ibaAnalyzer

Working with ibaAnalyzer

Manual Part 2

Issue 7.2

Measurement Systems for Industry and Energy

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Version	Date	Revision - Chapter / Page	Author	Version SW
7.2	02/2021	Archive, pdc and wav files, new marker and interval features, PDA trend graph, export in Parquet and MatLab	rm	7.2

Content

1 About this manual

This documentation describes the function and application of the software

ibaAnalyzer.

1.1 Target group

This manual addresses in particular the qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded as professional if he/she is capable of assessing safety and recognizing possible consequences and risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

This documentation addresses in particular professionals who are in charge of analyzing measured data and process data. Because the data is supplied by other iba products the following knowledge is required or at least helpful when working with *ibaAnalyzer*:

- Operating system Windows
- *ibaPDA* (creation and structure of the measuring data files)

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu *Logic diagram*
Calling the menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select the menu *Logic diagram - Add - New function block*.
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
File names, paths	"Filename", "Path" Example: "Test.doc"

1.3 Used symbols

If safety instructions or other notes are used in this manual, they mean:

Danger!

The non-observance of this safety information may result in an imminent risk of death or severe injury:

- Observe the specified measures.

Warning!

The non-observance of this safety information may result in a potential risk of death or severe injury!

- Observe the specified measures.

Caution!

The non-observance of this safety information may result in a potential risk of injury or material damage!

- Observe the specified measures

Note

A note specifies special requirements or actions to be observed.

Tip

Tip or example as a helpful note or insider tip to make the work a little bit easier.

Other documentation

Reference to additional documentation or further reading.

1.4 Documentation structure

This documentation describes the functionality of the *ibaAnalyzer* software in detail. It is created as a guide for familiarization as well as a reference document.

In addition to this documentation, you can also draw on the version history in the main menu Version history (file versions.htm) for the latest information about the installed program version.

In addition to the list of corrected program errors, this file also refers to extensions and improvements to the software by keyword.

In addition, each software update, which includes the main new features, also includes special documentation “NewFeatures...”, offering an extensive description of the new features.

The state of the software to which the respective part of this documentation refers is listed in the revision table on page 2. The documentation of ibaAnalyzer (PDF and printed edition) is divided into four separate parts. Each part has its own chapter and page numbering, beginning with 1, and is updated independently.

Teil	Title	Content
Part 1	Introduction and installation	General notes, licenses and add-ons Installation and program start User interface
Part 2	Working with *ibaAnalyzer*	Working with data file and analysis, representation features, macro configuration, filter design, preferences, printing, export, interfaces to *ibaHD-Server*, *ibaCapture* and report generator
Part 3	Expression builder	Directory of all calculation functions in the expression builder, including explanation
Part 4	Application examples	*In preparation*

2 The data file

2.1 What is a data file?

A data file for the purposes of *ibaAnalyzer* contains measuring values and additional information generated by an iba online data acquisition system. The data files have the extension *.dat*. They can be only read by *ibaAnalyzer* and cannot be changed!

The contents of the data file are displayed in the signal tree window. Online data acquisition systems, such as *ibaPDA*, not just store the real values measured, but also additional information in the data file. This additional information can be displayed and evaluated in *ibaAnalyzer* .

Each data file tree is split into the areas of Info, all modules - just like, for example, configured within the *ibaPDA* software -, analog and digital signals within the modules as well as additional signal information .

In line with the iba module concept, the signals are presented below the module level in a tree structure.

Furthermore, additional information on the data files and/or signals is also available. The analog signals are marked with a small sine wave while the digital signal is marked with a small rectangular line. In order to view the individual signals, click the small cross at a module icon.

The info fields of the data file can be used like measurement signals in the trend view.

By means of functions in the expression builder, the extraction dialogs and the report generator, practically all info fields can be used for further processing.

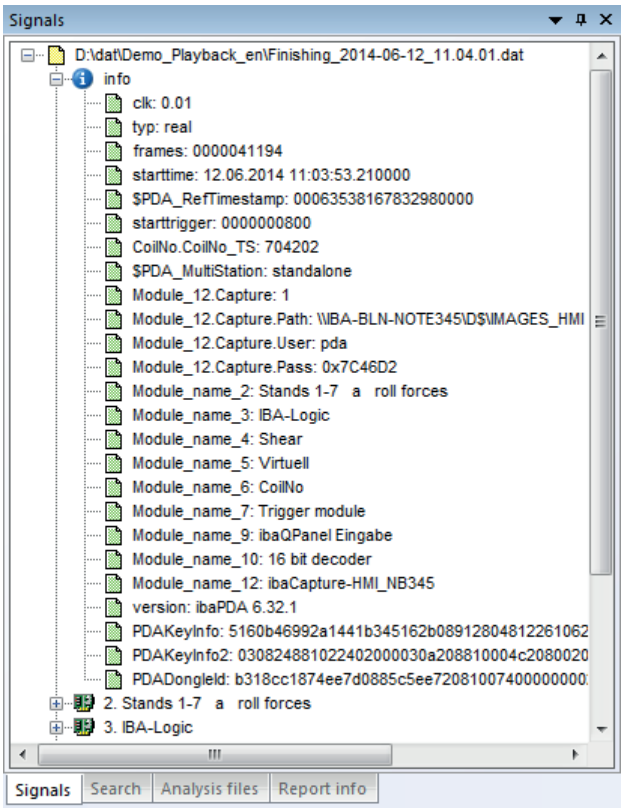


Fig. 1: Data file, Info part

The most important info fields in the info branch:

- clk: Acquisition time base in seconds
- type: Data type
- starttime: Start of recording (date, time)
- frames: Number of measuring cycles
- starttrigger: Distance of the start trigger from the beginning of the file, expressed as a number of frames
- stoptrigger: Distance of the stop trigger from the beginning of the file, expressed as a number of frames
- Module_name_x: Module names as defined in the *ibaPDA* system settings.
- PDAKeyInfo and PDADongleId: iba service information

Depending on the application and type of data file, more information can be contained.

If calculated signals, measurement signals or text signals were selected in the data storage configuration in *ibaPDA* for the node *Files - Info fields,* then these also appear in the info branch.

2.2 Opening data files

2.2.1 Opening a data file

ibaPDA, *ibaQDR* and *ibaLogic* save measurement data in data files based on defined measuring rules, so that such measurement data is then available for subsequent analysis. The data files are identified by the *.dat extension for their file names. The Windows Explorer attaches the pertinent icon to these data files .

A data file can be opened in several ways. If the data files were password-protected during creation with *ibaPDA*, then you will be prompted to input the password for any of the following methods.

You can find additional information about the password protection of data files in chapter
↗ *Password protection of the data file*, page 24.

Open data files with Windows Explorer

The easiest way is to double-click on the desired file in the Windows Explorer. If *ibaAnalyzer* is installed, all the *.dat files are linked to the *ibaAnalyzer* application.

The data files can also be opened from the Explorer using drag & drop:

- Dragging the data file to the opened *ibaAnalyzer* program window
- Dragging the data file to the desktop symbol of *ibaAnalyzer*

If there already is one or several data file(s) opened in *ibaAnalyzer*, the place where the new file is being dropped decides as to whether the file is added or appended (see below).

Open data files with the dialog

The second method of opening a data file is useful if *ibaAnalyzer* has already been started. You can then search for the file via the *Open data file* dialog which you can access via the *File – Open data file* menu or by clicking the button with the blue folder icon. The data file is opened by opening the desired folder in the left half and by subsequently selecting the data file and clicking the <OK> button to confirm.

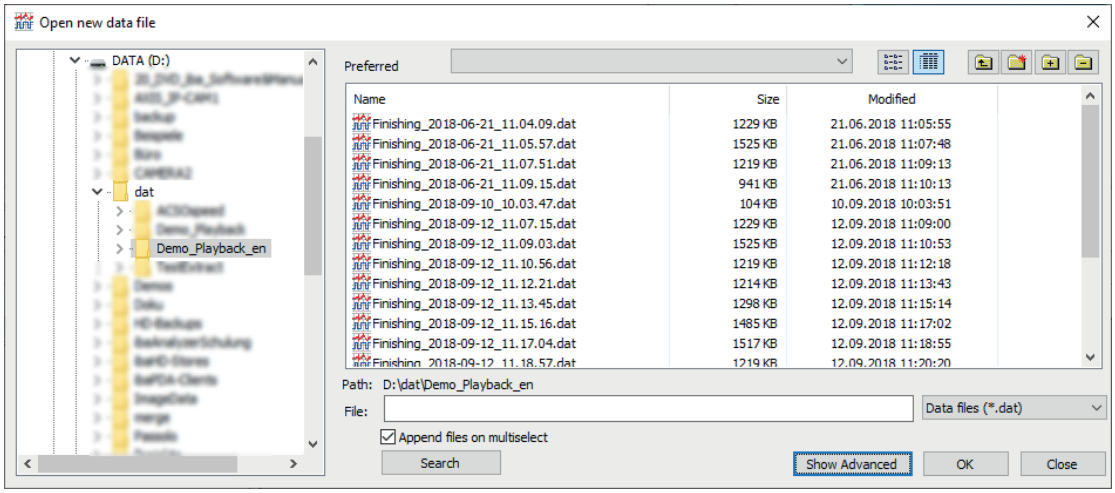


Fig. 2: Dialog for opening a new data file

Tip

If you usually save your data files in a particular directory, such as D:\dat, work becomes much easier if you define this folder as the preferred folder. You can do this by simply clicking the yellow folder icon with the plus sign in the upper right corner after selecting the folder. You can also define several preferred folders which you can then quickly select from the picklist (arrow key next to the input box for the preferred folder).

... By the way: If no data files are offered in this dialog, this can be due to the following reasons:

a) There are no data files (*.dat, *.hdq, *.txt, *.csv etc.)

b) You selected the "Open analysis" dialog by mistake (button with the yellow folder icon in the tool bar) because *ibaAnalyzer* suppresses the display of other file types.

c) A different file type was set in the file type selector.

Preview

A particularly user-friendly option is the extended dialog which can be opened by clicking the <Show advanced> button.

The preview function is only available for original iba data files.

This additional information is useful for a first general assessment of a data file before it is actually opened.

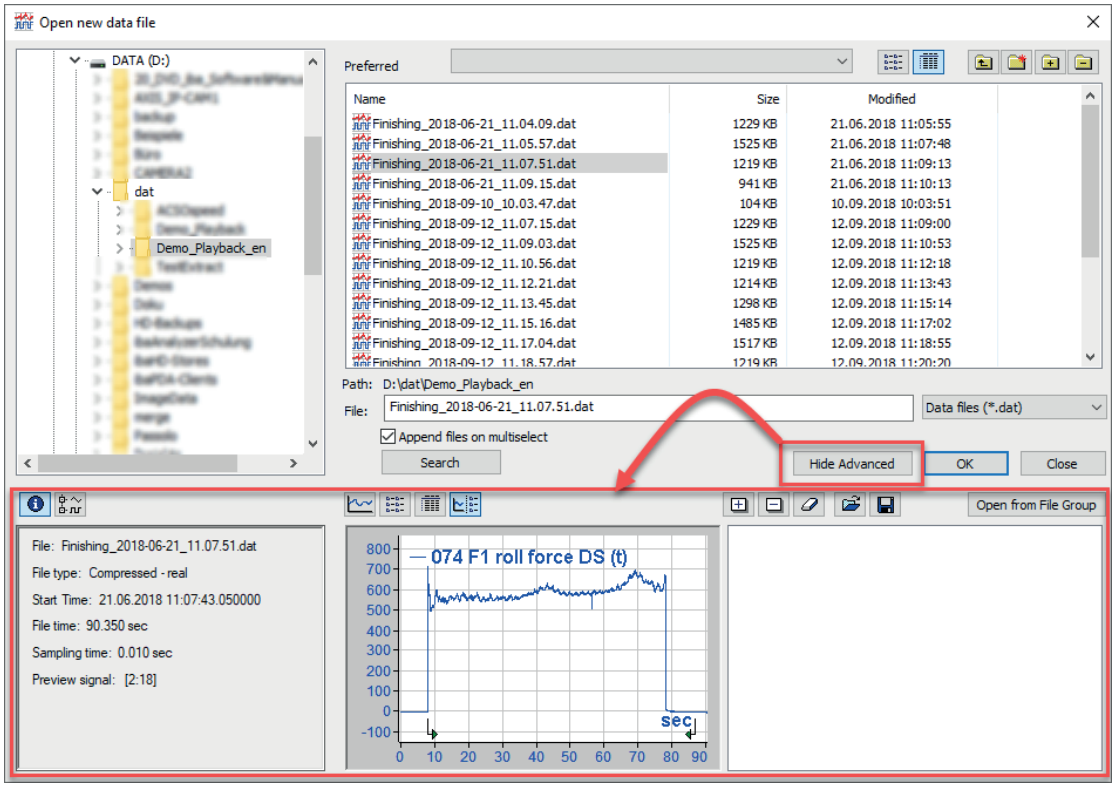


Fig. 3: Opening data files with enabled preview

The two icon buttons on the left can be used to toggle between an info display and the signal tree in the field below.

The area on the right to it can be divided in different ways. The buttons in the middle (see below) can be used to enable four views as follows:

- Curve of a signal which was marked in the signal tree on the left.
- File list if several data files were selected, so that several files can be opened or a file group defined. Optionally with/without detailed information on the files.
- Curve + file list; the same signal is displayed in each case depending on which file is marked in the file list.

The last-mentioned view is particularly suitable for a good pre-selection of data files by selecting a distinctive signal whose curve can be assessed at this point already. As long as no files have been copied into the file list (refer to the following section), you can also mark individual files in the selection window above or select individual files using the cursor in order to view the signal curve.

Tip

A short description (tooltip) is shown when moving the mouse over the button.

2.2.2 Opening several data files

ibaAnalyzer enables the simultaneous opening of any number of data files. Opening several data files at the same time is, for example, useful if you wish to compare the curves of a signal from several data files which were stored at different times.

The blue folder icon with the two ++ signs (see above) allows for adding further data files to previously selected data files in order to analyze signals from different sources. The same command can also be executed via the *File - Add new data file* menu.

You can also enter wildcards * and ? in the file name field of the *Open data file dialog* in order to open multiple files at the same time.

To open several data files from the Windows Explorer, you have the following options:

- Drag files one after another in the *ibaAnalyzer* program window. If you drag the files into the signal tree window, make sure the mouse is not placed on a data file while the files are being dropped. Otherwise, the new data file is appended (see below).
- Select several files (all files in the directory using <Ctrl>+<A>) and drag them into the program window using drag & drop.
- If multiple data files are packed in an archive file (*.pdc, *.zip, *.tar etc.) you can draw the archive file into the signal tree window. The contained files will be opened all on the same level. See also ↗ *Opening archived data files*, page 26

Note

Selecting several files and then pressing the <Return> key does not lead to the desired result. Instead, *ibaAnalyzer* opens each file in its own instance.

2.2.3 Defining groups of data files

Using a group of data files makes sense if several data files of the same type – for example, one file per product or test cycle – are to be analyzed successively.

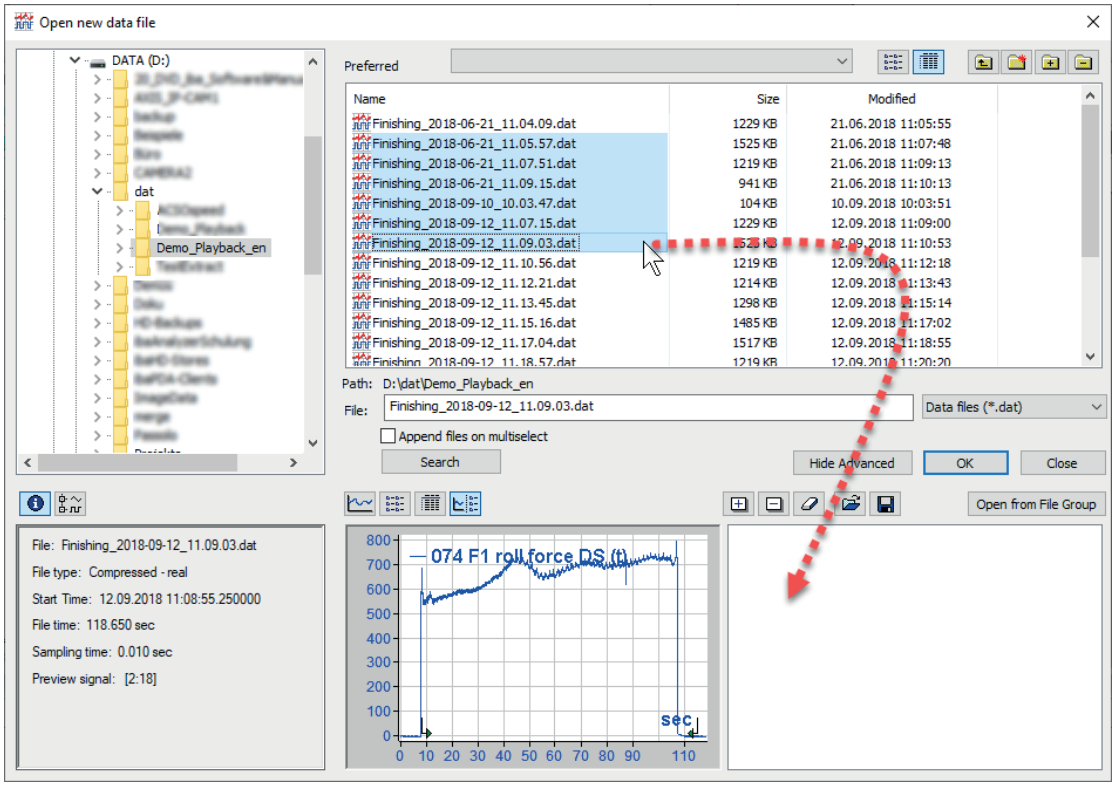
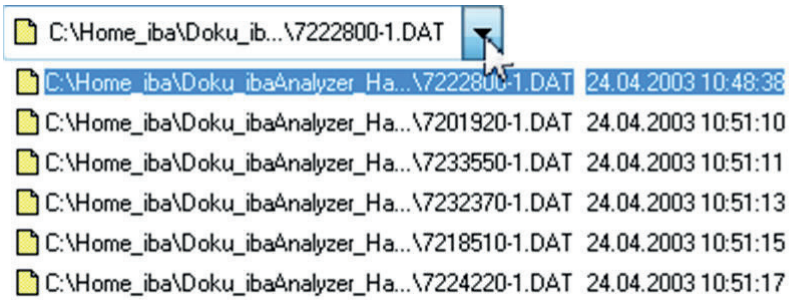


Fig. 4: Dialog: Open data file, create a file group

How to search:

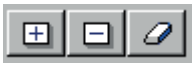
1. Open the *Open data file* dialog by calling up the  *File - open data file* menu or the button.
2. If you have not done yet, click the <Show Advanced> button in order to expand the dialog window and select the last of the four possible views.
3. In the browser field (top), select the drive and path where the desired data files are located.
4. Mark several files and, using drag & drop, drag them into the group window in the lower right area and click <OK>. (The files must be marked in the group window!)
5. You can now find the data files in the window of the data file group list above the signal tree:



6. Now select the file to be analyzed.

If you click the <Open from file group> button instead of <OK> in step 4, the data files are opened parallel in much the same manner as in the case of <Add new data file> and they are displayed in the signal tree window rather than in the group window.

Some more buttons are offered in conjunction with the definition of a data file group in the *Open data file* dialog:



- Use the "plus" button in order to add files which are marked in the upper window (browser) to the group of files.
- Use the "minus" button in order to remove the files marked from the group of files.
- The "rubber" button deletes the complete file list from the group window.

If a particular group of files is to be opened frequently, the list of files can be saved in a text file.

- When the "save" button is pressed, the current list of data files is saved in a text file. You can select any name and path for this file. You can, of course, also use a simple ASCII editor in order to create such a file.
- By clicking the "Open file" button, you can select a text file which contains a group of data files from a dialog window. In order to load this group of files, click <OK> in order to confirm the opening of the text file and the names of the data files are displayed in the file group window. Then, click the <OK> button in the *Open data file* dialog and the files are opened.

2.2.4 Appending data files

Appending or cascading of data files is useful if you wish to evaluate a signal pattern which comprises several data files. Online data acquisition systems, such as *ibaPDA*, enable continuous recording over time, however, with the data being distributed over many data files each of which covers a manageable time span, such as 10 minutes.

If you do wish to analyze the signal over one hour, *ibaAnalyzer* offers you the option to append six files to each other and to view the signal curves as a whole.

One or more files can at any time be appended to a file that is already open. In case of individual files, we recommend using the *File* menu or the context menu in the signal tree window where the *Append data file* command is available.

This command opens the familiar *Open data file* dialog where you can now select one or more data files to be appended to the file which is already open. Then, click the <OK> button in order to exit the dialog.

Even if a group of files was defined beforehand, it is still possible to append the files contained therein. For this purpose, open the *Open data file* dialog, select the *Append files on multiselect* option and click the <Open from file group> button.

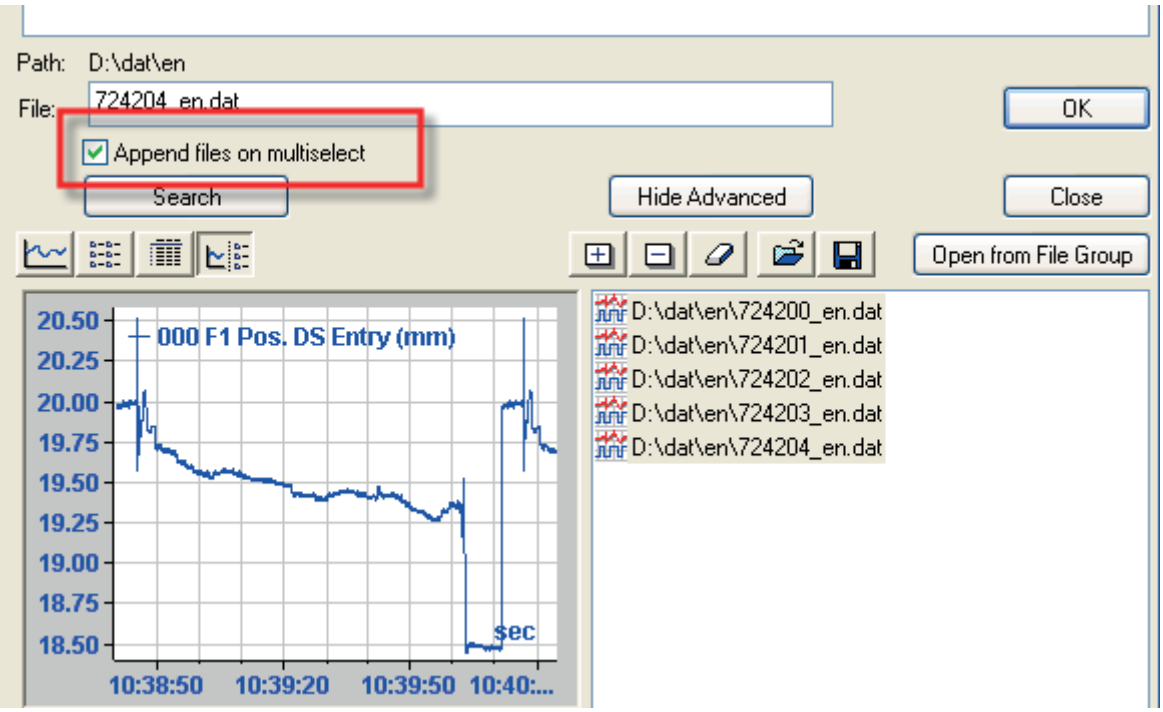


Fig. 5: Dialog: Open data file, append data files

If you want to append data files from the Explorer, proceed as follows:

1. Open the first data file as usual.
2. Then drag one file after the other from the Explorer exactly to the name of the last data file in the signal tree window.

The appended files are displayed as follows:

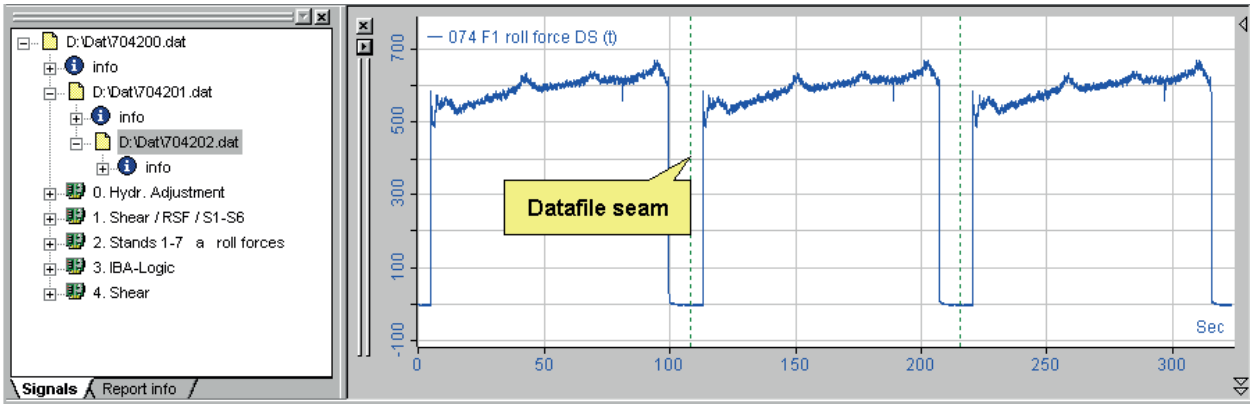


Fig. 6: Presentation of appended data files

The file boundaries are shown as vertical, broken green lines. If the start time of a data file is not available, e. g. when appending database query results, the lines have magenta color. If no lines are visible, please check the settings for 2D view in the preferences or strip settings. The *Show triggers and file separators* option has to be selected (checkmark).

