuration

Function

The curve window configuration can be saved in a file. This configuration includes curve window attributes such as window size, axes scaling and the names of additional curves in the window.

Mouse Operation

- Select menu item *File / Save as...* in the curve window menu.
- A dialog appears for selecting the file in which the configuration should be saved.



- Enter the name of the file in the input box.
- Select the file format "CCV".
- End the dialog by clicking on *Save*.

Remarks

- If the file into which you wish to save the configuration already exists, the program asks if it should be overwritten.
- When a configuration is saved with automatic axes scaling set, different values may be written to the axes when this configuration is loaded for a new waveform. An appropriate scaling is defined automatically for the new waveform.
- It is useful for some applications to save configurations with automatic axes scaling. This is recommended especially when the expected signals fluctuate strongly in their range of values.
- The standard file name extension is "CCV".
- The directory path for projects is the project folder, or the default CCV folder from imc FAMOS Options.
- Once a file has been saved or loaded successfully, the directory involved is used for any subsequent loading or saving operation.
- The waveforms displayed in the window and their corresponding data sets are not contained in the configuration.

- The name of the "basis curve" of a configuration is also specified.

Note

By means of Copy & Paste 270 you can directly transfer a configuration from one curve window to another.

3.8.1.3 Transfer to FAMOS!

"*Transfer to imc FAMOS*" creates a copy in imc FAMOS of the data sets displayed in this curve window. After the transfer, the data sets appear in the imc FAMOS Variables list, where they are available for working with. The transfer is normally only helpful if the curve window belongs to another imc program than imc FAMOS, such as imc STUDIO.

The settings made in the dialog "*Options*" > "*Transfer options* 257" for naming variables in imc FAMOS are also valid for this operation. A command can be specified to be executed after the variables have been transferred to imc FAMOS, for example, a command to call a sequence for analyzing the transferred waveform.

Note Variables will be overwritten

Existing variables in the Variable list will be overwritten without notification.

Reference

- Transfer of waveforms or sections of waveforms can be made from a measurement value window. Refer to the section "*Context Menu in Measure Window* 186" for more information.
- Waveforms can also be transferred to imc FAMOS using Drag&drop 270.

3.8.1.4 Report generator

This lets you open the Report Generator, which can be used to assemble your curve windows in a report. For more information, please see the Report Generator documentation.

3.8.1.5 Print

Function

Hardcopy of a curve window can be created on any printer or plotter supported by Windows. The hardcopy is always made to an entire page. The graphics are centered on this page.

The graphics are sent to the printer which was specified in the dialog belonging to the curve window's menu item *File/ Printer Setup...* Various printing preferences can be specified in the *Opt./ Clipboard settings....* The size, font, width, etc. correspond to these settings.

Mouse Operation

To print the curve window, choose *File/ Print.*

In consequence, a small info-dialog appears which indicates that the printout is in progress. The process can be canceled by clicking on the *Cancel* button.

Normally, you have to allow for a delay before a print job is actually stopped.

Remarks

- Use the MS-Windows Control Panel to make settings for the printer.
- Additional parameters can also be specified for the printer here, e.g. printer resolution, paper size and format (portrait/landscape), printer memory allotment, etc. To do this, use the curve window's menu item *File / Printer setup*...
- The quality increases with the resolution. Graphics only look good, of course, when they are printed with high resolution. Note however that the higher the resolution, the longer it takes to print. In fact, the time to compute a printer job increases with the square of the resolution.
- Select a low printing resolution if you value speed of printout more than quality.
- The current time is used as the "Created/ Modified" time if the waveform does not have one already.
- To combine text and graphics in a desktop-publishing program, send output to the Windows Clipboard instead of using the Print option. See "Clipboard 222".
- If the printer is either not correctly defined in the MS-Windows system or switched off, or if it has no paper, an error message will appear.
- If you wish to create a more detailed layout, use the imc Report Generator. See chapter "Report Generator 238" in this document for more information on this powerful program.
- The time format (date and time) can be changed in the Control Panel under *Regional Settings*.

Reference

See "Clipboard Settings 245", "Printer Setup 240"

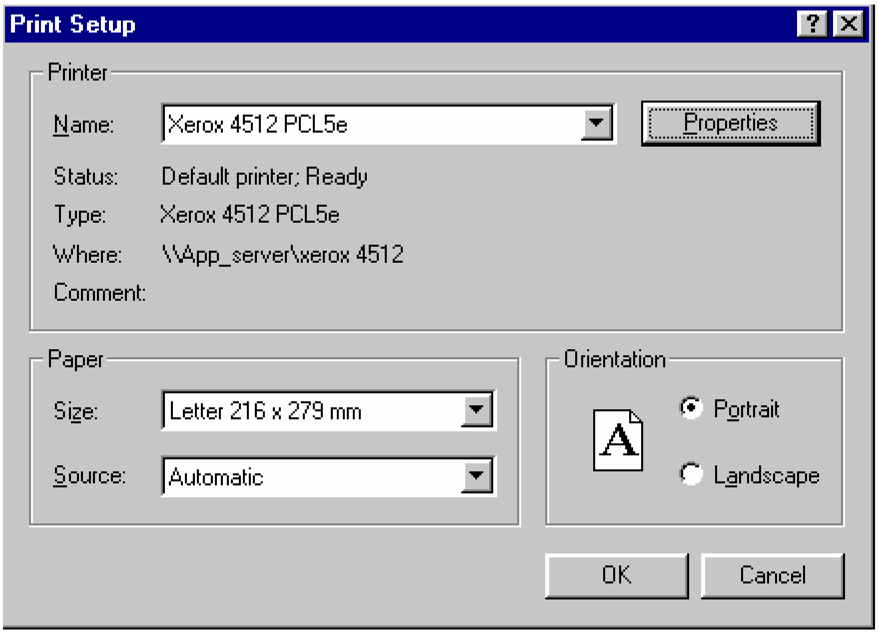
3.8.1.6 Printer setup

Function

This is where the printer is configured, which is used to produce the hard-copy output from the curve window.

Operation

Select menu item *File/ Printer setup*... in any curve window. The standard Windows dialog for selecting and configuring a printer.



This dialog's appearance varies according to what Windows version or printers are involved.

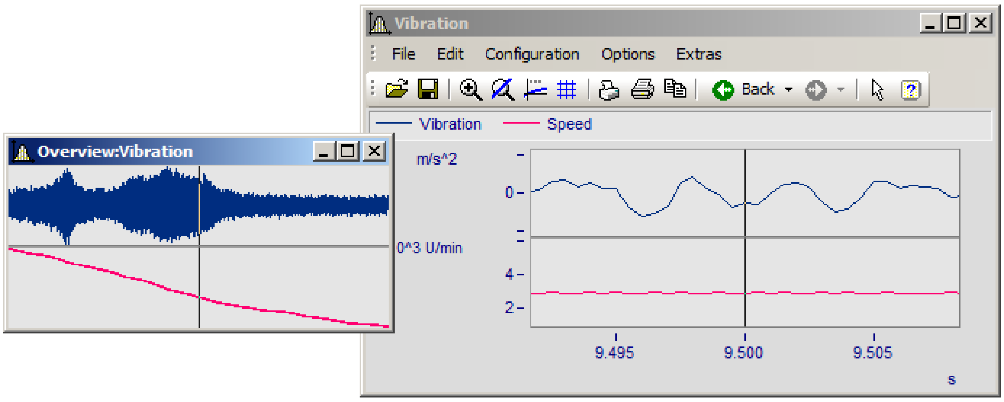
The settings apply to all of the computer's imc curve window's and remains operative upon the program's next start.

3.8.1.7 Overview window

Function

Whereas a curve window can display any portion of a waveform, an overview window, which is shown in conjunction with a curve window, will only display the entirety of any waveforms which are represented at all in the curve window. The curve- and overview window are linked with each other in the x-direction, in that the reference line of each window marks the same x-coordinate. The overview window is especially useful for:

- Keeping track of a position in convoluted or long curves (especially during zooming), or distinguishing between different axes lengths when several waveforms are displayed together.
- correctly associating a displayed section with its entire curve when scrolling in the curve window in the x-direction.



Mouse Operation

- To open an overview window, choose *File/ Overview Window*. A check mark appears beside the selected option.
- Zoom in on one region of the curve window and navigate through the signal using the reference line in the overview window.
- Click again on this option or select *Close* in the system menu of the *overview window* to close it.

Overview windows are independent windows which behave almost like curve windows. However, each overview window is assigned to a curve window and cannot exist without the curve window; the overview window also contains the same menu as the curve window. All settings for configuration and display of waveforms in curve windows can be made for the overview window. It is thus possible to display a curve together with variously strongly zoomed views by opening an additional overview window.

Remarks

- The overview window is only recommended if the range displayed in the curve window can be displayed fully in the overview window.
- When the curve window is reduced to an icon, the overview window is not visible.
- The display style used in the overview window can be changed and zoomed as desired.
- If an overview window and a measurement value window are displayed for the same curve window, the measurement value window should be closed when the zoom range is moved in the overview window. This reduces flickering while the curve window is being updated.
- The title of the overview window is composed of the string "Overview:" followed by the name of the corresponding curve window. This allows easy identification of the windows.

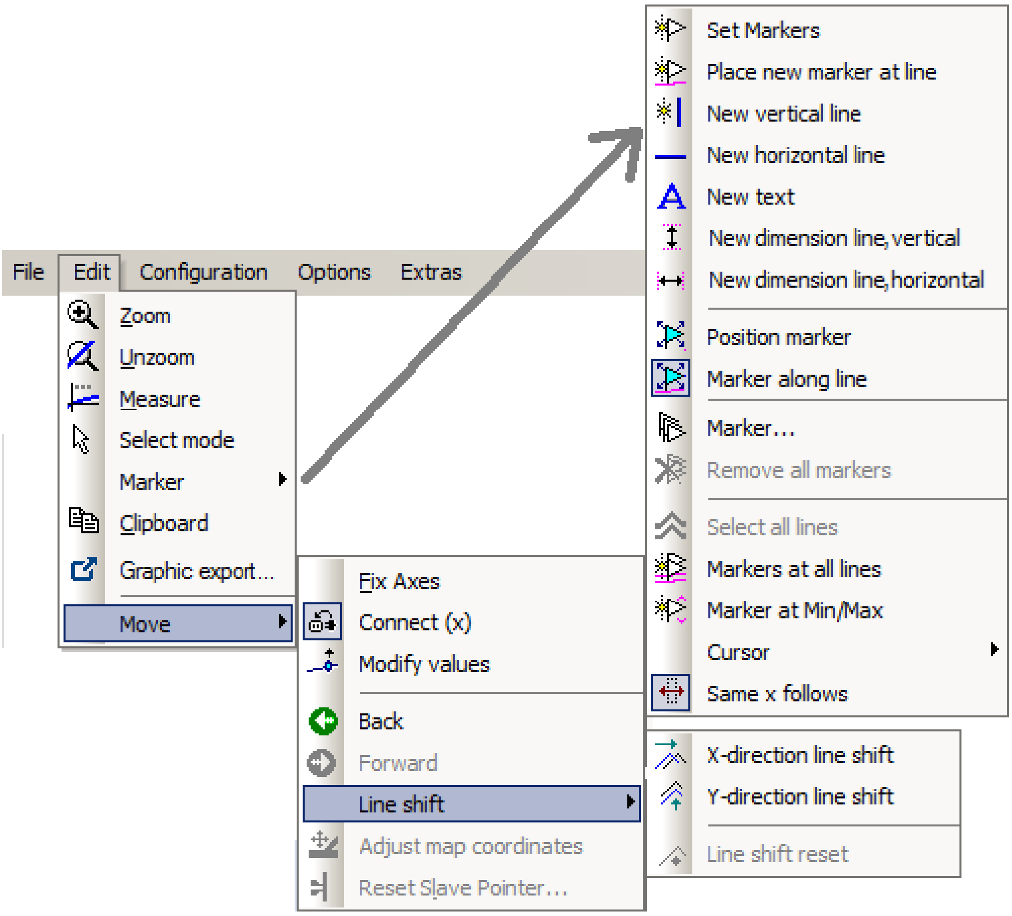
3.8.1.8 Twin window

Using this item you can create an identical copy of the curve window. Subsequently, both windows can be configured independently of each other.

Possible applications:

- During an online measurement, the measured data can be displayed both as a curve plot and as numerical values (Last Value as Number 37).
- Display of a Waterfall graph in 3D, or a color map.
- Simultaneous display of the exact same data both in an overview and zoomed.

3.8.2 "Edit" menu

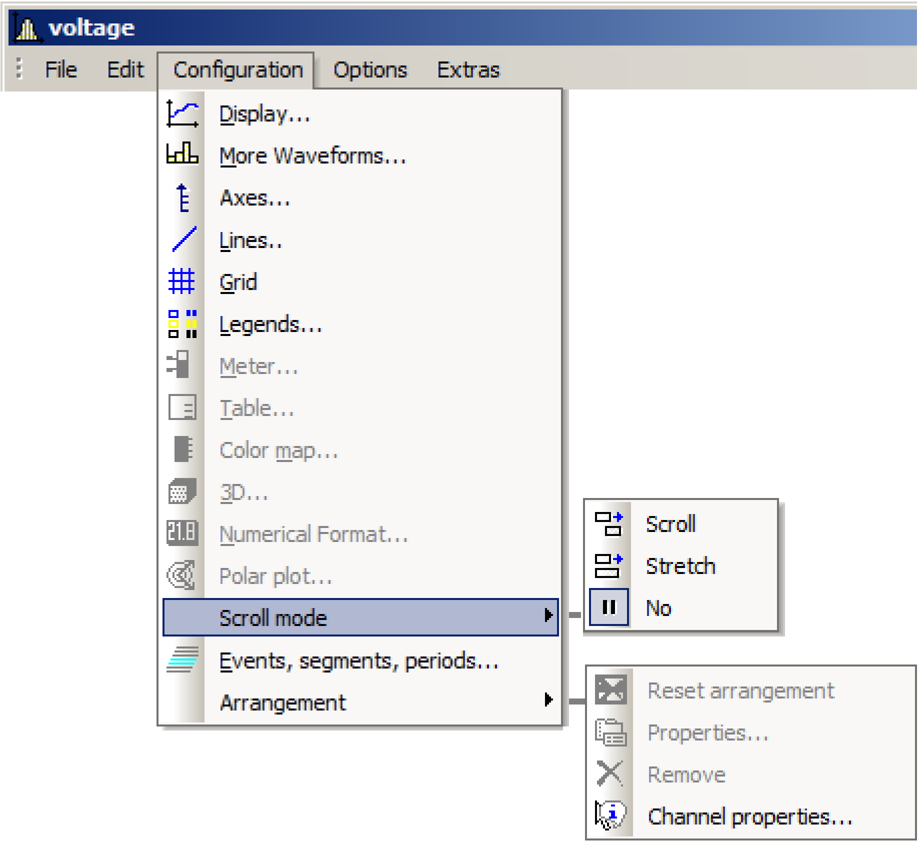


Menu item		Description
	Zoom 180	Enlarges a section of the curve window.
	Unzoom 181	Displays the entire curve.
	Measure 182	A measurement value window and measurement cursors for measuring curves are displayed.
	Select-mode 196	In this mode, it is possible to select and edit legends, coordinate systems, axes, curves and markers.
	Marker 198	Proceeds to the list of marker functions.
	Clipboard 222	Copies the graphics in the curve window into the Windows clipboard.
	Graphic-export... 222	The graphic of the curve window is saved as image or as a PDF file.
	Move 227	Proceeds to a submenu listing various curve viewing functions.

Reference

Another possibility to navigate through the curve window is provided by the 'Axes Navigation Bar' 271.

3.8.3 "Configuration" menu



Menu item	Description
Display 21	The structure of the curve window and other attributes, such as the "Freeze" mode and time/date display can be selected here.
More Channels 94	Selects additional waveforms to be displayed in the current curve window.
Axes 106	Sets x- and y-axis parameters.
Lines 125	Sets line (measurement cure) parameters.
Grid 159	A grid can be added to the coordinate system.
Legends 137	Sets the display of legends in the curve window.
Meter 48	Sets properties of bar meter display.
Table 42	Sets properties of tables display.
Color map 57	Sets properties of color map display.
3D 69	Sets properties of 3D display.
Numerical format 37	Sets properties of the display mode "Last value as number".
Polar plot 69	Sets properties of polar plot.
Scroll mode 169	In the curve window, a particular section of the data set can either "scroll past" or continuously "grow" from the beginning.

Menu item	Description
Events, segments, periods 170	Selects the display of individual events (in imc STUDIO: trigger events), individual segments (e.g. spectra or rows in a matrix) or even periods (period comparison).
Arrangement 177	Restores the curve window arrangement, access to properties and deletion of selected objects.

3.8.4 "Options" menu

Menu item	Description
Clipboard settings 245	Settings for graphics created for output or export with the clipboard are specified here.
Colors 249	Changes the colors in the curve window.
Presettings 251	Presettings such as the standard configuration directory and drives for storage of temporary files are made here.
Printer preview 258	This function makes it possible to switch between the Print Layout view and Normal view. It is used exclusively in curve windows which are embedded in the Data-Browser's Report view.

3.8.4.1 Clipboard settings

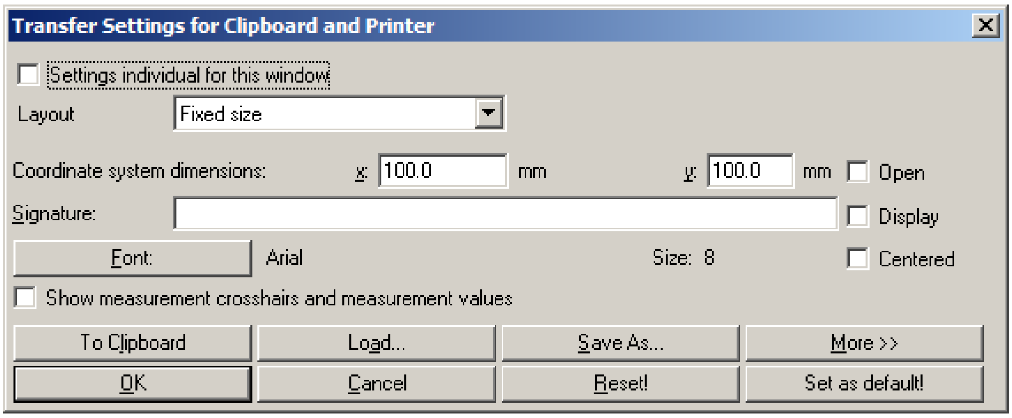
Function

The graphics in the curve window can be documented in professional quality. Graphics can be sent to the clipboard as vector graphics, for further processing by any text processing, graphics- or desktop publishing programs. The graphics can also be sent to the Report Generator for output in a report designed by the user.

The user can specify how graphics are generated by selecting the font and line width in the clipboard settings.

Operation

Call menu option *Options/ Clipboard settings*... in the curve window menu. The following dialog appears:



The settings are applied when the item *Clipboard* 243 in the *Edit* menu is called.

Settings	Description
Settings individual for this window	Here you can set whether the clipboard settings only apply to the current curve window or for all curve windows.

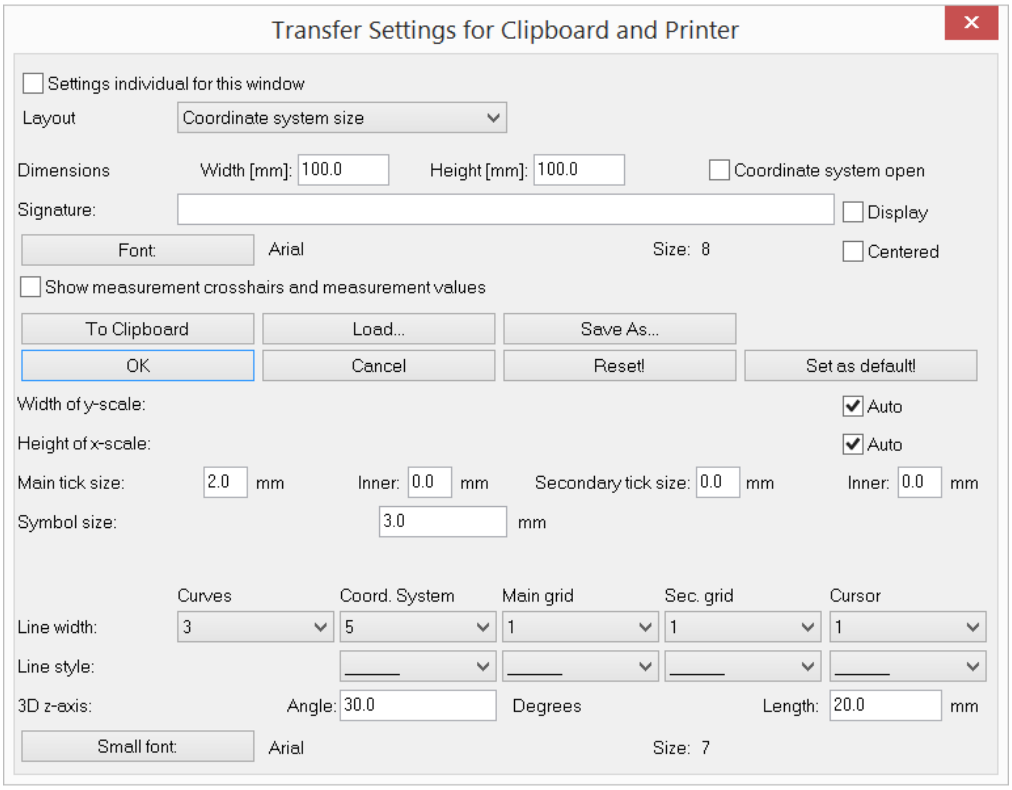
Settings	Description
Layout	***Proportions as on screen*** (the default setting!) saves the curve window to the clipboard with the proportions which accord with the settings currently applied on screen. The layout ***Coordinate system size*** creates a graph in which the **coordinate system** exactly applies the *x* and *y* values specified by the setting *Dimension*. Observe also the notes on the Table 246. ***Total size*** creates a graphic in which the **outer edge of the curve window** is determined by the x and y values.
Coordinate system	The ***width*** and ***height*** of the coordinate system, stated in mm, are set in the text boxes appearing in the dialog line *dimensions*. If the lines are particularly thick, the size is calculated from the middle of one line to the middle of the next line. Axis labeling of the coordinate system is not included in these dimensions, they are drawn outside of the actual coordinate system. Dimensions should be at least several mm, but no larger than the page.
Open coordinate system	This option causes curves in a standard display (y-axes not stacked) to be drawn in an open coordinate system, with no upper and right-hand borders. The curve is thus less crowded in the display. When this option is not selected, all lines in the coordinate system are drawn.
Caption	The user can specify a text to appear below the x-axis. This text may contain up to 60 characters. It will be displayed, along with the date and time, only when the option *Show* is selected.
Centered	When this option is selected, all labels (as much as possible) are centered under the ticks. The effect is most noticeable for the labels at the edges of the axes, at the far right and left of the x-axis and at the top and bottom edges of the y-axis. When the type is not centered, these labels are often drawn so that they end at the edges of the coordinate system.
Show measurement cursors (crosshairs) and measurement values	When a measurement value window is present when graphics are generated, and this option is active, the measurement cursors are included in the coordinate system display. The measurement values of the cursors are displayed below the x-axis.
Font	Select here the font for the axes scaling. The MS-Windows standard dialog appears when the "*Font*" button is selected. The dialog shows all fonts available for the printer currently set for the curve window. Select a font, the size in points and any other features desired, e.g. bold type. A font size of 10 to 12 points is generally very legible. TRUETYPE fonts are preferred since they can be scaled more easily.
To clipboard	Click on this button to copy the contents of the curve window with the current settings to the clipboard.
Reset!	When the *Reset*! button is selected, the controls of the dialogs are set to default values. Controls accessed with the *More* >> button are also reset.
Save as	A dialog appears for saving the contents of the *Clipboard settings* in a file.
Load	Once the contents of the dialog have been saved in a file, this file can be loaded to initialize the dialog with the settings in the file.

Note

It is possible to achieve an exact scale of units/cm by means of the combination *Layout: **Coordinate system size*** and an appropriate count of *Ticks* 109 along the X- and Y-axes. Note that due to particular presets in the target program, the size of the graphic may not be equal to 100%. For example, after insertion into a WORD document, it is necessary to specify 100% for the *Size and Position* (in the graphic's context menu).

More >>

The dialog box is enlarged when this button is selected. Additional, less frequently used settings for the graphics configuration are made here. The dialog appears as follows:



Settings	Description
Width of y-scale	The width of the y-scale is set automatically, if the checkbox appearing after *y-scale width* is marked. To specify a different width manually, deactivate the check box *auto*. A text box appears in which the width should be specified in mm. Make sure that the specified width is large enough for the selected font. The width is calculated from the middle of the line enclosing the coordinate system.
Height of x-scale	The height of the x-scale is set automatically, if the checkbox appearing after *x-scale height* is marked. To specify a different height manually, deactivate the check box *auto*. A text box appears in which the height can be specified in mm. Make sure that the specified height is large enough for the selected font. The height is calculated from the middle of the line enclosing the coordinate system.
Size of ticks	Specify here the length of the *main* and *secondary ticks*. The length is composed of sections: length within and outside the coordinate system. Specify the total length and the portion *inside* for the main ticks and the secondary ticks, respectively. The lengths are specified in mm with up to one digit after the decimal; a length of zero is also possible.
Symbol size	Lines can also be distinguished by accompanying symbols, see the menu items *Configuration/ Axes* 106 and *Configuration/ Display* 21. The size of the symbols is specified here. Enter the diameter of the symbols in mm, with up to one place after the decimal.

Settings	Description
Line width	The width can be specified for the following lines: • curves, coordinate system, main grid, secondary grid, measurement cursor Any specified line thickness 126 for an individual waveform overwrite the settings saved in the Clipboard. Specify the line width with a setting between 1 and 100. A very fine line width can be achieved with the lowest settings. Line width depends on the resolution of the output device. Since the width is always entered in pixels (units of resolution), only a whole number of points of the output device can be specified. A line width of 1 may be a practically invisibly fine line on a high-resolution laser printer, but may appear like bold type on a simple matrix printer. Line widths are generally set to between 1 and 5.
Line style	Various line styles can be selected for the following: • coordinate system, main grid, secondary grid, measurement cursor The following line types can be selected: • broken, dense dots, coarse dots, dense dashes, coarse dashes, alternating dots and dashes The various line types help differentiated between main and secondary grids when both are drawn with thin lines, so as to avoid distracting from the displayed curves.
z-axis angle	The angle of the z-axis can be set to between 1 and 89 degrees for the waterfall diagram. The larger the angle, the steeper the z-axis climbs. An angle of 30 degrees is recommended.
Length of z-axis	The length of the z-axis can be specified in mm for the waterfall diagram, with up to one place after the decimal.
Small font	The font for the small print in the 1/3-octave/octave labeling of the x-axis can be specified. Click on the button *Small font* to prompt the MS-Windows standard dialog for selecting the font.

Remarks

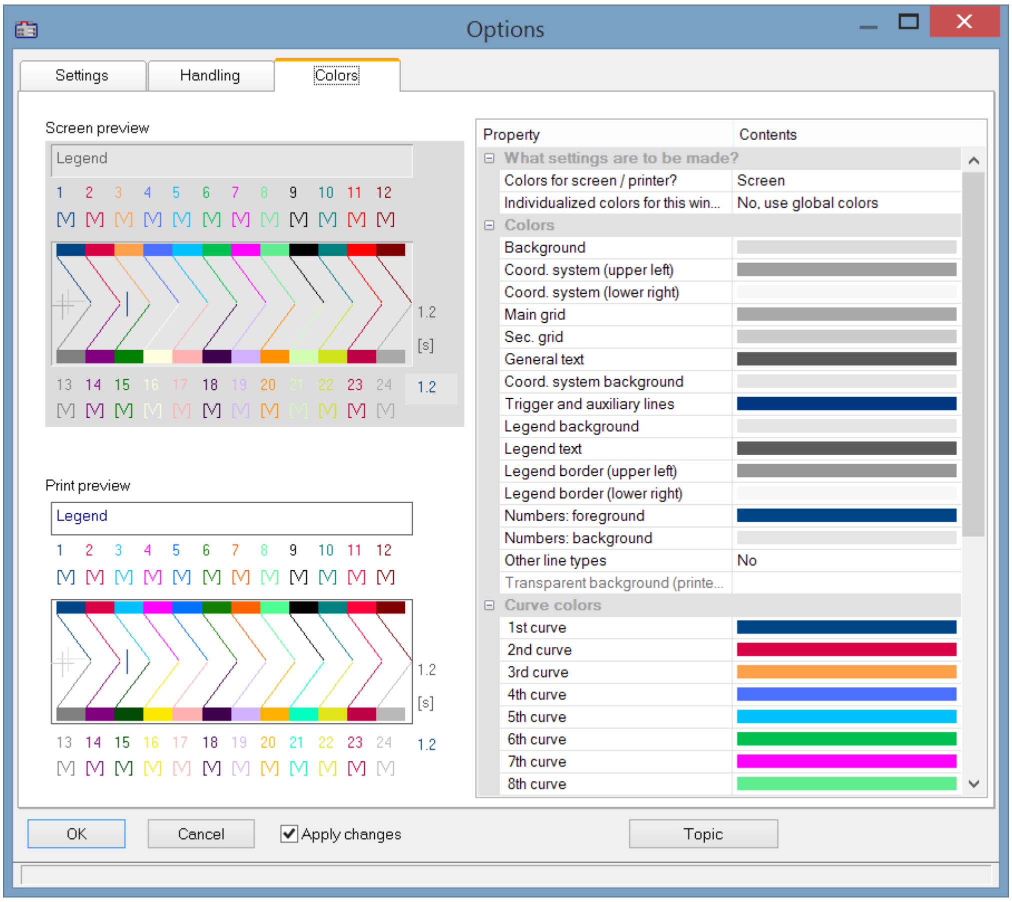
- The settings in this dialog apply to all curve windows.
- The fonts available for selection depend on the printer set for the curve window.
- When graphics are transferred to the clipboard, it is important that the printer set for the curve window is also the printer with which the graphics will later be printed. The meta file for the clipboard is created specially for the selected printer; if graphics are outputted on a different device, some fonts may not be available or scaling may change and then the graphics will appear in poor quality. Format settings such as landscape or portrait and the size of the page should also correspond. The metafiles are in some measure adapted to the output device.
- A metafile is created with the selected fonts and size for the curve window graphics when they are sent to the clipboard. If this metafile is later changed to a different size (e.g. because the graphics were shrunk by the text processing program after they were inserted in the clipboard), the font proportions may no longer be correct. The font may become too wide or too high. Use of truetype fonts may also have this result, since the Curve Manager only dictates the height of the font in points. Always create graphics in the size in which they will later be printed. If this is not possible, at least try to comply with the height-width proportions.

3.8.4.2 Colors

Function

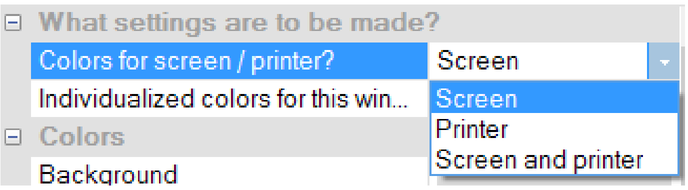
All colors used in the graphic interface of the curve window can be defined as desired in a special dialog. Single windows can use an individual color scheme.

The following dialog is used to define the colors:



Screen/Printer

A combobox is found at the top edge of the dialog, which contains the entries *Screen, Printer* and *Screen and printer*.



The colors can be changed from the default settings. The default colors for the printer are black/white. However, the screen colors can be applied for printouts, see below under **Copy..** 250.

The printer settings additionally offer the option of leaving the background transparent. Besides saving ink, this has the advantage of keeping graphics objects located behind the curves visible.

Individualized colors for this window decides whether the colors are adopted as the default setting for all windows or not. This option can be set separately for the **screen** and **printer** selection. So it is possible to set colors for the screen individually but to use the global default settings for the printout.

Color graphic elements

A curve window contains the following graphic elements:

- background
- coordinate system and grid ...
- coordinate-system background
- general text
- legend...
- numbers...
- trigger line, auxiliary lines
- curves 1 to 12

Operation

Select menu option *Colors*... in the *Options* menu in the curve window.

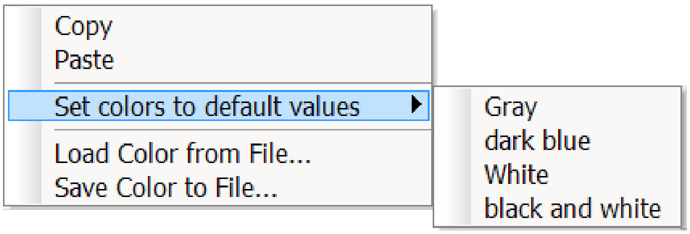
A dialog appears in which the colors can be defined. This dialog contains a list of the graphic elements in the curve window.

A display is found in the center of the dialog showing the colors currently defined for icons of the graphic elements. Colors are defined for one element at a time.

Select a graphical element from the list and set its color.

Context menu

Right-clicking the mouse in the dialog box calls the context menu:



Menu action	Description
Copy	The table including colors is copied to the clipboard.
Paste	The table values are pasted in the selected curve window in order to adjust the screen colors to the printer settings or for an individual window.
Set colors to default values	The colors are reset. There are serveral color schemes to choose from.
Load Color from File	The color settings for the monitor and for the printer are loaded from a file. This file must previously be created by using the menu option *Save Color to File*.
Save Color to File	Stores color settings in a file.

In the sequence, the colors can be loaded using the Curve Kit's function `CwGlobalGet("colors.printer.pattern")` or `CwGlobalGet("colors.screen.pattern")`.

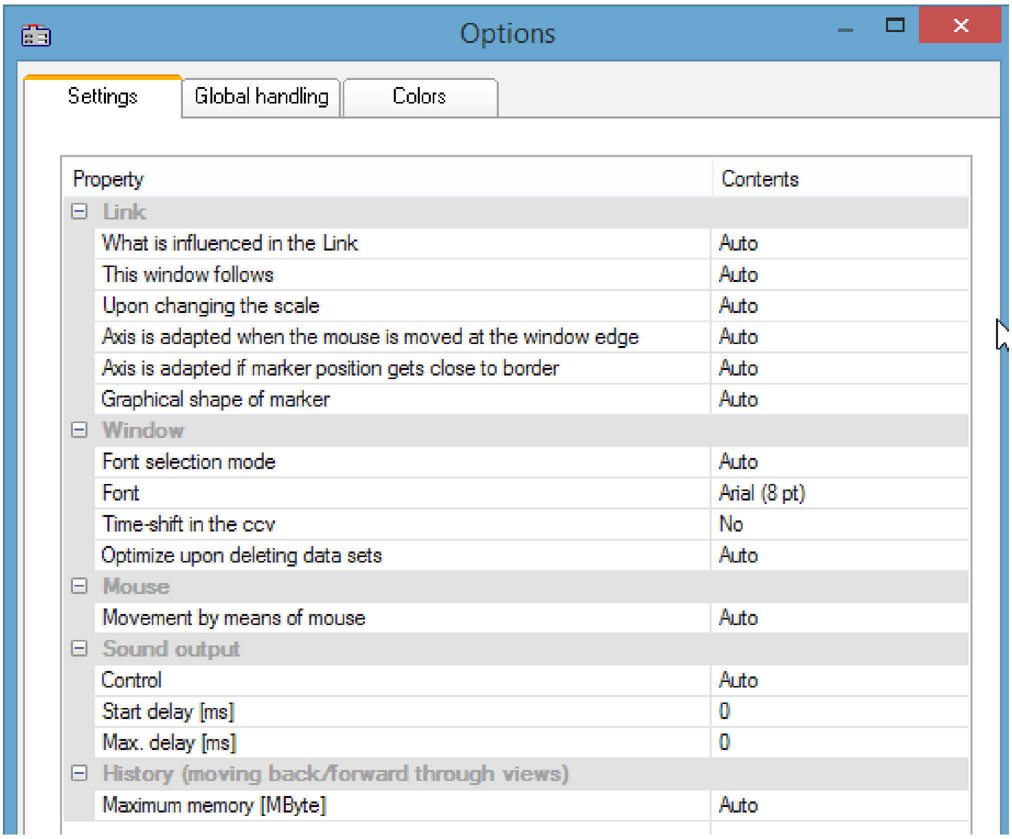
Remarks

- None of the colors produced by mixing and blending may be selected for lines and texts. If other color intensities are selected, the program will use the closest true color. This also applies to the coordinate system background color.
- It is recommended to select always colors which produce a good contrast. Yellow curves on a white background would be a very inappropriate combination.
- Background colors should not contain any noticeable pattern, to guarantee good contrast to the curves and lettering.
- Do not select a dark background color for printing. Laser printers are not designed to print large dark areas. A white background would be appropriate.
- Colors set in this dialog are effective for all curve windows.
- The colors for printing are also used when the graphics are transferred from curve windows to the MS-Windows clipboard, and when curves are sent to the Report Generator.
- The selected colors settings remain intact even after the program has been ended.
- Colors cannot be selected individually if more than twelve curves are displayed in the curve window. The colors are then repeated cyclically.

3.8.4.3 Presettings

Here you find more controls for the curve window's default settings, such as the font, axes, linkages to the curve window, etc.. By clicking on the column Contents, you can select from the possible options; see the arrow below.

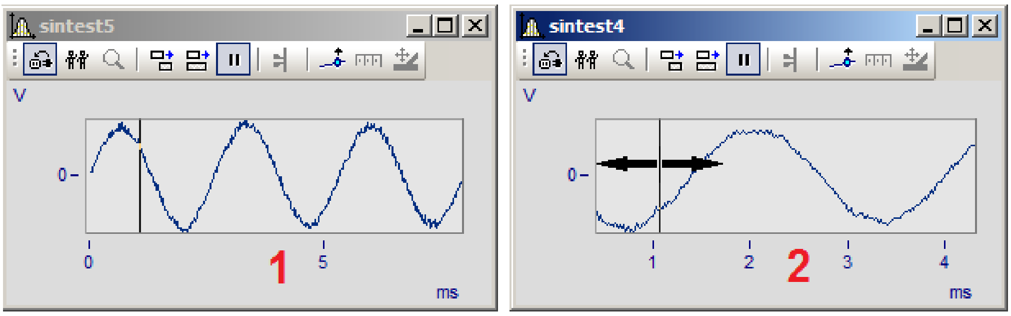
Settings



Property	Contents
Link	
What is influenced in the Link	Auto
This window follows	Auto
Upon changing the scale	Auto
Axis is adapted when the mouse is moved at the window edge	Auto
Axis is adapted if marker position gets close to border	Auto
Graphical shape of marker	Auto
Window	
Font selection mode	Auto
Font	Arial (8 pt)
Time-shift in the ccv	No
Optimize upon deleting data sets	Auto
Mouse	
Movement by means of mouse	Auto
Sound output	
Control	Auto
Start delay [ms]	0
Max. delay [ms]	0
History (moving back/forward through views)	
Maximum memory [MByte]	Auto

Presettings - Page: Settings

Link: The settings for the link affect how one curve window is linked to another one, for instance, one curve window's waveform in the time domain could be linked with second curve window showing GPS positions.	
What is influenced by link	**auto:** depending on the display type, one of the following options is used **x-axis:** usually default **Parameter of 1st XY-plot:** e.g. for the position on a *map* 147 **x-, yAxis (color map):** both the x-, and the y-direction are linked 228. **y-axis:** follows the y-direction in color maps **Cross section:** creates a cross-section referenced to the linked axis on the color map.
This window follows	**auto:** mostly Line follows **Axis follows:** The curve and the axis are moved, but the link pointer remains stationary. **Line follows:** The curve and axis remain stationary while the link pointer moves.
Upon changing the scale	**auto:** Stretching and compression of the x-axis; mostly: line remains at screen position **Line follows:** Line remains at screen position **Line remains at position on screen:** curve moves away behind it.
Axis is adapted when the mouse moved at the window edge	Affects curve windows where the line moves (in picture 2 below) **auto:** mostly "no", except with map 147 **yes:** the axis of the curve window whose line is moved is compressed. **no:** no changes.
Axis is adapted if marker position gets close to border	Affects curve windows which move due to linkage (in picture 1 below) **yes:** Axis of linked curve window is compressed
Shape of position marker	**auto:** always line, except with map 147 where a circle is used . **Line:** Vertical line



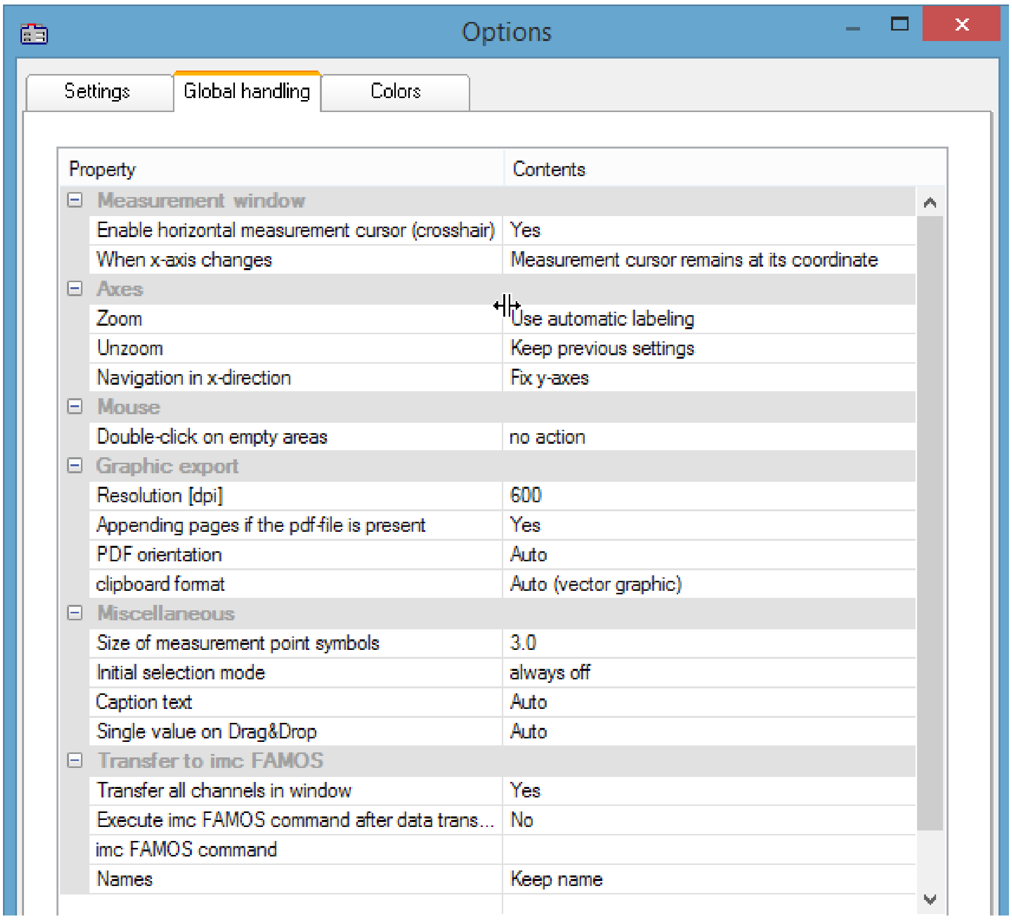
Link options

Window: In this section, set the **font**.	
Font selection mode	**Auto:** the font which is principally used whenever the curve window is opened. **Individual for this window:** Only affects the current curve window.
Font	All fonts used by Windows are available here.
Time-Shift in the ccv	**Yes:** Any shift made using the Time-Shift or Line-Shift function will be saved with a curve configuration file (ccv).
Optimize upon deleting data sets	With "*No: Lines and axes remain intact*", only a variable will only be removed from the curve window. The structure remains intact. This parameter can be set by the function `CwDisplaySet("opt.on.delete", 0)` as well. With "*Auto*", the system behaves the same way as before, which means the associated axes are removed. If the deleted data set is the only variable in the curve window, the curve window closes.
Mouse: Behavior of the curve window when dragging the mouse while holding its button	
Movement by means of mouse	**Auto:** Moves the location of the data in the curve window in the X and Y directions, similarly to moving a map. **Only in x-direction:** Like *Auto*, only in the x-direction. **No:** The display is not moved. Instead, the data can be moved into a different coordinate system or curve window by means of Drag&Drop. (Default behavior up to imc FAMOS Version 7.0)
Sound output: Options for playback of a data set by means of the audio output.	
Control	Either the data is played from the player position (*auto*) or the last, currently recorded data is played back(e.g. during the measurement with imc STUDIO).
Start delay [ms] Max. delay [ms]	Options for synchronization of online streaming data with imc STUDIO. More info is presented here 266.
History: Determines the maximum undo buffer depth for changed made.	
Max. memory [MByte]	Here you can determine the maximum memory allocated to the history of changes, which can be reversed by means of the undo 228 command.
Scroll mode: Options for automatic scrolling for streaming data with imc STUDIO	
Allow smart scrolling	*Yes/No*
Smart scrolling as of width	Stated in milliseconds. With this setting, you determine the scrolling behavior with streaming data during a running measurement. In particular with the output of sound, these settings can be used to avoid lapses.
Time lag with smart scrolling	
Jitter on the right edge	

Graphic export: Sets the maximum memory depth for the changes made.	
Export optimization	**Bitmap:** A bitmap is created containing the **interior of the coordinate sys**tem, with its curves and graph lines. This bitmap is then exported as a PDF. In consequence, when the graphic is complicated, having very many measurement points, graphics elements are not generated as a vector graphic, but only as a bitmap. Markers, axis labels and legends are not affected and continue to be processed as text elements as vector graphics. **Vector graphic:** The interior of the coordinate system generates a vector graphic. **Auto:** Set to either "*Bitmap or Vector graphic*", depending on the implementation. This setting may change in future versions.

- The setting "*Export optimization*" is only useful if overall a vector graphic is to be generated in Global handling 256. If the setting there is for export of the curve window as a Bitmap to PDF 256, this setting provides no benefit.
- This option is applied, besides when **exporting the curve window as PDF**, also when **printing out a Panel**, exporting the **Panel as a PDF** and when transferring to the **Report Generator**.
- **In a Report Generator printout file**, the setting Bitmap can cause very large DRB files, since bitmaps are not compressed there. But subsequently, compact and easily handled PDFs are generated from the DRB.
- This option applies **individually to each curve window** or ccv-file. It can thus be used to provide individualized modification of the behavior for particular curve windows, e.g. ones with complex graphics.
- When transferring a graphic to the **Report Generator**, any printer currently set for the Report Generator is taken into account. Thus, the coordinate system's bitmap is appears in shades of gray when a B/W printer is used. If this is not the desired behavior, because actually only a PDF is to be generated, a color printer (or if not available the XPDS printer) should be selected.

Global handling



Presettings - Handling

Measurement window	
Enable horizontal measurement cursor	*yes/no:* display of the horizontal measurement cursor (yes: crosshairs; no: vertical line)
When x-axis changes	*Sets whether the measurement cursor remains at the data set coordinate or at the pixel position when the zoomed region is changed.*

Mouse	
Double-click on empty areas	Enables *Select-mode* 196 to be activated by double-clicking on an empty space in the curve window.

Axes: Here, settings are made which affect the ticks on and at the ends of the axes, once zooming and or re-zooming has been performed.	
Zoom Rezoom	*Use automatic labeling; Place labels at end, use rounding;Place labels at end, use no rounding; Keep previous settings* *See Axes Scale* 107
Navigation in x-direction	Determines whether after navigating 271 the Y-axis is permanent or is scaled automatically.

Graphic export: Settings for exporting the curve window as a graphic to the Clipboard	
Resolution [dpi]	Dots per Inch (150, 300, 600, 1200)
Appending pages if the pdf-file is present	If the PDF document already exists, it can be overwritten or supplemented with the curve window.
PDF orientation	Portrait or landscape
clipboard format	Vector- or pixel graphic
Create PDF files	**Bitmap:** The entire graphic is converted to PDF as a bitmap. Resolution in dpi. (Default before Version imc FAMOS 7.3) **Vector graphic:** All graphics elements which are not available as a bitmap are embedded in the **vector graphic in the PDF**. For color maps and 3D, the resulting bitmaps have 300 dpi, which are retained. However, the text elements in the curve window are processed to vector graphics. The system can do a search through the PDF for these by text search. The vector graphic as significantly better resolution at lower memory requirements for normal curve plots. BUT: for graphics with many vector elements (e.g. 10000 big solid dots), the PDF becomes unwieldy large an export is slowed down by an extreme amount. In this case, it is preferable to use the Bitmap setting. On an individual basis, the interior of the curve window can be generated as bitmap and the text elements as vector graphics. To do this, use vector graphics here and for *Export optimization use "Bitmap" under Settings* 254. For vector graphics, the **Windows XPS printer** is used. This is installed by the operating system and must be operational. Otherwise, the printer will need to be reinstalled via the PC's control panel settings. Here, a resolution of 600 dpi is always assumed; the stated resolution is ignored! **Auto:** When exporting from the Panel or Report Generator, imc FAMOS checks which method is more advantageous. For specific conditions, always select either Bitmap or Vector Graphic. From directly in the curve window, *auto* is either set to *Bitmap or Vector Graphic*, depending on the implementation. The settings are global and can also be set in imc FAMOS, under the menu item: *Extra\Options \File - Save/Export: PDF*.

Miscellaneous	
Size of measurement point symbol	*0.5 -10* mm. Size of the symbols 127 representing the measured points, e.g. squares, circles...
Initial selection mode	Default setting for *Select-mode* 196.
Caption text	**Auto:** Name of first dataset. **Filename:** The filename of the loaded ccv file can be shown in the caption of a free-floating curve window.
Single value on Drag&Drop	With the option "*As horizontal line*", single values are always displayed as a line, e.g. for display of value limits.

Transfer to imc FAMOS: A detailed description is provided here 257.	
Transfer all channels in window	You can transfer either all of the data sets or only the first one which has the window's title.
Execute imc FAMOS command after data transfer	The function/sequence set under "*imc FAMOS Command*" is executed.
imc FAMOS command	Command which is executed once the data have been transferred if the option "*imc FAMOS command after data transfer*" is activated.
Names	Variables names can be changed in order to avoid overwriting existing variables.

Remark: The presettings remain in effect after the program is closed.

Reference: Colors 249

Transfer Options

Waveforms displayed in the curve windows can be transferred directly to imc FAMOS. It is often useful to transfer data from imc STUDIO or user-made programs which use the curve window to imc FAMOS for special evaluation.

But even within imc FAMOS, the measurement window 186 enables signal portions located between measurement cursors to be copied. Note that there is a way (Name 257) to automatically rename the portions, in order not to overwrite the original data.

Waveforms are transferred one by one to imc FAMOS. Once a waveform has been successfully transferred to imc FAMOS, it appears in the variables list.

For the purpose of transferring to imc FAMOS, it is also possible to select options via the presettings 257.

Execute imc FAMOS Command after Data Transfer:

Immediately after all selected waveforms have been transferred, a imc FAMOS-command can be optionally executed. Any command which can be executed in imc FAMOS can be transferred. For example, a sequence call can be transferred, which imc FAMOS uses to execute the sequence. When the option "*Execute imc FAMOS command after data transfer"* is not selected, it is irrelevant what the user enters in the input box.

Names

Use this option to decide under which file names the data are stored in imc FAMOS after transfer. The following options are available:

Options	Description
Keep	The name of the waveform is accepted unchanged. This option is useful when data are transferred from another application to imc FAMOS and the same name should be used. **Attention:** Be careful when transferring measurement intervals of imc FAMOS curves!
'_' instead of first character	The first character in the name is replaced by '_' (underline).
'_' precede	A '_' is placed **in front of** the name. If the name is too long, it is truncated at the end.
'_' append	A '_' is added **to the end** of a name. If the name is too long, the last character of the original name is dropped.
Fixed Names	User-defined names can also be specified. This option is useful only when just one waveform is transferred. If the user attempts to transfer multiple waveforms with the same name, each waveform will be overwritten by the next one.

The option most appropriate depends on the application and the particular names. The options '_' *precede* or '_' *append* are recommended for transferring measurement intervals within imc FAMOS. Any significant characters in the name should not be changed. The transferred data should have distinct names.

Mouse Operation

- Select menu item *Options/Transfer options*... to set the options for transferring data. A dialog appears in which settings are made.
- Select menu option *File/ Transfer to imc FAMOS* in the curve window to transfer data to imc FAMOS using the specified options.
- In order to transfer a curve window section defined by the measurement cursors, select the context menu item *Send curve segment to imc FAMOS* 186.

Remarks

- If the imc FAMOS application hasn't been opened yet, it is automatically started when transfer to imc FAMOS is executed. The imc FAMOS.EXE file is searched for in the same directory as the IM7CUDAM.DLL file.
- If waveforms are to be transferred to imc FAMOS, it is recommended to end any sequences running in imc FAMOS before starting transfer.
- The transfer options remain intact after the program is ended.
- Transfer options are valid for all curve and measurement value windows.

3.8.4.4 Printer preview

This item is only enabled in the Data Browser's Report view.

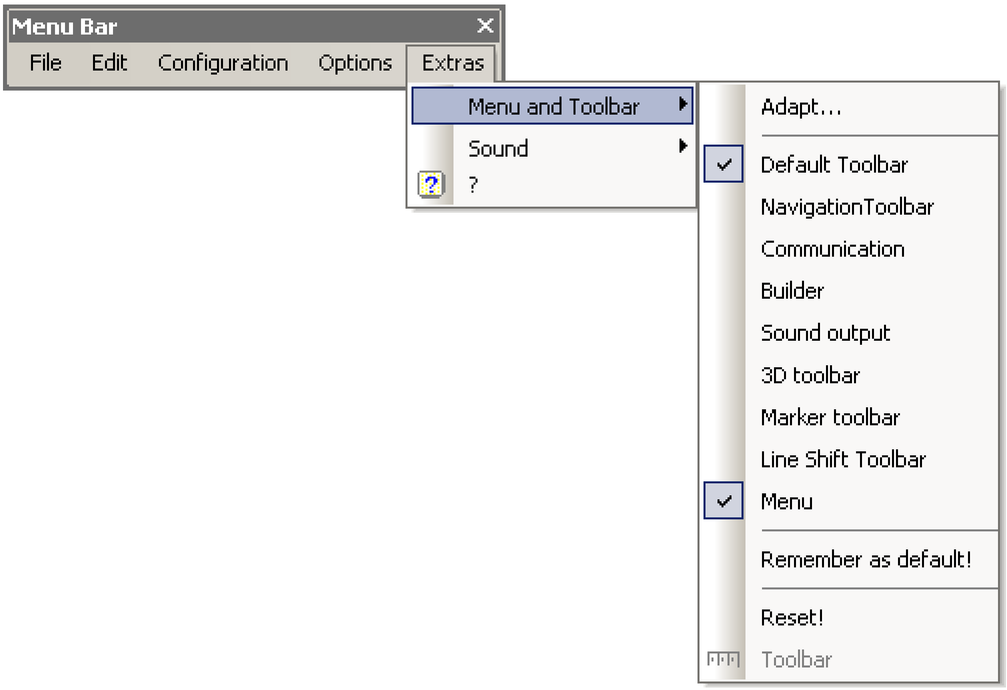
The *Print Preview* is activated by default for curve windows which are incorporated into a report in the Data-Browser. This means that the colors are displayed which the user set in the *Colors* 249-dialog in the *Options* menu as the color scheme for the printer.

With this option, it is possible to switch to the monitor screen's color scheme.

3.8.5 "Extras" menu

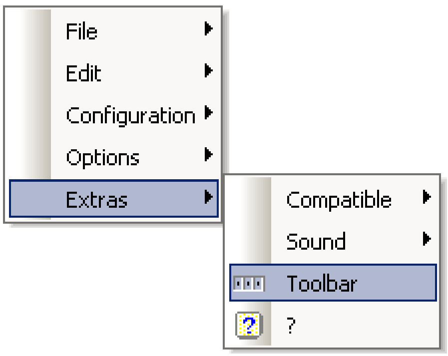
Menu item	Description
Menu and Toolbar 259	Options pertaining to the menu and toolbar.
Sound 262	Activates the sound output and access to the functions of the Sound-Toolbar.
?	Displays the curve window's Help.

3.8.5.1 Menu and Toolbar



Menu item	Description
Adapt... 260	Dialog for adapting (making one's own arrangement of and settings for) the curve window's menu and toolbar.
Standard Toolbar, Navigation Toolbar, ...Menu	These toolbars or even the menu bar can each be activated separately.
Remember as default!	The arrangement of the menu and the toolbar is saved as the valid default arrangement. In this way, the same settings are used even for a different, new curve.
Reset!	The menu and toolbar are reset to their initial, factory-set state.

Toolbar

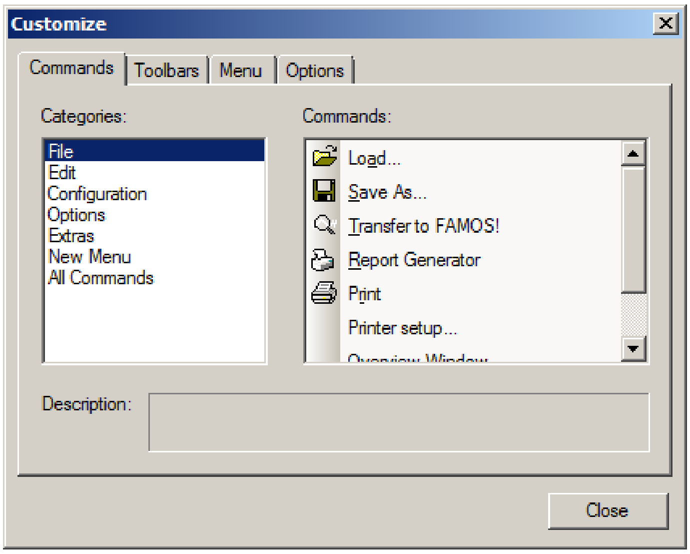


As a curve window integrated in the Data-Browser's Report view, the entire Toolbar only appears when a curve window is selected. To cancel this behavior so that the Toolbar does not appear, the function "Toolbar" can be selected. This is only available from within the Data-Browser. To make the toolbar visible again, select "Toolbar" under "Extras" in the curve window's context menu.

3.8.5.1.1 Adapt / Customize

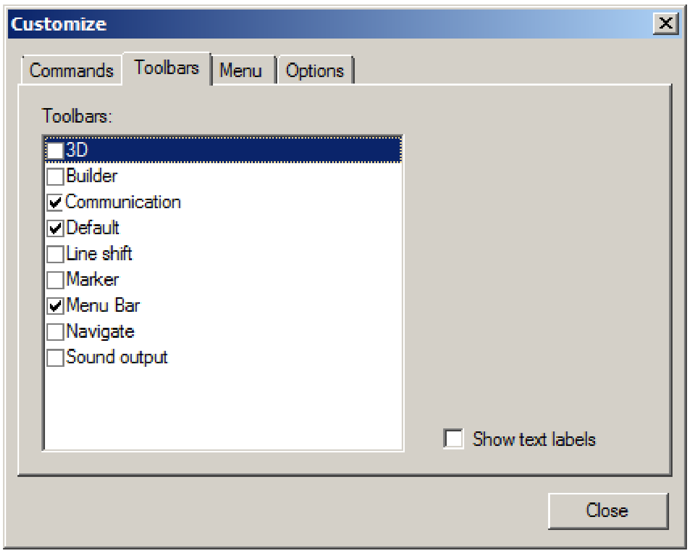
The curve window's menu and toolbar can be adapted. Right-clicking in either the menu or the toolbar opens the context menu. Alternatively, select the menu item *Extras / Menu and Toolbar*.

The menu item *Adapt*... opens the following dialog:

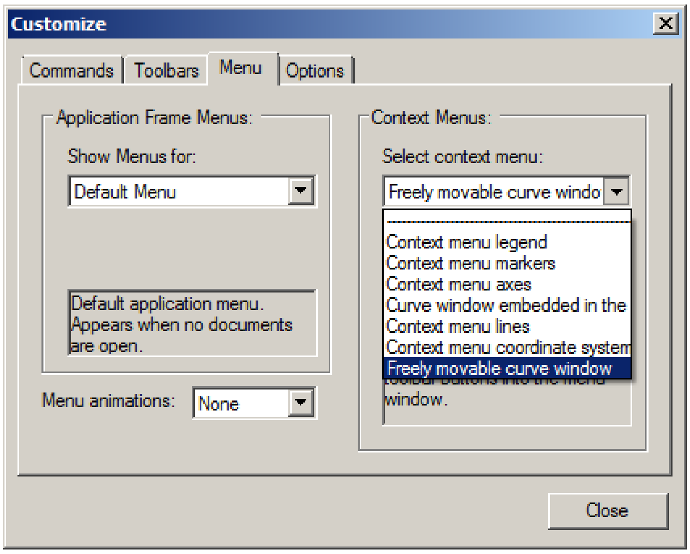


A command can be dragged from thee list at right and dropped on a menu or toolbar. Pop-down menus open by themselves when the mouse is moved over them. The list at left contains the different command topics.

The dialog below offers the additional option of showing or hiding the various toolbars:



The curve window has a context menu. This, too can be edited:



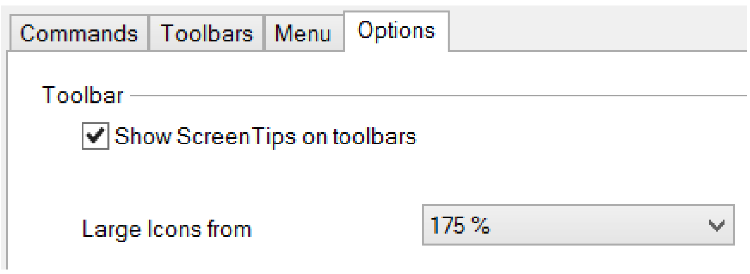
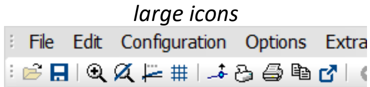
Select the display type which you wish to process.

- normal curve window which is free-floating and freely movable and can also be maximized (popup-window)
- a curve window without title bar (child window) embedded in a dialog.

While editing menus, the curve window can't be operated.

While the dialog *Customize* is open, all menu items as well as toolbar elements can be moved around by the Drag&Drop technique. Note that moving an element to the "outside" means deleting the element.

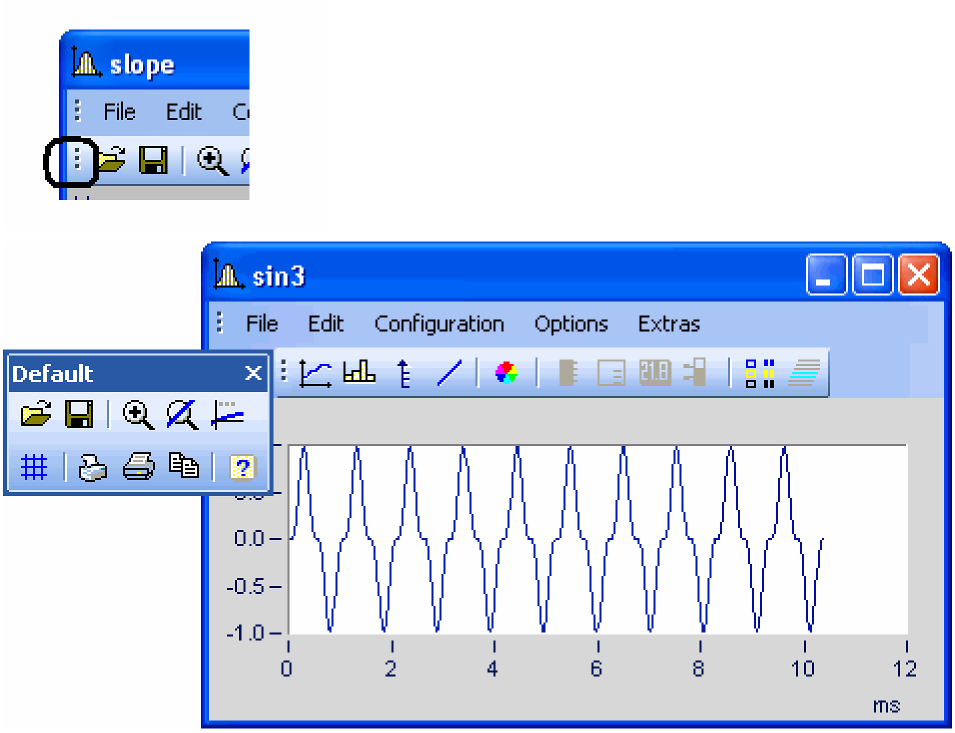
On the page "***Options***", there are two options for the display of the *Toolbars:*

Options	Description
Show tips on toolbars	A description of the icon is displayed when the mouse is moved over the window.
Large buttons	For clearer display at fine screen resolutions such as 4K, the icons can be automatically enlarged from a certain scale.  *small icons*  *large icons*  *small icons*

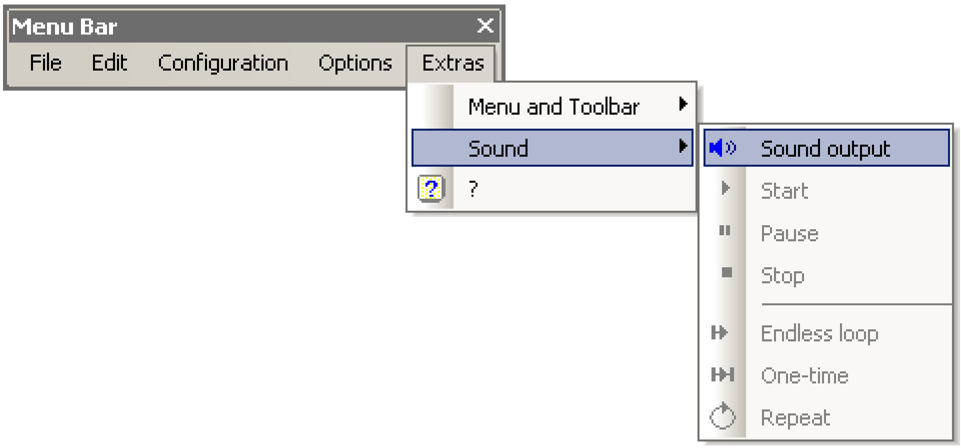
Changes of the menu are permanently saved when the dialog Customize is closed. The particular toolbar arrangement saved depends on the display type:

- Default
- Last value as number
- Overview window
- Table

The toolbars can also float freely away from the window. To accomplish this, drag the toolbar away by its left edge:



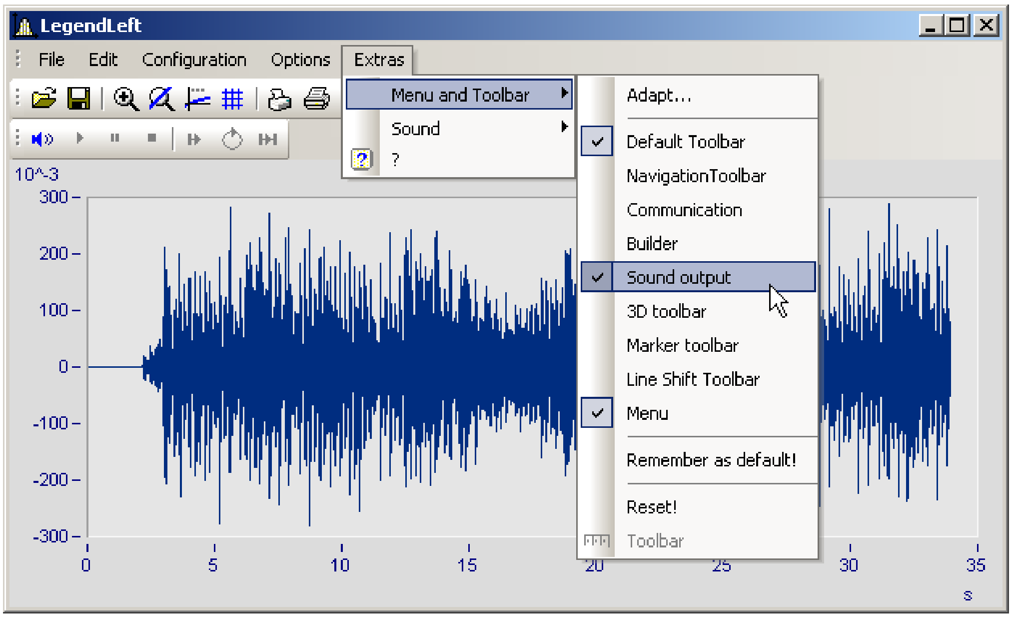
3.8.5.2 Sound



The Sound Toolbar lets you make measured data sets audible. For this purpose, a variety of functions such as cutting, endless looping and repeat are available. The sound output always only applies to the first data set in the first coordinate system and is only available in the Standard view, or with multiple y-axes.

3.8.5.2.1 Sound toolbar

For working with the sound output, you should select the associated toolbar from the menu *Extras / Menu and Toolbar / Sound output*.



Sound output toolbar

Under Sound Output, the following functions are available:

Menu item	Description
On/Off	This function lets you switch the sound output on and off. A vertical bar marks the current playback position within the curve window (playback marking), and a horizontal bar denotes the selected playback range.
Start	With this function you start output of the sound, and the selected range of the data set is played back in real time. The playback's starting and ending points can be freely selected and the position of the resulting playback time window can be moved as desired (see Cut Sound 265).
Stop	This function stops playback of the data set. The playback marking is set back to the start of the selected playback region.
Pause	This button pauses playback of the data set. The playback marking remains at its current position. By clicking on it again, playback can be resumed.
Loop from loop start to end of waveform	When you choose this operation mode, the final position for the playback is automatically set to the end of the waveform; see Cut sound 265)
Loop (repeat) from loop start to loop end	Repeated playback of loop (so-called Repeat-mode).
Loop (single) from loop start to loop end	One-time playback of the loop

Volume

The volume is set by setting the scaling of the y-axis. The range between y-min and y-max is interpreted as the maximum volume of the sound card. Thus for example, if the signal extends from -5 to 5 (units) and the y-axis extends from -5 to 5, the maximum volume is achieved. If there is an additional signal extending only from -0.5 to + 0.5, and if it is displayed with the same y-axis settings, the amplitudes from the sound card will only be 1/10 as high. I.e. the signal will be played back correspondingly softly.

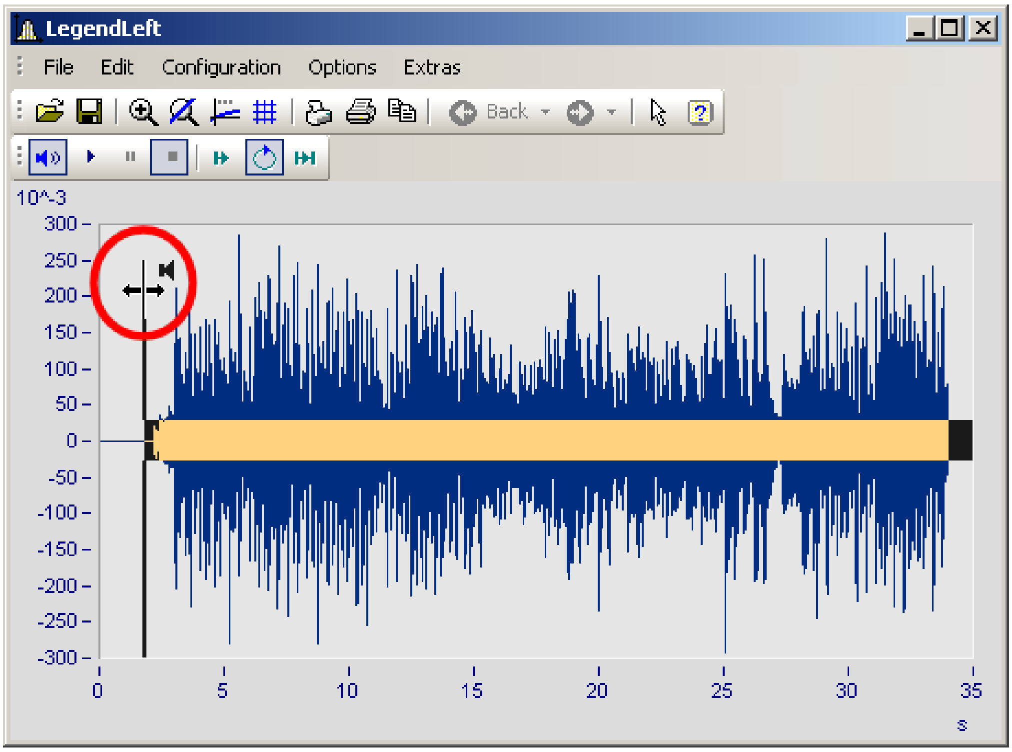
When the volumes of various signals are to be compared, all y-axes must be set to the same scaling. If the y-axes are scaled automatically, all signals have the sound card's maximum level.

The Sound Kit functions have not settings options for volume.

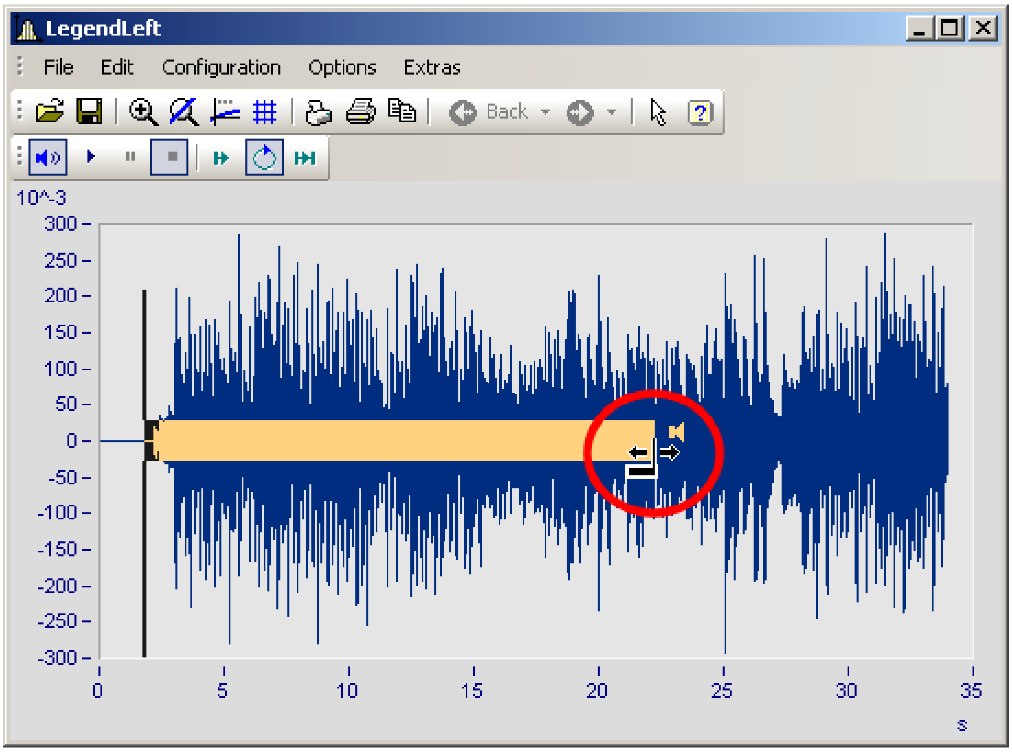
3.8.5.2.2 Sound clip

In sound output, it is possible to freely select (take a clip from) the playback region.