The picture above shows a number of data files recorded continuously one after another. This also means that the assignment of the values to the time axis is also correct. However, in case of linking data files which were not exactly recorded chronologically, this may lead to misinterpretation.

Note

If you wish to subsequently append data files which were not exactly recorded one after another, note that the time axis information is correct for the first file only. *ibaAnalyzer* does not by default evaluate the time stamp of the data file, and appends the files directly one after the other.

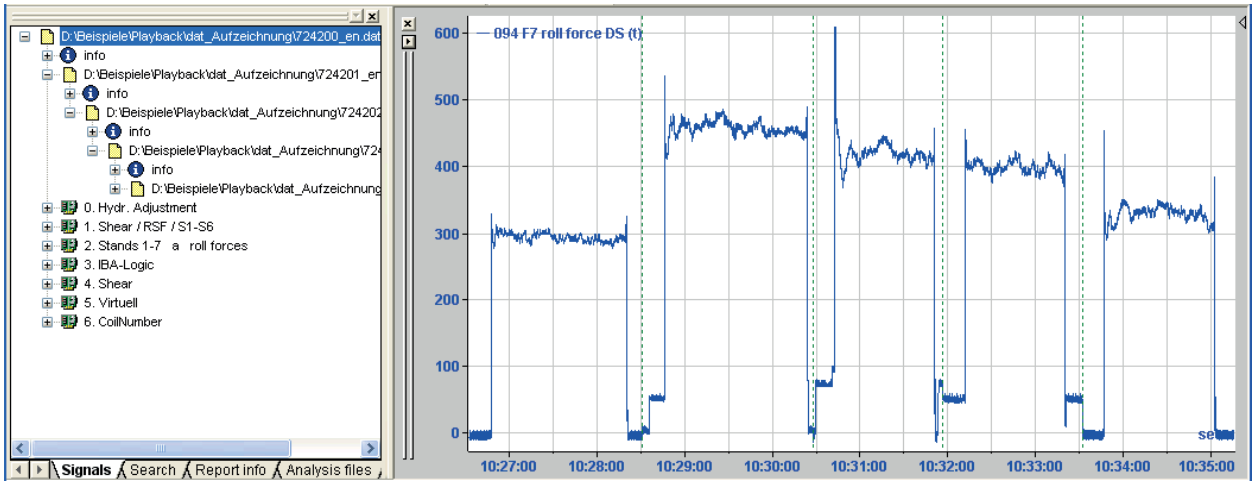


Fig. 7: Appending data files

The picture suggests that the signal trend only lasts about 8 minutes. This, however, is not the case at all, as the recording times of the data files are far apart from each other.

In order to present appended data files in their real positions on the X axis, the presentation must be synchronized with the real recording time. For this purpose, either enable the *Synchronize files on recording time* option in the strip settings, *X-axis* tab, or right-click on the X-axis and select the same command.

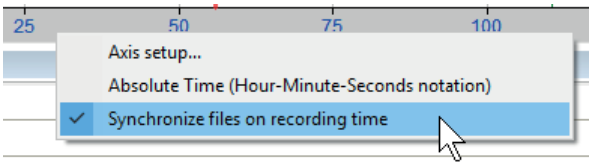


Fig. 8: Synchronize data files with recording time

The picture below provides a correct presentation.

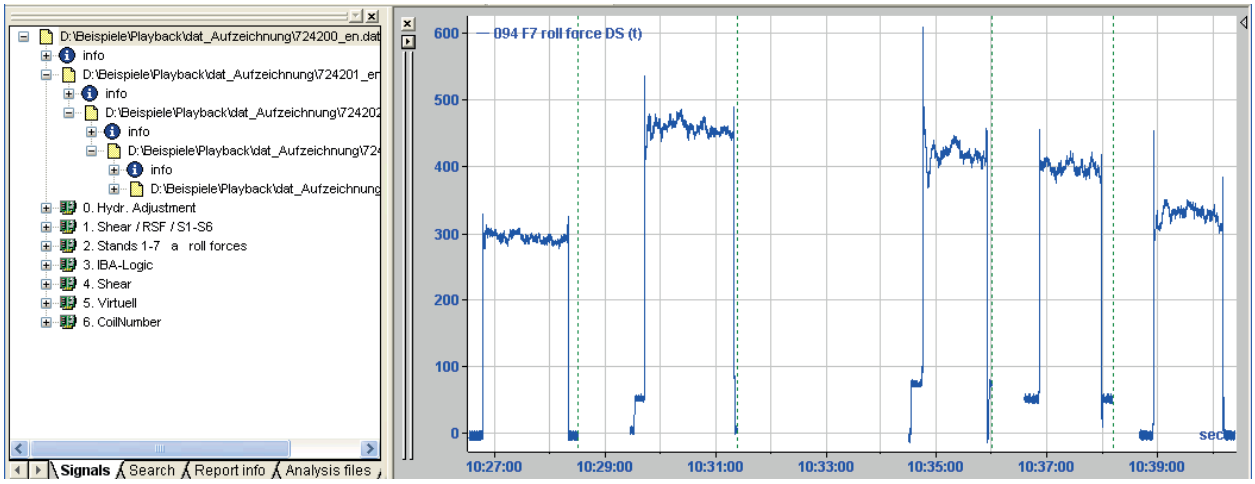


Fig. 9: Appending data files, synchronized in time

Note

If you select the setting Absolute time (hours – minutes – seconds) at the same time, you can additionally activate the date display in the axis settings. In case of long time periods, you can also see the changes of days.

2.2.5 Password protection of the data file

Both *ibaAnalyzer* as well as *ibaPDA* support the creation of password-protected data files.

If you want to use *ibaAnalyzer* to open a password-protected file, a dialog appears to input the password.

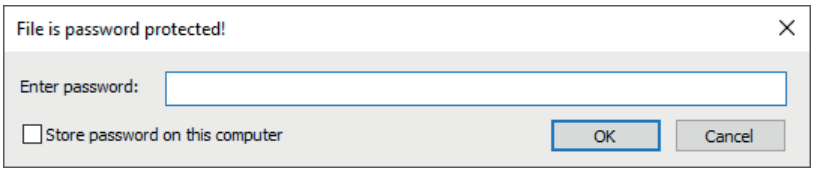


Fig. 10: Password prompt when opening the data file

Once the password has been input once, the password is saved for the duration of the *ibaAnalyzer* session so that you no longer have to enter it to open additional data files.

You can even permanently save the password by enabling the option *Save password on this computer*. This way it is no longer necessary to repeatedly input the password across several sessions.

If you want to remove the saved password from your computer, use the computer *Delete data file password* in the menu *File*.

If you want to create a new data file through export or extraction using *ibaAnalyzer*, you can also protect this file with a password.

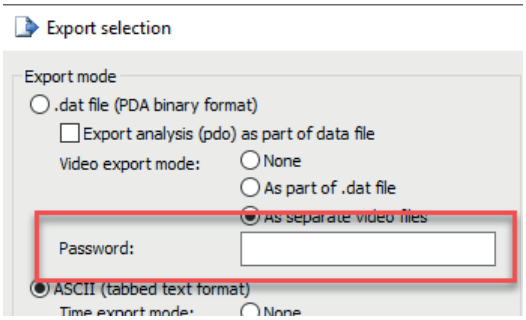


Fig. 11: Password entry for export

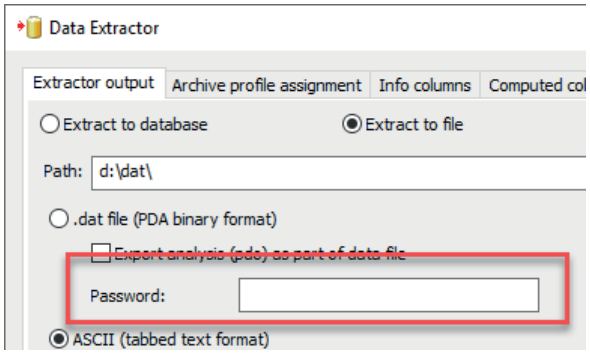


Fig. 12: Password entry for extraction

If you leave the password field empty, a data file without a password will be created, namely regardless of whether the original file had a password.

2.2.6 Opening foreign file types

If you have a license *ibaAnalyzer-E-Dat*, then you can also open data files of other file formats.

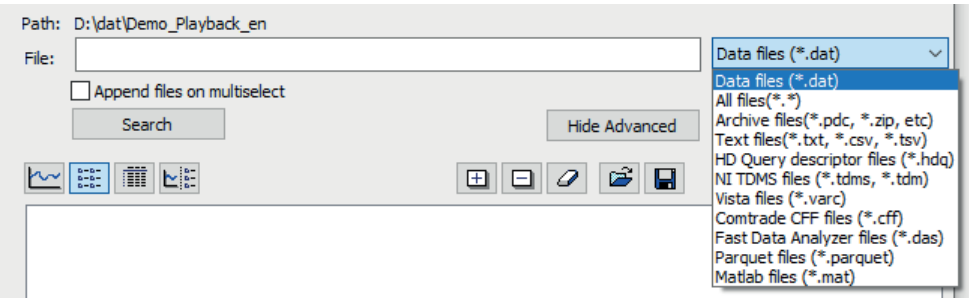


Fig. 13: File type selection for data files

Only files of the set type are displayed in the directory window.

Available for selection are:

- Dat files; iba data file format
- Text files, CSV files; License *ibaAnalyzer-E-Dat* required for opening
- HD query description files; Files that contain the rule for an HD Query
- National Instruments TDMS files; License *ibaAnalyzer-E-Dat* and installation of an additional component required for opening
- Vista Controls Vlogger files; License *ibaAnalyzer-E-Dat* and installation of an additional component required for opening
- Comtrade CFF files; Comtrade 2013 files; License *ibaAnalyzer-E-Dat* required for opening
- Fast Data Analyzer files; Data files of the Danieli FDA system; License *ibaAnalyzer-E-Dat* required for opening
- Parquet files (*.parquet); License *ibaAnalyzer-E-Dat* required for opening
- Matlab files (*.mat); License *ibaAnalyzer-E-Dat* required for opening
- Wav files (*.wav); uncompressed PCM wave files only, e.g. from Siemens 1281; License *ibaAnalyzer-E-Dat* required for opening

Thanks to the Unicode support (UTF-8, UTF-16), there is virtually no restriction with respect to the characters used.

Other documentation

You will find additional information about handling foreign file formats in the manual for the product *ibaAnalyzer-E-Dat*.

2.2.7 Opening archived data files

iba data files (*.dat) or data files of other supported file types (*.csv, *.parquet etc.) can be opened in *ibaAnalyzer* even when they are zipped in a common archive file.

Moreover, analysis files (*.pdo) and report layout files (*.lst) can be part of the archive and loaded automatically.

All files must be stored in the root directory of the archive. Folders will be ignored.

2.2.7.1 Supported formats and unpacking

The following formats are supported:

- .zip
- .rar
- .7z
- .xz
- .tar
- .bz2
- .gz
- .gzip

ibaAnalyzer opens the archive file and unpacks the contents into the temporary standard path of Windows (usually C:\Users\[User name]\AppData\Local\Temp). Afterwards, the files are regularly opened. When *ibaAnalyzer* is closed, the temporary files will be deleted.

Note

You may edit the open files. However, changes will not be stored in the files in the archive.

2.2.7.2 Archives filter in the “Open file” dialog

The dialog *Open new data file* offers in its drop-down list for file types a filter option *Archive files (*.pdc, *.zip, etc.)* for showing supported archive files only.

The option *Append files on multiselect* also works for archive files if more than one data files are included. Correspondingly, the switch /append can be used when opening by command line.

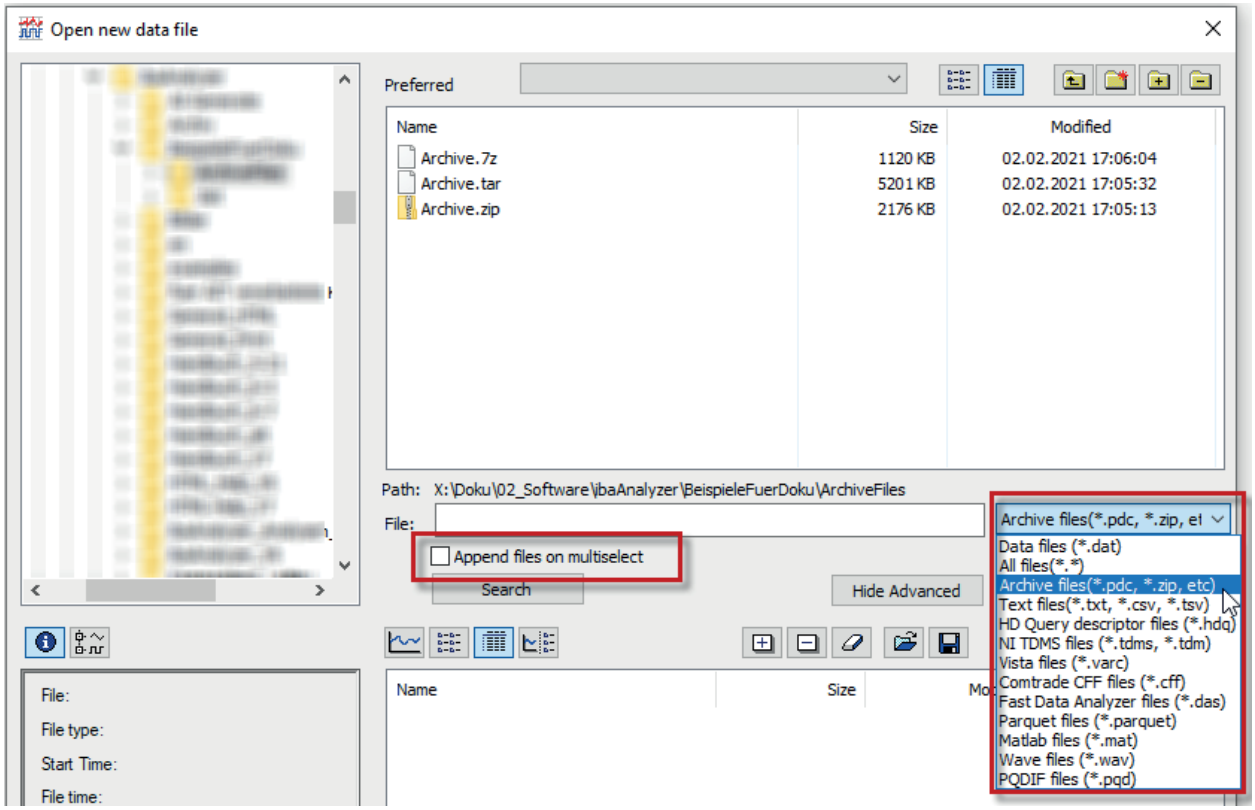
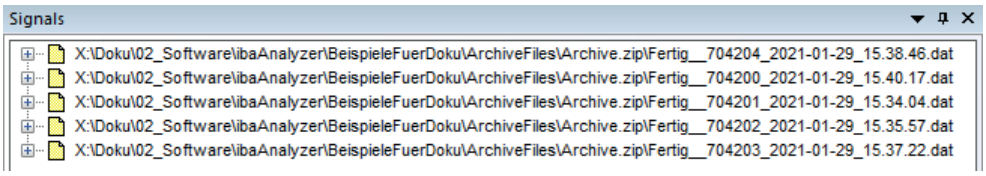


Fig. 14: Selecting the filter 'Archive files...' will show all supported archive files.

After opening the data files will be displayed together with the archive name in the signal tree pane.



2.2.7.3 The .pdc format

Beside the standard archive formats, a special format *.pdc* (Process Data Container) is available.

These files are normal .zip archives with a different suffix and have the same functionality as the standard archives.

The advantage is, though, that *ibaAnalyzer* registers the file ending *.pdc*, and thus these files can be opened via double-click in the Windows Explorer. Furthermore, *ibaAnalyzer* can be assigned as default app to these files, e. g. for downloads from ibaDaVIS.

The files have a separate icon:

2.3 Advanced search for data files

In the *Open data file* dialog window, you will find the <Search> button. This function allows you to perform a detailed search for data files or other file types, which can be read by *ibaAnalyzer* (*.dat, *.txt, *.csv, *.hdq etc.).

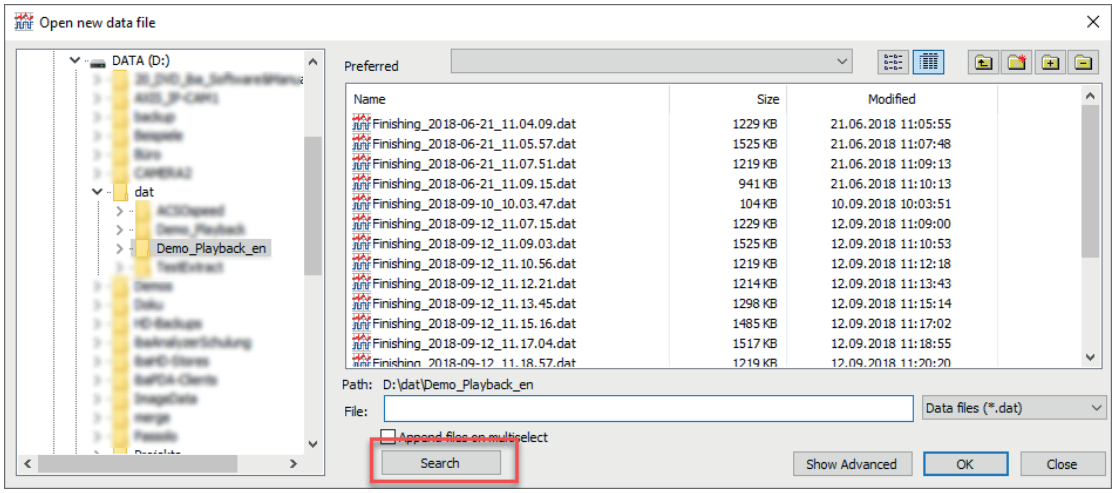


Fig. 15: Opening the "Search" dialog

While you have to search the folder tree for data files on your own when in the *Open data file* dialog, this task can be performed by the search function. When clicking the <Search> button, the following dialog will open:

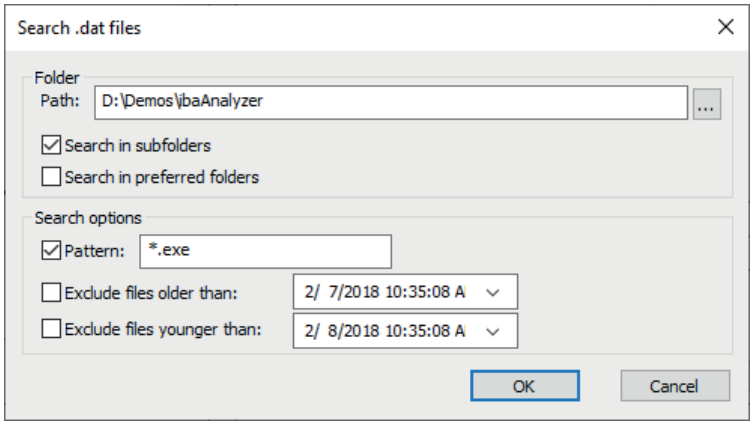


Fig. 16: Search function

You can see various options that will help you to specify or limit the search function. On the one hand, you can set the path from which the search is to start. Furthermore, by checking the corresponding box, you can decide whether the search is limited to the set path/folder only ("Search preferred folders") or if it should extend to the sub-folders, too. In addition, you can set a time limit and select whether to search for data files (*.dat) or other readable files. The search is exclusively limited to iba data files and other file types supported by the extension *ibaAnalyzer-E-Dat*.

After you have limited the search function, a search window (only displayed during the search process) will open and inform you about the current status of the search.

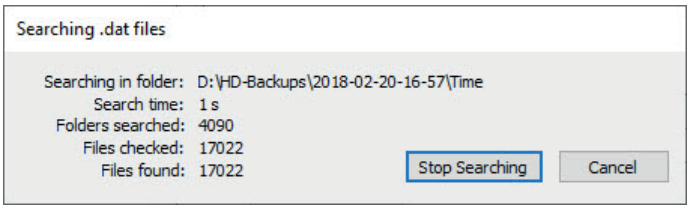


Fig. 17: Information on the search status

The dialog *Open data file* appears after the search is complete. The first data file found during the search process will be displayed in the main window. The related folder can be found in the structure on the left (grey background). All other search results are displayed in the preview window as a group.

2.4 Slide show

The so-called "slide show" function enables the consecutive opening of the data files of a group in *ibaAnalyzer*, so that these files can be viewed for a time span which you can define. This function can be helpful if you wish to successively view many files with the same analysis in order to obtain an overview.

As described in ↗ *Defining groups of data files*, page 19, you can select any files of a group from the picklist via the symbol bar for the data file group list.

The two arrow keys enable switching between the data files of the group.

In order to start the slide show, just click the  button. *ibaAnalyzer* will then successively open the data files of the group at an interval which you can select under "Automatic slide show" on the "Miscellaneous" tab of the "Preferences."

Click the  button once again in order to exit the slide show.

2.5 Closing data files

Just as much as files can be opened in several ways, several methods are also available for closing a file.

- When a new data file is opened (rather than being added or appended), the current data file is closed.
- If several data files are open, mark the file(s) to be closed in the signal tree and perform the *Close selected file* command in the context menu of the signal tree window (right mouse key) or in the *File* menu.
- In order to close all the data files which are currently open, use the *Close all data files* command in the *File* menu or in the context menu of the signal tree window.

2.6 Online analysis

ibaAnalyzer enables the opening even of data files which are currently being created by *ibaPDA*, so that the data recorded so far can be analyzed. By selecting the appropriate preferences, as described in ↗ *Miscellaneous*, page 78, the data file in question can be reloaded at cyclic intervals, so that the analysis is completed step by step.

Procedure

1. Data files are written into the path chosen under "Preferences".
2. Click in *ibaAnalyzer* on the button  and wait until a measurement file appears in the signal tree window.
3. To activate the cyclic reload function, click the button  .
4. Both buttons must be kept depressed for the permanent online analysis mode: 
5. If you prefer to reload the measurement file manually, click the button  once again in order to deactivate the automatic mode and subsequently use the  to find available drives and paths.

2.7 Time shift of data files

The simultaneous opening of multiple data files offers the possibility to overlay the signal curve of a signal from different measurements and compare them. But in case of an untriggered recording, repeating characteristic events rarely occur at the same moment in a data file. It is hence possible to shift the graphs along the time axis by entering the amount of the desired shift as a time value (s) for each file. This is what the *File time shifts* dialog is designed for which can be opened via the context menu in the signal tree (*Time shift data file...*).

The dialog shows a table with all data files currently being opened. The file to be shifted has to be marked with a check mark in the "Active" column.

In the "Expression" column, you can either enter a positive or negative time value, depending on the direction in which the curve is to be shifted. A positive time value shifts the curve to the right, a negative time value to the left. Instead of a value that you might have read by means of the markers, you can also enter a formula for calculating the time shift.

Finally, you need to select the correct unit (seconds, minutes or hours) in the "Unit" column. The result of the calculation is displayed in the "Value" column after clicking on <Apply>.

A separate shift factor can be defined for every file. In case of two data files, as in this example, it is enough to shift only one file.

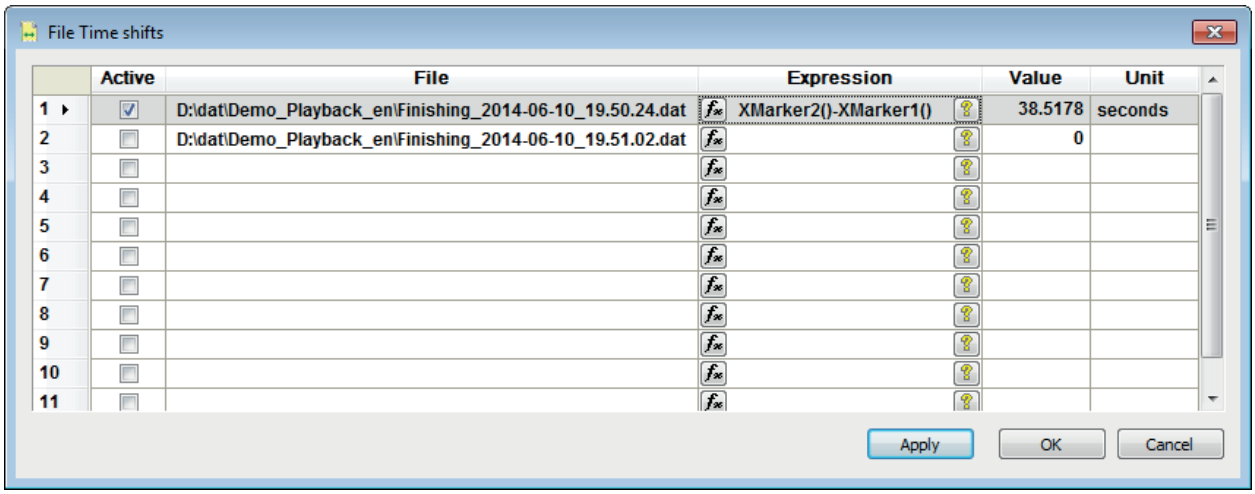


Fig. 18: Time shift data file dialog

In the example below, the time shift was calculated by means of the markers. The markers were each positioned on an event of equal rank in the graphs. Following this, the difference of the marker positions was used as expression for the time shift.

If a time shift is activated for a data file, this can be recognized by a green double arrow icon in the signal tree:

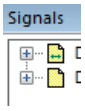


Fig. 19: Marking a time shift of the data file (upper icon)

If required, a collective time shift can be specified in the preferences or in the signal strip settings. The time shift then applies to all open data files. The setting can be found in the *X axis* tab, *Time* sub-tab.