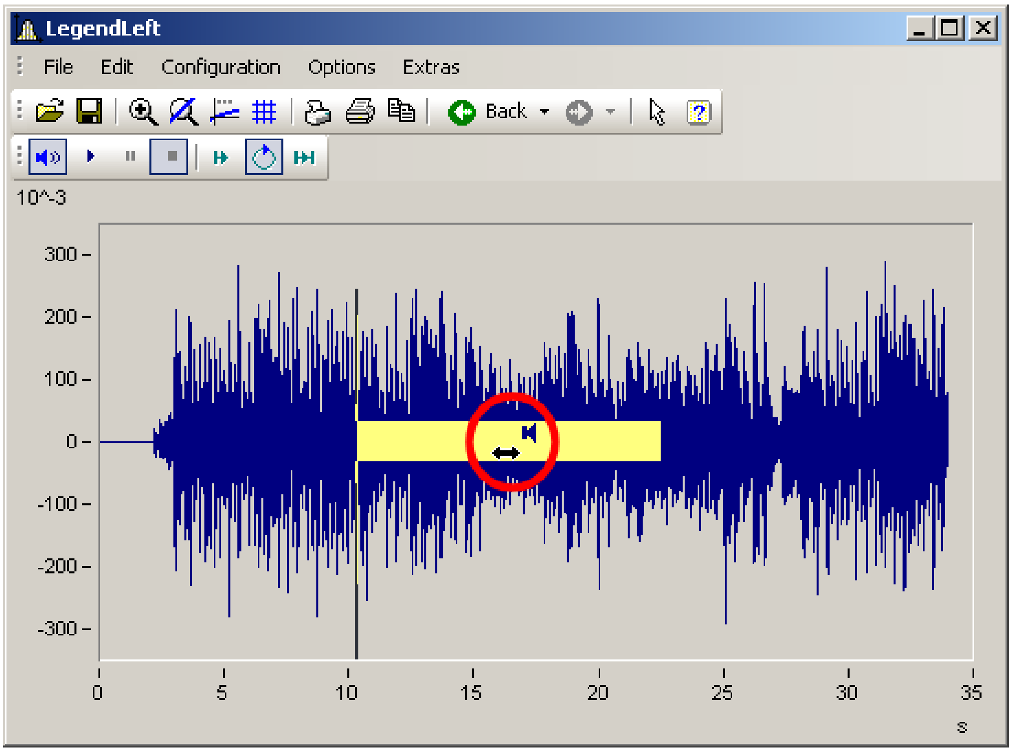
Grab the start position at the beginning of the Playback strip and move it to the position desired.



The final position for playback can also be changed. Grab the end of the playback strip and move it.



You can also move a selected playback region forwards or backwards along the data set. Click on the strip and move the mouse while holding down its button.



3.8.5.2.3 Audio output directly during measurement

During a measurement with imc STUDIO /DEVICES, it is possible to use the curve window to listen directly to the streaming data. Since the data are transferred block-by-block and sporadically, the output must be delayed in order for the playback to be seamless.

In the curve window settings 253, you will find the two entries "*Start delay*" and *"Max. delay"*.

At the beginning, as well as after losing synchronization, the *"Start delay"* takes effect. By means of *"Max. delay",* it is possible to compensate for asynchronization between the measurement device and the PC. Both values are stated in milliseconds.

3.9 Information and tips

3.9.1 Greek texts in comments, markers and axis labels

Axis labels and comments on the variables can be supplemented with Greek letters.

This is accomplished using the statement <g*Placeholder>.

Example

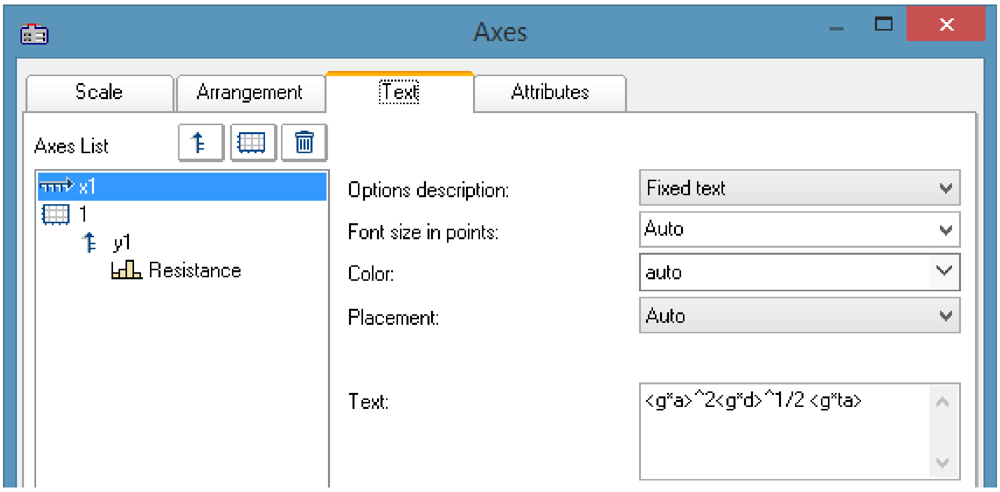
<g*a> ^ <g*a> is displayed as α^{β}.

The following table lists the available Greek letters with their respective placeholders. Here, the Unicode is only provided as a reference; it can't be used in the statement.

Placeholder		Meaning	Placeholder		Meaning
'a'	0x3b1	Alpha	'm'	0x3bc	My
'b'	0x3b2	Beta	'n'	0x3bd	Ny
'g'	0x3b3	Gamma	'x'	0x3be	Xi
'G'	0x393	uppercase Gamma	'X'	0x39e	uppercase Xi
'd'	0x3b4	Delta	'p'	0x3c0	Pi
'D'	0x394	uppercase Delta	'ph'	0x3c6	Phi
'e'	0x3b5	Epsilon	'ps'	0x3c8	Psi
'et'	0x3b7	Eta	'P'	0x3a0	uppercase Pi
'z'	0x3b6	Zeta	'Ph'	0x3a6	uppercase Phi
'th'	0x3b8	theta	'Ps'	0x3a8	uppercase Psi
'ta'	0x3d1	theta, (customary) notation	'r'	0x3c1	Rho
't'	0x3c4	tau	's'	0x3c3	Sigma
'Th'	0x398	uppercase Theta	'S'	0x3a3	uppercase Sigma
'k'	0x3ba	Kappa	'ch'	0x3c7	Chi
'l'	0x3bb	Lambda	'Ch'	0x3a7	uppercase Chi
'L'	0x39b	uppercase Lambda	'o'	0x3c9	Omega
			'O'	0x3a9	uppercase Omega

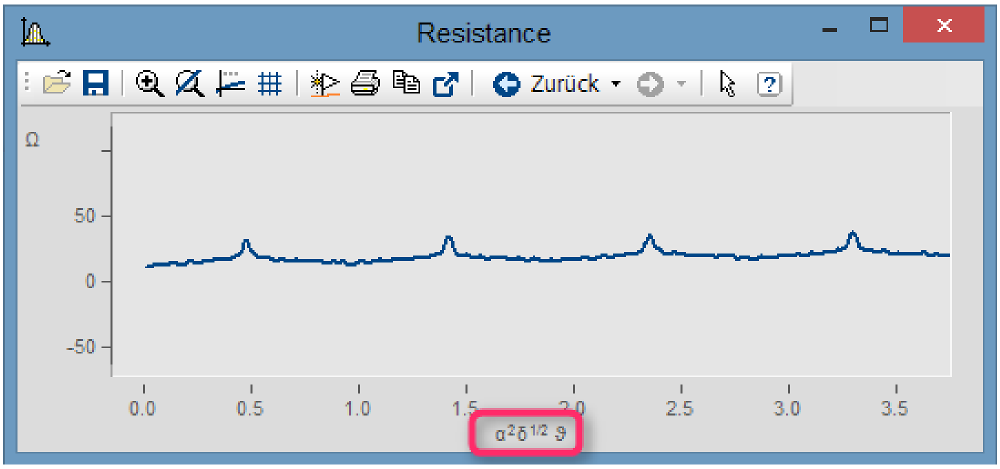
Example curve window

with



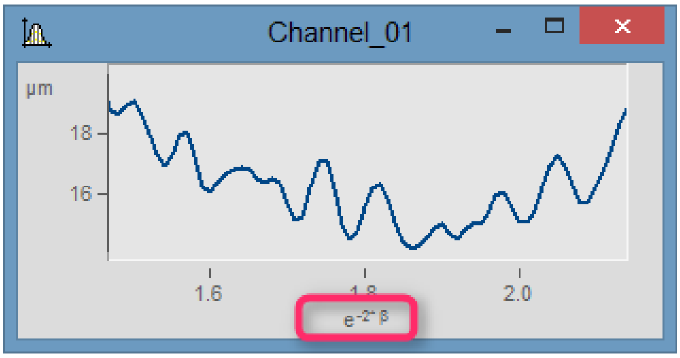
*Greek characters in "Axes\Text": <g*a>^2<g*d>^1/2 <g*ta>*

the result is:



Greek characters as text at the X-axis

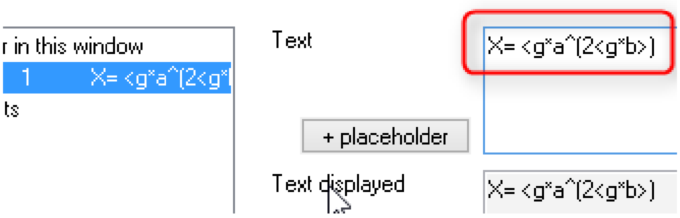
Exponent with multiple characters. From e^(-2*<g*b>) we obtain:



Exponent of placeholder in parentheses: e^(-2<g*b>)*

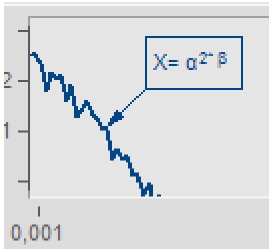
Example markers

with



Greek characters in marker-definition:

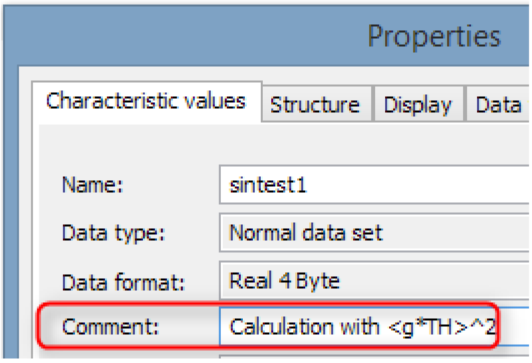
the result is:



Greek characters in markers

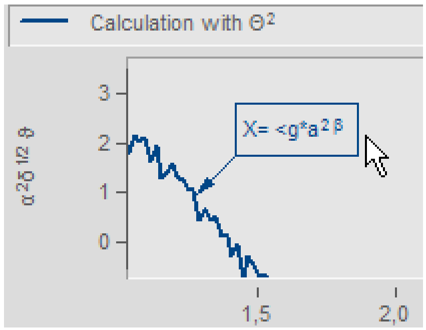
Example comment on variables

with



Greek characters in variable "Properties\Comment"

the result is:



Greek characters in "Axes/Legends"

Orders of magnitude and units

Specified orders of magnitude with units are recognized and displayed appropriately. For example, the unit 'mm' is corrected to the SI unit 'm'. 10.000 'mm' becomes 10 'm', 0.01 'mm' becomes 10 'µm'. The condition is that *"auto"* is set for *"Order of magnitude* 110*"* under *"Scale"*.

3.9.2 Curve window context menu

Function

Click with the right mouse button in the curve window to prompt a context menu, which offers quick access to further functions in the curve window. The context menu depends on the cursor's position and on whether or not you are in Select-mode.

3.9.3 Copy&paste - Transfer configuration

With Copy & Paste, you can transfer once curve window's configuration to another. To do this, copy the configuration of the selected window using ***CTRL-c*** and transfer it to another one using ***CTRL-v***.

With embedded curve windows, it is additionally necessary to hold down the *SHIFT*-key (curve window in the Panel).

3.9.4 Drag&drop, mouse wheel

Moving waveforms

Drag&drop allows the user to shift or copy waveforms in curve windows. To apply this technique within a coordinate system, hold down the CTRL-key. Use drag&drop for the following:

- **Drag** a waveform **from** the **imc FAMOS variable list to** the **curve window**. This allows the waveform to be displayed in the curve window as well as indicated in the list.
- Within a curve window: While the **CTRL-key is pressed**, **all data can be moved to an axis or to a coordinate system**.
  Note: The old behavior without the CTRL-key is made available by means of the Registry entry:
  `[HKEY_CURRENT_USER\Software\imc Measurement and Control\Default\CurveDataManager\Curves];` String value: `"dd63"="1"`
- Transfer **all data** for an axis, a coordinate system or an entire curve window **to another curve window** for display.
- Move **all data** concerning an axis, a coordinate system or a curve window **to** the **imc FAMOS** variable list. If the data do not belong to imc FAMOS (i.e. are from another application, e.g. imc STUDIO), they are copied to imc FAMOS.
- With maximized curve window display 30 (coordinate system = outer frame), Drag&Drop also starts when an axis is moved to the bottom. In that case, the mouse pointer symbol changes.

Displayed region

- Using ***drag&drop*** within a curve window moves the axes.
- By using the ***mouse wheel***, the region around the mouse cursor's current position is increased/reduced. The increments of size change are smaller/larger when pressing the SHIFT-/CTRL-key, respectively.
- If the **mouse wheel** is located over either the **X-** or the **Y-axis**, then only the respective axis is altered.
- Pressing the **CTRL-key** causes the **effect of the mouse wheel** to be **increased**, while pressing the **SHIFT-key** causes it to be **diminished**.

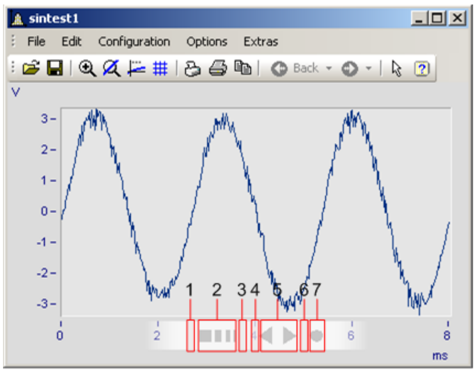
Remarks

- If the mouse is released over a y-axis, the data are displayed on this axis. Release the mouse over a coordinate system, and the data are displayed with a new y-axis for this coordinate system. Otherwise, a new coordinate system is opened.
- When data are moved to the variable list in imc FAMOS, the waveforms are actually copied. In all other cases, the same waveforms are simply relocated.
- The cursor changes its shape during "Drag". If a symbol appears indicating an invalid operation, "Drop" cannot be executed, only Cancel is possible.

3.9.5 Axes navigation bar

For quick navigation through the curve window, each axis has its own navigation bar. The controls appear when you move the mouse cursor square over the axis labeling. The navigation bar offers three basic functions:

- You can magnify or reduce the displayed region, while leaving the value in the middle of the x- or y-axis, or z-axis remains unchanged. This function is provided by the button denoted as "2" in the picture. Alternatively, you can change the axes' range using the mouse wheel.
- You can shift the region displayed to the right or the left. This function is provided by the button denoted as "5" in the picture.
- Any changes in the magnification, moving or zooming can be reversed and thus return to their original appearance.



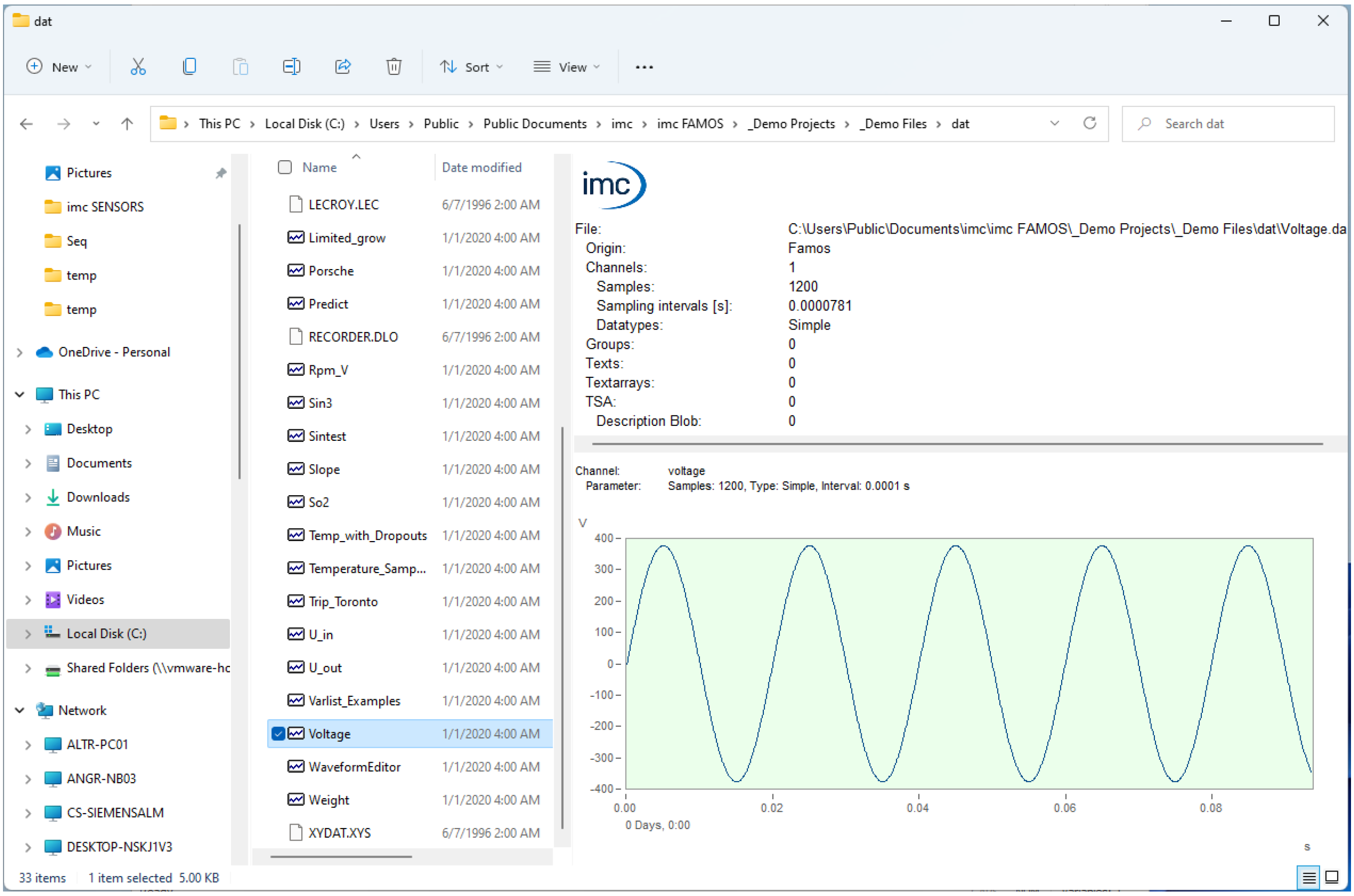
Dragging		Description
1 <- [2] 3	Dragging from 2 to 1	Magnification
1 [2] -> 3	Dragging from 2 to 3	Shrinking
4 <- [5] 6	Dragging from 5 to 4	Move left
4 [5] -> 6	Dragging from 5 to 6	Move right
[7]	Click on 7	Rezoom the X-axis. Displays all data

Use of the keyboard arrow keys

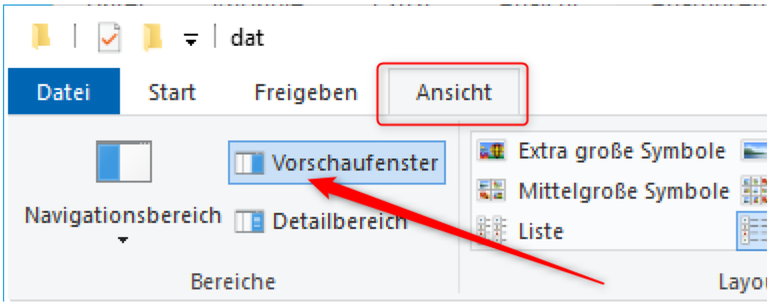
While holding down the left mouse button with the pointer in the Navigation pane, you can also move the region by using the keyboards arrow keys.

3.10 Preview in Windows Explorer

imc FAMOS files can be displayed using the Microsoft Windows Explorer's preview function.



Activating the Preview window



Activating the Preview window in the Windows Explorer's View menu

The following properties are displayed:

Upper view region

- A roundup of the data regarding the channel count, texts, text arrays, log channels, bus channel descriptions and groups.
- For channels, the lowest and the highest channel counts, the sample interval and the data types present are additionally listed.

Lower view region

- Info:
  Output of the displayed file set's name
  Roundup of channel parameters, sample count, interval, data type
  if applicable:,
    additional channel properties
    group association
- Curve window, text contents, array contents
  Only **one** data set is always displayed. When multiple files are selected, only the first is displayed.
  The curve window comes with a limited scope of the imc curve window's functions, including the ability to zoom in on a specific region.

Scroll bar

When the file contains multiple channels, a scroll bar appears, by means of which it is possible to navigate through the various channels.

4 Report Generator

4.1 Introduction

In many cases, the standard printout, which simply reproduces a curve window on paper, is inadequate for the user's needs. In imc FAMOS the **Report Generator** is available for personally designing a presentable document of one or more pages. Graphics and text can be combined and arranged in any order, allowing documentation to be adapted to any form of presentation desired, including such features as company logos. Additional graphics, created in a Windows graphics program (e.g. Paint) can be inserted using the Clipboard.

The general procedure towards this end involves defining an output mask or prototype, in the framework of which the arrangement and properties of the different visual elements can be specified. The elements or objects to choose from consist of variable objects, such as curves, texts and tables, as well as fixed objects like pictures. When required, a mask can be loaded, furnished with the desired curves, texts or tabular data and then printed out.

Furnishing a predefined mask is accomplished either manually via drag & drop from any imc-application as the source (specifically imc FAMOS, the imc-curve window), or by means of a function catalog (Report Generator kit), a imc FAMOS sequence.

Data transfer of texts and graphics between different Windows programs is possible by using the usual copy and paste with the Windows Clipboard. Company logos created using a Windows graphics program can be simply pasted into a report. Conversely, you can import entire reports or parts thereof, generated by the Report Generator, into any other Windows application.

Additionally, the Report Generator can act as an OLE server (OLE = Object Linking and Embedding). This way, it can admit objects, which it manages and embeds with reference to the program of origin, and which it therefore can subsequently edit.

The Report Generator is equipped with a multi-document user interface, to allow concurrent editing of several reports. The conventional editing operations, such as multiple selection, copying, pasting, moving, setting margins etc. are available. You can subject the properties of objects, such as colors, fonts, etc. to a variety of alterations, either individually of globally. An Undo-function, infinitesimally incremented zooms, a freely definable grid with snap-function and a context-sensitive on-line help routine complete the user assistance offered, thus enabling the easy preparation of complex report documents.

The availability of a mouse or similar pointing device is a prerequisite for operating the Report Generator. A screen resolution of 800x600 pixels is recommended.

4.2 Calling the Report Generator

There are different methods of calling the Report Generator:

- Selecting the soft key in the symbol bar with the icon for the Report Generator.
- Direct call of the executable file "Report.exe" via the program- or data manager.
- Selecting the menu option "Extra / Report Generator" imc FAMOS
- Selecting the menu option "File / Report Generator" in the imc curve window
- Using commands belonging to the Report Generator Kit
- By double-clicking on a file with the extension ".DRB" in the Explorer or via the menu option "Open" in the Explorer's document context menu .

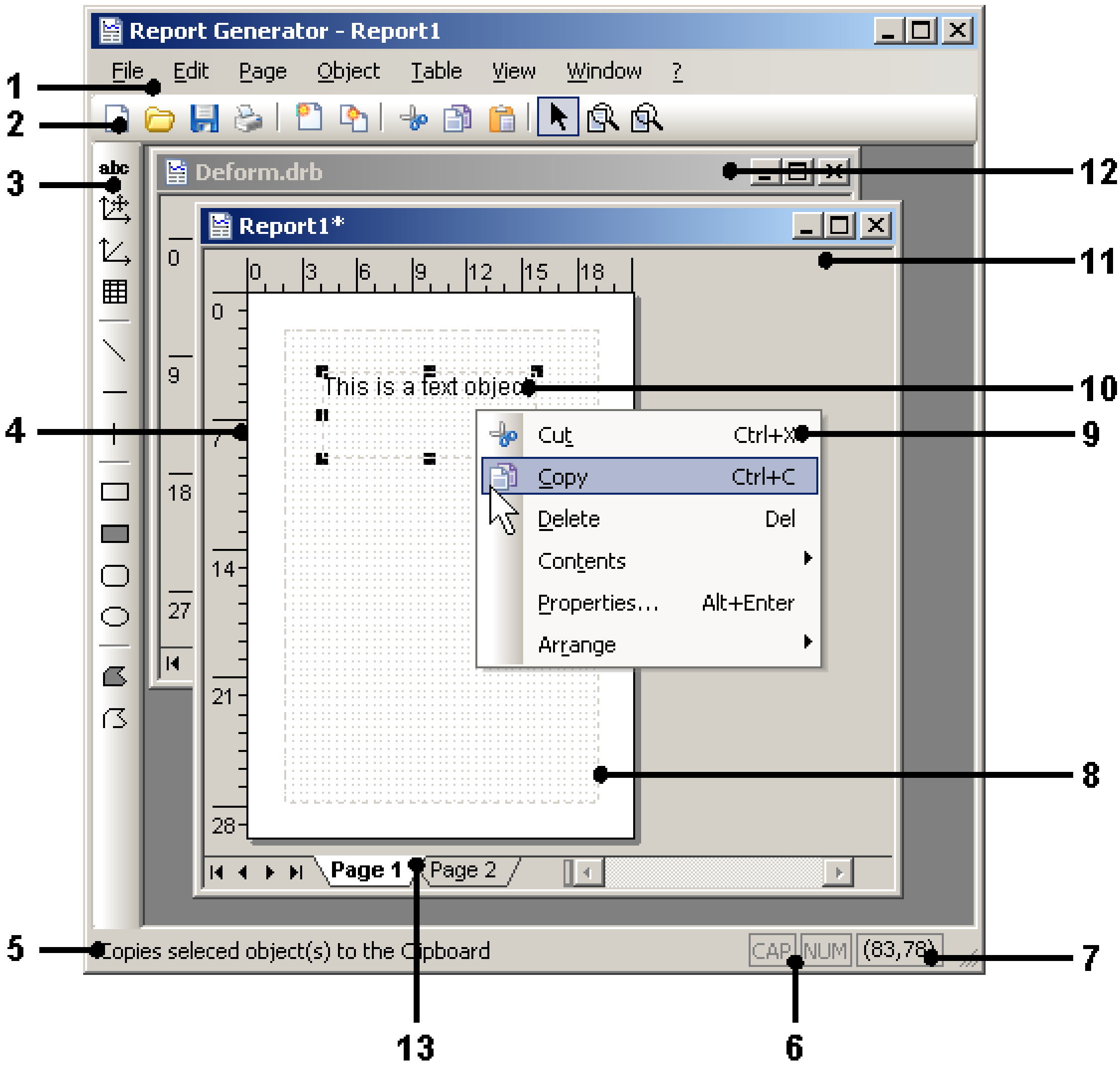
Remarks

- The first time the Report Generator is called, the Windows standard printer is accessed and registered as a presetting valid for the Report Generator. If no standard printer is defined for the system, an error message appears. In this case you must use the option "Printer setup" in the menu "Files". To install a printer and assign a port, use the Windows Control Panel.
- The Report Generator can be called only once per Windows session, calling the Report Generator. again only fetches the already opened window into the foreground.

4.3 The Elements of the Main Window

When the Report Generator is started, the working window will appear at the location it occupied during the last session. An empty document is created and displayed in full-screen mode.

To better illustrate the various elements of the working surface, a hypothetical configuration, one which could be achieved in the course of a session, is depicted below:



Many of the options offered in the **main menu (1)** are also accessible from the two toolbars. In the **horizontal toolbar (2)** there are screen buttons (soft keys) for loading, saving, editing, grabbing and zooming.

In the **toolbar on the left margin (3)** different object types are indicated, which otherwise could be accessed via the menu "Object".

The **status bar (5)** contains status information (e.g., a brief description of the currently selected menu option), information regarding the **keyboard status (6)**, and a display of the **current cursor position (7)**, if the cursor is located within the bounds of the Report window.

Inside the main window are situated the actual working windows, containing the currently developing **documents (11,12)**. A document can contain one or more pages. Click on the tab for the **pages (13)** to select a page. The **title bar** shows the name of a report. Upon creation of a new document, it is designated with a default name ("Report" + serial number), which naturally can be changed when the document is stored. An asterisk following the name indicates that the document has been changed since the last save-command. All menu options and commands affect the **active document (11)**, which can be identified by the presence of color in the title bar.

The document window is comprised of a **ruler (4)** and the actual **worksheet (8)**, upon which **objects for the print layout (10)** are to be arranged. The set margin is always displayed, the display of the grid is optional.

The proportions of the worksheet space at your disposal is adapted to the current setting for the paper format. Units in the x- and y-directions appear approximately equally large on the monitor. As a consequence, not the entire available screen area is used in full screen mode.

Right-clicking the mouse inside the worksheet space calls the **context menu (9)**. Its content depends on the current position of the mouse. Clicking on an object yields a menu for the processing of that object; clicking on unoccupied space makes an object-independent menu containing editing commands appear.

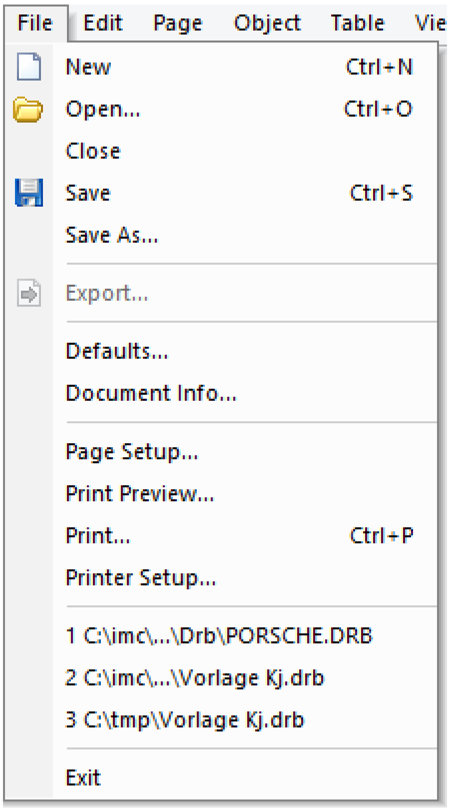
4.4 Overview of the Menus and Toolbars

In the following, the various menu items and their corresponding screen buttons are briefly described. In subsequent chapters the workings of the menu commands will be treated in greater detail, in connection with the explanations of operating procedures.

In case of uncertainty about the meaning of particular menu items, a brief explanation can be summoned into the status bar by simply selecting the item in question. Pressing the F1-button accesses the on-line assistance's more explicit explanation.

So-called "tool tips", describing the elements of the toolbar, are also available. If you move the mouse pointer to a screen button, a small window containing a brief description of the button's workings will appear after a short delay.

4.4.1 File Menu



This menu item includes the commands for loading, saving and printing documents, setting margins, specifying printers, making application-wide settings; as well as a list of the most recently processed reports.

New

A new report is created. At first, it is designated by a default title ("Report" + serial number). When saving the document, its name can be freely specified.

Open

This command allows you to place an existing report in a new window. The standard dialog for selecting a file appears. The presetting governing which is the suggested (default) directory can be specified via the menu item "*Presettings*" in the same menu.

The report generator remembers the documents you have been working on most recently. You can easily open such a document by clicking on the appropriate name in the lower part of the "*File*" menu.

Close

The command "Close" closes the active document. If the appertaining document was displayed in more than one window, this command shuts all windows which contain the active document. If you have made changes to the document since the last saving operation, the Report Generator will ask you whether you would like to save the changes, before it proceeds to perform the closing. Closing a document without previously saving causes new changes to be lost.

Save

This command allows you to save the active document under the current path. The first time the command is applied to a particular document, it executes the procedure for the "Save as" command, which prompts the user to specify via a dialog the desired path.

Save As

This command lets you save a document to a file whose directory path you must supply yourself. The command can also be used to change the name or file directory of a document.

Export

This command allows you to export the active document, specified by its filename and path location, into a graphics file. A variety of standard graphics formats are available.

Presettings

This command calls a dialog, in which you can specify the default directory for the filing of print layouts. Additionally, you can determine whether a backup copy should be created, before data are written over. The presettings dialogs also contains additional index cards for display and export options.

Document Info

A dialog appears, in which additional information to be stored along with the document can be specified.

Page Setup

A dialog is called, in which the basic appearance of a document, in terms of the page size (= paper size for printout), orientation ("portrait" or "landscape") and borders, can be specified.

Print Preview

Shows the appearance of the printed document in advance. You can zoom onto details and start the printing procedure, if the preview meets your satisfaction.

Printer Setup

This command lets you establish what printer to use. The standard Windows dialog for selecting the printer appears. Depending on the printer type, additional, more specific options for printing may be made available. Settings pertaining to the page format and orientation can also be made via the menu item "File / Presettings".

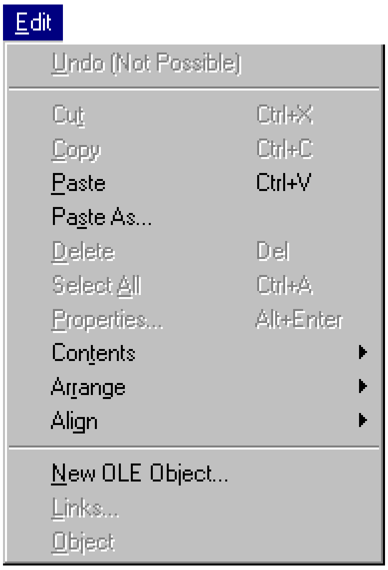
 **Print**

This command commences printing of the active document, using the printer specified in the setup.

Exit

Closes the Report Generator. If open documents have not yet been saved, the warning prompt appears, inquiring whether to save the documents after all, whether they may be discarded, or whether to cancel the "Exit" command.

4.4.2 Edit Menu



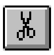
This contains commands for editing both the reports on the whole, and the individual objects of which the reports are comprised.

Undo

This command revokes certain operations previously performed on your report, including Move, Paste, the creation of new objects, changing of object size, etc.

The actual full command name is dependent on the particular, most recent command executed, for example "Undo (Move)". If the most recently executed command is not reversible, the current command name will be "Undo (Not Possible)".

Only up to the three last operations can be undone.

 **Cut**

Selected objects are cut out and transferred to the Clipboard. This command is only accessible if at least one object is currently selected.

 **Copy**

Selected objects are copied and the duplicate is transferred to the Clipboard. This command is only accessible if at least one object is currently selected..

 **Paste**

A new document object is created and is defined as the current contents of the Clipboard. The type to which the new object belongs depends on the format of the Clipboard contents.

Hint: This command always creates an entirely new object. To insert the contents of the Clipboard into an already existing object, use the menu item "Edit / Contents / Paste".

Paste As

A new document object is created and defined as the current contents of the Clipboard. In a dialog, the new object's type can be specified, subject to the exigencies of the particular contents of the Clipboard.

Hint: This command always creates an entirely new object. To insert the contents of the Clipboard into an already existing object, use the menu item "Edit / Contents / Paste".

Delete

Objects selected are erased.

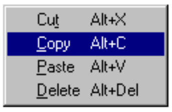
Select All

Selects all objects in the active document.

Properties

This calls a dialog for specifying properties of document objects selected. If several objects are selected, they must all be of the same type, otherwise this menu item is blocked (disabled). The structure of the dialog depends on the particular type to which the selected objects belong, and will therefore be discussed in connection with the object types.

Content



The commands in this item's submenu are only accessible if a text- or table object is selected. The commands affect the content of such objects, i.e. the text.

Content: Cut

The content (text) of a selected text- or table object is cut out and transferred to the Clipboard. The object itself remains as an entity in the document.

Hint: To cut out the entire object as a unit, use the menu item "*Edit / Cut*".

Content: Copy

The content (text) of a selected text- or table object is copied and the duplicate is transferred to the Clipboard.

Hint: To copy the entire object as a unit, use the menu item "*Edit / Copy*".

Content: Paste

This command is only available for text- and table objects. Furthermore, the current Clipboard must also contain text. The Clipboard content is written to the document object selected.

Hint: To create an entirely new text- or table object, which is to be defined as the current content of the Clipboard, use the command "*Edit / Paste*" or "*Edit / Paste As..*".

Content: Delete

This command is only available for text- and table objects The content (text) of a selected text- or table object is erased. The object itself remains as an entity in the document.

Hint: To erase the entire object as a unit, use the menu item "*Edit / Delete".*

Arrange

The commands of this item's submenu control the order in which the objects are drawn and thus regulates the overlapping and partial obscuring of individual objects by others.

Arrange: Foreground

The object selected is fetched into the foreground. It is located above all other objects and can not be partially covered by any other object.

Arrange: Background

The object selected is relegated to the background. It is located beneath all other objects and can not partially cover any other object.

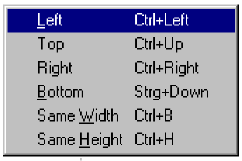
Arrange: Move to Front

The object selected is moved by one place up the hierarchy on the document; it can now partially cover the previously next-highest object.

Arrange: Move to Back

The object selected is moved by one place down the hierarchy on the document; it can now be partially covered by the previously next-lowest object.

Align



The commands in this item's submenu allow the alignment, in terms of position or size of objects, in reference to another object. The commands are only accessible if at least two objects are currently selected

Align: Left, Top, Right, Bottom

All objects selected are shifted in such a way that those of their edges, which correspond to the submenu item name, are aligned with the same edge of the reference object.

Align: Same Width

All objects selected are made to take on the width of the reference object.

Align: Same Height

All objects selected are made to take on the height of the reference object.

New OLE-Object

A new OLE-object is defined and either embedded or linked.

Links

The list with the current OLE-objects can be edited

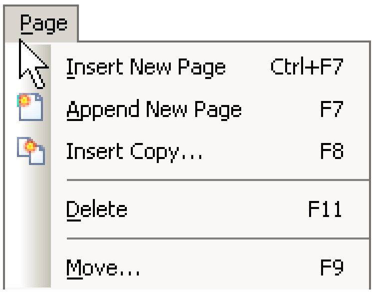
Object

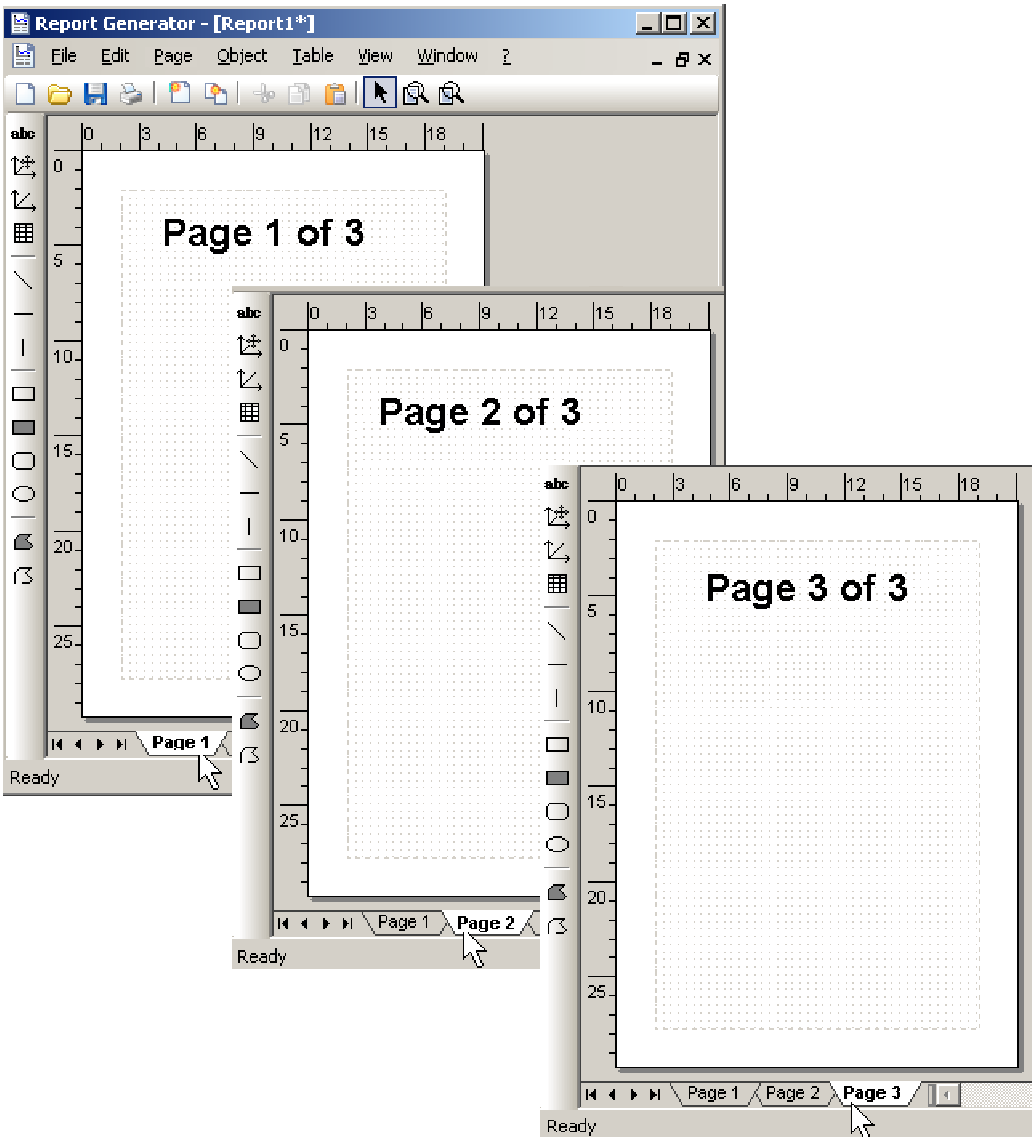
If an OLE-object is selected, a submenu providing commands for the editing and conversion of the. object can be found here. The particular menu text (menu-item name) and list of commands is dependent on the object-type.

Example

With an embedded bitmap, which was created using Microsoft Paint, the menu item name is "Bitmap Object" and the commands "Convert" and "Edit" are available.

4.4.3 Page Menu





Pages can be selected by tabs

Insert New Page

Insert a new page before the currently selected page. The new page receives the number of the previous page. The numbers of the subsequent pages are increased by one.

Example:

There are pages 1, 2 and 3. Page 2 is selected.

-> Insert New Page

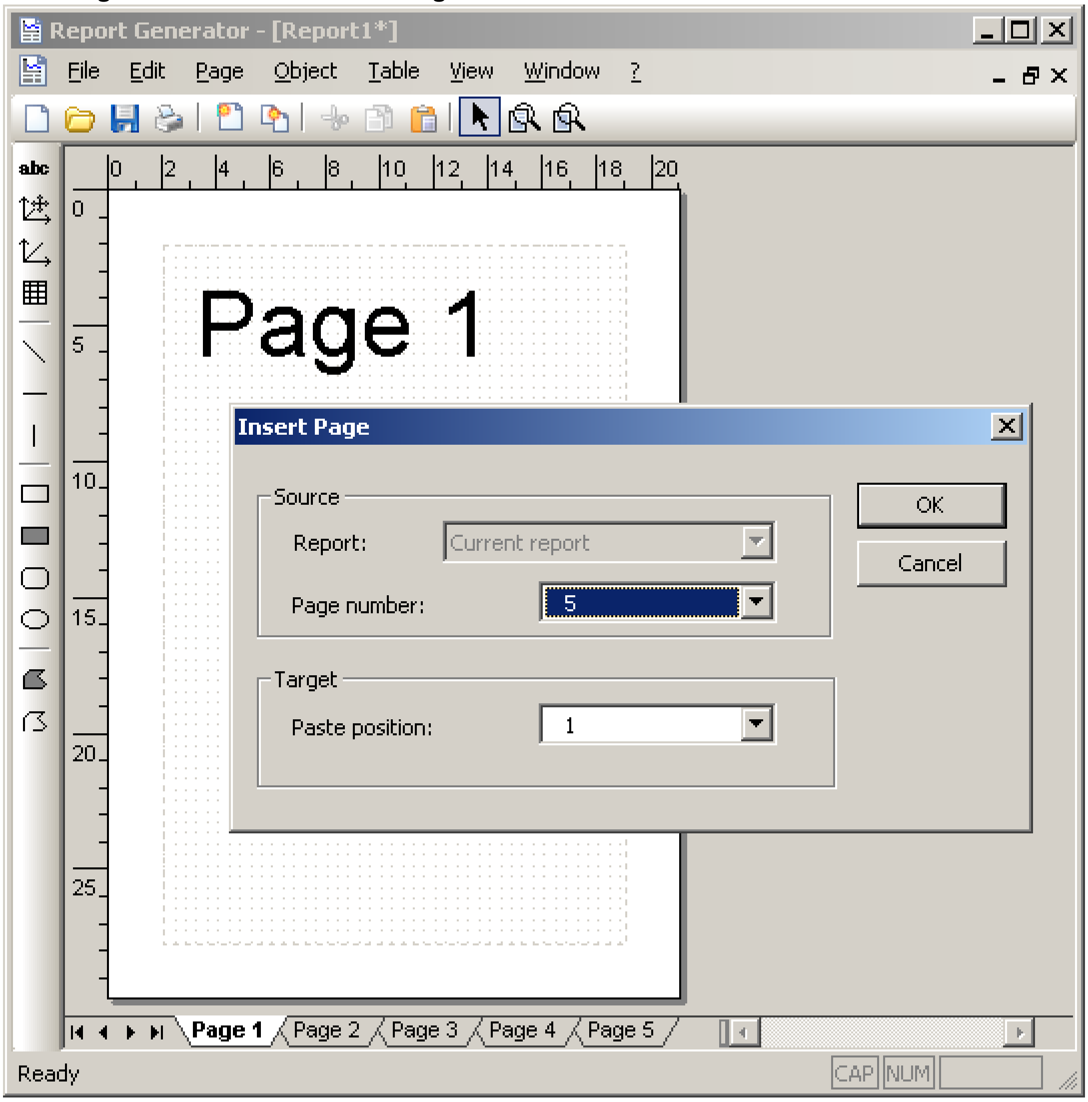
The new page receives the number 2. The previous page 2 becomes page 3. The page previously designated page 3 becomes page 4.

Append New Page

Appends a new page after the last page, independently of which page is currently selected. The new page receives the next free number.

Insert Copy

Selecting this command calls a dialog such as shown below:



Eaxmple: Insert Page

In this dialog, select the page to be copied ("Page number"). Then select the position **in front of which** insert the copy ("Paste position"). For "Paste position", you can also select "Append", which causes the copy to be appended **after the last page**.

In the example above, a copy of page 5 was added before the previous page 1, and was given the number 1. The previous pages 1 - 5 would receive the numbers 2 - 6.

Delete

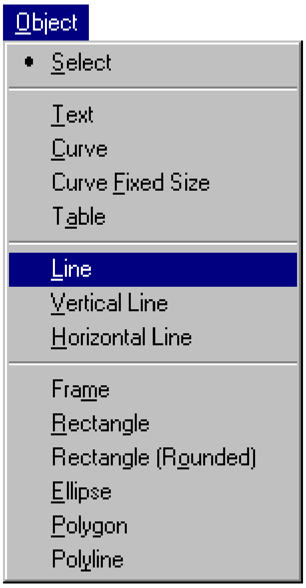
Deletes the currently selected page without prompting for confirmation.

Move

There are two ways of moving a page:

- if you use the menu command, a dialog appears which lets you select the new position for the selected page numerically ("Source", "Page number", "Paste position").
- using Drag&Drop from the tab bearing the page number. Move the tab to the desired position.

4.4.4 Object Menu



This menu displays a list of all available object types. If you wish to create a new object, specify its type via this menu and then its position and size using the mouse. This procedure is explained in greater detail in the chapter describing the particular object type involved. The object-type can also be specified by means of screen buttons in the tool bar.

As with the selection tools and the zooming tools, this group of menu items have the characteristic of being mutually exclusive; only one of them can be active at any one time. The active item or tool determines the effect of subsequent mouse operations.

Select

The selection tool is activated. That done, you can use the mouse to specify an object or group of objects, to which subsequent commands shall apply.

Text

The tool for creating text-objects is activated.

Curve

Curve Fixed Size

The tool for creating curve-objects is activated. The curve-objects are furnished with the graphical content of imc curve windows.

"Curve Fixed Size" makes the size of a curve-object subject to the pertinent setting of the curve window (menu item: "Opt. / Clipboard Settings..", otherwise, the user can arbitrarily determine the size.

Table

The tool for creating tabular objects is activated. Tables are especially well adapted to the display of numerical sequences

Line

Vertical Line

Horizontal Line

The tool for creating line-objects is activated.

Frame

The tool for creating rectangular frames is activated.

Rectangle

The tool for creating filled rectangles is activated.

Rectangle (rounded)

The tool for creating filled rectangles with rounded corners is activated.

Ellipse

The tool for creating ellipses and circles is activated.

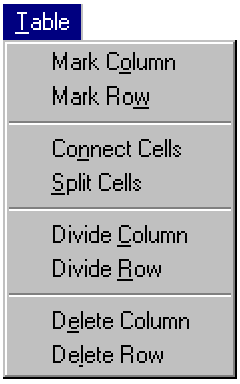
Polygon

The tool for creating polygons is activated.

Polyline

The tool for creating polylines is activated. In contrast to the case of the polygon, the polyline does not enclose a space and hence does not entail a filling procedure.

4.4.5 Table Menu



Tabular objects are the most versatile document objects in terms of the properties they can bear and the manipulations which they can be subjected to. Commands tailored to tables are assembled under this menu. The commands are only accessible if at least one tabular object is selected in the active document. Most of the commands are also available via the table-context-menu.

Each of these commands can affect either the whole object, if it is currently selected as a unit, or only currently highlighted (marked) component cells of the table.

The use and effects of the individual tools is explained in greater detail in connection with the forthcoming description of tabular objects (see Section , "*Tables* 324").

Mark Row/ Column

All rows / columns, of which any one cell is marked, are marked across the line.

Connect Cells

If the currently marked cells form a contiguous rectangular region, the region can be declared a new, combined cell.

Split Cells

A combined cell which was previously connected using the above command is dissolved into its components.

Divide Row/ Column

Entirely marked rows or columns are divided. The number of rows or columns displayed increases accordingly.

Delete Row / Column

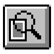
Entirely marked rows or columns are erased from the table. The number of rows or columns decreases accordingly.

4.4.6 View Menu

This menu contains the commands for zooming, setting a grid and specifying other display-options.

 **Zoom**

The zooming tool is activated. By pressing the left mouse button while the mouse pointer is situated at one corner of a region you would like to see enlarged, then moving the mouse pointer, while keeping the button held down, to the diagonally opposite corner and then releasing it, you will call a close-up of the rectangular region thus framed. The zooming procedure can be interrupted either by pressing the right mouse button or <Esc>.

 **Unzoom**

A previous zooming operation is reversed. The entire document is displayed once more.

Grid Properties

This command calls a dialog, with which you can specify such properties of the active document's grid as its color or size.

Grid On

If this option is activated, commands which govern document objects' positions (Move, Change Size, Paste..) automatically align the objects to the points of the grid (snap function is applied). The edges of the objects are placed on the nearest grid points.

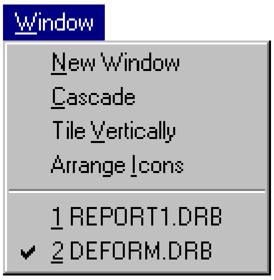
Snap to Grid

All objects already present in the active document are repositioned to have grid-based boundaries.

Options

This command calls a dialog, which allows you to determine whether to have the tool bars and status bar displayed. The dialog also contains the controls for making some global presettings concerning printout objects.

4.4.7 Window Menu



This menu contains commands for arranging the windows, as well as a list of the opened windows, which enables you to quickly change the currently active window.

New Window

A new window is opened on the currently active document. This way it is possible, for example, to display the document in two differently zoomed views.

Cascade

The document's already opened windows are arranged in offset stack (cascade) pattern, to make all title bars visible.

Tile vertically

The document's opened windows are arrayed side by side on the page (they are separated from each other by vertical dividers).

Arrange icons

The icons indicating the document windows in "Minimized"-mode are arranged on the bottom edge of the main window.

Window List

This lower region of the menu contains a list of all documents currently being edited. Select a document's listing from the menu to make the document active.

Hint: You can "thumb through" the items of the list via the key-combination Ctrl+F6.

4.4.8 Help Menu

This menu contains items concerned with the calling of on-line help, as well as general information about the installed version of the Report Generator.

Help Topics F1

Calls a roster of help topics available.

Search

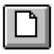
Opens a dialog, in which you can specify a topic or term to be searched for in the help-file.

About...

Opens a dialog with an indication of the installed program version.

4.5 Creating, Loading and Storing Report Files

4.5.1 Creating a New Report



To create a new Report, select the menu item "File / New" or the corresponding soft key (screen button) in the toolbar.

A new document window is opened, which contains an empty worksheet. The size and orientation of the new document window is governed by the valid settings in the dialog "File / Page Setup".The Report is at first designated by a default title ("Report" + serial number). The title can be arbitrarily declared at the first saving operation.

Hint: Please note that when working in "Maximize"-display mode, documents which you had been editing in the current session remain open, but their display is "buried" under the active document. Thus, it can occur that you unknowingly keep numerous documents open, and that the working speed of the computer and the demands on storage space is adversely affected. Therefore, document windows which are no longer required should be closed. A list of currently open document windows is present in the "Window" pop-down menu.

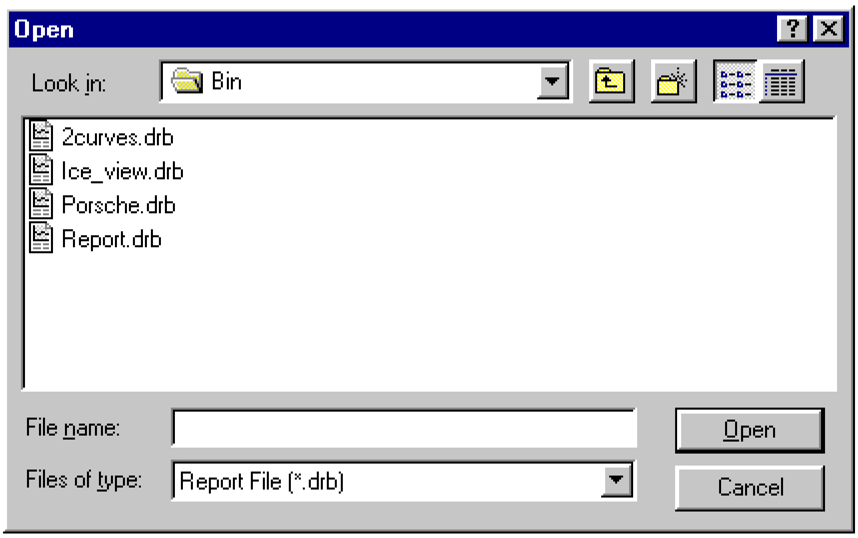
4.5.2 Loading Reports

There are various ways to load a previously created report into the active window.

1. "File / Open" Dialog

Select the menu option "File / Open", or the corresponding soft key in the toolbar.

The Windows "File Open" dialog appears.



The default directory path offered at the session's first loading operation can be set via the menu item "File / Presettings..". For every other loading operation, the dialog will refer to the most recent directory path.

If you enter a file name without specifying an extension, the extension ".DRB" is appended to your entry. To load a file without any extension, type in a period at the end of the name.

2. Selecting from the List of Most Recently Edited Reports

At the bottom of the "File" pop-down menu there is a list of the last few reports processed. If the desired file is located there, it can be accessed by selecting its name from the list.

3. Selecting from the Windows-Program Manager

Drag & drop the desired DRB-file from the Windows-Program Manager (Windows 3.1: File Manager, Windows 95/NT: Explorer) onto the open Report Generator.

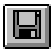
In Windows 95/NT you can also simply double-click on a listing (or select "Open" from the context menu). The Report Generator is then switched on unless it is on already.

Regardless of the method you use, a successful load will open a new document window and the loaded Report will be displayed in it. The report can then be edited or printed out.

Remarks

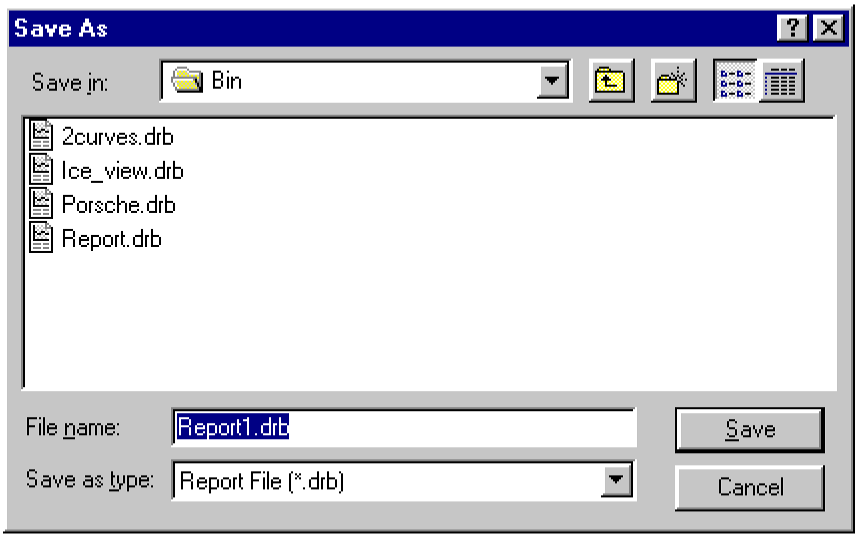
- If a file you intend to load is already open, and changes have been made to it during the current session, a warning dialog will appear and prompt you to confirm that changes should be discarded, before the reloading can be executed.
- Please note that when working in "Maximize"-display mode, documents which you had been editing in the current session remain open, but their display is "buried" under the active document. Thus, it can occur that you unknowingly keep numerous documents open, and that the working speed of the computer and the demands on storage space is adversely affected. Therefore, document windows which are no longer required should be closed. A list of currently open document windows is present in the "Window" pop-down menu.

4.5.3 Saving Reports to a File



To store the report in the active document window as a file, select menu item "File / Save" or "File / Save As..", or use the cor-responding button in the toolbar.

If you use the menu item "File / Save As..", or if a report is being saved for the first time, a standard Windows dialog appears, in which to specify the file's name and directory.



The default directory path offered at the session's first loading operation can be set via the menu item "File / Presettings..". For every other loading operation the dialog will refer to the most recent directory path.

If you enter a file name without specifying an extension, the extension ".DRB" is appended to your entry. To load a file without any extension, type in a period at the end of the name.

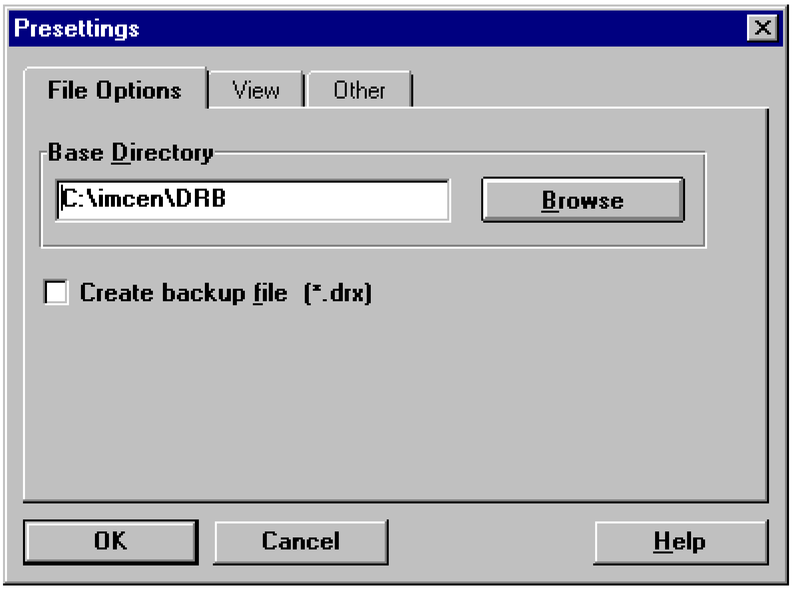
If the name you specify already belongs to an existing file, a warning dialog will appear and prompt you to confirm that the old file should be overwritten, before the save-command will be executed.

Hint: The dialog belonging to the menu item "Files / Presettings.." has a setting which offers automatic creation of **backup files,** for situations where new information is stored to old files.

4.5.4 File Presettings

Here you can specify the directory in which to keep the Clipboard for the storage of print layouts. Further, you can determine whether backup files should be created when overwriting existing files.

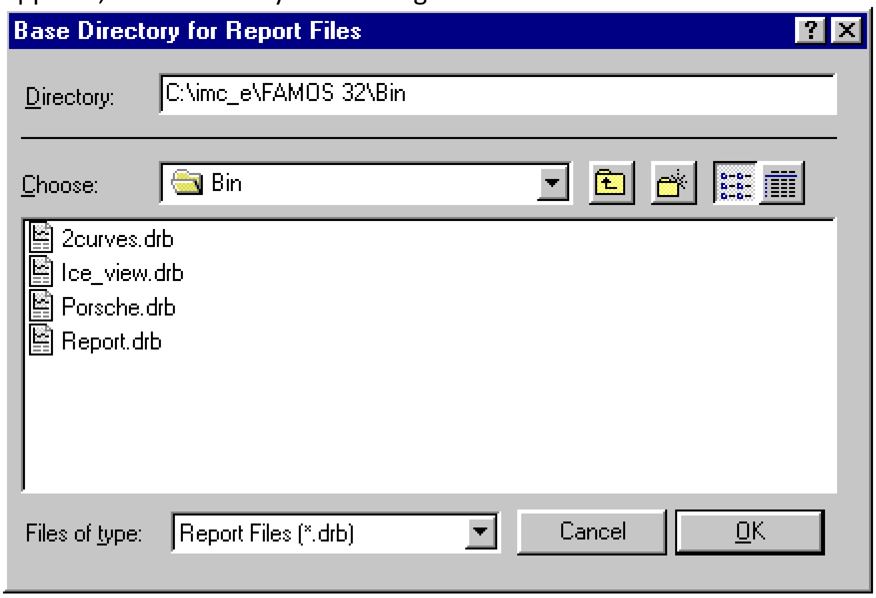
Select menu item "File / Presettings...". The following dialog then appears:



Base Directory

This lets you specify which directory the program will offer as the suggested destination or source of files when saving or storing.

You can enter the desired directory in the text box or select the soft key "Browse". In the latter case, a dialog appears, which allows you to change directories.



If this dialog is closed with <OK>, the directory selected will automatically be entered into the text box.

If you enter a valid directory in the text box, you can close this dialog with <OK>. Otherwise you can select <Cancel> to discard changes made to the dialog.

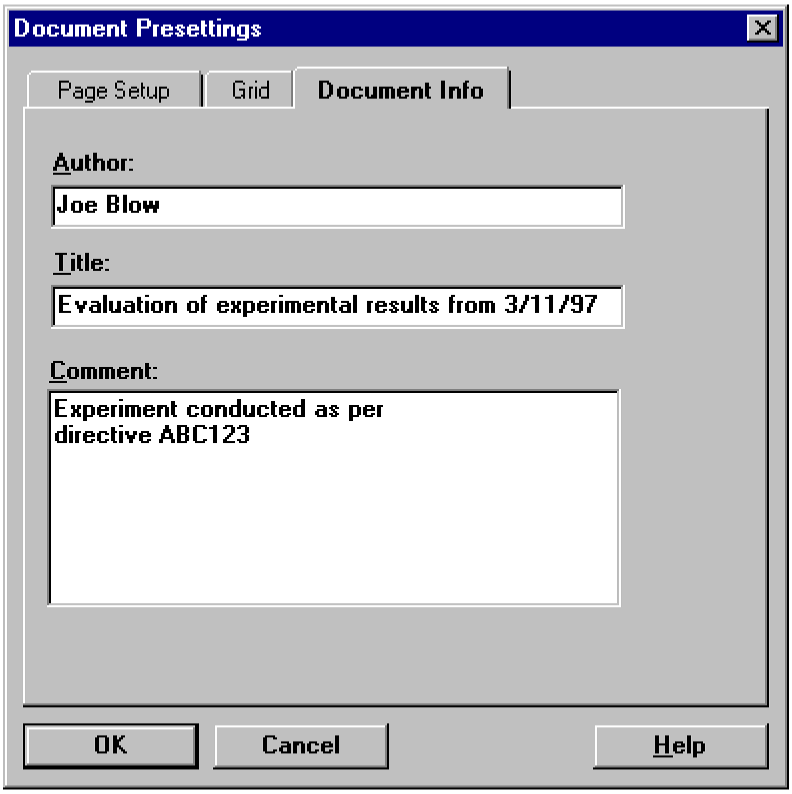
Create Backup File

If this setting is active, a backup file is created before a file is overwritten. The new, backup file receives the same name and directory as the old version but is denoted by its extension ".drx". A file bearing such a name will be overwritten directly.

4.5.5 Document Info

Additional information about a document can be stored together with the actual graphic printing layout. Examples could be the author, circumstances surrounding the report's production, name of a imc FAMOS sequence used to update the report, etc., in short, anything that could be helpful to know for a later user.

To enter or view such information, select the menu item "File / Document Info...". The following dialog appears:



You can enter an arbitrary text into each of the three input boxes.

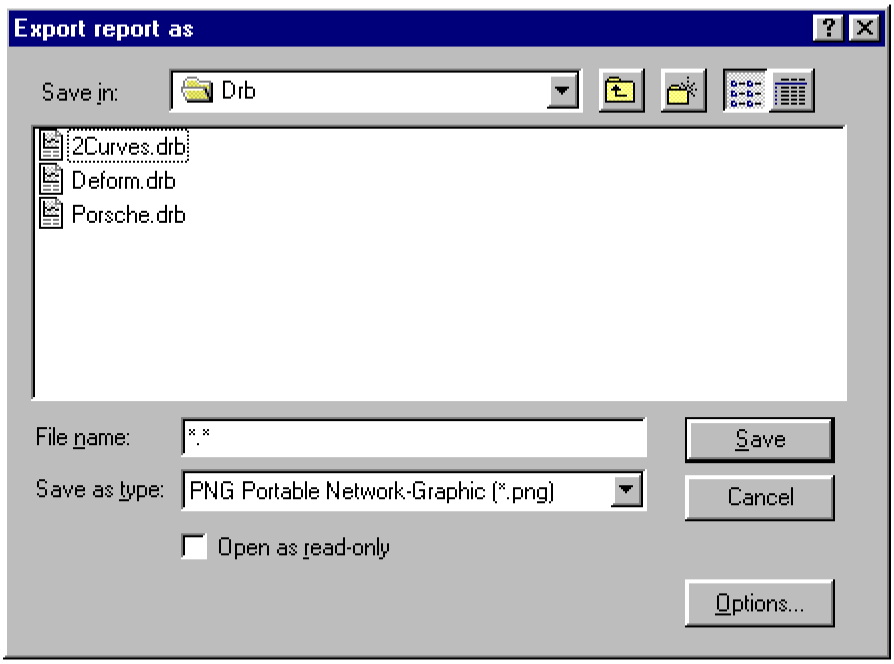
4.5.6 Exporting Reports

It is also possible to export reports to a graphics file. A variety of standard Windows graphics formats are available for the purpose of importing your reports to other Windows programs or to make your reports accessible to other users who don't have the imc Report Generator with which to display or print out the files.

Note that the Report Generator cannot, in turn, open such graphics files! Therefore, always use the command "*Save*" instead of "*Export*" to preserve your reports for subsequent use with the imc Report Generator.

To export the report in the active document window, select the menu item "*File: Export*".

The standard Windows dialog for specifying the filename and graphics format then appears.



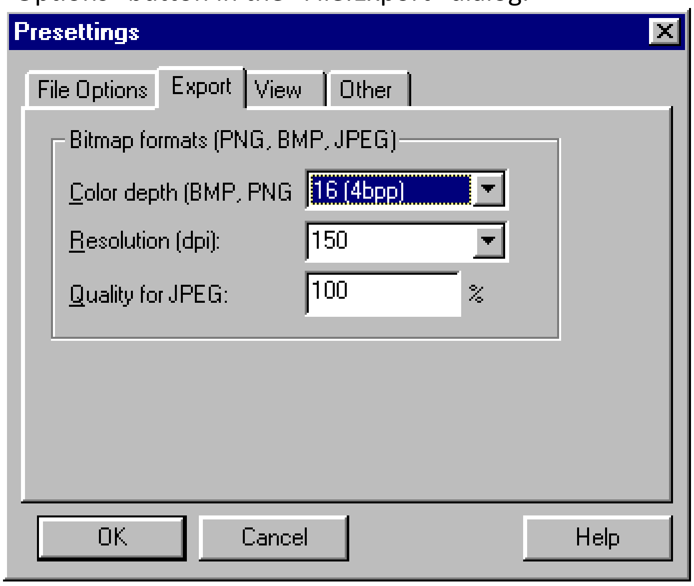
Here you can specify and the filename and the desired format in the customary manner. The "*Options*" button opens a dialog with presettings for the export of graphics, as illustrated in the next section. 293

As graphic formats EMF, WMF, BMP, PNG, JPEG and PDF are available. A description of the formats can be found in the user manual.

4.5.7 Graphics Export Presettings

Certain settings can be made for graphics export which influence the quality (and thus the resulting file size).

The corresponding dialog is accessed via the menu item "File: Presettings", on the index card "Export" or via the "Options" button in the "File:Export" dialog.



Color depth

Enter the desired color depth for BMP- and PNG files. The higher this setting is, the more memory needed to store a color value and thus the greater the file size. The figure above shows as an example the setting "16 (4bpp)", which means 16 colors (4 bits per pixel). But if the setting "16 Mio colors (24bpp)" is set, the resulting (uncompressed) file size increases by a factor of 6.

With a color depth of 16 (the basic 16 Windows colors) or 256 colors (a so-called half-tone color palette), the colors actually appearing in the report are replaced by the closest choice in the color table. Thus, it depends on the particular report whether the corresponding compressed color depth returns useful results. If, for instance, the report contains a color map, only true color display (16Mio colors) will generally provide good export graphics; otherwise 256 or even 16 colors are often enough.

JPEG-files are always created having 16Mio colors.

Resolution

Here, the desired resolution for bitmap files is to be entered in terms of "dpi" ("Dots per inch", where dots are equivalent to pixels). Higher resolution means better image quality, but of course also correspondingly large file size. The list box offers typical printer resolutions (150, 300, 600 dpi), but you can enter other values, as well. Note that doubling the resolution results in a quadrupling of the file size. If the graphic is to be printed out later, we recommend choosing a typical printer resolution (e.g. 300 dpi). However, if the graphic is only to be viewed on the screen, a lesser resolution is sufficient; a typical monitor resolution is 96dpi.

Quality

This control concerns the compression of JPEG-files. Higher quality (maximum: 100%) means lower compression and correspondingly larger file size. If too little quality is set , however, any lines can appear "washed out", which is of course a bad thing for lab reports displaying curves, as they typically do. Therefore, select an appropriate quality level (80% is a good starting value) or use PNG-format, if possible.

4.5.8 Closing a Report Window

Although the Report Generator supports the concurrent editing of several documents, it is advisable not to keep too many open at any one time, but rather to close those which aren't required, in order to conserve resources

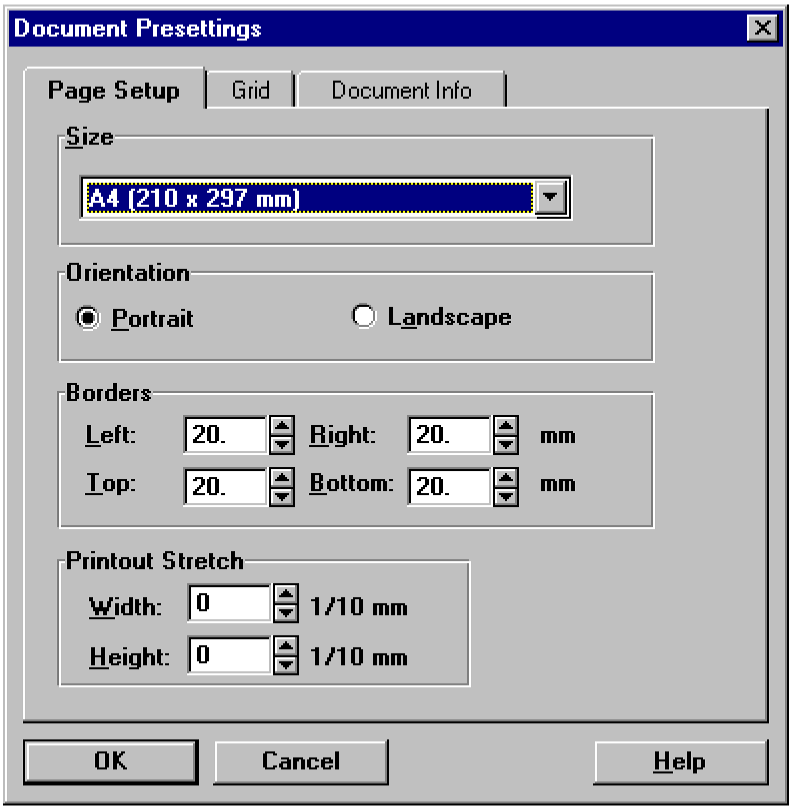
Select the menu item "File / Close" towards this end, or, alternatively, the command "Close" (key-combination Ctrl + F4) in the system menu of the document window.