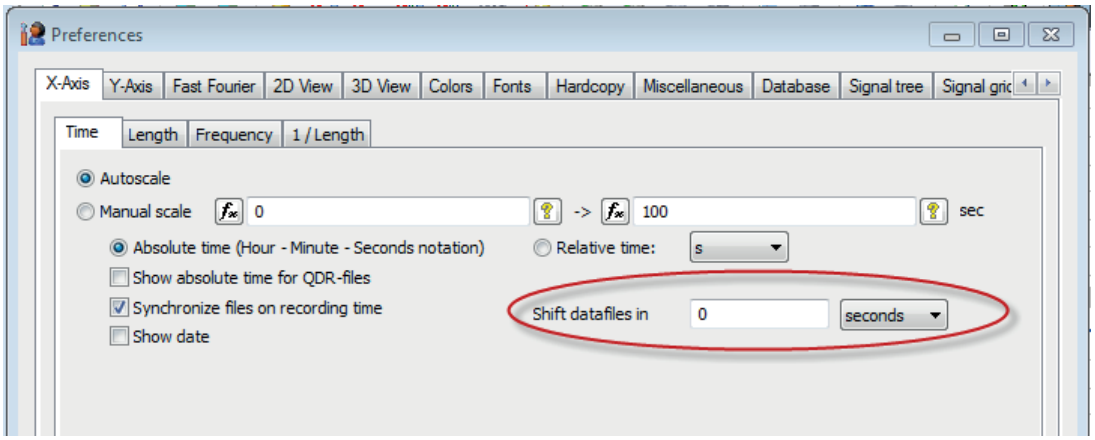


Fig. 20: Setting of time shift for data files in the preferences

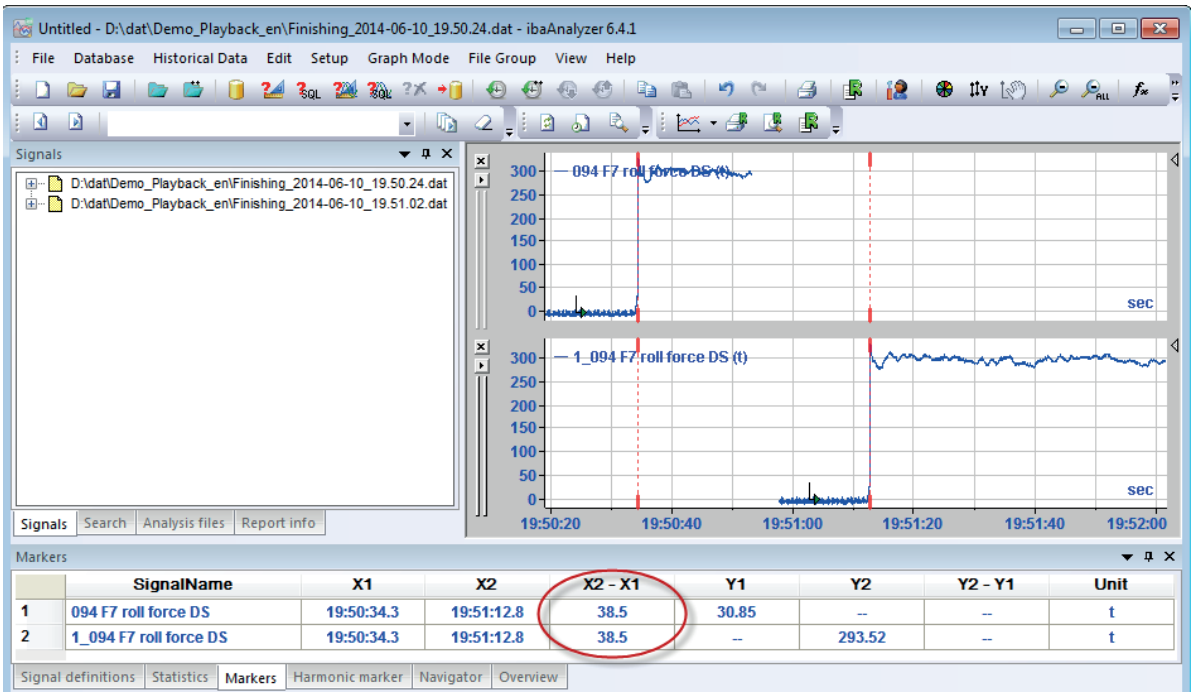
Note

If a collective time shift is applied to data files with individual time shift, the individual time shift will be overwritten. Therefore, it is important to define the collective time shift first and then the individual time shift.

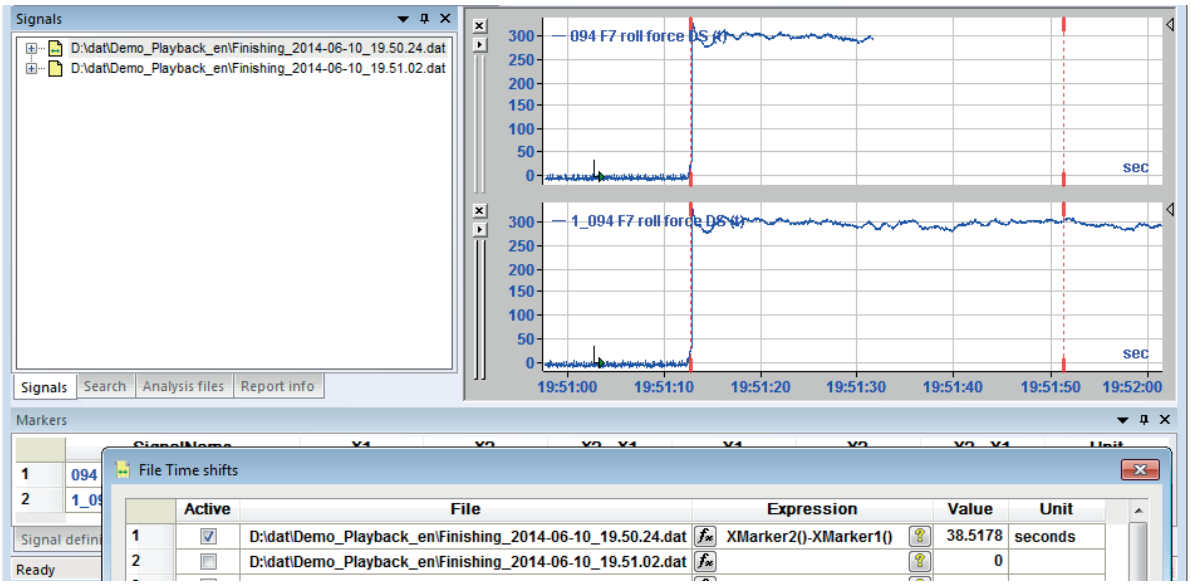
The time shift setting is stored in the analysis file. Thus, a time shift is immediately applied to an open data file as soon as the analysis with time shift has been opened.

Example: Alignment of two signal trends at marker position

The trends of two rolling force signals from two consecutive data files give the curves shown below:



In order to permit a better analysis of the two curves, the rising edges of the signal (marker) are to be made congruent. The position indicator in the signal table, "Markers" tab, shows a difference of 38.5 s between the markers (X2-X1). This means that it is only necessary to shift the upper curve by this amount to the left in order to make the two signal curves congruent.



In order to compare the curves absolutely precisely, it is additionally possible to place the curves, in the shifted condition, together into a common signal strip.

2.8 Export/import file tree

This command can export the file tree to a text file or import it from a text file. Taking into account the syntax (example see table), the file can be created with any text editor.

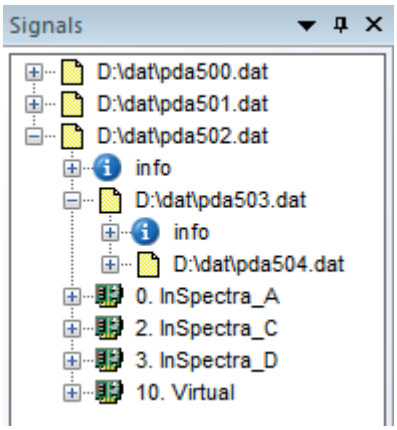
Signal tree	Content of the export file (*.txt)	Description
	[0] D:\dat\pda500.dat [1] D:\dat\pda501.dat [2] D:\dat\pda502.dat D:\dat\pda503.dat D:\dat\pda504.dat	1. Data file index Path and file name 2. Data file index Path and file name 3. Data file index Path and file name Path and file name Path and file name

Table 1: Export of a file tree with parallel and appended files

Tip

If you start *ibaAnalyzer* via the command line and want to specify a file tree at the same time, you can use the */filetree* switch.

Example:

```
c:\Program files\iba\ibaAnalyzer\ibaAnalyzer.exe /filetree: MyFileTree.txt
```

3 The analysis

3.1 What is an analysis?

An analysis is the compilation of all the settings of the user interface and additional items which are relevant for the analysis, such as expressions or virtual signals. An analysis can be applied to any number of data files.

The analysis is stored as a file with the extension .pdo on the hard disk. Every user can store and retrieve at any time the analysis which he or she is interested in under a user-defined name.

The following information is saved in the analysis:

- Number, sequence and size of the signal strips
- Signal composition (module and signal number)
- Strip settings, such as axis scaling, type of presentation, colors
- Mathematical and logic functions (expressions)
- Logic (virtual) signals
- Settings for the hardcopy, including additional text fields
- Setup for report/log generator
- If the database interface is used: all settings for data extraction (archiving profiles, computed columns, etc.) and/or for data exporting.
- Any other settings made under "Graph setup"
- The selected tab in the signal tree window

Note

Since the referencing of signals is based on the module and channel numbers, it is also possible to apply an analysis to data files which actually do not match this analysis, but in which signals exist with the same module and signal number. This means that values are displayed without an error message being generated.

Since also the analysis files with the .pdo extension are linked to the *ibaAnalyzer* program under Windows, it is also possible to start *ibaAnalyzer* by double-clicking a pdo file in the Windows Explorer. *ibaAnalyzer* will then start with the settings saved in the analysis rule, however, without any measured data unless the name of a data file was also saved in the analysis (see ↗ *Save an analysis*, page 37).

3.2 Create new analysis

If you start *ibaAnalyzer* directly or via a data file, the signal table (signal definition) and the recorder window are empty.

Using a data file containing data that you would like to analyze, you now put together your analysis step by step. This means that trend views are opened in the recorder window, calculations (expressions) are programmed, virtual signals are created, reports are configured, etc. These steps are described in the following chapters.

Once you have achieved the desired work progress, you can then save this latest condition as an analysis file.

If you have already made settings or arrangements which you wish to discard in order to start anew, you can create a new analysis via the *File - New analysis* menu or by clicking the corresponding button (see above).

Data files which have been loaded continue to be displayed in the signal tree window. The new analysis does not yet have a name (i.e. it is unnamed).

3.3 Open an analysis

In order to open an existing analysis, use the *File - Open analysis* menu or click the corresponding button in order to access the *Open analysis* dialog.

Tip

... By the way: If no analysis files are offered in this dialog, this can be due to the following reasons:

a) There are no analysis files (*.pdo).

b) You selected the *Open data file* dialog by mistake (button with the blue folder icon) because *ibaAnalyzer* suppresses the display of other file types.

Retrieve analysis from database

Beside the usual way to store the analysis files in a file system, it is also possible to store an analysis in a database (see next chapter). The command for retrieving an analysis from the database is located in the *File - Retrieve analysis from database...* menu. A window opens showing the content of the database, i.e. the available analyses.

In order to load an analysis rule, select the desired name so that it appears in the topmost field of the window and click <Retrieve>.

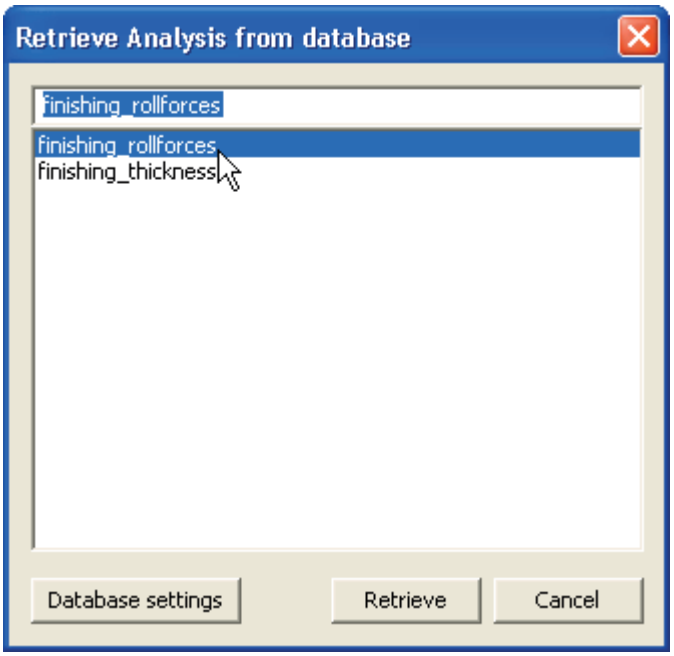


Fig. 21: "Retrieve analysis from database" dialog

Tip

You can place the menu command for opening the analysis from a database as button on the tool bar. For this purpose, go to the menu *View - Toolbar Setup...* and drag the appropriate button from the dialog into the tool bar.

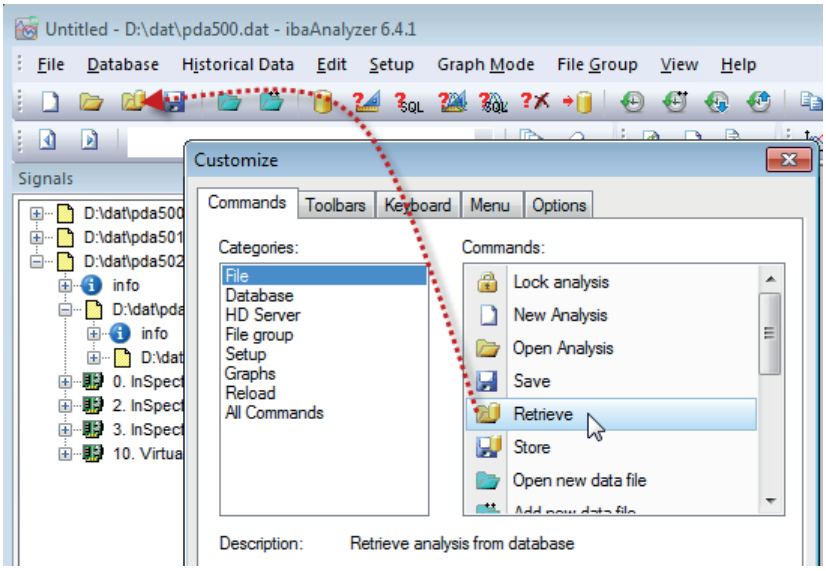


Fig. 22: Adjusting the toolbar for opening analyses from databases

3.4 Save an analysis

In order to save an analysis for the first time or to save an analysis under a new name, select the *File - Save analysis as...* menu. A browser window is opened in which you can select a suitable path. As already described for the *Open data file* dialog, you can define preferred folders in this case, too, in order to save time. Just enter any file name in the *File* input line and click the <OK> button. You only have to enter the prefix. *ibaAnalyzer* automatically adds the .pdo file extension.

You can optionally decide whether the name of the data file is to be saved together with the analysis. This is helpful if an analysis was specifically created for a particular data file. The respective data file for this must exist.

During editing, you can save the analysis at any time under its current name by clicking the corresponding button or by selecting *File - Save analysis* in the menu *File - Save Analysis*.

Store analysis in database

Beside the usual way to store the analysis files in a file system, it is also possible to store an analysis in a database.

Therefore, a database (SQL, Oracle, DB2-UDB or ODBC) must be installed on the local computer or on a database server in the network. The connection to this database is configured in the preferences dialog (see ↗ *PDO database storage*, page 87).

The command for storing an analysis in a database is located in the *File - Store analysis in database...* menu.

After using the command, a window will open which shows the contents of the database. The desired name of the analysis should be entered in the upper entry field. Then exit the dialog by clicking <Store>.

By clicking on the <Database settings> button, you will get to the "Preferences" tab. Here, you can check and configure the database connection.

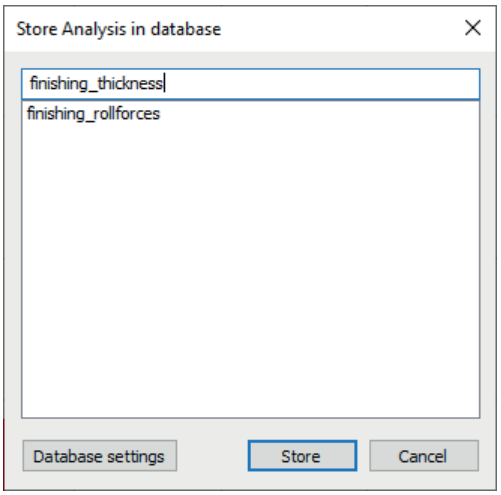


Fig. 23: "Store analysis in database" dialog

Tip

You can place the menu command for saving the analysis into a database as button on the tool bar. For this purpose, go to the menu *View - Toolbar Setup...* and drag the appropriate button from the dialog into the tool bar.

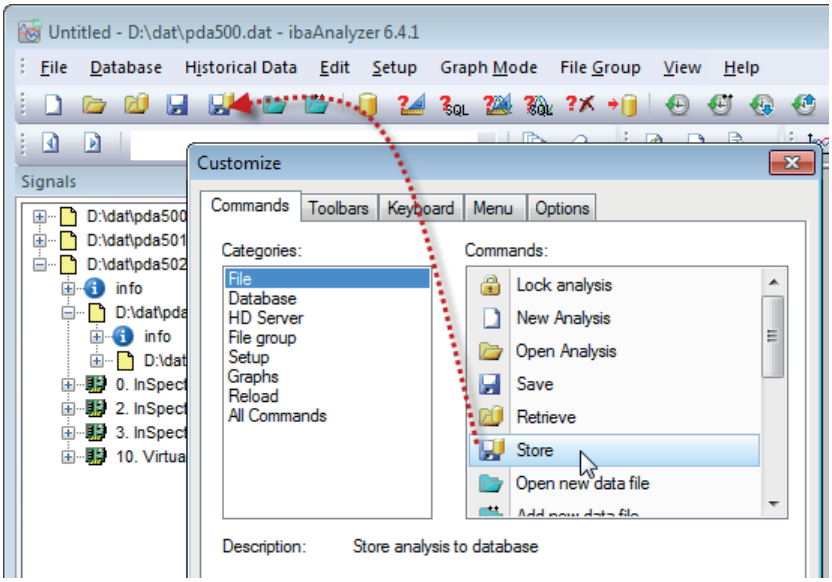


Fig. 24: Adjusting the toolbar for saving analysis rules in databases

3.5 Analysis password protection

The password protection helps you to prevent unauthorized or unintended changes of analysis settings. If the password protection is enabled each saving of an analysis requires the password. You can open the corresponding dialog via the main menu *File – Analysis password protection*.

This reduces the risk of overwriting a file that is already saved.

In addition, it is possible to make the interactive opening of an analysis dependent on the correct input of the password. This prevents an unauthorized person viewing the analysis.

If you execute the command *Analysis Password Protection...* in the *File* menu, the dialog *Change analysis password* opens.

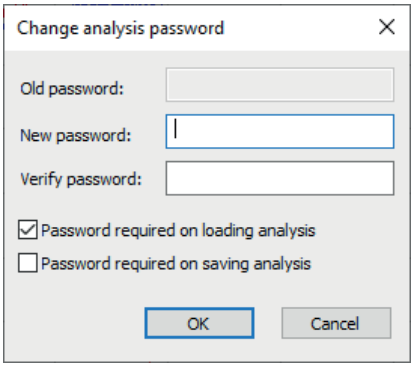


Fig. 25: Dialog for enabling, changing and deleting a password for analyses

The dialog contains the following items:

Old password
If a password has already been assigned, then it must be entered here if you want to change the password. If you do not enter the old password, then the dialog closes with a mouse click on <OK> without applying a change.

New password
Enter the new password here if you want to assign a password for the first time or if you want to change an existing password. If you leave the field empty, but an old password exists, then the password will be deleted and the password protection is thus disabled.

Verify password
Enter the exact text here as in the field of the new password. If the content of both fields does not match, closing the dialog will output an error and the dialog will remain open.

Password required on loading analysis
If you enable this option, then the password is queried for the interactive opening of an analysis.

Password required on saving analysis
If you enable this option, then the password is queried before the analysis can be saved.

At least one of these two options must be enabled so that the dialog can be closed via <OK>.

Create a Password (First Time)

1. Enter the new password in the field *New password*.
2. Enter the password again in the field *Verify password*
3. <OK>

Change a Password

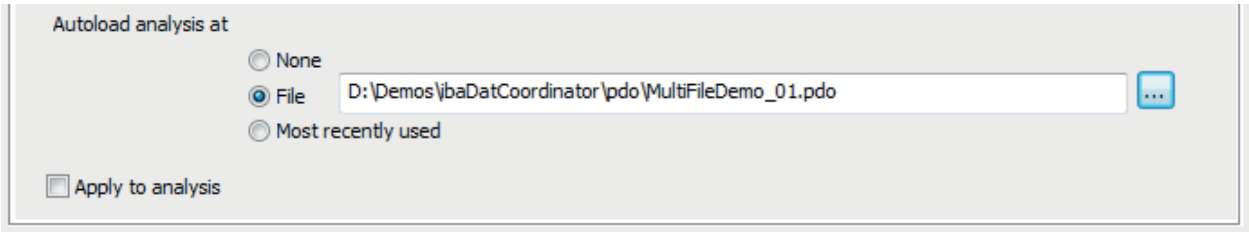
1. Enter the current password in the field *Old password*.
2. Enter the new password in the field *New password*.
3. Enter the password again in the field *Verify password*
4. <OK>

Delete a Password (Disable Password Function)

1. Enter the current password in the field *Old password*.
2. Leave fields New password and *Verify password* empty.
3. <OK>

3.6 Default analysis file

In order to open automatically a particular analysis file when starting *ibaAnalyzer* you should enter the analysis file name in the preferences dialog, tab *Miscellaneous*.



4 Quick access to analyses and more

In the *Analysis files* tab in the signal tree window, you can configure a tree structure with an arbitrary number of analysis files. You can apply each of these analysis files to a loaded data file simply by a double-click.

This makes it easy to have different views for different purposes on the same data set without the boring open-and-close-analysis-file procedure.

As you used to browse through a group of data files with the same view (= one analysis) you can now “browse” through different views (= multiple analyses) on the same data file.

In addition, you can include links (shortcuts) to signals, expressions and X-Axis markers in the tree.

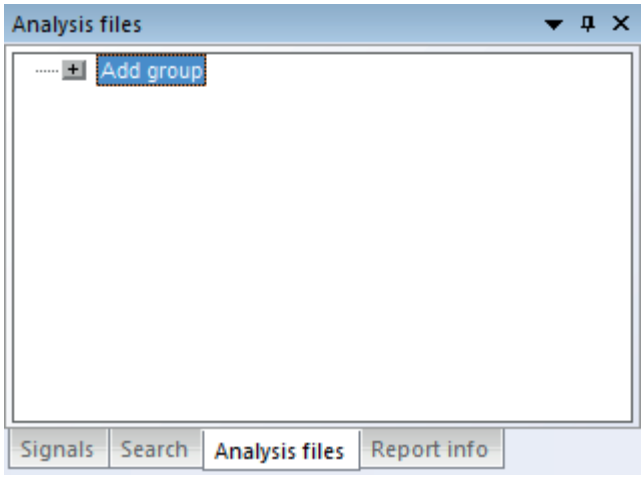
One or more data files (.dat files) can even be assigned to a group. The required steps to build the analysis tree and its elements are described in the following.

Note

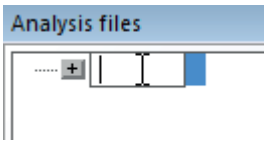
The analysis tree is NOT stored in an analysis file but in the registry (like the preferences). Therefore, the analysis tree- once created - is also available when *ibaAnalyzer* is started without an analysis. In order to remove an analysis tree it is required to delete all elements of the tree.

4.1 Create a new analysis tree:

1. Create the analysis files as required and save them (*.pdo files).
2. Select the *Analysis files* tab in the signal tree window.

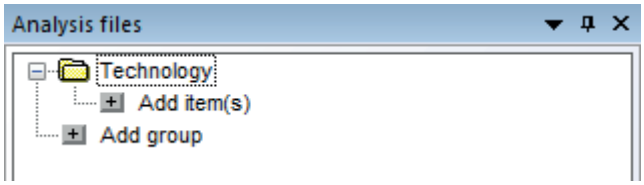


3. Add a first group.

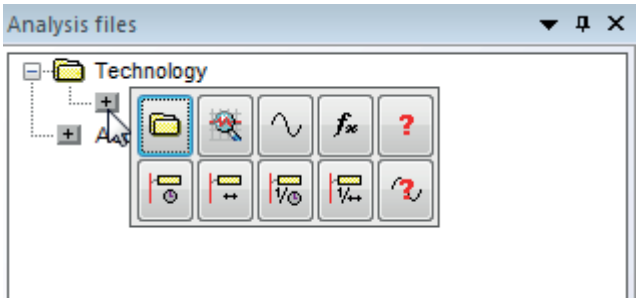


In order to enter a group name, click on the + symbol, double-click on the *Add group* branch or mark the branch and press <ENTER>.

4. After entering the group name, the group will be created and another branch called *Add group* will appear for you to create more groups. In the first group, you now have the possibility to add various items.



5. Add the desired items to the group(s). It is possible to select an item by clicking on the + symbol, double-clicking on the *Add item(s)* branch or marking the branch and pressing <ENTER>.