If a document was displayed in more than one window, this command closes all windows which contain the active document. If you have made changes to the document since the last saving operation, the Report Generator will ask you whether you would like to save the changes, before it proceeds to perform the closing. Closing a document without previously saving causes new changes to be lost.

4.6 Page Setup, Printer Setup, Print

4.6.1 Page Setup

To determine the page size, margins and orientation ("portrait" or "landscape") for the active report, select the menu item "File / Page Setup..". The following dialog then appears:



Size

Specify the paper size you intend to use for the printout in this list box. The format choices offered are determined by the printer which is indicated in the setup.

Orientation

Choose a format for printing, using this item.
Hint: Paper size and orientation can optionally be specified in the dialog under "File / Printer Setup...".

Borders

Here you can specify borders near the edges of the page, beyond which no part of an object's print layout can extend.
The border's absolute distance to the paper's edge is the necessary input. A border of distance 0 from the edge can't be achieved by most printers, since the printable region is generally smaller than the paper size.

Remarks

In contrast to older versions of the Report Generator, the specified border region is not displayed in the document window. This tends to allow a better overview of the page layout.

Older versions also required you to specify the borders' location in terms of the distance to the edge of the printable area. Now these specifications are made automatically when the print layout is loaded, in accordance with the printer indicated in the setup.

Example: In Report Generator Version 3.0, a border width of 20 mm is set. The printable region for the applicable printer begins 3mm from the left edge of the paper. Therefore the absolute distance to the edge of the paper is 23 mm. If such a print layout is loaded now, the total resulting border width will be indicated in the dialog.

If objects are already located on the page, onto which a print layout is later loaded, a change in the border width will not cause a repositioning of the objects. This also represents an improvement over the behavior of older versions.

Printout Stretch

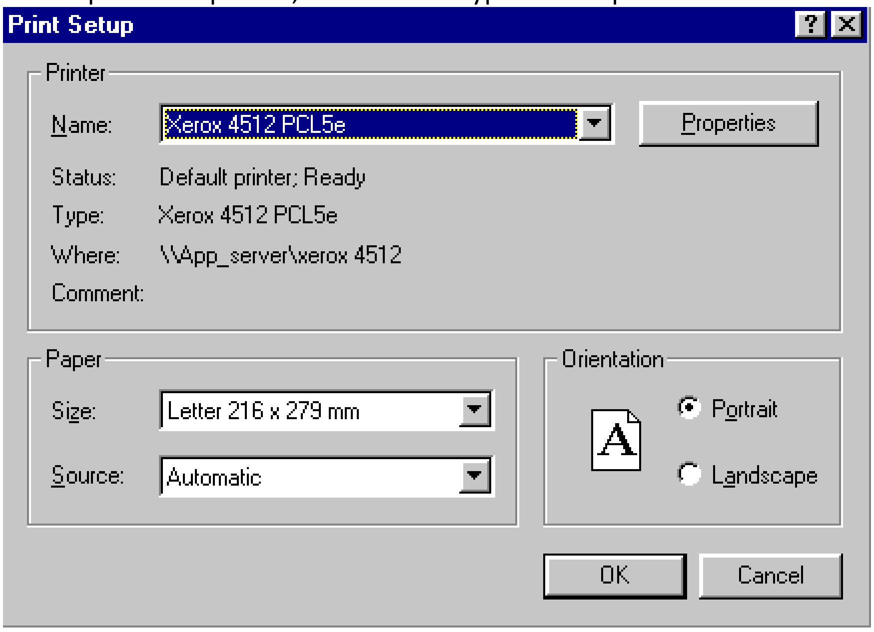
It is also possible to specify a stretching amount for the page. Some printers perform within such tolerances that, for example, a desired distance of 100 mm between objects turns out to be 99 mm on paper.

In that case, the printing output would need to be stretched. The stretching is specified in steps of 1/10 mm's across the entire page. (The stretching can be specified as negative, also). If the page, therefore, is 300 mm wide, then the stretching amount should be entered as 3 mm, so that a region 1/3 of the paper wide would be stretched by 1 mm, and 100 mm on paper would reflect 100 mm of intended print-layout in the above example.

If you don't yet know what stretching will be necessary, or great geometric precision isn't required, set stretch to zero. The empirical approach will eventually indicate what fine-tuning is needed. Ultimately you will be able to accurately print on graph paper.

4.6.2 Printer Setup

To assign the printout operation to a certain printer, or to change its optional settings, select menu item "File / Printer Setup". The makeup of the dialog which then appears depends on the installed version of Windows and on the particular printer, but here is a typical example:



You can choose between the system-wide default printer (to be specified in the Windows Control Panel), and any other printer which is set up under Windows.

Hint: Format (portrait or landscape) and paper size can also be determined under menu item "File / Page Setup..".

Properties

Selecting this button opens a further options-dialog, which depends on the particular printer previously specified. That dialog is part of the driver software furnished by the printer manufacturer and is therefore extremely variable in terms of what it offers and how it is operated.

The main issue of interest in that dialog is usually the resolution the printer should use, to be specified in DPI (Dots Per Inch). High resolution means high printout quality but is attended by correspondingly low speed.

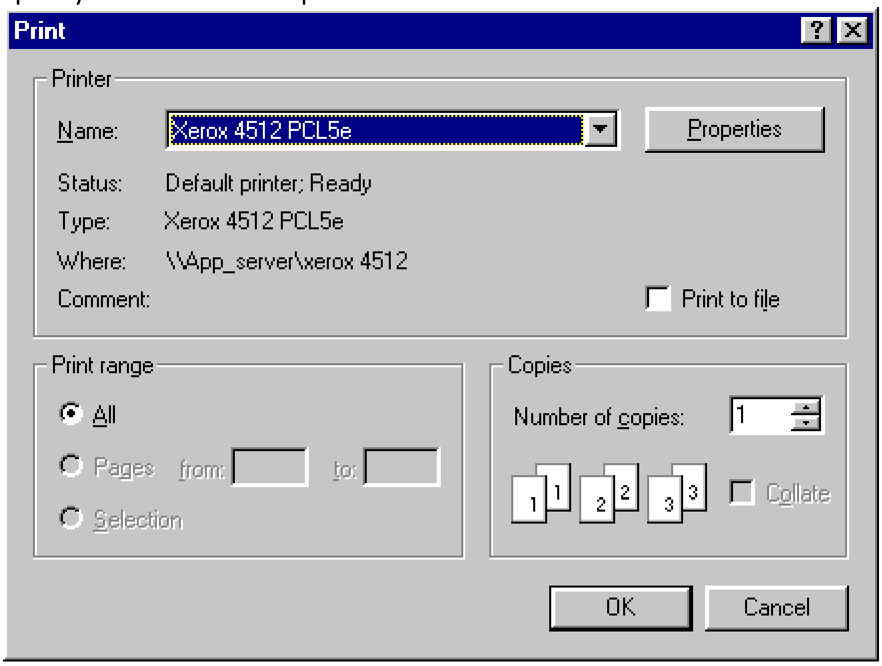
4.6.3 Print

Any printer or plotter supported by Windows can be used to deliver the graphic output in a print-layout. A printing operation always requires a full page.

To start the printout, select menu item "File/ Print", or use the corresponding screen button in the toolbar.

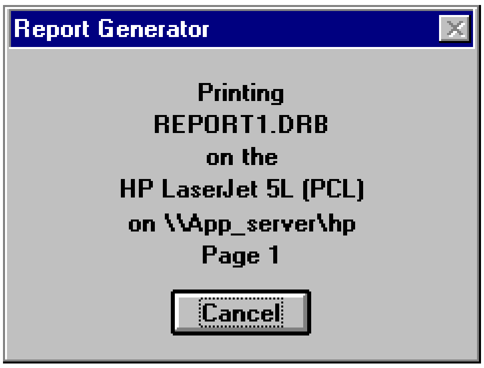
You an also use the menu item "File / Print Preview" to see the result in advance and then start the printout by selecting that option in the "Preview" dialog.

Starting the printing process by selecting menu item "File/ Print" makes a dialog first appear, in which you can specify the number of copies desired.



Using the corresponding soft key in the toolbar, on the other hand, does not cause this dialog to appear. Rather, the printout begins immediately using the default settings.

While the computer is spooling, that is to say, performing the calculations of printout data and transferring them to the Windows Print Manager, a small dialog appears and offers you the opportunity to interrupt the printing procedure:



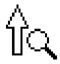
Remarks

- After the calculation, the Windows Spooler is called. This program's presence is indicated by its icon appearing on the screen. By enlarging (maximizing) this icon, you will see a list of printouts currently being performed. The spooler's function is to send data in the background to the printer.
- In order to correctly address the printer in Windows, special settings must be made with the aid of the options under menu item "File / Printer Setup..".
- Error messages arise if the printer isn't correctly specified in Windows, isn't switched on or hasn't any paper.
- If the printer has only been incompletely set up in Windows, a dialog will appear when you initiate the printout, to advise you of the situation. After you close the dialog, another (futile) attempt will automatically take place, then you must call the Control Panel and finish the setup.
- Independently of the Report Generator, it is possible to make a printout of the curve window, or to transfer a print-layout from there to the Clipboard.

4.7 Zoom

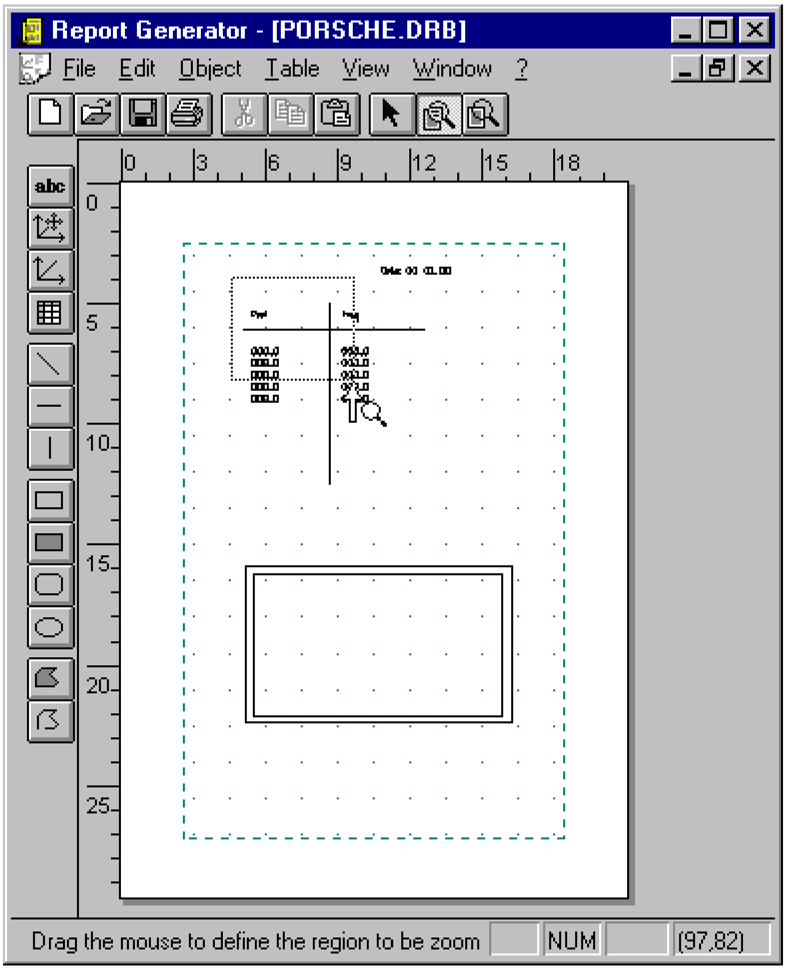
You can magnify the display of selected regions of a document, in order to better examine details.

 Select menu item "View / Zoom" or the corresponding button in the toolbar..

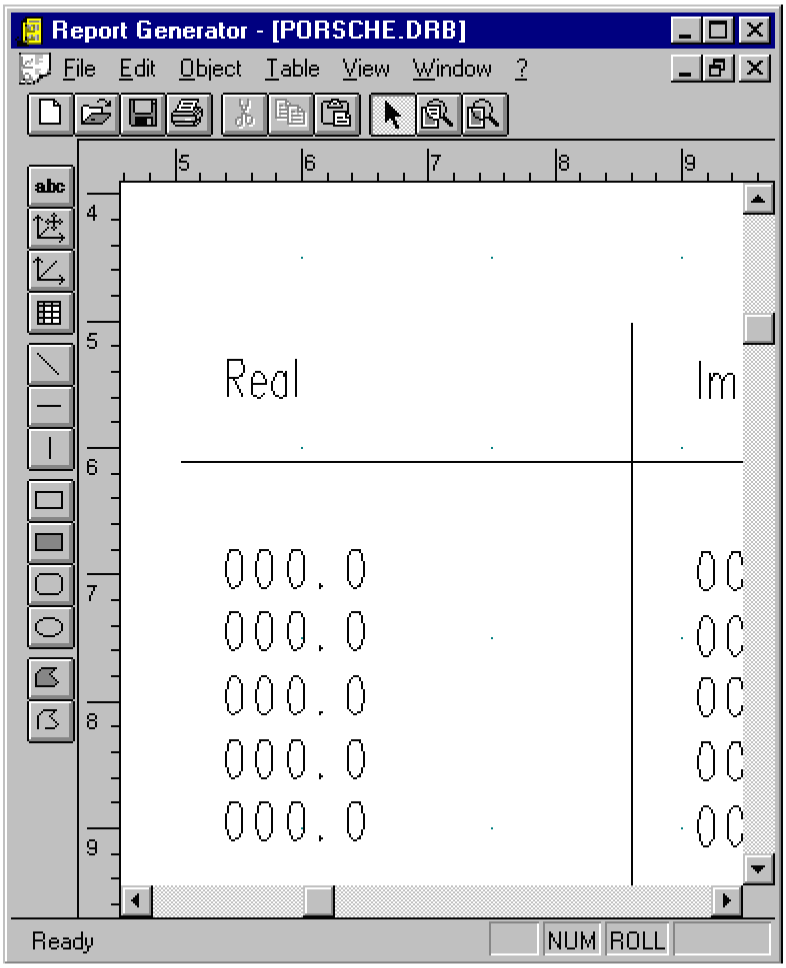
The mouse pointer takes on a new appearance: 

The zooming tool is activated. By pressing the left mouse button while the mouse pointer is situated at one corner of a region you would like to see enlarged, then moving the mouse pointer, while keeping the button held down, to the diagonally opposite corner and releasing the button there, you will call a close-up of the rectangular region thus framed. The zooming procedure can be interrupted either by pressing the right mouse button or <Esc>.

- Move the mouse pointer to where it is situated at one corner of a region you would like to see enlarged, then press the left mouse button and hold it down.
- Move the mouse pointer towards the corner of the desired region diagonally opposite the first one. The region currently destined for magnification is displayed inside a dotted line.



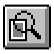
Upon release of the mouse button, the "Zoom" procedure is completed and the last region to have been displayed inside the dotted line is now displayed in the new window.



The scroll bars at the right and on the bottom of the window indicate the zoomed region's relative position within the entire page. By operating the scroll bars, you can browse through the entire page, displaying a region of it in the window which always has the same zoom factor as dictated by the zooming procedure you first executed.

Unzoom

This command restores the display of the entire page.

 Select menu item "View / Unzoom" or the corresponding button in the toolbar.

Remarks

- The smallest region which can be magnified into the whole window is about 1 cm x 1 cm.
- Not any arbitrarily selected region can be magnified in such a way as to fill the window; the proportions of the window are a given. Have regard, therefore, for the relationship between the lengths of the sides of the selected region; if they are chosen to correspond to the window proportions, the magnified view can accurately reflect what you select.
- You can interrupt the zooming procedure at any time by pressing <Esc>, or by right-clicking the mouse.
- A new zoom can be performed within a previously zoomed region to allow an even more detailed view.

4.8 Grids

You can force objects to be positioned on lines of a grid when changing their size, creating, or moving them. This naturally limits the amount of locations at which objects can be placed.

A grid width for both the x- and y-directions must be specified. Objects' edges can then only be situated at whole multiples of the grid width. The points of the grid can be displayed on screen in a variety of colors.

Grid on

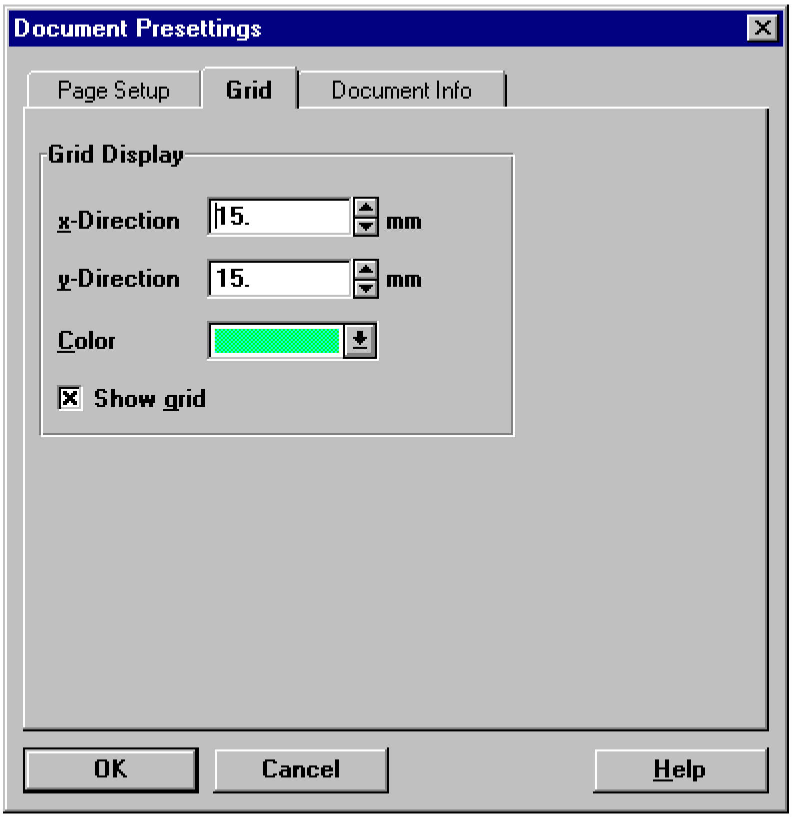
To activate or deactivate the grid-snap mode, use the menu item "View / Grid On". If the mode is active, a check-mark will appear beside the item's listing in the menu. This doesn't indicate that the grid is visible, only that it is operating.

Snap to Grid

The grid positioning can be retroactively imposed on existing objects using this command ("View / Snap to Grid").

Grid Properties

The menu item "View/ Grid Properties.." calls a dialog for use in setting the properties of the grid in the active document:



x-Direction

The horizontal distance between grid lines it specified here.

y-Direction

The vertical distance between grid lines it specified here.

Color

Assigns a color to the grid points. To actually display the points, the next option must also be activated:

Show Grid

This determines whether the grid appears in the window. Only the points of intersection are shown. The grid-snapping mode may be active, however, even if the grid points are invisible.

Remarks

- Some objects have a fixed size. In that case the top and left sides are aligned to the grid lines and the bottom and right sides are dictated by the particular size. Curves are an example of fixed-size objects.
- The bottom left corners of curve-objects' coordinate systems are aligned to grid points.

4.9 Creating Objects

The following presents the basic procedures for creating print-layout objects. These procedures will be explained again in connection with the description of the individual object types, however the emphasis there will be on the exigencies of the particular type presented.

4.9.1 Use of the Specialized Tools

Select the desired type of object from the "Object" menu or by its icon in the toolbar. The mouse pointer will now take on the appearance of crosshairs when located within the window. You can now set the position and size of an object.

For Texts, Tables, Curves, Lines, Frames and Rectangles:

- Move the mouse pointer to one prospective corner or endpoint of the object to be created.
- Press the left mouse button to mark one corner of the object.
- While keeping the left mouse button pressed, drag the mouse until the desired shape and size of the object is indicated on the screen. (This step is omitted if the mode "Curve Fixed Size" is set.)
- The mouse button can now be released.

For Polygons and Polylines:

- Left-click the mouse at the desired position of a corner- or end point of the object.
- Mark each additional corner point (except the last) with another left-click (the closing of the polygon is handled automatically).
- Define the last corner of the polygon by double-clicking at its location.

Remarks

- The procedure can be canceled at any time by right-clicking or pressing <Esc>.
- If you mark an area of size zero, no object is created.
- When **text- and table objects** are treated, a dialog for specifying the text and other properties subsequently appears; pressing <Cancel> from within this dialog automatically discards the whole object.
- When **curve objects** are treated, the mouse pointer subsequently takes on the appearance of a hand-cursor. With this, you can click on a curve window whose contents are to be transferred into the curve object. You can interrupt this procedure with a right-click or by pressing <Esc>, the (as yet empty) curve object will remain intact, though.
- Generally, when new objects are created, their initial properties are those which were most recently assigned as presettings with the "As Default" screen button in the properties dialog.
- The most recently created object is always on the "top" layer; i.e., it can cover any other object. If objects overlap, use the commands available under "Arrange" in the "Edit" pop-down menu in order to place objects according to your liking.

4.9.2 Pasting from the Clipboard

The Report Generator can establish new objects by simply inserting them from the Clipboard.

The object types available depend on the data formats provided in the Clipboard. The command "Edit / Paste" will automatically select an object type if several data formats are available; the command "Edit / Paste As" allows You to select a desired object type from a list.

The following is a list of the Clipboard formats recognized by the Report Generator, and the object types that they will be transformed into within the framework of the print layout:

Format in the Clipboard	"Paste"	"Paste AS"
Report Generator- objects (internal format)	original object type	original object type meta graphic text...(*) table (*)
text	text	text table
meta graph	meta graph	meta graph
Bitmap	Bitmap	Bitmap
OLE-object	OLE-object	OLE-object

(*) applies only to text- or table objects

Remarks

- When several formats are offered, the command "Paste" will proceed according to the order in the right column.
- When inserting in Report Generator format, an exact copy of the object previously copied to the Clipboard is created. Its position is slightly offset from the original, so that the copy and the original do not completely cover each other
- When inserting in other formats, the content of the object is determined as the content of the Clipboard. The object is set at a default position, and the size is automatically set if necessary. All other properties are determined by the current presettings for the object type concerned.
- To specify the position for insertion, you may also use the context menu. To do this, right-click the mouse over an unoccupied region of the worksheet.

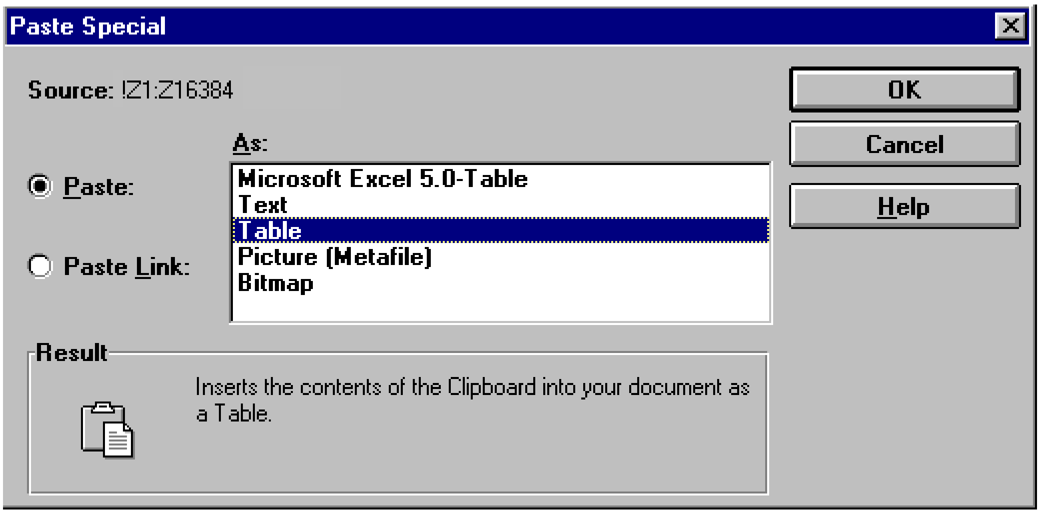
The menu options "Paste Here" and "Paste Here As"operate in a manner analogous to the workings of the corresponding commands under the "Edit" menu, except that they place the new object's left upper corner at the position clicked on.

Example

A table created with Excel is copied to the Clipboard. Excel stores data in different formats, of which the Report Generator understands the formats *Text, Meta graphic, Bitmap* and the format of the source file (*OLE). Text-type* data can be used by the Report Generator to create text- or table objects.

The command "Edit: Paste" automatically generates a text- object.

The command "Edit: Paste As" calls a dialog for selecting the format:



Remarks

When pasting in the source's format (in this case: *"Excel 5.0 Table"*) an OLE-link is created. This slows down the execution of the program and makes greater demands on storage capacity. Use this format, therefore, if You anticipate having to subsequently edit or automatically update the data from within the source program.More information about OLE-objects is available in Section "*OLE Objects* 348".

4.9.3 Creating Objects via Drag & Drop from other imc Applications

Text-, table- and curve objects can be created by using drag & drop from other imc application programs.

Curve Objects

Left-click the mouse on the desired curve window and, while keeping the button pressed, move the mouse onto the report-sheet. When it is at the desired location in the report sheet, release the mouse. The curve object is then created by transferring the graph and incorporating the current Clipboard presettings (curve window, menu option "Opt.: Clipboard".

Tables, Texts

Left-click the mouse

- in the imc FAMOS variables list on a selected entry,
- or on the column header in the imc FAMOS Data Editor,
- or, with the <Ctrl> button held down, on a highlighted region of the Data Editor,

and move the mouse while keeping its button pressed to the location in the layout which you wish the object to occupy, then release the mouse button. The text- or table object is now created and consists of the data or content of the data set or the text variable.

Further information on this topic can be found in the sections treating the creation of curve-, text-, and table objects, respectively.

Remarks

If you release the mouse over an already existing object, that object is restructured with the new content, rather than a new object being created.

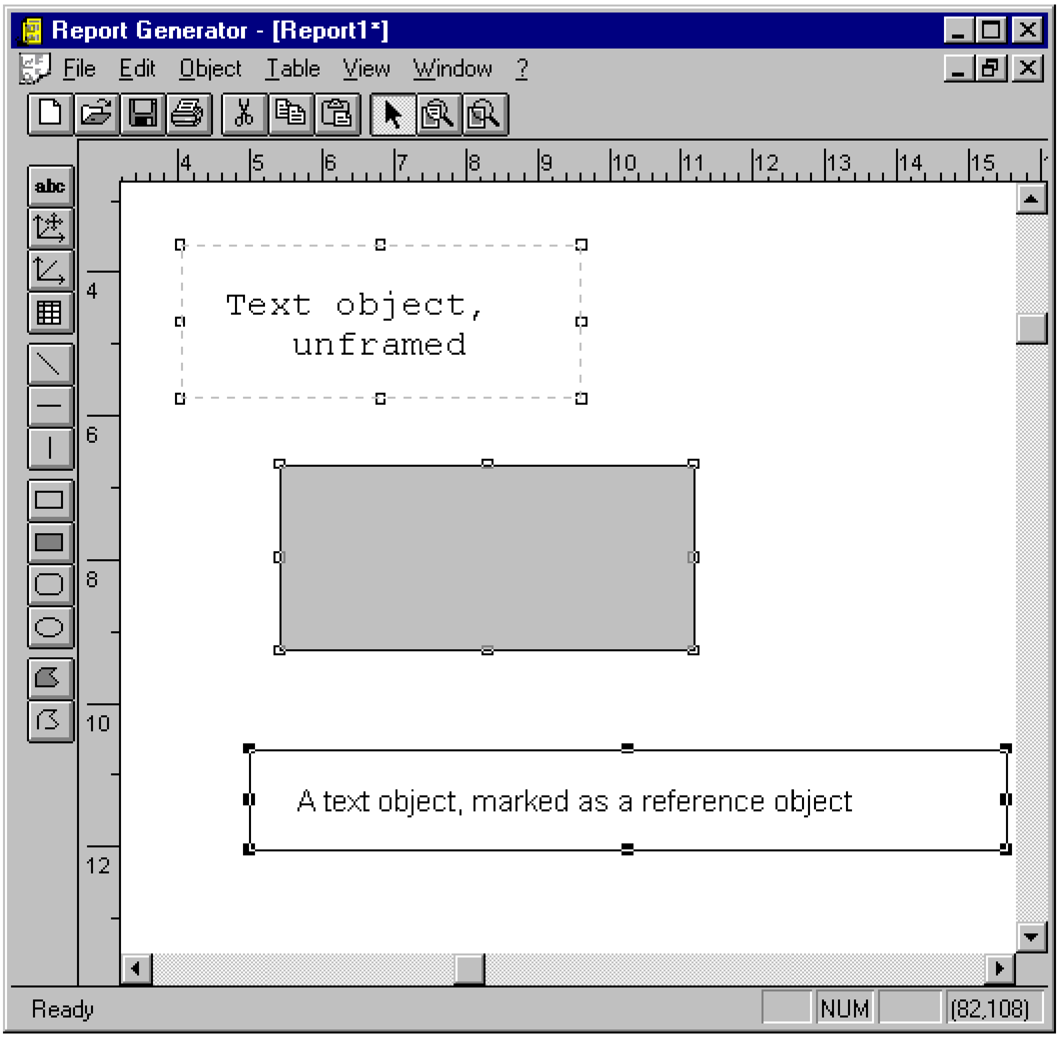
4.10 Selecting Objects

To edit any object or objects in the layout (e. g., to move, copy or alter them), they must first be selected.

Nearly all commands for the editing of objects act on the object which is currently in "selected" mode.

An object which is currently the selected object can be distinguished by the small, black squares which appear at its corners and along its edges. These squares are designated as "handles". Along with the selection-status indicator, these handles can also be used to change the size or shape of an object.

If the object has no frame, a gray slashed line additionally appears, in order to indicate the object's outline.



When multiple objects are selected, one of them is defined as the so-called "reference object", distinguished by its solid black handles, in contrast to the others which appear with transparent handles. The reference object is needed for the commands under "Edit: Align".

Individual Selection

There are different methods of selecting an individual object:

- If it is not already active, the option "Select" can be called from the "Object"-menu, or press the corresponding screen button. 
  Next, left-click the mouse on the object desired.
- Right-clicking the mouse on an object selects this while also calling the context menu.

- If You double-click over an object with the left mouse button, the object is selected and the pertinent Properties-dialog is called. For curve objects it is necessary to hold the <Alt>-button down while double-clicking.

Selecting Groups

There are several ways to select a group of objects. The entire composite selection can then be moved, copied, or deleted in unison. If all the objects belong to the same type, their properties can also be specified in unison.

- You can **specify a region by using the mouse**. Objects located inside of this region are then selected. If it isn't already active, call the "Select" command from the "Object" menu or activate it using the corresponding screen button. First left-click at the location of one corner of the prospective selection region, then move the mouse, while holding its button down, to the diagonally opposite corner as needed to specify the size and shape of the desired region. The currently affected region shall appear inside a slashed line as a frame. This procedure can be aborted by right-clicking or pressing <Esc>.
- To **select all objects** at once, call the command "Select All" from the "Edit" menu .
- To **add an object to an existing selection**, click on it while the "Select" menu option is active and while pressing <Shift>.
- To **change the current reference object**, left-click again on an already selected object, while holding down the <Shift> button.

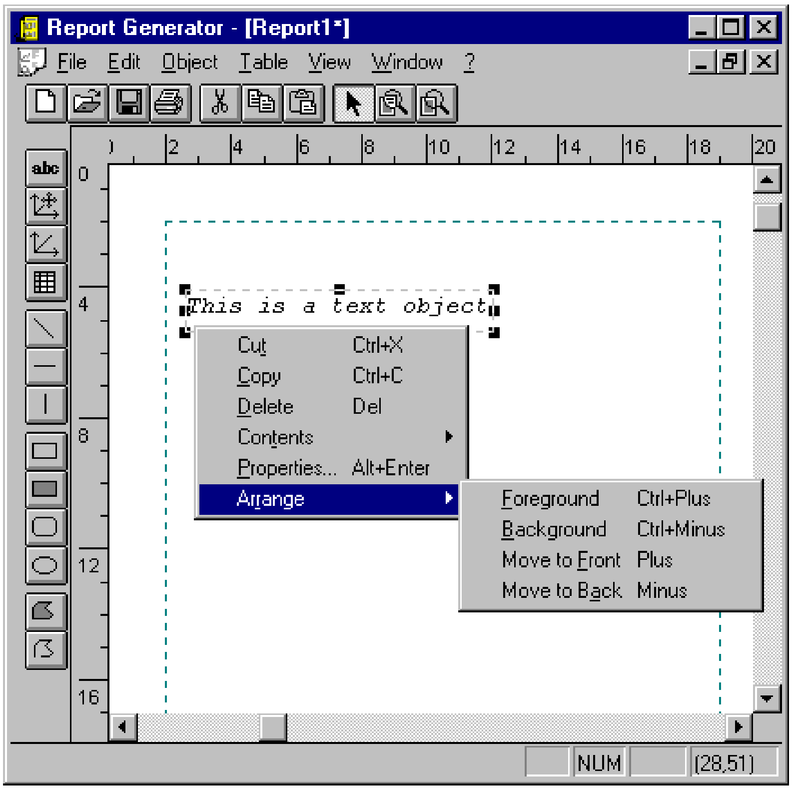
Remarks

If one object is covering another one which you wish to click on, use the commands under "Edit / Arrange" to remedy the situation.

4.11 Editing objects

4.11.1 Object Context menu

Almost all commands concerned with the editing of objects are available from the "Edit" menu, or the "Table" menu in the specific case of Table objects.
When You right-click the mouse on an object, a context menu appears, which provides You with various commands for editing the object. The particular context menu called depends on the type the object belongs to.



Under many circumstances it may be more convenient to access commands via the context menu, as this method accomplishes two steps (select object and open menu) at once.

4.11.2 Moving Objects

To move objects with the mouse, the selecting mode must be activated (a circle appears beside the listing of the "Select" option in the "Object" menu).

Moving One Object

Left-click the mouse over the object and drag the mouse to the desired position while keeping the button pressed.

When **table objects** are involved, the object may not be previously selected, otherwise the mode for selecting individual cells of the table is active.

Moving Groups of Objects

First select a group of objects as per instructions in section "*Selecting Objects* 307". Then left-click the mouse over the reference object (or, with the <Shift> button held down, over any currently selected object). While keeping the mouse button pressed, you can now drag the objects using the mouse to the position desired.

Remarks

- With the **grid** activated ("*View / Grid On*"), the edges of all objects are automatically situated on whole grid coordinates. The objects therefore do not move smoothly with the mouse but rather "skip" to discrete positions.
- When objects are moved, their content as well as the areas mutually obscured by different objects overlapping in the layout are continuously updated. On slow computers and in connection with complex print layouts, this can lead to distracting **delays**. This effect can be alleviated by activating the menu option "**Only Show Positioning Handles When Moving**" located under "View / Options.. This causes the full object layout to be drawn only after you have determined its ultimate location. The currently valid position of the object is, in the meantime, indicated only by a frame.
- If the display of the document is a **zoomed view**, and you drag the mouse in such a way as to make the mouse pointer go beyond the bounds of the **section** currently displayed on screen, the displayed section scrolls automatically with the motion of the mouse, in order to keep the mouse pointer's position in the layout within your view.
- Moving an object does not cause it to slide over objects previously appearing to (partially) cover it. Use the commands under menu item "Edit / Arrange" to place the object to be moved onto the uppermost layer, thus keeping it **within** Your **full view** for ease of manipulation.
- An object may be moved to a location such that parts of the object extend beyond the **margins of the page**. If this happens, parts beyond the margins will be neither displayed on screen nor printed to the document.

4.11.3 Changing Object Size

An object whose size is to be changed must first be the only one selected. The selecting mode must also be activated (a circle appears beside the listing of menu item "Object / Select").

In the "selected" state, an object is displayed with small black squares at its borders' corners and edges; these squares are the so-called handles. When You move the mouse pointer onto one of these handles, the pointer is altered to a standard Windows cursor for Move / Change Size operations. You can now left-click the mouse ("seize the handle"), and while holding its button down, use the mouse to drag the edge or corner of the object to the desired position.

Remarks

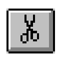
- With the **grid** activated ("View / Grid On"), the edges of all objects are automatically situated on whole grid coordinates. The objects therefore do not expand or contract smoothly with the motion of the mouse but rather "skip" to discrete shapes and sizes.
- When objects' sizes are changed, their content, as well as the areas mutually obscured by different objects overlapping in the layout, are continuously updated. On slow computers and in connection with complex print layouts, this can lead to distracting **delays**. This effect can be alleviated by activating the menu option "**Only Show Positioning Handles When Moving**", located under "View/ Options. This causes the full object layout to be drawn only after you have determined its ultimate location. The currently valid position of the object is, in the meantime, indicated only by a frame.
- If the display of the document is a **zoomed view**, and You drag the mouse in such a way as to make the mouse pointer go beyond the bounds of the **section** currently displayed on screen, the displayed section scrolls automatically with the motion of the mouse, in order to keep the mouse pointer's position in the layout within Your view.
- Moving an object does not cause it to slide over objects previously appearing to (partially) cover it. Use the commands under menu item "Edit/ Arrange" to place the object to be moved onto the uppermost layer, thus keeping it **within** Your **full view** for ease of manipulation.
- An object may be moved to a location such that parts of the object extend beyond the **margins of the page**. If this happens, parts beyond the margins will be neither displayed on screen nor printed to the document.

4.11.4 Deleting Objects

Any objects which are to be deleted must first be designated as currently selected, as per Section "*Selecting Objects* 307"

Access the command "Delete" either via the "Edit" menu or the context menu.

The currently selected objects are then erased from the display and are no longer available.

Alternatively, the command "Edit / Cut" or the corresponding screen button in the toolbar can be used. 

In contrast to the "Delete" operation, selected objects which are "Cut" are thereby copied to the Clipboard.

4.11.5 Cutting and Copying Objects

Cutting or copying objects transfers them to the Clipboard from where they can subsequently be pasted into other imc application programs.

Objects thus manipulated can just as easily be pasted back into the Report Generator; in this way, objects can be conveniently duplicated.

Whether objects are to be cut or copied singly or jointly, they must first be selected; refer to Section "*Selecting Objects*", for detailed instructions.

Access the "Copy" or "Cut" commands either from the "Edit" menu or via the context menu or by pushing the corresponding screen button in the toolbar

Cut means, that the objects are copied to the clipboard and then being removed from the print layout.

Remarks

Copying layout objects can produce **various data formats in the Clipboard**, depending on the particular object types involved.

In addition to the internal format of the Report Generator, which is utilized if the data are pasted back to the Report Generator, a picture in the form of a meta file is also generated. When text- or table- objects are present, the text contained in the object is also stored in raw format.

The two last-mentioned formats - metafiles and text are standard formats and can be read by very many Windows application programs.

4.11.6 Pasting Objects

The Report Generator can establish new objects by simply inserting them from the Clipboard. The object types available depend on the data formats provided in the Clipboard.

- The command "Edit / Paste" will automatically select an object type if several data formats are available.

- The command "Edit / Paste As" allows you to select an object type from a list as desired.

The commands "Paste Here" and "Paste Here As" become available from a context menu when You right-click the mouse over a blank area of the document.

Further information about creating objects by pasting from the Clipboard is available in Section "*Pasting from the Clipboard* 304" of this chapter., as well as in the chapters describing the different object types.

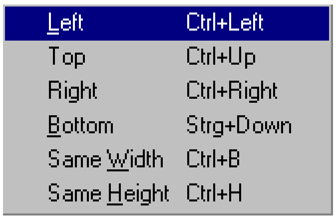
4.11.7 Aligning Objects

For a neat and orderly layout of several objects (for instance, all objects aligned to the left margin, or all objects equally wide), one tool available is the grid (menu item "View / Grid On"). The positioning of objects in accord with the grid coordinates can even be achieved retroactively by using the command "View / Snap to Grid!".

Several objects could also be positioned and sized in optically pleasing arrays by using one of the objects as a **reference object.**

First select the objects desired and designate one as the reference object, along whose lines the others are to be adapted. To simultaneously select several objects, click on some while holding down the <Shift> button.

The reference object is specified by re-clicking on one, while still holding down the <Shift> button. "*Selecting Objects* 307" at menu item "*Edit / Align*" the following commands are available



Left, Right, Top, Bottom

All selected objects are aligned to the respective edge of the reference object. Their sizes remain unchanged.

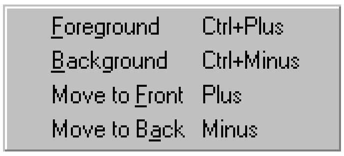
Same Width, Height

All selected objects are shaped to conform in either height or width to the reference object. The positions of their respective upper left corners remains unchanged.

4.11.8 Overlapping Objects

The various layout objects are always drawn in a set order. A later-drawn object can partially or wholly cover an earlier-drawn one.

To control the order in which objects are drawn, and thus their mutual overlapping, the commands under menu item "Edit / Arrange" can be used. An object, whose place in the order is to be changed, must first be selected. The same submenu appearing as a pop-down is also called as part of the object context menu (right-click of the mouse over the object).



Foreground

The object selected is fetched into the foreground. It is located above all other objects and can not be partially covered by any other object.

Background

The object selected is relegated to the background. It is located beneath all other objects and can not partially cover any other object.

Move to Front

The object selected is moved by one place up the hierarchy on the document; it can now partially cover the previously next-highest object.

Move to Back

The object selected is moved by one place down the hierarchy on the document; it can now be partially covered by the previously next-lowest object.

4.11.9 Changing Objects' Properties

Besides location and size, every layout object has a number of other attributes which govern its appearance and processing.

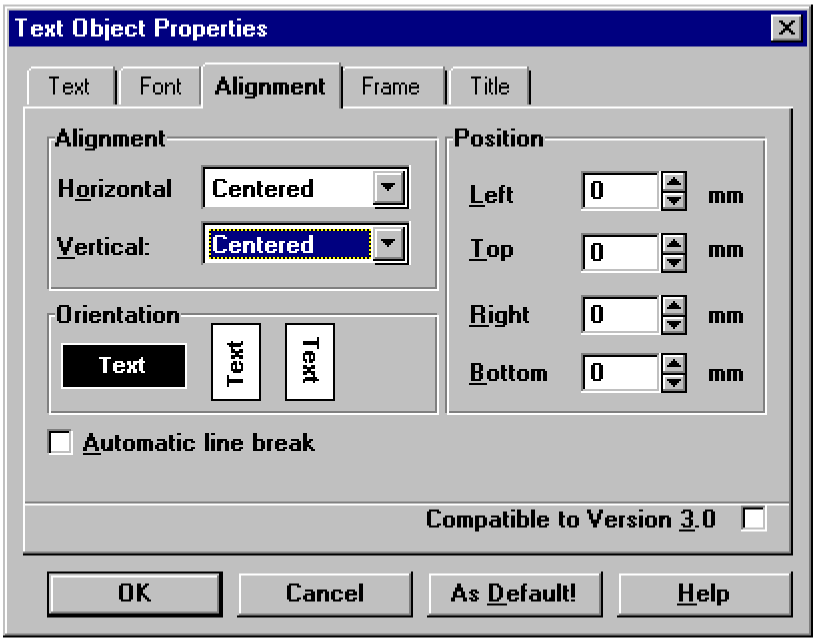
The properties available depend on the particular type the object belongs to. The properties can be set in a dialog, which is represented as a stack of cards, on each of which a related group of properties is indicated.

There are different means of calling the properties dialog:

- Select the object concerned and then click on the menu item "Edit / Properties". If you select multiple objects of the same type, you can simultaneously change properties of them all.
- Double-click the left mouse button on the object desired (for a curve object: while holding the <Alt> button down).
- Right-click the mouse and activate menu item "Properties" in the context menu which then appears

The structure (number and appearance of the various cards) depends on the object's type and is described in the chapters dealing with the object types.

Seen here is an example of a typical "Properties" dialog (for Text):



Changing the Card

The labeling on each card's tab indicates what group of properties is treated on that card. To change the card, simply click on the tab of the card you wish to see.

Implementing Changes

Changes made to the dialog are immediately reflected in the layout of the document. Therefore, if you position the dialog in such a way as to keep the worksheet in full view, you can monitor the effects of the operations you perform in the dialog.

Undefined States "???"

If You call the "Properties" dialog while multiple objects are currently selected, and there are properties which are not uniform among all the objects, those properties' boxes in the dialog will reflect the discrepancy by displaying "???" in the text- or list box.

By specifying a value in the box concerned, a uniform value for all selected objects is instituted, otherwise the objects keep their respective properties when the dialog is closed.

Cancel

The screen button <Cancel> closes the dialog. *This discards all changes made since the dialog was opened (including changes on separate cards)!* The object reassumes all properties it had at the beginning.

As Default!

By pushing this screen button, all settings in the currently open index card from the Dialog are established as the *valid presettings for the object type* concerned. The next time an object of this type is created, it will automatically incorporate the property settings shown when you pushed the button.

Title of Objects

The index card marked "Title" is available for every object type. It lets You specify a name by which it can be addressed for the purpose of remote manipulation by imc FAMOS. More information on this topic is available in the chapter "Window Management".

Remarks

- At each calling of the dialog, the index card which is initially open is the one that was open when the dialog was last closed
- The location of the dialog on the screen is also stored in memory and reassumed by the dialog at its next calling.

4.11.10 Undoing Changes

With the command "*Edit/ Undo*", previous commands, such as Move, Paste, object creation or size changing etc., can be revoked.

The item "*Undo*" appears with a supplementary command name in the menu, for instance "*Undo (Move)*", which reflects the last command executed -the one which will be undone by this method. If the last command can't be undone, the menu item is "*Undo (not possible)*".

The last three commands, at most, can be revoked in this manner.

4.11.11 Set size of Undo memory

In order to effect the function "Edit/ Undo", the Report Generator must occupy memory in which to store the information necessary for restoring previous states of the report.

When complex reports are involved, especially with colorful bitmap graphics having high resolution, this can lead to two problems (depending on the speed and memory capacity of your PC).

- The system places high demands on memory, thereby depriving other applications or even the Report Generator of it.
- When manually editing the report, long delays occur, during which the current state of the report is saved, before the actual editing operations can begin to be implemented.

The menu items "File/ Presettings" and "Options/ Display" both call the same dialog, in which the maximum amount of memory reserved by the Report generator can be specified. The control for this setting is located on the filecard "Other". The maximum setting is around 1.5 MBytes, which applies to each open document individually.

If more than this amount of memory is needed to store the information on previous states, the Undo command will not be able to restore those states. In exchange, the system resource strain is limited.

If you set the memory size to 0 kByte, the "Undo" command simply not be available.

4.12 Texts

Text objects serve to display non tabular texts in a report document. Font, alignment, frames and backgrounds can be specified.

The content of a text object can be changed by means of a dialog, drag & drop, or remotely by imc FAMOS.

4.12.1 Creating Text Objects

There are various ways to create a text object in a report:

- Define one manually from scratch,
- Paste from the Clipboard,

Drag & drop in conjunction with the imc FAMOS variables list.

All these methods are rudimentarily described in Section "*Creating Objects* 303". The following deals in greater depth with the peculiarities of text objects.

Newly Creating a Text Object

Access the menu item "*Object / Text*" or the corresponding screen button in the left toolbar.

Now use the mouse to outline the rectangular space in which the text object is to be positioned.

When the last step is completed, a "Properties" dialog for text objects is automatically called and displays the portion of the dialog used to enter the text. All other properties of the object are adapted to the valid default settings for text objects (these can be defined by pressing the "As Default" screen button).

Of course, You can also subsequently change the text, as with any other property. By exiting the dialog with <OK>, the object is completed.

Right-clicking the mouse, pressing <Esc> or the <Cancel> screen button in the properties-dialog will all abort the object-creation process.

Pasting from Clipboard

When creating a text object by pasting from the Clipboard (menu item "Paste" or "Paste As" in the "Edit" menu or context menu) one must differentiate between two different cases:

- The Clipboard contains a text object which was itself imported to there from the Report Generator. In this case a complete copy of the object is made, which incorporates all properties already specified for it. Thus, the commands "Copy" and "Paste" in conjunction offer a fast method of duplicating objects.
- The Clipboard contains unformatted text, which was generated by any Windows application program. The new text object is established with the Clipboard contents, and the object's size is determined automatically. All its other properties are assigned to it according to the valid default settings.

The command "Paste Here" allows you to specify the location of a new object, at the same time as you transfer it from the Clipboard; otherwise the pasting position is determined automatically.

Drag & Drop

Select a text variable in the imc FAMOS variable list. Click on the variable name and drag it, while keeping the mouse button pressed, to the location in the report you wish it to occupy, then release the mouse button.

The text object is then created and its size is determined automatically. All of its other properties are assigned to it according to the valid default settings.

4.12.2 Change Properties

Text objects have many properties aside from their textual content. For instance, there are the font, alignment, indents, and the color of the frame and of the background. As with every other object type available for the report's layout, all properties can be set via a dialog which consists of several "index cards", on each of which the controls for several related attributes appear.

Calling the dialog is accomplished by:

- double-clicking on the text object to be edited,
- right-clicking on the object concerned, thereby accessing the context menu, and selecting the item "Properties" from there,
- making the object to be changed the current selection and then calling menu item "Edit / Properties". You can also select multiple objects and change all of their properties at once.

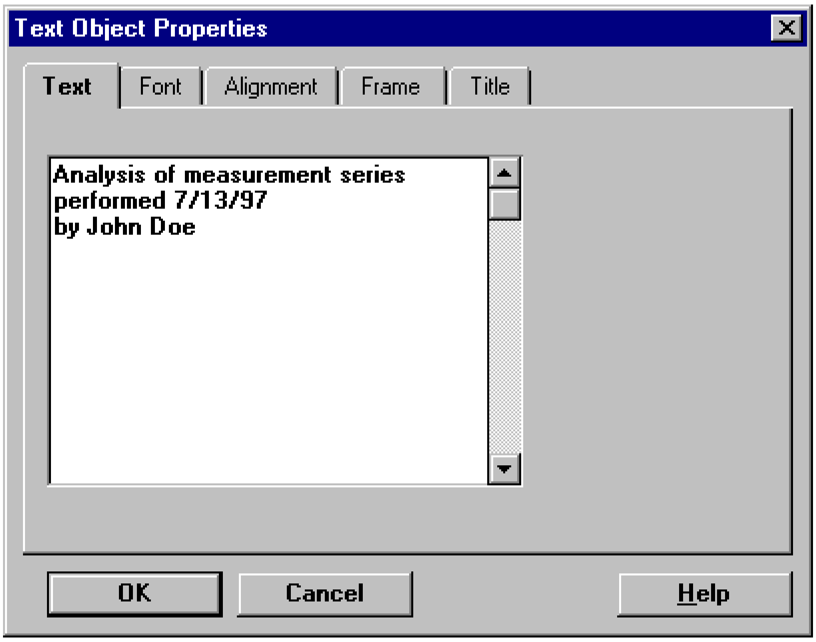
For changing the **content** of a text variable there are a variety of techniques, to be described in the next section. Some properties can be specified remotely by a imc FAMOS sequence.

4.12.2.1 Content of Text Objects

A text object's most important property is its content. The are several ways available to change it:

- "Properties/ Text" dialog
- Pasting text from the Clipboard
- Drag & drop
- calling a sequence from imc FAMOS

"Properties" Dialog: Text



Enter text as desired into the large text box. The display of the report layout is continuously updated during the entering of text. A new row of text can be begun by hitting <Return>.

Right-clicking the mouse calls the context menu, which offers the usual tools for editing (Cut, Copy, etc.).

Pasting Text from the Clipboard

Select the object to be changed and access the menu item "*Edit / Paste*", or right-click the mouse over the object and access the item "*Content: Paste*" from the context menu

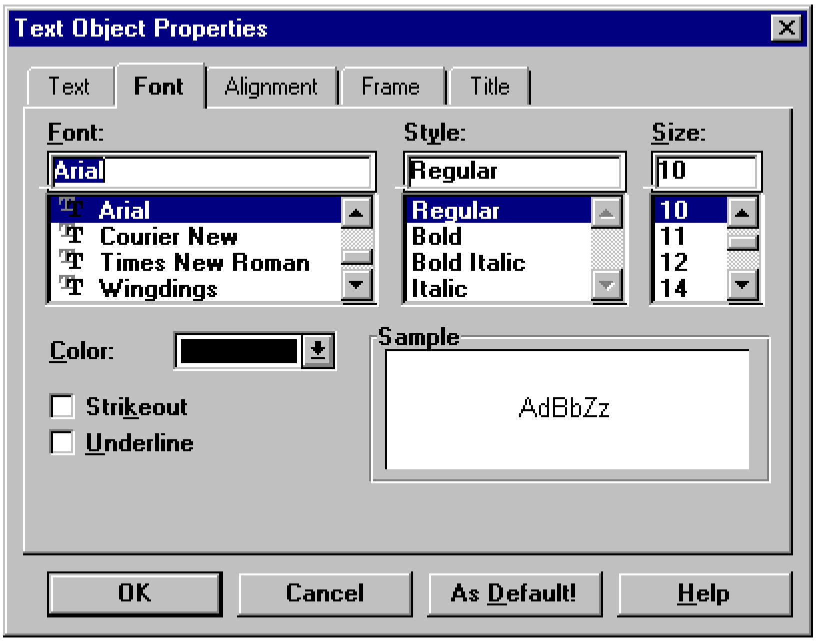
Hint: This menu option is only available when there actually is text in the Clipboard.

Drag & Drop

Select a text variable in the imc FAMOS variables list. Click on the variable's name and, while keeping the mouse button held down, move the mouse to above the text object in the layout, then release the button. The object is then updated to reflect the content of the text variable.

If the object contains **place holders** (see Section "*Place Holders in Text Objects*"), then the place holders are replaced by the transferred data. Then you can also drag & drop data sets or single values from the imc FAMOS variables list, the imc FAMOS Data Table, or from a curve window into the text object.

4.12.2.2 Fonts



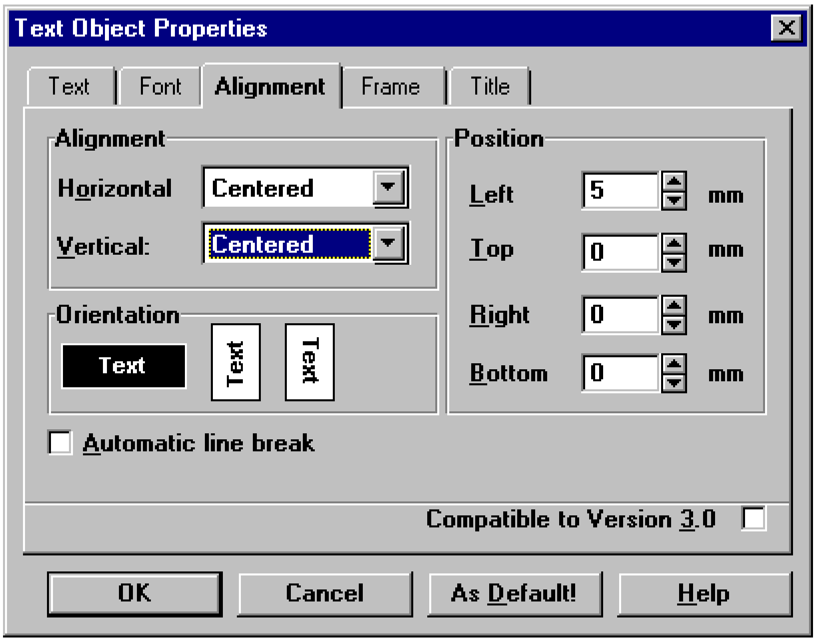
The dialog corresponds by and large to the standard Windows dialog for setting the font. Aside from the font itself (the list of fonts indicated depends on which are installed with Windows and the standard printer), the font size, additional attributes such as boldface, cursive, and the color can be specified.

By hitting the "As Default" screen button, all settings currently indicated are declared as the default settings, according to which future text objects are initialized.

Remarks

- It is generally recommended to choose a TrueType-font (distinguishable by a double "T" symbol in the list). These fonts guarantee a large capacity for being scaled up or down, as well as good agreement between the output on screen and on paper.
- If you are working with a 16-color color-depth, be aware that Windows can only display text in pure colors. These are indicated in the small rectangle in the upper right corner. If you select a composite color, produced by "dithering", Windows will implement the closest pure color instead.

4.12.2.3 Text Alignment



Alignment

Here you can specify whether the text should be aligned to the left or right margin or be centered.

Orientation

Click on the screen button which reflects the orientation you wish to give your text.

Automatic line break

This option causes typed text to jump to the beginning of the next row, analogously to <Return>, where necessary to prevent the width of the text space from exceeding the width of the text object, as the latter was previously defined. The line break always occurs at an entry of <Space> or <Tab>..

Position

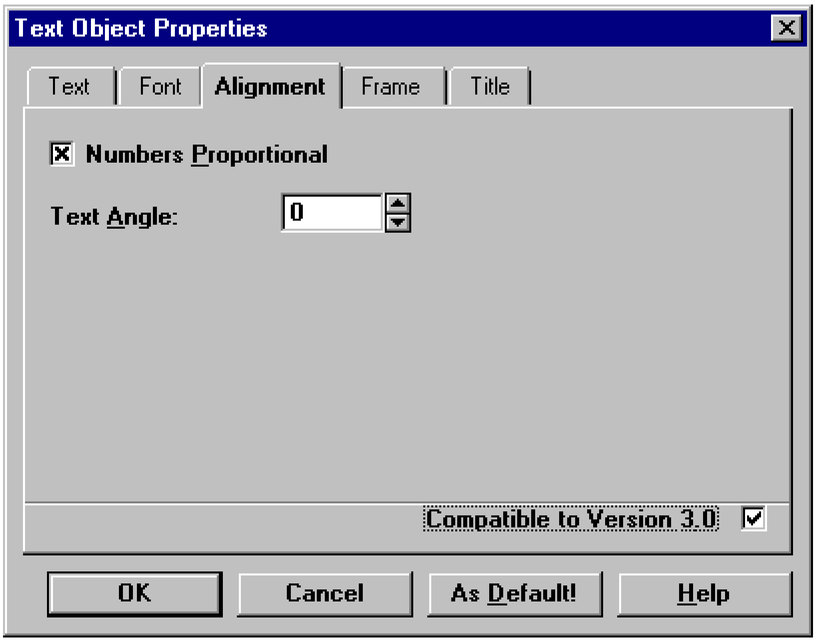
Here you can specify indents for the text layout. Entering "Left: 5mm" signifies that the text printout begins five millimeters away from the left border of the object.

As Default!

When you press this screen button, all the current entries in the dialog are declared as the valid presettings for subsequently created objects.

Compatible to Version 3.0

Clicking on this option changes the structure of the dialog.



Text objects that were created by older versions of the Report Generator automatically call this dialog.

The dialog only offers the options which were available in Version 3.0.

Numbers proportional

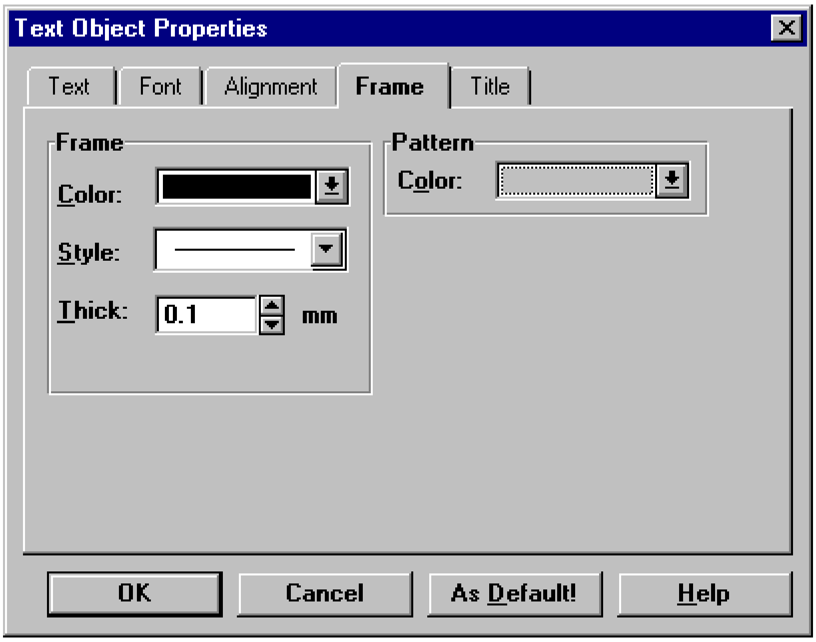
Activating this option allows numbers appearing within the text to be displayed normally in the chosen font. If this option is not active, all numbers (digits, decimal points, exponents, signs etc.) are not displayed proportionally to their actual dimensions, but rather each component character of a number is provided with an equally large space to occupy. This latter mode is useful for arraying numbers in vertical columns, otherwise digits above and below each other could appear horizontally offset from their intended positions, depending on the specific shape of the digit; and decimal points could only appear aligned by sheer coincidence.

If you anticipate creating a report which features such arrangements, it may be more convenient to create a table object in the first place..

Angle for Text

Here you can specify a slope along which to write out the text; any angle between 90° and -90° is available.

4.12.2.4 Frame and Background



In this dialog you can design a frame and a background for the text object.

When you press the screen button "As Default!", all the current entries in the dialog are declared as the valid presettings for subsequently created objects.

Remarks

- If **neither a frame nor a background** is desired, set their colors to "Transparent".
- A **Line Thickness** of 0 means that the edge will be drawn with the thinnest possible line (hair line), in other words with one screen pixel and one printer dot.
- If you are working with a 16-color color-depth, be aware that Windows can only display text in pure colors. These are indicated in the small rectangle in the upper right corner. If you select a composite color, produced by "dithering", Windows will implement the closest pure color instead.

4.12.2.5 Place holders in Text Objects

If a text is intended to be contemporaneously updated during a imc FAMOS application, or supplemented with data via drag & drop operations, the text can be equipped with place holders in preparation.

The text object containing the place holders serves as a mask or template, into which current data are entered. By this means, protocols can be made to contain comments and measurement values.

Remarks

The place-holding feature had great significance in earlier versions of the Report Generator, when the options for remote controlled arrangement of layouts was limited and the table object was not yet supported.

In creating new reports, programs and sequences, it usually allows for more flexibility to completely format the desired text and then to replace the entire content of the text object. It is also possible to access the content of the text object and then reestablish it after appropriate editing.

For the display of data sets in tabular form it is preferable to create a table object.

Available Place Holders

Place holders in the text object can be inserted using a "#" prefix. When data transmission then takes place, the first compatible place holder is replaced with fresh data. For real numbers the place holders "#e" and "#f" are well suited; for text, "#s".

The following place holders are defined for use in text objects:

#d	Current date in Windows format
#z	Current time in Windows format
#u	Unit of a single value or y-unit of a data set
#e?	Number in floating point notation, declaration of decimal places smaller than unity
#f?.?	Number in floating point notation, declaration of decimal places greater or smaller than unity
#s	Text

"?" in this instance signifies digits.

When you enter place holders, a default entry appears in the layout to indicate the format. In this way, you can evaluate the effect and size of the entries which will later be made.

Remarks

The place holders "#d" (current date) and "#z" (current time) are replaced with a transferring function the first time the text object is accessed.

If multiple place holders are present in a text object, only the first suitable one is replaced at each transmission. The other place holders remain intact and can be replaced during subsequent transmissions.

For displaying series of numbers in the form of a table, table objects should always be used. For "old" report layouts, where tables were displayed in text objects, the following applies:

- When data sets are transferred to text objects with place holders for real numbers, one place holder is replaced for each sample in the data set (each y-value). In this way, you can transfer an entire table (or: one row or column) using one command.
- When drawing up extensive tables it is convenient to design a one-row structure, have this copied to the Clipboard, and then paste from the Clipboard many times in succession.
- Often, however, it is useful to accommodate each column in its own text object.

Attention

Place holders in a text object, once replaced, are thereupon permanent. If you wish to make a new report with the same structure, it is necessary to first load a fresh mask (or template)!

Example

The text entered in a text object is as follows:

```
Date #d
Time #z
Values[#h]
#e2
#e3
#f3.1
```

The text appears in the layout thus:

```
Date 00.00.00
Time 00:00:00
Values[XXXX]
```

```
    0.00E+00
    0.000E+00
    000.0
```

After the pertinent transfers to the text object have been completed, the text below results:

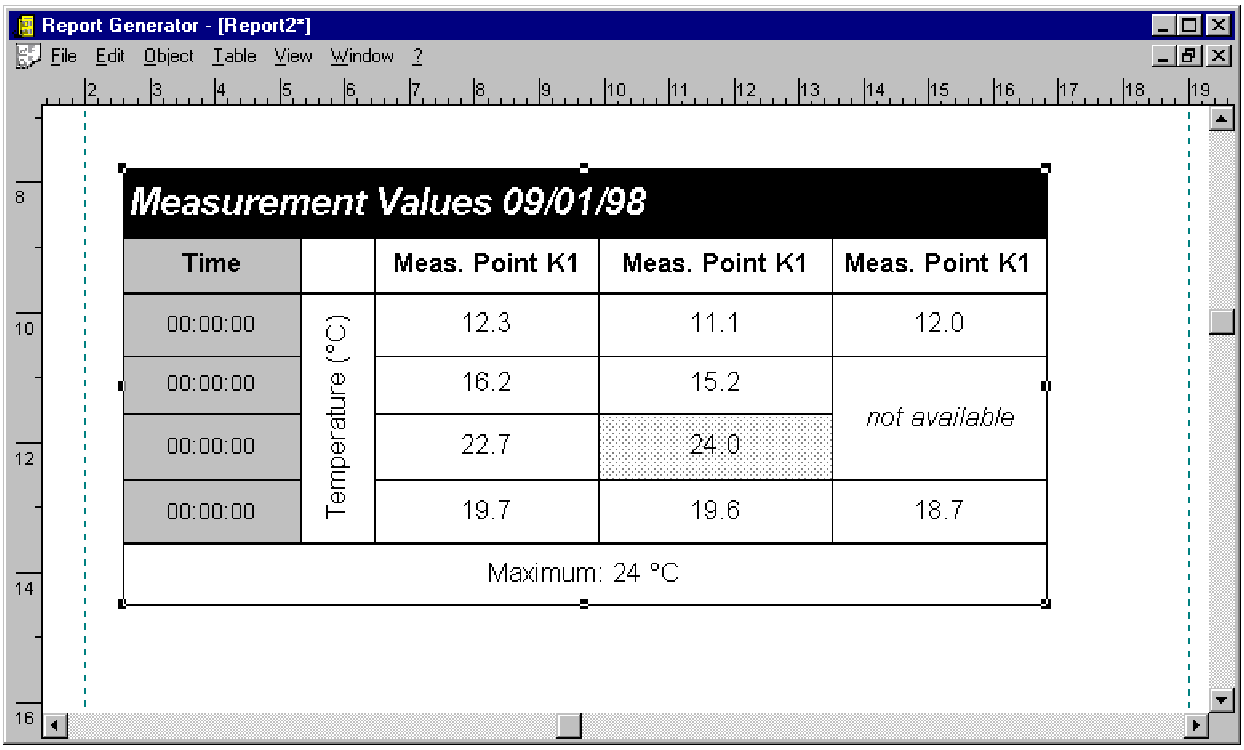
```
Date 31.12.91
Time 12:59:00
Values[V]
 1.23E+01
-4.567E-02
 312.9
```

Reference

See the chapter "*Remote Control*", Functions "*PrSet*" and "*RgTextSetData*".

4.13 Tables

Table objects can be used to display sequences of numbers, as well as for structuring texts easily. Therefore, a table can be considered a higher order of object, of which text is a particular subtype.



Each cell of a table possesses the same properties as a text object. Attributes such as content, font, orientation, frame and background can be defined **separately for every cell**.

Aside from the content of the various individual cells the distinguishing feature of a table is its **dimension**, i.e. the number of its columns and cells. The width of columns and the height of rows can be set arbitrarily.
The number of columns and rows determines the amount of cells. Element cells can be combined or conglomerated to larger cells.
An optional, additional attribute which can be specified for a table-cell is the fixed number format When transferring data via drag & drop or by means of remote controlling operations, the fixed number format allows a standardized display in the table, regardless of the possibly conflicting formats in the various data sources.
Due to the great variety of special editing operations which can be performed on tables, these are assembled under their own menu "Table" in the menu bar. The items in this menu are only available as long as a table object is currently selected and individual cells within it are highlighted.
The same commands are also available in the context menu for table objects, which is accessed by right-clicking the mouse over a table object.

The content of tables' cells can be changed via dialog, drag & drop or by remote control emanating from imc FAMOS.

4.13.1 Creating Tables

To create a table object in the report layout, you can use any of several methods:

- Define one manually from scratch,
- Paste from the Clipboard,

Drag & drop in conjunction with the imc FAMOS variables list.
All these methods are rudimentarily described in Section "*Creating Objects* 303". The following deals in greater depth with the peculiarities of table objects.

Newly Creating a Table Object

Access the menu item "*Object / Table*" or the corresponding screen button in the left toolbar..

Now use the mouse to outline the rectangular space in which the table object is to be positioned.

When the last step is completed, a "Properties" dialog for table objects is automatically called and displays the portion of the dialog used to enter the dimension, i.e., the number of rows and columns. All other properties of the object are adapted to the valid default settings for table objects (these can be defined by pressing the "As Default" screen button).

Of course, you can also subsequently change the dimension, as with any other property. By exiting the dialog with <OK>, the object is completed.

Right-clicking the mouse, pressing <Esc> or the <Cancel> screen button in the properties-dialog will all abort the object-creation process.

Pasting from Clipboard

When creating a table object by pasting from the Clipboard (menu item "Paste" or "Paste As" in the "Edit" menu or context menu) one must differentiate between two different cases:

- The Clipboard contains a **table object** which was itself imported to there from the Report Generator. In this case a complete copy of the object is made, which incorporates all properties already specified for it. Thus, the commands "Copy" and "Paste" in conjunction offer a fast method of duplicating objects.
- The Clipboard contains **text**, which was generated by any Windows application program. To create a table object from this material, the command "Paste As" must be used, as the command "Paste" would create a text object by default. The Report Generator tries to determine the dimension of the table automatically, by interpreting <Tab>-symbols as the demarcation between columns. The newly created cells are then filled with the corresponding portions of text. All other properties are set with the valid default settings.

The command "Paste Here" allows you to specify the location of a new object, at the same time as you transfer it from the Clipboard, otherwise the pasting position is determined automatically.

Drag & Drop

Left-click the mouse:

- in the imc FAMOS variables list on a selected entry,
- or on the column header in the imc FAMOS Data Editor

and drag the mouse while keeping its button pressed to the location in the layout which you wish the object to occupy, then release the mouse button. By holding the <Ctrl> button down, an entire selected region of the Data Editor can be drag and dropped.

A table object is created at the drop location and the column(s) are filled with the content of the data set(s) or data set(s). The number of rows is set automatically as a function of the length of the data set and the maximum relevant (in other words: maximum possible) number of rows.

All other properties of the table are given initial settings in accordance with the valid default settings for tables.

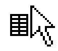
Remarks

If exactly one text variable is transferred, a text object is created, otherwise it will always be a table object

4.13.2 Marking Table Cells

The various properties can be specified separately for each cell of a table. But commands for table cells can just as well be made to operate on a selection of multiple cells. To specify which cell(s) should be manipulated by an operation, the selection must be marked.

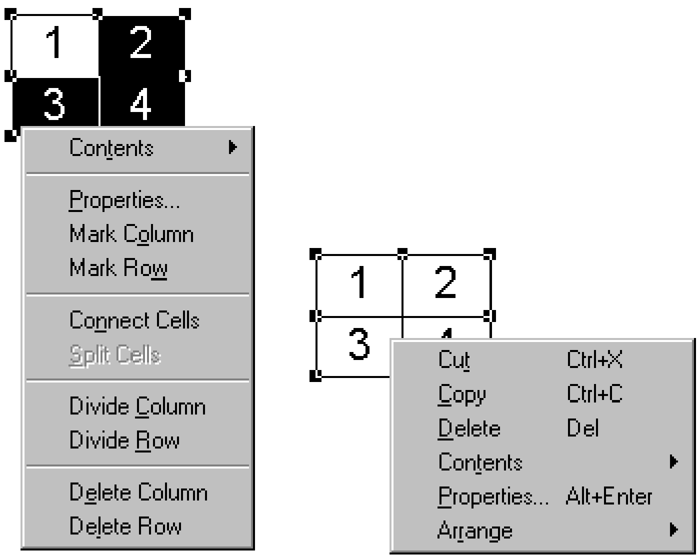
Proceed as follows to mark cells:

- Select the pertinent table
    - When you move the mouse pointer over the table now, the cursor takes on a different appearance: 
- You can now use the mouse to specify which region of cells to mark (left-click and sweep the cursor, while keeping the mouse button pressed, over the region).
- Holding down the <Shift> key allows you to mark additional cells by left-clicking the mouse over them.

A cell once marked will be distinguishable by its negative-colored appearance.

To revoke a cell-marking, deselect the table and then reelect it.

The accessibility of many items in the "Table" menu depends on cells of a table being marked. The structure of the context menu is also determined by this condition:



To **mark an entire row or column**, it is enough to mark any component cell and then use the command "Mark Column / Row" in the "Table" menu.

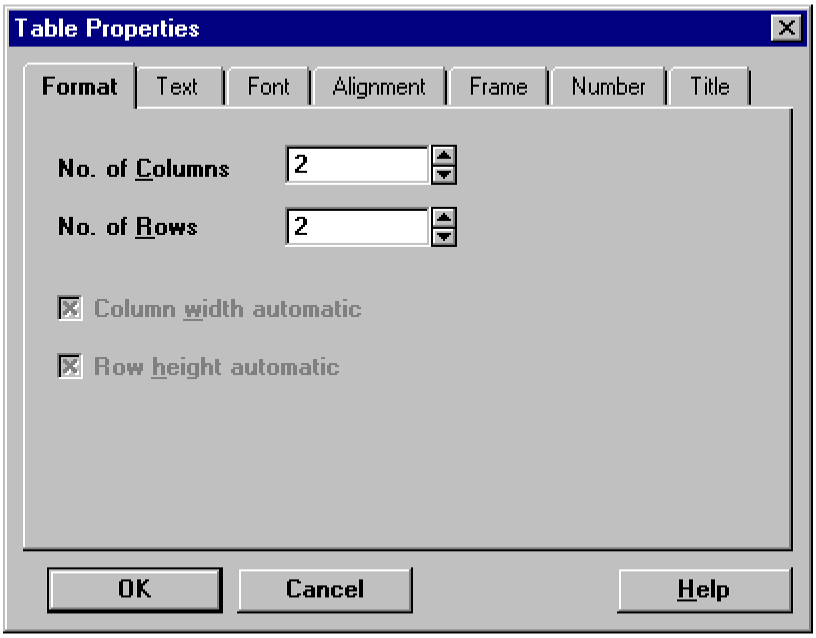
4.13.3 Changing Table Format

Aside from a table's content its most important attribute is its dimension, i.e., the amount of rows and columns it contains. The arrangement of the cells can also be influenced individually by specifying the width of columns or the height of rows. Cells can also be joined to other cells to form larger cells.

4.13.3.1 Changing the Number of Rows / Columns

The amount of rows and / or columns can be changed either via dialog or by deleting and dividing existing rows and columns.

Dialog "Table Properties: Format"



Calling the dialog is accomplished in the usual ways; either double-click on the object, or access menu item "Edit / Properties" or the context menu.

Attention

- The virtual index card "Format" is only available, if no cells are currently marked. When individual cells are marked, the setting controls in the dialog pertain only to marked cells. The format, however, is a global property.
- The settings made in this index card, in contrast to the other cards, are effective only after closing the dialog.

No. of Rows / Columns

Enter the amounts desired in these boxes. If the number is increased, the new cells are drawn either further to the right or further below, if the number is decreased they are erased beginning from the bottom or the right and moving up or to the left.

The outer measurements of the table remain unchanged in the process. If the width of the rows and columns was determined automatically (all equally wide or high), the available space is reapportioned evenly.

If the measurements of rows or columns were set manually (having once been manually edited), then the last row or column is halved to achieve an overall increase or the last two are fused to achieve an overall decrease; the measurements of the other rows and columns remain unaffected

Height/ Width Automatic

These two option boxes are only accessible, if the corresponding measurements are currently under manual control.

Automatic means that all rows have the same height and all columns the same width.

4.13.3.2 Deleting Rows / Columns

The following treats the deletion of columns; deleting rows is accomplished in an analogous manner.

To delete one or more columns of a table, all cells in that column must be marked.

This can be done either by marking all cells manually (see Section "*Marking Table Cells* 326" or marking just one cell of the column and selecting menu item "*Table / Mark column*", or the corresponding item in the context menu.

The entire column can now be deleted at one stroke using the item "Delete Column" in either the "Table" or context menu.

The outer measurements of the table remain unchanged in the process. If the column width was determined automatically, the available space is reapportioned evenly.

If the column width is under manual control (having one been edited manually), the column to the immediate left is expanded to fill the vacated space.

4.13.3.3 Dividing Rows / Columns

The following treats the division of columns; dividing rows is accomplished in an analogous manner.

To divide one or more columns of a table, all cells in those columns must be marked.

This can be done either by marking all cells manually (see Section "*Marking* 326 *Table Cells* 326" or marking just one cell of the column and selecting menu item "Table / Mark column", or the corresponding item in the context menu.

You can now split the column into 2 new, equally wide columns using the item "Divide Column" from either the "Table" menu or the context menu.

The outer measurements of the table remain unchanged in the process.

4.13.3.4 Connect / Split Cells

Multiple cells can be joined to form a new, larger cell.

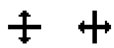
To do this, mark the cells which you intend to (see Section "*Marking Table Cells* 326"). The resulting markings must form a contiguous rectangular region of the table.
You can now use the command "Connect Cells" from either the "Table" or context menu to join the marked cells.
The new cells properties are adopted from the properties of the hitherto uppermost cell on the far left.
This connecting of cells is reversible via the command "Split Cells".

4.13.3.5 Changing Widths of Columns / Heights of Rows

When a new table object has been created, the heights of rows and the widths of columns are automatically set in such a way as to apportion available space evenly among the rows or columns.

Using the mouse, you can change the positions of the demarcations between separate rows or columns.

- To do this, first select a table object.
  - Next, move the mouse onto the border line which you intend to shift. The mouse pointer changes its form:.



- Now left-click the mouse and, while keeping the button pressed, move it to the intended new location of the border line. Releasing the button leaves the line stationary.

Remarks

To make all rows and columns have equal spacing once again, you can activate the options "Column Width Automatic" and "Row height Automatic" in the setting controls in the Properties dialog, on the index card "Format".

4.13.4 Change Properties

Along with their textual content, table cells possess a range of other properties. Examples are the font, orientation of the text, indentation, the colors of the frame and the background. As with any other object in the report layout, these properties can be specified in a dialog which consists of several virtual index cards.

In the dialog, you can set properties for either the whole table (i.e., for all cells in unison), or for a select group of cells.

If no cell is currently marked when the dialog is called, the specifications performed affect the whole table. The dialog then has the title "Table Properties".

To change the properties of select, individual cells, on the other hand, these must be marked before the dialog is called. (see Section "*Marking Table Cells* 326"). The dialog is then entitled "Table Properties (Selected Cells)".

Calling the properties dialog is accomplished in the usual ways:

- Double-click on the table object to be edited.
- Call the context menu by right-clicking the mouse on the table object and then clicking on the item "Properties" .
- Selecting an object and accessing menu item "Edit / Properties" allows you even to select multiple objects and change properties of them all at one stroke.

For changing the textual content of table cells, there are further possibilities available, as will be described in the next section.

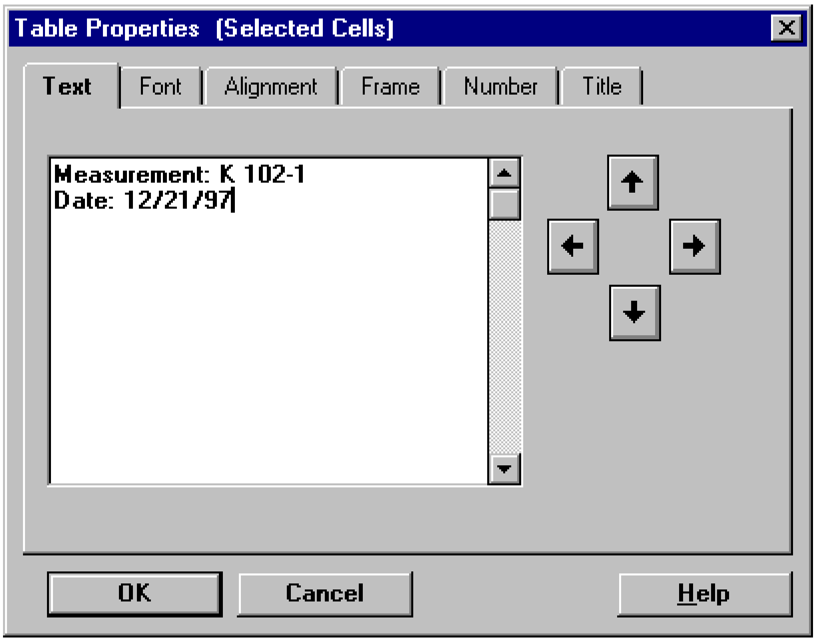
Some properties can be specified by commands emanating from a imc FAMOS sequence.

4.13.4.1 Content of Table Cells

As with text objects, there are various ways to change the content of table cells:

- Properties dialog, "Text" card
- Paste text from Clipboard
- Drag & drop
- Using imc FAMOS commands

Properties Dialog: Text



Enter the text as desired into the large box. The display in the report layout is continuously updated, while you do so. Press <Return> to begin a new line of text. Right-clicking the mouse calls a context menu, which offers the standard editing commands (Cut, Copy, etc.).

If **no cell is marked** at the moment you call the dialog (in which case, the dialog is entitled simply: "Table Properties"), the changes apply globally to the table; the entries you make will be written to all cells. If the cells previously each had their own content, the entry box will display the symbols "???" to ensure that you consider what you are doing.

If, on the other hand, **any or several cells were marked** (dialog entitled: "Table Properties: (Selected Cells)"), any entries apply only to marked cells.

If **exactly 1 cell** was marked, the **arrow buttons** (depicted above at right) are active. These allow you to proceed to the adjacent cell while the dialog is open, and enter text there. This is to be recommended, whenever you intend to write different text to separate cells. Instead of the screen buttons, the corresponding cursor buttons can also be used while holding down the <Ctrl> key.

Pasting Text from the Clipboard

Select a table for editing and mark the cells whose content you wish to replace with the content of the Clipboard. Unless a cell is marked, the entire table will be changed.

Access menu item "*Edit / Content / Paste*" or right-click the mouse over the table object and access the command "*Content / Paste*".

Hint: These menu items are only accessible, if there actually is text present in the Clipboard.

Pasting transfers the text from the Clipboard to the marked regions in the table. <Tab>-symbols are interpreted as the borders between columns.

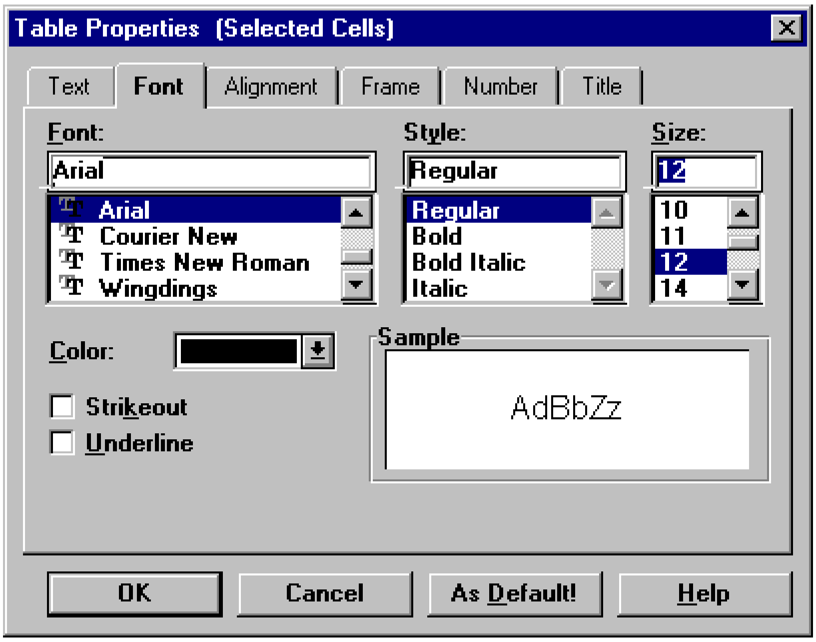
Drag & Drop

With drag & drop you can fetch data sets (possible sources: curve window, imc FAMOS variables list, column header or marked region in the imc FAMOS Data Editor) and deposit them over a cell of your choice in a table object. Numerical values are converted into text and are inserted down the column, beginning with the cell specified.

The number format, into which the conversion is made, is subject to the setting on the index card "Number" in the properties-dialog.

You can also use drag & drop to transfer a text variable from the imc FAMOS variables list into a table cell.

4.13.4.2 Font



The font can be changed either for all cells of a table in unison (if no particular cell is marked), or only for selectively marked cells.

If several cells are subject to the changes being made in the dialog, and there are properties which are not uniform among all the cells, those properties' boxes in the dialog will reflect the discrepancy by displaying "???" in the entry box. Entering new values specifies this property's setting for all affected cells at once, otherwise exiting the dialog will leave conditions unchanged.

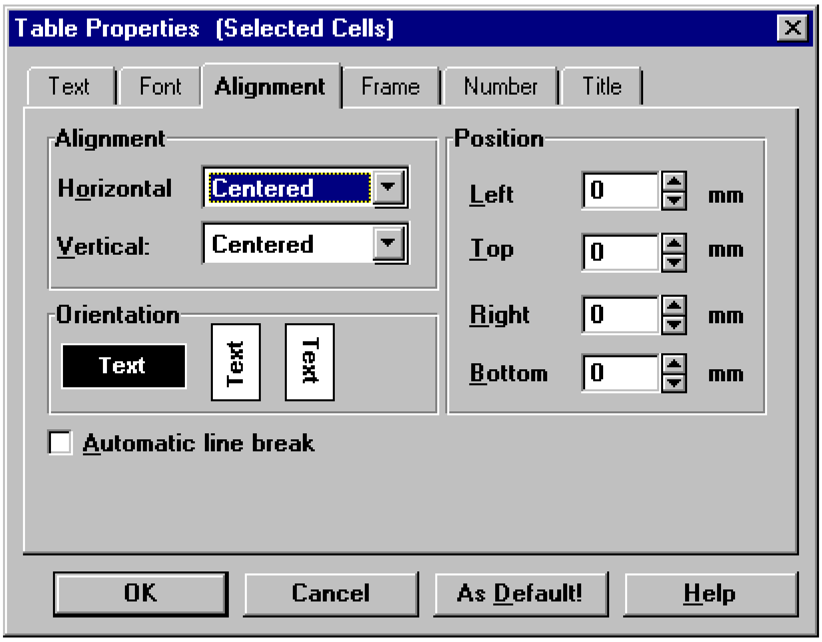
The dialog corresponds by and large to the standard Windows dialog for setting the font. Aside from the font itself (the list of fonts indicated depends on which are installed with Windows and the standard printer), the font size, additional attributes such as boldface, cursive, and the color can be specified.

By hitting the "As Default" screen button, all settings currently indicated are declared as the default settings, according to which future text objects are initialized.

Remarks

- It is generally recommended to choose a TrueType-font (distinguishable by a double "T" symbol in the list). These fonts guarantee a large capacity for being scaled up or down, as well as good agreement between the output on screen and on paper.
- If you are working with a 16-color color-depth, be aware that Windows can only display text in pure colors. These are indicated in the small rectangle in the upper right corner. If you select a composite color, produced by "dithering", Windows will implement the closest pure color instead.

4.13.4.3 Text Alignment



The font can be changed either for all cells of a table in unison (if no particular cell is marked), or only for selectively marked cells.

Alignment

Here you can specify whether the text should be aligned to the left or right margin or be centered.

Orientation

Click on the screen button which reflects the orientation you wish to give your text.

Automatic Line Break

This option causes typed text to jump to the beginning of the next row, analogously to <Return>, at such a point as to prevent the width of the text space from exceeding the width of the text object, as the latter was previously defined. The line break always occurs at an entry of <Space> or <Tab>.

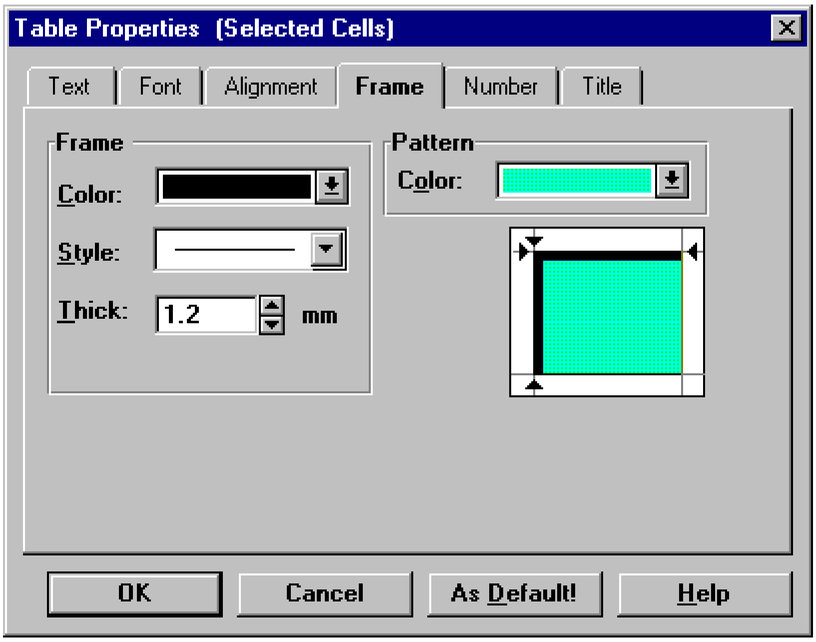
Position

Here you can specify indents for the text layout. Entering "Left: 5mm" signifies that the text printout begins five millimeters away from the left border of the object.

As Default!

When you press this screen button, all the current entries in the dialog are declared as the valid presettings for subsequently created objects.

4.13.4.4 Frame and Background



In this dialog you can design a frame and a background for the text object.

The design can be changed either for all cells of a table in unison (if no particular cell is marked), or only for selectively marked cells.

The individual edges of the frame can be designed separately. The edge which is currently being treated is distinguished in the preview window by arrows; as seen above, where the upper and left edges are being edited.

When the dialog is first called, all edges are active and ready to be edited. Left-clicking the mouse over a particular edge leaves only that one active. You can add additional edges to the currently active set by clicking on it while holding down the <Shift>-key.

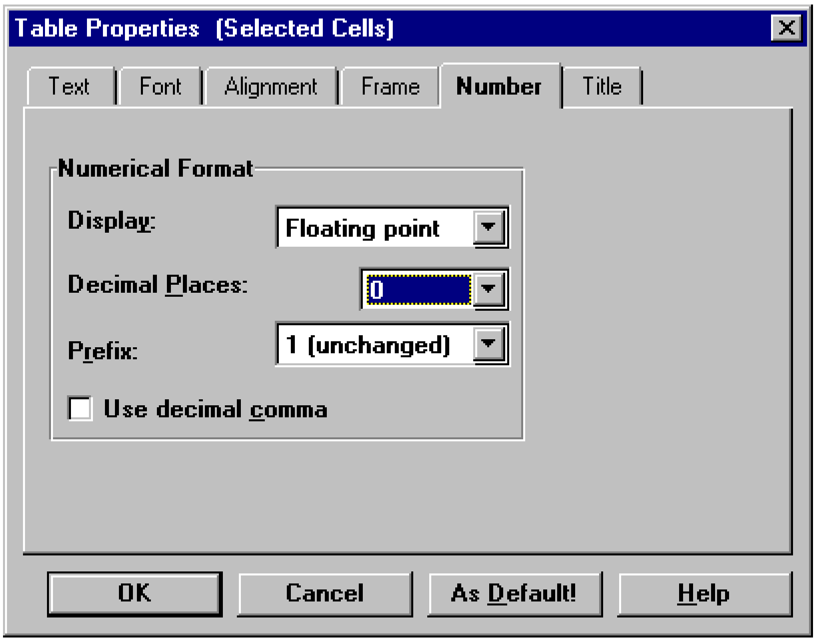
When you press the "As Default!" screen button, all the current entries in the dialog are declared as the valid presettings for subsequently created objects.

Remarks

- If **neither a frame nor a background** is desired, set their colors to "Transparent".
- A **Line Thickness** of 0 means that the edge will be drawn with the thinnest possible line (hair line), in other words with one screen pixel and one printer dot.
- If multiple cells, having different background colors, are marked, this constitutes an undetermined state and is denoted in the preview window by **gray hatching**.
- If you are working with a **16-color color-depth**, be aware that Windows can only display text in pure colors. These are indicated in the small rectangle in the upper right corner. If you select a composite color, produced by "dithering", Windows will implement the closest pure color instead.

4.13.4.5 Number format

It is possible to specify a fixed number format for table cells. This is useful for cases where remote control or drag & drop. deposits data sets, and thus numerical values, into the table. This way, the display in your table can be made uniform, although the content may stem from a variety of sources and may have different formats.



The setting can be made either for all cells of a table in unison (if no particular cell is marked), or only for selectively marked cells.

If the cells are still empty, the settings are applied the first time data is transferred by drag & drop or remote control. If data is already present, these are immediately reformatted.

Display

you can choose among:

- **Floating point:** Floating point notation uses the E-character to indicate the exponent, following its sign and preceding its absolute value; for example: 1.00023+E4.
- **Fixed point**: e.g., 1000.23
- **Automatic**: The notation used depends upon the particular number; the shortest notation is used.

Decimal Places

Here you can set the amount of decimal places to use. The options range from 0 to 14. If no places after the decimal are to be used, the point is also omitted.

Prefix

Numerical values can have a fixed prefix appended to them. Take, as an example, a measurement of a current of 0.1A. Choose the prefix "milli" to display the value in mA. In this case, the value would be multiplied by 1000. "1 (unchanged)" leaves a value in the notation as it was entered. Setting a prefix is recommended especially where fixed point notation is used. If the values vary strongly in their orders of magnitude, it is preferable to use floating point notation.

Use Decimal Comma

Replaces the decimal point with a comma. Otherwise the global setting in "*Extra\Options\Display and Curve window*" is used.

As Default!

When you press this screen button, all the current entries in the dialog are declared as the valid presettings for subsequently created objects.

4.14 Curves

Curve objects serve to display the graphic content of imc curve windows.

Curve windows can be transferred into curve objects simply by the click of a mouse. Towards this end, the curve window itself generates the graphic information in the form of a meta-file, and exports it to the curve object. The appearance of the graph is in large measure determined by the settings for the curve window ("Colors..", "Clipboard Settings..", "Legends..").

Remarks

As an alternative to using a curve object for displaying a graph in the report layout, the content of the curve window can be copied to the Clipboard by accessing menu item "<> / Clipboard". Afterwards, you can insert the resulting meta-file into the Report Generator via its menu item "Edit / Paste". Note, however, that in this case you won't have the option of replacing the graph by simply selecting another curve window; the meta-file read to the Report Generator is treated as a "picture"-object.

4.14.1 Creating Curve Objects

There are two methods available for placing a curve object into the report layout:

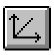
- Define one manually from scratch,
- Drag & drop in conjunction with a curve window.

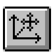
Placing Manually

When creating a curve object one must differentiate between the objects "Curve" and "Curve Fixed Size".

Note with "Curve Fixed Size" that the object's size at placement is determined by the curve window setting "Opt. / Clipboard Settings../ Coordinate System".

To establish a curve object, access items "Curve" or "Curve Fixed Size" in the "Object" menu, or the corresponding screen button in the left toolbar.

 **Curve Fixed Size**

 **Curve**

- **"CURVE":** The mouse pointer is transformed into a crosshairs-cursor, as soon as it is moved to above the report sheet.. Left-click the mouse on the position where you wish one corner of the curve object to be, and, while holding the mouse button down, draw the object perimeter open to the desired shape and size; then release the button. The process can be aborted at any time by right-clicking the mouse or pressing <Esc>. Depending on the valid settings, the resulting rectangle reflects either the dimensions of the entire curve object, or the location of the coordinate system.
- **"CURVE FIXED SIZE":** As soon as you move the mouse pointer to over the report sheet, you see the size of the curve object according to the valid settings in the curve window. You must drag the frame to the position desired and place it by left-clicking the mouse. The process can be aborted at any time by right-clicking the mouse or pressing <Esc>. Depending on the valid settings, the mouse position is indicates the location of the left upper corner of either the entire curve object or the coordinate system.

- The mouse pointer now takes on the shape of a hand-cursor. By clicking on an open imc curve window you will cause the content of the curve window to be exported to the curve object. The exportation can be aborted by right-clicking the mouse of via <Esc>.

Drag & Drop with the Curve Window

Click on the curve window desired and drag the mouse, while keeping its button pressed, to its prospective location in the report layout. The curve object is thus established and furnished with the content of the curve window. The object's size is subject to the valid settings in the curve window ("Opt. / Clipboard / Coordinate System"). Depending on the valid settings, the mouse position is indicates the location of the left upper corner of either the entire curve object or the coordinate system.

Remarks

An object of the type "Curve Fixed Size" is in every other respect equivalent to a "normal" curve object. The only difference is that during its inception, the option "Size of Curve Object: Automatic.." is active. See Section "*Additional Curve Object Properties* 341", for more details.

4.14.2 Changing Content of Curve Objects

The content of a curve object can be redefined at any time. You can even replace the content of a curve object with material from a different curve window. Towards this end, there are various options:

- Select a curve window by a click of the mouse
- Drag & drop
- Commands emanating from imc FAMOS

Selecting a Curve Window by Mouse-Click

Double-click on the curve object concerned. The mouse pointer is transformed to a hand-symbol.

Now left-click the mouse on the curve window, whose content you wish to import.

Drag & Drop

Left-click on the curve window, whose content you wish to import, and hold the button down.

With the mouse button held down, move the mouse over the curve object to be updated and then release the button.

Remarks

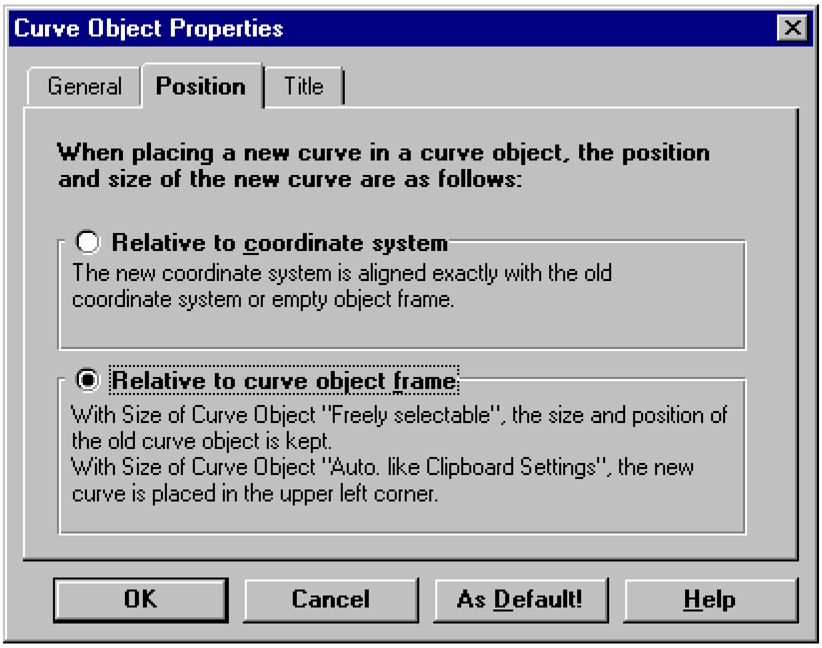
The appearance and position of the graph is determined by the object's properties as specified in the Report Generator. The position is subject to the controls on the "Position"-card of the "Properties" dialog.

The setting controls on the "General"-card of the "Properties" dialog let you specify whether the settings in the curve window ("Opt. / Clipboard Settings.."), or the valid settings for the object itself should be implemented. This pertains to such properties as font, line thickness, etc.

4.14.3 Positioning the Graph When Importing into the Curve Object

How the graph is positioned when importing from the curve window to the curve object is subject to the setting controls on the "Position"-card of the "Properties" dialog.

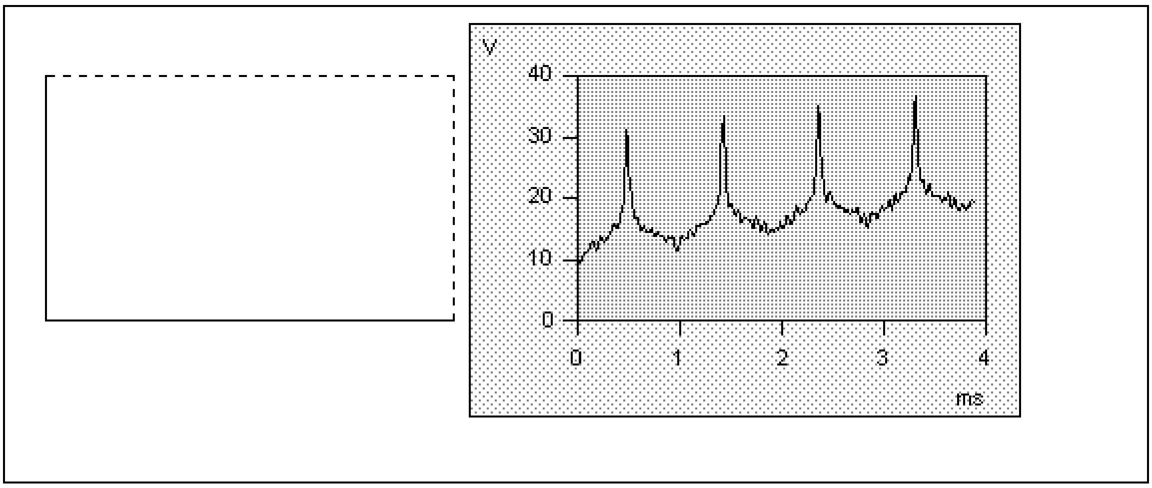
Attention: In contrast to other layout objects, a curve object requires you to **hold down the <Alt> key if calling the dialog with a double-click**. Otherwise, a double-click starts the routine for selecting a curve window.



Relative to Coordinate System

A curve object featuring this option is distinguishable by dashed lines as its top and right edges.

The perimeter which one spreads open when first creating the object determines the position of the **coordinate system**. After the importation, the curve object is enlarged accordingly, in order to accommodate the scaling and legends in the display.



In the picture above, the dark hatching denotes the object's space before the importation, the light hatching the space afterwards.

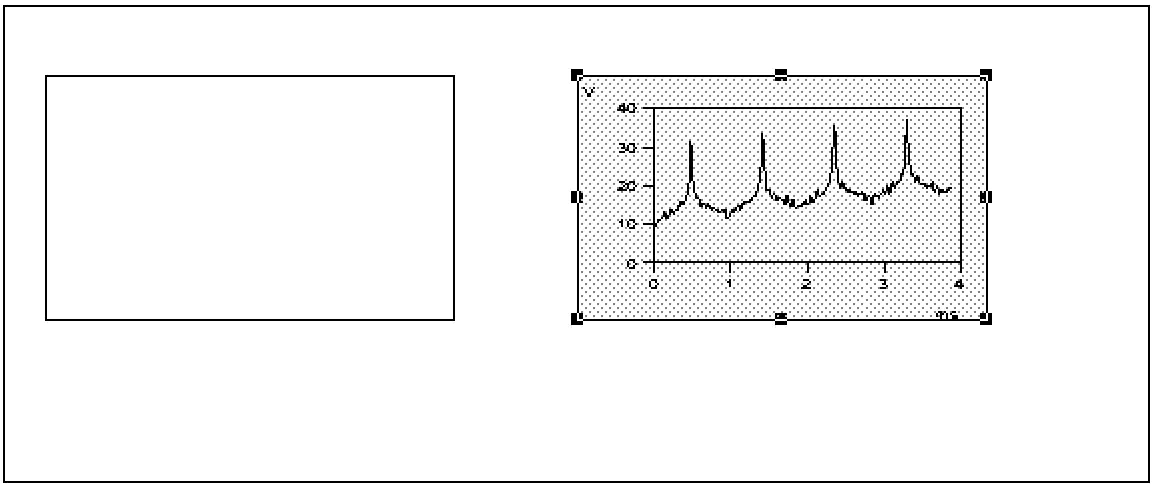
This option is to be recommended whenever there are multiple curve objects to place in the layout, and their coordinate systems should appear aligned.

If the curve object is already occupied by a graph, the new graph incorporates the location, size and shape of the old coordinate system upon importation.

Relative to Curve Object Frame

An empty curve object featuring this option is distinguishable by solid lines as its edges.

With objects created using the menu item "Object / Curve", the perimeter spread open at the outset is indicative of the **total size of the curve object**. Upon importation, the graph is so scaled as to "compress" it into the available space. The curve object's size doesn't change the way it would with the other option activated, as above.

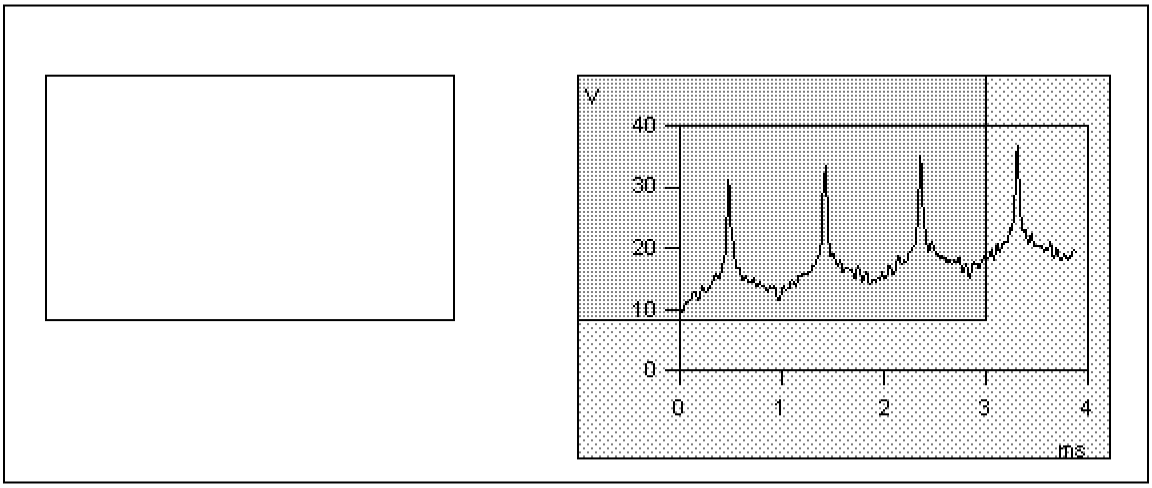


The illustration above depicts the object's originally specified space as hatched.

This option is to be recommended, when it is important to establish an object's total space allotment, in order to avoid overlapping

The curve object retains its space despite any subsequent imports of graphs; the new material's size and shape is always adapted to the available space.

With "Curve Fixed Size", the upper left corner of the curve object is determined from the originally entered perimeter. At importation, the size of the coordinate system is subject to the valid settings in the curve window; the graph is arranged together with the accompanying scaling and legends. The size of the curve object is usually changed in the process.



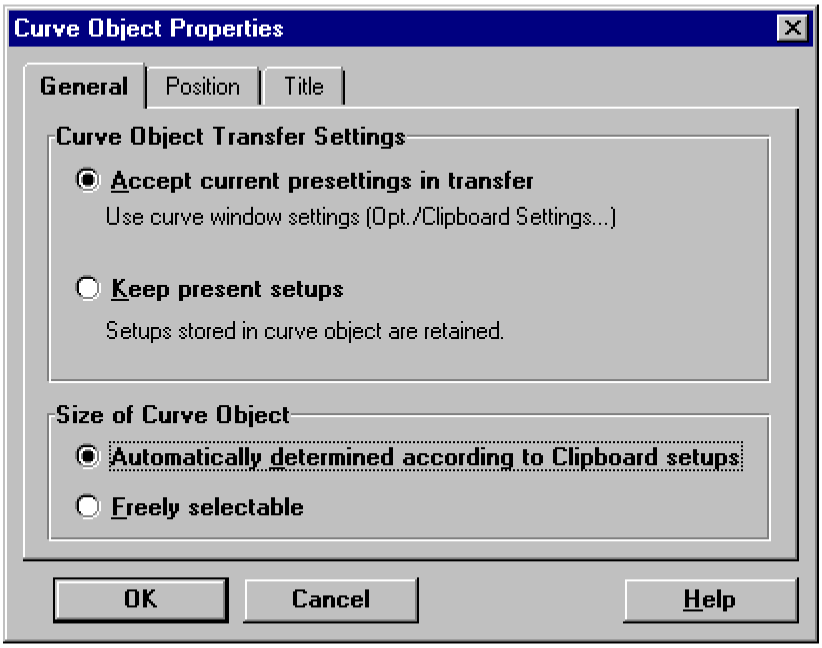
In the picture above, the dark hatching denotes the object's space before the importation, the light hatching the space afterwards.

4.14.4 Additional Curve Object Properties

Other settings for curve objects' attributes can be made on the "General"-card of the "Properties" dialog.

Attention

In contrast to other layout objects, a curve object requires you to **hold down the <Alt> key if calling the dialog with a double-click**. Otherwise, a double-click starts the routine for selecting a curve window.



Curve Object Transfer Settings

The appearance of the curve upon importation into a graph depends on, among other things, the settings in the dialog "Opt. / Clipboard" of the curve window. There, you can specify the line thickness and -type, the width and height of the scaling, fonts, and more.

At the first importation of a curve into a curve object, the above mentioned settings are implemented. At each subsequent importation, you may choose whether to implement the currently active options of the curve window, or those of the curve object.

Accept current presettings in transfer

The current settings under "Opt. / Clipboard" are used.

In other words, if you have selected a particular font and line thickness, and would like to apply these to an imported curve, first activate this option for the curve object and then import the graph from the curve window.

Once an object was imported using this option, the settings for the Clipboard are written to the curve object.

Keep present setups

If you wish to retain the Clipboard settings stored by the curve object, activate this option. If you then subsequently import graphs from curve windows into this object, the stored Clipboard settings are used, irrespective of the current Clipboard settings.

This option should be used, whenever you intend to create multiple reports with a common layout and wish not to be obliged to check the curve window's current settings each time.

Size of Curve Object - Automatically determined ...

The size of the curve object is adapted to the settings in the curve window (menu item "Opt. / Clipboard") for the coordinate system's dimensions.

If you reactivate this option, once it was deactivated, the curve object isn't updated; the setting is only implemented for subsequent imports.

This option is active, if you create a new curve object via menu item "Object / Curve Fixed Size".

Size of Curve Object - Freely selectable

The size of the curve object can be arbitrarily specified by the user and arbitrarily changed later.

If you wish to change the size later, you should keep the page proportions approximately intact and use freely scaleable fonts (TrueType). Otherwise, it could occur that the labels and the coordinate axes overlap. Upon importation, the font is set according to the original size.

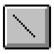
This option is active if a new curve object is created via the menu item "Object / Curve".

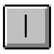
4.15 Lines

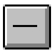
4.15.1 Creating Line Objects

Simple Lines

For making straight lines there are 3 separate tools available, which can all be found under the "Object" menu or in the left toolbar.

 Line

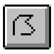
 Vertical line

 Horizontal line

- Select the desired command either from the menu or the toolbar.
- Left-click the mouse at the location where your prospective line has one end, then drag the mouse while holding its button down to the other end of the line; then release.

Polylines

To create a polyline consisting of several straight line segments, access menu item "Object / Polyline" or the corresponding screen button in the left toolbar.

 Polyline

- Left-click the mouse at the desired position of a corner- or end point of the object.
- Mark each additional corner point (except the last) with another left-click (the closing of the polygon is handled automatically).
- Define the last corner of the polygon by double-clicking at its location.

Creation of the object can be aborted by right-clicking the mouse or via the <Esc>-key.

Remarks

As with any object, a new line could be created by duplication; copying an existing one to the Clipboard and transferring it back from there.

4.15.2 Change Properties

Line objects are characterized by their color, line thickness, and, excepting polylines, the shape of their ends.

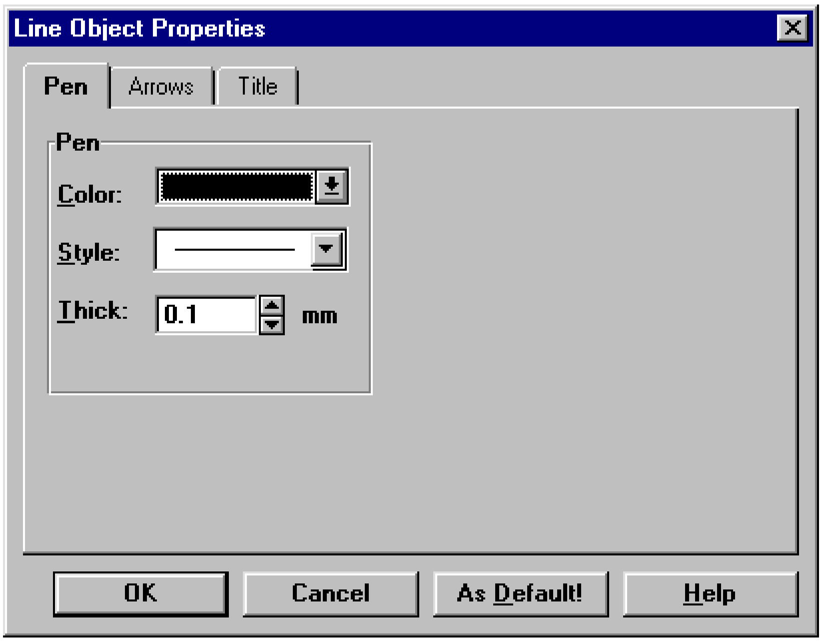
As with any other object in the report layout, these properties can be specified in a dialog which consists of several virtual index cards.

Calling the properties dialog is accomplished in the usual ways:

- Double-click on the line object to be edited.
- Call the context menu by right-clicking the mouse on the line object and then clicking on the item "Properties" .
- Selecting an object and accessing menu item "Edit / Properties" allows you even to select multiple objects and change properties of them all at a single stroke.

4.15.2.1 Line Thickness and Color

To change the line thickness or color of a line, use the "Pen"-card in the properties dialog.



If multiple lines are currently selected when the dialog is called, changes specified will be applied to all selected lines. Attributes whose settings differ among the selections are denoted by "???" in the dialog's corresponding boxes.

As Default!

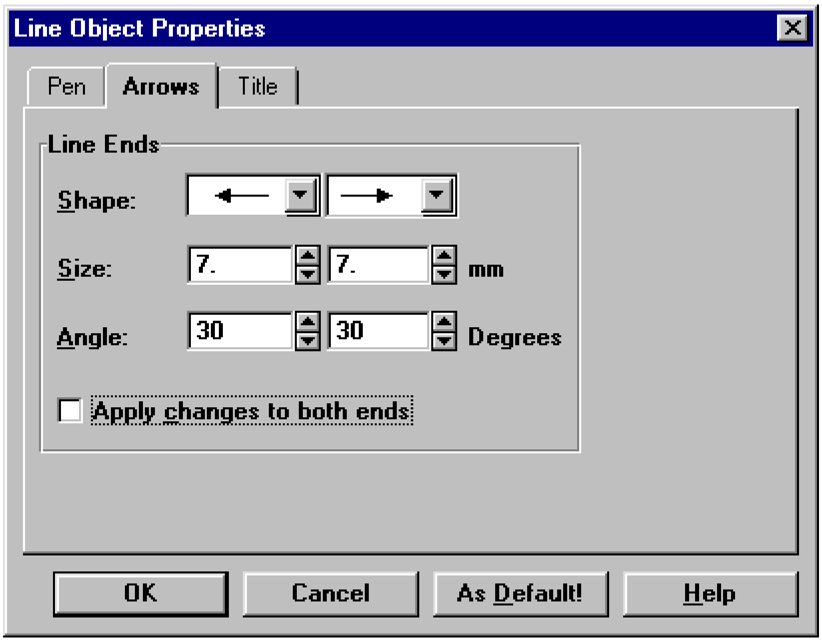
When you press this button, all the current entries in the dialog are declared as the valid presettings for subsequently created objects.

Remarks

- A **Line Thickness** of 0 means that the edge will be drawn with the thinnest possible line (hair line), in other words with one screen pixel and one printer dot.
- If you are working with a **16-color color-depth**, be aware that Windows can only display text in pure colors. These are indicated in the small rectangle in the upper right corner. If you select a composite color, produced by "dithering", Windows will implement the closest pure color instead.

4.15.2.2 Line Ends and Arrows

To change the shape of a line's ends, use the "Arrows"-card in the "Properties" dialog. This card isn't present, however, for a polyline.



Shape

The shapes available are indicated in this list box. whether or not the other entry boxes, "Size" and "Angle", are present depends on what selection is active here.

Size

Specify the desired size for the line's ends here. For arrows, specify the arrowhead's length (the width is then determined from the accompanying angle specification), for circles, the diameter.

Angle

This option is offered only if "arrow" is the specified shape. The angle can take any value between 0...45° and denotes the angle between the shaft of the arrow and the arrowhead's edge. In other words, the arrowhead's total splay is twice the specified angle (max. 90°).

Apply Changes to Both Ends

An aid for making the settings. Activating this option causes the setting for the opposite line-end to be adapted automatically.

As Default!

When you press this screen button, all the current entries in the dialog are declared as the valid presettings for subsequently created objects.

Remarks

If multiple lines are currently selected when the dialog is called, changes specified will be applied to all selected lines. Attributes whose settings differ among the selections are denoted by "???" in the dialog's corresponding boxes.

4.16 Frames and Areas

4.16.1 Creating Frames and Areas

Simple Frames and Areas

The following tools, accessible either from the "Object" menu or the left toolbar are provided for creating simple frames and areas:

Frame

Rectangle

Rectangle (rounded)

Ellipse

- Select the desired command either from the menu or from the toolbar.
- Left-click the mouse at the position of one corner of the object (for ellipses: one corner of the circumscribed rectangle), and spread the perimeter open, while holding the mouse button down. Finally, release the button when the object has assumed the proper shape.
- To set the rounding of the corners for "Rectangle (Rounded)" objects, activate "Select"-mode (via menu item "Object / Select", or the pointer-icon in the upper toolbar), and use the additional "handle" appearing in the bottom right region of the object. When the mouse pointer is over this handle, it becomes a standard Windows "move"-prompt. Left-click the mouse on this and drag the handle to where you wish to have the central point of the rounding-radius; then release the mouse button. Symmetric radii are drawn at all four corners.

Polygons

To establish a polygon object, access item "Polygon" in the "Object" menu, or the corresponding screen button in the left toolbar

Polygon

- Left-click the mouse at the desired position of a corner- or end point of the object.
- Mark each additional corner point (except the last) with another left-click (the closing of the polygon is handled automatically).
- Define the last corner of the polygon by double-clicking at its location.

Object creation can be aborted by right-clicking the mouse or via <Esc>.

Remarks

- As with any object, a new polygon could be created by duplication; copying an existing one to the Clipboard and transferring it back from there.
- The command "Frame" simply creates a rectangle object with the presetting "Background: Transparent". Using that option, it is possible to switch between the representation as a frame- and as a rectangle object.

4.16.2 Changing Frames and Backgrounds

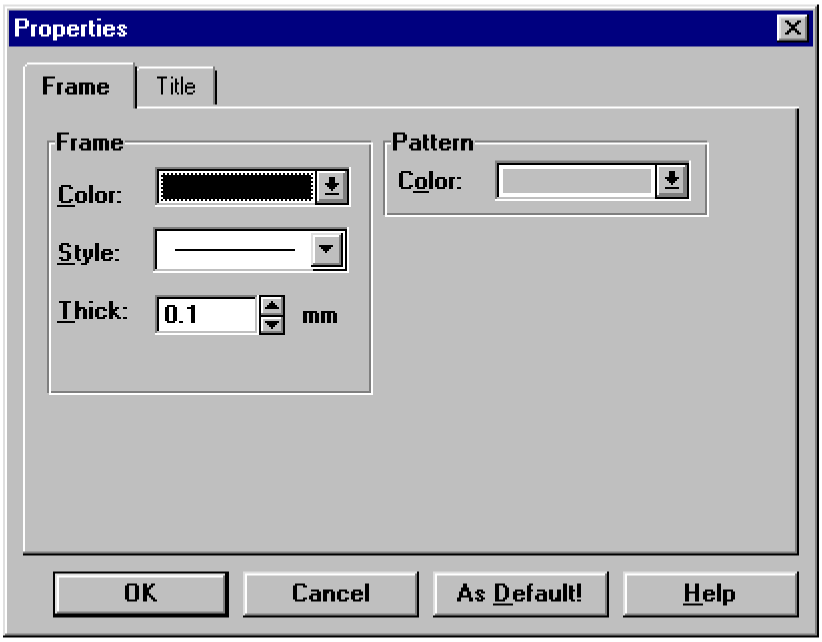
Frame- and area objects are characterized by the color and line thickness, and the background color, respectively.

The difference between a frame and an area is that the former features the attribute: "Background: Transparent".

As with every other object type available for the report layout, these properties can be set via a dialog which consists of several "index cards", on which the controls for several related attributes appear.

Calling the properties dialog is accomplished in the usual ways:

- Double-click on the table object to be edited.
- Call the context menu by right-clicking the mouse on the table object and then clicking on the item "Properties"
- Selecting an object and accessing menu item "Edit / Properties" allows you even to select multiple objects and change properties of them all at one stroke.



If multiple objects are currently selected when the dialog is called, changes specified will be applied to all selected objects. Attributes whose settings differ among the selections are denoted by "???" in the dialog's corresponding boxes.

When you press the <As Default!> screen button, all the current entries in the dialog are declared as the valid pre-settings for subsequently created objects.

Remarks

- A **Line Thickness** of 0 means that the edge will be drawn with the thinnest possible line (hair line), in other words with one screen pixel and one printer dot.
- If you are working with a **16-color depth**, be aware that Windows can only display text in pure colors. These are indicated in the small rectangle in the upper right corner. If you select a composite color, produced by "dithering", Windows will implement the closest pure color instead.

4.17 Picture Objects (Bitmaps and Meta-files)

4.17.1 Introduction

A picture object contains a bitmap or meta-file graphic. Bitmap and meta-file are the standard Windows formats for storing and transferring graphs.

Bitmap

A bitmap is the complete data of the color display at each point of a graph. In newer versions of Windows, DIB-format (Device Independent Bitmap) is commonly used. This guarantees a similar display of a graph by every output medium (monitor, printer, etc.).

The drawbacks are the immoderate demands on storage space for pictures of large size or color depth, and the loss of quality when magnifying a picture or reducing its size.
Pixel-based drawing applications, such as Windows Paint, tend to use bitmap format.

Meta-file

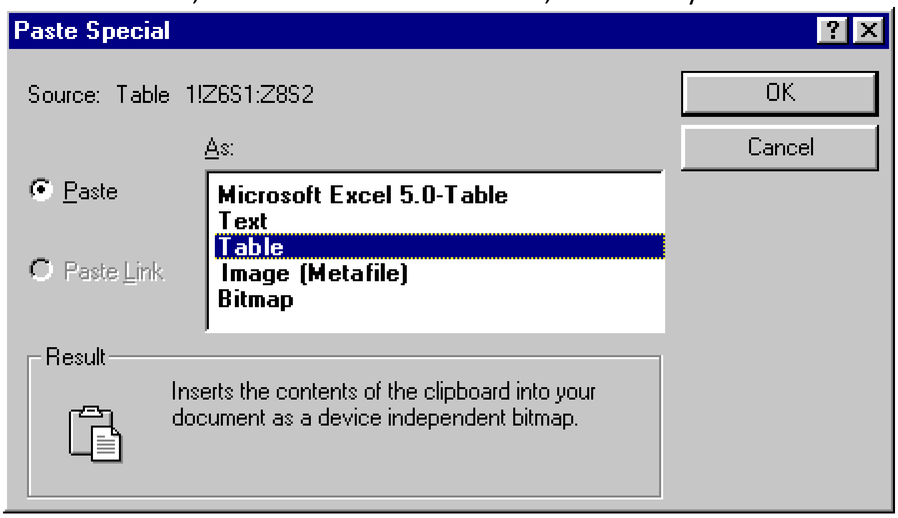
Meta-files, on the other hand, contain a sequence of graphing commands, which are stored in a file by the application programs which issue them. The program for displaying the picture executes these commands to generate the graph. The advantages of this format (as well as bitmaps) are the decreased demand on space and the better scalability.

Due to these advantages, the meta-file format is the one preferred by most graphics-oriented Windows application programs for transferring pictures via the Clipboard. The Report Generator also uses this format whenever the command "Copy" is executed.

4.17.2 Inserting Picture Objects

Picture objects cannot be created directly by the Report Generator, but arise rather when material is transferred from the Clipboard. To insert a firm's logo into a report, for example, first draw the logo using a suitable program (e.g. Paint), and then transfer it into the report via the Clipboard
To do this, use the command "Paste" or "Paste As" from either the "Edit" menu or the context menu (right-click the mouse over an unoccupied space in the report sheet).
The "Paste" command uses the meta-file format as its first choice, if various formats are available to choose among.

With "Paste As", the user chooses the format, if necessary.



Normally, the meta-file-format is preferable to bitmap formats, including DIB-format.

Remarks

If the source program supports it, importation of a file in the original format (in this case *"Excel 5.0 Table"*) is offered. This creates an OLE-link.
This slows down the program execution and raises the demands on resources. This format, then, should be chosen only if you anticipate subsequently editing the object from the source program. Further information on OLE-objects is to be found in the next section.

4.18 OLE Objects

4.18.1 Introduction

OLE (Object Linking and Embedding) denotes a Windows-internal mechanism for transferring information between application programs.

In contrast to transferring data via the Clipboard, where conversion into a data-format which is understood by both programs takes place, the use of OLE-links doesn't involve conversion. Rather, editing and display of the object is handled by the source program.

There are two options to choose from -embedding and linking. The main difference between the two is in the location where they are stored.

Embedding

"Embedding" signifies the insertion of data, such as a diagram, a formula or a spread sheet, into a report document. The insertion makes the data (the object) an integral part of the report. By double-clicking the mouse on an embedded object, the source program is called and the object can then be edited. The changes are displayed in the report document. You can embed an existing object, an existing file, or an existing marker; or you can create and embed a new object / file.

Linking

"Linking" doesn't store object data in the report document, but provides, rather, a reference to the original document. If the original document is changed, the content can be updated in the Report Generator either manually or automatically; then the current content of the original is once again displayed. The precondition for this type of connection is that the original is constantly accessible, but the size of the report is only slightly increased.

Embedded and linked objects can be subsequently converted, if desired. Both options also require the source program (the OLE-server) to be accessible for display and editing. The Report Generator functions as an OLE-container, that is to say, objects to be manipulated by OLE-servers can be embedded and linked to it.

Attention

Data transfer via OLE in Windows is a highly effective and user-friendly means of connecting data belonging to different application programs.

BUT: Due to its being designed as a versatile and universal interface, together with the fact that, often, several application programs are open in the background, the OLE tends to use a lot of resources. It is very taxing even for computers equipped with high speed and ample storage.

It also frequently occurs that the embedding and linking procedures are implemented incorrectly, and that problems with, for instance, the scaling or proportions in a re-scaled display of an OLE object result. Because of the complexity of the processes involved, and the multitude of possible client-server-combinations, which cannot all be tested, hardly any Windows application program is immune to making such errors.

For these reasons, OLE should only be used when it is necessary and practical to subsequently edit data from the source program, or to automatically adopt changes made to linked data.

Example

To insert a company logo, which is unlikely to need altering or to be replaced soon, it may make more sense to insert the graph directly as a bitmap or meta-file.

4.18.2 Inserting OLE Objects

There are various ways to insert an OLE object into the report layout:

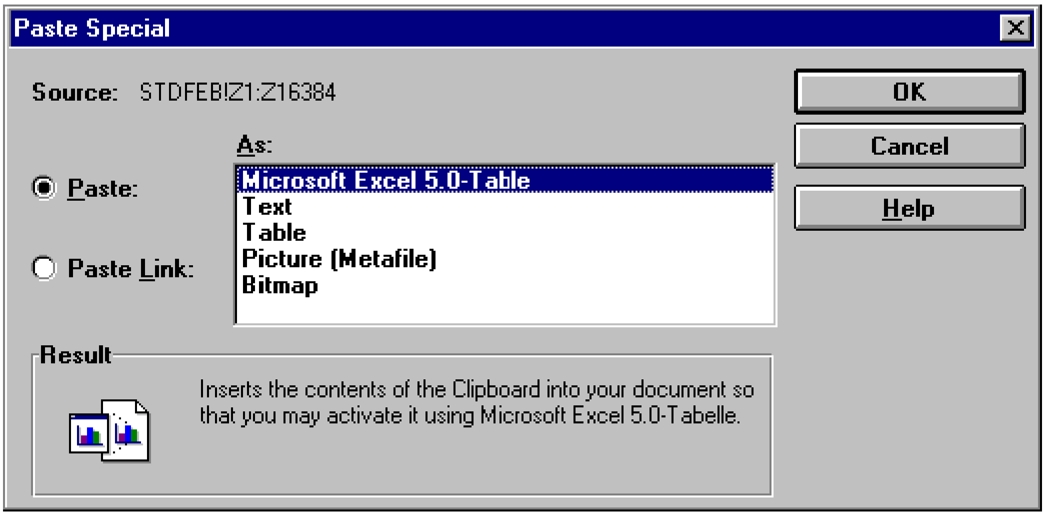
- Paste from the Clipboard
- Create a new OLE object from the source program
- Insert (paste) a file

Pasting from the Clipboard

First open an application program with OLE-server capability, and create or load the document to be pasted.

Mark (select, highlight) the portion to be pasted and access the command "Edit / Copy" or whichever analogous command is offered by the particular program (see program documentation, if necessary).

Activate the Report Generator and access either the command "Edit / Paste" or "Edit / Paste As", or the corresponding items in the context menu.

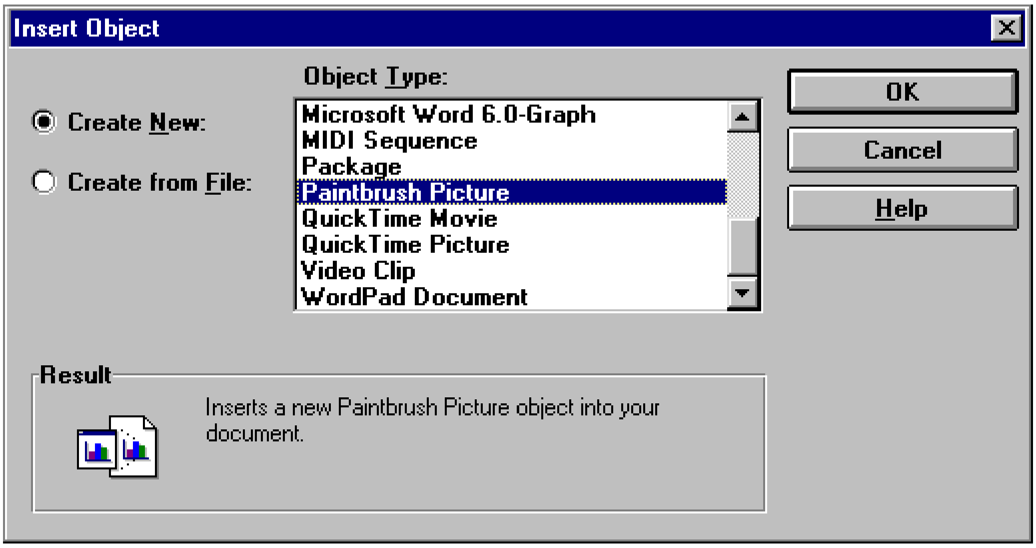


In the dialog box which then appears, select the entry for the source's format, which is usually at the top of the list and is denoted by the name of the pertinent program. (here: "Microsoft Excel 5.0 Table").

Then activate either the option "Paste" (embeds the object) or "Paste Link" (creates a link), and exit the dialog via <OK>.

Creating a New OLE Object

Access the command "New OLE Object" from either the "Edit" menu or the context menu. In the dialog which then appears, there is a list of available object types, generally including an indication of the source program. The content of the list depends on which of the application programs installed on your computer support OLE.



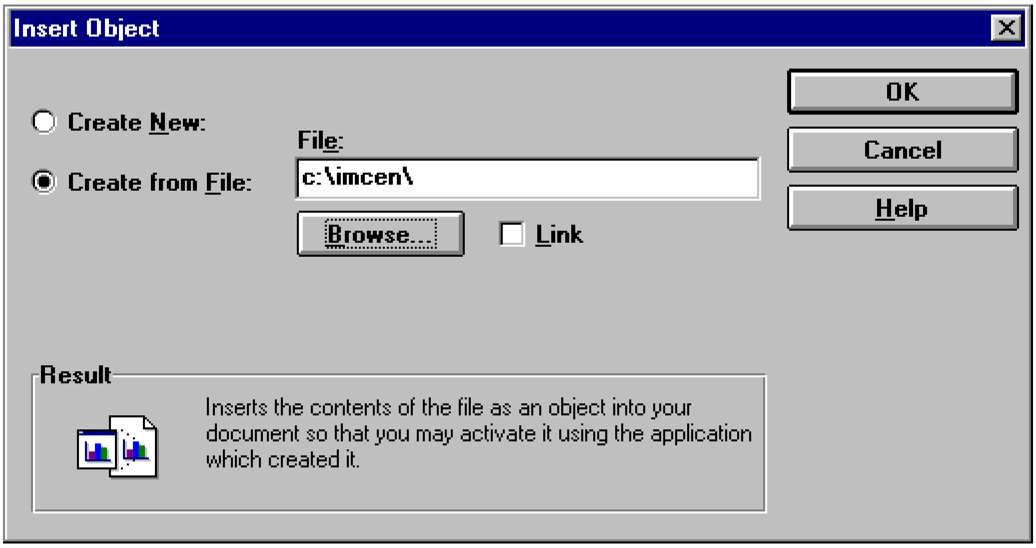
Select the object type desired and close the dialog via <OK>.

This opens the selected application program, with which you can create the new object. Either a new window containing the program is opened, or the program is "enveloped" by the Report Generator main window, and occupies the menus and toolbars with its own items. For information on the editing of objects by the source program, see Section "*Editing OLE Objects* 351".

Pasting from a File

Access the command "Edit / New OLE Object"

In the dialog which then appears, activate the option "Create from File".



Remarks

- In the "File" box you can enter the desired file's name.
- "Browse" allows you to select a file from a standard Windows file dialog. If the "Link" option is activated, a link to the source document is created, otherwise the data are embedded.
- The object is inserted as soon as you exit the dialog via <OK>.

4.18.3 Editing OLE Objects

4.18.3.1 Editing an Embedded Object

Embedded objects are edited in the source program. In most cases, it is possible to open this program by double-clicking the mouse over the object. Otherwise, proceed as follows:

- Select the object.
- The last entry in the "Edit" menu is designated with the name of the selected object (e.g., "Table Object" for a Microsoft-Excel table).
- In the appertaining submenu, select one of the options "Edit" or "Open".
- **"Open":** The application program replaces the Report Generator's toolbars and menus with its own and thus allows you to perform the operations from within the Report Generator work space. To end the "Edit"-mode, click outside of the embedded object or press <Esc> (perhaps repeatedly). If the server program doesn't support such on-site editing, the effect of "Edit" is as for "Open" (below).
- **"Open":** The application program opens a separate window, in which the object can be edited. Upon completing the editing, return to the Report Generator by selecting the menu item "File / Close".

4.18.3.2 Editing a Linked Object

Links are always edited from within the source program. In most cases, it is possible to open this program by double-clicking the mouse over the object. Otherwise, proceed as follows:

- Select the object.
- The last entry in the "Edit" menu is designated with the name of the selected object (e.g., "Table Object" for a Microsoft-Excel table).
- In the appertaining submenu, select the option "Open".

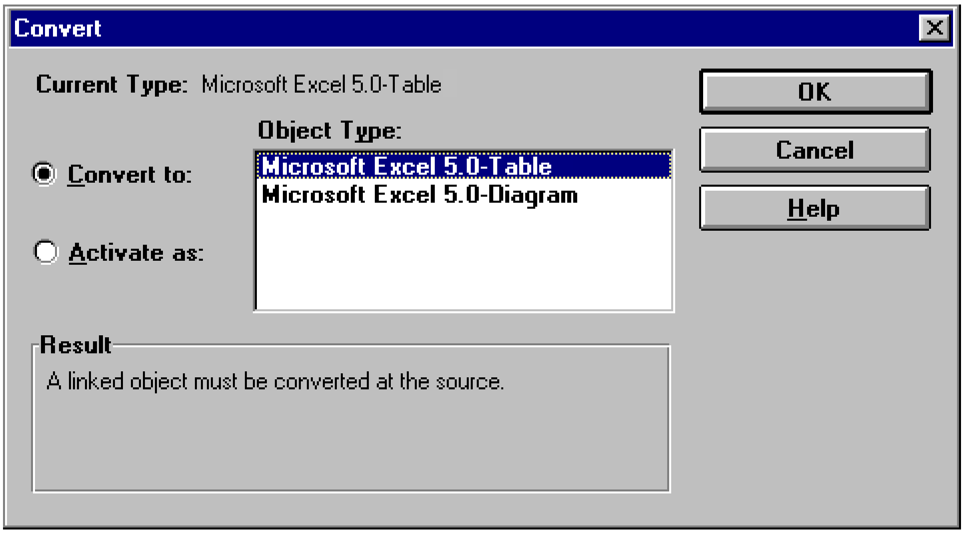
The source program is opened and also the document concerned. You can now carry out the operations as desired and save these.

The screen button "Update Now" in the dialog called via "Edit / Links.." causes the new material to appear in the display.

4.18.3.3 Changing the Format of an Embedded Object

An embedded object's data format can be converted.

- Mark the object, whose format you wish to change.
- Select the item in the "Edit" menu, which is denoted by the object's name, and select "Convert" from the appearing submenu.

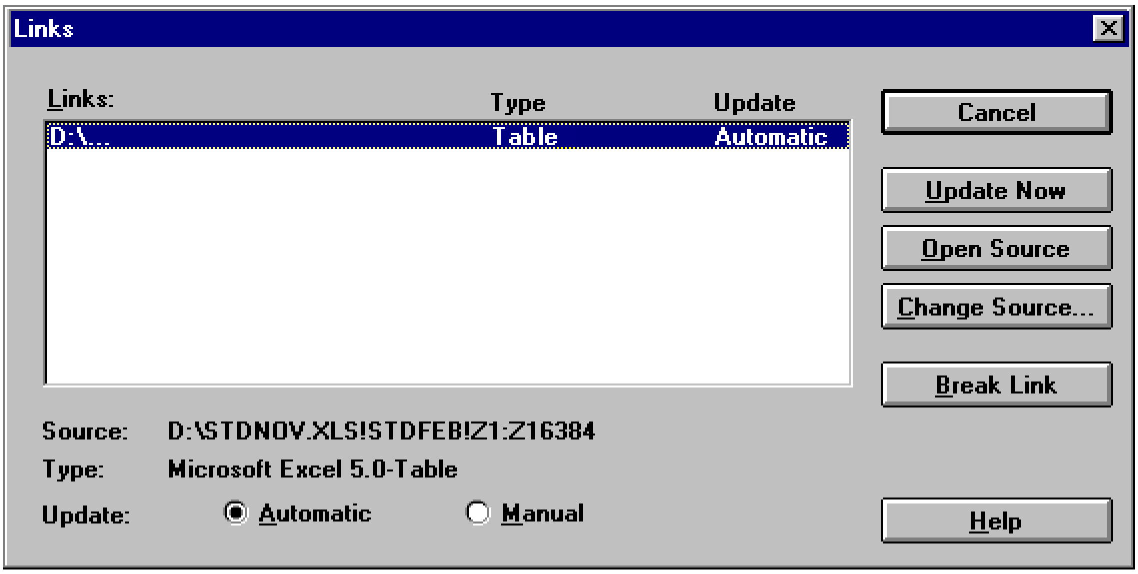


- The list in the "Object Type" box depends on the server-program's capabilities. If only the source format is listed, no conversion is possible. Select the object type desired.
- To convert the embedded object's format to that data format selected in the list, activate the option "Convert To".
- To convert the format of not only the marked embedded object, but of all embedded objects featuring the same data type, activate the option "Activate As". When editing, the user-selected data format is used; however, when saving the source data format is used.
- In the "Object Type" box, select the application program, into whose data format you wish to convert the embedded object, then press the screen button <OK>.

4.18.3.4 Updating Links

Linked information can always be updated, whenever the data in the source file have been changed. You can specify whether this should be accomplished manually or automatically.

Automatic links are updated each time the report is opened, or when the source file is changed while the Report Generator is open. Manual links, by contrast, are updated only when you press the "Update Now" screen button in the "Links.." dialog (accessible via the "Edit" menu).



Setting Update Mode

- Select the item "Links.." from the "Edit" menu.
- Select from the list the link to the information you wish to update (to mark multiple entries, hold down the <Ctrl> button, while clicking on the listings).
- If you wish linked information to be updated each time a change to the source file takes place, activate the option "Automatic" beside "Update".
- If you wish to update information manually, after having made changes to the source file, activate the option "Manual" beside "Update".
- End the dialog via "Close".

Performing an Update Manually

- Select the item "Links.." from the "Edit" menu.
- Select from the list the link to the information you wish to update.
- Press the screen button "Update Now". All changes made since the last update are supplied to the selected links in the destination document.
- Close the dialog by pressing the screen button "Close".

4.18.3.5 Breaking Links

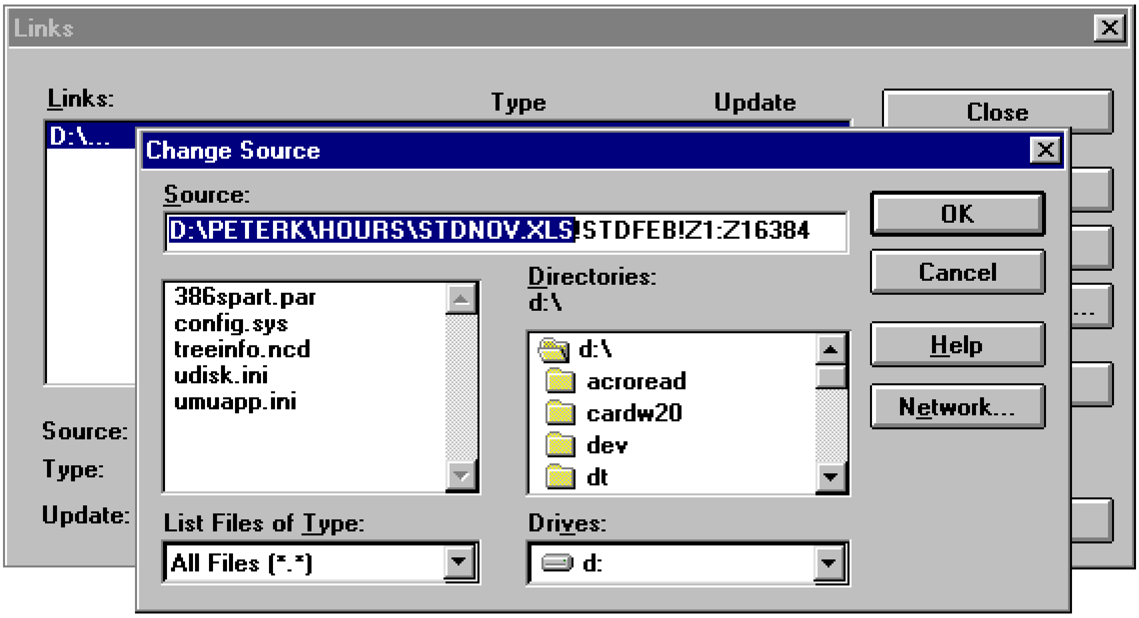
If you sever a link, the data is retained in the document, but cannot be updated any longer. It is also impossible to reestablish a link, once severed.

- Access menu item "Edit / Links.."
- Mark the entries in the list which represent the links you wish to sever.
- Click on <Break Link> and close the dialog via "Close".

4.18.3.6 Restoring and Changing Links

If a source file is renamed or relocated, a link may be lost. In that case, you must restore the link or reroute it. You only can create a link to a new source file if the new source file was generated by the same application program as the original.

- Access menu item "Edit / Links.." in the Report Generator. .
- Mark the entries for those links in the list which you wish to restore or change.
- Press the screen button "Change Source".



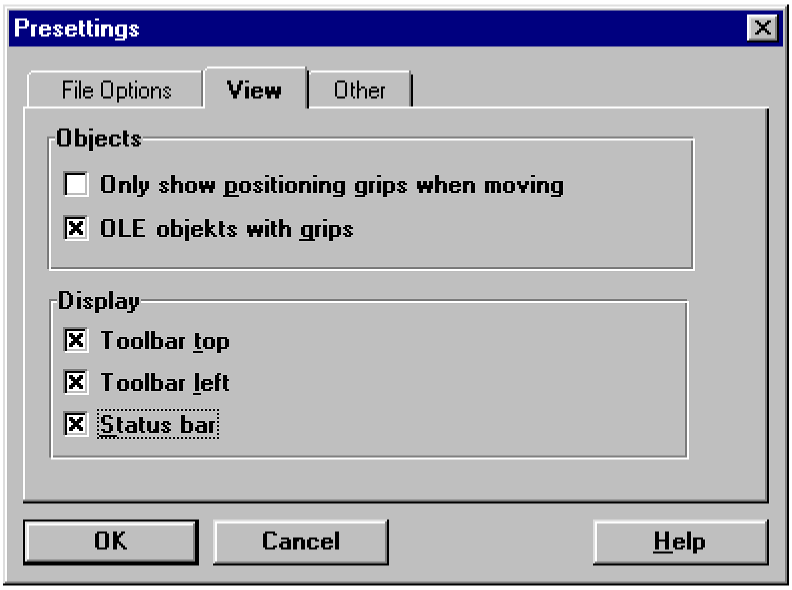
- Enter into the "Source" box the name of the file to which you wish to establish a link, (whether for the first time or remedially), or select a name from the list. Then press the <OK> screen button.

Remarks

If multiple links to the source file existed, ascertain whether all links are established with the new source file.

4.19 Configuring the Display

Accessing the menu item "View / Options.." calls a dialog for making global presettings affecting the appearance of the working window and of the objects it contains.



Only Show Positioning Handles when Moving

Normally, the display is continuously updated while objects are being moved. This can cause delays when complex layouts and / or slow computers are involved, and lead to "skipping" in the display of the object's or mouse pointer's position. This option allows you to determine that a window should not be continuously redrawn during moving, but that solely the "handles" should appear in order to assist you in positioning the object.

OLE Objects with Frame

Specifies that OLE objects should appear framed, **on the screen only**, not on the printout.

Toolbar / Status Bar

Toggles between the "On" and "Off" states of the bars.

Remarks

The increment and the visibility of the grid are controlled via the command "View / Grid Properties.."

5 imc Data format

5.1 Overview

The file format in FAMOS contains information about stored data in addition to the actual data in binary format.

Individual information is stored in keys in the file. These keys consist of a series of ASCII characters or binary data. A key begins with the character "|" (ASCII 124), followed by two letters used for identification. The corresponding parameters, separated by commas, follow the letters. Each key ends with a semicolon.

The file format in this current version of FAMOS has been modified and varies from the older versions. However, files in the older formats can still be read in the new format.

With the **file format imc2**, alongside the saving of single-channel, real-number data sets and of complex data, the following capabilities are additionally available:

- Several waveforms and texts can be saved together in one file.
- Channels can be written in the file in multiplex (sorted by time) or in blocks (sorted by channel).
- Channels and texts can be summarized in data groups to structure related measurement quantities.
- Comments can be assigned to channels, texts and data groups.
- The maximum length of all texts, such as channel names, comments and units is 255 characters.
- Digital and analog data can be combined in one file.
- Each channel or an entire channel group can have its own time track.