	Subgroup
	Analysis (pdo-file)
	Signal
	Expression
	X axis marker time-based
	X axis marker length-based
	X axis marker frequency-based
	X axis marker 1/length-based
	SQL query
	SQL trend query

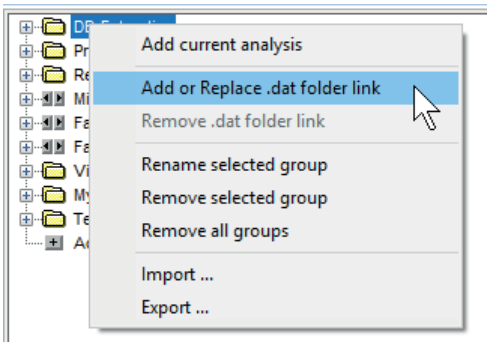
4.2 Groups and subgroups

Beside a number of items, one or more subgroups can be added to a group, which have their own items included, such as shortcuts to signals, expressions, markers or even further subgroups.

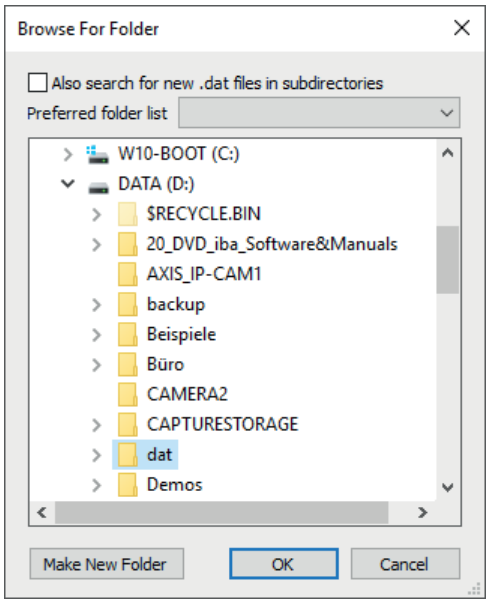
The number of groups is generally unlimited.

Adding subgroups to a group is to be done in the same manner like for the parent groups. After you have clicked on the subgroup button in the pop-up control another group branch will be created, prompting you to enter a group name. After finishing the entry of name another node "Add item(s)" is added to the subgroup branch.

Beside of elements a shortcut to a path containing data files can be assigned to a group or subgroup. Therefore, you should click with the right mouse button on the group. In the context menu, choose *Add or Replace .dat folder link.*



After, a browser window opens for selecting the desired path.

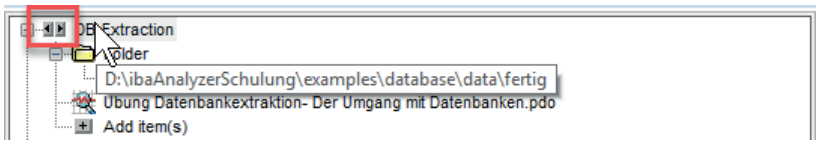


Also search for new .dat files in subdirectories
Enable this option if you want *ibaAnalyzer* to search on a regular basis for new data files in the selected folder and its subfolders.

Preferred folder list
If you have already selected preferred folders in the dialog *Open data file* of *ibaAnalyzer* then you can select one of those preferred folders in the list of this combobox.

Button <Make New Folder>
If required you can create a new folder by this button.

After you have selected a placeholder for path and closed the browser with <OK> you will see two arrow buttons at the node of the group, indicating that a file path is assigned to the group. The path name is indicated in the tool tip when you place the mouse pointer on the group node.

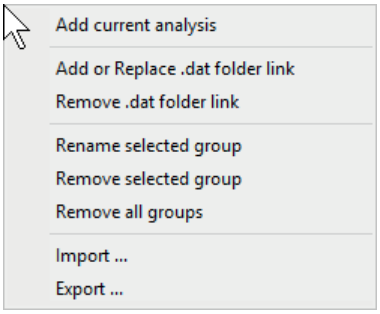


When you click on an arrow button for the first time, *ibaAnalyzer* will open the youngest data file in the assigned folder, if available. Further clicks on the arrow buttons will open the data files which are older (left arrow) or younger (right arrow) as the current file, if available. If you opened another file in the meantime on a different way, e. g. via dialog *Open data file*, then a click on the arrow buttons after will open again the youngest file in the assigned folder, like at the first time.

If you hold the <ALT> key when clicking on the arrow buttons, then the new data files will be appended to the current file instead of replacing it. The function of the arrow buttons is altered by the use of the <ALT> key too. A click on the right arrow button will append a younger data file to the end of the current file and thus at the end of the chain of appended files. A click on the left arrow button appends the file which is older than the current first file in the chain before that file, i. e. it puts the new file at first position of the chain. This rule guarantees the correct chronological order of the data file in the chart display.

Instead of using the mouse for these operations you may use the cursor keys together with the <CTRL> key, provided the group node is marked. The appending of files works respectively with the key combinations <ALT> + <CTRL> + < ← >/< → >.

Besides adding, replacing or removing dat folder links, the context menu which pops up when clicking on a group node, contains some more functions.

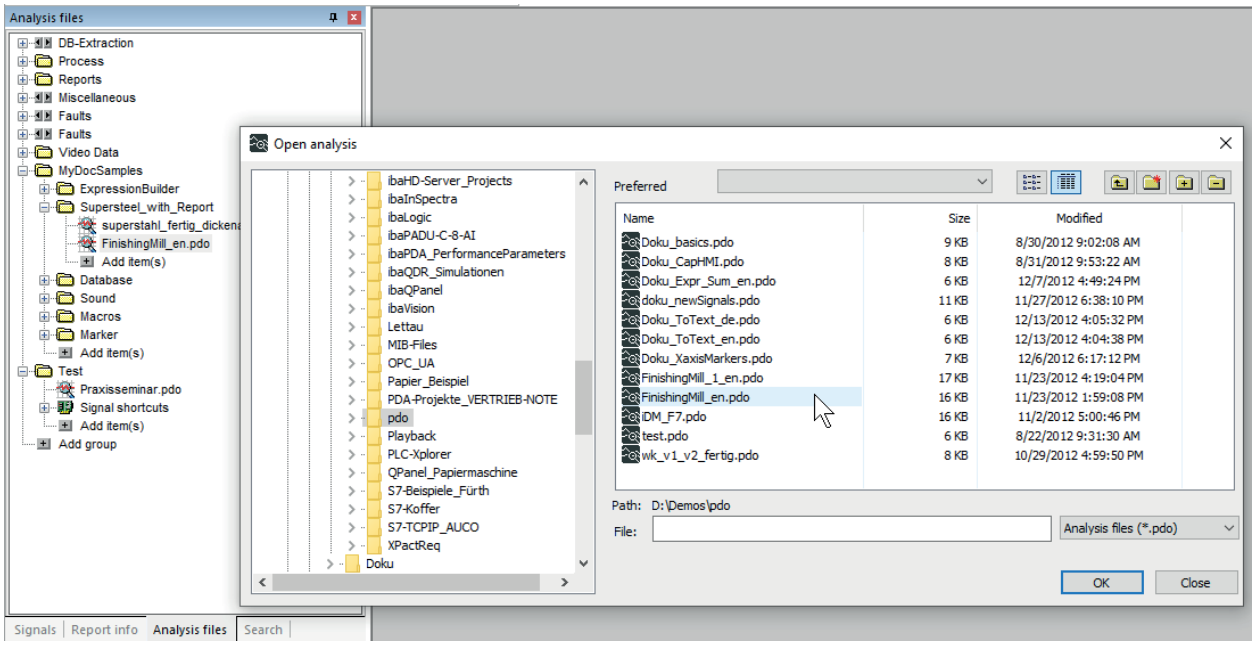


You can rename and remove a selected group, all groups or add the current analysis to a group.

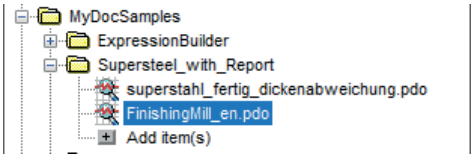
Groups and subgroups can be moved inside the analysis tree by drag & drop.

4.3 Analyses (.pdo files)

It is easy to add an analysis to a group. After clicking on the “Add item(s)” node and the corresponding button for analyses in the pop-up window, the *Open analysis* file browser opens. There you can browse and choose the desired analysis file(s).



The selected analysis files are always added to the tree right beneath the group or subgroup.



The analysis file can be opened by a double-click on the item or pressing <Enter> when it is marked. Also, using the context menu (right mouse click on the item) and choosing *Opened file* will open the analysis.

You may use the context menu for removing an analysis file from the tree as well (*Remove selected file*).

You should group your analyses in a way that suits best your requirements. For example you can create groups with reference to the technological structure of your plant or process (e. g. entry section, cleaning, furnace, skin pass mill, exit section) and assign the corresponding analyses. Or you decide to create more general groups like technology, production, statistics, maintenance etc. Also personalized groups can be useful, particularly when several people use the same computer for different analyses.

Analysis files can be moved inside the analysis tree and assigned to another group by drag & drop.

Note

The analysis tree is NOT stored in an analysis file but in the registry (like the preferences). Therefore, the analysis tree- once created - is also available when *ibaAnalyzer* is started without an analysis.

4.4 Signal shortcuts

In each group or subgroup you can create shortcuts for preferred signals. By means of these shortcuts you may display the signals as usual in the recorder window by drag and drop or double-click (like from the signal tree).

Note

Using signal shortcuts makes switching between the signal and analysis tree unnecessary.

The data file must be opened in order to create signal shortcuts.

After you have clicked on the node “Add item(s)” and chosen the button for signal in the pop-up window, a signal browser *Select signal(s)* will open with the familiar signal tree of the data file. Here, you can now select one or more signals.

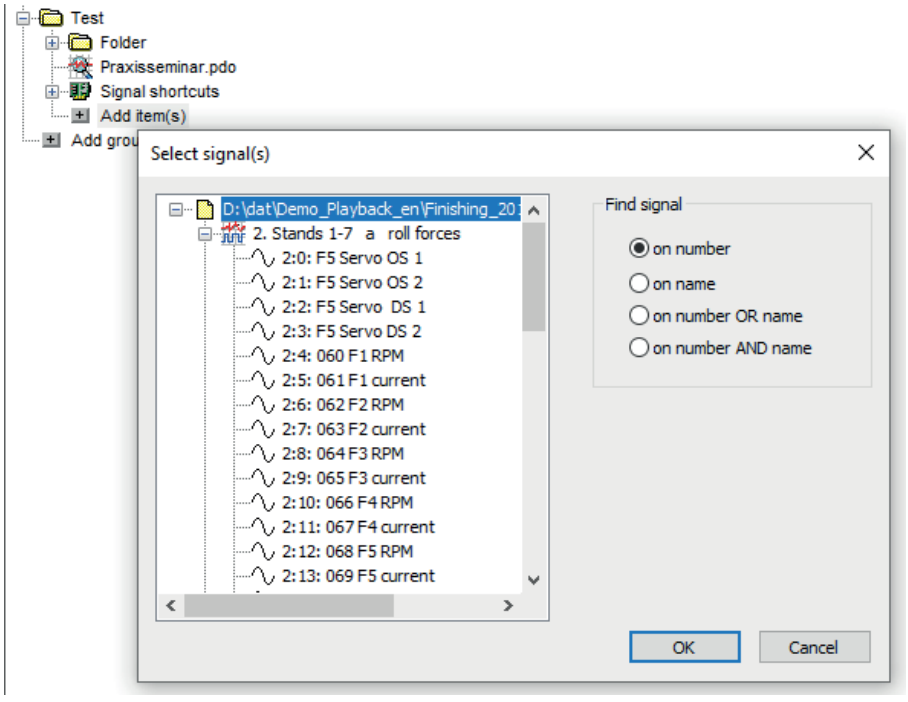


Fig. 26: Signal browser for creating signal shortcuts

In the signal browser the following options are available to find a signal. They should be selected by mouse click on the corresponding radio button:

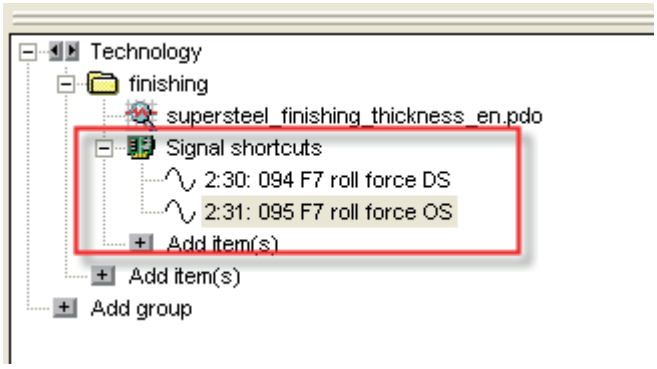
on number
A signal of a currently open data file can always be displayed via this signal shortcut if it has the same number (i.e., file number, module number and channel number).

on name
A signal of a currently open data file can always be displayed via this signal shortcut if it has the same name. The first signal in a data file which has this name will be displayed (in case of multiple signals having the same name).

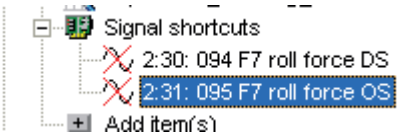
on number OR name
A signal of a currently open data file can always be displayed via this signal shortcut if it has either the same number (see above) or the same name. The first signal matching one of these conditions will be displayed.

on number AND name
A signal of a currently open data file can only be displayed via this signal shortcut if it has both the same number (see above) and same name.

After closing the browser window by <OK> the signal shortcuts will be created in the analysis tree.

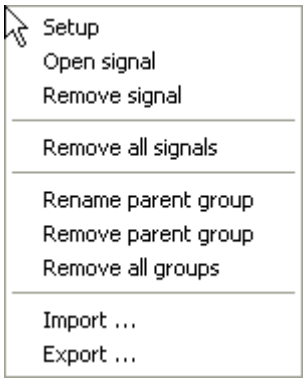


If a signal, the shortcut refers to, is not available in the data file it will be indicated by a red cross on the shortcut icon.



This can happen when the loaded data file does not contain the same signals as the data file which had been used for creating the signal shortcuts.

A right mouse click on the signal shortcut opens a context menu with some signal-specific options.



Setup
This command opens the signal browser just like when adding a signal shortcut. You may select a different signal or change the option for finding and opening a signal.

Open signal
This will display the signal in the recorder window.

Remove signal
This will remove the signal shortcut from the group. If it is the only signal, the node "Signal shortcuts" will also be removed from the group.

Remove all signals
This command will remove all signal shortcuts including the node "Signal shortcuts" from the group.

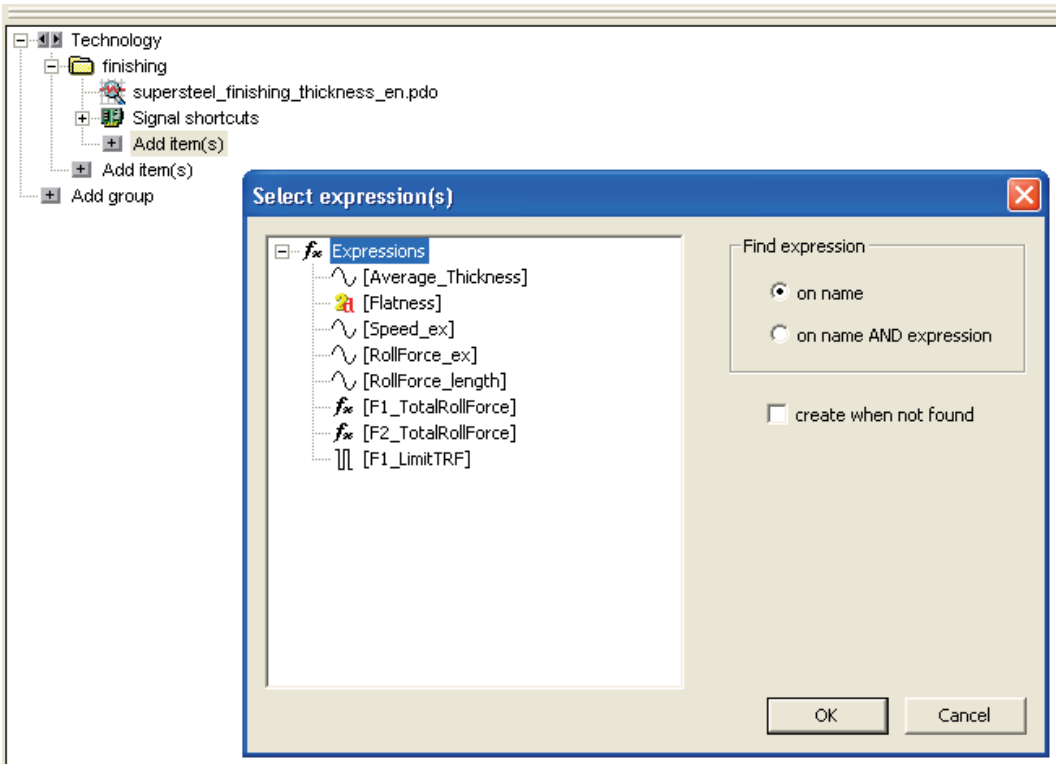
By the way, another method for adding a signal shortcut is to drag and drop a signal from the recorder window on a group or a node in the analysis tree.

Signal shortcuts can be moved within the analysis tree and assigned to another group by drag and drop.

4.5 Expression shortcuts

Shortcuts to expressions can be added to the analysis tree too and used in the same way like signal shortcuts. An expression shortcut can either refer to an expression which had been created in the signal grid or to a logical signal definition. Of course, expression shortcuts can only be created if expressions are available in the signal grid or logical signal definitions of the current analysis.

After you have clicked on the node “Add item(s)” and chosen the button for expression in the pop-up window, a signal browser *Select expression(s)* will open. In the browser, you’ll see a signal tree consisting of expressions (fx) or logical signal definitions respectively. You may select one or more signals from the tree.



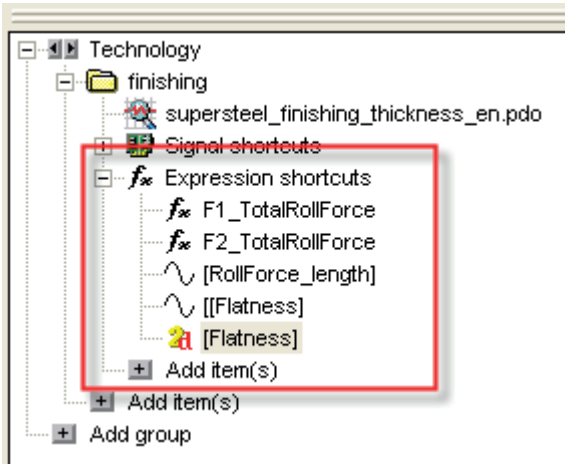
In the signal browser, the following options are available to find the expressions. They should be selected by mouse click on the corresponding radio button:

on name
An expression of an actual open analysis can always be displayed via this shortcut if it has the same name. The first expression in an analysis which has this name will be displayed (in case of multiple expressions having the same name).

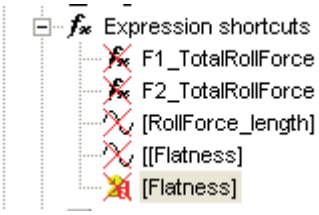
on name AND expression
An expression of an actual open analysis can always be displayed via this shortcut if it has both the same name and the same expression.

create when not found
If this option is enabled an expression which is already available in the analysis tree will automatically be created in the signal table of the current analysis. This may occur for example when a different analysis file has been loaded which doesn't contain yet the expression in question. With the help of this option an expression shortcut can always be opened.

After closing the browser window by clicking <OK>, the expression shortcuts will be displayed in the analysis tree.

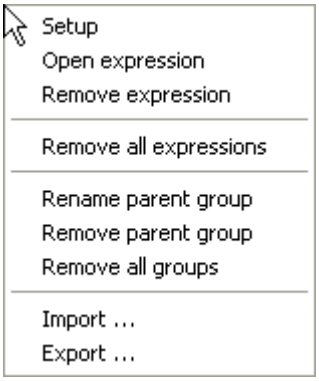


If an expression, the shortcut refers to, is not available in the analysis file it will be indicated by a red cross on the shortcut icon.



This can happen when the current open analysis does not contain the same expressions like already available in the analysis tree.

A right mouse click on the expression shortcut opens a context menu with some expression-specific options.



Setup
This command opens the expression browser like for adding an expression shortcut before. You may select a different expression or change the option for finding an expression.

Open expression
This will display the expression in the recorder window. Opening an expression will not necessarily open a new signal strip in the recorder window. It may be displayed in a signal strip with other signals, depending on where it was created.

Remove expression
This will remove the expression shortcut from the group. If it is the only expression, the node "Expression shortcuts" will also be removed from the group.

Remove all expressions
This command will remove all expression shortcuts including the node "Expression shortcuts" from the group.

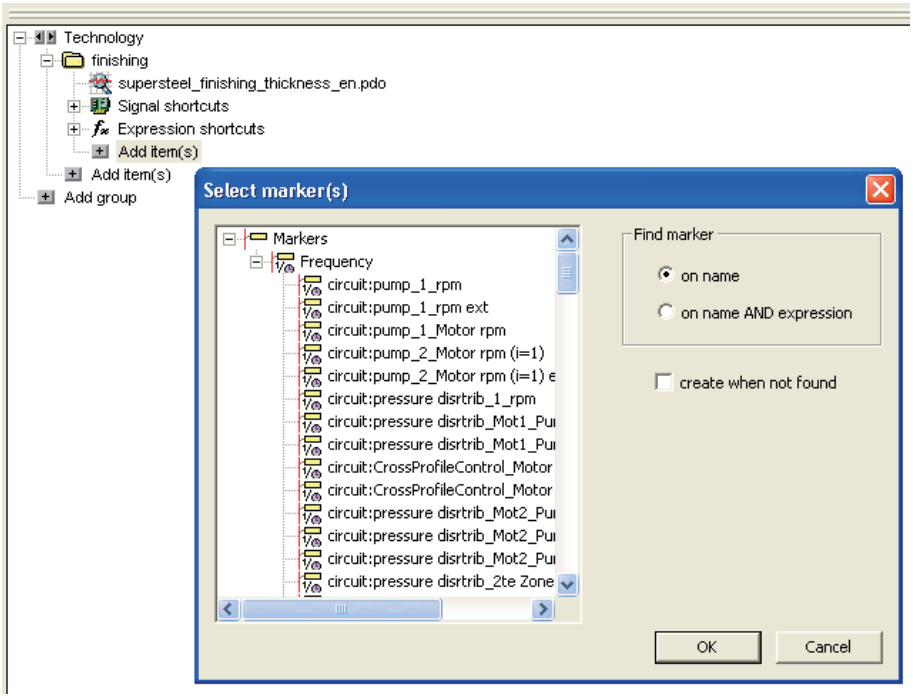
By the way, another method for adding an expression shortcut is to drag and drop a currently displayed expression from the recorder window on a group or a node “expression shortcuts” in the analysis tree.

Expression shortcuts can be moved inside the analysis tree and assigned to another group by drag & drop.

4.6 Marker shortcuts

Shortcuts to X-axis markers can be added to the analysis tree and used in the same way like expression shortcuts. Four different buttons for creating marker shortcuts are available in the pop-up control on node “Add item(s)”. Of course, marker shortcuts can only be created if markers are available in the currently opened analysis.

After you have clicked on the node “Add item(s)” and chosen one of the buttons for marker shortcuts in the pop-up window (time, length, frequency, inverse length), a signal browser *Select marker(s)* will open. In the browser you’ll see a signal tree that only has markers of the selected type. You may select one or more markers here.



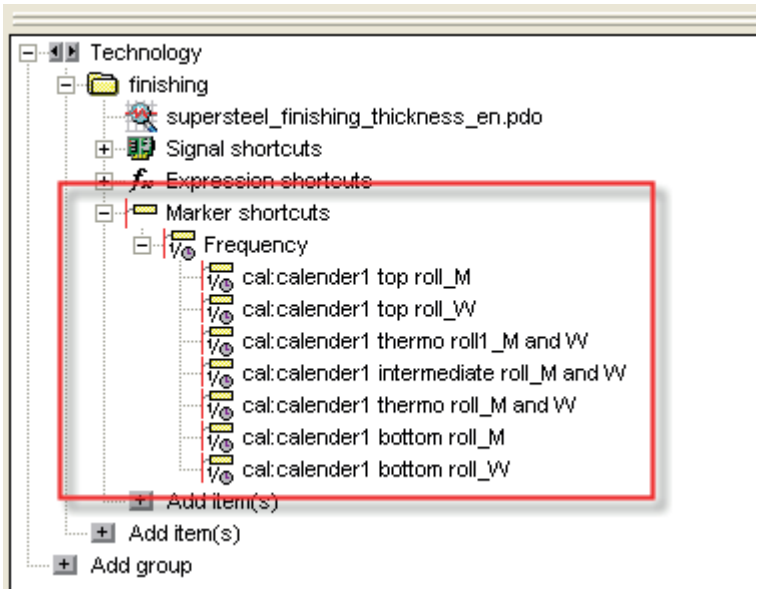
In the signal browser, the following options are available to find the markers. They should be selected by mouse click on the corresponding radio button:

on name
A marker in an actual open analysis can always be displayed via this shortcut if it has the same name. The first marker in an analysis which has this name will be displayed only (in case of multiple markers having the same name).

on name AND expression
A marker of an actual open analysis can always be displayed via this shortcut if it has both the same name and the same expression which defines the marker.

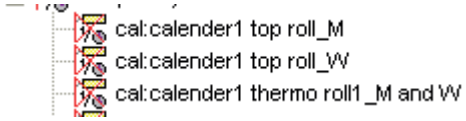
create when not found
If this option is enabled a marker which is already available in the analysis tree will automatically be created in the current analysis (marker table). This may occur for example when a different analysis file has been loaded which doesn't contain yet the marker in question. With the help of this option a marker shortcut can always be opened.

After closing the browser window by <OK> the marker shortcuts will be displayed in the analysis tree.



The marker shortcuts are automatically grouped by type in the tree.