The file format can be extended by the following:

- Effective storage of matrices
- Storage of measurements which differ by sampling rate, start time and number of samples in the same waveform
- Storage of markers, which display pointers on marked places in the waveform.

As of **imc FAMOS 7.4**, the **format imc3** is supported. This format has been particularly designed to enable faster setup of the visual display whenever the data volumes involved become very large. Along with the individual sample values, the format saves a min-max envelope curve of the data, which is usually sufficient for the curve window. The complete data are loaded only upon zooming into the data or when applying calculation operations to them in FAMOS.

5.1.1 Key structure

1. **|XX**,

   Vertical line (ASCII 124) and two characters. The first letter is either a C or an N. C stands for "critical" (key must be understood to interpret data correctly), N for "noncritical". The second letter indicates the meaning of the key, and is followed by a comma.
2. The version of the key, beginning with 1. It must be a whole number and it ends with a comma.
3. Length of the key, the number of bytes after the comma until the closing ';'. The comma and ';' are no longer counted. Thus, it is the number of connected characters, as in the length of a name. The key length is generally an integer. In some exceptional cases, it is a "Long Integer". Whether this exception applies is noted with the key concerned.
4. Additional parameters, each separated by a comma.
5. The last parameter is ended with a semicolon.

Remarks

For the keys, upper and lower case letters are important.

Spaces (also CR, LF for legibility) are allowed between the keys.

Keys, which cannot be understood, are skipped using their length when reading a file.

Names and comments may contain only legible characters without zeros between them. Texts may have a maximum of 255 characters.

Real numbers in ASCII format may occupy a maximum of 25 bytes. Possible places right of the decimal should be stored with a decimal point, not a decimal comma. Point and exponent (E or e) are optional.

All integers may have a maximum of 10 characters. The range of values must be within 0 .. 2^31-1, thus may not be negative.

In a few certain locations the data type "Long Integer" is allowed. These may have a maximum of 20 characters. The input range is 0 ... 2^63 - 1. These locations are specially denoted by an indication of the data type.

Spaces are **not** allowed between the introductory vertical line | and the comma after the key version. Introductory and closing spaces are allowed in numbers, with regard to the maximum number of characters allowed.

All real numbers (float, double) in binary keys must be valid and must lie within the valid range of numbers -1e35.. -1e-35, 0.0, 1e-35..1e35.

In tuple or multiplex data, each partly started tuple must be present completely in the file, even if not all samples are defined at the end in (some) channels. This allows each software to read in tuples, and the structure of the tuples is observed.

Reference

Refer to the chapter "File Assistant", section "Data Types" for detailed description of the number formats used for storing numbers in binary format.

5.2 imc2 data format

5.2.1 Key Labels

|CF,2,1,1;	
	File format and processor always have a fixed length. File format = 2, Key length =1, Processor = 1 Pay attention to immediately follow this with the CK-key, without any other character -such as a space- in between.

|CK,1,3,1,Finished**;**		
	Start a group of keys. Always follows the ICF-Key. Key length is always 3.	
	Finished	**=1:** This key group is finished correctly in the file and matches. **=0:** This key group is not finished correctly. This may happen during running measurement, if measurement data were already entered, but the header was not updated completely; may also occur if the PC is switched off during file storage. Procedure: file is first created with Finished =0. When the file is written completely, Finished=1 is set.

|NO,1,KeyLength, Origin, NameLength, Name, CommLength,Comment**;**		
	Origin of data. If this key is present in the file, it must immediately follow |CK-key.	
	Origin	0= Original, 1= calculated
	NameLength Name	Name of creator, e.g. IMC-FAMOS
	CommLength Comment	File comment

|CB,1,KeyLength,IndexGroup,NameLength,Name,CommLength,Comment**;**		
	Group definition. A variable group is defined; may be found several times in succession with different index.	
	IndexGroup	Index of group, begins with 1 at the first |CB key in the file
	NameLength, Name	Name of data group
	CommLength Comment	Comment about data group

|CT,1,KeyLength,IndexGroup, NameLength,Name,TextLength,Text, CommLength,Comment**;**		
	Definition of a text	
	IndexGroup	**0**: No group assigned **1..n**: Index of preceding group, see |CB-key
	NameLength Name	Identification, title of text
	TextLength Text	Text content
	CommLength Comment	Comment about text

|CT,2,KeyLeng,IndexBlockKey, NameLeng,Name,ElementCount,[TextElementLeng,TextElement, ...], CommentLeng,Comment;		
	Text Array	
	IndexBlockKey	Index to a block definition, =0 no block
	NameLeng Name	Identifier, title of the text array
	ElementCount	The Text Array contains this many elements. >= 0, Max.: 2^{31} - 1
	TextElement	Content of an array's elements. Can > 255 characters in length. Max.: 2^{31} - 2 For each of the array's elements, the parameters TextElementLeng and TextElement are specified, as often as the value of ElementCount.
	CommLeng Comment	Comment on the text array

|CG,1,KeyLength,NumberComponents,Field type, Dimension;		
	Definition of a data field; start of a group of matching components. Attention: This is not a FAMOS group, but is only a collection within the file, which we are designating by "group" for simplicity.	
	NumberComponents	The components listed in this group: Number of following |CC keys within this group. In digital data, all bits together make up one component (i.e., 16 bits = 1 component). >= Dimension
	FieldType	= **1**: Real number, real equidistant waveform, may be several. Also Timestamp ASCII. = **2**: XY, x monotonous increasing, (several) real time data with common time track; use ulong for time track type! **= 3**: 3 XY, characteristic curve, possibly several y for one x, or several x for one y. No request for monotony. From here only a pair, not like above with several! = **4**: Complex, real, imaginary part = **5**: Complex, magnitude, phase = **6**: Complex, magnitude in dB, phase
	Dimension	According to field type = **1**: for type 1 = **2**: for type 2 .. 6

|CD,1,KeyLength,dx,Calibrated,UnitLength, Unit, 0, 0, 0**;**		
	Older version for standard applications. Use either CD,1 or CD,2. Scaling, valid for all components in the field. (x-axis in single-component data, parameter in two-component data)	
	dx	between Interval 2 samples, at >1: components for parameter
	Calibrated	= **1**: Time base is calibrated = **0**: Not calibrated
	UnitLength Unit	Length of unit Unit of this axis

|CD,2,KeyLength,dx,Calibrated,UnitLength, Unit, Reduction, IsMultiEvents, SortBuffer, x0, PretriggerUse;		
	Common version for complicated data types. Scaling, valid for all components in the field. (x-axis in single-component data, parameter in two-component data)	
	dx	between Interval 2 samples, at >1: components for parameter
	Calibrated	= **1**: Time base is calibrated = **0**: Not calibrated
	UnitLength Unit	Length of unit Unit of this axis
	Data reduction for the entire	**0** : no reduction (or no XY-data or not relevant, or unknown)

	group; only required for XY, X-monotonic; else, set to 0	**1** : data storage when threshold exceeded, or according to other criteria **2** : imc linear approximation **3** : user-defined
	IsMultiEvents	**0** : only data triggered one single time are available. **1** : the data have (possibly) been triggered multiple times. They are thus multi-shot data. |CV, |CV -Key may be present with events. If they are, this information applies. Else, the applicable information is in the |Cb-Key (x0,...),
	SortBuffer	**0** : The data are imported from the file according to the order in which the buffer periods appear in the file. If a channel's data are distributed in three buffer periods, the data belonging to the first buffer are imported first. The first buffer is the one whose description appears first in a |Cb-key. If data are distributed across multiple buffers, the order of the |Cb-keys for these buffers, or if applicable, the order in which the individual buffers are listed within a |Cb-key, determines the outcome. **1 :** A cyclically prolonged long-term measurement encompassing multiple buffer periods is defined. When such a file is imported, the buffers are arranged in ascending order according to the absolute time "AddZeit". In this case, it doesn't matter in what order the buffer periods are listed in the |Cb-keys.
	x0	x0 of the data in FAMOS. The x-coordinate of the first measurement value for equidistantly sampled data, in other words the pre-trigger time, starting frequency. Or, for XY-plots and complex data, the starting value of the parameter. If not the pre-trigger, x0 is the fixed x0 for all measurements, especially with data having two components. The parameter0 and for FFT the f0. The meaning of x0 is a function of PretriggerUse. Set x0 to zero if not needed.
	PretriggerUse	PretriggerUse (How is Pretrigger used in Cb?) In the Cb-key also, the pre-trigger can stand for every trigger event in multishot data. Whether this entry under Cb or the x0 from CD,2 is used depeds on the following entry: **0**: no x0 is copied to the data set's x0 (for exaple, for a matrix, or Rainflow matrix). **1**: Pretrigger under Cb copied to x0 Normal, 1-component time data (also individually for each event). This is the nornal case for writing data yourself. Then this x0 =0 and the pre-trigger is placed in the x0 under Cb. **2**: As the offset for time-track, which is then an integer and scalable using a faktor and offset, in XY-data. For transitional recording **3**: In z0 for Multi- also individually for each event). x0 is copied to z0 of the data set. **4**: For Time Stamp Ascii data, as the offset for the time track, which is then an integer and has a scalable factor and offset (also event-by-event)

|NT,1,KeyLength,Day,Month,Year,Hours,Minutes,Seconds**;**		
	Trigger time The seconds are real numbers, all others integers Day 1 .. 31 Month 1..12 Year >= 1980 Hours 0 .. 23 Minutes 0 .. 59 Seconds >= 0.0 .. <= 60.0 with max. of 7 digits right of decimal, =60 allowed due to rounding errors	

|CZ,1,KeyLength,dz,dzcali,z0,z0cali,Unitlength,Unit, SegmentLength;		
	Scaling of the z-axis with segments Always present with segments (2dim-matrices) With simple data types, the CZ-key is generally not in the file.	
	dz	Interval between 2 segments. > 0.0. Z-coordinate of one row of a is z = z0 + i * dz, i>= 0.
	dzcali	is dz calibrated? 1 (yes, default), 0 (no) 0 no, 1 yes, 2 color values in the data set (data to be interpreted as RGB values (DWORD with red in the low byte, like COLORREF, high byte=0) or as greyscale (BYTE))
	z0	Offset of the z-coordinate. Z-coordinate of the first row.
	z0cali	is z0 calibrated? 1 (yes, default), 0 (no)
	Unitlength, Unit	Unit of the dat in z-direction
	SegmentLength	Number of samples in one segment (1 row), fixed for the whole group.If > 0, then data are divided into segments. If = 0, not. But the z-coordinate remains valid.

|CC,1,KeyLength,ComponentIndex,AnalogDigital**;**		
	Start of a component	
	Component-Index	= **1**: real single value real part magnitude magnitude in dB y of XY y of XY, x monotonous TimeStamp ASCII = **2**: x of XY, x monotonous x of XY imaginary part phase
	AnalogDigital	= **1**: analog and TimeStamp ASCII = **2** : digital

|CP,1,KeyLength,BufferReference,Bytes,NumberFormat,SignBits, Offset, DirectSequenceNumber,IntervalBytes**;**		
	Packet information about this component	
	BufferReference	A number > 0, which identifies the corresponding buffer description in the |Cb-key. All buffers with this number contain data for this channel
	Bytes	Bytes for a measurement value (1..8)
	Number format	**1** unsigned byte **2** signed byte **3** unsigned short **4** signed short **5** unsigned long **6** signed long **7** float **8** double **9** imc STUDIO Transitional Recording **10** Timestamp Ascii **11** 2-Byte-Word digital **12** 8byte unsigned long **13** 6byte unsigned long: like unsigned long, but with 6 instead of 4 Bytes. MS Byte also at highest address. Only used for strict monotonously increasing time tracks **14** 8byte signed long
	SignBits	Number of significant bits, 0< SignBits <= Bits in numbers
	Mask	Default = 0 For digital (binary 0 or 1) data also = 0. Otherwise, for analog data, a mask with all invalid bits, which should be ignored. For example 3, where the two lowest bits should be ignored. Mask is defined with a decimal without a sign (0.. 65534). At least 1 bit must be valid.
	Offset	Offset of the first sample in the binary data block, >= 0. The offset is counted from the first valid measurement value in the buffer. The offset is a logical offset, thus is always >= 0 in ring buffer with data overflowing forward.
	DirectSequence-Number	This number of samples are in direct succession for this channel. = 1 if no other channels come between samples. Always >= 1.
	IntervalBytes	This number of bytes from the last sample of this channel to the next. Interval between sample groups = 0 if no other channels come between. Always >= 0.

		In data with IntervalBytes > 0 (with data packets) there must be sufficient space for a number of packets in the appropriate buffers and sample keys; even if the last packet is incomplete (data at the end are missing), there must be sufficient space.

|Cb,1,KeyLength,NumberBufferInKey,BytesInUserInfo,
BufferReference, IndexSamplesKey,
OffsetBufferInSamplesKey, BufferLengthBytes, OffsetFirstSampleInBuffer, BufferFilledBytes,
NewEvent**,** X0, AddTime, UserInfo, [BufferReference, ...]**;**

	Buffer description: Several buffers can be listed in this key. Each buffer can be organized as a ring buffer. In ring buffers, measurement values may not be taken apart, i.e. 1 byte of a 2-byte number may not be found at the end of the buffer and the next byte at the beginning of the buffer.	
	Number-BufferInKey	This number of buffers are described in this key. >= 0.
	BytesInUserInfo	The UserInfo has this length.
	The following information is repeated for each buffer!	
	BufferReference	A number > 0, which identifies a sequence of buffers for the |CP key. All buffers which contain measurement data for the same channel also have the same buffer reference.
	IndexSampleKey	Data are present in the specified CS key.
	OffsetBufferIn-SamplesKey	A number of bytes should be skipped from the beginning of the CS key until the buffer starts. Data type "Long Integer"
	BufferLength-Bytes	The buffer has a length of this number of bytes, >= 0. There must be sufficient space in the corresponding |CS key!
	OffsetFirst-SampleInBuffer	The offset of the first measurement value in the buffer, which counts bytes from the start of the buffer. In a ring buffer, OffsetFirstSampleInBuffer is >= 0 and < BufferLengthBytes, otherwise equal to 0. Data type "Long Integer"
	BufferFilledBytes	This number of valid bytes are in buffer. 0<= BufferFilledBytes <= BufferLengthBytes
	x0	At the beginning of a new trigger event (NewEvent) >0, this time is considered to be the shot's offset with respect to the trigger. > 0: Posttrigger, < 0: Pretrigger. Specification as per |CD-key.
	AddTime	At the beginning of a new trigger event (NewEvent) >0, this time is added to the time in |NT, to determine absolute trigger time for the shot. Specify as real number; the number will always be considered to be in seconds. If SortBuffer = 1 in the |CD key of a channel to this buffer, AddTime applies to each buffer. When a file is read in, "AddTime" is sorted accordingly. If, during a long measurement, the buffers are overwritten, the logical start of the data is often not at the first buffer in the file. The ascending absolute time then indicates the progressing time.
	UserInfo.	Binary info for creator of file.
	NewEvent	0: No new event. The measurement data will be append to the previous buffer of the same number. Logically, the data stream is not interrupted.

|Cb,1,KeyLength,NumberBufferInKey,BytesInUserInfo, BufferReference, IndexSamplesKey, OffsetBufferInSamplesKey, BufferLengthBytes, OffsetFirstSampleInBuffer, BufferFilledBytes, NewEvent**,** X0, AddTime, UserInfo, [BufferReference, ...]**;**		
		1: New event, AddX0, AddTime is valid. A new event of measurement data.With the new event, the data stream to previous events is aborted and starts again with the format of the very first event. For the first buffer for a channel, it must be set to 1. Only for data with multi-events and the case of 0 events is 0 also entered for the first event. For data that is not in multi-event format, 1 may also be used.

|CR,1,KeyLength,Transformation,Factor,Offset,Calibrated, UnitLength, Unit**;**		
	Value range of components, only in analog, not digital data. For TimeStamp ASCII, this scales the time track	
	Transformation	= **1**: yes, according to factor and offset, only in integer raw data. = **0**: no, possibly in integer raw data, always in real raw data.
	Factor Offset	Following is valid for transformation: PhysicalData=RawData * Factor + Offset
	Calibrated	Scale is calibrated at 1, at 0, not calibrated.
	UnitLength Unit	Length of unit Unit of this axis

|ND,1,KeyLength,ColorR,ColorG,ColorB,yMin,yMax**;**		
	Display properties	
	ColorR ColorG ColorB	Red-Green,Blue parts, range 0 to 255, 0 minimum, 255 maximum. (0,0,0) is black. (255,255,255) is white. The color in which the data should be displayed. Note differences for various output devices. If all are set to -1, no set color is linked to this channel. The color is selected according to the output device.
	yMin,yMax:	Set both to 0, if no special display range is desired. Otherwise, real numbers with yMin < yMax, which are used in y-axes (only in real, xy, magnitude of complex data) for set scaling, if the waveform is displayed as a curve.

|Cv,1,KeyLength, IndexEventListKey, OffsetInEventList, DirectSuccessionCount, DistanceEvents, EventCount, ValidNT, ValidCD, ValidCR1, ValidCR2;		
	Event allocation. If this key appears, it applies for all subsequent CN-keys of the current group.	
	IndexEventListKey :	Index of a key with EventList, not 0.
	OffsetInEventList	The event-structure with this index (>=0) is the first one belonging to this channel.
	DirectSuccessionCount	This many event-structures belonging to this channel appear in the Event-List in direct succession, always >= 1. = 1, if there are no other intermediate event-channels. At the present time, always set to 1
	DistanceEvents	Between the blocks of length Direct SuccessionCount. = 0, if there are no other event-channels in between; always >= 0 and <= 1000 Constraint: If DistanceEvents = 0, then it must apply to the entire event list-key. In that case, each channel's events must appear in succession in solid blocks. Each event-channel may have its own amount of events. The event list-key is then structured so that all events of the first event channel appear first, next all events belonging to the next channel, etc. If DistanceEvents <> 0, then it must be the same for all of them. The distance is then exactly one event-channel. The event list-key is then structured so that it begins with each channel's respective first event, then each channel's respective second event, etc.
	EventCount	This many events belong to this channel, always >= 0
	ValidNT	1, if the trigger time is taken from the event list instead of from the NT-key, else 0
	ValidCD	0, if the CD-key's or |Cb-key's time base applies. Bit 1 (LSB) set: dx is taken from the event list (else from Cd). Bit 2 set: x0 is taken from the event list (else from Cb) Bit 3 set: Z0 is taken from the x0 of the event list (else from CZ)
	ValidCR1	0, if the scaling of the 1st component (y) is fixed. Bit 1 (LSB) set: dy from 1st component of the event-structure Bit 2 set: ditto, but y0
	ValidCR2	0..3, ditto, but 2nd component (x). Is 0 for 1-component data

|CV,1,KeyLength,Index,EventCount,RawDataEvents;		
	Event-List	
	EventCount	Amount of events in the list.
	RawDataEvents	The event-data themselves Index, beginning with 1 for the first such key in the file Array of densely packed elements in the form: typedef struct { DWORD Offset_Lo; Offset of the event, expressed as relative number of samples. E.g. expressed as Tuple-count. Bottom 32 bits of a total of 64 bits. DWORD Leng_Lo; Length of the events, expressed as relative number of samples. Bottom 32 bits of a total of 64 bits. double time ; Event-specific time (abs. trigger time for multishot) double Off[2] ; Event-specific offset for magnitude of data double x0 ; Event-specific x0 double factor[2] ; Event-specific gain factor for data double dx ; Event-specific dx DWORD Offset_Hi ; Offset of the event, top 32 bits DWORD Leng_Hi ; Length of the event, top 32 bits } FILE_EV ; Offset_Hi <> 0 or Leng_Hi <> 0 for 64-bit version

|CN,1,KeyLength,IndexGroup,**0,** IndexBit,NameLength,Name,CommLength,Comment**;**		
	Name, Comment about channel. In digital data, exactly one of two matching components have a name for each bit.	
	IndexGroup	**0**: No group assigned. **1..n**: Index of preceding group, see |CB key
	IndexBit	= **0** in analog data, in digital = 1 for LSB ... 16 for MSB.
	NameLength Name	Identification, Title
	CommLength Comment	Comment
	CommLength Comment	Comment

|CS,1,KeyLeng,Index,RawData**;** For KeyLeng, the data type "Long Integer" is used.		
	Samples, RawData	
	Index	Starts with 1 at the first such key in the file.
	RawData	Binary data block. The data volume may exceed the range of a 32-bit integer.

|CS,2,KeyLeng,Index,DataCompression,UncompressedLeng,RawData**;** For KeyLeng, the data type "Long Integer" is used.		
	Samples, RawData	
	Index	Starts with 1 at the first such key in the file.
	DataCompression	**0** : uncompressed **1** : compressed with ***zlib***. If data are compressed, the buffer period lengths are always stated in |Cb for uncompressed data.
	Uncompressed-Leng	The length of the uncompressed binary data block
	RawData	Binary data block. The data volume may exceed the range of a 32-bit integer.

|NU,1,KeyLeng,IdentLeng,Keyword,Data**;**		
	User-defined key	
	IdentLeng Keyword	Identification for user-data, keep unambiguous for entire system.
	Data	Binary block, any data, also ASCII for parameters in DSFstyle.

|Cl,1,KeyLeng, IndexBlockKey, NumFormat, NameLeng, Name, Value, UnitLeng, Unit, CommentLeng, Comment, Time;		
	Numerical value, single value, numerical value with unit. Real numbers such as Overflow and NAN are allowed (replacement value 1e[35] when calculating)	
	IndexBlockKey	Index for block-definition, 0 =no block
	NumFormat	1 unsigned byte 2 signed byte 3 unsigned short 4 signed short 5 unsigned long 6 signed long 7 float 8 double 11 LSB in 2byte-Word digital 13 6byte unsigned long
	NameLeng	Length of name to follow
	Name	ID, title
	Value	Binary numerical format, length in Bytes as determined by numerical format.
	UnitLeng	Physical unit
	CommentLeng	Length of comment to follow
	Time	Time to develop in seconds since 1980; decimal places possible. Binary, always 8 Byte double

|Np,1,KeyLang, Property[,Property...];		
	Property: A property of a channel. Form: "PropertyName" "PropertyValue" DataType Flags	
	PropertyName:	in quotation marks ("). If a "-character appears within the designation, it must be repeated.
	PropertyValue:	in quotation marks ("). If a "-character appears within the name, it must be repeated.
	DataType:	0 String 1 Integer 2 Real 3 Time-stamp in DM-format, seconds as of 1/1/1980 4 Enumeration 5 Boolean
	Flags:	2: hide in Editors 4: read-only in Editors Flags can be combined (2+4 -> 6)

|Ca,1,KeyLang, AddRef,p1;		
	Add-Reference-Key. From here on, an increment is added to each reference found (e.g. Buffer-reference, IndexSamplesKey, IndexEventListeKey, Index-Block-Key ...). References are also valid beyond this key. This key may be located anywhere after the correct beginning of a file. It is never added for: IndexBlockKey = 0 in |CT ComponentIndex in |CC IndexBlockKey = 0 in |CN IndexMarkerListeKey = 0 in |CN IndexBit in |CN	
	AddRef:	Integer >= 0, added to the reference in all subsequent keys.
	p1:	Reserved; = 0

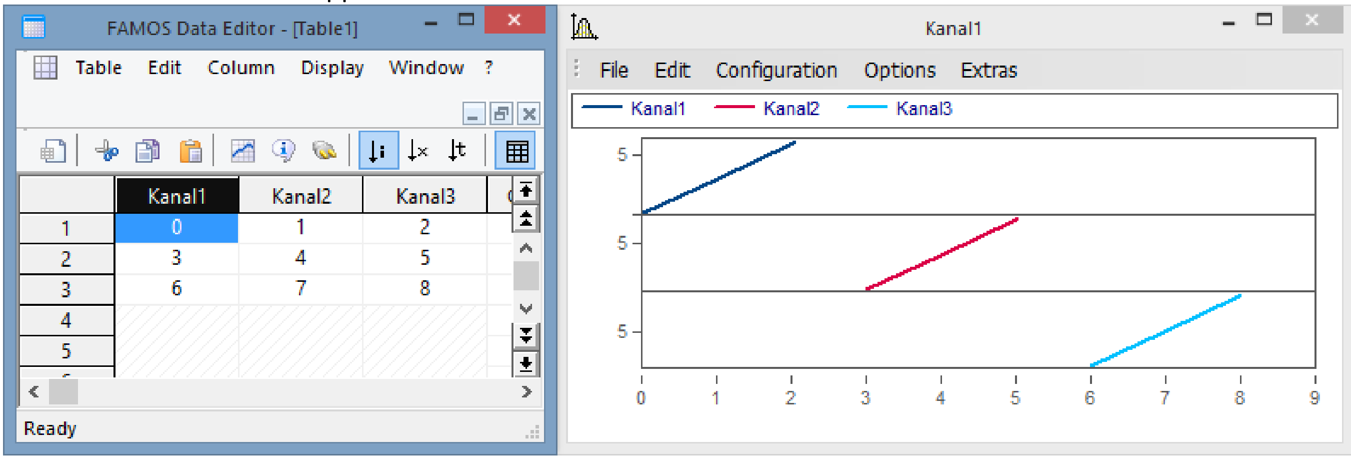
|NE,1,KeyLeng, Data;		
	Instruction for extracting data for channels from logged Bus messages. Assigned to a Time-stamp Ascii channel. Only one per file. Thus, only for files containing a maximum of 1 Time-stamp Ascii channel.	
	Data:	Compressed binary block with the instruction. Interpretation/creation is only handled internally by imc.

|NL,1,KeyLang, CodePage,Language;		
	Language of the texts contained. Used, for example, by imc FAMOS to convert certain special characters to units, otherwise not. Meaning: not for contents of TimeStampASCII, which could also be binary, after all! With Windows programs, it is possible to query the codepage using GetACP(). For the purpose of reconstructing text in other language regions, the CodePage is absolutely necessary. The Language Code is not absolutely required and is disregarded by FAMOS 7.1. When saving, the NL key is always written, even with versions of imc FAMOS 7.0 and earlier.	
	CodePage:	See "MSDN Code Page Identifiers". e.g. 1252 for "ANSI Latin 1; Western European (Windows)" e.g. 932 for "Japanese (Shift-JIS)" 0 for unknown
	Language:	Language Code; see "MSDN Language Codes" Specify Language, incl. sublanguage Hexadecimal entry, characters (0..9,A..F) e.g. 0x407 for German e.g. 0x40C for French 0 for unknown

|Nv,1,KeyLang,MainVersion,Subversion,Revision,Plattform,AppCode,Debug;		
	Only available if data are saved via the imc Data Manager. Version of the Data Manager. This is also only entered by the Data Manager itself. If any other application generates files in this format, this key should not be written to the file.	
	MainVersion:	Portion of the version number before the period, e.g. the 7 in "7.1 Rev 12"
	Subversion:	Portion of the version number after the period, e.g. the 1 in "7.1 Rev 12"
	Revision:	Revision number, e.g. the 12 in "7.1 Rev 12"
	Platform:	32 for x86 or other 32-bit software, 64 for 64-bit software whichever was used to generate the file.
	AppCode:	Various fixed values, e.g. 1 for calling the Data Manager under imc FAMOS.
	Debug:	1 Debug translation/compile, 0 Release translation/compile

5.2.1.1 Notes on the multiplexed storage of data

The sample file comprises 3 channels (Channel_01, Channel_02, and Channel_03). Each of the channels comprises 3 measurement values in the Float format (4 Bytes real).
Channel_01's XOffset is 0, that of Channel_02 is 3, that of Channel_03 is 6.
The measurement values appear as follows:



In the buffer, the data are stored in alternating (multiplexed) order:

Channel_01[1], Channel_02[1], Channel03[1], Channel_01[2], Channel_02[2], Channel03[2], Channel_01[3], Channel_02[3], Channel03[3]

The keys CP und Cb govern where the data are positioned within the file.

Key CP

KeyLength,BufferReference,Bytes,NumberFormat,SignBits,Offset, DirectSequenceNumber,IntervalBytes**;**

CP – Keys from the FAMOS file generated:

|CP,1,	KeyLength	Buffer Reference	Bytes	NumberFormat	SignBits	Mask	Offset	DirectSequence Number	IntervalBytes;	
|CP,1,	16,	1,	4,	7,	32,	0,	0,	1,	0,;	Channel 1
|CP,1,	16,	2,	4,	7,	32,	0,	0,	1,	0,;	Channel 2
|CP,1,	16,	3,	4,	7,	32,	0,	0,	1,	0,;	Channel 3

Please note:

KeyLeng = the count of Bytes after thenext comma up to the concluding ';'. The comma is not included in the count, nor is the ';'.

Offset = (K - 1)*Bytes per sample, K = current channel number.

DistanceBytes = (Ktotal -1) * Bytes per sample , Ktotal = channel count in file

CP – Keys after processing:

|CP,1,	KeyLength	Buffer Reference	Bytes	NumberFormat	SignBits	Mask	Offset	DirectSequence Number	IntervalBytes;	
|CP,1,	16,	1,	4,	7,	32,	0,	***0,***	1,	***8,;***	Channel 1
|CP,1,	16,	2,	4,	7,	32,	0,	***4,***	1,	***8,;***	Channel 2

|CP,1,	16,	3,	4,	7,	32,	0,	***8,***	1,	***8,;***	Channel 3

Key Cb

Cb – Keys from the FAMOS file generated:

|Cb,1,	Key Length	Buffer InKey Count	BytesIn User Info	Buffer Reference	Index Samples Key	Offset BufferIn Samples Key	Buffer Leng Bytes	OffsetFirst SampleIn Buffer	Buffer Filled Bytes;	0	X0	Add Time	UserInfo
|Cb,1,	24,	1,	0,	1,	1,	0,	***12,***	0,	***12,***	1,	0,	0,;	Channel1
|Cb,1,	25,	1,	0,	2,	1,	12,	***12,***	0,	***12,***	1,	3,	0,;	Channel2
|Cb,1,	25,	1,	0,	3,	1,	24,	***12,***	0,	***12,***	1,	6,	0,;	Channel3

Please note:

KeyLeng = the count of Bytes after the next comma up to the concluding ';'. The comma is not included in the count, nor is the ';'.

OffsetBufferInSamplesKey Set this to 0.

BufferLangBytes = ntotal· Ktotal * Bytes per sample (ntotal = sample count per channel,· Ktotal = channel count)

BufferFilledBytes = ntotal · Ktotal * Bytes per sample

Example:

*BufferLengthBytes = ntotal * Ktotal· Bytes per sample = 3 * 3 * 4 = 36*

Cb – Keys after processing:

|Cb,1,	Key Length	Buffer InKey Count	BytesIn User Info	Buffer Reference	Index Samples Key	Offset BufferIn Samples Key	Buffer Leng Bytes	Offset First SampleIn Buffer	Buffer Filled Bytes;	0	X0	Add Time	UserInfo
|Cb,1,	***24,***	1,	0,	1,	1,	***0,***	***36,***	0,	***36,***	1,	0,	0,;	Channel1
|Cb,1,	***24,***	1,	0,	2,	1,	***0,***	***36,***	0,	***36,***	1,	3,	0,;	Channel2
|Cb,1,	***24,***	1,	0,	3,	1,	***0,***	***36,***	0,	***36,***	1,	6,	0,;	Channel3

5.2.2 Key Order

<table>
<tr><td colspan="5">After |CF</td></tr>
<tr><td></td><td colspan="4">must |CK</td></tr>
<tr><td></td><td colspan="4">can |NO</td></tr>
<tr><td></td><td></td><td colspan="3">could |CT (texts),</td></tr>
<tr><td></td><td></td><td colspan="3">|CB (group definitions),</td></tr>
<tr><td></td><td></td><td colspan="3">|CI (single value),</td></tr>
<tr><td></td><td></td><td colspan="3">|CG (data fields) any consecutive order</td></tr>
<tr><td></td><td></td><td colspan="3">After |CG</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">can: |CD (if same for entire group)</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">can: |NT (if same for entire group)</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">can: |CZ (if same for entire group and the data are matrix data)</td></tr>
<tr><td></td><td></td><td></td><td colspan="2">must: (following can repeat several times)</td></tr>
<tr><td></td><td></td><td></td><td></td><td>|CC</td></tr>
<tr><td></td><td></td><td></td><td></td><td>can |CD, |NT, |CZ valid for this |CC and all following keys in this group, until it is redefined</td></tr>
<tr><td></td><td></td><td></td><td></td><td>must |CP</td></tr>
<tr><td></td><td></td><td></td><td></td><td>can |CR, (only in analog data)</td></tr>
<tr><td></td><td></td><td></td><td></td><td>can |Cv</td></tr>
<tr><td></td><td></td><td></td><td></td><td>can |ND</td></tr>
<tr><td></td><td></td><td></td><td></td><td>can |CN, in digital data, several times consecutively</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Definition of a component if finished with |CS, |CC, |CG, |CT, |CB</td></tr>
<tr><td></td><td></td><td></td><td></td><td>can |CV</td></tr>
<tr><td></td><td></td><td colspan="3">Additional |CG, |CB, |CT, |CI ....</td></tr>
</table>

The key **|Cb** can be placed anywhere and may be present several times.

Example:

File with one single value ("Average", unit "V" and comment) and a text variable ("TxTester").

```
|CF,2,1,1;|CK,1,3,1,1;
|Nv,1,12,7,3,4,64,1,0;
|NO,1,12,1,5,FAMOS,0,;
|NL,1,10,1252,0x407;
|CG,1,5,1,1,1;
|CD,1,13,1,1,1,s,0,0,0;
|NT,1,19, 6, 4,2018,11,33,54;
|CC,1,3,1,1;
|CP,1,16,1,8,8,64,0,0,1,0;
|Cb,1,22,1,0,1,1,0,8,0,8,1,0,0,;
|CR,1,11,0,0,0,1,1,V;
```

```
|CN,1,35,0,0,0,7,Average,16,Measurement 0815;
|CT,1,43,0,8,TxTester,8,E. Smith,16,Measurement 0815;
|CS,1,10,1,ÍÌÌÌÌÌ(@;
```

Example:

The file contains a data group ("Meas1"), consisting of 2 channels ("Chan1","Chan2") with a length of 3. Data are in a 1 byte integer format without a prefix in a value range of 0 to 10V. Both channels have a sampling rate of 0.5s and a start offset of 3s. The unit is "V". The scaling for the curve window is defined at 0 to 10V.

```
|CF,2,1,1;|CK,1,3,1,1;
|Nv,1,12,7,3,4,64,1,0;
|NO,1,12,1,5,FAMOS,0,;
|NL,1,10,1252,0x407;
|CB,1,12,1,5,Meas1,0,;
|CG,1,5,1,1,1;
|CD,1,16,5E-1,1,1,2,0,0,0;
|NT,1,19, 6, 4,2018,11,24,18;
|CC,1,3,1,1;
|CP,1,15,1,1,2,8,0,0,1,0;
|Cb,1,22,1,0,1,1,0,3,0,3,1,3,0,;
|CR,1,30,1,3.937007874015748E-2,5,1,1,V;
|ND,1,15,-1,-1,-1,0,1E+1;
|CN,1,16,1,0,0,5,Chan1,0,;
|CG,1,5,1,1,1;
|CD,1,16,5E-1,1,1,2,0,0,0;
|NT,1,19, 6, 4,2018,11,24,18;
|CC,1,3,1,1;
|CP,1,15,2,1,2,8,0,0,1,0;
|Cb,1,22,1,0,2,1,3,3,0,3,1,3,0,;
|CR,1,30,1,3.937007874015748E-2,5,1,1,V;
|ND,1,15,-1,-1,-1,0,1E+1;
|CN,1,16,1,0,0,5,Chan2,0,;
|CS,1,8,1,šššš;
```

Example:

The file contains an xy-waveform with a monotonous x-track. The length is 4. The y-component has a floating data format, the x-component is unsigned long. The units are "V" and "s". The file contains a comment.

```
|CF,2,1,1;|CK,1,3,1,1;
|Nv,1,12,7,3,4,64,1,0;
|NO,1,12,1,5,FAMOS,0,;
|NL,1,10,1252,0x407;
|CG,1,5,2,2,2;
|CD,1,12,1,1,0,,2,0,0;
|NT,1,18, 6, 4,2018,11,37,1;
|CC,1,3,1,1;
|CP,1,16,1,4,7,32,0,0,1,0;
|Cb,1,24,1,0,1,1,0,16,0,16,1,0,0,;
|CR,1,11,0,0,0,1,1,V;
|CN,1,20,0,0,0,9,MyXY_plot,0,;
|CC,1,3,2,1;
|CP,1,16,2,2,3,16,0,0,1,0;
|Cb,1,23,1,0,2,1,16,8,0,8,1,0,0,;
|CR,1,30,1,4.577706569008927E-5,0,1,1,s;
|CS,1,26,1,   @  €?   @ffF@  UUªªÿÿ;
```

5.3 imc3 Data Format

For measured data. For imc FAMOS. Only for offline data storage (not during the measurement).

This description applies to VersionMajor=1 and VersionMinor=2.

Byte-order

all Intel (little Endian, low byte starts the file)

Data types

DBL
SINT16
SINT32
UINT8
UINT16
UINT32
UINT64
CHAR: 1 Text character. For bUnicode =0, this is 1 Byte per character and under some circumstances 2 Bytes per character in (Chinese, etc) double byte character character sets. For bUnicode != 0, these are Unicode characters (1 to 4 Bytes, depending on the Unicode character set).
[] Array of the type, including specified length where appropriate
ARRAY: array of the subsequent items.

Intro of a Key

4 Bytes. E.g. |CG1 as a string with the bytes "|" = 0x7C, "C" = 0x43, "G" = 0x47, "1" = 0x31. These 4 Bytes appear in the file in this order. Represented in UINT32: 0x3147437C (low Byte at very beginning of the file).
KeyBegin: Member in all type-definitions with exactly this UINT32.

Otherwise, all keys are written in direct uninterrupted succession.
When the position of a key is expressed, or rather precisely the position of its beginning, this refers to the position of the introductory '|' character indicating the key.

Key-length

When the key-length is used, then this is the key's complete content, including its introductory KeyBegin. Thus the counting extends as of the introductory '|' character indicating the key.

Complete Key

When the complete Key is meant, this includes KeyBegin, meaning as of the introductory '|'.

Saving strings: STR(Len=TYP)

TYP = UINT16 or UINT32	Leng Byte count of the subsequent text. Also counted in Bytes with Unicode! Initially Leng < 2.1e9. Also with 64-bit software. Also with Unicode.
CHAR[]	Content of strings. ANSI or Unicode. Without concluding \0 (null character). \0 (null character) anywhere in the middle is not allowed.

Interpreted for 64-bit-software for reading purposes. 32-bit software is not always able to process gigantic data volumes; the upper limits must be ascertained.

As is sensible, many indices and lengths are defined as unsigned UINT32. Famos sometimes has a value range with an upper limit, like with SINT32. Famos is then not able to import such files. This must be given consideration when writing.

5.3.1 Description of the Keys

|imc3,1;	Fileformat

UINT64, complete fix
Always the first 8 Bytes of the file

UINT64	|imc3,1;

|CB1	Beginning

Fortsetzung Beginn der Datei
Magic numbers, both random numbers, as different as possible in each file created on this medium. dwMagic1 can, for example, be obtained from the lowest bits of a fast hardware counter. Both can be won with different techniques. dwMagic2 for example can be derived from the system time.

UINT32	KeyBegin, |CB1
UINT32	dwMagic1
UINT32	dwMagic2
UINT8	bVariant 0 written offline (e.g. by imc FAMOS) This value must absolutely be verified upon reading. Other values are set by other imc software.
UINT8	bCS 0
UINT8	bUnicode 0 ANSI or DBCS. No Unicode 1 UTF-8. Used in all names, comments, units, properties, names and description (of file and measurement). Not in TSA.
UINT8	bCompr 0
SINT16	TimeZone Time zone By how much is the specified time offset from the UTC? Specified in minutes =-1 for unknown Local_Time = UTC_Time + Timezone Example: = 60 (UTC+1h) for Germany during standard time, = 120 for Germany during daylight savings time = -360 (UTC-6h) for New York Value range: -60*24 to +60*24. Only multiples of 15 or 30 or 60.
UINT16	wSummertime Daylight saving time 0: it is not known whether the specified local time is daylight savings or standard time 1: The specified local time is standard time 2: The specified local time is daylight savings time
UNT16	VersionMajor =1
UINT16	VersionMinor =1

Handling and interpretation of the version numbers

- VersionMajor is incremented when there are incompatible changes. Existing users could interpret data incorrectly.
- VersionMinor is incremented when expansions are made. Expansions are additional keys or additional values in enumerations (such as PretriggerUse).

- The writer of the file uses the version numbers associated with their implementation.
- The user must check the version numbers.
  - If VersionMajor is higher than expected, it is not possible to read.
  - Depending on the VersionMajor, reading must be conducted in accordance with the respective specifications.
  - If VersionMajor is the same, but VersionMinor is higher than expected, it is necessary to assume that there are expansions. These expansions may not appear, but if they do, import must be canceled, because there is a risk of incorrect interpretation.

|CL1	Language

Language of the texts contained.
Used, for example, by imc FAMOS to convert certain special characters into units, otherwise currently not used. Thus, not for contents of Timestamp ascii, which can also be binary! Also not for text variables and channel names.

UINT32	KeyBegin, |CL1
UINT16	wCodePage Siehe "MSDN Code Page Identifiers". E.g. 1252 for "ANSI Latin 1; Western European (Windows)" E.g. 932 for "Japanese (Shift-JIS)" 0 for unknown. At present not allowed; especially not with Unicode. Do not specify any Unicode-Codepage! Even when bUnicode is nonzero, the Codepage for the underlying language is specified here.
UINT16	wLanguage Language Code; see "MSDN Language Codes" Language specification, including of sub-language E.g. 0x407 for German Z.B. 0x40C for French 0 for unknown

The following combinations are allowed. SUBLANG_ is usually freely selectable, except in case of Chinese.

This means that for example with Japanese language, only wCodePage=932 can be used.

Language	wCodePage	wLanguage
WESTERN EUROPE	1252	LANG_GERMAN=0x407 LANG_ENGLISH= 0x409 LANG_FRENCH=0x40c LANG_ITALIAN= 0x410 LANG_SPANISH= 0x40a LANG_SWEDISH= 0x41d
JAPAN	932	LANG_JAPANESE= 0x11
CHINESE	936	LANG_CHINESE SUBLANG_CHINESE_SIMPLIFIED =0x804
TAIWAN	950	LANG_CHINESE SUBLANG_CHINESE_TRADITIONAL =0x404
CYRILLIC	1251	LANG_RUSSIAN= 0x419
TURK	1254	LANG_TURKISH= 0x41f
EASTERN EUROPE	1250	LANG_BULGARIAN= 0x402
KOREA	949	LANG_KOREAN= 0x412

Even if a file contains Unicode characters (bUnicode <> 0), it does not mean that the program reading it knows Unicode. Programs such as imc FAMOS 7.3 are not (complete) Unicode programs. Thus, whenever imported, all Unicode-texts (except units) are converted to the codepage wCodePage. For this reason, wCodePage and wLanguage must be filled correctly even when bUnicode <> 0.

Only once later versions of the programs have been completely revised for Unicode will such characters remain intact, which can otherwise not be displayed in the program's current language.

|CO1	Origin

Specifications for generating the file

UINT32	KeyBegin, |CO1
STR(Len=UINT16)	File Producer Name of the generating software, author, manufacturer
STR(Len=UINT16)	File Comment comments on the file

|Cd1	Data Manager version

Optional. Only available when data storage is via the imc Data Manager, meaning im7cudam.dll or successors. Version of the Data Manager.

This is also only entered by the Data Manager itself. When a different application generates data in this format, this key may not be written to the file.

UINT32	KeyBegin, |Cd1
UINT8[16]	version ASCII text. e.g. " 7.1 Rev 12" with \0=0x00 completed, 1 space in front
UINT8[4]	platform ASCII text. "32" or "64" completed with \0=0x00
UINT8[8]	compile ASCII text. "debug" or "release" completed with \0=0x00
UINT16	AppCode: Various fixed values, e.g. 1 for a call of the Data Manager under imc FAMOS.
UINT16	SystemLanguage: from the DLL

|CA1	Count Dataobjects

Overview of amounts (to be written later).

UINT32	KeyBegin, |CA1
UINT32	dwCountGroups Count of groups: This many FAMOS-group variables. Count of |CG1.
UINT32	dwCountNamedChannels Count of known_channels This many channels. Count of |CN1. Single values generated with |CV. The channel may be equidistant or XY or even a bit. Only channels having names are counted. With bits, if the port is also saved, a port can consist of 1+16 channels. If the port has no name, then their count is only up to 16 bits. This does not apply to channels generated by means of an extraction instruction.
UINT32	dwCountIndexChannels Count of dwIndexChannels There are this many dwIndexChannels. Count of |CC1. Meaning there are this many streams in the file. Each analog channel counts as one (regardless of whether with or without a time track). Each TSA counts as one. With bits, the port counts as one; the bits themselves do not count. This does not apply to channels generated by means of an extraction instruction. Single values are not counted here.
UINT32	dwCountTextVars Count of TextVar There are this many FAMOS text-variables and FAMOS text-arrays. Count of |Ct1 and |CT1.
UINT32	dwCountSingleValues Count of single values There are this many FAMOS single values with|CV1 (name+numerical value). For single values, no dwIndexChannel is assigned.

|CG1	FAMOS Group

A group must be defined in the file before dwIndexGroup is referenced by other keys.

UINT32	KeyBegin, |CG1
UINT32	dwIndexGroup beginning with 1 the first in the file, then incremented
STR(Len=UINT16)	Name. May not be an empty string.
STR(Len=UINT16)	Comment

|Ct1	FAMOS text variable

UINT32	KeyBegin, |Ct1
UINT32	dwIndexGroup Reference to the associated group. 0, if not
STR(Len=UINT16)	Name. May not be a string.
STR(Len=UINT16)	Comment
STR(Len=UINT32)	Content

|CT1	FAMOS text array

UINT32		KeyBegin, |CT1
UINT32		dwIndexGroup Reference to the associated group. 0, if not
UINT32		dwCountElements Element count The text array contains this many elements
STR(Len=UINT16)		Name. May not be an empty string.
STR(Len=UINT16)		Comment
ARRAY		accross dwCountElements
	STR(Len=UINT32)	Content content of the element

|CV1	Single Value

Numerical value, single value, numerical value for unit.

UINT32	KeyBegin, |CV1
UINT32	dwIndexGroup Reference to the associated group. 0, if not
DBL	dTime time of origin in seconds since 1/1/1980
UINT8[8]	BinaryNumerical numerical value As of the beginning of this array binary numerical value, exactly as many bytes long as the numerical format determines. The remaining Bytes are 0.
UINT8	NumericalFormat Numerical format. As with the |CM1 component, but only 1, 2, 3, 4, 5, 6, 7, 8, 12, 14. With integer formats, all bits are considered valid. Thus it is not possible, for example, to denote 12 of 16 bits as valid.
STR(Len=UINT16)	Name. May not be an empty string.
STR(Len=UINT16)	Comment
STR(Len=UINT16)	Unit

|CC1	Channel Base

Preface for any channel

UINT32	KeyBegin, |CC1
UINT32	dwIndexChannel beginning with 1 for the first in the file, then incremented
DBL	dx Sampling interval > 0.0. With 2-component data, it is the delta-parameter
DBL	x0 With 1-component data it is the initial value of the x-values (pretrigger). With 2-component data, it is the parameter's initial value. If corresponding PretriggerUse fix, then specify here. Otherwise it may be for example 0.0 or the value when PretriggerUse deviates, without trigger released.
UINT32	dwIndexGroup Reference to the associated group. 0, if not
UINT32	dwDefaultChunkBytes: For bVariant = offline, always = 0.
UINT8	Flags Bit 0x01: IsMultiEvents 0 no multi events 1 multi events Bit 0x02: AllowRemove 0 no. Default behavior; channel is loaded in the regular way. Bit 0x04: IsColorValues 0 no. Default behavior 1 yes: Data to be interpreted as RGB-values (DWORD with red=low byte, like COLORREF, highest byte=0) or as grayscale (BYTE)
UINT8	PretriggerUse for bVariant = offline, always = 0
UINT8	ComponentCombination xy, xy monotonic, RI, BP, MP 1 single, 1-component, equidistant data set. Also Time Stamp Ascii 2 XY, x monotonic increasing. 1st component: Y; 2nd component: X in raw data and in |CM 3 XY, characteristic curve; no requirements for monotonicity. 1st component: Y; 2nd component: X in raw data and in |CM 4 complex; 1st component: Real part; 2nd component: Imaginary part. 5 complex; 1st component: magnitude; 2nd component: phase 6 complex; 1st component: magnitude in dB; 2nd component: phase 7 single, 1-component equidistant data set. Monitor channel with min/max values; dx is half of the time interval between 2 consecutive min values.
UINT8	bZero. = 0. Because of alignment.
STR(Len=UINT16)	xUnit. Unit in x-direction for 1-component. For 2-component data, the unit's parameter. With TSA, the x-unit (e.g. “s“).

|CM1	Component

One for each component

UINT32	KeyBegin, |CM1
UINT8	NumericalFormat Numerical format 1 unsigned byte (1 byte) 2 signed byte (1 byte) 3 unsigned short (2 byte) 4 signed short (2 byte) 5 unsigned long (4 byte) 6 signed long (4 byte) 7 float (4 byte real as per IEEE) 8 double (8 byte real as per IEEE) 9 Transitional recording Time 10 Time Stamp Ascii: 6 byte time stamp, monotonically increasing. Not necessarily strictly monotonic. Doubleword added for synchronization. Binary info/texts with specified length; the text may contain zeroes. 11 2byte-Word digital 12 8byte unsigned long 13 6byte unsigned long: like unsigned long, but 6 instead of 4 Bytes. MS Byte also at the highest address. Used only for strictly monotonically increasing time tracks 14 8byte signed long A subset is also used with |CV1 Single Value.
UINT8	AdditionalSpecifier Should be set = 0 except in the following cases: Meaning when NumericalFormat=11=2byte-Word digital: IndexBit 0 bVariant= offline for 1st component 1…16 bVariant= offline for the selected Bit with 2nd component Meaning in the case of NumericalFormat with integer format: IntegerBits. The number has this many valid bits (beginning with with LSB). This is only extra information for the nominal value range. IntegerBits=0, when there are no special limitations. In that case all bits are valid. Example of NumericalFormat =4=signed short (2 byte): Allowed: 2 <= IntegerBits <= 16 or also IntegerBits=0 (is to be interpreted by the reader as 16). With TSA, 0 or 48 are allowed. With Transitional recording Time, only 8 is allowed in conjunction with Float, or 15 in conjunction with a digital port.
UINT16	wZero Always = 0 due to alignment

DBL	ScaleFactor Scaling factor For integer formats and TSA. With real formats and digital, always: Factor = 1.0 and Offset = 0.0 [Physical value] := [Integer-value] * ScaleFactor + ScaleOffset
DBL	ScaleOffset Offset of scaling. Like factor, but with 0.0 instead of 1.0
STR(Len=UINT16)	Unit: Must be empty string for TSA and digital bit data. With the unit, wCodePage also must be noted. For example, µ and ° not simply as an ANSI value, but in the user's code page. Also interpreted this way when reading the file.

|CH1	Offline Trigger

Raw data ordered in this sequence: Samples (both component), next Envelope, then Events. This is repeated for each channel.

Envelope contains statistics values about the channel: Min,Max.

UINT32	KeyBegin, |CH1
UINT32	dwEnvelopeReduction From this many samples, an envelope pair is formed. >= 10, if there is an Envelope. At this time only 1024 is supported. Otherwise it can also be = 0. If software not created by imc writes the file, then dwEnvelopeReduction is set = 0.
DBL	Triggertime Absolute trigger time in seconds since 1/1/1980. With decimal places. 0.0 for a multi-event, if the value is from the Event list
UINT64	uEffectiveLengBytes Effective Byte count. For IsMultiEvents=1: Gaps between events are not counted. Sum of the net lengths in the events is = EffectiveLengBytes. EffectiveLengBytes <= uChunkBytes. Most of the time, EffectiveLengBytes = uChunkBytes. Frequently with Transitional Recording, Data < uChunkBytes. For IsMultiEvents=0: Always EffectiveLengBytes = uChunkBytes.
UINT64	uChunkBytes: Byte count of the data in the binary block for this channel. The entire length of the channel's binary range, which in case of Multi-Event in special formats can also have gaps. It is then = Offset+Length of the event at the back.
UINT64	uEnvelopeBytes The chunk with Envelope data is this many Bytes long. If <> 0, then dwEnvelopeReduction must be <> 0. The following applies to software not created by imc: When reading the file, the corresponding amount of data in the binary key is skipped. When writing, uEnvelopeBytes=0 is set.

|Cq1	Previous Samples

Optional when bVariant = offline. Otherwise not.

Samples are being used in this channel which belong to a channel previously already written to the file. Only the samples and envelopes are re-used, not the events. The samples and envelopes are then not repeated in the binary data block. The Events are always written. The decision is made separately for each component of the channel.

Neither CM1.NumericalFormat=9 nor CH1.EffectiveLengBytes != CH1.uChunkBytes are supported.

CH1.EffectiveLengBytes, CH1.uChunkBytes, CH1.uEnvelopeBytes are each specified in their full length. It does not matter whether one or both components are used by another channel. When reusing, the sample-counts derived from CH1.uChunkBytes and CH1.uEnvelopeBytes of the current and of the referenced channels must match, as well as the CH1. dwEnvelopeReduction.

When there is a reference to a component, then the data of this component must genuinely be contained in the binary key; this means that the component may not in turn reference another one.

When a components is referenced, its CM1. NumericalFormat must match.

CH1. uChunkBytes > 0 is necessary.

UINT32	KeyBegin, |Cq1
UINT32[2]	dwIndexChannelRef For each of the two components, the relevant channel index of a predecessor channel containing the samples for these components. 0 if not used.
UINT16[2]	wComponent 0 or 1 for the channel's first or second component of the channel addressed by dwIndexChannelRef. 0, if dwIndexChannelRef is 0.

|CX1	Extraction rules with TSA

Blob with directions for extracting channels from the TSA channel

UINT32	KeyBegin, |CX1
UINT32	dwSizeBytes Count of subsequent Bytes. Always > 0.
UINT8[]	Content Bytes of content of extraction

|CZ1	z-coordinate

Scaling of the z-coordinate, especially with segments

Always present with segments (2D-matrices)

Optional with other data in which however z-properties are defined in FAMOS.

UINT32	KeyBegin, |CZ1
UINT32	dwZero = 0 due to alignment
DBL	dz Distance between 2 segments. 1.0, if not used.
DBL	z0 Offset of the z-coordinate. 0.0, if not used.
UINT64	SegmentLeng Segment length Count of samples in 1 segment; permanent for the whole channel. If > 0, then the data are segmented. If = 0, then not. But the z-coordinate is still valid. With Transitional Recording and TSA, always = 0.
STR(Len=UINT16)	zUnit

|CD1	Display

UINT32	KeyBegin, |CD1
UINT8	ColorFix Color fixed: 1 Following color values are applicable. 0 no fixed defined color.
UINT8	ColorR
UINT8	ColorG
UINT8	ColorB: Red-Green, Blue-component, range: 0...255, 0 minimum, 255 maximum, so (0,0,0) is black. The color in which the data are to be displayed. All = 0 for ColorFix=0.
DBL	yMin
DBL	yMax Set yMin to 1 and yMax to 0.0 if no particular display range is desired. Otherwise, real numbers between yMin and yMax, which are used in y-axes (only with real, xy, magnitude of complex data) for fixed scaling if this data set is displayed as a curve plot.

|Cw1	Famos Events Description

When IsMultiEvents=1, the Famos event list must also be in the file. When IsMultiEvents=0, it may not be here.

UINT32	KeyBegin, |Cw1
UINT32	dwCountEvents Event count Triggered this many times in a multi-event. Count of entries in the Events list. Else 0
UINT8	ValidNT 1, wenn Triggerzeit aus event -Liste Else 0
UINT8	ValidCD 0, if the time base does not come from the Events-list Bit 1 (0x01, LSB) set: dx taken from Events-list Bit 2 (0x02) set: x0 taken from Events-list Bit 3 (0x04) set: Z0 taken from x0 of the Event-list
UINT8	ValidCR1 0, if scaling of the 1st component (y) is fixed. Bit 1 (0x01, LSB) set: dy from 1 component of the Events-list Bit 2 (0x02) set: dto, but y0
UINT8	ValidCR2 0..3, dto, but 2nd component (x). Is 0 for 1-component data

Event-list in the raw data:

Array of 9 densely packed elements (each 64 bits wide, Intel order) of the form

```
typedef struct {
   unsigned __int64 uOffset ; // offset of the event, relative count of
samples
   unsigned __int64 uLang   ; // length of the event, relative count of
samples
   double Time ; // absolute trigger time, default: 0.0
   double ScaleOffset[2]   ; // offset for data, default: 0.0
   double x0 ; // x0, default: 0.0
   double ScaleMultiply[2]   ; // factor for data, default: 1.0
   double dx ; // dx, default 1.0
} FILE_EV ;

[Physical value] := [Integer-value] * ScaleMultiply + ScaleOffset
```

|Ce1	Envelope setting

If envelope is used on this channel.

UINT32	KeyBegin, |Ce1
UINT32	dwEnvelopeReduction Reduction factor from which an envelope pair is formed. Currently fixed at 1024.
UINT32	dwDefaultEnvelopeBytes Number of bytes for a chunk with envelope data, if not specified otherwise. 0 also possible.

|CN1	Channel name

Per named channel / Bit

UINT32	KeyBegin, |CN1
UINT8	IndexBit 0 for channel without bits, 1…16 for bits. Each bit may occur at most once. With NumericalFormat=11=2byte-Word digital of the first component
STR(Len=UINT16)	Name. May not be an empty string.
STR(Len=UINT16)	Comment

|CP1	Properties

Directly behind Group,Text,Channel or repeating at the end. The one at the end overwrites but does not delete. This means that at the end only such properties are specified which are new or which have new values.

UINT32		KeyBegin, |CP1
UINT32		dwIndexChannel Reference to channel. 0 for object previously defined in the file. This applies to the preceding group or channel or text variable or single value. Always = 0 when bVariant= offline
UINT16		IndexBit 0 for channel without bits, 0 for port, 0 for dwIndexChannel =0 Always = 0 when bVariant= offline
UINT16		CountElements Element count The text array contains this many elements
ARRAY		across CountElements
	UINT16	wOption Option wOption= Data type*256+flags wOption=0, if nothing further is known Data type (one of these):

	0 string 1 Integer 2 Real 3 Time stamp in the DM-format, seconds as of 1/1/1980 4 Enumeration 5 Boole Flags, logical disjunction: 0: default 2: hide in Editors 4: read-only in Editors (corresponds overall to a logical disjunction of the CMPROP_FLG_* CMPROP_FLG_HIDE, CMPROP_FLG_RDONLY, CMPROP_FLG_DT_STRING .. CMPROP_FLG_DT_BOOL)
STR(Len=UINT16)	Name Name of the element
STR(Len=UINT32)	Content Content of the element

|RR1	Raw data start

Samples, raw data, once per file.

Binary data always in chunks: 1 Chunk contains multiple samples of a channel. With equidistant data a compact sequence of y-values. With 2-component data, a compact sequence of values of the 1st component (with xy: y), next a compact sequence of values of the 2nd component (with xy: x). Then with equidistant data, the size of a chunk is: [Bytes per y] * [Sample count], with 2-component data ([Bytes per y] + [Bytes per y]) * [Samples count]. With Transitional Recording and TSA, the chunk length is a multiple of 512, except at the end of the very last event in Transitional Recording and in TSA at the end of each event. With segmented data, the count of samples in the chunk is additionally also a multiple of the segment length.

The first component is y with xy, M with MP, B with BP, R with RI, D with DP.

UINT32	KeyBegin, |RR1
UINT8[]	raw Array with raw data, binary data block. Fille with |RN1 and chunks of data.

|RN1	no chain

Without further content. Only once directly after the start of the raw data key.

Directly followed by, for all channels, in the order of |CH1:

- all samples 1st component
- all samples 2nd component
- all envelopes
- all events

UINT32	KeyBegin, |RN1

|RC5	chain, selected channels and lengths

Follow chunks with selected channels of individual length.

IndexEnvelope allowed.

UINT32		KeyBegin, |RC5
UINT32		dwEntries: Number of entries
ARRAY		Number of elements: dwEntries
	UINT32	dwIndexChannel valid index of a channel
	UINT32	dwChunkBytes. 0 also possible. If = 0, however, this list entry may also be omitted by the writer without damage.

|RT1	chain, Trigger

Info about channels that have just been triggered. Without data, only with trigger info. No chunks follow directly after this key.

Before chunks with data are available for a channel, the channel must appear in a chunk with trigger.

Channels (e.g. xy) without samples must also be triggered once when a trigger is released, so that they have the same event counts/indices as channels with samples.

If IsMultiEvents=0, the channel may appear only once or not at all in such a key per file.

If IsMultiEvents=1, the number of occurrences determines the number of events for that channel.

If whole trigger events are lost due to overflow, **|Ro1** is created instead of this key.

Each triggered channel generally appears only once in the list. Since each occurrence is interpreted as a trigger, multiple occurrences would count as multiple triggers.

IndexEnvelope is not allowed. It is assumed that they trigger at the same time as the real channels.

UINT32		KeyBegin, |RT1
UINT32		dwEntries: Number of entries. For this number of channels there is the following additional information.
UINT64		uTriggertime Trigger time Absolute trigger time in nanoseconds as of 1.1.1980. All channels to the same trigger must have the same absolute trigger time. Depending on the software used, accuracy may be lost when converting to a real number for further processing.
ARRAY		Number of elements: dwEntries
	DBL	Pretrigger E.g < 0.0 for typical pretrigger
	UINT32	dwIndexChannel Valid index of a channel
	SINT32	iEnvelopeDelayed 0, if no envelope 0, if the envelope starts with the first sample. > 0: Envelope starts so many samples later. < dwEnvelopeReduction. < 0: Envelope starts so many samples earlier. The first pair of values of the envelope is calculated of values before. > - dwEnvelopeReduction.

|Ri1	chain, index of contents

Index of contents is written

- after a certain number of written records
- when the length of the table of contents exceeds a certain memory limit, but at least also when the raw data key is terminated, .

For particularly efficient evaluation, the index of contents is arranged from back to front. |RC* is arranged for forward chaining, as of evaluation from front to back.

After previous use of |RC*.

Behind it continues with |RC* or also |RE1.

For backward chaining.

UINT32	KeyBegin, |Ri1
UINT32	dwLengthPreceding Key length of the previous index of contents in bytes, incl. '|' character. = 0, if no previous index of contents.
UINT32	dwEntries: Number of entries Number of keys with concatenations after the previous index of contents. If there is no previous index of contents, then all chainings from the beginning to here are valid.
ARRAY	Number of elements: dwEntries

One of the following follows as an array element.
Either

one of |RC*	the complete key incl. |RC*

or

one of |RT*	the complete key incl. |RT*

or

one of |Ro*	the complete key incl. |Ro*

|RE1	Raw data end

End of the raw data key

UINT32	KeyBegin, |RE1

|CS1	Summary with chain

Only if raw data |R* are available.

Enumeration for all channels, in order of all dwIndexChannel.

<table>
<tr><td colspan="2">UINT32</td><td>KeyBegin, |CS1</td></tr>
<tr><td colspan="2">UINT32</td><td>KeyLengRi
Last index of contents in bytes
Key length preceding (=last) index of contents in bytes, incl. '|' character.</td></tr>
<tr><td colspan="2">UINT64</td><td>CountRi
Number of |Ri index of contents.
>= 1.</td></tr>
<tr><td colspan="2">ARRAY</td><td>Number of elements := dwIndexChannel</td></tr>
<tr><td></td><td>UINT64</td><td>TotalBytes
Number of total bytes
The total number of bytes present in the channel, for all components, for all chunks of the channel with all samples and all events. Envelopes are not counted.</td></tr>
<tr><td></td><td>UINT64</td><td>CountChunks
Number of chunks
All chunks that exist in total for this channel (without envelope). Only chunks with length > zero are counted. For example, |RT1 contains no chunks.
If no length is explicitly specified in a |RC*, then the following applies
Length := DefaultChunkBytes.</td></tr>
<tr><td></td><td>UINT64</td><td>TotalEnvelopeBytes
total number of bytes of envelope
This is the total number of bytes in the envelope, for all envelope chunks of the channel with all events.</td></tr>
<tr><td></td><td>UINT64</td><td>CountEnvelopeChunks
All chunks that exist in total for this channel for the envelope. Only chunks with length > zero are counted.
If no length is explicitly specified in a |RC*, then the following applies
Length := DefaultEnvelopeBytes.</td></tr>
<tr><td></td><td>UINT32</td><td>dwCountEvents
Number of events
for multi event:
number of triggered events. Inclusive the number of lost due to overflow. >= 0.
without multi event:
0: not triggered, -> no chunks
1: one trigger, normal</td></tr>
<tr><td></td><td>UINT32</td><td>dwReserved
always 0. because of alignment</td></tr>
</table>

<table>
<tr><td>|CJ1</td><td>Jump back</td></tr>
</table>

Jump back from here to other keys so that the file can be analyzed starting from the end.

magic1 and magic2 must match those at the beginning of the file. If the file is correctly and completely concluded.

UINT32	KeyBegin, |CJ1
UINT32	dwMagic1 repetition of the value from |CB1
UINT64	FileOffset_RE The position of the |RE1 (Raw data end) key. Specified as a FileOffset which counts the Bytes as of the file beginning. FileOffset=0 for the file's first Byte. Thus a jump-back without search becomes possible when reading the file.
UINT32	dwMagic2 Repetition of the value from |CB1
UINT32	dwKeyLengCJ: fixed value 32, Key-length of the Jump keys, including "|"-character.
UINT32	dwSpace. Initially = 0. Not checked when reading in.
UINT32	dwEnd: fixed content |CE1

|NU1	User-defined key

UINT32	KeyBegin, |NU1
UINT32	dwUser user-defined value
UINT64	SizeBytes Count of subsequent Bytes
UINT8[]	Content The user's Bytes

|N**	unknown non-critical key

** defined later

UINT32	KeyBegin, corresponding |N**
UINT32	dwLater Depending on the key, content defined later
UINT64	SizeBytes Count of subsequent Bytes
UINT8[]	Content Bytes of the content to be defined later

Sections of the file. Sequential orders in the sections

File start

|imc3,1;	File format	always
|CB1	Beginning	always
|CL1	Language	always
|CO1	Origin	always
|Cd1	Data Manager version	optional

Description of the channels before the beginning of the measurement / Famos variables

Intro

|CA1	Count Dataobjects	always

Repetition. Arbitrarily often, also 0-times:

either

|CG1	FAMOS Group	always
|CP1	Properties	optional

or

|Ct1	FAMOS text variable	always
|CP1	Properties	optional

or

|CT1	FAMOS text array	always
|CP1	Properties	optional

or

|CV1	Single Value	always
|CP1	Properties	optional

or

|CC1	Channel Base	always
|CM1	Component	always
|CM1	Component	always with 2-component data. Otherwise not
|CH1	Offline Trigger	always
|Cq1	Previous Samples	optional
|Cw1	Famos Events Description	optional
|CZ1	z-coordinate	optional
|CX1	Extraction rules with TSA	optional

Repetition at least 1 time. Maximum 1 time per Port/Channel and each contained bit once

|CD1	Display	optional
|CN1	Channel name	always
|CP1	Properties	optional

Raw data

|RR1	Raw data start	always

Repetition. Arbitrarily often, also 0-times:

|RC*	chain	optional
|RT*	chain, trigger	optional
|Ro*	overflow	optional
|Ri1	chain, index of contents	at least 1 time

|RE1	Raw data end	always

Description of the channels after the end of the measuremen

|CS1	Summary with chain	always, if |RR1 exists, otherwise not.

Repetition. Arbitrarily often, also 0-times:

|CP1	Properties	dwIndexChannel valid. IndexBit also defined.

File end

|CJ1	Jump back	always

Not bound to a section. May only be in the sections.

nach |CO1 und vor |RR1

nach |CS1 und vor |CJ1

|NU1	User-defined key	optional In the file beginning section only after all other keys. In the "Description channels before measurement" area only after |CA1. In the "Description of channels after end of measurement" area only after |CS1. Not at all in the sections raw data file end
|N**	unknown non-critical key	May only be present where specified later. Everywhere, but: In the file beginning section only appended. In the file end section only prefixed.

Sections of the file. Order of the sections

File beginning

Description Channels before start of measurement / FAMOS variables.

Raw data. May be omitted completely if there is neither data nor trigger.

Description Channels after end of measurement. Not applicable if raw data are omitted

File end

5.3.2 Analysis of the file content

What are all the things which need to be checked upon reading a file?

- There must be check of whether the key currently read from the file is the one expected or a different one. Error, if the key is not expected.
- With all fields having enumerations (such as PretriggerUse), it is necessary to check whether the content is a known value.

With imc FAMOS 7.4 (64 bit), when the file is read a protocol is optionally created which analyzes the file read. As a result, file offsets and contents are outputted, e.g.

FILE = J:\tmp\dataimc3.DAT

8: |CB1 "Beginning" dwMagic1=24601516; dwMagic2=464710727; bVariant=0=offline; …

32: |CL1 "Language" Codepage=1252=WESTEUROPA; Language=407H=GERMAN;

40: |CO1 "Origin" File Producer=Famos; File Comment=;

..

198328324: |CC1 "Channel Base" dwIndexChannel=6178; dwIndexGroup=0; …

198328363: |CM1 "Component" Component=1; ScaleFactor= …

..

Analysis is performed when a valid name is specified in the Registry:

[HKEY_CURRENT_USER\Software\imc Measurement and Control\Default\CurveDataManager\Curves]

"RawAnalyse"="D:\tmp\raw-analyse.txt"

After use, be sure not to forget to rename/delete the Registry key, so that the time-demanding log stops being generated!

5.3.2.1 Example: File with a channel

```
  0 | 7c 69 6d 63 33 2c 31 3b   |imc3,1;
  8 | 7c 43 42 31 4d 43 4f cf   |CB1MCOÏ
 16 | dc 87 ca 1b 00 00 00 00   Ü‡Ê.....
 24 | ff ff 00 00 01 00 01 00   ÿÿ......
 32 | 7c 43 4c 31 e4 04 07 04   |CL1ä...
 40 | 7c 43 4f 31 05 00 46 61   |CO1..Fa
 48 | 6d 6f 73 00 00 7c 43 64   mos..|Cd
 56 | 31 20 37 2e 34 20 52 65   1 7.4 Re
 64 | 76 20 32 00 00 00 00 00   v 2.....
 72 | 00 36 34 00 00 72 65 6c   .64..rel
 80 | 65 61 73 65 00 01 00 07   ease....
 88 | 04 7c 52 52 31 7c 52 4e   .|RR1|RN
 96 | 31 00 00 01 00 02 00 03   1.......
104 | 00 04 00 05 00 06 00 07   ........
112 | 00 08 00 09 00 7c 52 45   .....|RE
120 | 31 7c 43 41 31 00 00 00   1|CA1...
128 | 00 01 00 00 00 01 00 00   ........
136 | 00 00 00 00 00 00 00 00   ........
144 | 00 7c 43 43 31 01 00 00   .|CC1...
152 | 00 00 00 00 00 00 00 f0   .......ð
160 | 3f 00 00 00 00 00 00 00   ?.......
168 | 00 00 00 00 00 00 00 00   ........
176 | 00 00 00 01 00 01 00 73   .......s
184 | 7c 43 4d 31 03 00 00 00   |CM1....
192 | 00 00 00 00 00 00 f0 3f   ......ð?
200 | 00 00 00 00 00 00 00 00   ........
208 | 02 00 4e 6d 7c 43 48 31   ..Nm|CH1
216 | 00 00 00 00 00 00 80 b1   ......€±
224 | 09 47 d2 41 14 00 00 00   .GÒA....
232 | 00 00 00 00 14 00 00 00   ........
240 | 00 00 00 00 00 00 00 00   ........
248 | 00 00 00 00 7c 43 4e 31   ....|CN1
256 | 00 06 00 4d 79 52 61 6d   ...MyRam
264 | 70 00 00 7c 43 4a 31 4d   p..|CJ1M
272 | 43 4f cf 75 00 00 00 00   COÏu....
280 | 00 00 00 dc 87 ca 1b 20   ...Ü‡Ê.
288 | 00 00 00 00 00 00 00 7c   .......|
296 | 43 45 31 .. .. .. .. ..   CE1.....
```

<table>
<tr><th>File offset</th><th>Content</th></tr>
<tr><td>8:</td><td>|CB1 "Beginning" dwMagic1=3478078285; dwMagic2=466257884; bVariant=0=offline; bCS=0; bUnicode=0=ansi; bCompr=0; Timezone=-1=unknown; wSummertime=0=unknown; VersionMajor=1; VersionMinor=1;</td></tr>
<tr><td>32:</td><td>|CL1 "Language" Codepage=1252=WESTEUROPA; Language=407H=GERMAN;</td></tr>
<tr><td>40:</td><td>|CO1 "Origin" File Producer=Famos; File Comment=;</td></tr>
<tr><td>53:</td><td>|Cd1 "datamanager version" version= 7.4 Rev 2; platform=64; compile=release; AppCode=1; SystemLanguage=407H</td></tr>
<tr><td>89:</td><td>|RR1 "Raw data start"</td></tr>
<tr><td>93:</td><td>|RN1 "no chain"</td></tr>
<tr><td>267:</td><td>|CJ1 "Jump back" FileOffset_RE=117; dwMagic1=3478078285; dwMagic2=466257884; dwKeyLengCJ=32; dwSpace=0; dwEnd=826622844=|CE1</td></tr>
<tr><td>117:</td><td>|RE1 "Rawdata end" total size of binary=20;</td></tr>
<tr><td>121:</td><td>|CA1 "Count Dataobjects" dwCountGroups=0; dwCountNamedChannels=1; dwCountIndexChannels=1; dwCountTextVars=0; dwCountSingleValues=0</td></tr>
<tr><td>145:</td><td>|CC1 "Channel Base" dwIndexChannel=1; dwIndexGroup=0; dwDefaultChunkBytes=0; dx=1.000000e+00; x0=0.000000e+00; Flags=0H;IsMultiEvents=0;AllowRemove=0; PretriggerUse=0=no; ComponentCombination=1=one; bZero=0; xUnit=s;</td></tr>
<tr><td>184:</td><td>|CM1 "Component" Component=1; ScaleFactor=1.000000e+00; ScaleOffset=0.000000e+00; NumericalFormat=3=UINT16; AdditionalSpecifier=IntegerBits=0; wZero=0; Unit=Nm;</td></tr>
<tr><td>212:</td><td>|CH1 "Offline Trigger" dwEnvelopeReduction=0; Triggertime=13.11.2018 13:08:22; uEffectiveLengBytes=20; [Samples=10;] uChunkBytes=20; uEnvelopeBytes=0; [Pairs=0;]</td></tr>
<tr><td>252:</td><td>|CN1 "Channel name" Name=MyRamp; Comment=; IndexBit=0;</td></tr>
</table>

5.3.2.2 Example: File with a single value

```
  0 | 7c 69 6d 63 33 2c 31 3b   |imc3,1;
  8 | 7c 43 42 31 0b 57 7e 31   |CB1.W~1
 16 | 9a 86 ca 1b 00 00 00 00   š†Ê.....
 24 | ff ff 00 00 01 00 01 00   ÿÿ......
 32 | 7c 43 4c 31 e4 04 07 04   |CL1ä...
 40 | 7c 43 4f 31 05 00 46 61   |CO1..Fa
 48 | 6d 6f 73 00 00 7c 43 64   mos..|Cd
 56 | 31 20 37 2e 34 20 52 65   1 7.4 Re
 64 | 76 20 32 00 00 00 00 00   v 2.....
 72 | 00 36 34 00 00 72 65 6c   .64..rel
 80 | 65 61 73 65 00 01 00 07   ease....
 88 | 04 7c 52 52 31 7c 52 4e   .|RR1|RN
 96 | 31 7c 52 45 31 7c 43 41   1|RE1|CA
104 | 31 00 00 00 00 00 00 00   1.......
112 | 00 00 00 00 00 00 00 00   ........
120 | 00 01 00 00 00 7c 43 56   .....|CV
128 | 31 00 00 00 00 00 00 40   1......@
136 | 62 09 47 d2 41 00 00 00   b.GÒA...
144 | 00 00 00 f0 3f 08 0d 00   ...ð?...
152 | 4d 79 53 69 6e 67 6c 65   MySingle
160 | 56 61 6c 75 65 00 00 01   Value...
168 | 00 56 7c 43 4a 31 0b 57   .V|CJ1.W
176 | 7e 31 61 00 00 00 00 00   ~1a.....
184 | 00 00 9a 86 ca 1b 20 00   ..š†Ê. .
192 | 00 00 00 00 00 00 7c 43   ......|C
200 | 45 31 .. .. .. .. .. ..   E1......
```

File offset	Inhalt
8:	|CB1 "Beginning" dwMagic1=830363403; dwMagic2=466257562; bVariant=0=offline; bCS=0; bUnicode=0=ansi; bCompr=0; Timezone=-1=unknown; wSummertime=0=unknown; VersionMajor=1; VersionMinor=1;
32:	|CL1 "Language" Codepage=1252=WESTEUROPA; Language=407H=GERMAN;
40:	|CO1 "Origin" File Producer=Famos; File Comment=;
53:	|Cd1 "datamanager version" version= 7.4 Rev 2; platform=64; compile=release; AppCode=1; SystemLanguage=407H
89:	|RR1 "Raw data start"
93:	|RN1 "no chain"
170:	|CJ1 "Jump back" FileOffset_RE=97; dwMagic1=830363403; dwMagic2=466257562; dwKeyLengCJ=32; dwSpace=0; dwEnd=826622844=|CE1
97:	|RE1 "Rawdata end" total size of binary=0;
101:	|CA1 "Count Dataobjects" dwCountGroups=0; dwCountNamedChannels=0; dwCountIndexChannels=0; dwCountTextVars=0; dwCountSingleValues=1
125:	|CV1 "Single Value" dwIndexGroup=0; dTime=13.11.2018 13:03:05; NumericalFormat=8=DOUBLE; Name=MySingleValue; Comment=; Unit=V; dValue = 1;

5.4 TSA

Time Stamp ASCII Format

Field busses receives texts and binary values which are arranged in a data stream. imc Online FAMOS RecordEvents () function produces this datatype as well. Each text is given a time stamp. One has, then, a sequence of time-stamped texts in a datastream or channel. Synchronisation markers are added for the purpose of recovery after a data overflow.

Texts in this format also can originate from the RecordEvents function of imc Online FAMOS.

Main features:

- Texts can also be binary and can thus each byte can be from 00H to FFH.
- Text beginnings can be quickly located anywhere within the file.
- Space-saving
- The conditions that times increase monotonously enables rapid binary searches for particular times

5.4.1 Data format in the file

Start of the binary data segment

<table>
<tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td></td><td>6</td><td></td><td>8</td><td></td><td>10</td><td></td><td>12</td><td></td><td>14</td><td></td><td>16</td><td></td><td>...</td><td></td><td></td><td></td></tr>
<tr><td>low</td><td>high</td><td>low</td><td>high</td><td>low</td><td>high</td><td>low</td><td>..</td><td>..</td><td>..</td><td>..</td><td>high</td><td>t[0]</td><td>t[1]</td><td>t[2]</td><td>fill</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Lo Word
Synch_Last</td><td colspan="2">Hi Word
Synch_Next</td><td colspan="2">WORD
Leng</td><td colspan="6">3WORD time stamp</td><td colspan="4">Text, N whole WORDs</td><td colspan="2">WORD
Leng</td><td colspan="4">...</td></tr>
<tr><td colspan="4">Synch</td><td colspan="12">1^{st} sample in the channel</td><td colspan="6">2^{nd} sample in the channel...</td></tr>
</table>

<table>
<tr><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td colspan="3">...</td><td>512</td><td>513</td><td>514</td><td>515</td><td>516 ...</td><td>e.g. 530 ...</td></tr>
<tr><td colspan="4">Synch</td><td colspan="2">1^{st} sample</td><td>2^{nd} sample</td><td>3^{rd} sample
Start</td><td colspan="4">DWORD Synch, e.g.
Synch_Next = 18</td><td>3^{rd} sample
continuation</td><td>4^{th} sample</td></tr>
</table>

#define TSA_SYNCHBYTES (512)

A Synch-Cluster has this many bytes.

Synch:

Synchronisation marker. Double-Word. Always at fixed intervals and positions in the data stream. The first marker is at the very beginning, the others at the positions i * TSA_SYNCHBYTES.
Synch consists of HiWord and LoWord

LoWord:
Synch_Last, number of invalid bytes before this Synch-marker. Invalid bytes result when old, uncompleted Synch-Clusters are filled up after a data overflow.
Synch_Last can be: 0...512. 0 is default. With 0, the last Synch-Cluster is completely valid. It may never become > 512. (Reason: 1st it is superfluous and 2nd it would delay detection of invalid former clusters, complicating the evaluation process). Synch_Last must be <= 508.. The Synch cannot become invalid. Reason: 1) only whole samples are written to the data stream, 2) only whole samples or clusters are read, 3) therefore, no half- Synch can be read

HiWord:

Synch_Next, Synch is the number of bytes to the next following end of a sample, counting from the boundary N* TSA_SYNCHBYTES, where the Synch Double-Word is located. Therefore, Synch_Next >= 4, because the next thing it can point to is the following Word in memory. Synch divides the storage space in Synch-Clusters of the size TSA_SYNCHBYTES bytes. Synch_Next generally points to the end of a sample, the beginning of the next sample. But it can also point to a Synch, if a sample ends right before the Synch. Synch_Next always can also point to an illegal. Synch_Next is always a multiple of 4. Therefore, even if the sample is not a multiple of 4 in length, Synch_Next points to after the sample's filler-bytes.

Synch interrupts right in between the sequence of samples.

Synch_Next can be: 4...65532. The higher values cannot occur in the temporary format.

Synch_Next > 0: The fact that in a ring-buffer, the writing of data can actually continue forwards, is neglected. Also note that lang datastreams can be repeatedly interrupted by Synchs.

Leng

Normally >= 8: Number of Bytes in a sample, in other words, 8 + number of characters in the text.

The top 2 bits are 0. These are for future enhancements (for instance 0: 6Bytes time + short text, lower 14 bits the length, ...).

The value range is then 8 .. 16383The length of the text is then 0...16375 Bytes.

TSA_ILLEGAL_DW is a special value. See below.

#define TSA_ILLEGAL_DW   (0x0000)

#define TSA_ILLEGAL_B   (0x00)

If Leng takes this value, this is a single, invalid Word, for instance as filler. Always compare Leng and the next following Word with TSA_ILLEGAL_DW (DWORD because of 4 Byte alignment).

Time-stamp

48 bit time, unsigned, as wih CAN bus. To derive a time from this integer value:

Time = Pretriggertime [s] + 48Bit_Value * SamplingTime [s]

The time stamp must increase monotonously within the data stream. But not necessarily strictly monotonously; two adjacent time stamps may sometimes be equal. This is a regular occurrence when the time stamp's time-resolution is not sufficient or especially if events occur on multiple channels at the same time.

Text

The characters of the text, Byte-by-Byte. No terminating zero, since the length is already specified. Therefore, the t[i] = 0 may occur for any i.

Note! Alignment set to 4 bytes!

If Leng is not a multiple of 4, some zero-Bytes are appended to the text in order ensure that the data stream is filled with a complete number of Double-Words. Any block of binary data is also text (however, in the curve window it is temporarily interpreted as Ascii-text and displayed as such).

Sample

Here, a sample refers to a time-and-text pair. The pair has no fixed length.

5.4.2 Writing to the file

- Synch is only written if at least 1 Word of a sample is still to come, in other words, only if necessary.
- The Fieldbus firmware always sets Synch_Last = 0. Synch_Next is always correctly entered as >= 4.
- Empty texts can also be written with a time-stamp. This is not the same thing as writing nothing at all. An empty text is a block 4 Words in size.

5.4.3 Keys in the file format imc2

CG,1

FieldType: 1 for Time Stamp Ascii

CD,2

PretriggerUse: 0, if Pretrigger is given in |CR. This is the preferable setting if you wish to personally write the files.

PretriggerUse: 4: with Time Stamp Ascii data as the offset for the time track, which is then integer and can be scaled (also event-event) in terms of factor and offset. x0 is copied to data set ->offset[Component_1].
Take this option if Pretrigger is given in |Cb.

CC,1

Component index: 1 for Time Stamp Ascii
AnalogDigital: 1 for Time Stamp Ascii

CP,10

Bytes: 6 for Time Stamp Ascii
Number format: 10 for Time Stamp Ascii, 6 byte time stamp, increasing monotonously. Not necessarily strictly monotonous. Double-Words inserted for synchronisation. Text with specification of length, text may contain zeroes.
DirectSequenceNumber then means individual Bytes, gen. = 1
SignBits = 48
Mask = 0

CR,1

In Time Stamp Ascii the scaling of the time track

Example imc2 Format

```
00000000  7C 43 46 2C 32 2C 31 2C 31 3B 7C 43 4B 2C 31 2C 33 2C 31 2C 31 3B 0D   |CF,2,1,1;|CK,1,3,1,1;.
00000017  0A 7C 4E 4F 2C 31 2C 31 32 2C 31 2C 35 2C 46 61 6D 6F 73 2C 30 2C 3B   .|NO,1,12,1,5,Famos,0,;
0000002E  0D 0A 7C 43 47 2C 31 2C 35 2C 31 2C 31 2C 31 3B 0D 0A 7C 43 44 2C 32   ..|CG,1,5,1,1,1;..|CD,2
00000045  2C 35 34 2C 31 2E 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 45 2B   ,54,1.000000000000000E+
0000005C  30 2C 31 2C 30 2C 2C 30 2C 30 2C 30 2C 30 2E 30 30 30 30 30 30 30 30   0,1,0,,0,0,0,0.00000000
00000073  30 30 30 30 30 30 30 45 2B 30 2C 30 3B 0D 0A 7C 4E 54 2C 31 2C 32 37   0000000E+0,0;..|NT,1,27
0000008A  2C 33 31 2C 20 35 2C 32 30 30 30 2C 31 32 2C 33 39 2C 35 30 2E 30 30   ,31, 5,2000,12,39,50.00
000000A1  30 30 30 30 30 3B 0D 0A 7C 43 43 2C 31 2C 33 2C 31 2C 31 3B 0D 0A 7C   00000;..|CC,1,3,1,1;..|
000000B8  43 50 2C 31 2C 31 37 2C 31 2C 36 2C 31 30 2C 34 38 2C 30 2C 30 2C 31   CP,1,17,1,6,10,48,0,0,1
000000CF  2C 30 3B 0D 0A 7C 43 62 2C 31 2C 34 35 2C 31 2C 30 2C 31 2C 31 2C 30   ,0;..|Cb,1,45,1,0,1,1,0
000000E6  2C 35 39 32 2C 30 2C 35 39 32 2C 31 2C 30 2E 30 30 30 30 30 30 30 30   ,592,0,592,1,0.00000000
000000FD  30 30 30 30 30 30 30 45 2B 30 2C 30 2C 3B 0D 0A 7C 43 52 2C 31 2C 35   0000000E+0,0,;..|CR,1,5
00000114  30 2C 31 2C 31 2E 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 45 2D   0,1,1.000000000000000E-
0000012B  31 2C 2D 35 2E 30 30 30 30 30 30 30 30 30 30 30 30 30 30 30 45 2B 30   1,-5.000000000000000E+0
00000142  2C 31 2C 31 2C 73 3B 0D 0A 7C 43 4E 2C 31 2C 31 37 2C 30 2C 30 2C 30   ,1,1,s;..|CN,1,17,0,0,0
00000159  2C 36 2C 41 6C 61 72 6D 73 2C 30 2C 3B 0D 0A 7C 43 53 2C 31 2C 35 39   ,6,Alarms,0,;..|CS,1,59
00000170  34 2C 31 2C 00 00 04 00 16 00 02 00 00 00 00 00 54 65 78 74 20 31 20   4,1,............Text 1 
00000187  61 74 20 2D 34 2E 38 00 00 16 00 09 00 00 00 00 00 54 65 78 74 20 32   at -4.8..........Text 2
0000019E  20 61 74 20 2D 34 2E 31 00 00 1E 00 09 00 00 00 00 00 54 65 78 74 20    at -4.1..........Text 
000001B5  33 20 61 74 20 2D 34 2E 31 20 61 73 20 77 65 6C 6C 00 00 77 00 97 00   3 at -4.1 as well..w.█.
000001CC  00 00 00 00 54 65 78 74 20 34 20 62 69 67 3A 30 30 30 30 30 30 30 30   ....Text 4 big:00000000
000001E3  30 30 31 31 31 31 31 31 31 31 31 31 32 32 32 32 32 32 32 32 32 32 33   00111111111122222222223
000001FA  33 33 33 33 33 33 33 33 33 34 34 34 34 34 34 34 34 34 34 35 35 35 35   33333333344444444445555
00000211  35 35 35 35 35 35 36 36 36 36 36 36 36 36 36 36 37 37 37 37 37 37 37   55555566666666667777777
00000228  37 37 37 38 38 38 38 38 38 38 38 38 38 39 39 39 39 39 39 39 39 39 39   77788888888889999999999
0000023F  00 77 00 AE 00 00 00 00 00 54 65 78 74 20 35 20 62 69 67 3A 30 30 30   .w.®.....Text 5 big:000
00000256  30 30 30 30 30 30 30 31 31 31 31 31 31 31 31 31 31 32 32 32 32 32 32   00000001111111111222222
0000026D  32 32 32 32 33 33 33 33 33 33 33 33 33 33 34 34 34 34 34 34 34 34 34   22223333333333444444444
00000284  34 35 35 35 35 35 35 35 35 35 35 36 36 36 36 36 36 36 36 36 36 37 37   45555555555666666666677
0000029B  37 37 37 37 37 37 37 37 38 38 38 38 38 38 38 38 38 38 39 39 39 39 39   77777777888888888899999
000002B2  39 39 39 39 39 00 77 00 CC 00 00 00 00 00 54 65 78 74 20 36 20 62 69   99999.w.Ì.....Text 6 bi
000002C9  67 3A 30 30 30 30 30 30 30 30 30 30 31 31 31 31 31 31 31 31 31 31 32   g:000000000011111111112
000002E0  32 32 32 32 32 32 32 32 32 33 33 33 33 33 33 33 33 33 33 34 34 34 34   22222222233333333334444
000002F7  34 34 34 34 34 34 35 35 35 35 35 35 35 35 35 35 36 36 36 36 36 36 36   44444455555555556666666
0000030E  36 36 36 37 37 37 37 37 37 37 37 37 37 38 38 38 38 38 38 38 38 38 38   66677777777778888888888
00000325  39 39 39 39 39 39 39 39 39 39 00 77 00 FC 00 00 00 00 00 54 65 78 74   9999999999.w.ü.....Text
0000033C  20 37 20 62 69 67 3A 30 30 30 30 30 30 30 30 30 30 31 31 31 31 31 31    7 big:0000000000111111
00000353  31 31 31 31 32 32 32 32 32 32 32 32 32 32 33 33 33 33 33 33 33 33 33   11112222222222333333333
0000036A  33 34 34 34 34 34 34 34 34 34 00 00 38 00 34 35 35 35 35 35 35 35 35   3444444444..8.455555555
00000381  35 35 36 36 36 36 36 36 36 36 36 36 37 37 37 37 37 37 37 37 37 37 38   55666666666677777777778
00000398  38 38 38 38 38 38 38 38 38 39 39 39 39 39 39 39 39 39 39 00 16 00 31   8888888889999999999...1
000003AF  01 00 00 00 00 54 65 78 74 20 38 20 61 74 20 32 35 2E 35 00 00 3B      .....Text 8 at 25.5..;
```

```
|CF,2,1,1;|CK,1,3,1,1;
|NO,1,12,1,5,Famos,0,;
|CG,1,5,1,1,1;
|CD,2,54,1.000000000000000E+0,1,0,,0,0,0,0.000000000000000E+0,0;
|NT,1,27,31, 5,2000,12,39,50.0000000;
|CC,1,3,1,1;
|CP,1,17,1,6,10,48,0,0,1,0;
|Cb,1,45,1,0,1,1,0,592,0,592,1,0.000000000000000E+0,0,;
|CR,1,50,1,1.000000000000000E-1,-5.000000000000000E+0,1,1,s;
|CN,1,17,0,0,0,6,Alarms,0,;
|CS,1,594,1, >>>>>>>>;
```

In **CG, CD, CC, CP**, the entries are fixed for Time Stamp Ascii. CR contains the time-resolution (dx) of the time track, the start-time (x0) of the time track and the time track unit. **Time**:= (48Bit Integer) * dx + x0

The region of binary data, denoted here with >>>>, is described in the documentation provided.

|CS,1,594,1,"Synch" "1. Samples" "2. Sample" .... "Synch" .... ;

```
00000168  7C 43 53 2C 31 2C 35 39 34 2C 31 2C   |CS,1,594,1,
00000174  00 00 04 00 16 00 02 00 00 00 00 00   ............
00000180  54 65 78 74 20 31 20 61 74 20 2D 34   Text 1 at -4
0000018C  2E 38 00 00 16 00 09 00 00 00 00 00   .8..........
00000198  54 65 78 74 20 32 20 61 74 20 2D 34   Text 2 at -4
000001A4  2E 31 00 00 1E 00 09 00 00 00 00 00   .1..........
```

The excerpt shows the 1st text plainly, starting from the Synch aus 0 and 4, then the length of 16 Hex = decimal 22. One can also see 2 appended 0-Bytes providing the alignment for the next text.

6 File Assistant

6.1 Introduction

The **File Assistant** allows you to create import masks for reading other file formats into FAMOS. After loading an example file, you create an import mask or configuration file (file extension: *.FAS). This configuration file can then be used to import files of this format into FAMOS.

6.2 Starting the File Assistant

To start the File Assistant, click on the File Assistant icon in the start menu, in the application group containing FAMOS, or select "Extra/ File Assistant" from the main menu in FAMOS.

The File Assistant opens as an independent application - it is not closed when FAMOS is closed. The starting window consists of a main menu, a toolbar and an editing window containing a simple import configuration file.

How do I use the *.FAS files which I've already received?

Before you can use a *.FAS file for importing files into FAMOS, you must first specify a default directory for them in FAMOS. Then the file must be copied into this directory. Afterwards, data files using this format can be imported into FAMOS. If the disk you received with the *.FAS file(s) does *not* include an installation program ("`setup.exe`"), then proceed as follows:

1. Start FAMOS

Start `famos.exe` or double-click on the FAMOS icon, if one has been created.

2. Open directory dialog

Select "Options/ Directories..." from the main menu in FAMOS. A dialog appears for specifying various directories.

3. Specify directory path

The default directory is `c:\imc\def`. To select a new directory path, click on "Definition files:" and enter a new path in the input box. Alternatively, click on <Browse> to browse to the new directory. To save any changes made, quit the dialog by clicking on <OK>.

4. Copy the *.FAS files into definition directory

Copy the *.FAS file(s) from your diskette to the definition directory.

5. Start File Assistant

In the menu "Extra" of FAMOS, select "File Assistant". The File Assistant will be started.

6. Import data files into FAMOS

To import data files into FAMOS using the new mask, restart FAMOS, use "File/ Load..." and select the appropriate format from the "File format:" list.

6.3 Tutorial

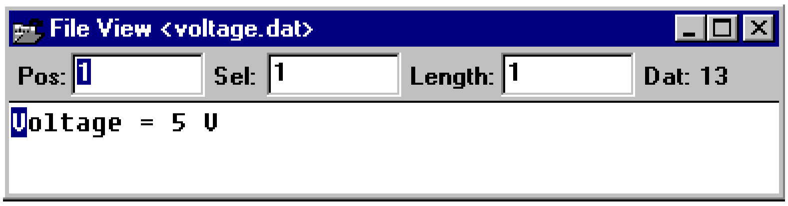
This tutorial has been provided to acquaint you with the File Assistant. First, we'll create a very basic example data file (in ASCII) using the Windows Editor (`notepad.exe`). Then we'll create an import mask for files of this type. The contents of the example data file are simply "`Voltage = 5 V`". Save this file as "`voltage.dat`".

This tutorial can also be modified by using different file types. In fact, you should try this means of testing an import mask with your own data formats.

Load the example file

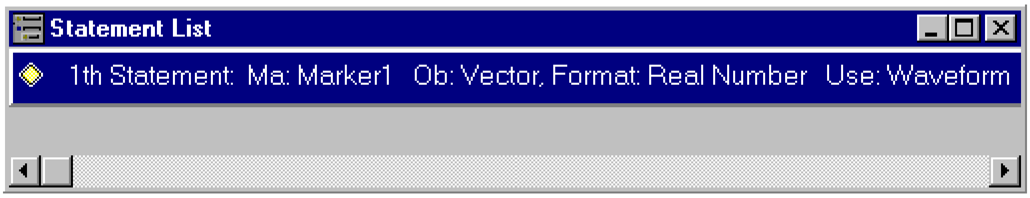
To load your example data file, click on:

Select `voltage.dat` and end with "OK". The window for viewing the file appears. Here, the example file is displayed.



Create a configuration

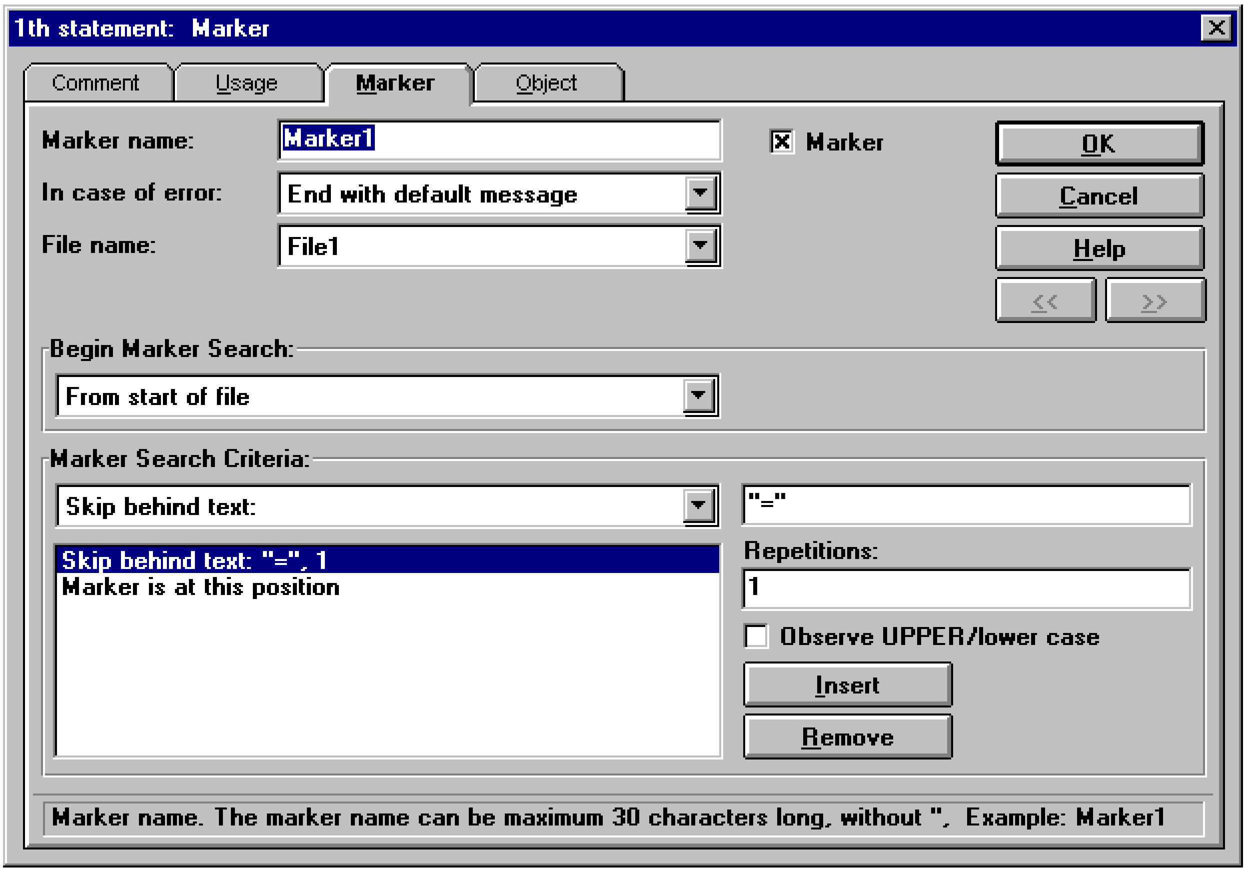
The following statement usually appears in the statement list window.



Double-click on the statement to open the marker definition dialog.

Marker Dialog

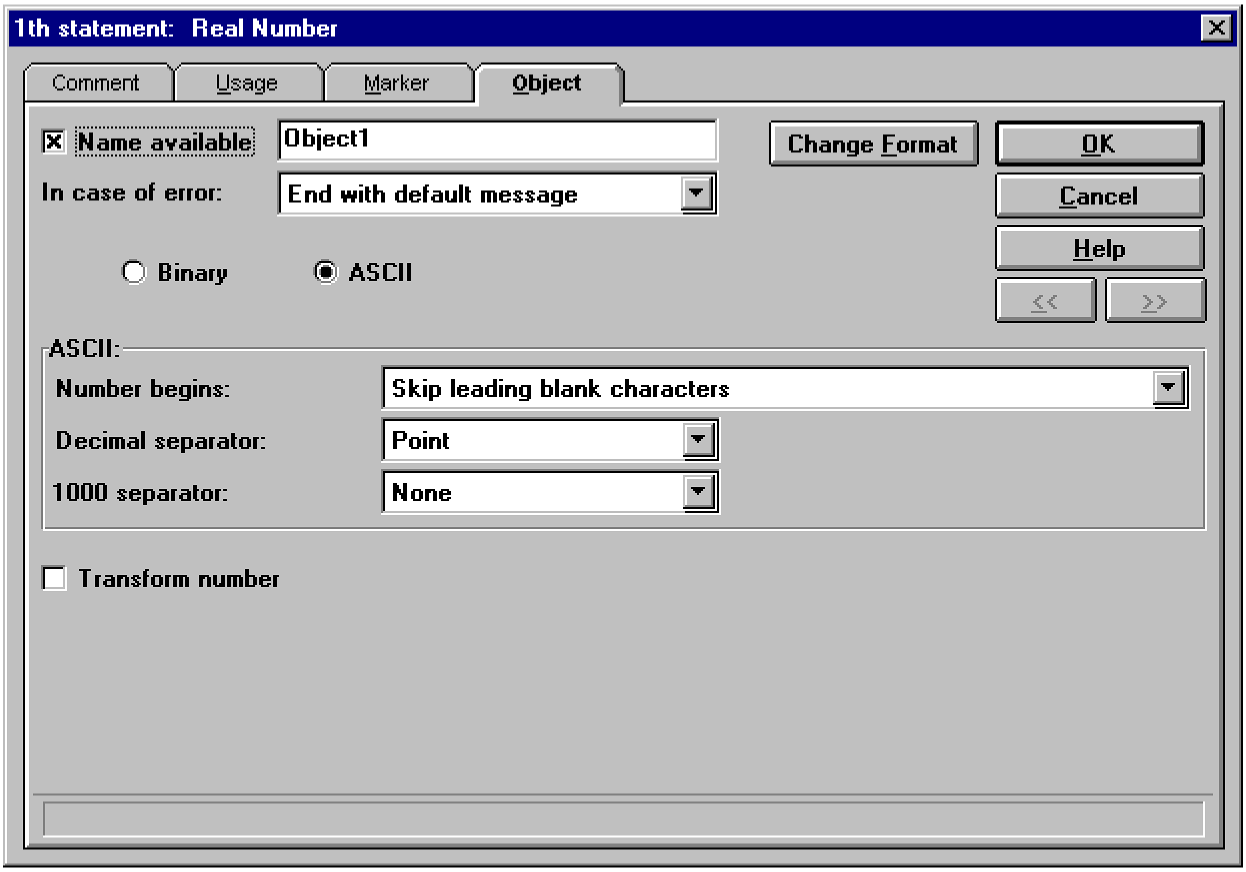
A marker is an element in the data file which indicates the beginning of a data object. The marker itself, however, is not a data object. In our example file, The equal sign "=" is a marker which is followed by the actual value ("5"). First of all, you need to specify where to begin searching for markers in the file. In this case, we want to begin from the start of the file, so select "'From start of file" under "Begin Marker Search:". The procedure for finding each marker needs to be specified. To do this, click on the <Insert> button under "Marker Search Criteria" and specify the appropriate condition(s). In our example, we wish to skip to the position following the equal sign. Select "Skip behind text:", enter "=" to the box to the right of this list and "1" (without the quotation marks) to the "Repetitions" box:



We now have defined a marker which skips behind the equal sign ("="). The import routine expects to find a data object at this position. Thus, we are now ready to define the first (and only) data object for the import mask. Click on the "Object" tab to the right of the "Marker" tab to open the object definition dialog. Note that all changes made to the marker dialog are automatically saved when a different tab is selected.

Object Dialog: Real Number

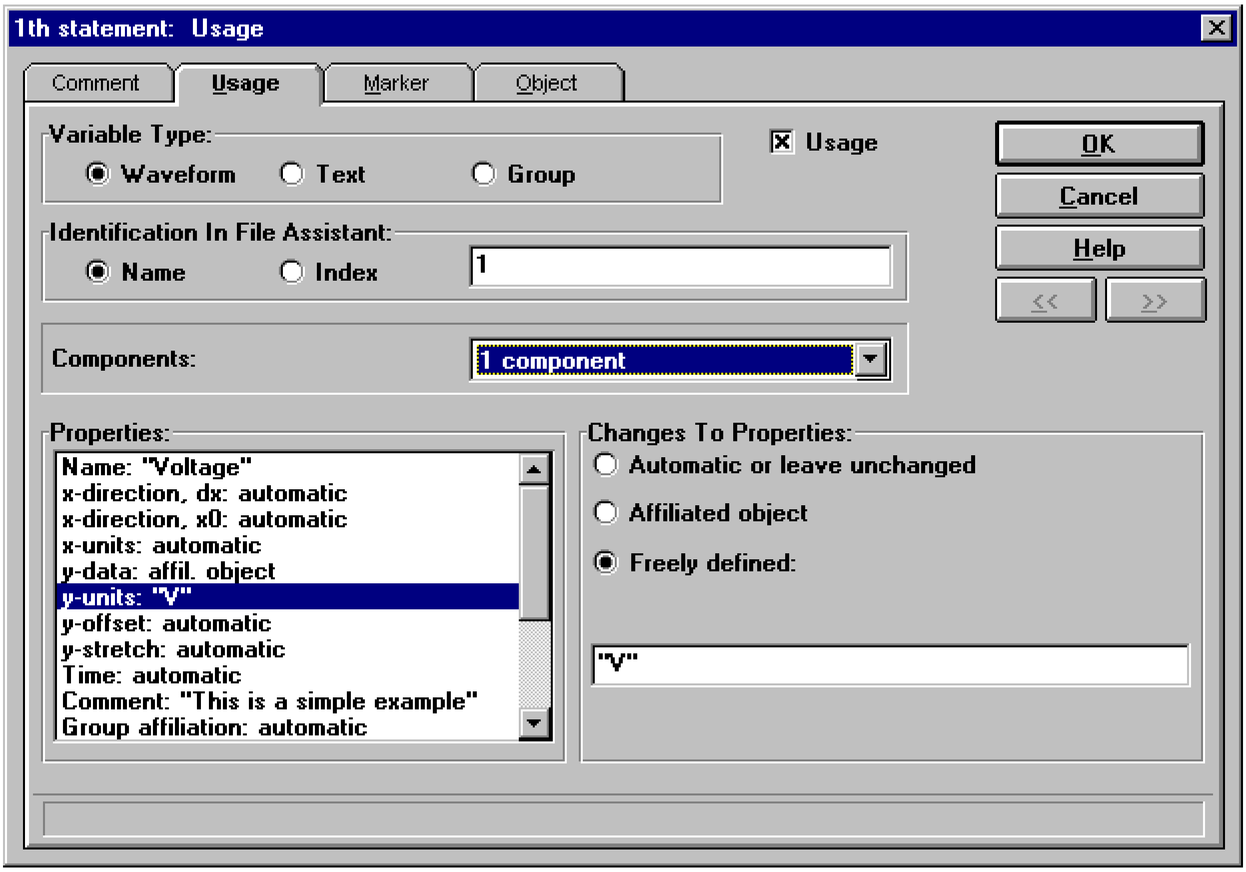
In the title bar of the window, "Statement 1: Real Number" appears. This indicates the current format of the data object. This can be changed by clicking on <Change Format> and selecting one of the other formats. But in our example, we'll use real number format. Check that the "ASCII" option has been selected. In the "Number Begins:" list, choose "After skipping all non-numbers". This makes sure that the blank character following the equal sign is skipped.



The data object has now been defined. The import routine skips any non-number characters following the marker and reads a real number data object. We are now ready to define the "usage" of the data object, i.e. the data type and properties. Click on the "Usage" tab to the left of the "Marker" tab to open the usage dialog. Note that all changes made to the object dialog are automatically saved when a different tab is selected.

Usage Dialog

In our example, the data object is a single-value. Therefore, we need to check the "Waveform" option under "Variable Type". Even though a single-value is not strictly a waveform, it is in the sense that it is numerical data. We also need to make sure that "1 component" has been selected in the "Components" box. The various properties of the variable can be specified in the "Properties:" box. To specify a value for a property, choose "Freely defined" under "Changes to Properties:" and enter a value in the input box which appears. In our example, specify "Voltage" as the name and specify "Affiliated object" for "y-data". Finally, enter "V" as the y-unit.



The usage of the data object has now been defined. The import routine reads the variable "Voltage" and assigns it the unit "V". If you wish, you could now enter a statement comment by clicking on the "Comment" tab.

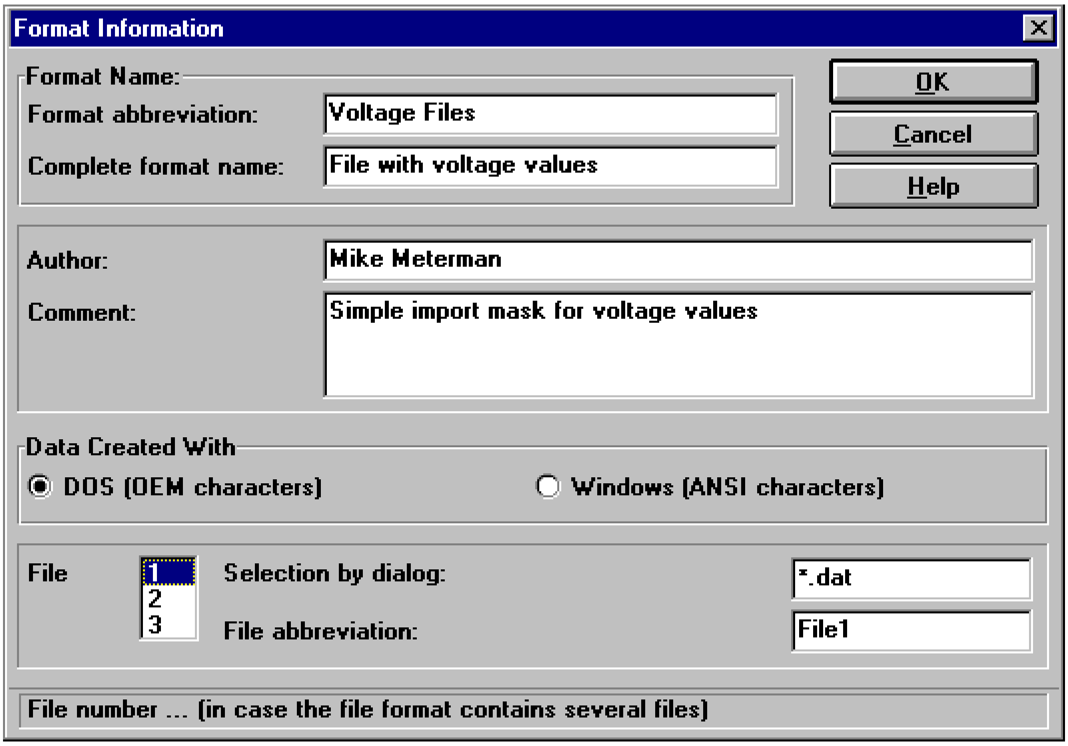
Quit the statement dialog by clicking on <OK>. This completes the statement definition. This simple import routine can now be used to import the file "`voltage.dat`" into FAMOS.

Save configuration

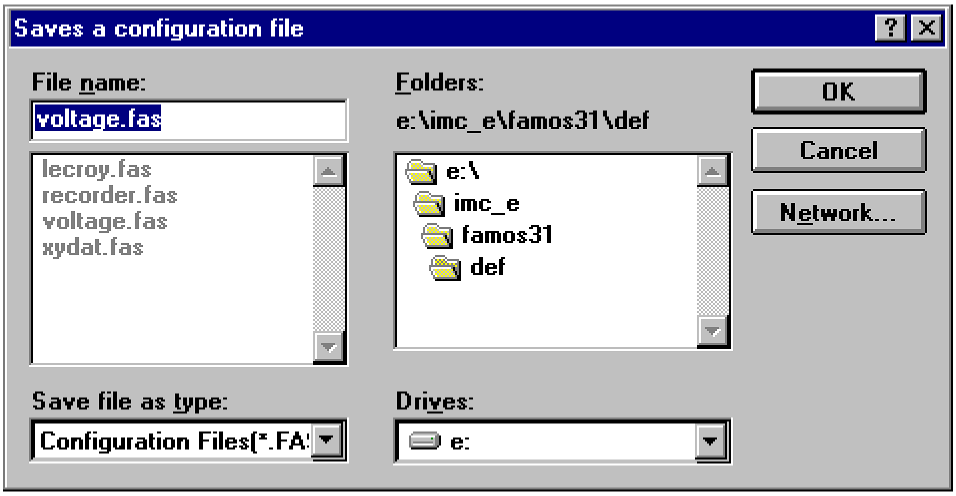
Before proceeding, we should save the import mask. Choose "File/ Save Configuration As..." and the "Format Info" dialog appears.

Format Info Dialog

Enter here whether the example file was created under DOS (OEM characters) or Windows (ANSI characters). Enter `*.DAT` as the file specification in the first file to the right of "Selection by dialog". Make sure that "No file" is selected for the second and third files. The format names can be changed if desired, and you can also enter your name and a comment to the corresponding boxes. End the dialog with "OK" to save the entries.



In the file saving dialog which follows, enter the file name as `voltage.fas` (or use a file name of your choice) and quit the dialog by clicking on <OK>.

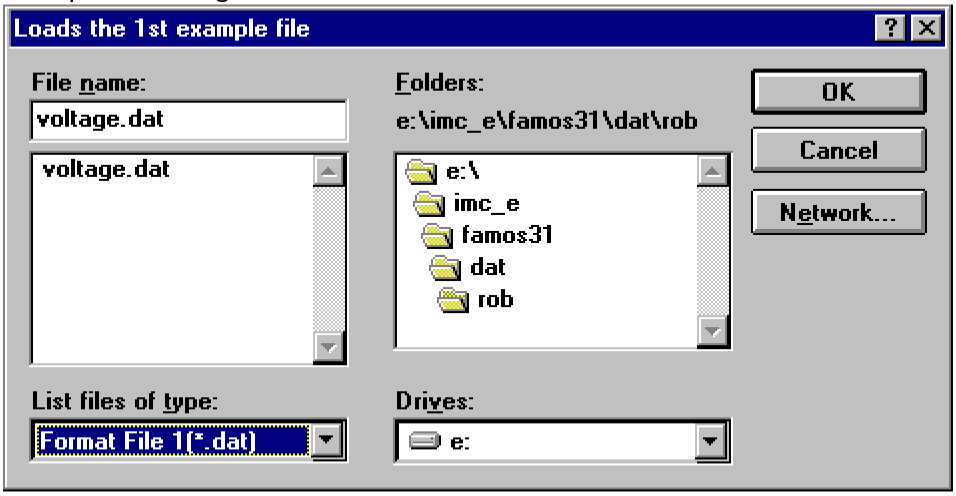


Debugger

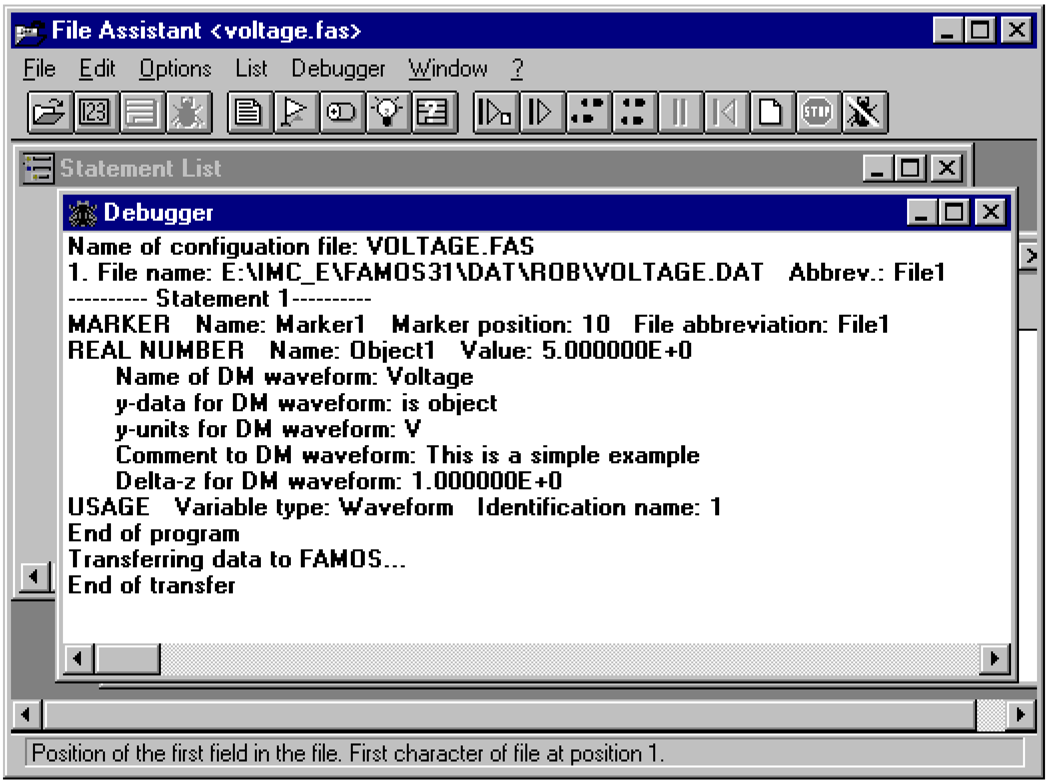
To check your import mask for errors, a debugger is available. To start the debugger, click on the following icon:

The debugger window appears:

To specify a file for debugging, choose "Debugger/ Select File and Start". In our example, we will load the example file voltage.dat.



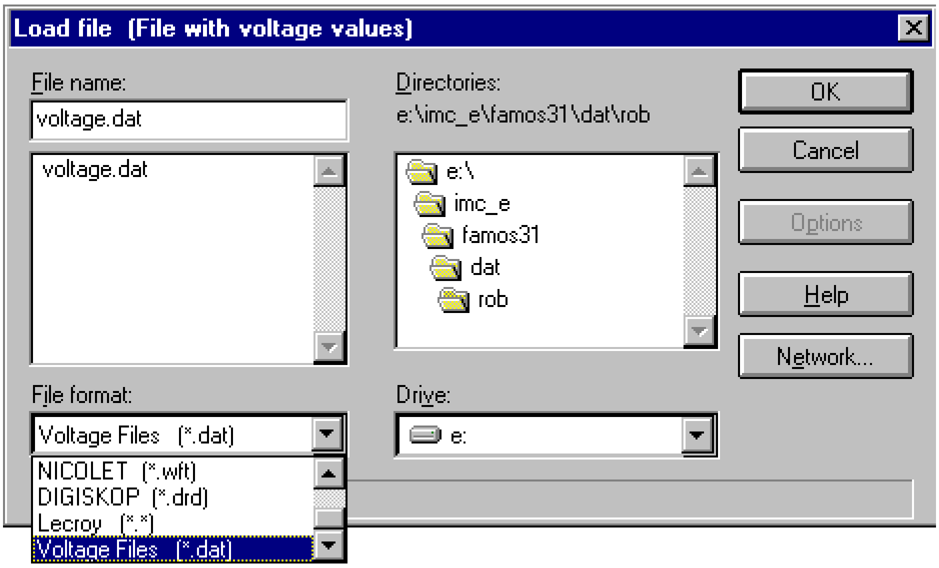
This launches the debugger. Various information concerning the statement(s) is displayed in the debugger window:



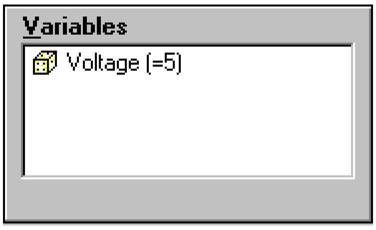
When finished debugging, the "Voltage" variable can be viewed in FAMOS.

Importing the file into FAMOS

To import the file in FAMOS, select "File/ Load..." select the new file format from the "File Format" list. Select the example file and click on <OK>:



The variable "Voltage" appears in the variable list in FAMOS.



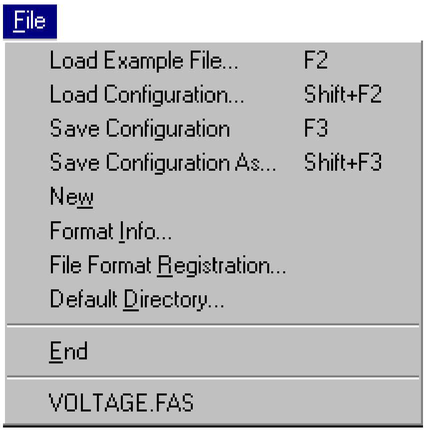
When done, remove this variable from the FAMOS variables list.

The Next Step

The next step is to read the unit (V) from the example file. For detailed information on how to do this, please refer to Section "*Creating Import Masks* 426" later in this chapter.

6.4 Menus

6.4.1 File Menu



Load Example File...

In this dialog you can select an example data file to load into the File Assistant. These appear in viewing windows - see also "*Viewing Data Files* 423". Several example files can be opened at the same time. However, you cannot edit these files in the File Assistant - to do this use the Windows Notepad (for ASCII files) or any other appropriate Data Editor.

Load Configuration...

This opens a dialog for loading configuration (*.FAS) files. These are masks for importing data files into FAMOS. The File Assistant is essentially a tool for creating these. We recommend using the default directory for storing FAS files but they can also be loaded from other directories. FAS files are displayed in list windows - see also "*Statement List Window* 427". It is only possible to open one FAS file at a time.

Save Configuration

This saves the current configuration (*.FAS) file. If the FAS file has not yet been saved, the "Save Configuration As..." dialog appears instead.

Save Configuration As...

This enables you to save the current configuration (*.FAS) file under a new name. The "Format Info" dialog is called first - see "*Format Info Dialog* 425".

New

This closes all windows in the File Assistant and reloads the current FAS file. This is equivalent to individually closing each window and reloading the last FAS file.

Format Info...

This opens the Format Info dialog - see "*Format Info Dialog* 425".

Default Directory

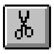
In this dialog, you can specify the directory where FAS files are to be saved. This is the default directory which automatically appears when the Load Configuration dialog is started. In FAMOS, this is referred to as the definition directory. All *.FAS files from registered formats must be located in this directory.

End

This quits the File Assistant.

6.4.2 Edit Menu

Cut



This function cuts selected statements from the list in the list window and drops them in the clipboard.

Copy

This function copies selected statements from the list in the list window into the clipboard. If the focus in on the debugger, the content of the debugger window is copied into the clipboard.

Paste

The contents of the clipboard (statements copied to the clipboard) are inserted in the list by moving the arrow pointer with the mouse to the statement box in the list window and then clicking with the left mouse button.

Delete

This function deletes selected statements from the list in the list window.

6.4.3 Options Menu

File View Font

In this dialog, you can specify the font to be used File View window. We recommend using the "Terminal" font.

List Font

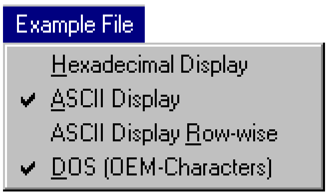
In this dialog, you can specify the font to be used in the statement list window.

Error Messages...

This dialog enables you to define error messages with corresponding error codes.

6.4.4 Example File Menu

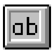
The "Example File" menu is displayed only when the "File View" window is selected.



Hexadecimal Display

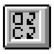
Displays example file using hexadecimal characters.

ASCII Display



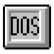
Displays example file using ASCII characters.

ASCII Display Row-wise



The Displays example file row-wise using ASCII characters.

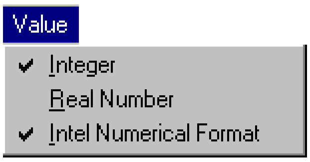
DOS (OEM Characters



Interprets characters in the File View window as OEM characters (DOS), when selected. Otherwise, they are interpreted as ANSI characters (Windows).

6.4.5 Value Menu

The "Value" menu is available only when the "Selected Value" window is selected.



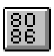
Integer

This interprets the selected characters in the example file as an integer number.

Real Number

This interprets the selected characters in the example file as a real number.

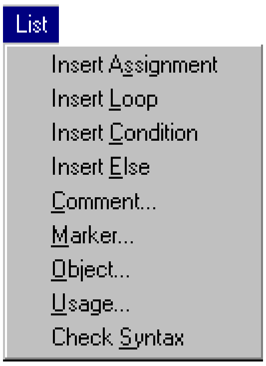
Intel / Motorola Format



When on, the selected characters in the example file are interpreted in Intel (OEM - DOS) format. Otherwise, they are interpreted in Motorola (ANSI Windows) format. In Intel format, the first byte in the selection has the lowest value, while in Motorola format it has the highest value. The Intel and Motorola formats are the same only for 1-byte numbers.

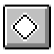
6.4.6 List Menu

The "list" menu is displayed only when the "Statement List" window is open.



The following icons are provided for editing statement lists:

Insert Assignment



To insert an assignment statement, click on this icon and move the symbol to the desired position in the list and click there.

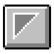
Insert Loop

To insert a loop, click on this icon and move the symbol to the desired position in the list and click there.

Insert Condition

To insert a condition statement, click on this icon and move the symbol to the desired position in the list and click there.

Insert Else



To insert an 'Else' statement, click on this icon and move the symbol to the desired position in the list and click there. Note: only one 'Else' statement is permitted per condition statement.

Comment...

To open the comment dialog for a statement, click on this icon, move the symbol to the desired statement in the list and click there.

Marker...

To open the marker dialog for a statement, click on this icon, move the symbol to the desired statement in the list and click there.

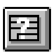
Object...

To open the object dialog for a statement, click on this icon, move the symbol to the desired statement in the list and click there.

Usage

To open the usage dialog for a statement, click on this icon, move the symbol to the desired statement in the list and click there.

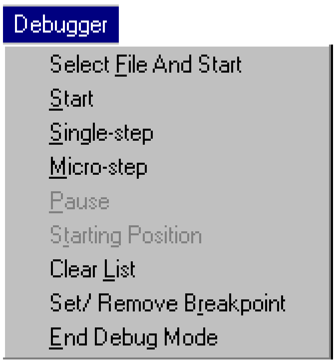
Check Syntax



The program created by the user is checked for any possible errors; the entries for formulas are checked. For example, if a+2+ is entered as a formula an error is displayed in the corresponding dialog and the program is incorrect.

6.4.7 Debugger Menu

The "Debugger" menu appears only if the application is in debug mode.



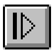
End Debug Mode

This quits debug mode and closes the debugger window.

Select File and Start

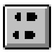
Opens a dialog for selecting an example file and starts the debugger immediately thereafter.

Start



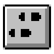
Starts the debugger.

Micro-Step



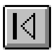
Executes a micro-step in the debugger (smallest displayable step).

Single-Step



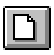
Executes a single-step in the debugger. Exactly one statement is processed.

Starting Position



Returns the debugger to the starting position.

Clear List

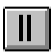


Clears the debugger list.

Set/Remove Breakpoint

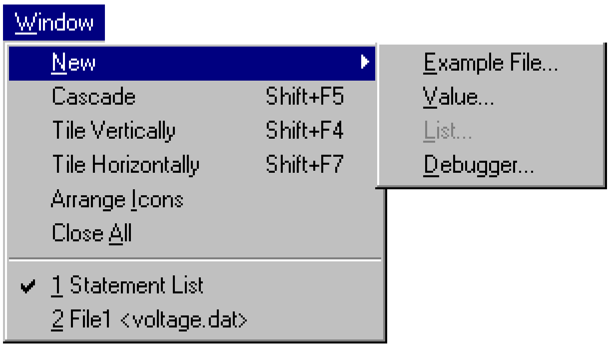
Inserts or deletes a breakpoint in the statement list (appears to the left of the statement). To insert a breakpoint click on the icon, move the cursor to the desired position, and click again. To remove a breakpoint, click on the icon and then on the breakpoint to be removed.

Pause

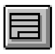


If the debugger is running, this pauses it. If already paused, this resumes debugging.

6.4.8 Window Menu



New

	"Example File...:"	Starts dialog for loading an example file. Once loaded, it is displayed in the file view window.
	"Value..."	Opens the "Selected Value" window.
	"List.."	Opens the "Statement List" window with the current configuration.
	"Debugger..."	Calls the debugger; the window for debug messages is displayed and the list window is shown in debug mode.

Cascade

Cascades the windows in the File Assistant.

Tile Vertically

Tiles the windows vertically in the File Assistant.

Tile Horizontally

Tiles the windows horizontally in the File Assistant.

Arrange Icons

Minimizes the windows in the File Assistant to icons in the lower left corner.

Close All

Closes all windows in the File Assistant; the application remains open.

6.4.9 ? (Help) Menu

Help Topics

Displays a list of help topics. Click on the topic link to display it.

Search...

Search for help topics containing specific keywords. Click on <Display> to view the topic.

Info...

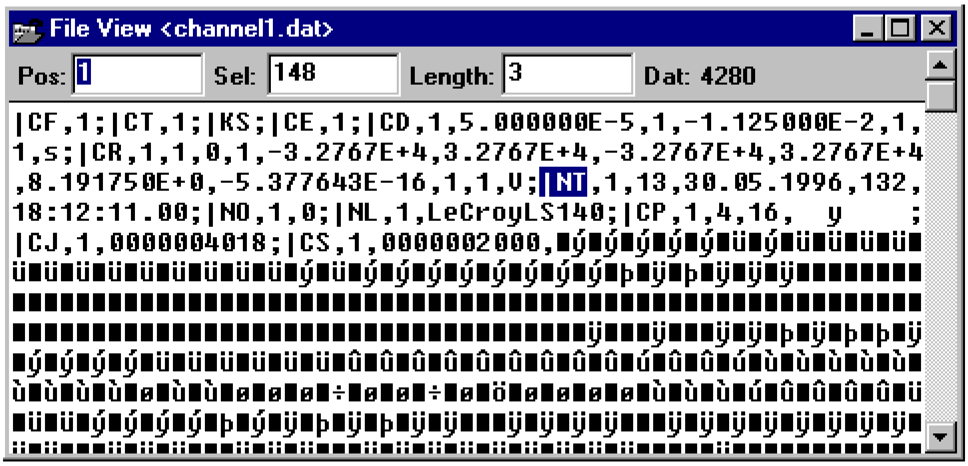
Displays the version number and copyright number as well as the available memory and system resources.

6.5 Viewing Data Files

6.5.1 File View Window


The file view window enables you to view an example data file. To open a file view window, first start the Load Example File dialog by selecting "File/ Load Example File..." or "Window/ New/ Example File...". Alternatively, click on

Once a file has been loaded, the file view window appears:



The "File View" window permits you to display a file in either ASCII or hexadecimal format. Values can be selected using the mouse. The position, selection number, selection length and file length are displayed at the top of the window. In row-wise ASCII display, the row and column number are also displayed.

Pos: indicates the position of the first character displayed in the window, i.e. the *offset of the upper left value*. To move the File View window to a new offset, enter the position and press <Return>. The value of the specified position appears in the upper left corner. The first character of a file has an offset of 1.

Sel: indicates the position of the first character in the current selection., i.e. the *offset of the selection*. To move the selection, enter the new position and press <Return>. The length of the selection remains the same, but the starting position changes. Note: moving to a selection outside of the current window is possible. In ASCII format, the row and/or column number change automatically.

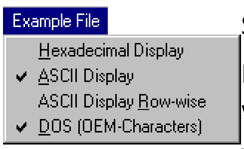
Length: indicates the length of the current selection. To change the length of the selection, enter a new value and press <Return>. The position of the first selected character in the file view window remains the same, but the length of the selection changes according to the new value.

Dat: indicates the size of the file in bytes.

Rw: and **Co:** these indicate the row and column number of the current selection. These settings only appear in "ASCII row-wise" display mode.

The following display mode icons are available for the File View window:

The display modes can also be selected in the "Example File" menu:



See also "*Example File Menu*419".

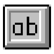
If the position and/or length of the selection is changed, the contents of the "Selected Value" window are updated automatically.

To create a selection which extends beyond the window, drag the cursor in the direction in which the selection is to be continued.

Hexadecimal - Display

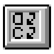
Displays example file using hexadecimal characters.

ASCII Display



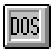
Displays example file using ASCII characters.

ASCII - Display Row-Wise



The Displays example file row-wise using ASCII characters.

DOS (OEM Characters)/ Windows (ANSI Characters)



Interprets characters in the File View window as OEM characters (DOS), when selected. Otherwise, they are interpreted as ANSI characters (Windows).

6.5.2 Selected Value Window

To open the Selected Value window, select "New/ Value..."or click on

The Selected Value window appears as follows:

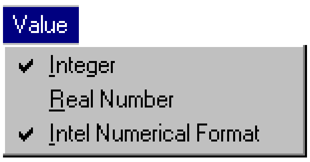
Selected Value (Integer, Intel)

Bytes:	Signed:	Unsigned:	Hex:	Binary:	Asc. Hex:
1	124	124	7C	01111100	
2	20092	20092	4E 7C		---
4	743722620	743722620	2C 54 4E 7C		---

This window provides you with a convenient means of viewing a value in various numerical formats. The selected value can be interpreted as an integer or a real number and using Intel (OEM/ DOS) or Motorola (ANSI/ Windows) format. Beginning with the first selected character, the characters are interpreted as binary numbers (in 1-byte numbers, the first byte is interpreted, in 2-byte numbers the first two bytes, etc.). If a number cannot be created from the selected characters, "---" is displayed. If the selection in the File View window is changed, the Selected Value window is automatically updated.

The following display mode icons are available for the Selected Value window:

The display modes can also be selected in the "Value" menu:



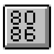
Integer

When selected, the selected characters in the example file are interpreted as integers in the "Selected Value" window. 1, 2 and 4 byte versions of the selection are provided. They are displayed in the following formats: signed/ unsigned integer, hexadecimal (at least 2 bytes), binary (only for 1 byte) and ASCII-coded hexadecimal (see "*Object Dialog: Integer* 438").

Real Number

When selected, the selected characters in the example file are interpreted as real numbers in the "Selected Value" window. 4, 6 and 8 byte versions of the selection are provided. They are displayed in real and hexadecimal formats (see "*Object Dialog: Real Number*436").

Intel / Motorola Format

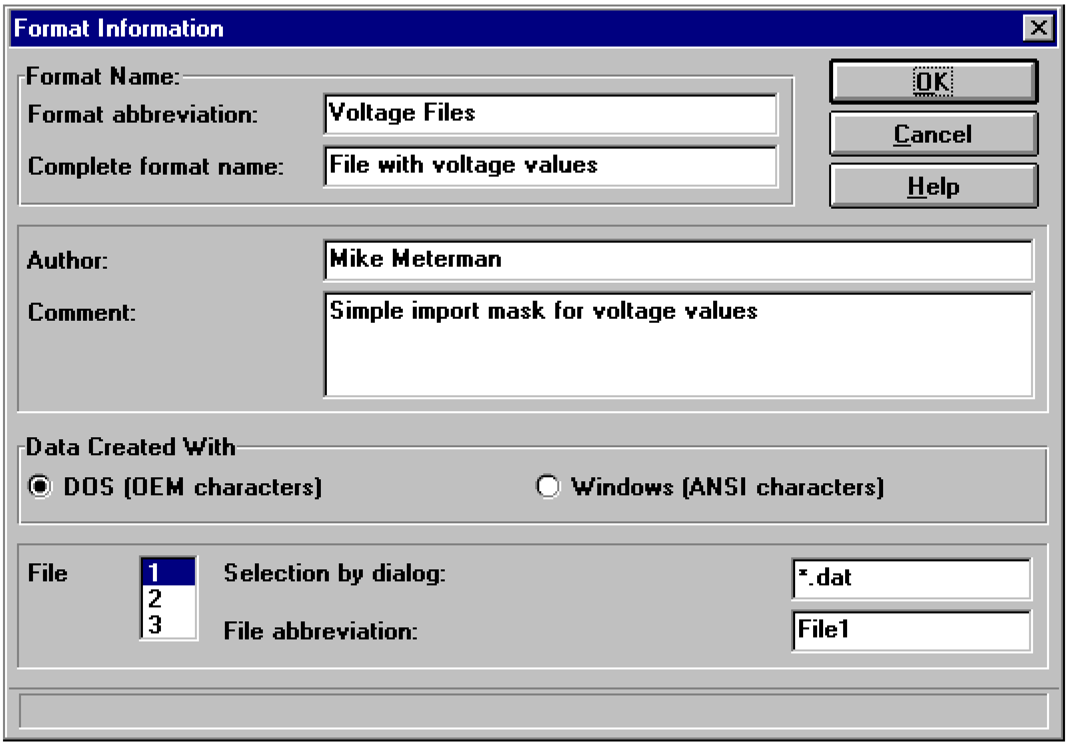


When selected, the selected characters in the example file are interpreted as Intel (OEM - DOS) characters. Otherwise, they are interpreted as Motorola (ANSI - Windows) characters. Intel format interprets the first byte in a selection as the lowest value, while Motorola format interprets it as the highest value. The Intel and Motorola formats are the same only for 1-byte numbers.

6.6 Defining a File Format

6.6.1 Format Info Dialog

Select "File/ Format Info..." to open the Format Info dialog:



The Format Info dialog allows you to specify various additional information for a file format.

Format abbreviation

Enter an abbreviated name (max. 50 characters) for the created format here. The following characters are not allowed: "=" , "|" , ";". This abbreviated name appears together with the file extension in the "File Format:" list in the FAMOS "Load File" dialog.

Full name of format

Enter a complete name for the format here; Up to 100 characters can be used.

Author

Enter your name here; this field can also be left blank.

Comment

Enter your name here; this field can also be left blank.

Data created with

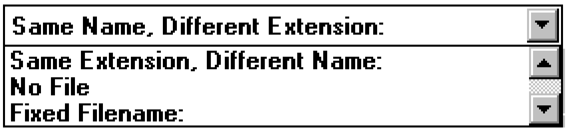
If the data files to be imported were created under DOS, select "DOS (OEM characters)", otherwise "Windows (ANSI characters)".

Multiple File Formats

Although, the majority of data formats use only 1 file to store the measurement information, there are exceptions where 2 or even 3 files are associated with a single measurement. For example, the ASCII *header* information may be stored in one file (e.g. `measure.hdr`) and the binary *measurement values* in a second file (e.g. `measure.bin`). In FAMOS, these files need not be imported separately - the user simply selects the first file. In the example above, this would be the header file (`measure.hdr`).

Enter the extension of the first file to be loaded to the input box "Selection by dialog:". For example, if `*.hdr` is specified here, only files with the extension `*.hdr` are displayed in the FAMOS "Load File" dialog when this format is selected.

The following list appears when selecting the second and third files:



- **Same name, different extension**

This file has the same name as the first, but a different extension. Enter the extension in the input box to the right (e.g.: first file: `xy.cp1`, second file: `xy.cp2`, then enter "`*.cp2`" in the input box of the second file).

- **Same extension, different name**

This file has the same extension as the first file, but a different name. Enter the name in the input box to the right (e.g.: first file: `header.crt`, second file: `data.crt`, then enter "`data.*`" in the input box if the second file).

- **Fixed name**

A fixed file name or relative directory can also be specified. Examples: SYSTEM.TXT or ..\001\SETUP.TXT.

- **No file**

Select this option if the file is not needed. Note: File 3 can only be specified if File 2 is being used.

File abbreviation

Each file to be accessed by the import routine is referenced by this name. These names also appear in the marker dialog so that you can specify which file a marker is to be associated with. A maximum of 50 characters can be used, but the following characters are not allowed: "=" and ";".

6.7 Creating Import Masks

6.7.1 Design Philosophy

The File Assistant enables you to create import masks for loading special formats into FAMOS. By now you may well be asking, *how do I actually design an import mask for my special data format*? The following chapters explain this in detail.

First of all, let's make some general observations. You have data which has been saved in a special format, or at least, a format not known by FAMOS. Your task is then to create an import mask which locates and reads the individual information from these files so that they can be used in FAMOS. Your import mask has to search for various cues in the file and be able to correctly extract the information there. Furthermore, your import mask must be able to deal with exceptions in the data format and generate error messages if necessary. Finally, the data must reach FAMOS.

An import mask generally consists of a series of instructions or statements which can make use of loops and conditions. The properties of each statement can be edited in convenient dialogs. All statements are processed in a top-down manner.

Each statement consists of the following elements:

- **Marker (*where is the object in the file?*):**

  A marker is a cue which indicates where the data object is to be found. As search criteria, you can specify certain positions in the file; skipping a number of bytes, lines, moving to or behind a text string or numbers can be skipped over.

- **Object (*what is the object?*):**

  Specify here what is located at the position defined by the marker search; differentiates between integers, real numbers, text, date and/or time or vector.

- **Usage (*what is it for?*):**

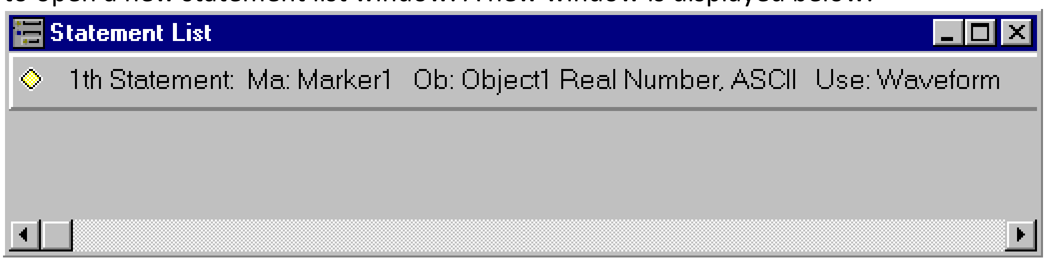
  Specify here the function of the object found; can be used for a waveform, text or a group in FAMOS. For example, the y-unit of a waveform can be used, a measurement value (sample) for data, sampling rate, etc.

- **Comment:**

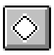
  Enter here a description of the assignment.

6.7.2 Statement List Window


Entering and defining statements for an import mask (FAS file) is performed within the statement list window. To open a new statement list window, select "Window/ New/ List", "File/ New", "File/ Load Configuration...". Alternatively you can also click on
to open a new statement list window. A new window is displayed below:

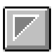


Inserting objects

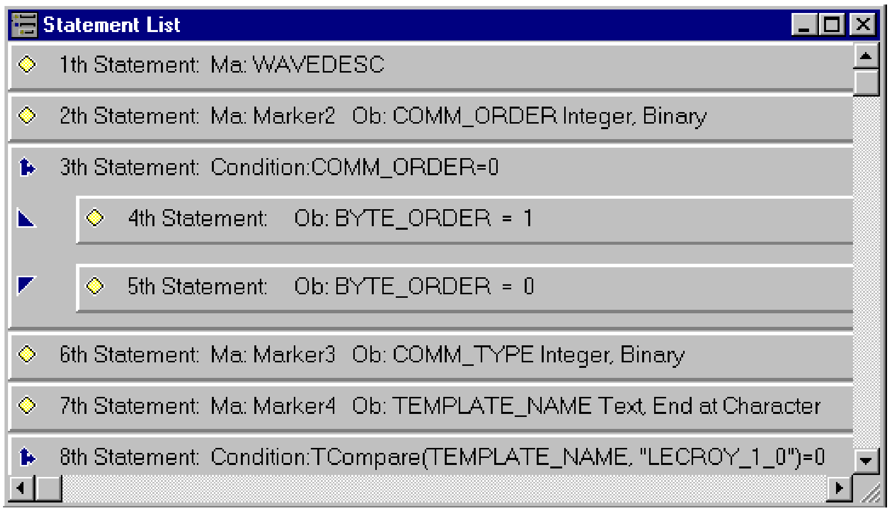
 Insert statement object

 Insert loop object

 Insert conditional object

 Insert else statement object

To insert an object, click on its icon, move the cursor to the desired position and click there. NOTE: Only one Else statement can be inserted below a condition object.



Opening Object, Markers, Usage and Comment Dialogs

 Open comment dialog

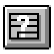
 Open marker dialog

 Open object dialog

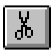
 Open usage dialog

To open any of the above dialogs, click on its icon, move the cursor to the desired statement and click on it.

Check Syntax

 Performs a syntax check on the current FAS (import mask) file; various formulas are also checked. For example, if "+2+" was entered as a formula, the syntax check will return an error message appears.

Cut

 Cuts the selected statement(s) from the list and copies it to the Clipboard.

Copy

 Copies the selected statement(s) from the list to the Clipboard.

Paste

 Pastes the Clipboard contents (statements previously copied to the clipboard) to the list.

6.7.3 Statement Structure

Nested Loops and Conditional Statements

Nested loops and If/Then/Else conditional statements can also be used in import masks. Thus, import masks can be created for extremely complex data formats.

Variable Initialization

Variable initialization statements are a special form of statements. Only one marker or object variable can be initialized in a given statement.

6.7.4 FAT Variables

Variables can also be defined in the File Assistant. A variable in this sense is a generic statement object containing various marker/ object/ usage specifications. By creating variables, you save having to reenter complicated statements over and over again. To avoid confusion with FAMOS variables, the File Assistant variables are referred to as **FAT variables** (File Assistant variables).

Furthermore, there are two types of FAT variables: **numerical FAT variables** and **text FAT variables**. When defining a FAT variable, its type always has to be specified. Markers are always numerical FAT variables. In the object dialog, text variables can be created by selecting "Text" from the <Change Format> button-menu. Or, when "Only Variable" has been selected from this menu, a text variable can also be specified. All other objects create numerical FAT variables (e.g. real number objects).

Four FAT-variables are internally reserved and may not be used for other purposes:

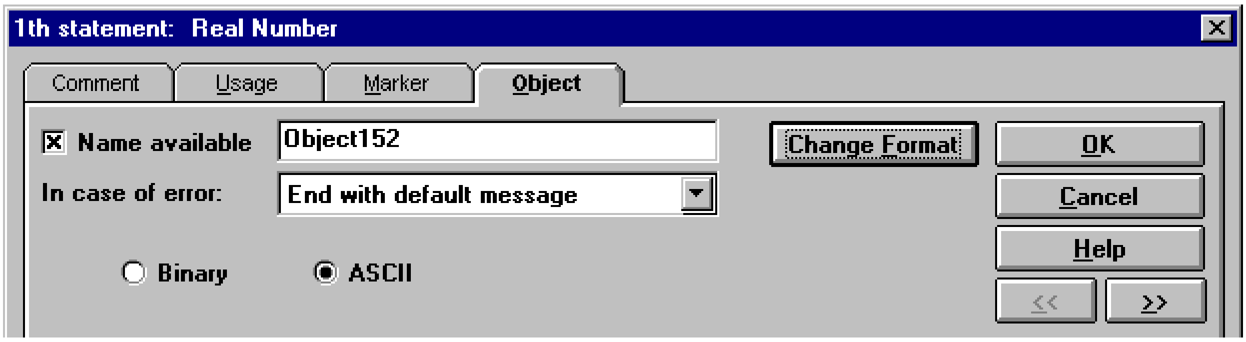
X, Y, Z and T.