If a marker, the shortcut refers to, is not available in the analysis file it will be indicated by a red cross on the shortcut icon.



This can happen when the current open analysis does not contain the same markers like already available in the analysis tree.

A right mouse click on the marker shortcut opens a context menu with some marker-specific options.

Setup
This command opens the marker browser like for adding a marker shortcut before. You may select a different marker or change the option for finding a marker.

Open marker
This will display the marker in the recorder window. Typically the markers are not opened in new signal strips but in signal strips of other signals or expressions (e. g. frequency based markers in FFT-strips). It is recommended to drag and drop the desired marker from the analysis tree into an appropriate signal strip.

Remove marker
This will remove the marker shortcut from the group. If it is the only marker, the node "Marker shortcuts" will also be removed from the group.

Remove all markers
This command will remove all marker shortcuts including the node "Marker shortcuts" from the group.

By the way, another method for adding a marker shortcut is to drag and drop a currently displayed marker from the recorder window on a group or a node “marker shortcuts” in the analysis tree.

Marker shortcuts can be moved inside the analysis tree and assigned to another group by drag and drop.

4.7 SQL query

SQL queries can be used in combination with an *ibaAnalyzer-DB* license only. An SQL query is designed for requesting and showing data and analysis files which had been extracted into a database before.

By means of these group elements, you can make SQL queries, which you had generated before, easier to perform.

For configuring, the same dialog opens as with the database tool bar after selecting the *SQL query* group element. Here, you can either enter an existing SQL query file or directly enter the SQL statement.

After clicking, the SQL query is entered in the analysis tree. If you want to execute an SQL query, double-click on the corresponding branch.

Note

For detailed information on database queries, please refer to the *ibaAnalyzer-DB* manual.

4.8 SQL trend query

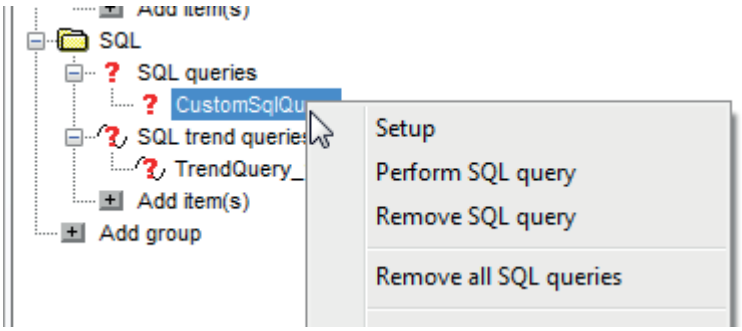
SQL trend queries can be used in combination with an *ibaAnalyzer-DB* license only. An SQL trend query is designed for finding corresponding database entries based on certain conditions and showing selected characteristic values of these database entries as trend in the *Overview* tab (Signal table area). From this trend view, the complete data extractions (measuring and analysis data) can be specifically requested and displayed.

By means of these group elements, you can make SQL trend queries, which you had generated before, easier to perform.

For configuring, the same dialog opens as with the database tool bar after selecting the *SQL trend query* group element. Here, you can either enter an existing SQL trend query file or directly enter the SQL statement.

After clicking <OK>, the SQL trend query is entered in the analysis tree. If you want to execute an SQL trend query, double-click on the corresponding branch.

Alternatively, you can also use the context menu on the entry:



Note

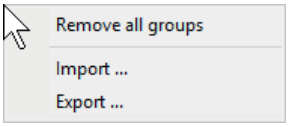
For detailed information on database queries, please refer to the *ibaAnalyzer-DB* manual.

4.9 Import and export of analysis trees

The menu items *Import* and *Export* in each context menu of the *Analysis* tab are also very helpful. It's an easy way to save more or less complex analysis trees and to transfer them from one computer to another. The *Export* function saves the analysis tree in a text file which can be imported on another computer. Of course, the text file can be edited with any usual text editor or MS Excel if required.

Also service or maintenance engineers who are in charge of different works or plants and thus use different configurations can take advantage of the export and import function.

The commands for export and import are always available in the context menu of the analysis tree pane even if the tree is empty yet.



Import and export function are up and down compatible. Export files created by previous versions of *ibaAnalyzer* usually can be imported by newer versions.

If analysis trees which had been created by a newer version should be imported in *ibaAnalyzer* of versions <5.8 then the subgroups and in versions <5.1 the shortcuts to signals, expressions and markers will be ignored.

5 Settings

There is generally little difference between the dialog window for the preferences and for the graph setup. They differ with respect to the generally valid and (signal)-specific settings.

Y axis preferences

The dialog for the preferences can be opened via the menu *Setup* - *Preferences*...

The preferences determine the form of presentation when a new analysis is created or when a new signal strip is opened. A change in preferences has no immediate influence on the trend views which are currently displayed unless the *Apply to analysis* option (in the dialog window usually in the lower left corner) is enabled before the change is applied. The preferences are saved in an initialization file of *ibaAnalyzer* rather than in the analysis, and are hence independent of an analysis file.

Graph setup

You open the dialog for the graph setups via the menu *Setup* - *Graph setup*... or in the context menu of a trend view under *Setup*...

The difference between the graph setups and preferences is that the graphs only apply to the trend view which is currently active (see part 1, chapter The recorder window) and/or to the graph in which the context menu was opened. The strip setting dialog always offers only a subset of the tabs available for the preferences, i.e. only those tabs which are relevant for the strip in question. On the other hand, the dialog boxes differ between preferences and graph setup. Thus, e.g. the X axis settings of the strip in the *Time*, *Length*, *Frequency* and *1/length* tabs also show the markers which is not the case with the preferences.

A change in the strip settings immediately affects the strip in question when the <Apply> button is clicked. Such a change has no effect on the preferences unless the *Apply to preferences* option was enabled beforehand (in the dialog window usually in the lower left corner).

The strip settings are saved in the analysis.

Note

Formatting of numerical data such as time, date, etc., for example on the time axis, in tables or in the export dialog, is based on the regional and language settings under Windows.

5.1 X-axis

5.1.1 Time tab

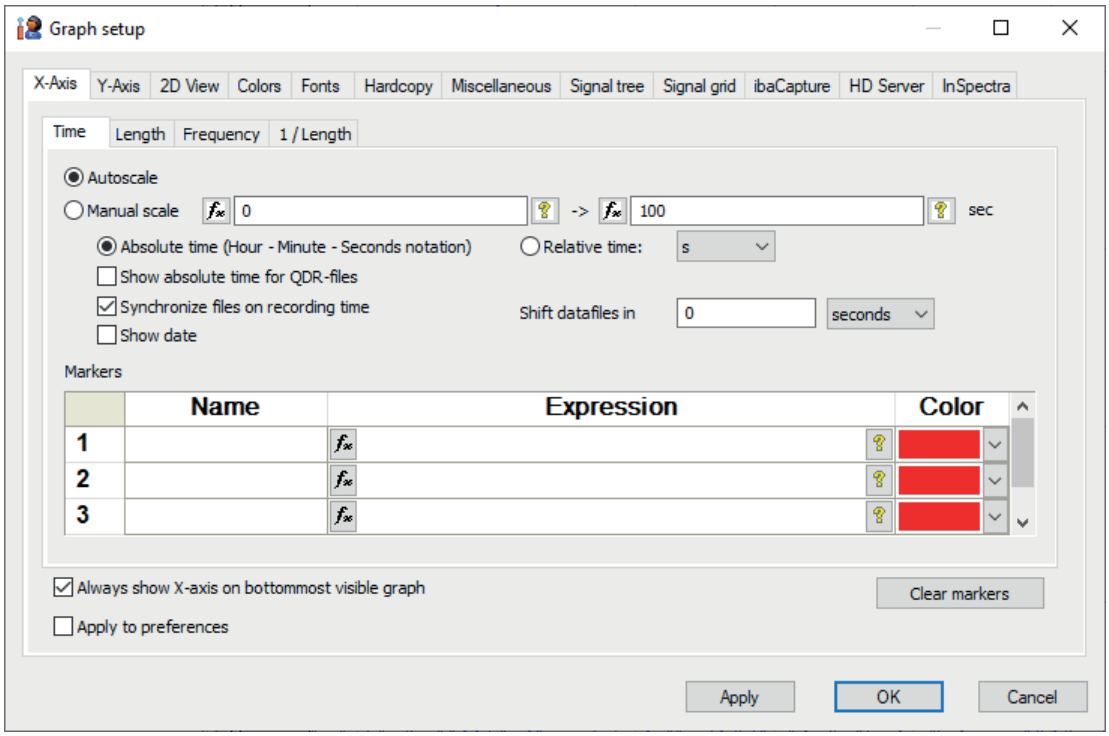
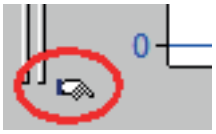


Fig. 27: X axis settings, time mode

- Autoscale:
  Default setting; the X axis is scaled in line with the recording time of the data file. If, at the time a data file is already open, a signal from another data file is opened covering a longer period of time, the time scale is adjusted in accordance with the longer signal. At any given point in time, only one time axis can exist in an analysis which is then applicable to all the time-based signal graphs.
- Manual scale:
  Fixed start and end scale values can be entered here instead of the autoscale function. Moreover, you may define variable start and end values for the scales by entering an expression instead of a constant in the corresponding fields. So you can define scale limit values with respect to certain process parameters. In order to edit the expression, just click on the fx button in the corresponding field and use the expression builder functions (see part 3). Irrespective of the length of the signal in the data file, only the specified section is displayed. A hand symbol (see below) displayed near the scale origin indicates that the manual scale option is active.



- Absolute time (Hour-Minute-Seconds notation):
  Selecting the scale notation; if this option is selected, the time values at the scale are presented in hours:minutes:seconds. If this option is not selected, a time value of 0 is entered at the origin of the scale, with all the other scale values being entered as distance therefrom in seconds.
- Show absolute time for QDR-files:
  This option is only applicable to data files which were generated by the *ibaQDR* system. Both the length reference and the time reference are stored in these files. Usually, also in time-based presentation the signals are scaled to the overall X axis. Thus, the measuring signals are "stretched" to the entire runtime of the strip in the plant. In terms of quality, you get a trend over time, however, the assignment of the Y values to the time axis is not correct.
  By enabling this option, the signal curve is correctly presented on the X axis in terms of time. This shows very clearly as to when and how long a measuring signal has been recorded for the corresponding strip.
- Synchronize files on recording time:
  This option is important for the presentation of appending data files. This option must be selected as a precondition for arranging the individual signal records on the time axis in accordance with the recording data of the data file (also see ↗ *Appending data files*, page 21).
- Show date:
  When selecting the absolute time, the date can be additionally displayed on the scale. Particularly in case of data files covering several days or the time around a date line, the additional data display serves as orientation.
- Relative time:
  For the relative time reference, you can choose between the display in seconds, minutes : seconds or hour: minute : seconds.
- Shift data file in time
  With this setting, you can perform a graph-specific shifting of the curves, for example, to align them with curves in other graphs. This setting can also be configured in addition to a general time shift, as described in chapter ↗ *Time shift of data files*, page 30.
- Marker table
  The marker table shows all X-axis markers currently defined for the time axis. Here, you can define or delete markers. The table shows the marker pool which you can also access via *Markers*... in the context menu of a strip. You decide at a later time as to whether a marker is displayed in the strip in question by dragging it from the signal tree to the strip. For more information about the markers, see chapter ↗ *X-axis markers (computed markers)*, page 123
- Always show X-axis on bottommost visible graph
  If more trend views are opened than fit in the display area, a scroll bar is displayed on the right edge. If you have not enabled this option, then the X-axis (scale) is located on the lowermost trend view (graph) and is no longer visible if the view was scrolled up. If you enable this option, then the X-axis is automatically always displayed under the lower trend view, which can still be fully seen in the display area.

5.1.2 Length tab

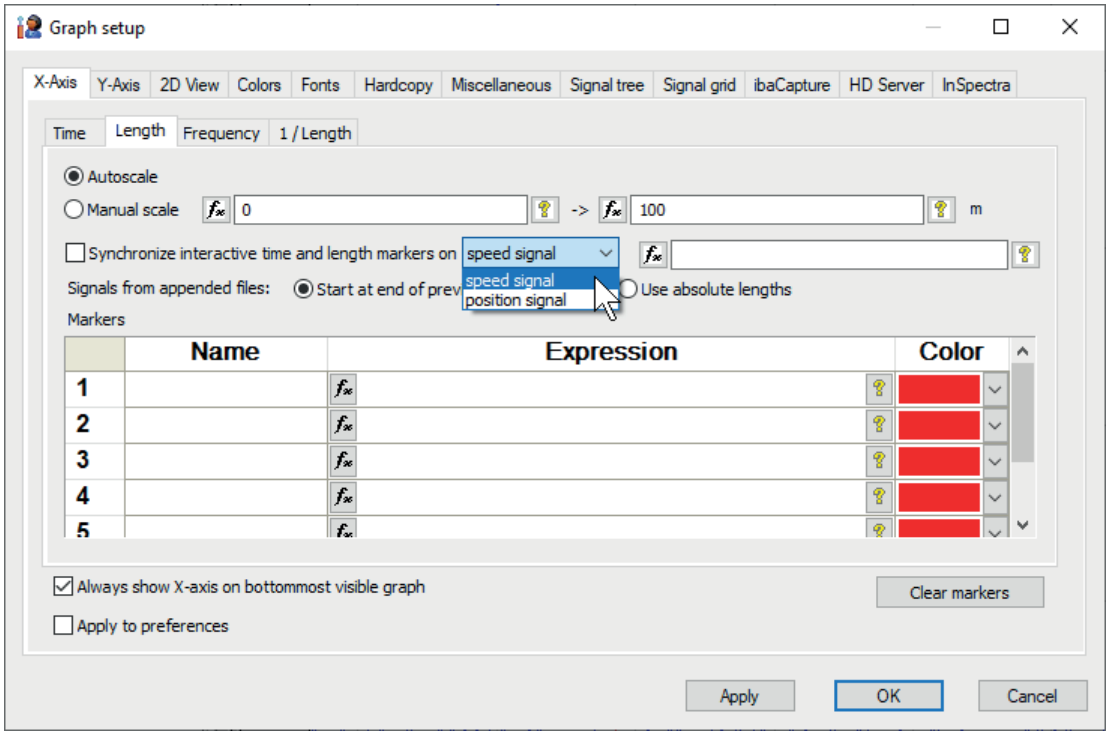
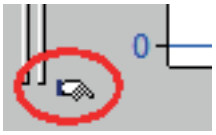


Fig. 28: X-axis settings, length mode

- Autoscale:
  Default setting; this is similar to the time axis, however, with the difference that the X axis represents a length unit (m). If a length-related signal is generated in the analysis, the length position of the last sample determines the end of the scale. Similar to the time axis, only one length axis can exist for several length-related signal strips, so that in this case, too, the length scale is determined by the longest signal.
- Manual scale:
  Similar to the time axis, fixed start and end values can be entered here for the length scale on the X axis. In this case, too, a hand symbol is displayed at the scale origin in order to indicate that the manual scale mode is active.



- Synchronize interactive time and length markers with...
  If you enable the *Synchronize interactive time and length markers with* option, the markers of time-based and length-based signals will be synchronized. This is of particular interest if you display time-based and length-based signals in the recorder window at the same time and if you want to immediately determine the suitable length value at a particular time (or vice versa). This may be required, e.g., with the analysis of video signals to get a time and length reference for particular events. Depending on which strip is activated, the length-time-reference for the marker is established.
  For this function, you either have to select a speed signal or a position signal used as synchronization signal.

Via the drop-down menu, you can determine whether the time-based signal is a speed or position signal.
For example, if you select “position signal,” you have to enter a position signal in the adjacent field providing the length measured value. If you do not have a position signal, then select the “speed signal” and enter the name of the speed signal. *ibaAnalyzer* then applies the conversion of time and length in order to position the cursor correctly, similar to with the functions TimeToLength or TimeToLengthL.
If negative speed signals occur, these will be ignored. The same applies to invalid or unused position signals.

- Signals from appended files...
  Use this selection to decide whether the measured values for appended data files are to be displayed in trend graphs with length axis directly behind each other or according to the length value in the trend graph. The latter setting corresponds to the axis setup *Synchronize files on recording time* for time-based signals.
- Marker table
  Meaning and usage according to the description provided under the chapter *Time tab* (above).

5.1.3 Frequency tab

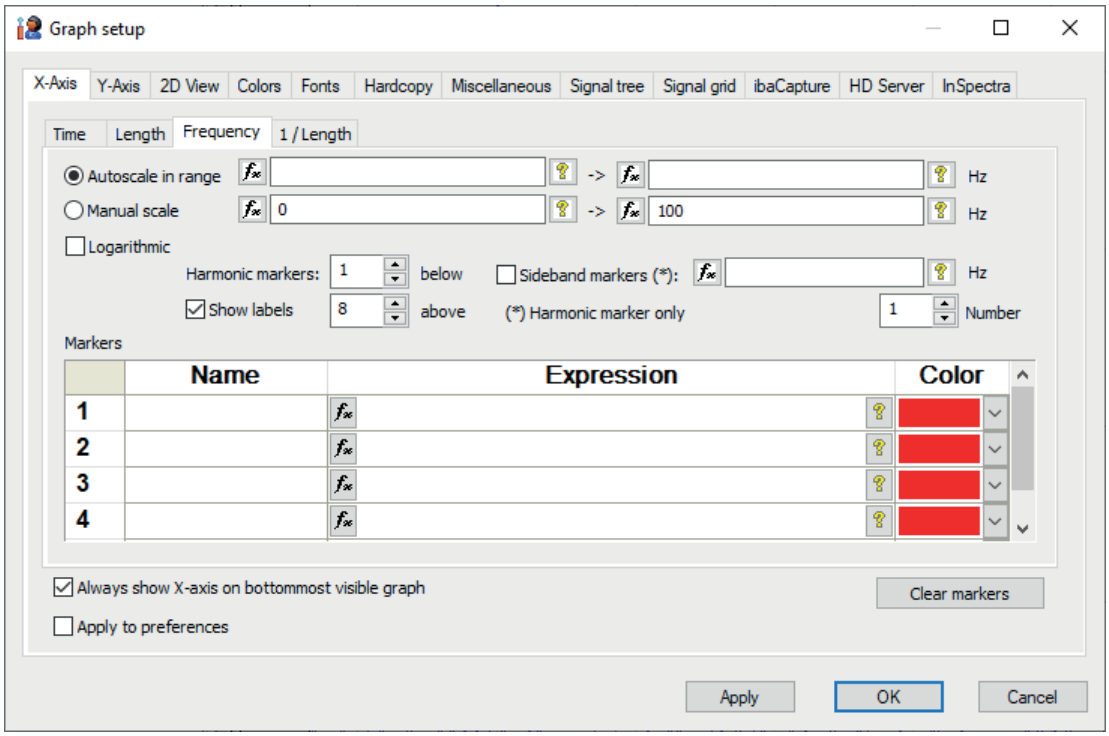
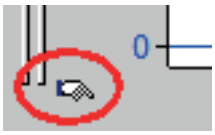


Fig. 29: X axis setup settings, frequency mode (FFT)

- Autoscale in range:
  Default setting; upper and lower limit values can be entered for the scaling of the frequency axis (for FFT presentation) even for the autoscale mode. This makes sense because the interesting frequency range is usually known when the FFT presentation option is used.

- Manual scale:
  If the frequency range in which you are interested is to be further limited in order to increase the resolution, manual scaling is possible here with fixed scale start and end values. The hand symbol is displayed in this case, too, in order to show that the manual scale mode is active.
  For both options, the upper and lower limit can be entered either as constant values or as expressions, with the expression enabling the user to configure the limits depending on various conditions.



- Logarithmic:
  Check this option if you rather like to have a logarithmic scale on the X axis instead of a linear scale. This option is recommended when viewing wider ranges of frequencies in the FFT view mode. The following graphics show the difference:

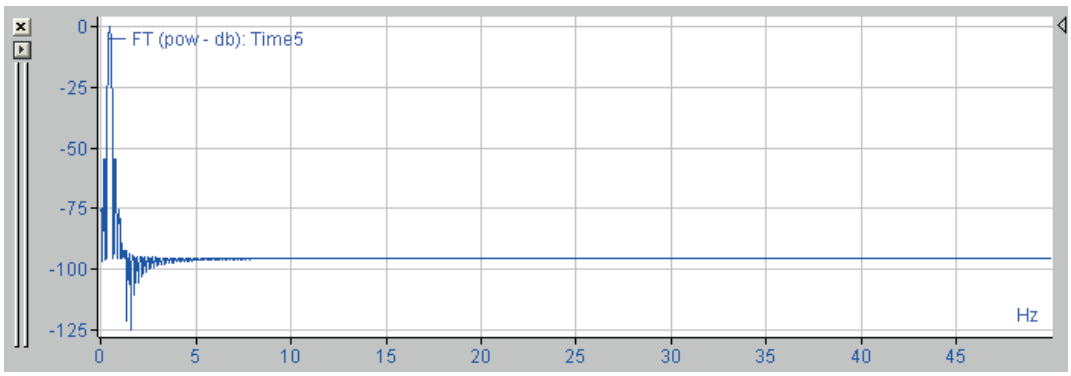


Fig. 30: Linear frequency axis

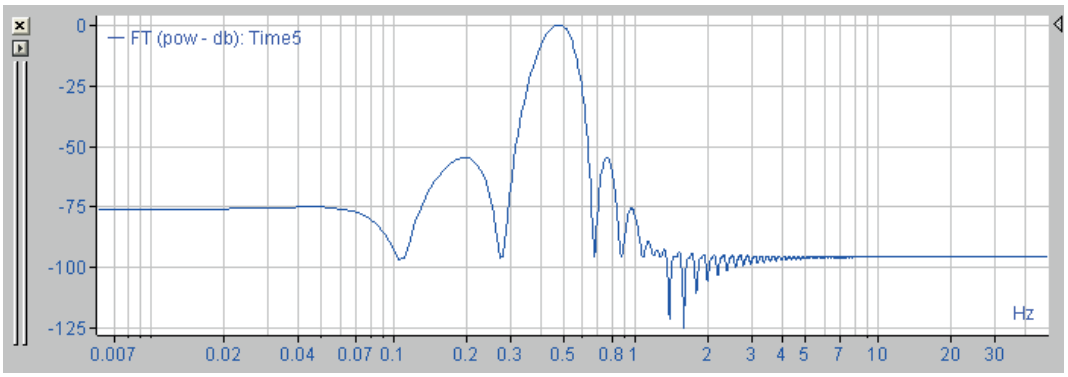


Fig. 31: Logarithmic frequency axis

- Harmonic markers... below / above:
  Here, you can enter the number of harmonic markers which should be displayed in the signal strip (FFT) below and / or above the main frequency in question.

See ↗ *Harmonic markers*, page 121

- Show labels
  With this checkbox, you can enable or disable the flags for displaying the frequency values of the harmonic markers.

- Sideband markers:
  Check this option if you also want to display the sidebands around the main frequency. You may additionally enter an expression for configuration of the sideband markers and a number which specifies the number of sideband markers to be displayed.

See ↗ *Markers*, page 119 for detailed information on sideband markers.

- Marker table
  Meaning and usage according to the description provided under the chapter *Time tab* (above).

5.1.4 Tab 1/Length

Settings according to the *Frequency* tab.

5.2 Y-Axis

The Y axis settings are an exception to otherwise identical procedure that is applicable to the preferences and strip settings. In the case of the preferences, only the basic settings which are independent of the data files are offered (see ↗ *Preferences*, page 65), whilst in the case of the graph setup (see ↗ *Graph setup*, page 66), more setting options are offered because *ibaAnalyzer* then has more information.

5.2.1 Preferences

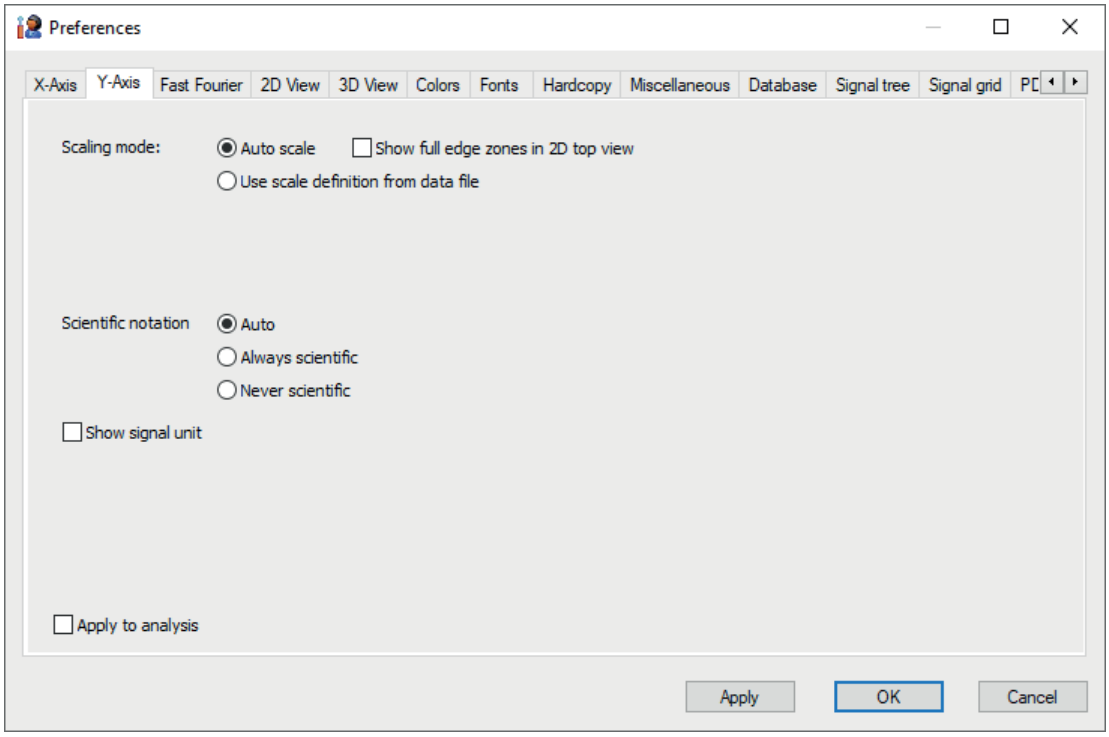


Fig. 32: Y axis preferences

Scaling mode

- Autoscale:
  This is the default setting; if one or more signals are displayed, the Y axis of the strip is scaled in accordance with the smallest or largest of all occurring values.
- *Use scale definition from data file*:
  Already at the time of data acquisition using *ibaPDA*, it is possible to pre-set measuring-range values in the module settings for each signal and to save these pre-set ranges in the data file. If this option is selected, the measuring-range limits are interpreted as scale start and end values.