6.7.5 Statement Dialogs

Operating the dialogs for comment, marker, object and usage

Double-click on a statement to open the statement dialog. This multi-card dialog allows you to specify object, marker and usage properties as well as a comment for the given statement. To access one of these dialogs, click on its tab. *Note:* Changes are automatically saved when the new dialog is selected.

All four dialogs are operated in essentially the same manner. The operation of these dialogs will now be explained using the following example of a "real number" object:

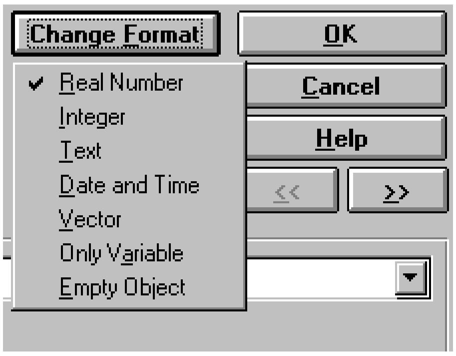


Buttons:

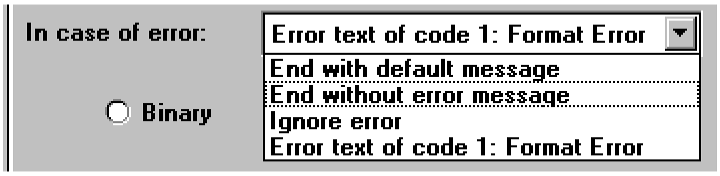
OK	Ends the dialog and saves the changes
Cancel	Ends the dialog and discards any changes
Help	Opens online help for dialog
<<	Opens the same dialog (here: "Object" dialog) for the preceding statement
>>	Opens the same dialog (here: "Object" dialog) for the following statement

Change format

To change the object format (and the corresponding dialog), click on the <Change Format> button in the object dialogs. Select a new object format from the drop-down menu:



Error messages



- **End with default message**

The default error message is generated if the File Assistant cannot execute an operation (i.e. an error occurs).

- **End without error message**

If the File Assistant cannot execute an operation, the file import (into FAMOS) is stopped without generating an error message. Any data imported before the error occurred is displayed in FAMOS.

- **Ignore error**

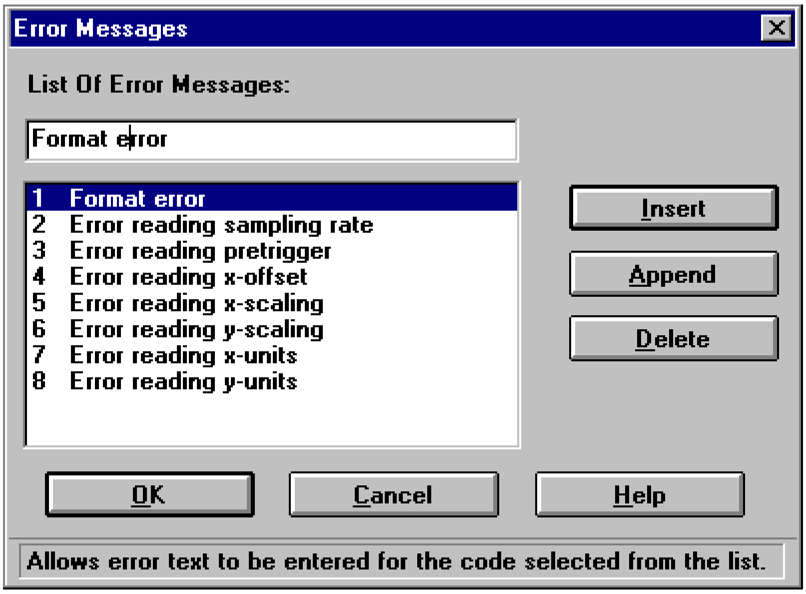
All occurring error are ignored. The statement containing the error is aborted and the next statement is executed. If an error occurs in a marker search, the marker is set to 0 (0 is not allowed for markers and can be queried later). Numerical objects are set to 0, text objects receive an empty string.

- **User-defined error messages**

You can also create your own error messages. For example, if the statement reads the "modified time" from the file, the error message could be, "Error reading time". If the error occurs while executing this statement, the message is displayed in a pop-up dialog and the file import is stopped. Once created, an error message is available for use in other markers and objects.

6.7.6 Error Messages Dialog

To edit the error messages, select "Options/ Error Messages". All of the error messages are displayed here with their corresponding code. Existing messages can be edited and/ or deleted and new ones can be added to the list.



Insert

Click on <Insert> to insert an error message above the selected line.

Append

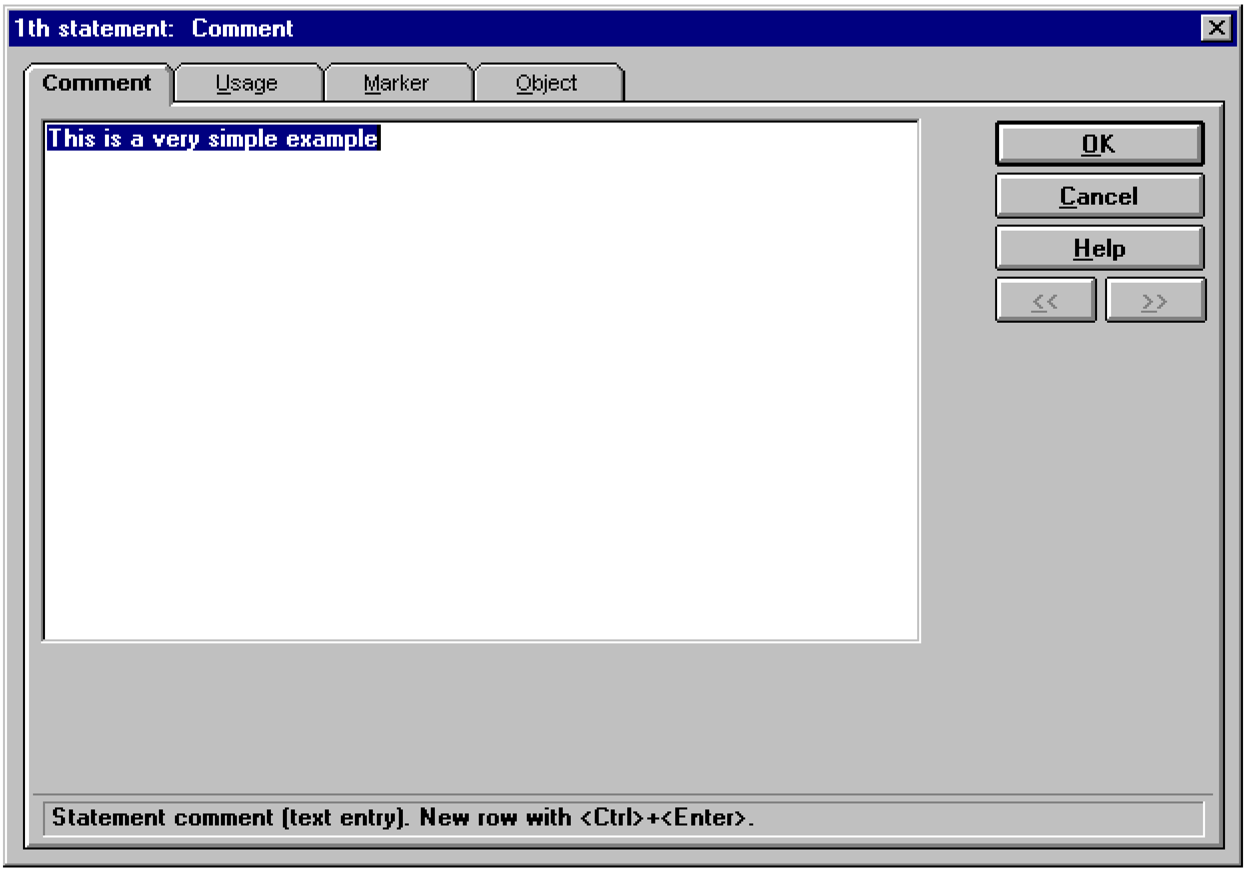
Click on <Append> to insert an error message to the end of the list.

Delete

Click on <Delete> to remove the selected line from the list.

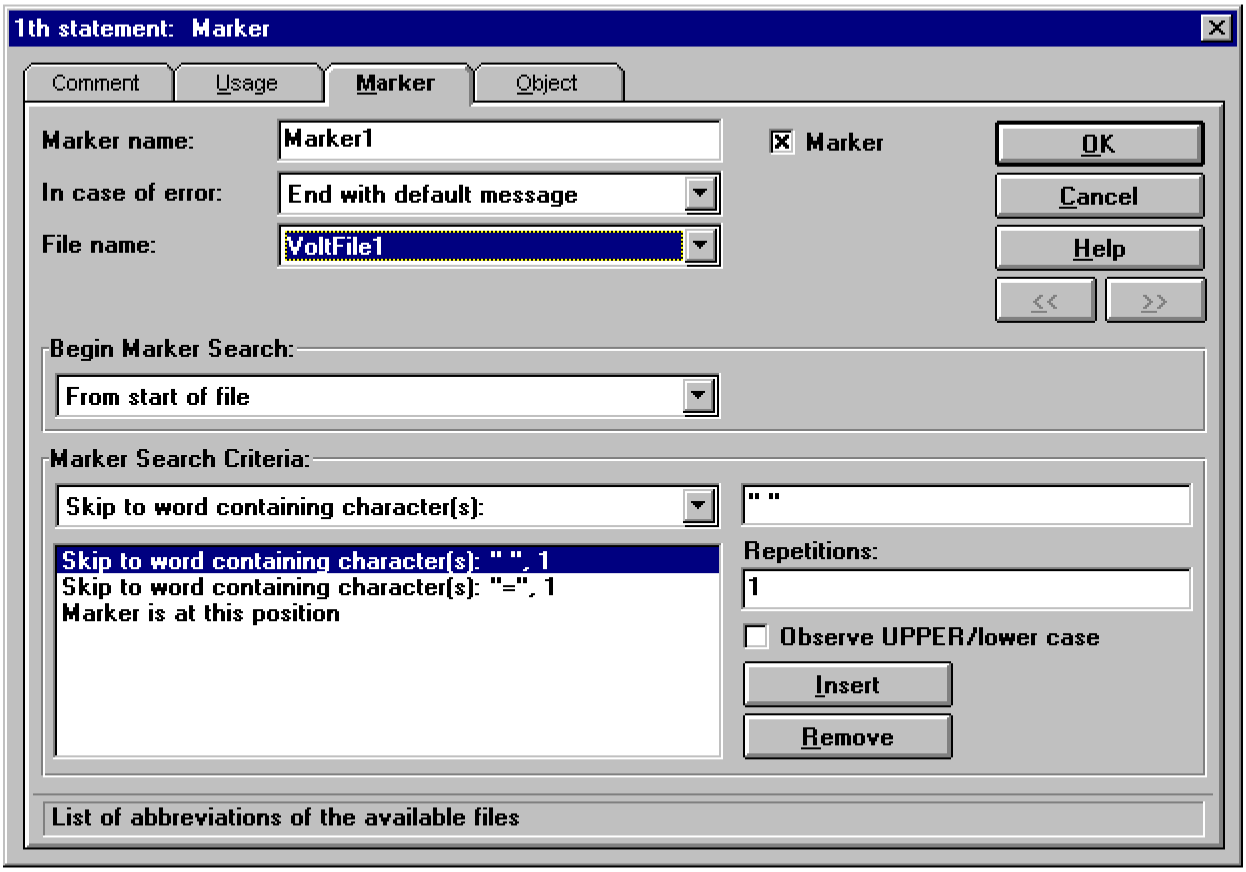
6.7.7 Comment Dialog

A comment can be defined for each statement. The comment box can also be left blank.



6.7.8 Marker Dialog

Each statement requires a marker. The marker search criteria define the position of an object in the file.



Marker name:

Enter the name of the marker here. Up to 32 characters can be used but the following characters are not allowed: "=" , ";"

File name:

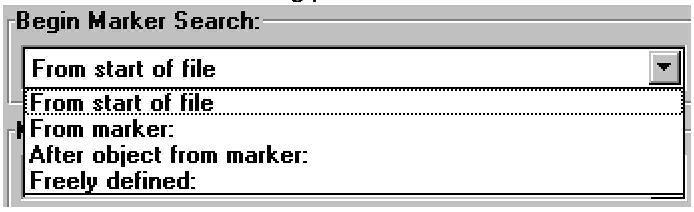
As described above ("Multiple File Formats") up to three files can be imported by an import mask. These files may contain different information pertaining to a measurement, e.g. ASCII header, component 1 binary data, component 2 binary data. Each marker in an import routine can point to any of these files. The short names of the available files are displayed here. These can be specified in the "Format Info" dialog (see "*Format Info Dialog*425 - File abbreviation"). The majority of data formats store all of the measurement information in one file - in these cases only one file appears in the list. The number of files to use can be specified in the "Format Info" dialog. The file which this marker should refer to can be selected here.

In case of error:

Select an error message to use in case of error. To edit/ add/ delete error messages, select "Options/ Error Messages...". See also "*Error Messages Dialog*431".

Begin Marker Search:

Select from the following possibilities for the marker search starting point:



- **From start of file**

Begin marker search from start of file. *Note:* the beginning of the file is at position 1, not 0!

- **From marker:**

A drop-down list containing all of the currently defined markers appears to the right. The marker search begins at the position of the selected marker.

- **After object from marker:**

A drop-down list containing all of the currently defined markers appears to the right. The marker search begins immediately after the object belonging to the selected marker.

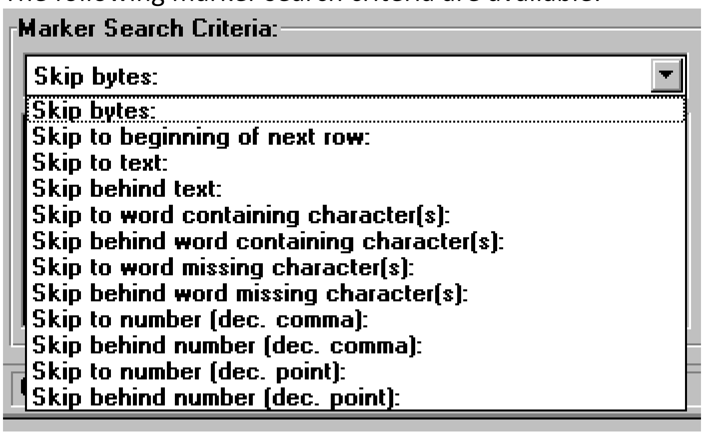
- **Freely defined:**

With this option, you can enter a formula in the input box on the right. The marker search begins at the calculated position. *Note:* the beginning of the file is at position 1, not 0!

Marker Search Criteria:

Up to 10 search criteria can be selected from the "Marker Search Criteria" drop-down list. Once selected, a search criteria is inserted into the list below. The last step in this list is always "Marker is at this position". To add a new search criteria to the list, click on <Insert>. Likewise, an entry can be removed by selecting it and clicking on <Delete>. When a line is selected in the list, its contents are displayed in the boxes above and to the right of the list. By changing the contents, you can edit the search criteria.

The following marker search criteria are available:



- **Skip Bytes:**

The specified number of bytes are skipped. A formula for the number of bytes can be entered in the input box on the right. In effect, this defines an offset in bytes, for example, 100 bytes.

- **Skip to beginning of next row:**

The marker search continues from the first character of the next row. The beginning of a row is indicated by a Carriage Return (CR) or Line Feed (LF) string (ASCII 13, 10).

- **Skip to/ behind text:**

The specified string is searched for in the file, e.g. "Start". Enter the string *without* quotation marks! Depending on which of these options was selected, the marker search begins before or after this string.

The text string can also be searched for repeatedly. To do this, enter the number of repetitions to the "Repetitions:" box. The marker search continues until the desired string has been found as often as specified.

- **Skip to/ behind word containing character(s):**

This option allows to specify a collection of characters which may appear in the string to be searched for in any order. Only one of the characters needs appear in the string to be searched for (i.e. characters). ***Hint:*** To skip to *any* unsigned integer, enter: "0123456789".

The characters can also be searched for repeatedly. To do this, enter the number of repetitions to the "Repetitions:" box. If several repetitions are specified, the routine first searches for one of the characters. Once a character has been found, the string containing the character is skipped. The marker search continues until the specified characters have been found as often as specified.

- **Skip to/ behind word missing character(s):**

These options are similar to those above with the exception that you specify a collection of characters which are not appear in the search string. For example, if you wanted to skip past all of the punctuation in a "grammatical" sentence, the search string would contain ", . (space) : ? ! ". If only one of the specified characters appears in a string, the string is completely skipped.

The characters can also be skipped repeatedly. To do this, enter the number of repetitions to the "Repetitions:" box. Once a character has been found, the string containing the character is skipped. The marker search continues until the specified number of repetitions have been performed.

- **Skip to/ behind number (dec. point/ comma):**

The marker search skips to the beginning or end of a number (in ASCII). Options are available for using decimal comma or decimal point numbers.

The number can also be searched for repeatedly. To do this, enter the number of repetitions to the "Repetitions:" box. The marker search continues until the number has been found as often as specified.

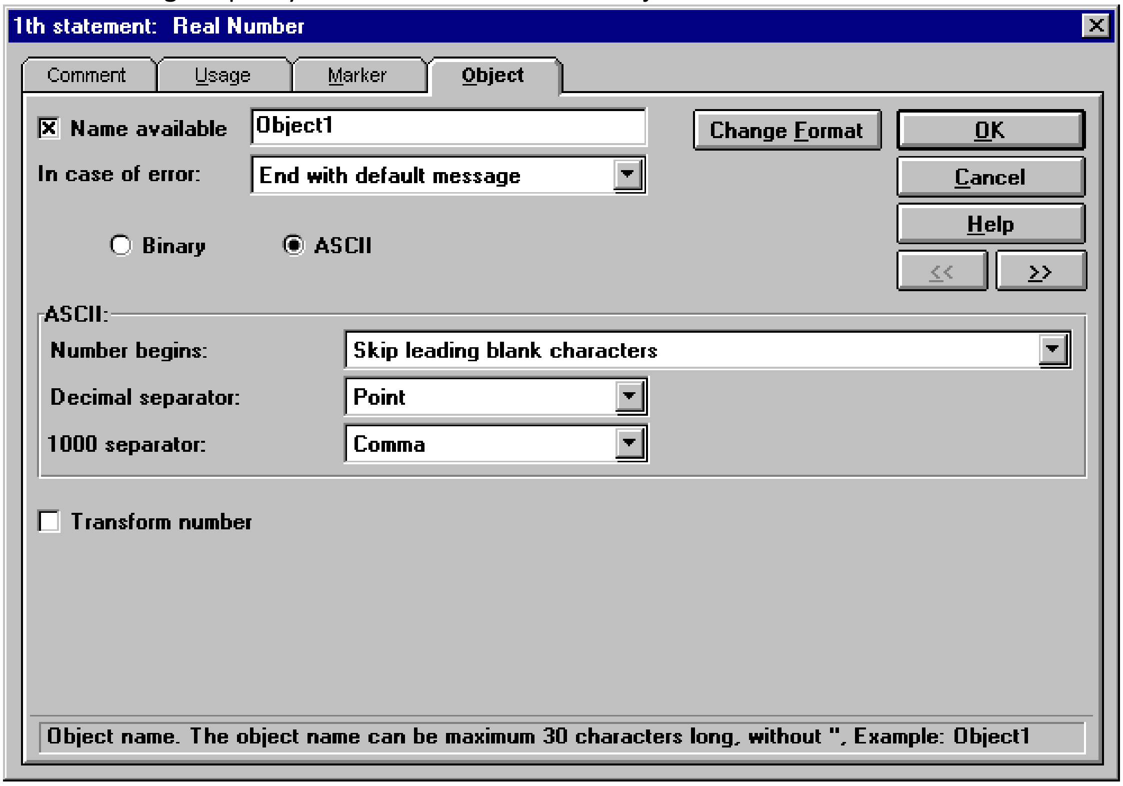
Observe UPPER/ lower case

Select this option to perform a case-sensitive search.

To specify which character set to use, select "File/ Format Info..." and select either DOS (OEM) or WINDOWS (ANSI). This is often important when importing files which use special (non-English) characters (e.g. German, Russian).

6.7.9 Object Dialog: Real Number

Use this dialog to specify how to read real number objects from the file.

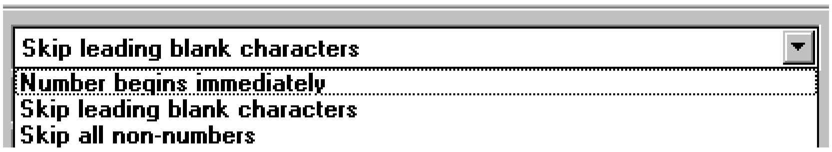


To specify a name for the object, check "Name available:" and enter the name in the input box to the right of this option. The name can have up to 30 characters. An object need only be named if it is to be made available for marker searches etc.

ASCII

Check this option to interpret the object in ASCII.

Number begins:



- **Number begins immediately**

The real number is read directly from the last marker position.

- **Skip leading blank characters**

All leading blank characters are skipped before the real number is read from the file. The number begins with the first character non-blank character.

- **Skip All Non-Numbers**

All non-numbers are skipped before the real number is read from the file. The following characters are identified as belonging to a real number: all numbers from 0 to 9, the decimal separator, the 1000'S separator, positive/ negative signs ("+" and "-") and the exponent abbreviations ("e" and "E").

Decimal separator:

You can choose between "Point", "Comma" or "Freely Defined" for the decimal separator. With the "Freely defined" option, you can enter the decimal separator between the quotation marks in the box to the right. Alternatively, you can also enter a formula.

1000 separator:

You can choose between "Point", "Comma", "Blank", "None" and "Freely Defined" for the 1000's separator. With the "Freely defined" option, you can enter the decimal separator between the quotation marks in the box to the right. Alternatively, you can also enter a formula.

Binary

Check this option to interpret the object data in binary.

Bytes

Specify the number of bytes used for each number here - "4", "6" or "8" bytes. A formula can be entered if "Freely Defined" is selected. The result of the formula must be either 4, 6 or 8. For more information, refer to "*Data Types* 492".

Order:

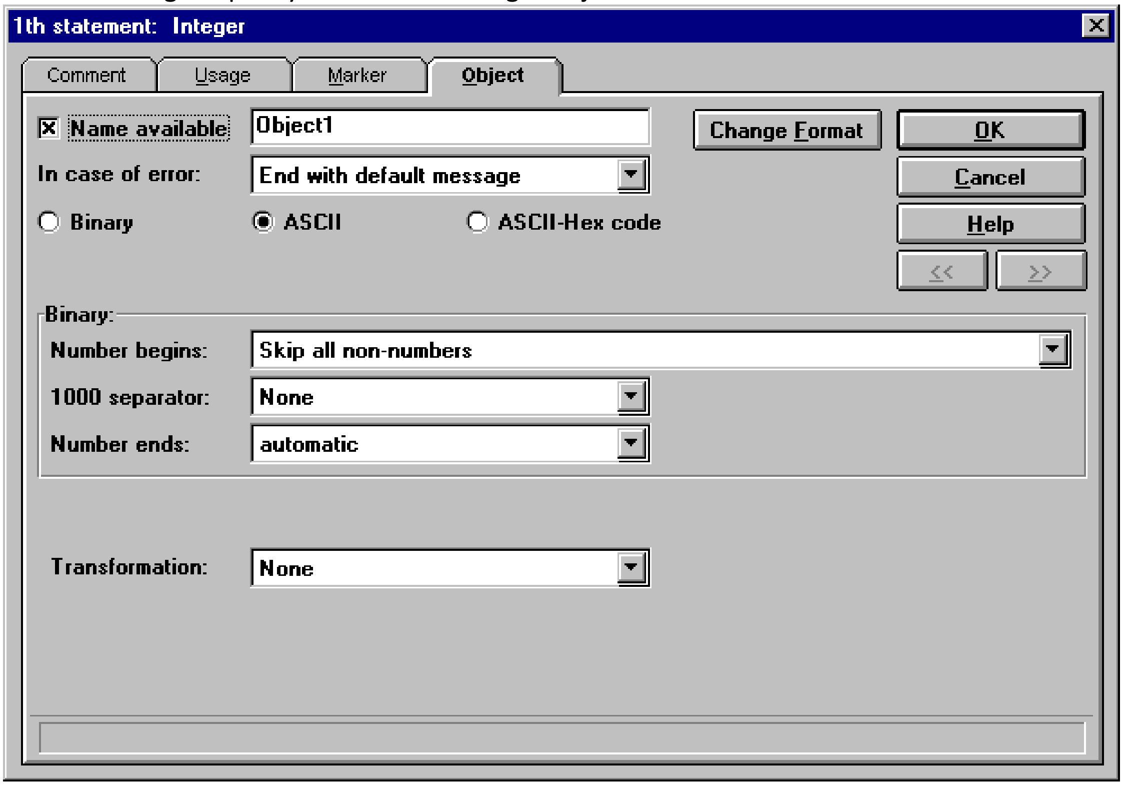
The byte order differs depending on the data format used. You can choose between Intel format (8086), Motorola format, or VAX format. With "Freely defined" you can enter a formula for determining which format to use. The result of this formula must be either 0 (Intel), 1 (Motorola) or 3 (VAX). The VAX format is only available for 4 byte data.

Transformation:

A transformation can be specified for ASCII, binary and hex-coded ASCII-numbers. If a transformation is selected, an input box appears on the right for entering a formula. The value read from the file according to the information given in this dialog is saved in the internal variable "X". For example, to multiply a real number read from the file by 5, enter "x * 5" (without quotation marks) in the input box.

6.7.10 Object Dialog: Integer

Use this dialog to specify how to read integer objects from the file.



To specify a name for the object, check "Name available:" and enter the name in the input box to the right of this option. The name can have up to 30 characters. An object need only be named if it is to be made available for marker searches etc.

ASCII

Check this option to interpret the object in ASCII.

Number begins:

See "Number begins" above.

1000 Separator:

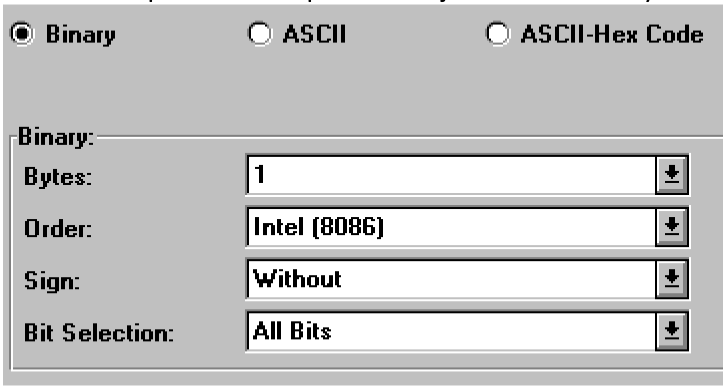
See "1000 Separator" on above

End of Number

The end of the number can be determined either automatically, or the numbers according to which reading the number from the file should be ended can be entered in the input box. The end can be determined automatically as long as a number or the specified 1000 separator occur as the next character in the file continue to be read from the file. Otherwise, reading is ended and the entire number is determined. A formula can also be entered here.

Binary

Check this option to interpret the object data in binary.



Bytes:

Select "1", "2" or "4" bytes as the file format. If "Freely defined" is selected, a formula can be entered. The result of the formula must be 1, 2 or 4. See also "*Data Types* 492".

Order:

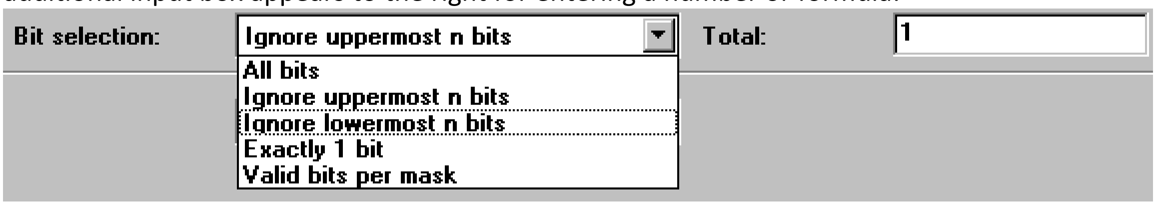
The byte order differs depending on the data format used. You can choose between Intel format (8086) or Motorola format. With "Freely defined" you can enter a formula for determining which format to use. The result of this formula must be either 0 (Intel) or 1 (Motorola).

Sign:

Specify whether the values are to be interpreted as signed integers ("With") or unsigned integers ("Without"). *Note:* signed integers are represented in two's-complement notation. With "Freely defined" you can enter a formula for determining which format to use. The result of this formula must be either 0 (unsigned) or 1 (signed). See also "*Data Types* 492-*Integer* 494".

Bit selection:

Specify the bits to be selected from the integer object here. With all of the options other than "All bits" an additional input box appears to the right for entering a number or formula:



With signed integers ("With Sign" option above), the top bit is analyzed following the bit selection. If the top bit is set (=1), the remaining bits are interpreted as a negative number in *two's complement* notation. Each bit is reversed (0-->1 and 1-->0) to obtain the true binary value.

The following examples deal with unsigned numbers.

- **All bits**

All bits are read from the integer object.

- **Ignore uppermost n bits**

The uppermost *n* bits are ignored - enter the number of bits to ignore in the input box. For example, when the 4 uppermost bits of a 2-byte number 0x A1 B2 are to be ignored, the result is 0x 01 B2.

- **Ignore lowermost n bits**

The lowermost *n* bits are ignored - enter the number of bits to ignore in the input box. For example, if the 4 lowermost bits of the 2-byte number 0x A1 B2 are to be ignored, the result is 0x 0A1 B.

- **Exactly 1 bit**

Reads exactly one bit - enter which bit is to be read in the input box. For example, if 3 is entered, the third bit is used. Counting starts at the LSB = 1. The bit is shifted to the lowermost bit of the result object.

- **Valid bits per mask**

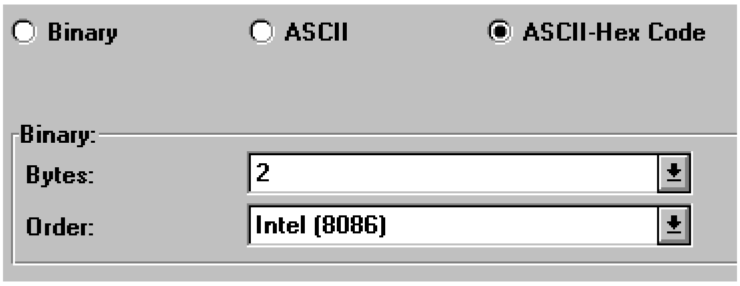
Reads the bits using a mask - enter the mask as a number in the input box. The bits are shifted to the lowermost bits of the result object. For example, if the 4 uppermost and 4 lowermost bits of the 2-byte number 0x A1 B2 are to be ignored, the resulting bit would be 0x 00 1B (after shifting!). In this case, the mask is 0x 0F F0 (hexadecimal notation - enter without the spaces). The mask can also be entered as a binary (0b 1111 1111 0000) number or a normal number (4080).

Example

The lowest 4 bits of a 2-byte number 0x A1 B2 (0b 1010 0001 1011 0010) are to be truncated. The option "Ignore lowermost n bits" is selected and the value 4 is entered to the "Total:" box. For an unsigned integer, the result would be 0x 0A 1B (0b 1010 0001 1011). But for a signed integer, the top bit is set (= 1) meaning that the number is negative. After flipping the top bits, the result is 0x 0A 1B (0b 0000 1010 0001 1011).

ASCII hex code

Check this option to interpret the object data in ASCII hexadecimal code. An integer is created from the hex-coded number in the file. For example, the integer 251 is created from the hex-coded number "FB" in the file.



Bytes

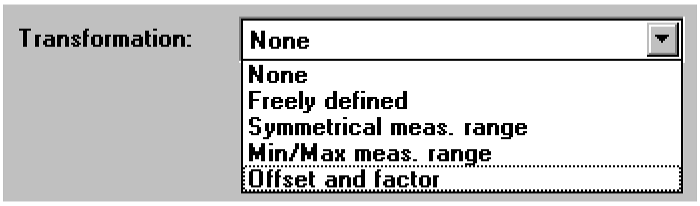
Select "1", "2" or "4" bytes as the file format. If "Freely defined" is selected, a formula can be entered. The result of the formula must be 1, 2 or 4. See also "*Data Types* 492".

Order:

The byte order differs depending on the data format used. You can choose between Intel format (8086) or Motorola format. With "Freely defined" you can enter a formula for determining which format to use. The result of this formula must be either 0 (Intel) or 1 (Motorola).

Transformation

A transformation can be specified for ASCII, binary and hex-coded ASCII-numbers. If a transformation is selected, an input box appears on the right for entering a formula. The transformed integer is no longer an integer. The following transformations are possible:



- **None**

No transformation is selected. The number remains unchanged, as when read from the file.

- **Freely defined**

The read value is first saved to the internal variable x. The transformation is performed on the variable x. For example, if the read value is to be multiplied by 2, enter "2 * x" in the input box.

- **Symmetrical meas. range**

A symmetrical measurement range is a special case of a Min/Max measurement range, where Max = -Min; see below.

- **Min/Max meas. range**

The measurement range is determined by the maximum and minimum values. The number read from the file is transformed to a value in this range. Enter the number of bits of the number to be transformed in the "Bits" input box. The following example shows the transformation of a saved 1 byte number (= 8 bit number):

Signed (two's complement):

Transformed number	Integer i
(Max + Min) / 2	0
Max	max (i) = 2 (number of bits-1) -1 = 127
Min	-max (i) = -127

Unsigned:

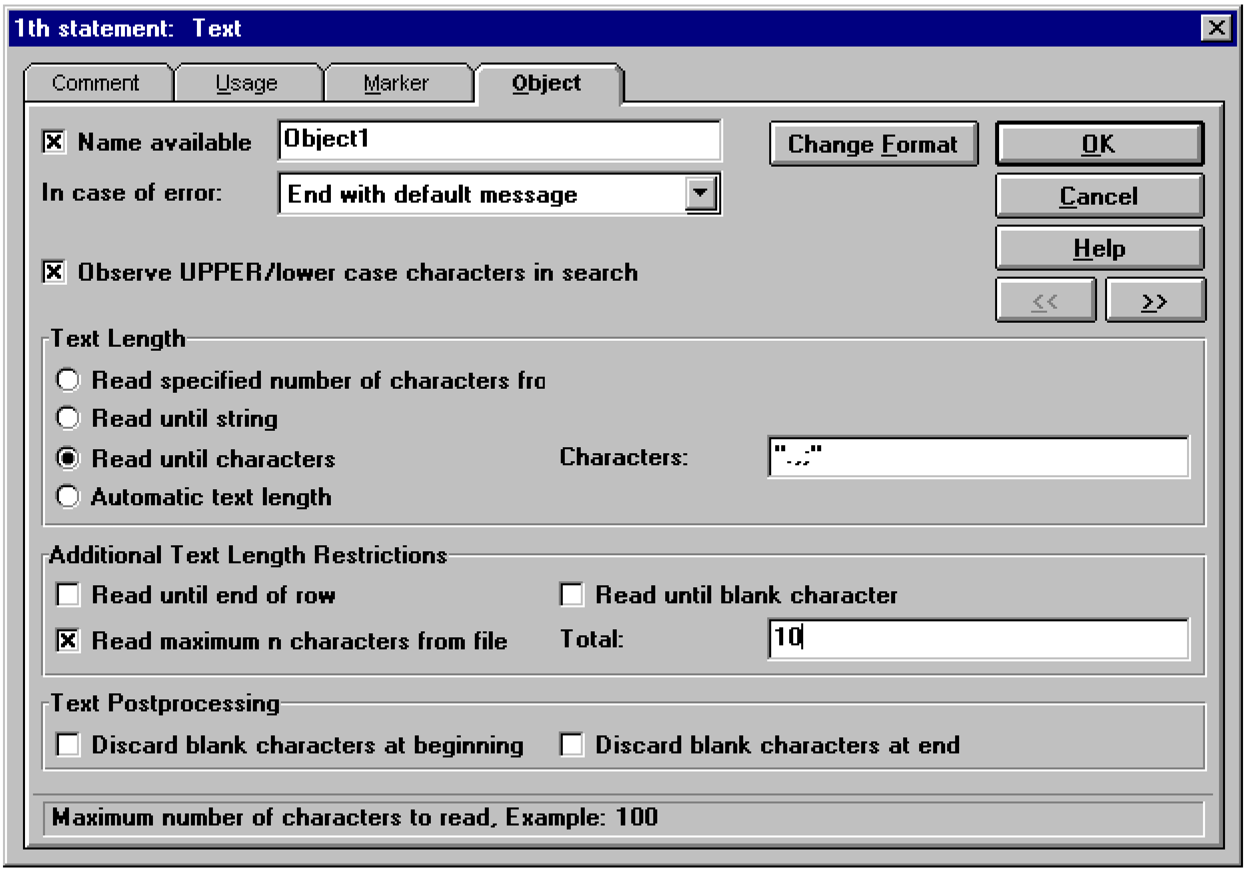
Transformed number	Integer u
(Max + Min) / 2	(max (u) + 1) / 2 = 128
Max	max (u) = 2 Number of bits -1 = 255
Min	1

- **Offset and factor**

The integer read from the file is multiplied by the specified "Factor". The "Offset" value is added to the result of multiplication. For example, to transformation 2 * x + 3 (where x is the integer read from the file), enter 2 in the input box to the right of "Factor:" and 3 in the input box to the right of "Offset:".

6.7.11 Object Dialog: Text

Use this dialog to specify how to read text objects from the file.



To specify a name for the object, check "Name available:" and enter the name in the input box to the right of this option. The name can have up to 30 characters. An object need only be named if it is to be made available for marker searches etc.

Text Length

The length of the text is determined by the following conditions:

- **Read specified 1number of characters**

Enter a formula for the number of characters to be read in the input box at the right. Only the specified number of characters are read from the file.

- **Read until string**

Enter the character string in the input box at the right. The text is read from the file until this character string has been found. The option "Observe UPPER/lower case letters in search" can be used here.

- **Read until characters**

Enter any number of single characters in the input box at the right. The text is read from the file until any one of these characters is found. For example, if a period, comma or semicolon specifies the end of a text, enter ".,;" in the box. The option "Observe UPPER/lower case letters in search" can be used here.

- **Automatic text length**

The text is read from the file until a line break or a space appears. The option "Punctuation mark as end of text" can also be selected here; the text is read from the file until any one of the following punctuation characters is found: . , ; :! ?

Additional Text Length Restrictions

Additional text length restrictions can be made supplementing those entered under "Text Length". Thus, if one of the following conditions is met before the "Text Length" conditions, the read procedure is ended prematurely:

- **Read until end of row**

The text read is ended prematurely if a line break is encountered while searching for the end of a text.

- **Read until blank character**

The text read is ended prematurely if a blank character is encountered while searching for the end of a text.

- **Read maximum n characters from file**

Enter a formula for the maximum number of characters to be read from the file in the input box at the right. If the text is not yet at the end, but the specified number of characters has been read, the text is ended prematurely.

Text Postprocessing

Two additional options can be selected once the text has been completely read from the file:

- **Discard blank characters at beginning**

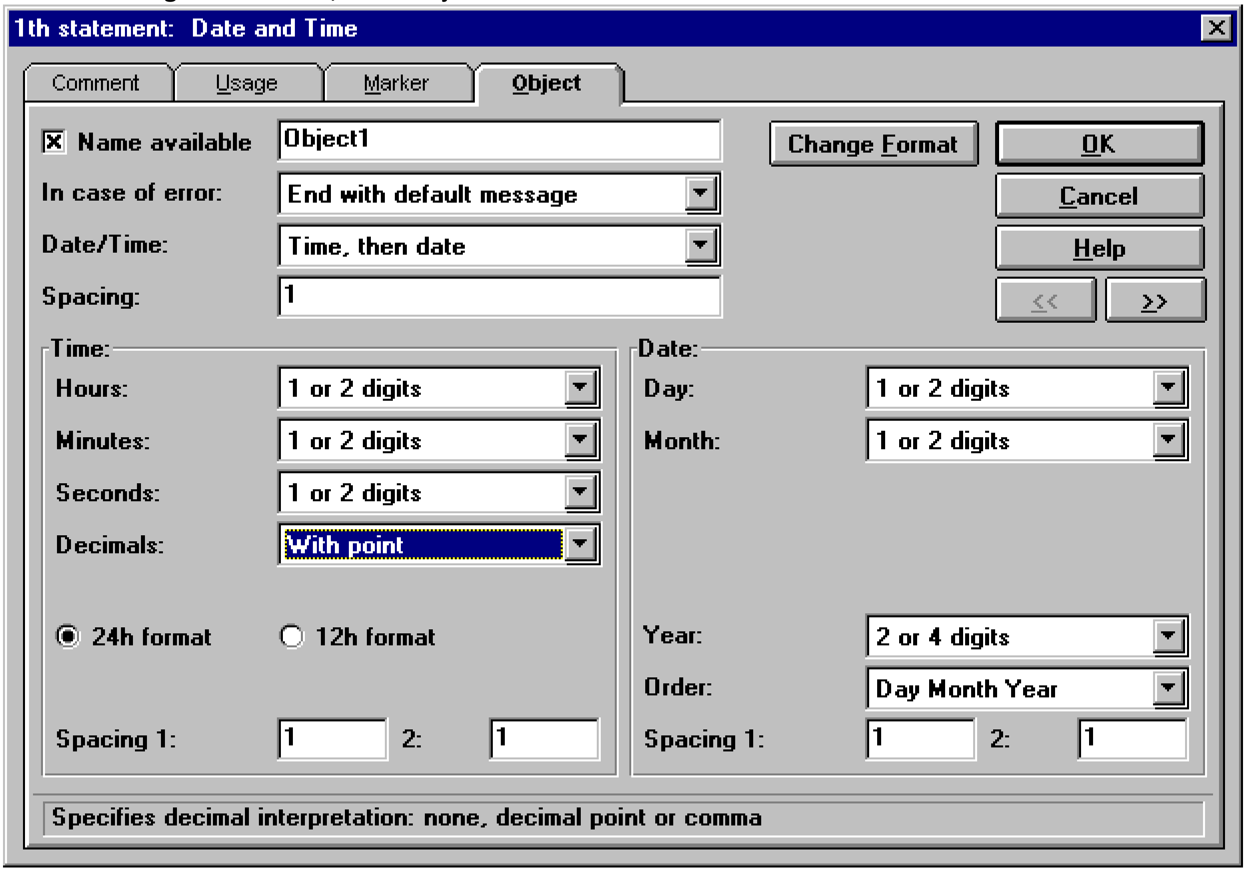
Discard all blanks at the beginning of the text.

- **Discard blank at end**

Discard all blanks at the end of the text.

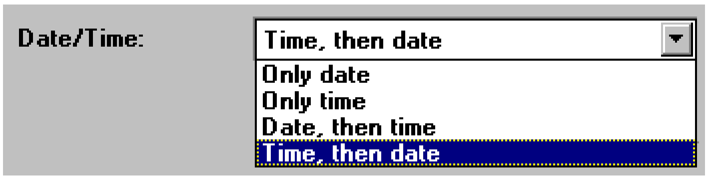
6.7.12 Object Dialog: Date and Time

Use this dialog to read date/ time objects from the file.



To specify a name for the object, check "Name available:" and enter the name in the input box to the right of this option. The name can have up to 30 characters. An object need only be named if it is to be made available for marker searches etc.

Date/ Time:



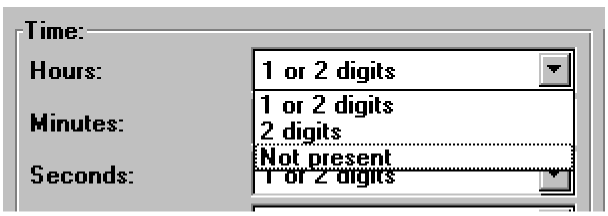
Even if the option "Only date" or "Only time" is selected, the input boxes for date and time appear. Only the relevant information is needed to execute the desired option.

Spacing:

Enter here a formula for the number of characters between the time and date information in the file.

Time:

Specify the time format in this box "Hours:", "Minutes:" and "Seconds:":



Choose between "1 or 2 digits" (relevant entry may be either 1 or 2 characters long), "2 digits" (entry must be exactly 2 characters long) or "Not present" (entry does not exist in file).

24h / 12h format

Specify either a 24-hour or a 12-hour format. Two input boxes appear for the 12-hour format: the left box indicates morning and the right box indicates afternoon. The text can be entered with a formula.

Spacing 1: / 2:

In the "Spacing 1:" box, enter the spacing between hours and minutes and in the "Spacing 2:" box, enter the spacing between minutes and seconds. Formulas are allowed.

Date

Specify the "Day:", "Month:" and "Year:" as with "Hour", "Minute" and "Second".

Exception: The "Month names" have to be additionally specified in the "Month:" box. A list with the names of the months appears, as well as an input box. The selected month is displayed in the input box so that it can be changed if necessary.

Order:

Specify the order in which the day, month and year appear in the data file:

Spacing 1: / 2:

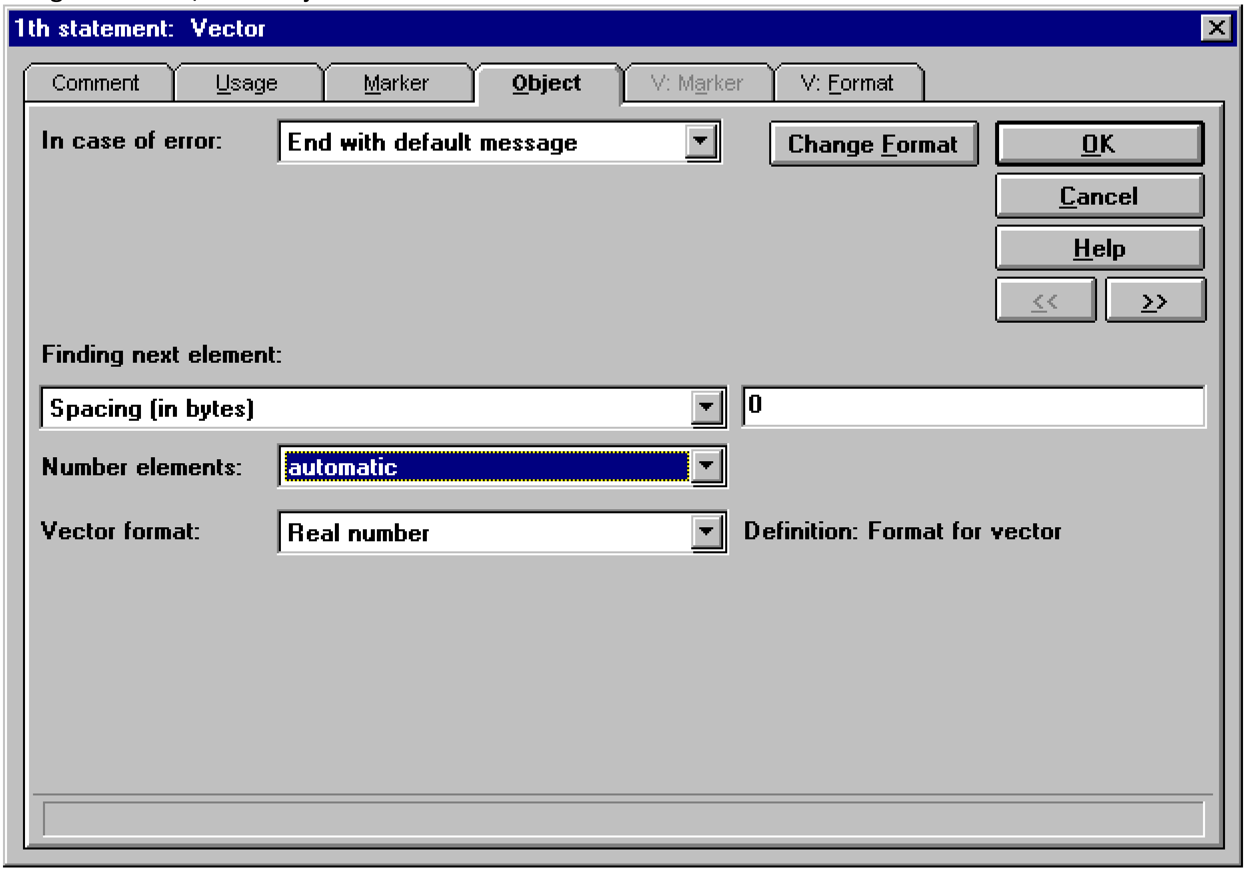
Depending on the specified order (see above), these values specify the spacing between the 1st / 2nd and 2nd / 3rd date parameters respectively. For example, with Day-Month-Year format, the first value ("Spacing 1:") is the spacing between the day and month parameters while the second value ("Spacing 1:") is the spacing between the month and year parameters. Formulas are allowed.

Result:

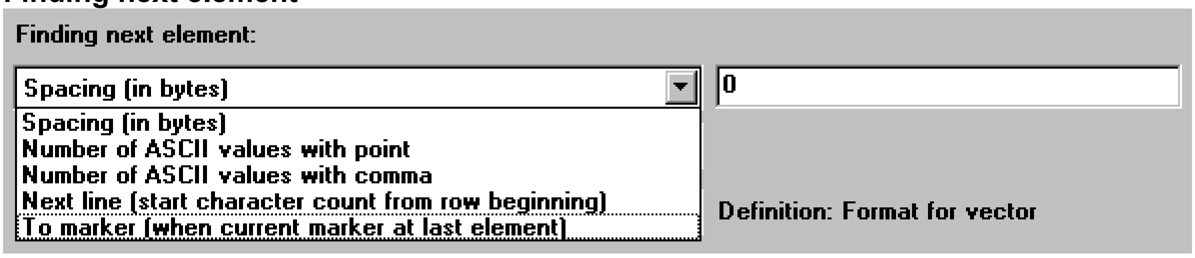
The result is a real number, which returns the time as an internal time. See the section on the formula and time*( ) functions. This time can be used in the Usage dialog as the waveform property "Time" (absolute trigger time).

6.7.13 Object Dialog: Vector

Use this dialog to specify how to read vector objects from the file. The vector elements can be real numbers, integers or date/ time objects.



Finding next element



Spacing (in bytes)

Enter here the number of bytes between two values in a vector. This interval is the number of bytes between the end of the previous object and the beginning of the next object. The interval may also be 0 (one number follows the other). A formula may also be entered in the input box.

Number of ASCII values with point/ comma

Enter a formula for the number of ASCII values with a point or comma. This number of values are then skipped. The number specified must be at least 1 (for a number already read).

Next line (start character count from row beginning)

First the program skips to the beginning of the next line and then the number of bytes specified in the input box are skipped. Formulas can also be entered.

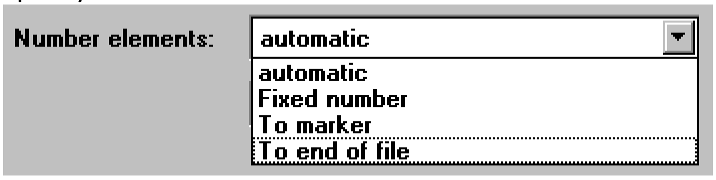
To marker (when current marker at last element)

The next element is found using a marker. To define the marker, click on the marker tab labeled "V. Marker" and a dialog for the marker will appear. Unlike the standard marker dialog, the marker names, the selection of user-created error messages and a file are missing in this dialog.

Define this marker just like in the standard marker dialog. However, only the marker name Y appears in "Begin Marker Search" to the right of "From marker" and "After marker from marker". This is an internal FAT-variable for markers which are used in vectors. When processing the individual vector elements, the current position in this internal variable is saved. This allows the user to determine the position of the next vector element starting from the position of the last element.

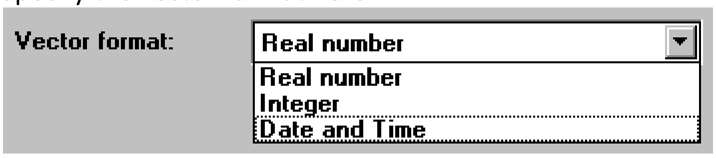
Number elements:

Specify the number of vector elements here:



Vector format:

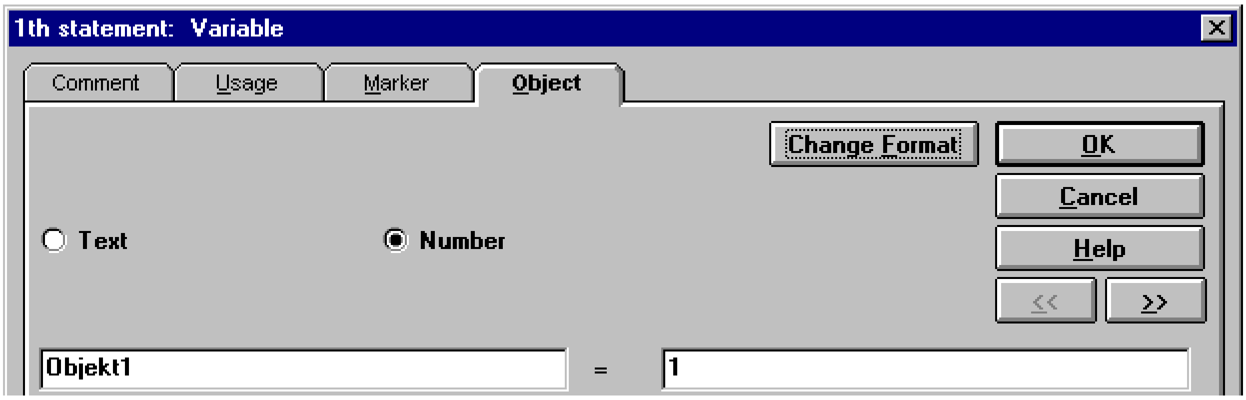
Specify the vector format here:



The format is defined in the corresponding dialog. To define the format, click on the marker tab labeled "V. Format". The dialog for the selected format appears. This dialog is basically the dialog of the corresponding objects. However, the object names and the user-created error messages are not contained in the dialogs for format definition. Definition itself is made just as for the corresponding object.

6.7.14 Object Dialog: Variable Only

Use this dialog to define variables. Variables can be of text or number type.



Enter the variable name to the left input box and an initial value to the right. For example, a numerical variable might be initialized with "1" and a text variable with "abs". A formula can also be used in the initial value box.

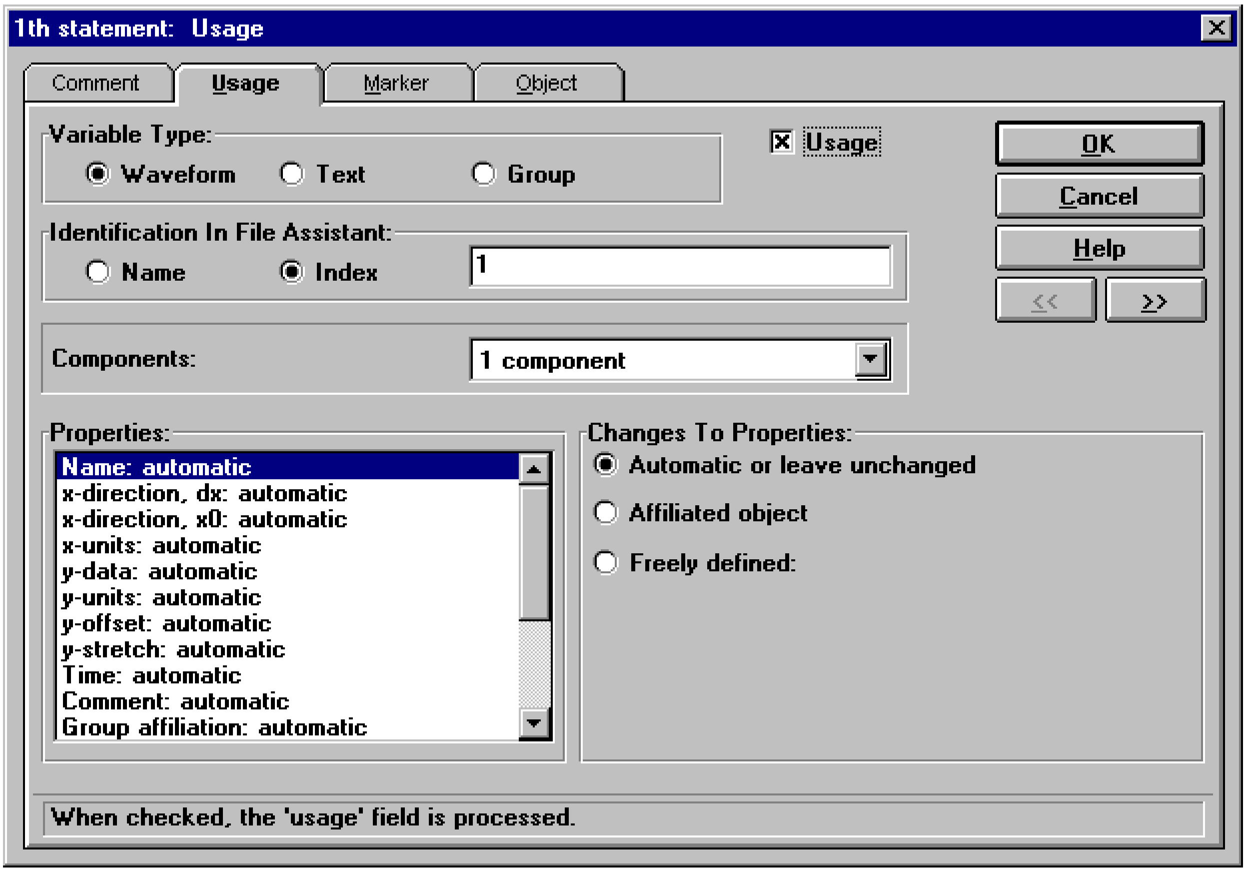
6.7.15 Object Dialog: Empty Object

It is recommended to select the dialog "Empty object" if no certain object should be used in a statement. This requires very little memory. This also saves time in FAMOS when loading files with this configuration.

6.7.16 Usage Dialog

In addition to describing the marker and defining the object type of a given statement, you can also specify its "usage". However, it is also possible to specify no usage for the given statement by leaving the "Usage" box unchecked.

Use the Usage dialog to add FAMOS properties to a waveform, text or group:



Reference

The properties for FAMOS waveforms, texts and groups are not described here. Please refer to the FAMOS User's Manual, Chapter 5-8.

Variable Types Defined by Properties

Choose between identifying the object as a "Waveform", "Text" or "Group" variable in FAMOS.

Identification in File Assistant

An identification in the File Assistant is necessary in order to be able to define additional properties for FAMOS variables in later statements. This identification is either an index or a name. A new FAMOS variable is created when a name or an index not previously used is entered in the box.

The name must be unique and may contain a maximum of 30 characters; *note:* this is not a FAT variable! If the specified name or index has already been used, only the new properties are added to the previously defined properties of the FAMOS variable.

Changes To Properties:

Each individual property can be defined or remain unchanged. Several properties can be set at the same time in this dialog using the list of available properties.

- **Automatic or leave unchanged**

When a variable is defined, it is initialized to a standard value. If the variable is already defined, the value is not changed when this option is selected. Thus, "Automatic" is valid when a new variable is created and "Leave unchanged" is valid for additional modification of an existing variable.

- **Affiliated object**

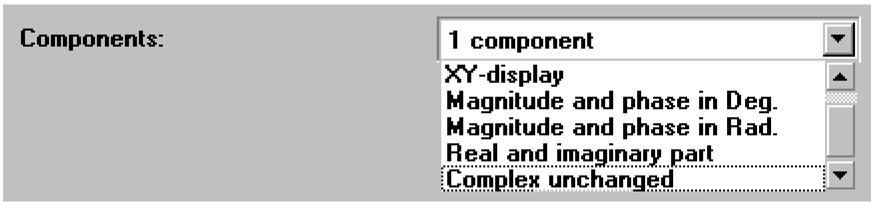
This property receives the value of text of the affiliated object. Note that the object "Text" can be assigned only one property, which expects text (e.g. units or comments). The same is valid for numbers.

- **Freely defined**

The property can be defined directly in the input box. If text is expected in a property, enter a text in quotation marks, otherwise, enter a number without quote marks. Formulas are also allowed.

Waveform

When "Waveform" is selected, a one-lined list appears in which the components of the waveform can be specified:



Select the components from this list when defining a new waveform. When properties of this waveform are changed in later statements, always select exactly the same properties in "Components:" as when defining this waveform. In complex waveforms, you can change from "Magnitude and Phase..." to "Real and Imaginary Part" display and vice versa. Select "Complex unchanged" if no changes are made in complex waveforms.

- **1 component**

The waveform contains only one component and is a real waveform with equidistant time in FAMOS.

- **XY-display**

The waveform is composed of two components (x- and y-components). Four additional properties for the second component (x-component) appear in the Properties List; in FAMOS, the waveform is a time-waveform with monotonous time track or a characteristic curve.

- **Magnitude and phase in degrees / radians**

The waveform is composed of two components (magnitude and phase). Four additional properties for the second component (phase) appear in the Properties List; is a complex waveform in polar coordinates in FAMOS.

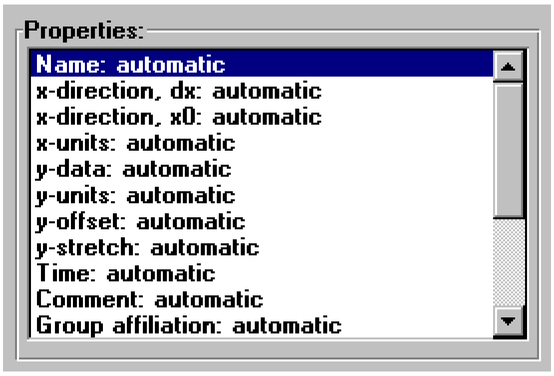
- **Real and imaginary part**

The waveform is composed of two components (real and imaginary part). Four additional properties for the second component (imaginary part) appear in the Properties List; is a complex waveform in rectangular coordinates in FAMOS.

- **Complex unchanged**

Selections made in "Components:" when defining the waveform remain intact. "Complex unchanged" may only be selected if the waveform was defined as a complex waveform. Otherwise, always make the same selections in "Component:" as when defining the waveform.

Waveform Properties:



- **Name:**

The name of the waveform - a text string. *example:* "Waveform1".

- **x-direction, dx:**

Delta-x in x-direction (distance between 2 points on the x-axis), the same for two component data. A number is expected, *example:* 1. The "delta parameter" changes according to the variable type: dt (parametric) with XY data, df (spectrum line spacing) with complex waveforms.

- **x-direction, x0:**

Offset in x-direction (for x-axis), the same for two component data. A number is expected, *example:* 25: The "offset parameter" changes according to the variable type: t0 (parametric) in XY data, f0 (usually 0) in complex waveforms.

- **x-units:**

This specifies the x-axis units. A text string is expected, *example:* "s" for time in seconds. This is the same for two component data. The "units parameter" changes according to the variable type: t-unit (parametric) with XY-data, frequency units (e.g. Hz) in complex waveforms.

- **y-data:**

The affiliated object may be a number or a vector. Numerical values affiliated with the object are added to those affiliated with the y-data. If a fixed number is defined, this number is appended. This parameter changes according to the variable type. With complex variables: magnitude data, real-imaginary variables: real part data.

- **y-unit:**

This specifies the y-data units for single component or XY data. A text-string is expected; *example:* "V". This parameter changes according to the variable type. With complex variables: magnitude units, real-imaginary variables: real part units.

- **y-offset:**

This is the y-offset with single component or XY-data, likewise the magnitude offset with complex variables and the real part offset with real-imaginary variables. *Important:* Always leave this setting on *automatic!*

- **y-stretch:**

This is the y-stretch with single component or XY-data, likewise the magnitude stretch with complex variables and the real part stretch with real-imaginary variables. *Important:* Always leave this setting on *automatic!*

- **Time:**

This is the absolute trigger time, specified as a real number in internal time format. The object type "Date/Time" returns a corresponding format, just like the Time*( ) functions. *Example:* affiliated object. *See also:* Time track in XY data below.

- **Comment:**

Waveform comment - a text is expected. *Example:* "This is the voltage waveform".

- **Group affiliation**

FAMOS variables can be assigned to a group. If groups are already defined in the File Assistant using the Usage dialog, a waveform (channel) can be assigned to a group.

Group affiliation of the waveform, either the index (identification in File Assistant) of a group is expected (i.e. enter a number, e.g. 1), or the name of the group in the File Assistant (i.e. enter a text, e.g. "DAS_Group1"). Select "No group affiliation" if the waveform is not assigned to a group.

- **y-max curve window**

The largest value displayed in the curve window. A number is expected, *example:* 100.

- **y-min curve window**

The smallest value displayed in the curve window. A number is expected, *example:* 0. If y-min and y-max (both!) have fixed definitions, this set of properties is assigned to the FAMOS variable.

- **Color**

RGB color, in which the waveform should be displayed. Use the function RGB( ), to enter a color. *Example:* RGB (255, 0, 0).

- **Segment length**

This specifies the segment length. A number is expected - *example:* 0 (no segments). *Important:* Always leave this setting on *automatic!*

- **z-direction, dz:**

Delta-z in z-direction (distance between two points on the z-axis). A number is expected. *Important:* Always leave this setting on *automatic!*

- **z-direction, z0:**

Offset in z-direction (for z-axis). A number is expected. *Important:* Always leave this setting on *automatic!*

- **z-unit:**

Unit of z-axis. Text is expected; *example:* "A".

- **x-data**

This is the x-data with XY-data, likewise the phase data with complex variables and the imaginary data with real-imaginary variables. Single component data is equally spaced on the x-axis and thus has no x-data. Note when transferring two-component data to FAMOS that both components must contain the same number of measurement values. If the number of values is unequal, the smallest number is used. *See also* "Time Track for XY-data" and "Time Track options" below.

- **x-units:**

This specifies the x-axis units with single component and XY-data, likewise the phase units with complex variables and the imaginary units with real-imaginary variables. A text is expected, *example:* "s".

- **x-offset:**

This specifies the x-offset with single component and XY-data, likewise the phase offset with complex variables and the imaginary offset with real-imaginary variables. *Important:* Always leave this setting on *automatic!*

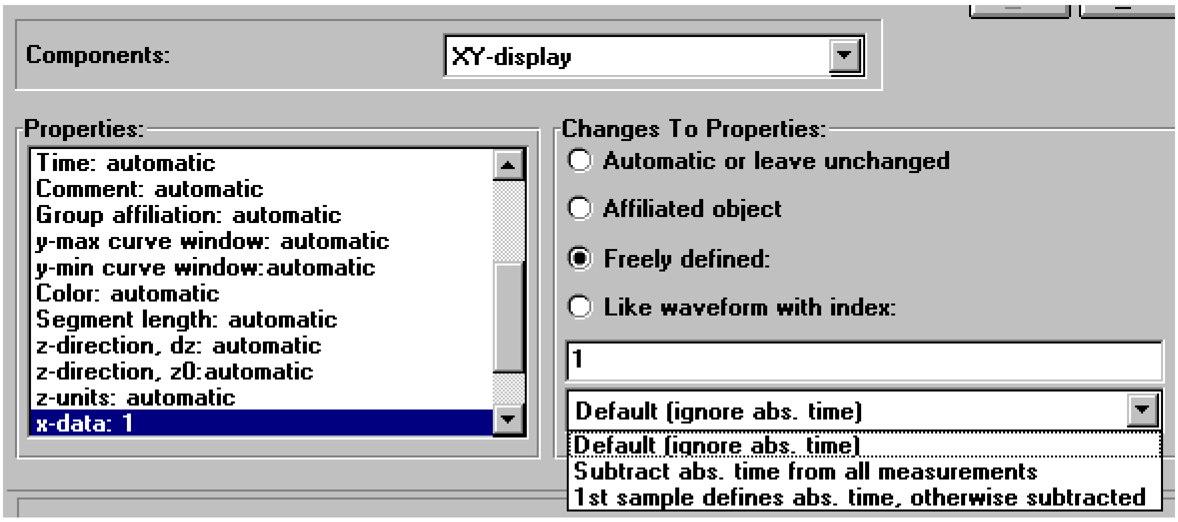
- **x-stretch:**

This is the x-stretch with XY-data, likewise the phase stretch with complex variables and the imaginary stretch with real-imaginary variables. Single component data is equally spaced on the x-axis and thus has no x-data. *Important:* Always leave this setting on *automatic!*

- **Time track in XY data**

The time track with XY-data deserves extra attention. Time is a quantity which increases monotonously, i.e. each new value is larger than the previous one. XY-data with monotone time tracks are treated specially by FAMOS and offer a few advantages over normal characteristic curves.

The time track should be viewed carefully when absolute times (i.e. information containing date and time) are read from the file. FAMOS variables contain the absolute trigger time. This is a real number in internal time format which indicates the trigger time and date. The trigger instant itself is considered in relative time as x=0. Therefore, in order to display the absolute time correctly in FAMOS, the trigger time and relative time of a measurement point must be added together. Since there are various possibilities of achieving the same sum, it is recommended (and practical) to assign the large time offset of the absolute trigger time and assign small and easily distinguishable relative times to individual measurement values.



Time Track Options

Several options are available for defining the time track (X component of XY-data):

- **Default (ignore abs. time)**

This is the default setting, which can always be used when you are uncertain. The x-components are read from the file without being transformed by the absolute time. For example, if the property "Freely defined" is selected and 1 entered, 1 is appended to the x-components. This option must be selected for characteristic curves and other data whose x-components are not a time variable.

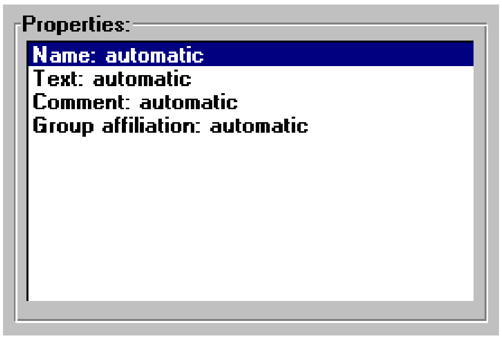
- **Subtract abs. time from all measurements**

The absolute time of the waveform is already defined and the property "Time" was already defined in a previous statement (previous is important! therefore, not this statement). The absolute time is subtracted from all times which should be appended to the x-component, so that the numerical values in the x-component remain small. The comparably large offset is shifted to the absolute time. The data should normally appear in this way in FAMOS. In general, the absolute times lie in a size of several 100 million, and 1 second (e.g. the interval to the next measurement value) is hardly noticeable - you would have to look very closely in the Data Editor. Data displayed using a relative time component in a curve window is also often undesirable. However, when the large offset is subtracted, the option is convenient. When calculating the difference, it is assumed that the absolute time of the waveform and the new data for the time track are in the internal time format. The following short-cut is often practical for optimization, and can be selected as an option:

- **1st sample defines abs. time, otherwise subtracted**

This is a short-cut which can be used in most cases. The first time value entered in the x-component is simultaneously the absolute trigger time. The absolute time of the waveform is defined by the very first measurement value to be entered in the x-component, and a zero is entered in the x-component. This does not cause any problems, because FAMOS adds the absolute time and relative time together when displaying in absolute time. The absolute time of the waveform determined first is subtracted for all measurement values to be added to the x-component.

Text properties



- **Name:**

This is the name of the text variable, a text is expected, *example:* "Text1".

- **Text:**

This is the contents of the contents of text variable, a text is expected, *example:* "abc".

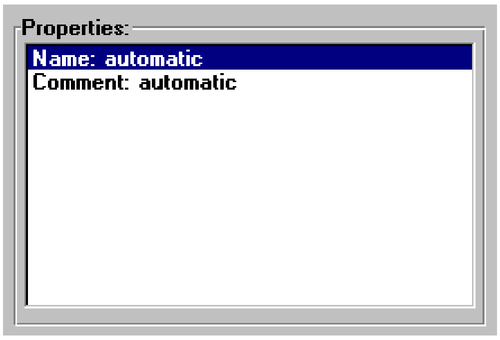
- **Comment:**

This is the comment of a text variable, a text is expected, *example:* "This is a comment for the text variable".

- **Group Affiliation:**

See group affiliation in waveforms.

Group properties



- **Name**

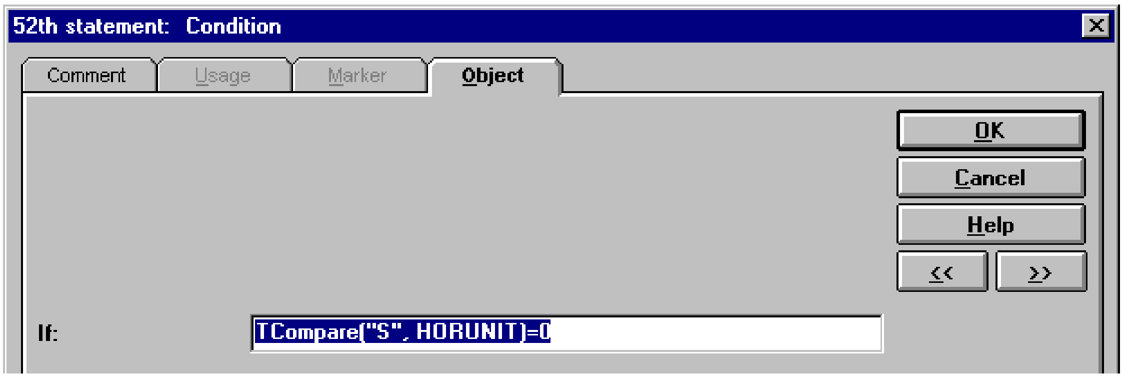
Group name: a text string is expected, *example:* "Group1"

- **Comment**

Comment field with additional information about the group: a text string is expected, *example:* "This is the first group".

6.7.17 Condition

The "Condition" dialog appears as follows:

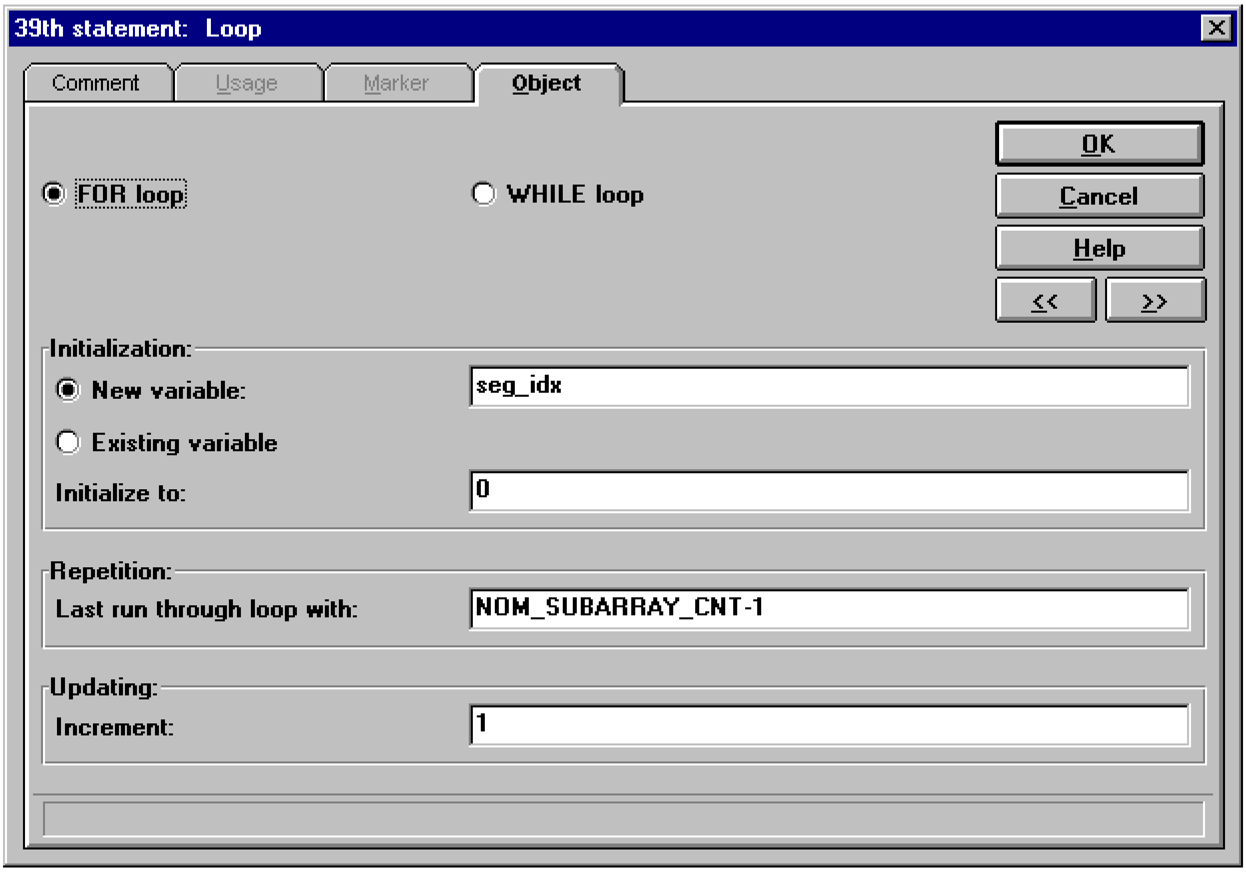


Neither a "Marker" nor "Usage" can be selected from the Condition dialog. The condition consists of a comment and object.

Enter the condition in the input box (a formula is also allowed). When the condition is fulfilled (not equal to 0), the THEN statement is executed. The ELSE statement is executed when the condition is not fulfilled.

6.7.18 Loop

The "Loop" dialog appears as follows:



Neither a "Marker" nor "Usage" can be selected from the Loop dialog; the loop consists of a comment and object.
Select between a "FOR" and "WHILE" loop.

"FOR" Loop

The loop variable is defined as an integer.

Initialization

Initialize the loop variable here; a formula is allowed. A new FAT-variable can be introduced, or an existing FAT-variable can be used (no FAT-variable for text!).

Repetition

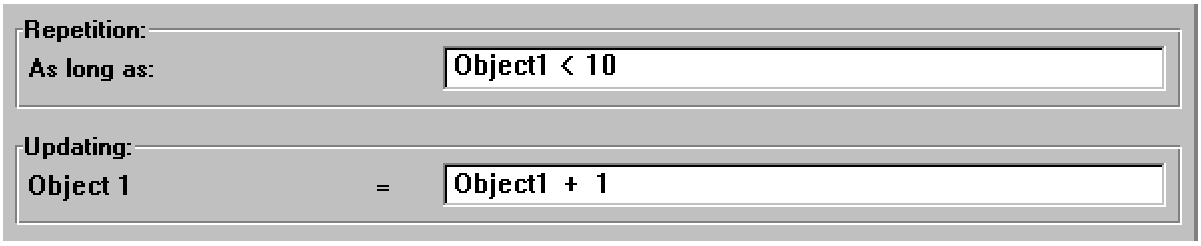
Enter here the number of repetitions the loop should make; a formula is allowed. In the example above, the loop repeats until loop variable reaches the value specified by the formula "NOM_SUBARRAY_CNT-1".

Increment

The loop variable is increased by the value specified here. Negative numbers are allowed, as well as a formula.

WHILE Loop

The loop variable can be specified as a real number.



Initialization

The same procedure as with "FOR" loops.

Repetition

The loop is repeated as long as the condition specified by the formula is fulfilled. Formulas and values are allowed. In the example above, the loop repeats as long as object1 (10.

Increment

The loop variable accepts the value defined in this input box; formulas are allowed.

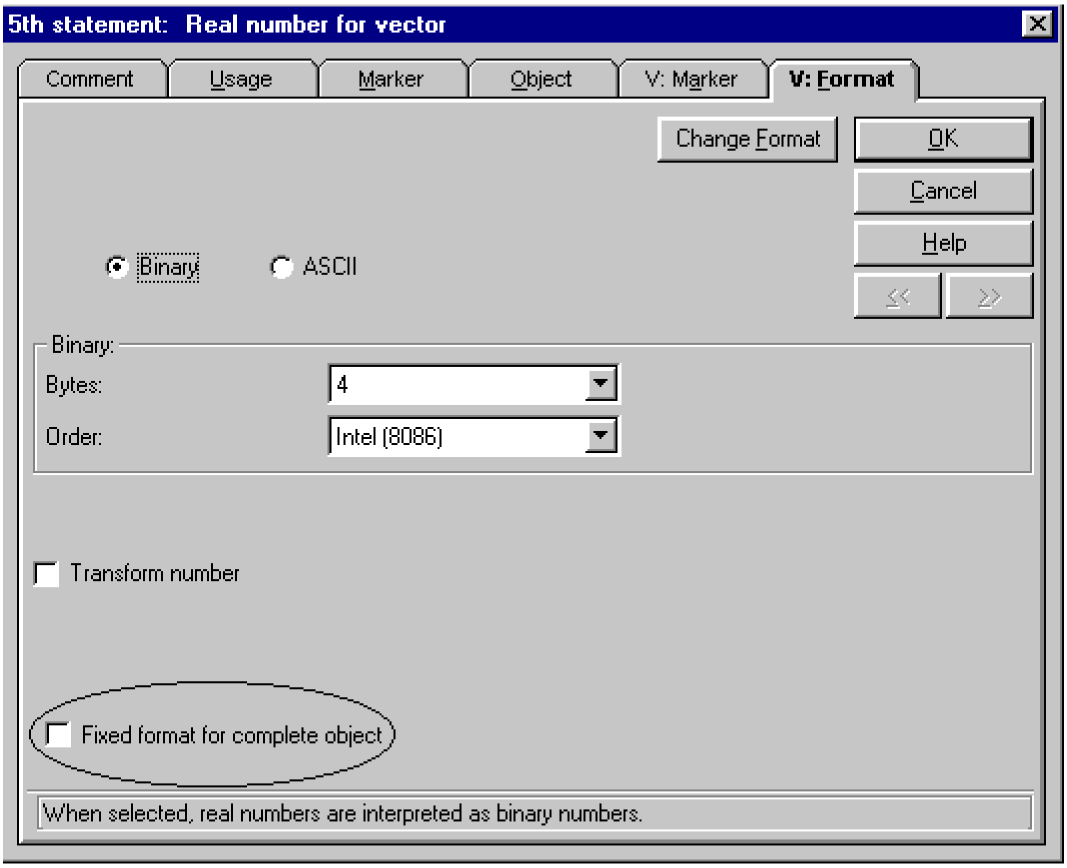
6.7.19 Technique: Fixed Format

Description

Fast reading of compact binary vectors expressed in the basic formats. Once in FAMOS, the respective data type is preserved. This is the only way to keep data loaded into FAMOS in any format other than 4 byte float (or 8 byte double for time tracks). Whenever the necessary conditions are met, simply selecting this options offers considerable advantages in terms of speed and conservation of memory.

Settings:

If a vectors format is binary, then the option "Fixed format for complete object" on its "Vector format" filecards is accessible.



Preconditions

Concerns only certain objects within a vector. The following is a list detailing the choices available for the vector and for its numerical format:

Conditions required of any vector:

- Vector format: integer or real numbers
- Number [of] elements: Fixed number [of samples], to end of file, or automatic
- Finding next element: only for fixed buffer in bytes, >= 0 also definable by formulas. Especially effective with compact vectors which have no spacing, but also useful in other instances.

Conditions required of a vector in 'real number' format:

- binary
- 4, 8 byte, freely defined
- Intel, freely defined
- Transformation: none
- select option "Fixed format for complete object"

Conditions required of a vector in 'integer' format

- binary
- 1, 2, 4 byte, freely defined
- Intel, freely defined

- Sign: with, without, freely defined
- All bits
- Transformation: none (if necessary, see below)
- select option "Fixed format for complete object"

Usage:

- The vector must really be used (see Usage dialog: x-data or y-data).
- The vector contains the object's first data. This means that the channel concerned may not have contained any data beforehand (at least not in the component concerned).
- For x-component only as default: ignore absolute time.

Checking:

Except in the case of the numerical format float (or x-component and numerical format double) the specified data type will verifiably be used in FAMOS. Otherwise there will be only a notification of missing microstep debugging.

Limitations

- No debugging in microsteps, therefore, switch off the option "Fixed format for complete object" when debugging.
- Attention: for float data there is no checking for illegal floats (overflow, not a number), in contrast to the usual case! If this option is off, each real number is rechecked. Therefore, don't select the "Fixed format for complete object" option if there is a danger that invalid numbers might have entered the file. Otherwise, subsequent display of the data, e.g. in FAMOS will cause a crash. This option provides speed, but is not 100% reliable for real numbers.

Working with integers

Since no transformation can be specified, the properties

- y-stretch
- y-offset

are defined and of decisive importance, outside of this application they have no meaning.

Physical value = (y-stretch) * (integer) + (y-offset)

(integer) here refers to the number as it is in the file, e.g. 16 bit, signed integer, range -32768 ... 32767.

y-stretch and y-offset can also be redefined later. Both quantities are ignored in the case of real numbers format. In that format, the data should always be left unaltered (automatic)!

Defaults: y-stretch = 1.0 and y-offset = 0.0.

For 2 components, x or Magnitude/Phase, ... the above applies analogously (x instead of y, ...).

Attention: If stretch and offset were not defined in the course of previous instructions, an unscaled number is outputted in the debugger. The usage is always evaluated at the end, after the object!

Attention: When the vector takes fixed format, the y-stretch and y-offset are always ignored and the integer data are always directly stored internally, without the numerical value being changed.

Appending data

A vector in fixed format cannot be appended to existing data. It always contains an object's first data. However, other vectors and single values can be appended to an object in fixed format. The values read are forced into the fixed format after transformation (if this is set), in other words, converted in such a way as to best preserve the physical, numerical value. For fixed integer format, the currently valid y-stretch and y-offset are used.

Attention: When values are forced into other formats, such serious distortions as drastic rounding or truncation of the value range can occur.

Preferred appending of many single integer data elements. As below under 'Tips', prefix with an empty vector. Append all integers without prior transformation and only afterwards define the y-stretch and y-offset on the 'Usage' filecard. Otherwise it is difficult, since the y-stretch and y-offset are ignored when the vector format is fixed, but are implemented later when integer-formatted values are appended!

When appending data the speed-advantage is lost (the advantage is most noticeable where large vectors are involved). The savings on memory remain, even then.

Tips

- When in doubt: leave the fixed format option off
- Forcing data in FAMOS to take a certain type: Prefix with a fixed-format vector of length 0, specify the type and then append the values to the object in the format of their file.
- Since all specifications must be given explicitly, it is recommended to use conditional logic (IF...THEN). The extra effort is worthwhile.

6.8 Tips for Creating Import Masks

Increasing Execution Speed

The speed of execution when loading files with the created configuration is of consequence in large or multi-channel files. Note the following when creating configurations:

Each marker search costs time and unnecessary searching should be avoided. If you want to execute several marker searches from the file start far into the file, check whether markers created later could be used for searching (especially for vectors).

Adding a certain number of bytes takes considerably less time than complicated comparisons with several characters.

It takes considerably more time to evaluate complicated formulas than numbers entered directly. Extensive formulas should only be used when necessary.

Always set unnecessary markers, objects and uses to empty, since they take up memory and cost calculating time.

Use fixed format

See the last section, 'Technique: Fixed format'. Where it is possible, it provides significant improvements.

Comments

Use the comment boxes as often as possible to document your program. This option is often neglected, but is helpful when viewing the program at a later time.

Binary Formats

1. Binary formats often exist in several versions, but differ greatly in structure. Always request the version number first, and in case of doubt, end the program with an error message (see remarks "Create error"). Create a configuration file for each version of the file format to avoid numerous distinctions, which make the program unclear.
2. Occasionally there are binary formats in which important characteristic quantities, e.g. sampling rate, are filed as an index and not directly as a value. This is very rare. There is no general rule for proceeding in such a case. However, it is often possible to find an assignment between the index and quantity. Example: the sampling rate is defined as an index in a format:

Index	**Sampling rate**
0	10µs
1	20 µs
2	50 µs
....	....
15	1 sec
16	2 sec
17	3 sec

The sampling rate can be calculated from the index using the following formula:

```
Samp. rate=Condi(MOD(Index, 3)=0, 1, Condi( MOD( Index, 3) = 1, 2, 5)) * 10^ (-5 + DIV( Index, 3))
```

Another possibility would be to set up a translation table in a separate file with a fixed name. This file must be located in the same directory as the data file. However, this method is not very fast.

Text Formats

1. If the data format has more than just one waveform or channel, a group with the name of the file should first be defined. Select "Freely Defined" in the Usage dialog Type->"Group" and in the box Properties ->"Name". Then use the function "FileName(1)" to assign the file name to the group in the edit box.
2. All channels in this file are placed in the group as normal waveforms with the property "Group Affiliation" (see example files). This allows several files created at different times to be loaded and evaluated in FAMOS.1
3. Recorder files in text format usually contain several channels. Following is a general approach to preparing format description: first determine all properties the channels have in common, e.g. trigger time, x-offset (or pretrigger time), sampling rate and y-unit and make them available as variables (select "Name available" and enter appropriate name). Then the number of channels contained in the file must be determined. A loop can then be constructed from this number of channels (1 to ChanNumber), and the channel-specific information (name, y-unit, y-data) are read in this loop.
4. This is more difficult when the file contains several channels with varying sampling rates, but equidistant and are arranged next to each other. Try to avoid reading in the channels as xy-waveforms; although this is most comfortable, FAMOS regards such xy-waveforms as non-equidistant. This means that some of the mathematical functions in FAMOS cannot be used for such waveforms. The file must be read line by line, and the values of the relevant channels individually determined and appended (see remarks about vectors). If the sampling rate is not specified exactly, it must be determined from the specified time values of the individual samples. Calculate the difference between two absolute times using the function TimeDiff ().
5. Often text must be searched for in ASCII-files, which is quite time consuming for the computer. The user should consider how to effectively search for a text, or avoid it in the first place. It is especially ineffective to search for a text fixed at the back of the file using the marker search "From File Beginning" and repeating this set often. If repeated searching is necessary, always try to use the marker from the preceding search. This way, the file is run through only once from beginning to end. If only one text at the back of the file should be located, specify a fixed offset in "Further by bytes".

Units

Only units allowed in FAMOS should be transferred to FAMOS. Prefixes such as milli- or kilo- are generally not allowed. instead, the data should be scaled to standard units. The reason: FAMOS usually recognizes units independently and uses them in subsequent mathematical operations. If an unknown unit is found, it is regarded as user-defined and is not used any further. Use the functions EngPot () and Tpart() to help in such situations.

Date

1. **Problem:** date and time cannot be read into a date-object statement, for example, because the date is specified normally, but the time is specified in ms from midnight.

In this case, the date must first be read in a separate statement and then the time in ms in a second statement. The usage must remain empty. Assume that the objects are called "Date" and "Time". Define "Only Variable" in a third statement and insert the statement:

```
Trigger time = TimeAdd(Date, Time/1000)
```

Use the same procedure when the time should be composed of year, month, day, hour, etc. However, the user should first determine if the function TimeJoin() would be more effective.

2. **Problem:** the trigger time is not contained in the file, it corresponds to the time for the file.

Use the function "TimeFile(1)" in an object "Only Variable" or specify "Freely fefined" for the time in the Usage dialog. The formula can then be entered in the edit box.

Vectors

1. Vectors should always be used when data are present in relative compact blocks. This is often the case in binary files; in text files in ASCII-format, the channels are usually arranged next to each other. The file must always be scanned completely from beginning to end for each channel read with a vector. Load time is increased significantly when there are several channels and the PC is slow. This can be improved by reading the file line by line and searching for values for each channel individually in the line. This way, the file only has to be run through one time. However, vectors are incapable of doing this; a program must be created consisting of statements, loops, conditions and markers. In one example, such a program brought a speed gain of 30-40% in loading. The user must decide which advantages are important for the situation.
2. It is useful to use a date vector for XY-waveforms. The entire time track can be read into a single statement using such vectors. Combine the date vector with the x-data in the Usage dialog. Select "Affiliated Object" for x-data; this prompts a selection list, from which the second or third option should be selected. If the third option is selected ("1st measurement value defines absolute time, otherwise subtract"), the trigger time does not need to be assigned extra. The vector takes care of this and the user does not have to drag along a large time offset for each instant.

Reading Time Tracks

If a time vector consisting of two absolute times (date and time) is read, there are two possibilities for transferring it to a waveform:

1. The vector with absolute times is transferred directly to the waveform.
2. The first absolute time of the vector is entered in "Time:" in the properties in the Usage dialog. The remaining times are transferred relative to the absolute time first specified (executed automatically by File Assistant).

The second method is preferred, especially when individual time differences are very small (e.g. in microseconds).

Creating Error Messages, Marker Search

1. *Problem:* a statement which only creates an error message to cancel the program?

   Define your own error message in the menu "Options/ Error messages..." and then select "Marker" in the statement. The self-defined error message can now be selected in the dialog box "In case of error". An invalid marker operation should be executed; insert "Further by bytes" in the box Continuation of marker search:". Enter "-1" as the number of bytes. That is it - this leads to the invalid marker 0.
2. Sometimes it is useful when an unsuccessful marker search does not lead to cancellation. Select the option "Disregard error" in the marker dialog "In case of error". The marker is then set to the value zero, which can be inquired in a condition or While-loop.

Complex Waveform

Problem: a file format contains complex waveforms, whose type of display (real/ imaginary, magnitude/ phase in degrees or radians) is first determined at the running time.

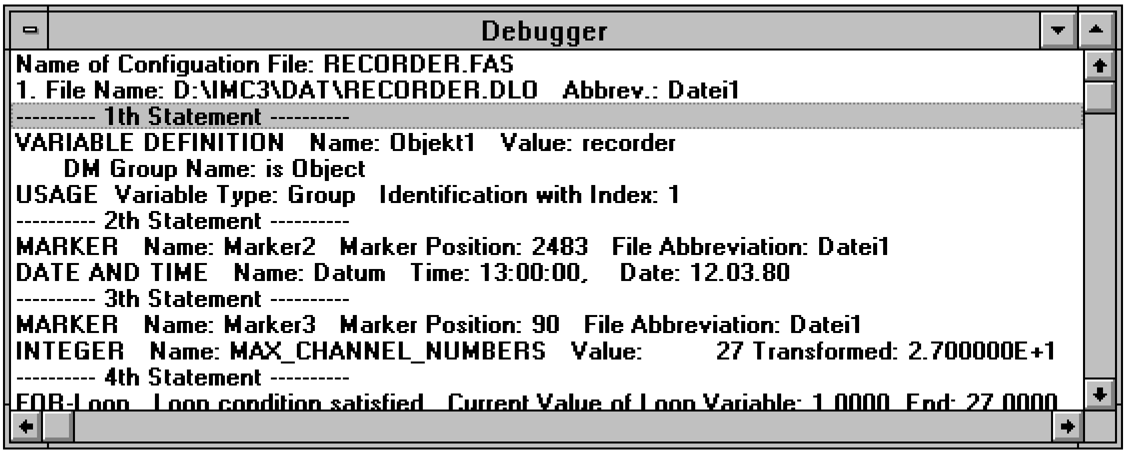
First determine the type of display for the waveform. When deciding the type of waveform, the corresponding setting for "Components" must be selected one time when creating the waveform in the Usage dialog. In all other statements (e.g. channel name, trigger time, data, etc.), the settings for "Components" must be set to "Complex unchanged" in the Usage dialog. This allows other statements to be used independent of the type of display. The user thus avoids having to decide for the entire statement list, and statements must not be present twice for each type of display.

6.9 Debugger

Use the debugger to check the configuration. The results of the statements are generated. Use micro-steps to check each individual search in the file.

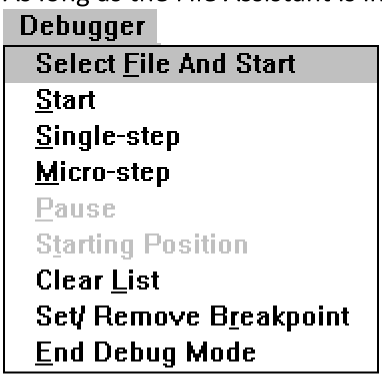
6.9.1 Starting and Stopping the Debugger

Select "Window" in the menu bar and then the option "New" and then "Debugger" to prompt the "Debugger" window. As an alternative, click on the following button:

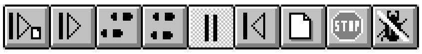


The application is in debug-mode when the debugger window is called; the debug mode remains intact when the Debugger window is closed. This mode is not ended until the option "End debugger mode" is selected.

As long as the File Assistant is in debugger mode, the following debugger menu is displayed:



If the Debugger window has focus, the following options are also displayed in the toolbar:



No further statements may be created in debug mode. The existing statements can be changed; as soon as a statement has been changed, the debugger starts at the beginning of the configuration.

End Debug Mode

The debug mode is ended and the Debugger window is closed.

6.9.2 Using the Debugger

There are several possibilities for starting the debugger. By selecting "Load and Start file", a dialog is called in which a new example file can be loaded. When "Start", "More", "Micro-step" and "Single-step" are selected, the previously selected example file is used as a basis. The debugger start is the exception: if a file has not yet been selected, the dialog for file selection always appears.

Essential information is always displayed in the Debugger window when a statement is executed in this window. The micro-step yields additional information. Here the individual search operations for a marker search can be checked. Detailed information is then displayed in the Debugger window.

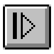
The Debugger window is filled continuously while stepping through a configuration in debug mode. The uppermost lines in the window are deleted if there is not enough memory available for additional lines. In this case, the overflow is displayed in the first lines in the Debugger window.

In complicated configurations, breakpoints can be set in front of selected statements.

Load and Start File

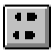
A dialog appears in which a new example file can be loaded. The debugger is started after the new example file is selected. The entire configuration created by the user is then stepped through and the most important information is displayed in the window.

Start



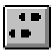
Starts the debugger. The entire configuration created by the user is stepped through; the most important information for each statement is displayed in the Debugger window.

Micro-Step



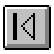
A micro-step is executed in the debugger (smallest executable step). Detailed information is displayed in the Debugger window.

Single-Step



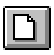
A single-step is executed in the debugger; exactly one statement is processed completely. The most important information from this statement is displayed in the Debugger window.

Starting Position



The debugger returns to the starting position.

Clear List

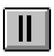


The debugger list is cleared.

Set/Remove Breakpoint

Move the arrow with the mouse to a statement box in the list window and click with the left mouse button to set a breakpoint in front of a statement (breakpoint appears to the left of the statement), if no breakpoint was already present. Otherwise, the breakpoint to the left of the statement is deleted.
Program execution is paused at this breakpoint.

Pause



If the debugger is running, it is paused; otherwise it continues running from the current position.

6.9.3 Clipboard

The contents of the Debugger window can be copied to the clipboard the Debugger window must have the focus to copy to the clipboard. Select "Edit" in the menu bar and then "Copy" from the menu.

6.9.4 Transfer to FAMOS

When the configuration has run through the debugger, the created waveforms, texts and blocks are transferred to FAMOS. To check the configuration, the created waveforms, texts and groups can be viewed in FAMOS.

6.10 Formulas

It is possible to use formulas in almost all input boxes in the File Assistant. Exceptions are comments, FAT variable names and internal identifiers for FAMOS variables and groups. Using formulas increases the flexibility of the configuration created by the user, since a defined value (e.g. a defined position in a file) is not always the same for all files used. However, as soon as a number or text is defined for all files used, enter this directly.

All entries in the File Assistant are interpreted as ANSI characters (Windows). To convert to OEM characters (DOS), use the function WinToDOS (see below).

Various options are available for filling the input boxes. The following table gives a few examples:

Enter a text	"Text"
Enter a number	152
Enter a FAT variable	Marker4 - Marker1
Enter functions	Min(Marker1, Marker3) + Abs(Object1)

Numbers (numbers, FAT variables and functions for numbers) must be strictly separated from texts (texts, FAT variables and functions for texts). As long as this basic rule is observed, the elements can be combined. Always be sure that the syntax is correct, e.g. each open parenthesis must be closed.

Length

The maximum length of a formula is 255 characters. Parentheses and quotation marks are counted as characters.

Special characters

To enter special characters, use the character "~", followed by three numbers which represent the ASCII code of the desired special character. For example, "~009" represents a tab character as text.

Comments

When the comment character ";" appears outside a text, the rest of the formula will be interpreted as a comment.

Syntax

Operators, functions and parentheses can be combined and nested according to the mathematical conventions.

Entering numerical values

- **Decimal numbers:** real or integer, for example -1.2e-3 or 567 or 0.0012
- **Hexadecimal numbers: begin with** 0x or 0X, for example 0xAAB or 0x1122
- **Binary numbers:** begin with 0b or 0B, for example 0b01001011

Variable names

To use names in formulas, they must represent relevant words, which may not contain any syntax elements of the formula.

Numerical range, integers

Integers are required for many operators and functions. The integers are limited to 32 bits. For example, in all bit operators, integers are interpreted as whole numbers without signs with 32 bits.

Numerical range, real numbers
Like in FAMOS, e.g. -1e35..-1e-35, 0, 1e-35..1e35

Internal time format

Times are stored as real numbers in an internal format. It is not necessary to know this internal format, since the Time*() function converts day, month, year, etc. to the internal format and itself calculates with the internal format. For example, the internal format counts seconds starting on a defined day and increases with the progression of time. However, this should not be taken advantage of. The Usage dialog with the characteristic "Time" also expects the internal time format, the object dialog "Date/ Time" returns the internal time format.

The time value of the internal time format in the File Assistant is saved as a real number and counts the seconds starting from the 1.1.1980 at 0:00:00,0.

Errors in formulas

If the numerical range is exceeded, the result is set to 0; in invalid text results, it is set to an empty text. Warning messages are not generated. Dividing by 0 yields a results of 0.

Order of execution

Point calculation is executed before addition. In all other cases, use parentheses for clarity.

Several operators and functions are available for entering formulas. They are described in the following section.

6.11 Operators

The following operators can be used when entering formulas.)

6.11.1 + (Addition

Parameter	Definition
Number1	The first of two numbers to be added
Number2	The second of two numbers to be added

The numbers Number1 and Number2 are added

Example:

```
Result = 6 + 4 = 10
```

6.11.2 - (Subtraction)

Parameter	Definition
Number1	Number to be subtracted from Number 2
Number2	Number to be subtracted from Number 1

Number2 is subtracted from Number1.

Example:

```
Result = 6 - 4 = 2
```

6.11.3 * (Multiplication)

Parameter	Definition
Factor1	The first of two numbers to be multiplied
Factor2	The second of two numbers to be multiplied

The numbers Factor1 and Factor2 are multiplied.

Example:

```
Result = 6 * 4 = 24
```

6.11.4 / (Division)

Parameter	Definition
Numerator	Number to be divided by the denominator
Denominator	Number to be divided by the numerator

A number (numerator) is divided by another number (denominator).

Example:

```
Result = 6 / 4 = 1.5
```

6.11.5 ^ (Power)

Parameter	Definition
Base	Numbers by which the exponents is to be raised to a power
Exponent	Number by which the bases it to be raised to a power

A number (base) is raised to a power by another number (exponent) - $\text{Base}^{\text{Exponent}}$.

Example:

```
Result = 6^2 = 36
```

6.11.6 << (Shift up)

Parameter	Definition
Number	Number to be shifted upward
Shift number	Number by which should be shifted upward

A number is shifted upward by another number (shift number), i.e. the bits are shifted to the left. Only numbers with a maximum of 4 bytes can be shifted; the shift number must be an integer and positive.

Example:

```
Result = 5 << 2 = 20
```

6.11.7 >> (Shift down)

Parameter	Definition
Number	Number to be shifted downward
Shift number	Number by which should be shifted down

A number is shifted downward by another number (shift number), i.e. the bits are shifted to the right. Only numbers with a maximum of 4 bytes can be shifted; the shift number must be an integer and positive.

Example:

```
Result = 20 >> 5 = 2
```

6.11.8 BitAnd

Parameter	Definition
Number	Number to be linked with the mask by "AND"
Mask	Mask to be linked with the number by "AND"

A number is linked with the masks by AND. The individual bits of both numbers are compared. When the observed bit is defined in the number as well as in the mask (= 1), the result is also a defined bit (= 1). Otherwise, the bit of the result is = 0.

Example:

```
Result = 27 BitAnd 23 = 19
```

6.11.9 BitOr

Parameter	Definition
Number	Number to be linked with the mask by "OR"
Mask	Mask to be linked with the number by "OR"

A number is linked with the mask by OR. The individual bits of both numbers are compared. When the observed bit is defined in the number, the mask , or both (= 1), the result of a defined bit is (= 1). Otherwise the bit of the result is = 0.

Example:

```
Result = 27 BitOr 23 = 31
```

6.11.10 BitXOr

Parameter	Definition
Number	Number to be linked with the mask by "XOR"
Mask	Mask to be linked with the number by "XOR"

The number is linked with the mask by XOR. The individual bits of both numbers are compared. When the observed bit is either defined in the number and not in the mask or vice versa (= 1), the result is a defined bit (= 1). Otherwise, the bit of the result is = 0.

Example:

```
Result = 27 BitOr 23 = 12
```

6.11.11 < (Smaller Than), > (Greater Than)

Parameter	Definition
Number1	The first of two numbers to be compared
Number2	The second of two numbers to be compared

Two numbers are compared. The result is 1 (TRUE), if the first number (Number1) is smaller or greater than the second number (Number2). Otherwise the result is 0 (FALSE).

Example:

```
Result = (3 < 4) = 1
Result = (3 > 6) = 0
```

6.11.12 <= (Smaller Than or Equal To), >= (greater than or equal to)

Parameter	Definition
Number1	The first of two numbers to be compared
Number2	The second of two numbers to be compared

Two numbers are compared. The result is 1 (TRUE), if the first number (Number1) is smaller than or equal to (or greater than or equal to) the second number (Number2). Otherwise the result is 0 (FALSE).

Example:

```
Result = (4 <= 4) = 1
Result = (3 >= 6) = 0
```

6.11.13 = (Equal To), <> (Not Equal To)

Parameter	Definition
Number1	The first of two numbers to be compared
Number2	The second of two numbers to be compared

Two numbers are compared. The result is 1 (TRUE), if the first number (Number1) is equal to (or not equal to) the second number (Number2). Otherwise the result is 0 (FALSE).

Example:

```
Result = (3 <> 6) = 1
Result = (3 = 4) = 0
```

6.11.14 And

Parameter	Definition
Expression1	The first of two expressions to be linked with "AND"
Expression2	The second of two expressions to be linked with "AND"

Expression1 and Expression2 are logically linked with AND. The result is = 1 only when both expressions are <> 0. When at least one of the expressions = 0, the result is = 0.

Example:

```
Result = (3 > 2) And (1 < 8) = 1
```

6.11.15 Or

Parameter	Definition
Expression1	The first of two expressions to be linked by "OR"

Expression2	The second of two expressions to be linked by "OR"

Expression1 and Expression2 are logically linked with OR. The result is = 1 when at least one of the expressions is <> 0. If both of the expressions are = 0, the result is = 0.

Example:

```
Result = (3 > 2) Or (11 < 8) = 1
```

6.11.16 XOr

Parameter	Definition
Expression1	The first of two expressions to be linked with "XOR"
Expression2	The second of two expression to be linked with "XOR"

Expression1 and Expression2 are logically linked with XOR. When exactly one of the two expressions is <> 0 and the other expression is = 0, the result is = 1. Otherwise the result is = 0.

Example:

```
Result = (3 > 2) XOr (11 < 8) = 1
```

6.11.17 - (Negative Sign)

Parameter	Definition
Number	Number which is to receive inverse sign

Inverses the sign of a number.

Example:

```
Result = 255 BitAnd ( BitNot 19, 255 ) = 236
```

6.11.18 BitNot

Parameter	Definition
Number	Number whose bits are to be flipped

Flips individual bits in a number: a *set* bit (= 1) is *reset* (= 0) and vice versa.

Example:

```
Result = 255 BITAND BitNot19 = 236
```

The unsigned single byte number 19 was required here.

6.11.19 Not

Parameter	Definition
Expression	Expression whose result is to be inverted

The result of an expression is logically inverted: if the expression is <> 0, the result is = 0. If the expression is = 0, the result is = 1.

Example:

```
Result = Not (3 < 5) = 0
```

6.12 Functions

The File Assistant provides you with many functions which can be used in formulas. Following is a list of all functions available in the File Assistant; all functions yield the result as a return value.

6.12.1 Abs

Parameter	Definition
Number	Number from which the absolute value is to be calculated
Result	Absolute value of the number

This function calculates the absolute value of a real number. Positive numbers remain unchanged. In negative numbers, the sign is inverted.

Example:

```
Result = Abs( -2 )
```

The result is 2, just as for Abs(2).

6.12.2 CharactT

Parameter	Definition
ASCII	ASCII code to be converted to text
Result	ASCII code converted to text

The ASCII code character is converted to text. It is only allowed to enter an ASCII code as the parameter.

Example:

```
Result = CharactT( 66 )
```

The result is "B" (the ASCII code 66 = 0x42 becomes the character B).

6.12.3 CrLf

Parameter	Definition
No parameter	
Result	Character for the carriage return and linefeed as text

The characters for carriage return and linefeed are created and returned as text.

Example:

```
Result = CrLf( )
```

The result is the carriage return and linefeed characters as text, thus a text with a length of 2 with ASCII codes 13 and 10.

6.12.4 Condi

Parameter	Definition
Condition	Condition which determines the return of one of the two numbers (Number1 or Number2)
Number1	Number to be returned if condition is fulfilled
Number2	Number to be returned if condition is not fulfilled
Result	Number1, if condition is fulfilled Number2, if condition is not fulfilled

Depending on the condition, one or the other parameter is returned. If the condition is fulfilled (condition not equal to 0), the second parameter is returned (Number1); otherwise, the third parameter is returned (Number2).

Example:

```
Result = Condi( Object1=5, 10, 15 )
```

The result is 10, if the Object1 = 5. Otherwise the result is 15.

6.12.5 Div

Parameter	Definition
Number1	Number to be divided by Number2 (dividend or numerator of the fraction)
Number2	Number to be divided by Number1 (divisor or denominator of the fraction)
Result	Integer quotient (remainder of division is ignored)

The function "Div" determines the quotients of two numbers. Digits right of the decimal are left off. The denominator is subtracted from the numerator so that the result is not less than zero. The number of subtractions is the result.

Example:

```
Result = Div( 20, 6 )
```

The result is 3.

6.12.6 DOSToWin

Parameter	Definition
Text	Text in DOS format (OEM characters) to be converted to Windows format (ANSI characters)
Result	Text in Windows format (ANSI characters)

A text in DOS format (OEM characters) is transformed to Windows format (ANSI characters).

Example:

```
Result = DOSToWin( "Hello" )
```

The result of transformation is the text " Hello" (in Windows format). The OEM character "ö" (ASCII 148) was converted to the ANSI character "ö" (ASCII 246).

6.12.7 EngPot

Parameter	Definition
Text	Text (with a sign) from which the power of ten is to be calculated
Result	Power of ten

The power of ten is calculated from a text with sign. The following signs are supported by FAMOS:

Sign	Prefix	Definition
f	femto	10^{-15}
p	pico	10^{-12}
n	nano	10^{-9}
µ	micro	10^{-6}
m	milli	10^{-3}
k	kilo	10^{3}
m	mega	10^{6}
g	giga	10^{9}
t	tera	10^{12}

A zero is returned if none of these signs are specified as the parameter.

Example:

```
Result = EngPot( "m" )
```

The result is 10^{-3}.

6.12.8 FileExt

Parameter	Definition
Index	Index of an available file from which the file name extension is to be determined. 1... 3
Result	File name extension

This function determines the extension of the file name belonging to the specified index. The index of the first file is 1. The extension is returned as text string without the point.

Example:

```
Result = FileExt( 2 )
```

The result is the file name extension with the index 2. In the corresponding file name "TEST0001.FAT", the result would be "FAT".

6.12.9 FileLength

Parameter	Definition
Index	Index of an available file from which the length is to be determined. 1 ... 3
Result	Length of the file

This function determines the length of the file corresponding to the specified index. The index of the first file is 1. The number of bytes in the file is returned.

Example:

```
Result = FileLength( 2 )
```

The result is the number of bytes in the file with index 2.

6.12.10 FileName

Parameter	Definition
Index	Index of one of the available files, from which name is to be taken. 1 ... 3
Result	File name

This function determines the name of the file corresponding to the specified index. The index of the first file is 1. The name is returned without the directory and without the file extension.

Example:

The file with index number two is called "c:\tmp\myfile.txt".

```
Result = FileName( 2 )
```

The result is = "myfile".

6.12.11 Log10

Parameter	Definition
Number	The logarithm of this number is taken.
Result	10-base logarithm

The parameter must be greater than zero, otherwise zero is returned.

Example:

```
Result = Log10( "100.0" )
```

The result is 2.0".

6.12.12 Max

Parameter	Definition
Number1	The first of two numbers from which the maximum is to be determined
Number2	The second of two numbers from which the maximum is to be determined
Result	Maximum of the two numbers

The maximum of two numbers is determined.

Example:

```
Result = Max( 3, 7 )
```

The result is 7.

6.12.13 Min

Parameter	Definition
Number1	The first of two numbers from which the minimum is to be determined
Number2	The second of two numbers from which the minimum is to be determined
Result	Minimum of two numbers

The minimum of two numbers is determined.

Example:

```
Result = Min( 3, 7 )
```

The result is 3.

6.12.14 Mod

Parameter	Definition
Number1	Number to be divided by Number2 (numerator)
Number2	Number to be divided by Number1 (denominator)
Result	Remainder of the division (modulo) of numerator and denominator

The "Mod" function (modulo) determines the remainder of division of two numbers. The denominator must not be an integer. Following is a brief explanation of how the function works:

The numbers Number1 (numerator) and Number2 (denominator) are made positive. Then the denominator is subtracted from the numerator so that the result is not less than zero. The sign of the result is then set to the sign of the numerator.

Example:

```
Result = Mod( 20, 6 )
```

The result is 2.

6.12.15 NoBlanks

Parameter	Definition
Text	Text from which all white spaces are to be deleted
Result	Text without white space

All white spaces are deleted from the specified text (spaces, tabs, etc.).

Example:

```
Result = NoBlanks( "  Sampling rate: " )
```

The result is the text "Samplingrate:".

6.12.16 Path

Parameter	Definition
Index	Index of that one of the available files whose name is to be determined, 1 ... 3
Result	The directory-portion of the complete pathname.

This function determines the directory path for the file denoted by the index number which the user supplies. The index for the first file is 1. The directory path is then outputted with a "\" character at the end. An empty string is returned if an error occurs.

Example:

```
Result = Path( 2 )
```

The result is then = "c:\tmp\1\", if the 2nd file was "c:\tmp\1\data.txt".

6.12.17 Path1LSub

Parameter	Definition
Index	Index of that one of the available files whose lowest-level subdirectory is to be determined, 1 ... 3
Result	The last subdirectory appearing in the complete pathname

This function determines the last element of the directory path for the file denoted by the index number which the user supplies. The index for the first file is 1. The directory path is then outputted with a "\" character at the end. An empty string is returned if an error occurs.

Example:

```
Result = Path1LSub( 2 )
```

The result is then = "run01", if the 2nd file was "c:\tmp\run01\data.txt".

6.12.18 Path2LSub

Parameter	Definition
Index	Index of that one of the available files whose second-lowest-level subdirectory is to be determined, 1 ... 3
Result	The next-to-last subdirectory appearing in the complete pathname

This function determines the next-to-last element of the directory path for the file denoted by the index number which the user supplies. The index for the first file is 1. The directory path is then outputted with a "\" character at the end. An empty string is returned if an error occurs.

Example:

```
Result = Path1LSub( 2 )
```

The result is then = "engine", if the 2nd file was "c:\tmp\engine\run01\data.txt".

6.12.19 Quot

Parameter	Definition
No parameter	
Result	Quotation mark as text: "

A quotation mark is generated as returned as text.

Example:

```
Result = Quot( )
```

The result is a quotation mark as text with a length of 1.

6.12.20 Rgb

Parameter	Definition
Red	Red color portion (0..255)
Green	Green color portion (0..255)
Blue	Blue color portion (0..255)
Result	The color made up of the three color portions

A color is created from the three specified color portions red, green and blue. When a 0 is entered as the color portion, this color will not be used; when 255 is entered, the maximum portion of this color is used. The result is a number corresponding to the color.

Example:

```
Result = Rgb( 255, 0, 0 )
```

The result is the color red.

6.12.21 Round

Parameter	Definition
Number	Number to be rounded
Result	Rounded number

Rounds a number to the next integer.

Example:

Rounding to next closest integer: 3.33 --> 3

```
Result = Round( 3.33 )
```

Rounding to next closest integer: 3.77 --> 4

```
Result = Round( 3.33 )
```

Rounding to next smallest integer: 3.9 --> 3

```
Result = Round( 3.9 - 0.5 )
```

Rounding to next largest integer: 3.1 --> 4

```
Result = Round( 3.1 + 0.5 )
```

Rounding to next whole multiple of an integer, e.g. 0.01: 0.12345 --> 0.12

```
Result = Round( 0.12345 * 100) / 100
```

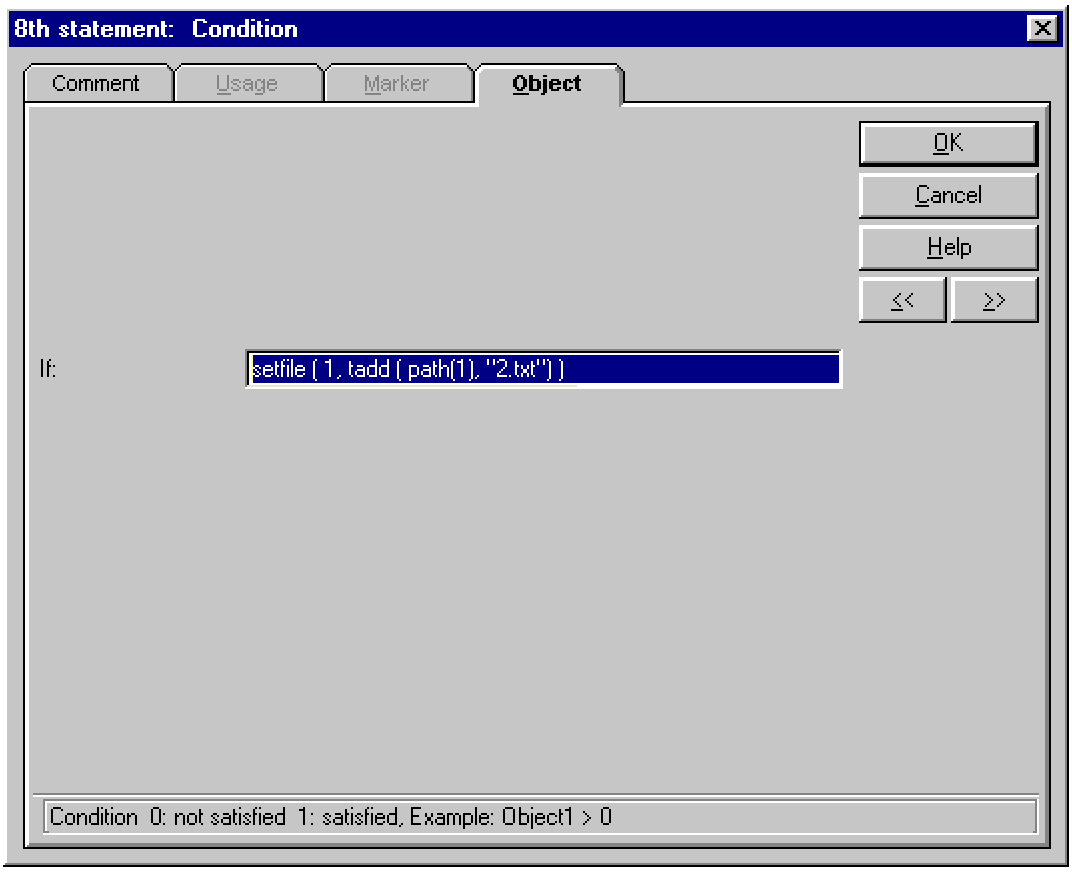
6.12.22 SetFile

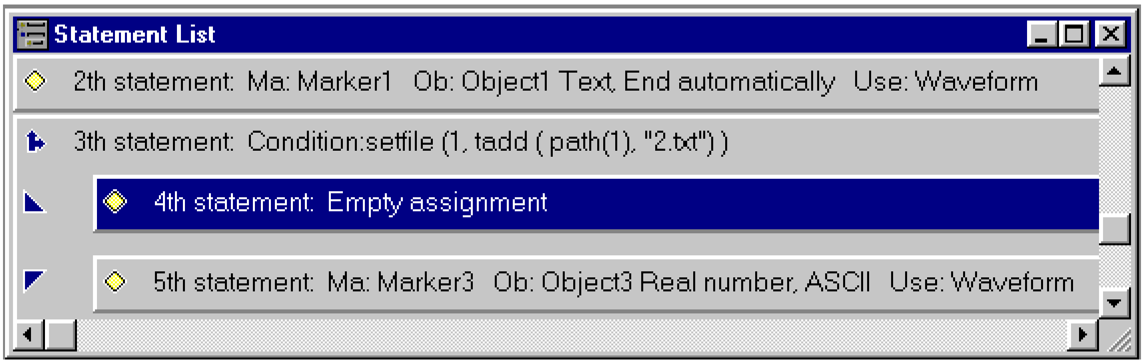
Parameter	Definition
Index	Index of that one of the available files which contains a reference to another file, 1 ... 3
FileName	The complete new name for the referenced file
Result	1, if the referenced file was opened successfully 0, if the referenced file could not be opened (incorrect filename, read authorization denied, ...)

This function makes it possible to open a file whose name was not yet known at the time the import filter was created. This makes it also possible to read data formats which consist of more than 3 files, as well as to open files whose directory path or name is stated in other files.

Once this function has been successfully executed, only the new file remains open; the previously open file is then closed.

This function may only be called within a conditional clause; this will be checked automatically. The return value must always be requested; this is not automatically checked, but it should be done anyway. If it is successful, the import may continue its execution. For the case of an error occurring, the filter must be supplied with an instruction on how to respond; either to generate an error statement, or to open a different file...





Example: (see also above):

```
IF:   setfile ( 1, tadd ( path(1), "2.txt") )
```

If the first filename was "c:\imc\data.001", the file "c:\imc\2.txt" is opened. The return value is checked in the IF clause.

6.12.23 Sqrt

Parameter	Definition
Number	Number from which the square root is to be calculated
Result	Square root of the number

The square root of a number is calculated. The root is defined only for numbers greater than or equal to zero.

Example:

```
Result = Sqrt( 64 )
```

The result is 8.

6.12.24 Tab

Parameter	Definition
No parameter	
Result	Tab character as text

The tab character (ASCII 009) is generated and returned as text.

Example:

```
Result = Tab( )
```

The result is the tab character as text, thus a text with a length of 1 with the ASCII code 9.

6.12.25 TAdd

Parameter	Definition
TextFront	Text to be appended
TextBack	Text to be added to TextFront

Result	Concatenation of both specified texts

The two specified texts are concatenated.

Example:

```
Result = TAdd( "c:\imc\", "dat" )
```

The result is the text string "c:\imc\dat".

6.12.26 TCharact

Parameter	Definition
Text	Text to be converted to ASCII code
Result	Text converted to ASCII code

The character specified as text is converted to the corresponding ASCII code. Only a sign can be entered as a parameter.

Example:

```
Result = CharactT( "B" )
```

The result is 66 (ASCII code 66 = 0x42 corresponds to the character "B").

6.12.27 TCompare

Parameter	Definition
Text1	The first of two texts to be compared
Text2	The second of two texts to be compared
Result	A number indicating the alphabetic relation of the two texts

Two texts are compared. The possible relations between the texts and the corresponding return values are defined as follows:

Return value	Relation
-1	Text1 < Text2, the first text is to be arranged alphabetically in front of the second text.
0	Text1 = Text2, both texts are the same
1	Text1 > Text2, the first text is to be arranged alphabetically after the second text

The function differentiates between upper and lower case letters. A comparison of the texts "ab" and "AB" yields a 0. Refer to the functions ToLower () and ToUpper (). In comparison after converting to upper case letters, the function works without regard to upper and lower case.

An empty text is arranged in front of all other texts when alphabetically sorted.

Example:

```
Result = TCompare( "x", "y" )
```

The result is -1.

6.12.28 TCond

Parameter	Definition
Condition	Condition on which return of one of the two texts depends
Text1	Text to be returned if condition is fulfilled
Text2	Text to be returned when condition is not fulfilled
Result	Text1, if condition is fulfilled Text2, if condition is not fulfilled

The second (Text1) or the third parameter (Text2) is returned, depending on the condition. If the condition is fulfilled (not equal to 0), Text1 is returned; otherwise Text2 is returned.

Example:

```
Result = TCond( Object1=5, "ab", "xy" )
```

The result is "ab" if Object1 = 5. Otherwise the result is "xy".

6.12.29 TFormat

Parameter	Definition
Number	Real number to be converted
Format	Specification of desired format
Result	Formatted text

A real number is converted to a formatted text. Several different format types can be specified. The parameter format contains the necessary information. The following formats are available. The letters in bold print represent obligatory format identification; the other letters are to be replaced by the desired numerical values.

eN	Floating point format	N: Number of digits right of the decimal, 0..9
fVN	Fixed point format	V: Number of digits left of decimal N: Number of digits right of decimal, 0..9
xG	Hexadecimal format	G: Total number of places, 1..8
bG	Binary format	G: Total number of places , 1..32

These options are entered as text constants (in format) and therefore must be in quotation marks.

In floating-point display, the exponent is specified with 1 or 2 places; an "E" is used to represent the exponent, followed by the sign.

In fixed-point display, the places in front of the number are filled with spaces until the specified number of digits left of the decimal has been reached. Set the number of digits left of the decimal to 1 if no spaces are desired before the number. If the number has more digits left of the decimal than specified in the format, all places left of the decimal are generated to prevent the number from being distorted.

Examples*:*

```
Result = TFormat( 3.15269, "f24" )
```

The result is the text " 3.1526".

```
Result = TFormat( 47, "x2" )
```

The result is the text "2F".

```
Result = TFormat( -523.469, "e4" )
```

The result is the text "-5.2346E+2".

6.12.30 TimeAdd

Parameter	Definition
Time	Time in internal time format to which seconds are to be added
Seconds	Number of seconds to be added to the time in internal time format
Result	Sum of specified time and seconds in internal time format

A number of seconds is added to an existing time in the internal time format. The result is in the internal time format.

Example:

```
Result = TimeAdd ( TimeNow( ), 7 )
```

The result is the current time plus 7 seconds; the result is in the internal time format.

6.12.31 TimeDay

Parameter	Definition
Time	Time in internal time format from which the days are to be requested
Result	Day from date

The days in the existing time are requested (the day in the date, 1...31).

Example:

```
Result = TimeDay( TimeNow( ) )
```

The result is the number of days in the current time.

6.12.32 TimeDiff

Parameter	Definition
Time1	Time in internal time format from which the Time2 is to be subtracted
Time2	Time in internal time format to be subtracted from Time1
Result	Difference of the two times in seconds

The difference in seconds is calculated for two times.

Example:

```
Result = TimeDiff( TimeNow( ), TimeFile(1) )
```

The result is the difference between the current time and the time of the file with the index 1.

6.12.33 TimeFile

Parameter	Definition
Index	Index of an available file from which the internal time is to be determined, 1... 3
Result	Internal time of the file with the selected index

The function determines the time of the file corresponding to the specified index. The index of the first file is 1. The time is specified in the internal time format.

Example:

```
Result = TimeFile( 1 )
```

The result is the file time of the file with the index 1.

6.12.34 TimeHour

Parameter	Definition
Time	Time in internal time format from which the hours are requested
Result	Hours in the time

The hours are requested from the time in the internal format (0..23).

Example:

```
Result = TimeHour( TimeNow( ) )
```

The result is the number of hours in the current time.

6.12.35 TimeJoin

Parameter	Definition
Days	Number of days (1..31 allowed)
Months	Number of months (1..12 allowed)
Years	Number of years (1980..2040 allowed)
Hours	Number of hours (0..23 allowed)
Minutes	Number of minutes (0..59 allowed)
Seconds	Number of seconds (0.0.. 60.0 allowed)
Result	Time value in the internal time format

A time value is generated in the internal time format from the specified parameters. Only whole numbers are allowed in the parameters days, months, years, hours and minutes. The parameter seconds can be specified as a real number. The result is a real number.

Example:

```
Result = TimeJoin( 31, 12, 1995, 22, 5, 0 )
```

The result is the time value in the internal time format for 22:05:00,0 on 31.12.1995.

6.12.36 TimeMinute

Parameter	Definition
Time	Time in internal time format from which the minutes are requested
Result	Number of minutes

The minutes are requested from the existing time (0..59).

Example:

```
Result = TimeMinute( TimeNow( ) )
```

The result is the number of minutes in the current time.

6.12.37 TimeMonth

Parameter	Definition
Time	Time in internal format from which the months are requested
Result	Month in date

The months are requested from an existing time in the internal time format (the month: 1.. 12).

Example:

```
Result = TimeMonth( TimeNow( ) )
```

The result is the number of months in the current time.

6.12.38 TimeNow

Parameter	Definition
No parameter	
Result	Current time in the internal time format

The current time in the internal time format is determined. The result is a real number.

Example:

```
Result = TimeNow( )
```

The result is the current time in the internal format.

6.12.39 TimeSecond

Parameter	Definition
Time	Time in internal format from which the seconds are requested
Result	Number of seconds (fractional parts allowed)

The seconds are requested from the existing time in the internal time format (0... 60).

Example:

```
Result = TimeSecond( TimeNow( ) )
```

The result is the number of seconds in the current time.

6.12.40 TimeYear

Parameter	Definition
Time	Time in internal format from which the years are requested
Result	Year in the date

The years are requested from an existing time in the internal time format (1980...2040)

Example:

```
Result = TimeYear( TimeNow( ) )
```

The result is the current year.

6.12.41 TLeng

Parameter	Definition
Text	Text whose length is to be determined
Result	Number of characters in the text

The number of characters in a text (including spaces) is determined and returned.

The length of an empty text is 0.

Example:

```
Result = TLeng( "Sampling rate" )
```

The result is 12.

6.12.42 ToLower

Parameter	Definition
Text	Text to be converted to lower case letters
Result	Text in lower case letters

The letters in a text are converted to lower case. Numbers are not changed. The text must use the ANSI character set.

Example:

```
Result = ToLower( "HELLO" )
```

The result is "hello".

6.12.43 ToUpper

Parameter	Definition
Text	Text to be converted to upper case letters
Result	Text in upper case

The letters in a text are converted to upper case. Numbers are not changed. The text must use the ANSI character set.

Example:

```
Result = ToUpper( "hello" )
```

The result is "HELLO".

6.12.44 ToVar

Parameter	Definition
Text	Text to be converted to a valid FAMOS variable name.
Result	The valid name

Variables names in FAMOS and LOOK use a defined syntax. This is especially important in FAMOS, because the variables are used in computations. For example, variables may not contain spaces or operating symbols (e.g. '+', '-' etc.) and variable names may not begin with a number. This function corrects variable names with incorrect syntax.

The function algorithm may be changed in future versions. Currently, all incorrect characters in a variable name are replaced by an underline ('_') - if the incorrect characters are at the end of the variable name, they are simply omitted.

This function does not necessarily create *unique* names in FAMOS, because the function has no way of determining whether a variable using the new name already exists.

Example:

```
Result = ToVar( " MeasLocation 12-4" )
```

The result is "MeasLocation_12_4"

6.12.45 TPart

Parameter	Definition
Text	Text from which a section is to be copied
StartPos	Starting position of the part to be copied
TotalLength	Total number of characters to be copied
Result	Copied text

This function copies a part of a text object. The size of this part is determined by the position of the first character to be copied and the total number of characters to be copied.

Note: The position of the first character in the text is 1.

If the specified starting position is greater than the specified length, an empty string ("") is returned.

If + PartLength is greater than the length of the text, the section to be copied is ended at the end of the text.

Example:

```
Result = TPart( "Marker15", 7, 2 )
```

The result is "15".

6.12.46 TReplace

Parameter	Definition
Text	Text in which a string is to be replaced
TextOld	Existing text string to be replaced
TextNew	New text string to replace the old string
Result	Text with replaced section

This function replaces a string in text with another one. This function can be used to create dynamic text.

Example:

```
Replace = TReplace( "File: AB.DAT", AB", "XY" )
```

The result is the text "File: XY.DAT".

6.12.47 TxToSV

Parameter	Definition
Text	Text to be converted to a number
Format	Specification of the desired format
Result	Number in the specified format

This function converts text to a single value in the specified numerical format.

The following numerical formats can be specified.

Numerical Format	Example	
e, f	Decimal format	e.g. 4.66 or -2.38e-5
x, X	Hexadecimal format	e.g. 8C
b, B	Binary	e.g. 001010

These options are entered as text constants (in format) and must be in quotation marks.

Examples:

```
Result = TxToSV( "001010", "b" )
```

The result is 10.

```
Result = TxToSV( "8C", "x" )
```

The result is 140.

6.12.48 TxWhere

Parameter	Definition
Text	Text from which the position of the search string is to be determined
SearchString	Search string whose position in the text is to be determined
Result	Position of the search text in the text

This function tries to locate the position of the specified search string in a given text. If found, the starting position of the string is returned. Otherwise the return value is zero. The value of the first position in the text is defined as 1.

Example:

```
Result = TxWhere( "Searchtext", "text" )
```

The result is the value 7

6.12.49 WinToDOS

Parameter	Definition
Text	Text in Windows format (ANSI character set) to be converted to DOS format (OEM character set)
Result	Text in DOS format (OEM character set)

A text in Windows format (ANSI character set) is converted to a text in DOS format (OEM character set).

Example:

```
Result = WinToDOS( "Hallooo" )
```

The result is the text "Hall~148chen" (in DOS format). The ANSI character "ö" (ASCII 246) was converted to the OEM character "ö" (ASCII 148).

6.13 Data Types

The File Assistant supports several data types. Most data formats save measurement values in binary form. In the following sections, the various supported data types are described.

A bit storage table has been provided for each data type. These show which bits are stored at which "address" in the file. An address consists of one byte (= 8 bits) and points to the position in the file. The least significant bit (LSB) is defined as bit 0.

Remarks

All of the bit storage tables are based in files saved using **Intel** format! In this format, the least significant byte is located at the first (left-most) address. This is the standard form of numerical representation on PC's. To convert these tables to **Motorola** format, simply reverse the order of the addresses so that the least significant byte is located at the last (right-most) address.

6.13.1 Byte

Address+0	Address+1	Address+2	Address+3
7 - 0			

Signed byte

Signed bytes are represented as the two's complement of the positive binary number. The LSB is located in the last position.

Binary (bits 7..0)	Hexadecimal	Signed Integer
00000000	00	0
00000001	01	1
01111111	7F	127
10000000	80	-128
10000001	81	-127
11111111	FF	-1

Unsigned byte

Each byte is interpreted as an unsigned integer.

Binary (bits 7..0)	Hexadecimal	Unsigned Integer
00000000	00	0
00000001	01	1
01111111	7F	127
10000000	80	128
11111110	FE	254
11111111	FF	255

6.13.2 Integer

The bit storage table for the integer data type is as follows:

Address+0	Address+1	Address+2	Address+3
7 - 0	15 - 8		

Signed integer

The two bytes represent the two's complement (signed integer) of the number.

Hexadecimal-coded	Signed Integer
00 00	0
00 01	1
7F FF	32767
80 00	-32678
80 01	-32767
FF FF	-1

Unsigned integer

The two bytes represent the number as a signed integer.

Hexadecimal-coded	Unsigned Integer
00 00	0
00 01	1
7F FF	32767
80 00	32768
FF FE	65534
FF FF	65535

6.13.3 Long Integer

The bit storage table for the long integer data type is as follows:

Address+0	Address+1	Address+2	Address+3
7 - 0	15 - 8	23 - 16	31-24

Signed long integer

Four bytes are understood as a number in two's complement.

Hexadecimal-coded	Signed Long Integer
00 00 00 00	0
00 00 00 01	1
7F FF FF FF	2147483647
80 00 00 00	-2147483648
80 00 00 01	-2147483647
FF FF FF FF	-1

Unsigned long integer

Four bytes are understood as a number without sign.

Hexadecimal-coded	Unsigned Long Integer
00 00 00 00	0
00 00 00 01	1
7F FF FF FF	2147483647
80 00 00 00	2147483648
FF FF FF FE	4294967295
FF FF FF FF	4294967296

6.13.4 Single (Single Precision Floating Point)

In the tables for memory occupation of real numbers, the bits and their definition are specified.

m : mantissa

e : exponent

s : sign

The bit storage table for the single data type is as follows (IEEE standard):

Address+0	Address+1	Address+2	Address+3
7 - 0	15 - 8	0, 22 - 16	0, 7 - 1
mmmmmmmm	mmmmmmmm	emmmmmmm	seeeeeee

- A number consists of 4 bytes: Byte0, Byte1, Byte2 and Byte3. Byte0 is found at the lowest address in the memory.
- Most significant bit byte3: sign. 0 = positive, 1 = negative.

- The lower 7 bits of Byte3 and the most significant bit of Byte2 form the 8-bit exponent. The MSB of Byte2 is the least significant bit of the exponent.
- The lower 7 bits of Byte2, the complete Byte1 and Byte0 form the mantissa. Byte0 is the least significant byte.
- Only the digits right of the decimal in the mantissa are coded in the number format. The 1 in front of the comma is fixed and not coded.

The value of a number z stored in the number format Single can be determined as follows:

$0 < e < 255$	$z = ((-1)^s) * (2^{(e-127)}) * 1.m$
$e = 0, m \neq 0$	$z = ((-1)^s) * (2^{(e-126)}) * 0.m$
$e = 0, m = 0$	$z = 0$
$e = 255, m \neq 0$	z is undefined (not a number)
$e = 255, m = 0, s = 0$	z is infinite in positive direction
$e = 255, m = 0, s = 1$	z is infinite in negative direction

Example

Hexadecimal-coded	Real number
`00 00 00 00`	`0.0`
`00 00 80 3F`	`1.0`
`00 00 00 40`	`2.0`
`00 00 80 BF`	`-1.0`
`00 00 00 42`	`32.0`
`00 00 00 C2`	`-32.0`
`00 00 40 42`	`48.0`
`00 00 40 C2`	`-48.0`
`F0 97 C6 43`	`397.187`
`00 00 80 7F`	`infinite, positive`
`00 00 80 FF`	`infinite, negative`
`00 00 C0 FF`	`not a number`

In the examples at the left, the content of the memory is specified in hexadecimal format. The bytes are sorted according to increasing addresses, as can be seen in the hex-dump.

6.13.5 Double (Double Precision Floating Point)

Bit storage table for the double data type

Address+0	Address+1	Address+2	Address+3
7 - 0	15 - 8	23 - 16	31 - 24
mmmmmmmm	mmmmmmmm	mmmmmmmm	mmmmmmmm
Address+4	**Address+5**	**Address+6**	**Address+7**
39 - 32	47 - 40	3 - 0, 51 - 48	0, 10 - 4
mmmmmmmm	mmmmmmmm	eeeemmmm	seeeeeee

- A number consists of 8 bytes: Byte0, Byte1, ... Byte7. Byte0 is found at the lowest address in the memory.
- Most significant bit byte7: sign. 0 = positive, 1 = negative.
- The lower 7 bits of Byte7 and the four highest bits of byte6 form the 11-bit exponent. The bits of Byte6 are the least significant bits of the exponent.
- The lower 4 bits of Byte6, the complete Byte5 to Byte0 from the 52-bit-mantissa. Byte0 is the least significant byte.
- Only the digits right of the decimal in the mantissa are coded in the number format. The 1 in front of the comma is fixed and not coded.

The value of a number z of data type **Double** is determined as follows:

$0 < e < 2047$	$z = ((-1)^s) * (2^{(e-1023)}) * 1.m$
$e = 0, m \neq 0$	$z = ((-1)^s) * (2^{(e-1022)}) * 0.m$
e = 0, m = 0	z = 0
e = 2047, m ≠ 0	z is undefined (not a number)
e = 2047, m = 0, s = 0	z is infinite, positive
e = 2047, m = 0, s = 1	z is infinite, negative

Examples

Hexadecimal-coded	Real number
00 00 00 00 00 00 00 00	0.0
00 00 00 00 00 00 F0 3F	1.0
00 00 00 00 00 00 00 40	2.0
00 00 00 00 00 00 F0 BF	-1.0
00 00 00 00 00 00 40 40	32.0
00 00 00 00 00 00 40 C0	-32.0
00 00 00 00 00 00 48 40	48.0
00 00 00 00 00 00 48 C0	-48.0
A2 A5 B6 F3 FD D2 78 40	397.187
00 00 00 00 00 00 F0 7F	infinite, positive
00 00 00 00 00 00 F0 FF	infinite, negative
00 00 00 00 00 00 F1 7F	not a number

6.13.6 Real (6-Byte Pascal)

The bit storage table for the real data type is as follows

Address+0	Address+1	Address+2	Address+3
7 - 0	7 - 0	15 - 8	23 - 16
eeeeeeee	mmmmmmmm	mmmmmmmm	mmmmmmmm
Address+4	**Address+5**		
31 - 24	0, 38 - 32		
mmmmmmmm	smmmmmmm		

- A number consists of 6 bytes: Byte0, Byte1, ... Byte5. Byte0 is found at the lowest address in the memory.
- Most significant bit Byte5: sign. 0 = positive, 1 = negative.
- Byte0 forms the 8 bit exponent.
- The lower 7 bits of Byte5 and the complete Byte4 to Byte1 form the 39-bit mantissa. Byte1 is the least significant byte.
- Only the digits right of the decimal in the mantissa are coded in the number format. The 1 in front of the comma is fixed and not coded.

The value of a number z stored in the number format Real is determined as follows:

$0 < e \leq 255$	$z = ((-1)^{s}) * (2^{(e-129)}) * 1.m$
e = 0	z = 0

Example

Hexadecimal-coded	Real number
00 00 00 00 00 00	0.0
81 00 00 00 00 00	1.0
82 00 00 00 00 00	2.0
81 00 00 00 00 80	-1.0
86 00 00 00 00 00	32.0
86 00 00 00 00 80	-32.0
86 00 00 00 00 40	48.0
86 00 00 00 00 C0	-48.0
13 38 A6 42 1A 8B	1179.77

Remarks

The following cannot be stored: "not a number" (undefined values), "infinite, positive" or "infinite, negative".

7 Appendix

7.1 Concepts and Abbreviations

' (single quote)	The single quotation mark is entered in Windows by pressing the ' key and then the SPACEBAR or SHIFT and #.
^ (power)	The exponent sign is entered in Windows by pressing the ^ key and then the SPACEBAR.
ALT	Keyboard key used to change the function of another key; usually held down while another key is pressed.
Application	A program which runs under Windows
BACKSPACE	Keyboard key used to delete the last character entered; labeled with an arrow pointing left or with BS, generally located above the ENTER or RETURN key.
Browser	Program for navigating through filing / directory organization structures.
Check-mark	Small mark displayed next to certain menu options to indicate that the corresponding option is activated.
Click	Short press of the left mouse button, i.e. short selection and immediate release; in some cases it is required to hold down the button after clicking. The right and left mouse buttons can be switched in the control panel.
COM	Abbreviation for "Component Object Model". Microsoft software standard designed to simplify communication between processes and programs. COM defines its own object-oriented interface for this purpose.
Context menu	Special menu adapted to particular object and offering commands which affect the same object. Usually called by right-clicking on the object, but sometimes via SHIFT+F10 or some other special key.
CTRL	Keyboard key used to enter control characters; usually held down while another key is pressed.
DELETE	This is the keyboard delete key: the character located at the marked position or to the right of the cursor is deleted; usually labeled with Del.
Direction keys	The four keyboard keys labeled with arrows in all four directions; used to move objects or the cursor on the screen; also called cursor keys.
Directory	Windows file container which may hold files and/or other directories; used to add structure to hard disks and diskettes. Also known as "Folder".
Double-click	Clicking the mouse button twice in quick succession; the speed can be specified in Windows (Control Panel/ Mouse).
DOWN	Direction key with arrow pointing downward

Drag&Drop	A method of moving objects with the mouse. Click on an object and move the mouse while keeping its button down to move the object; release the mouse button over the desired new location for the object.
Editor	Program or program component for entering or editing data (often text).
END	Keyboard key used to move the cursor to the right edge of the screen.
ENTER	Keyboard input key, sometimes labeled as Return, Enter, CR or an arrow pointing down and then left.
ESCAPE	Keyboard key, sometimes labeled with Esc; used to cancel commands or interrupt operations.
Function key	Function keys are available as a block at the top or the left of the keyboard, usually labeled with F1, F2,...; used to execute commands.
HOME	Keyboard key used to move the cursor to the left edge of the screen.
Kit	In imc FAMOS, the name of special extension libraries providing additional functions which can be called in formulas or sequences.
LEFT	Direction key with arrow pointing left.
Mouse cursor	Mouse cursor; in Windows usually an arrow, moved across the screen with the mouse.
OLE	Abbreviation of "Object Linking and Embedding". A method of shared use of information where data from a source document are linked to or embedded in a destination document. If the embedded data are selected in the destination document , the source document is reopened so that the data can be processed using the appropriate functions in the original environment. A special implementation of the interface standard COM (which see).
Parameter	Characteristic assigned to a function; called an argument in mathematics.
Path	Directory
PgDn	Keyboard key which moves the image displayed one page downward; labeled with PgDn and an arrow pointing downward.
PgUp	Keyboard key which moves the image displayed one page upward; labeled with PgUp and an arrow pointing upward.
Plug-in	General term for an auxiliary program extending an application's functionality. In imc FAMOS, it means an expansion module having its own user interface, which can be seamlessly integrated into the imc FAMOS main window.
Rezoom	Command to undo the zoom, shows entire page.
RIGHT	Direction key with arrow pointing right.

SHIFT	Keyboard key used to switch between upper and lower case characters, located twice on every keyboard for the right and left hands; is usually held down while other keys are pressed.
SPACEBAR	Keyboard key which inserts a space; the longest key.
TAB	Keyboard key used to indent in word-processing programs, used in Windows to move to the next control in a dialog; tabulator function.
UP	Direction key with arrow pointing upward.
Waveform	A series of numerical values which belong together and have a combined meaning, e.g. a series of temperatures measured in succession.
Zoom	Enlarges a section of a window; opposite function is Unzoom.

7.2 Constants and Predefined Variables

sRms	Root-mean-square of a data set or waveform
e	Euler's constant e
InDegr	Constant for converting radians to degrees
InRad	Constant for converting degrees to radians
sMax	Maximum of a waveform
sMaxPos	X-coordinate of the maximum of a waveform
sMin	Minimum of a waveform
sMinPos	X-coordinate of the minimum of a waveform
PI	Circle constant pi (P)
PI2	2 x circle constant pi (P)
StDev	Standard deviation of a waveform

7.3 Units

Supported SI Units

A	Ampere	Electric current
cd	Candela	Light intensity
K	Kelvin	Temperature
kg	Kilogram	Mass
m	Meter	Length
s	Second	Time

Additionally Supported SI Units

Unit	**Name**	**Definition**	**Conversion**
°C	Celsius	Temperature	1 °C = 1 K for temperature differences
C	Coulomb	Electric charge	1 C = 1 As
F	Farad	Electric capacity	1 F = 1 As/V
H	Henry	Inductivity	1 H = 1 Vs/A
Hz	Hertz	Frequency	1 Hz = 1 1/s
J	Joule	Energy	1 J = 1 Nm = 1 Ws
lm	Lumen	Light flux	
lx	Lux	Illumination	1 lx = 1 lm/m2
mol	Mol	Amount of substance	
N	Newton	Force	1 N = 1 kgm/s2
Ohm	Ohm	Electric resistance	1 Ohm = 1 V/A
Pa	Pascal	Pressure	1 Pa = 1 N/m2
S	Siemens	Conductivity	1 S = 1 A/V
T	Tesla	Magnetic field strength	1 T = 1 Vs/m2
V	Volt	Voltage	
W	Watt	Power	1 W = 1 VA
Wb	Weber	Magnetic flux	1 Wb = 1 Vs

Additional units and pseudo-units recognized by imc FAMOS

dB	Decibel	Not a unit, logarithmic representation
Degr	Degrees	Angle, range 0 ... 360
Empty		Not a unit
%	Percent	Not a unit
Rad	Radian	Angle, range 0 ... 2*Pi

7.4 Maximum Values

Maximum number of drives for temporary files	5
Max. data set length (in Bytes) for Windows x86 for Windows x64	$2.1 * 10^9$ unlimited
Maximum length of a variable name	255 characters
Length of texts (text variables, units, comments)	2^{31}-1 characters
Largest possible number (magnitude)	10^{35}
Smallest possible number (magnitude)	10^{-35}

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