Scientific notation

- *Auto*:
  Depending on the order of magnitude of the scale values (number of digits before and behind the decimal point), *ibaAnalyzer* uses the scientific notation (decimal powers) at the scales or not.
- *Always scientific*:
  Scale values in powers of 10
- *Never scientific*:
  Scale values always with digits before and behind the decimal point.

Show signal unit

If you enable this option, the measuring unit is written behind the scale values as defined in the signal table.

Show full edge zones in 2D top view

If you enable this option, the Y axis is scaled to the entire width including the empty margins of the outer zones when autoscaling in 2D top view. This produces empty stripes, as the first and last presentable and interpolable value is in the center of the zone.

For more information about the zone settings, see chapter ↗ *Setting when using zone widths*, page 139.

5.2.2 Graph setup

The *Y axis* tab in the strip settings provides more information and setting options than in the preferences (see picture below). If more than one Y axis has been set up in a strip, a corresponding number of "Y axis #" tabs is also offered in the setup dialog (see the picture "Strip settings Y axis..." below). Thus, you can set up all Y axes individually.

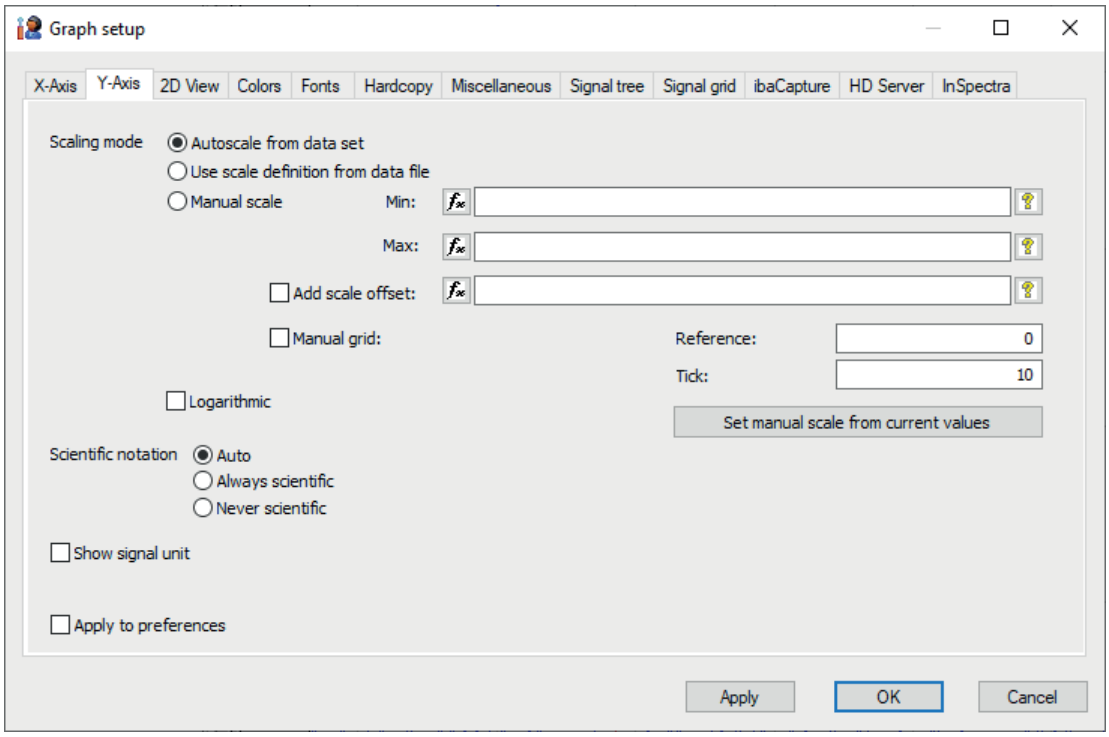


Fig. 33: Strip setting Y axis (example)

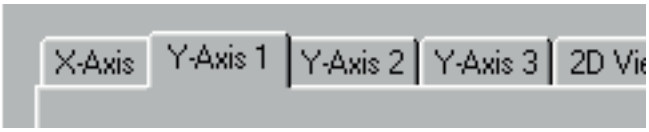


Fig. 34: Strip setting Y axis (example with three separate Y axes in one strip)

Scaling mode

- *Autoscale from data set*:
  see autoscale under ↗ *Preferences*, page 65
- *Use scale definition from data file*:
  see under ↗ *Preferences*, page 65
- *Manual scale*:
  This option can be used in order to set the start (min) and end (max) value of the scale manually.
- *Add scale offset*:
  A scale offset value can be additionally chosen in conjunction with the manual scale option. For this purpose, you can enter a fixed value in the box on the right. This value is then used to offset the range defined by Min and Max on the Y axis. A negative value shifts the scale range downwards, a positive value upwards. However, a constant scale offset does not necessarily make sense, for example, if the level of the values measured often varies from file to file. In such a case, you can also define a variable scale offset to be calculated in any manner you like; if necessary, even via the measured signals themselves. The button f_x next to the input field serves this purpose. A click on this button opens the expression builder which you can then use to create any expressions the result of which then gives the scale offset. Also see part 3, expression builder.

- *Manual grid*:
  Furthermore, it is also possible to divide the Y axis and/or the grid in a certain manner in conjunction with the manual scale option. Two values must be entered in the appropriate boxes for the manual grid:

  Reference: The reference value is the basis for determining the position of the grid. The reference value does not necessarily have to be identical to the minimum or maximum value of the manual scale. It may be within or outside of the range, which was defined with Min and Max. The reference value determines to a certain degree where the first grid line appears.

  Tick: The "Tick" value represents the step width of the grid lines. Based on the reference value, grid lines and scale values are displayed at always the same distance (tick mark).
  For example, in order to divide the Y axis (and the grid) in steps of 1/16, enter 0.0625 for the tick mark value.

Note

ibaAnalyzer will nevertheless adjust the scale in order to optimize the display. This mainly depends on the value range, i.e. on the min and max values. If the grid would become too narrow, the grid lines are displayed at integral multiples of the tick value.

- <Set manual scale from current values> button
  If you press this button while the autoscale mode is active, the current settings in the graph display are used for the fields for manual scaling. This simplifies the setting of a manual scale because the Y axis in the recorder window can also be adjusted graphically using the mouse.
- Logarithmic
  If you enable this option, then the scale is split logarithmically on the Y-Axis. In the case of an X-Y appearance, both axes (horizontal and vertical) may have a logarithmic scale. If a trend view is converted to an X-Y appearance, then the logarithmic option in the graph setup is also available in the X-axis tab.

Scientific notation
see under ↗ *Preferences*, page 65

Show signal unit
see under ↗ *Preferences*, page 65

Show zone margin in 2D top view (only with strips in 2D top view)
see under ↗ *Preferences*, page 65

5.3 Fast Fourier

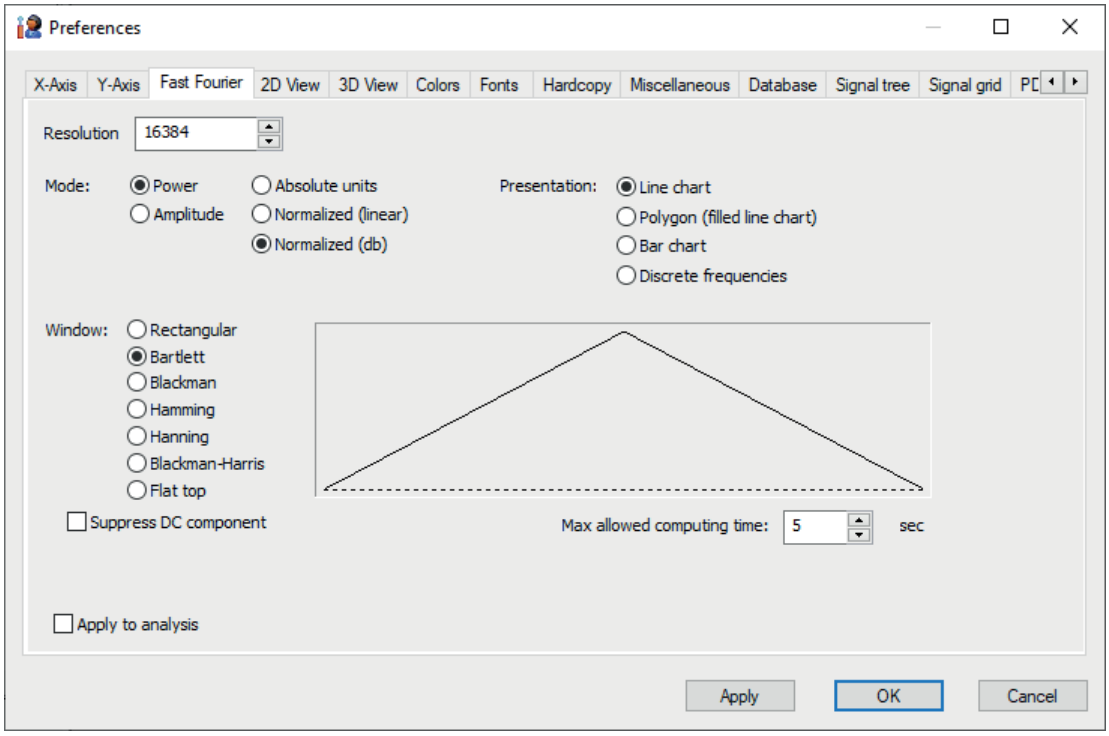


Fig. 35: Fast Fourier (FFT) settings

With the settings for the Fast Fourier Transformation (FFT), the calculation basis and the algorithms are selected which *ibaAnalyzer* uses for the FFT analysis if the FT mode is selected for a strip in the display. Like with the other settings, default values can be defined under ↗ *Preferences*, page 65. However, if the FT mode is selected for a signal strip, the FFT settings are also offered in the context of the strip settings and can be adjusted individually. Which calculation mode or which evaluation window is selected for the FFT function depends on the particular application.

Resolution
In this input box, you can set any resolution value between 128 and 131072 at intervals of powers of two using the small arrow buttons. The larger the number, the finer and denser the FT presentation, i.e. the more frequencies are considered in the range.

Mode
The mode settings determine what to calculate.

- Power:
  Calculation according to power; returns the square of the amplitude of the FFT coefficients;
- Amplitude:
  returns the amplitude of the FFT coefficients;

Any of the above two options can be combined with one of the following three options.

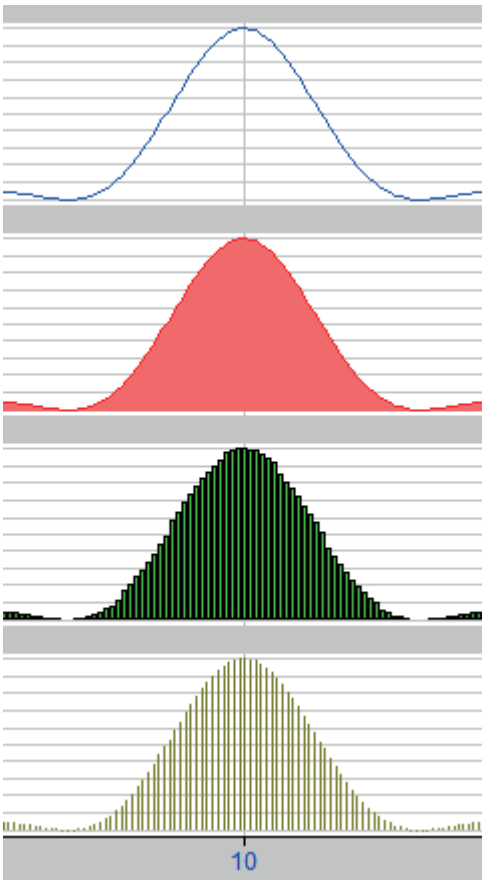
- Absolute units
  returns power or amplitude on the FFT coefficients unaltered;

- Normalized (linear):
  normalizes the output relative to the estimated amplitude of the input signal or its square respectively for the Amplitude or Power option;
- Normalized (db):
  normalizes and returns result in dB

Window
Selection of the evaluation window for the FFT. The shape of the window indicates which samples of a finite signal are weighted how strongly during FFT.

- Rectangular:
  All the samples of a signal – from the beginning to the end – are weighted equally.
- Bartlett, Blackman, Hamming, Hanning, Blackman-Harris, Flat Top:
  Samples in the middle portion of the signal are weighted more strongly than the samples at the margin (beginning, end).

Presentation

	*Line chart*: Presentation of the frequency amplitude values as a simple "temperature curve".
	Polygon (filled line chart): Presentation of the frequency amplitude values as a curve with a filled, color body (same as 2D presentation).
	Bar chart: Presentation of the frequency amplitude values as wide, vertical bars, in each case at the corresponding frequencies.
	Discrete frequency Presentation of the frequency amplitude values as vertical lines at the corresponding frequencies.

Suppress DC component
If this option is activated, the DC component (frequency = 0) of a signal is exempted from the FFT analysis.

Max. allowed computing time
If the measuring records are very long and/or contain a very large number of samples, and if a high resolution was chosen in the FFT settings, it may well happen that the calculation takes

some time. This means that problems may occur in the case of automated analyses parallel to fast-running processes. Here, the computing time can be limited, however, as the case may be at the expense of precision.

Note

The highest frequency to be observed is a maximum of 0.5-times the sampling rate. At a sampling rate of 1000 Hz, for example, only signal frequencies up to 500 Hz can be shown.

For this purpose, also see ↗ *FFT*, page 131.

5.4 2D View

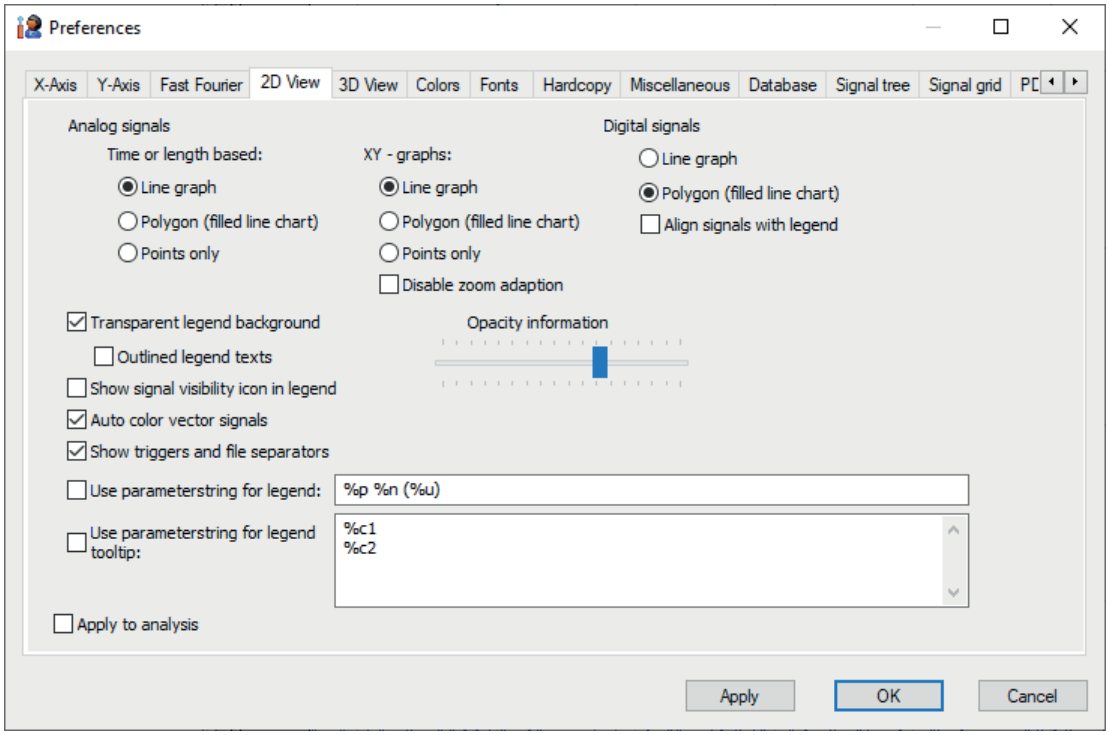


Fig. 36: 2D view settings

This dialog is used to determine how the curves are to be presented in the two-dimensional view. The default settings are "Line graph" for analog values and "Polygon" for digital signals, being the variant of choice in most cases.

In the case of the filled line chart presentation, it may happen that the curves conceal each other if several signals exist per strip. The "front" curve always belongs to the signal occupying the bottommost position in the graph legend.

The *Points only* option presents the signal curves like a series of dots (one dot for each sample) without the connecting lines.

More options:

Align signals with legend
This option applies to digital signals only. If it is activated, the digital signals are aligned exactly at the height of the suitable signal legend.

Disable zoom adaption
If you zoom into a trend graph with time-based signals and then switch to the X-Y appearance, the value range according to the zoom level is used by default for the X-Y graph. In this way, you get an X-Y appearance with the values from the zoomed area. If you enable this option, the zoom level is ignored when switching to the X-Y appearance and the X-Y graph shows the complete value ranges.

Transparent legend background
Enabling this option will remove the background from the legend so that only the characters are visible. This will cause a better visibility of the curve but may reduce legibility of the legend text. Disabling this option will cause a background behind the legend text. Since the background is also part of the so called information layer, you can control its transparency and/or opacity with the parameter nearby. (also see ↗ *Formatting the legend*, page 116)

Outlined legend texts
When activating this function (only possible when the "Transparent legend background" option is activated at the same time), the legend is also shown, e.g., if it is not visible due to an overlap with a curve having the same color. The outline of the text characters is represented in contrasting color.

Opacity information
All types of markers, legends, units and cursors on the graph are assigned to a transparent layer that is on top of the graph called the information layer. By adjusting the slider, you can control the opacity or transparency of this layer.

- Position far left = no opacity (100 % transparent), no information visible.
- Middle position = approx. 50 % opacity, curves still visible behind information layer.
- Position far right = 100 % opacity.

Auto color vector signals
If you drag a vector signal from the signal tree into a normal trend view, then the signals contained in the vector are shown as individual curves.

If you have enabled this option, then the individual signal curves are automatically colored differently according to the color scheme (preferences - colors). If you do not enable this option, then all curves of the vector signal receive the same color.

Show triggers and file separators
Enabling / disabling the display of start and stop triggers and file separators (appended data files) in the graph.

Use parameterstring for legend
When activating the “Use parameterstring for legend“ option, you can add additional information or comments to the legend, e.g. the signal name. You can also replace the signal name by information or comments. There are parameter strings available for the different options which are entered alone or together with the information or the comment in the command line (default setting: “%p %n (%u)).

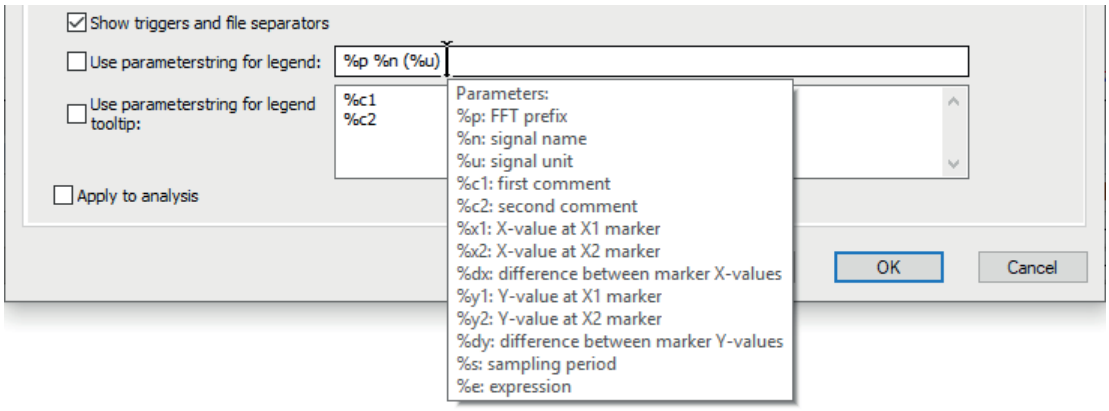


Fig. 37: Parameter setting for the legend

The following parameter strings are available:

- %p:
  In the FFT view, e.g., the FT prefix is displayed followed by the signal mode, e. g.: “FT (amp-norm)”.
- %n:
  The signal name is displayed.
- %u:
  If available, the signal unit is displayed. If no unit is available, this string is not taken into consideration.
- %c1, %c2:
  With these strings, the first or second comment of the signal can be inserted.
- %x1: %x2:
  With these strings, the current position of the marker 1 or 2 on the X axis can be inserted.
- %dx:
  Using this string, the difference of the marker positions can be inserted in x axis units.
- %y1, %y2:
  With these strings, the current signal value at the position of the marker 1 or 2 can be inserted in the suitable signal unit.
- %dy:

  With this string, the difference of the signal values at the positions of the markers 1 and 2 can be inserted in the suitable signal unit.
- %s:
  With this string, the time or length basis can be inserted with which the signals were written in the data file. The time-based data is given in seconds (sec), the length-based data in meters (m).
- %e:
  With this string, the expression is added on which the signal is based or with which the signal is created/calculated (as in the column *Expression* in the signal grid).

Using parameterstrings for legend tooltip

Alternatively or in addition to the previous item, you can enter the same information in a tooltip which becomes visible if the cursor is placed on the legend. You can thus decide which information is always displayed in the legend and which is displayed in the tooltip.

5.5 3D View

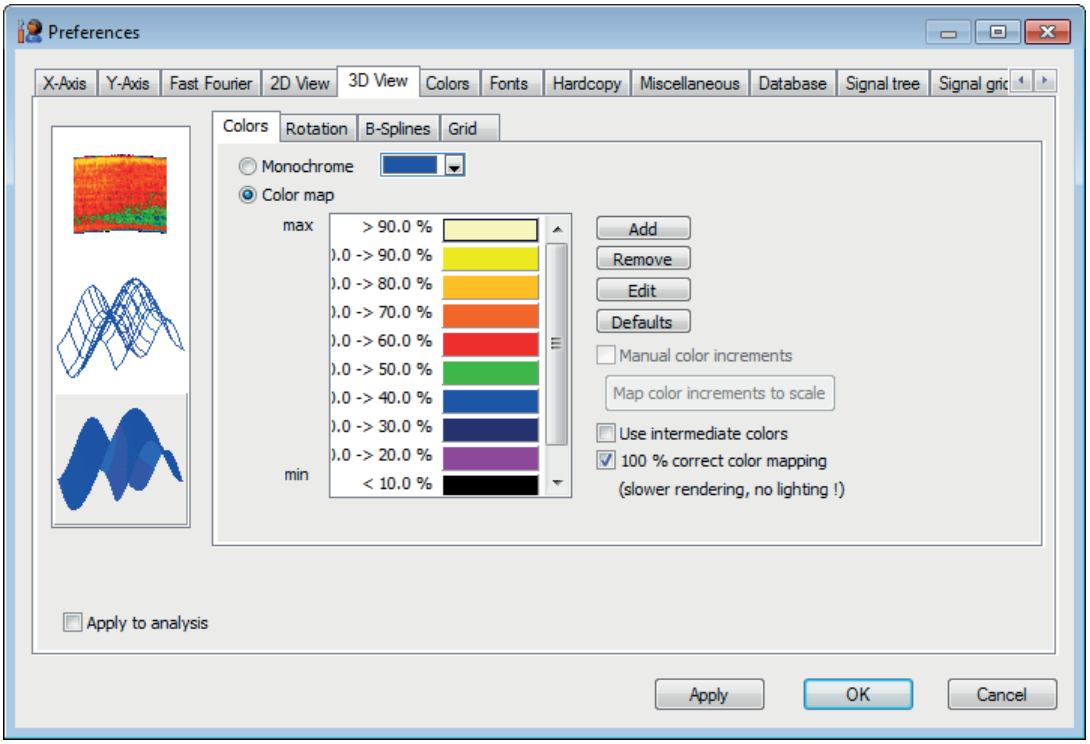


Fig. 38: 3D view settings

The mode of three-dimensional presentation can be configured in the setup dialog for the 3D view. The three variants to be generally distinguished are as follows:

- 2D top view, multi-color
- 3D surface view, monochrome or multi-color
- 3D wire frame presentation, monochrome or multi-color

For a detailed description of presentation settings and options, please refer to:

For this purpose, also see ↗ *2D top view*, page 135

For this purpose, also see ↗ *3D wire frame*, page 141

For this purpose, also see ↗ *3D surface*, page 144

5.6 Colors

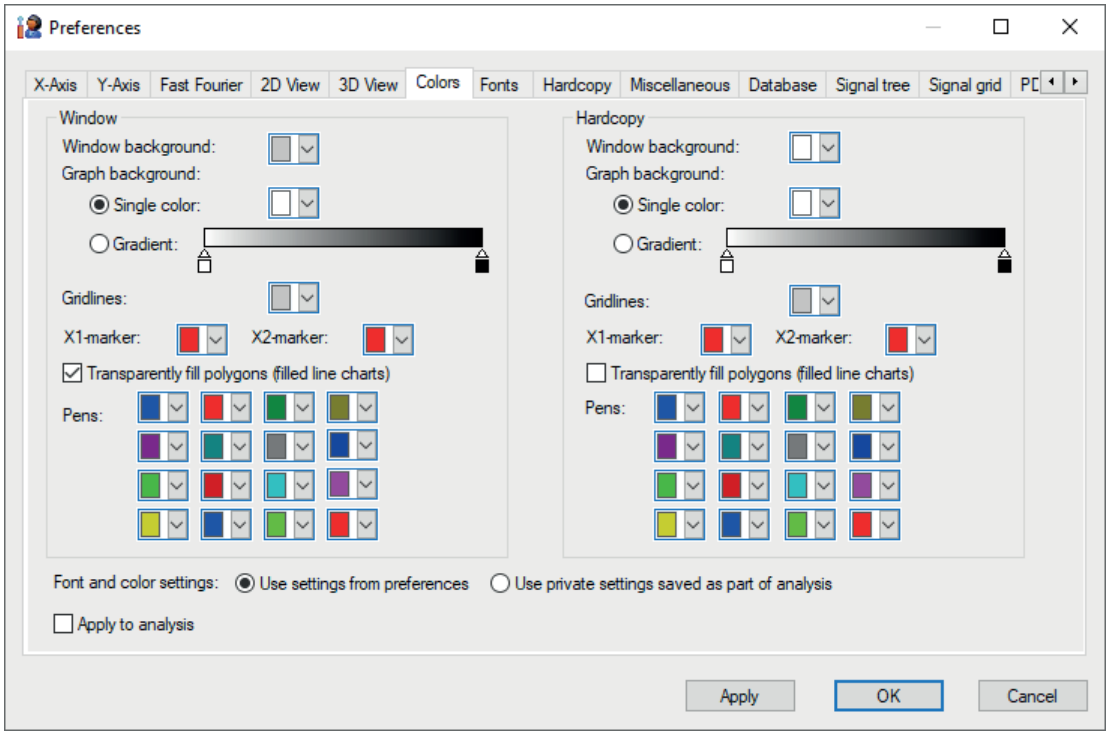


Fig. 39: Color settings

This dialog can be used to adjust the colors used for the user interface of the program and for the curves. The colors are presented in separate sections for the screen and for the hardcopy in order to enable optimizing the colors for the two different media. A dark background may be suitable for the screen, but would need too much ink for the hardcopy.

The pen colors define the 16 curve colors which are to be available during work with *ibaAnalyzer*. The program uses these 16 colors in order to automatically adjust the colors for the curves. The pen colors are also provided in the signal definition table in the signal table in the sequence shown here (line wise from the top to the bottom).

The background of the signal strips can be presented either with a non-varying color or with a gradient. If 'gradient' is activated, the gradients can be independently selected by double-clicking the rectangular boxes on the left and right-hand side of the color bar.

Moreover, the markers can be colored individually.

Tip

If you use *ibaAnalyzer* together with video recordings of *ibaCapture-CAM* or *–HMI*, the different colors of the markers make it easier to identify the video marker.

When activating the *Transparently fill polygons...* option, filled polygons are presented transparently, grid lines and signals overlapping each other remain visible.

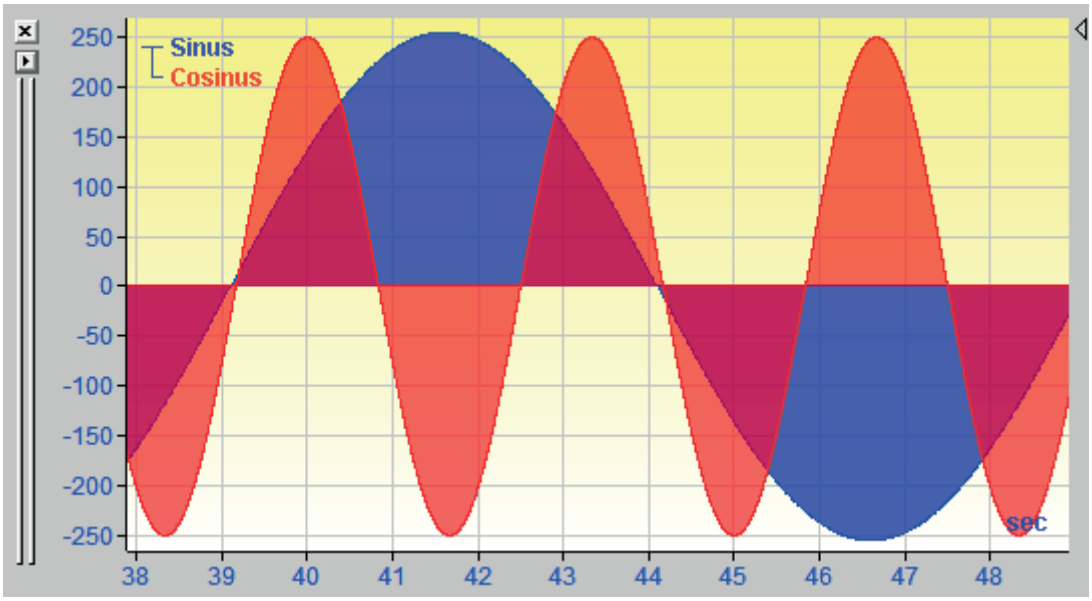


Fig. 40: Transparently filled polygon with gradient background

The choice for *Font and color settings* applies to both this tab and the *Fonts* tab. It determines whether the "Preferences" settings made here are to be used or the settings configured and saved in an analysis.

5.7 Fonts

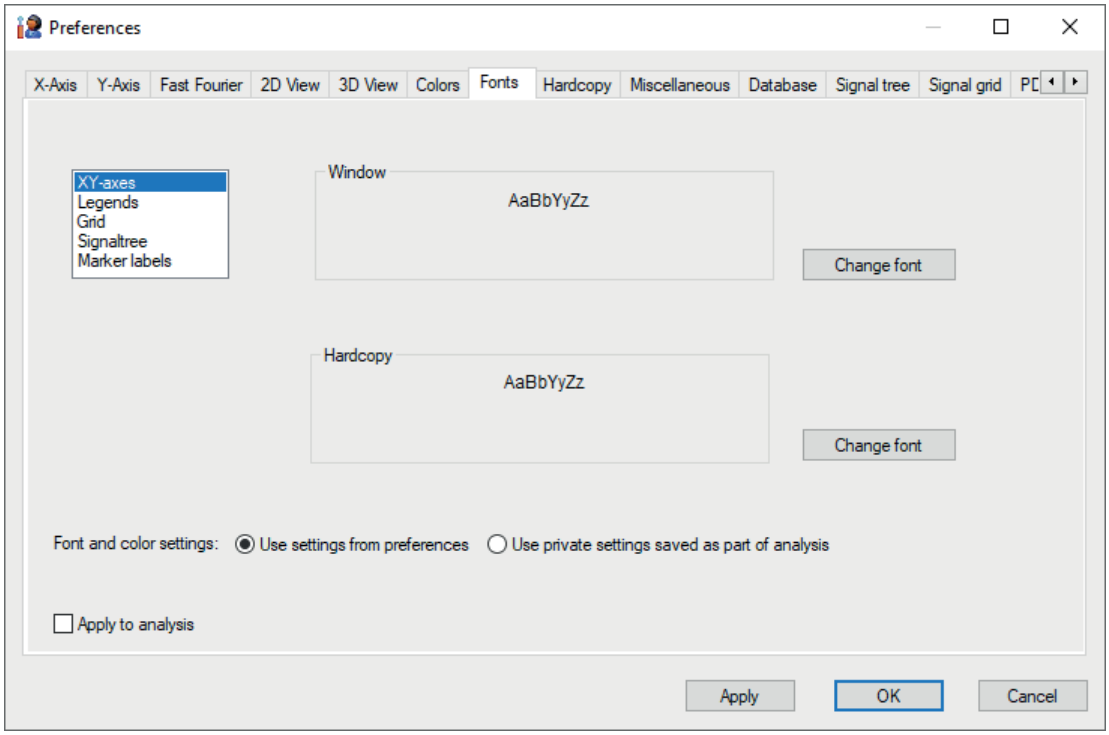


Fig. 41: Fonts settings

This setup dialog can be used to adjust the fonts for the screen display (windows) and for the hardcopy. All the fonts installed under Windows are available. Font, font size, color and style can be defined for four areas of the user interface.

In order to change a font, first click the desired area in the small window on the left, then click the <Change font> button and finally change the font.

If you change the font in the "Preferences", activate the "Apply to analysis" option before clicking <Apply> in order to see the changes in the current analysis.

5.8 Hardcopy

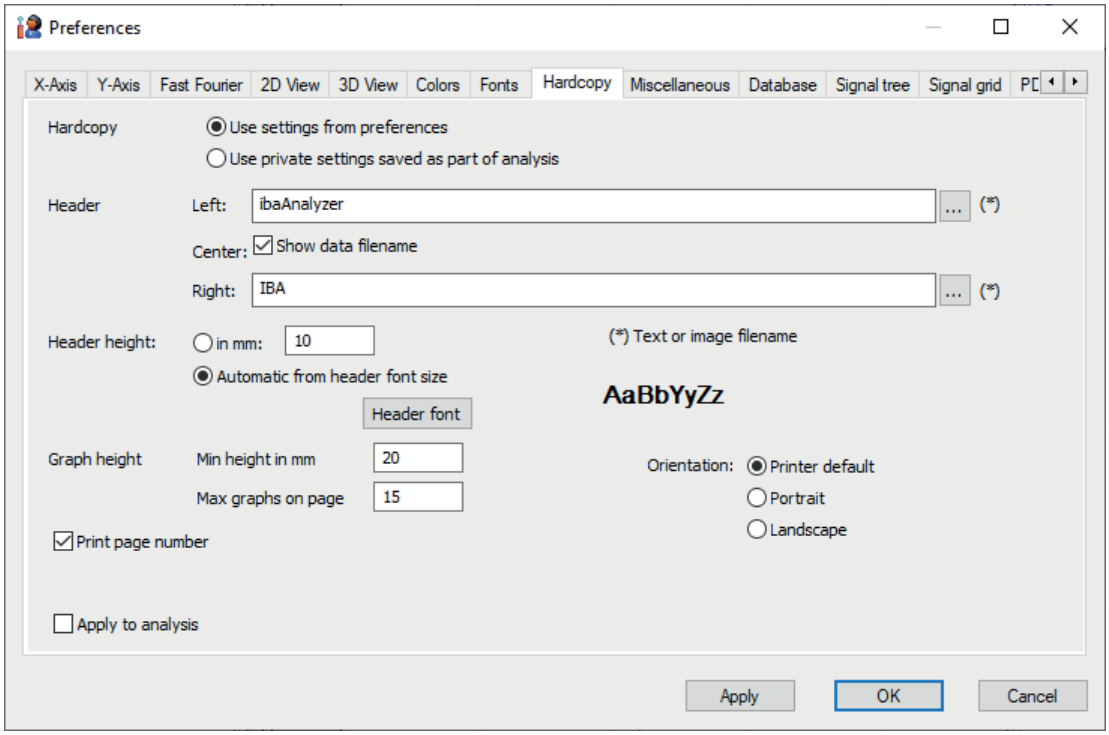


Fig. 42: Hardcopy settings

In the "Hardcopy" dialog window, you can define various attributes for a report/log hardcopy.

Hardcopy
Choose between the two options depending on whether you generally prefer to use the hardcopy settings as set in the preferences or rather the settings as stored in the analysis file(s).

Header
Three areas are provided for the head or top line of the subsequent expression: left, right and center.

In the corresponding input boxes, you can enter any self-defined text or integrate pictures, such as a company logo.

If you wish to use a picture file, you must enter the complete path and file name. Entry is facilitated by using the browser key. Pictures must be available in standard formats such as BMP, JPG, PNG etc.

Header height
The header height, i.e. the distance between the header bottom line and the upper page margin, can be adapted to your specific needs. If you choose the "Automatic from header font size" option for the header height, this will be adapted to the font height chosen or to the picture to

be integrated. If you choose the "in mm" option and enter a value in the input box, this value will then determine the header height.

When a picture is integrated into the header line, the program automatically adjusts the picture dimensions to the previously selected header height. If the picture becomes too small, you will have to increase the header height.

Header font selection button
By means of this button, you can determine the font to be used in the top line.

Graph height
The graph height values refer to the rendering of the signal strips (graphs) on the hardcopy. The hardcopy function prints the current view of *ibaAnalyzer*, i.e. the curves and the current tab of the signal table. If many signal strips were opened, *ibaAnalyzer* tries to print as many of them as possible on the first page which may affect the readability. You can avoid this by entering at this point a minimum height for the strips and a maximum number of strips per page.

Finally, you can also choose the paper orientation and enable / disable the printing of page numbers.

Orientation
For printout, you can specify the paper orientation (portrait and landscape format) or print according to the default settings of the printer.

5.9 Miscellaneous

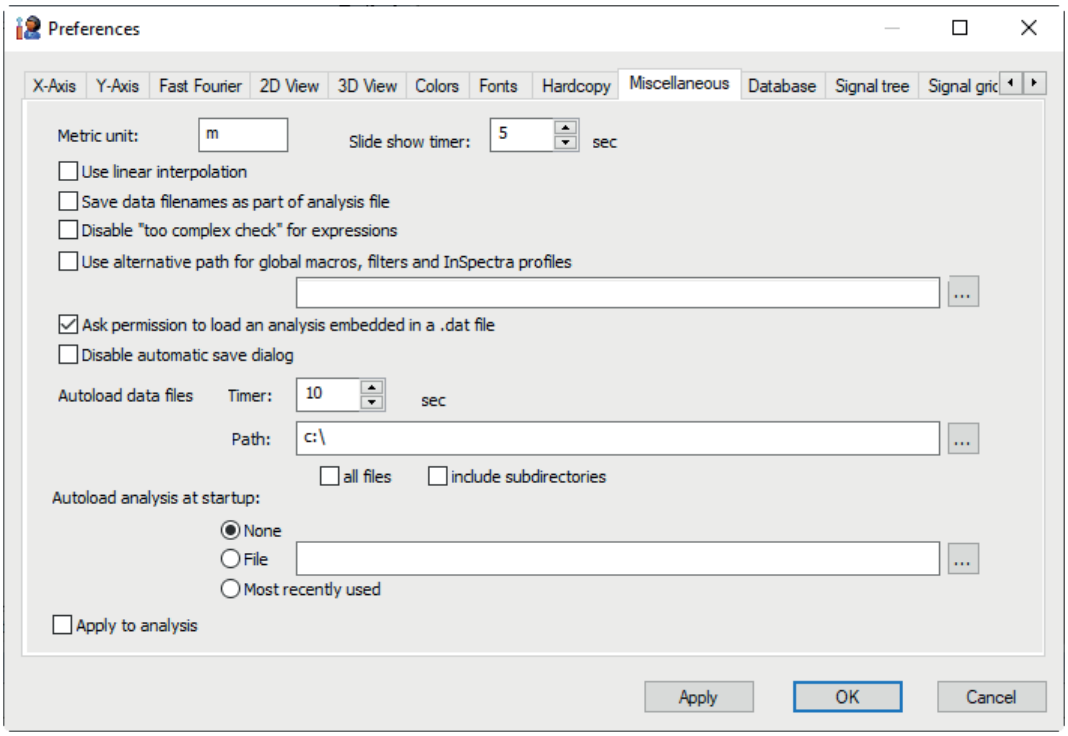


Fig. 43: Miscellaneous settings

Metric unit
In this input box, you can enter the unit for the length axis for length-related presentation, such as m, km, inch, mls. This is just a plain-text entry used for captioning the X axis with a length-re-

lated presentation of a signal strip. This entry has no influence on the calculation of the expressions in the analysis! In the case of systems other than the metric system – for example, when using British or US units – the appropriate conversion factors must be considered when programming the expressions.

Slide show timer
In this input box, you can enter a time value (in seconds) which determines the change in data files (of a group) in conjunction with the "Slideshow" function (see also ↗ *Slide show*, page 29).

Use linear interpolation
With this option you can enable an additional linear interpolation for the representation of curves. This can be useful if two curves are added with different time bases which can be the case, for example, after a database query. Without using a linear interpolation the resulting curve may look somehow confusing (see picture below, blue curve). With the help of the linear interpolation, the samples of the resulting curve are linked in the expected shape (see below, red curve).

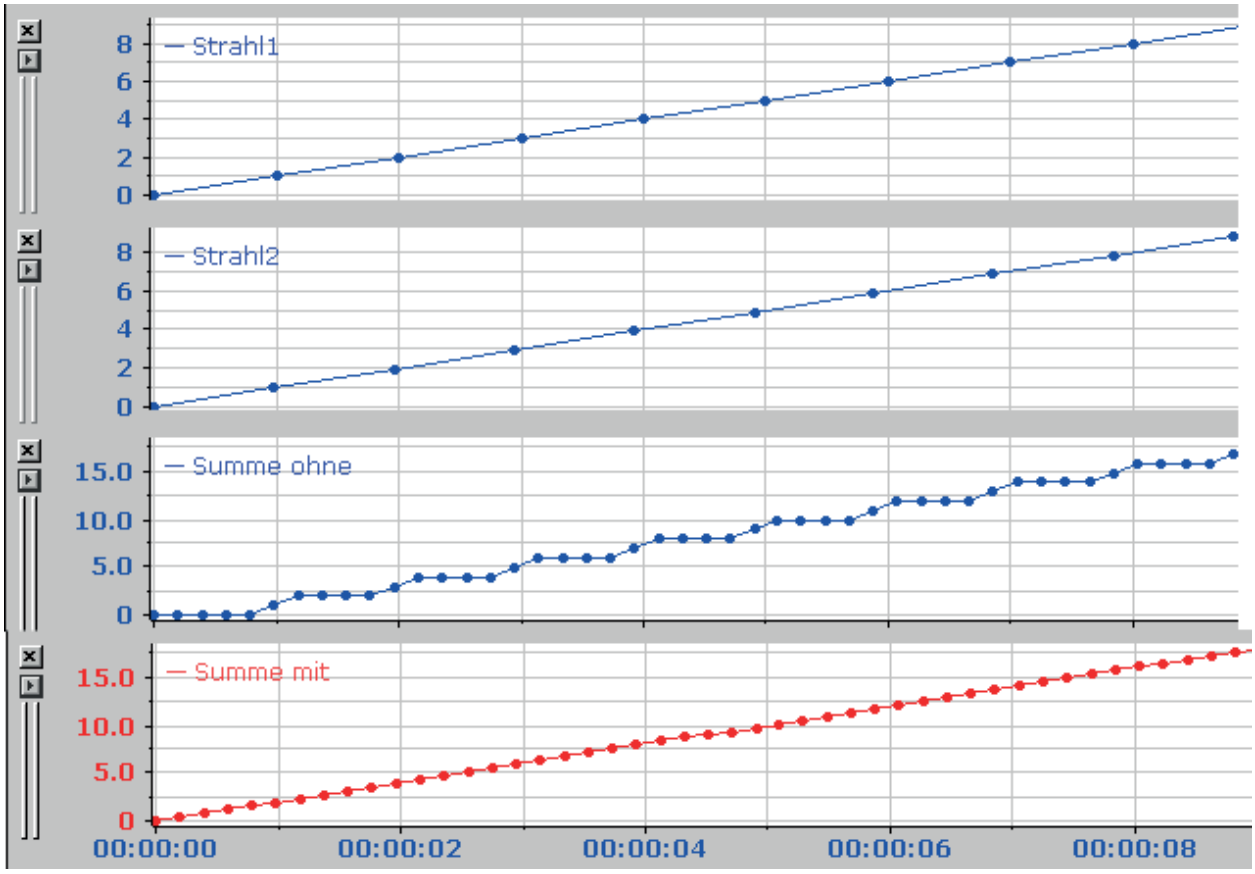


Fig. 44: Example for the result using linear interpolation

Save data filenames as part of analysis file
In order to enable an analysis to directly access one or more specific data file(s) at a later time, the name of such data file(s) can be saved in the analysis. The names of the data files saved are those which are opened at the time of saving.

This process only creates a reference to the file name. The data file itself is not saved during this process. If the analysis with the data measured is to be used on another PC, for example, after transmission by e-mail, the pertinent data file must also be copied and sent.

This option can also be selected in the "*Save analysis as*" dialog.

Disable “too complex check” for expressions
There is a factory-set limit for calculating expressions to prevent all system resources being completely used for the calculation and the computer being no longer usable. This could be the case, for example, if signals with a lot of samples (> 10 mio.) are used for comprehensive calculations. If *ibaAnalyzer* considers an expression "too complex", the result signal strip remains empty and the diagnostics (mouse click on the ? symbol in the field of the expression in the signal table) shows a smiley with crossed eyes.

If you want to avoid this limit, enable the option.

Note

Functions such as “resample,“ “margin“ and “time“ can also lead to exhaustion of the resources if parameters being too large are indicated. There is also a limit for these functions, however, it cannot be disabled.

Use alternative path for global macros, filters and InSpectra profiles
If global macros and/or filters are used in an analysis, it can happen that they do not work anymore, e.g., after opening the analysis in another environment than that of their original configuration.

This might be the case, for example, if analyses and data were sent via e-mail for reasons of support or diagnostics and are to be analyzed in another environment on another computer. The receiver stores global macros and filters on another path.

By enabling this option and indicating the new path at this point, global macros and filters are automatically found.

Ask permission to load an analysis embedded in a .dat file
If you enable this option, then you will be asked when opening data files whether (if present) the analysis embedded in the data file should also be loaded. If you disable this option, then a data file with an embedded analysis will be opened immediately and the analysis will be loaded.

Disable automatic save dialog
By default, you are requested to save the analysis if you try to close *ibaAnalyzer* itself or try to close the current analysis (e.g. by loading a new one) in case you have changed it. If you enable this option the save dialog will be suppressed. If you then close *ibaAnalyzer* or load a new analysis all changes of the current analysis will get lost.

Autoload data files, timer
In this box, you will have to enter an appropriate time value in [s] if *ibaAnalyzer* is to analyze a data file in online mode. The data file which is currently being written by *ibaPDA* is then reloaded at this interval, so that new data generated in the meantime will be included in the analysis.

Autoload data files, Path
In order to enable the automatic detection of open data files, enter in this box the name of the path in which *ibaPDA* stores the data files. If you click the symbol key during operation, *ibaAnalyzer* will search for an open data file in this specified path (online mode).

All files
This option applies to the case that several files are opened at a time in *ibaAnalyzer* which are written simultaneously by one *ibaPDA* system, different *ibaPDA* systems and / or other systems, e. g. ibaLogic. If you do not select this option, only the first data file (on top in the signal tree) will be reloaded automatically.

Including subdirectories
This option should be chosen if the file system of *ibaPDA* is organized in such a manner that further subdirectories – for example, per hour or per day – are created under the above-mentioned path.

Autoload analysis at startup
This option should be used if you prefer a certain analysis being executed when starting *ibaAnalyzer*. Click *File* and enter the path and file name of the requested analysis into the box next to it or use the browser function. Or check *most recently used* if you prefer to start with the analysis most recently used.

5.10 Database

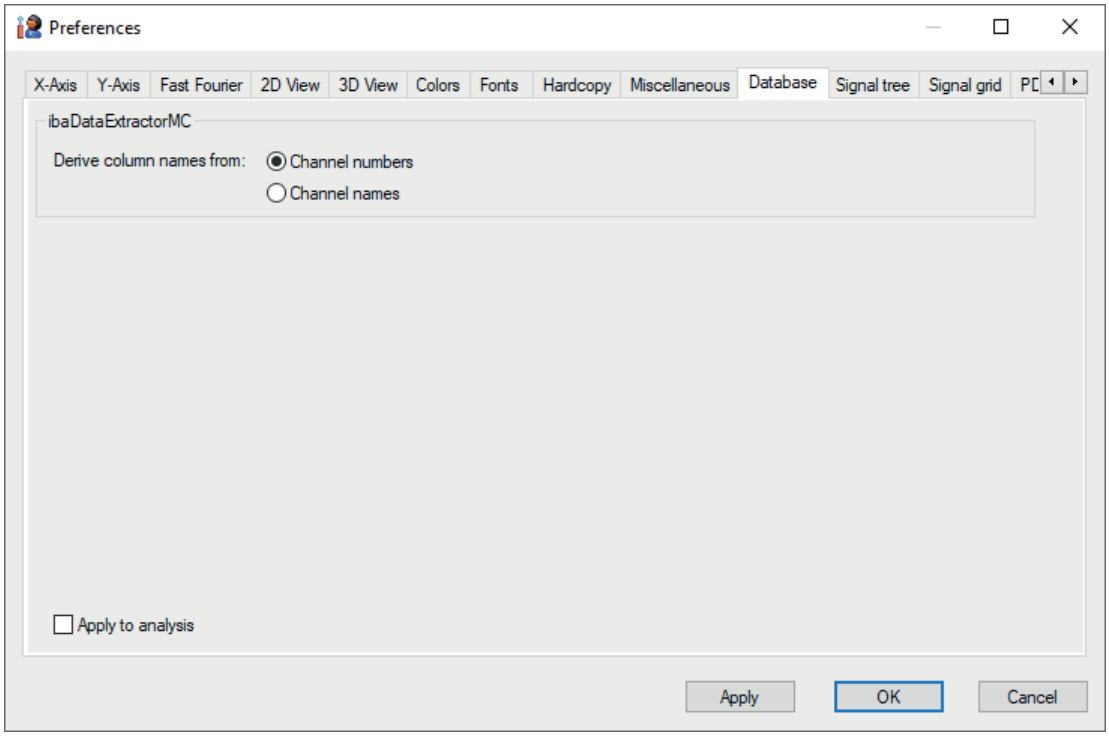


Fig. 45: Database settings

The *Database* tab applies to database extraction (ibaAnalyzer-DB) only. Provided you are using the ibaDataExtractor MultiColumn (MC) format, you can choose whether column names in the database tables will be derived from the channel numbers ([module:channel]) or the channel names (signal names).

5.11 Signal tree

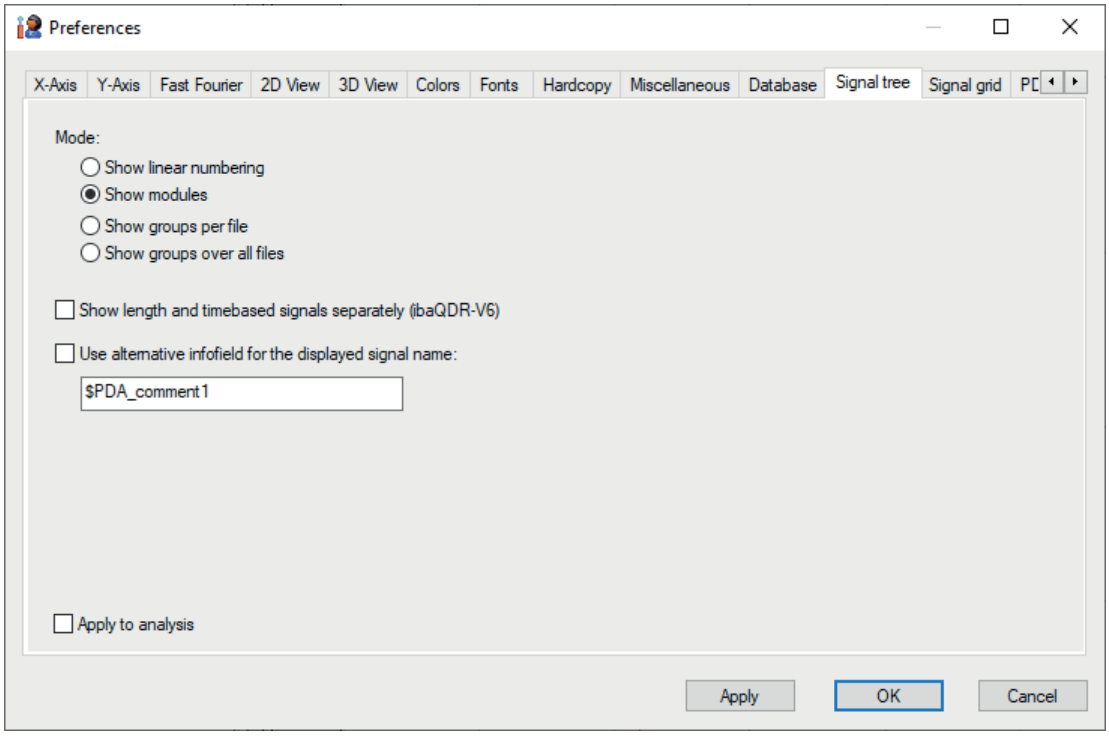


Fig. 46: Signal tree settings

You can use these settings in order to decide how the signals are to be normally displayed in the signal tree after the start of *ibaAnalyzer*. You can also make this selection at any time from the context menu in the signal tree window.

- *Show linear numbering*:
  All the signals of a data file are listed consecutively without the module names. All that remains is the change in analog and digital signals. The linear numbering option should be used if many signals of the same type and belonging to the same technological process units cover several modules, such as the 72 measuring zone values of a flatness measuring roll. This is an advantage for creating arrays (logical signal definitions) for the presentation of profiles.
- *Show modules*:
  In this case, the signals are shown in the module structure defined in *ibaPDA*, so that the arrangement of the signals reflects the technological structure.
- *Show groups per file / ...over all files*:
  These display options allow to show signals in a group-structured manner if a signal-group-assignment has been stored in the data file. "Show groups per file" displays the data files as the topmost structure level in the signal tree window, with the pertinent signal groups being displayed below. "Show groups over all files" displays the signal groups on the topmost structure level in the signal tree window.

Show length and time-based signals separately (ibaQDR-V6)
ibaQDR-V6 enables you to store measured values in the product file both length-based and time-based when storing data.

Usually, the signals of such an *ibaQDR* file are listed only once in the *ibaAnalyzer* signal tree. To show a signal on the length or time scale, select the corresponding type of presentation in the recorder window.

If you enable this option, all signals existing in the data file with length and time reference, incl. measuring point and module, are listed twice in the signal tree.

Use alternative infofield for the displayed signal name

There are signal-specific info fields for every measured signal filled with information depending on the configuration in the *ibaPDA* or *ibaQDR* system. Only if the corresponding information was configured, the info fields will be available also in the signal tree of the data file. The following figure shows an example of a signal for which the comment fields 1 and 2 were also used.

The corresponding info fields are called $PDA_comment1 and $PDA_comment2.

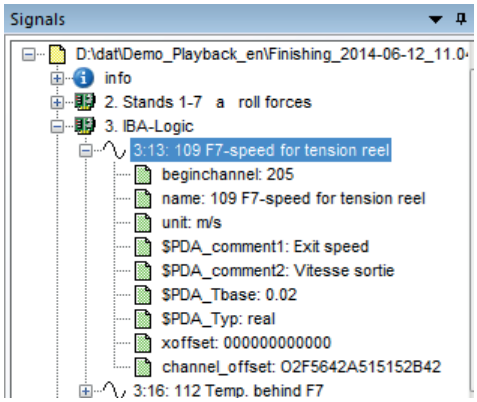


Fig. 47: Signal with different info fields

If the original signal name is not understandable or, for example, a different language (2nd comment) is desired, its content can be displayed in the signal tree instead of the signal name by enabling this option and specifying the desired info field.

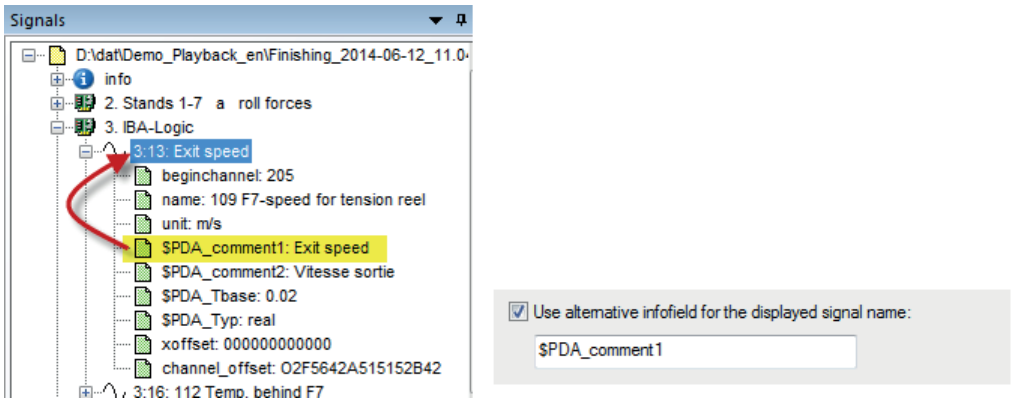


Fig. 48: Using the $PDA_comment1 info field as signal name in the signal tree

Note

This setting only changes the display name of the signals as it is used in the signal tree and in the legend of the signal strips. You do **not** change the signal reference as it is, for example, used in expressions!

You can change the signal reference using the preferences, “Signal grid” tab.

5.12 Signal grid

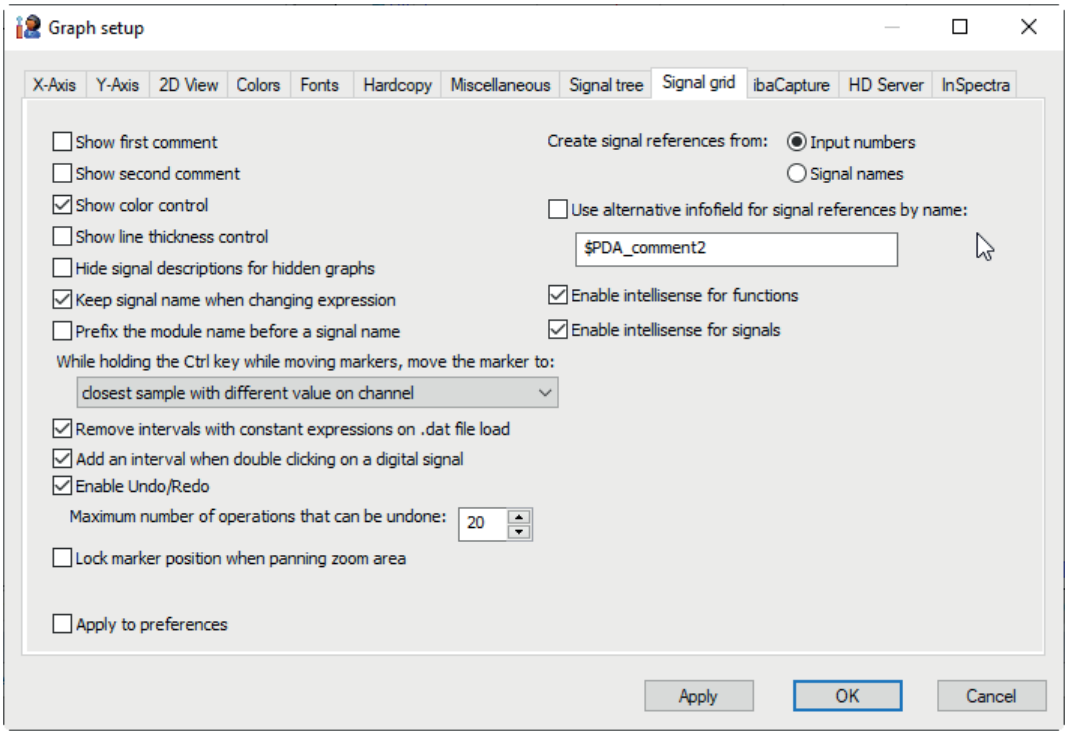


Fig. 49: Signal table settings (signal grid)

This dialog offers multiple settings for configuration of the signal table (signal grid).

Show first / second comment
ibaPDA usually offers the possibility to enter up to two comments for each signal, e. g. for multilingual remarks. The comments are also included in the data files and thus can be displayed in the signal grid of *ibaAnalyzer*. Enable or disable if required.

Show color control / ...line thickness control
Enable or disable if required.

Hide signal descriptions for hidden graphs
Enable this option if you want to hide signal table rows of signals in hidden signal strips in order to save space and improve clarity.

Keep signal name when changing expression.
Enable this option if you want to avoid that changes in the expression column are automatically taken for signal name.

Disable this option if you want to make sure that the signal name always equals the contents in the expression column.

Create signal references from
Here, you can decide whether the unambiguous module/channel name or the signal name (plain text) is to be used as the signal identifier in the table of signal definitions (signal table), according your preference. Although the plain-text version may be easier to understand and clearer, you as the user must ensure to define unambiguous signal names in order to avoid mixing up.

Use alternative infofield for signal reference by name
Select this option if e.g. comment 2 of the signal is to be used as reference instead of the original signal name. In this case, enter "$PDA_comment2" in the input box below. A prerequisite is that the signal comments were already configured in *ibaPDA* and/or *ibaQDR* and that they are saved in the data file.

By default, the first comment field *$PDA_comment1* is recommended for an alternative display name (see chapter ↗ *Signal tree*, page 82) and *$PDA_comment2* for an alternative signal reference. Of course, however, you may also enter any other channel info field.

Enable intellisense for functions / ... for signals
Here, you can activate or deactivate the intellisense function.

The intellisense feature can be helpful for entering expressions and signals, e.g. into the signal or marker definition tables. When typing expressions in the signal definition table or the expression builder, a pop-up window appears allowing you to complete the expression without fully typing it. For example, you only have to type the first letter of a mathematical expression to get a pop-up window with a list of all functions beginning with this letter. Or you enter *[* and a list of the available signals appears. Further selection is carried out by means of the cursor or the mouse and the selected function / signal is added to the expression with <Enter> or one mouse click.

Prefix the module name before the signal name
With this option, the name of the module is displayed in the signal strip and the signal table in addition to the actual signal. This applies to signals being opened from the signal or analysis tree as well as from the search dialog. By selecting one out of these options you determine how the markers behave when moving along the X-axis.

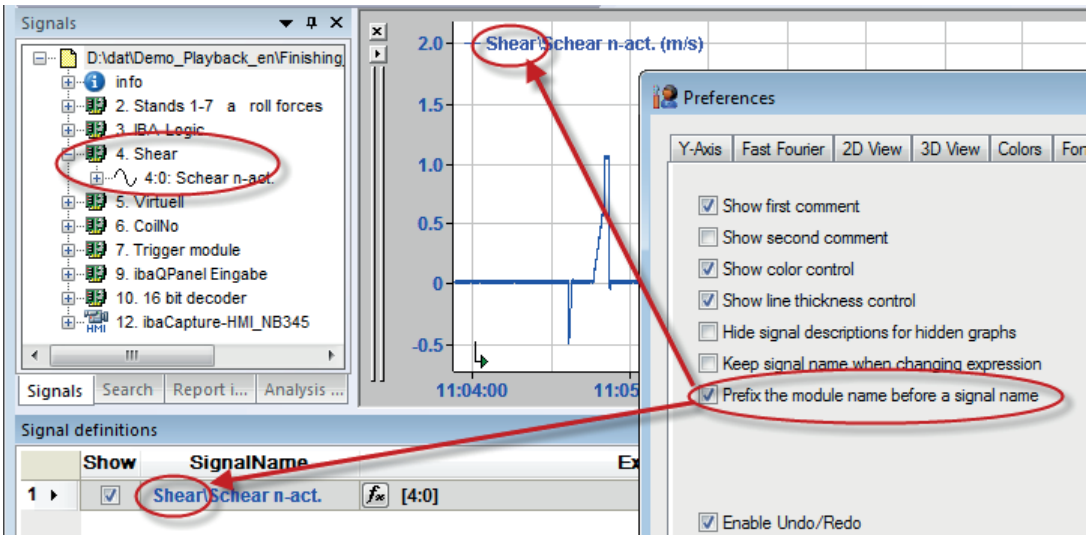


Fig. 50: Setting for displaying the module name in the signal table and legend

While holding the <Ctrl> key while moving markers, move the marker to...
When you only hold the mouse key down, you can move the marker “variably.” When you only press the <Ctrl> key, then the marker jumps from sample to sample.

By selecting one of these options, you determine the samples for which the marker engages.

Remove intervals with constant expressions on .dat file load
If you enable this option, only the intervals whose start and/or stop expression is based on a dynamic calculation remain when loading a data file.

Add an interval when double clicking on a digital signal
If you enable this option, double clicking on the signal again leads to the removal of the interval.

Enable Undo / Redo
Under *Edit* in the main menu, you may use the undo / redo commands in order to undo or redo the most recent editing actions. Please enter the maximum number of actions to be taken into consideration in the field below.

Limiting the number or even disabling the function can make sense if many actions are to be carried out over a long period without occasionally closing ibaAnalyzer. Since every saved action uses RAM capacity, it may result in a slowdown of other ibaAnalyzer activities in the most unfavorable case, as not enough memory is available anymore. In order to benefit from this function nonetheless, it is recommended enabling the function and limiting the number of operations to 10 to 20.

Lock marker position when panning zoom area
If you enable this option, the position of the marker(s) relative to the zoom area will be fixed. Thus, the markers remain at the same position within the zoom area even when you are panning along the X-axis, e.g. by scrolling the X-axis with the middle mouse button or shifting the frame in the navigator pane.

5.13 PDO database storage

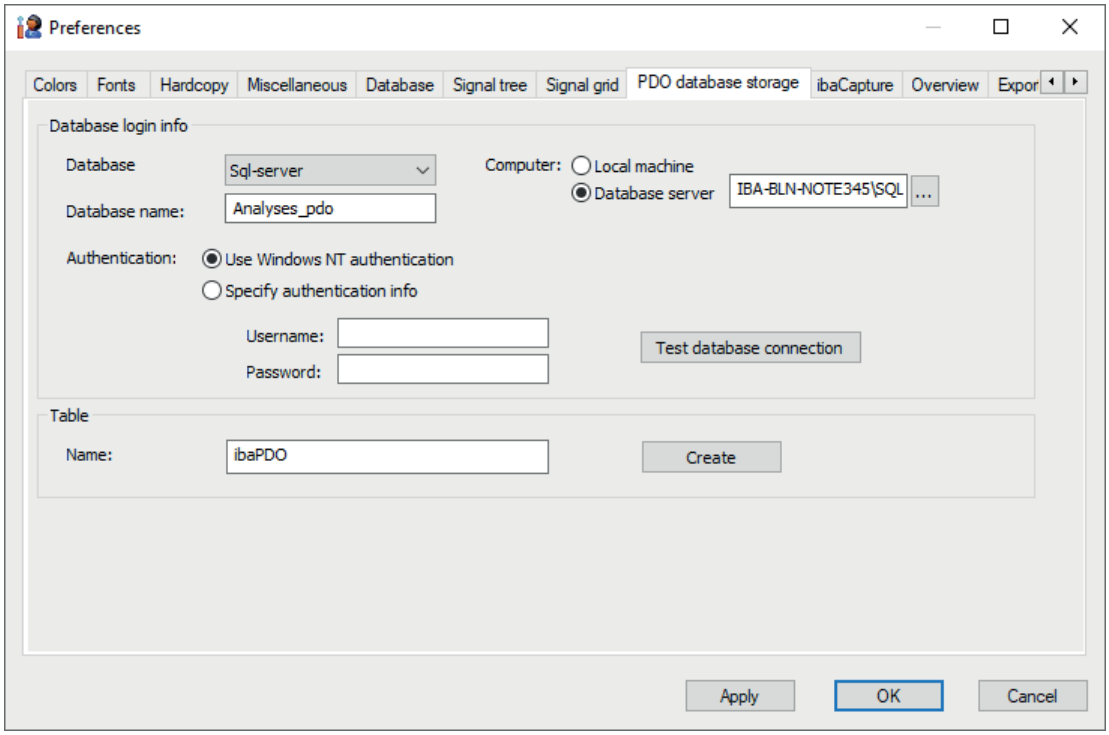


Fig. 51: PDO database settings for analyses

If you use a lot of analyses (*.pdo files) and you do not want to store and manage them in a file system, you are also able to store them in a database. This dialog is used for configuration of the database connection and creation of the database table. The settings in this dialog are completely independent from the database settings for extraction and query of measured data (*ibaAnalyzer*-DB). Saving the analyses to the database will be done in the *File* menu.

Database System and Name
Select the database type from the combo box, i. e. choose between SQL, Oracle, DB2-UDB or ODBC. Then enter a name of the database into the corresponding field.

Computer
Select the computer which is the database server. If it is the local computer, the same where *ibaAnalyzer* is used, then click the “Local machine” radio button. If the database server is a remote computer in the network, click the “Database server” radio button and enter the computer name and the name of the database server in the field next to it (e.g. MYCOMPUTER\SQLEXPRESS). You may use the button ... to browse the network.

Authentication
Choose how the *ibaAnalyzer*-PC should login on the database. You could use either the current user login (which has been used for *ibaAnalyzer* itself) or another user login which had been created specifically for using the database. In the latter case, you should enter the login information for username and password.

<Test database connection> button
At any time you may test the database connection by clicking on this button, i.e. whether your entries and settings are correct and the network access is working.

Table

The analyses are stored in a table inside the database. You can enter a name for the table in the corresponding field (overwrite the default name) and let create the table in the database by clicking the <Create> button.

Note that the system always creates an empty table when clicking the button. Existing tables with the same name will be overwritten.

5.14 ibaCapture

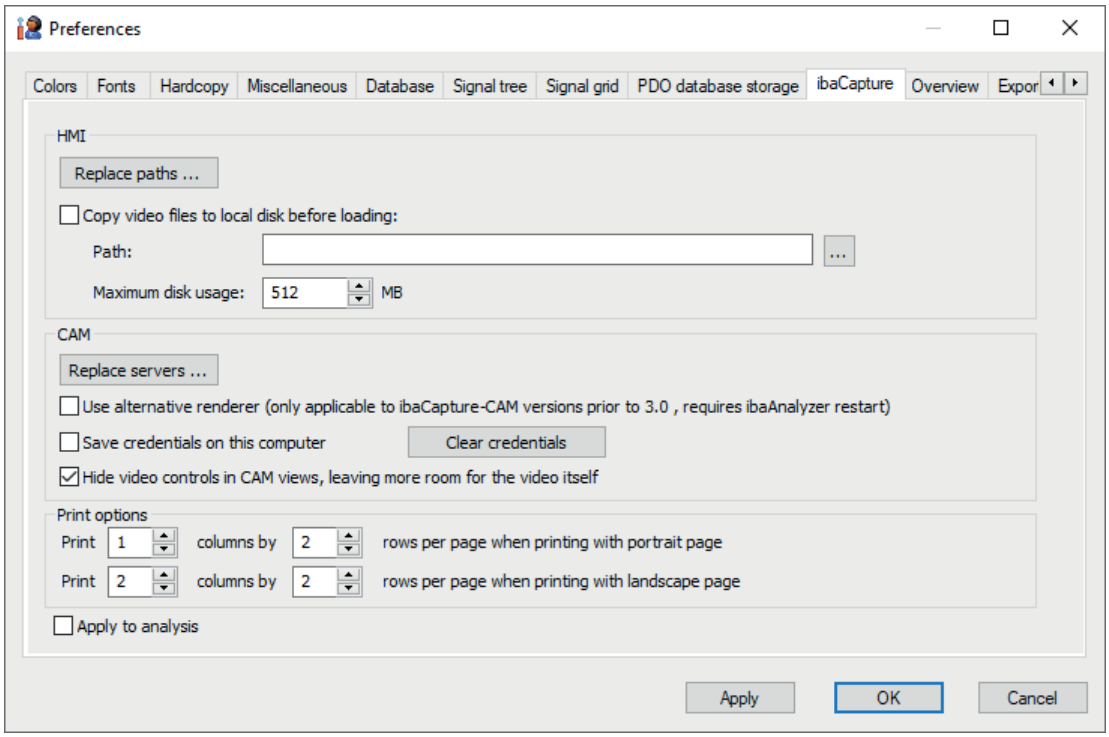


Fig. 52: ibaCapture application settings

ibaCapture is a complete system consisting of hardware and software for the time-synchronous recording of measured values and visual information on the basis of *ibaPDA*. With *ibaQDR*, both time and length-synchronous recording of videos is possible.

ibaCapture-HMI was a system for synchronous recording of graphic screen content of HMI stations combined with measured values from *ibaPDA*. The HMI recording has now been integrated in ibaCapture as a virtual camera. For reasons of downward compatibility, settings for old *ibaCapture-HMI* records are still available here.

ibaCapture (formerly *ibaCapture-CAM*) permits the synchronous recording of animated video recordings and measured value from *ibaPDA*.The intention of the application is to record specific processes and process results in a target-oriented manner and not so much to generally monitor processes as it is realized with conventional video equipment.

In the *ibaCapture* tab, settings can be made being relevant to data files which also include *ibaCapture* modules.

The particular (HMI, CAM) visual information is stored in separate video files. The storage location (computer, network drive, folder etc.) is to be configured in the *ibaCapture* module in

ibaPDA and thus included as UNC path in the data file. The video recordings can be watched together with the measured data in *ibaAnalyzer*.

If you open an *ibaCapture* module in *ibaAnalyzer*, the corresponding video file is usually loaded with reference to the path information in the data file. However, you may change this behavior (replace path or server).

HMI:

Button <Replace paths...>
Clicking on this button opens a dialog in which you can adjust the path for storing the movie files if the movie files are generally stored in a different location than where they were initially stored by *ibaCapture*. For example, if you have copied the video files manually to another drive or computer.

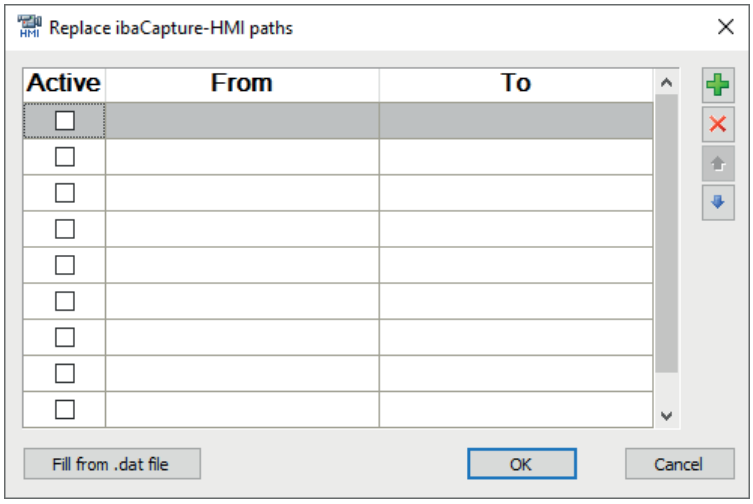


Fig. 53: Configuration dialog for the replacement paths of ibaCapture HMI movie files

In the *From* column, enter the original path (as noted in the data file) and in the *To* column enter the new path where the files are actually located.

If you have loaded a data file and the cursor is in the *From* column, then you can read out the original path with the button <Fill from .dat file> and have it entered in the table.

In the *Active* column, you can indicate which redirections are to be used.

If necessary, you can add rows, delete them or change their order using the buttons on the right edge.

Copy video files to local disk before loading:
Enable this option if you want to play the video files on the local drive. In this way, you can play videos faster and more fluidly and reduce the network load. *ibaAnalyzer* then first creates a copy of the movie file to be watched on the local hard disk in the directory which had been specified by you in the *Path* field. In order to prevent the local hard disk being filled up with video files, you should set a limit of disk space for the video files. If the limit of this space is about to be reached, the oldest video files will be deleted and overwritten.

You may enable both options in combination.

CAM:

Button <Replace server...>
Clicking on this button opens a dialog in which you can customize the name of the server where the video data is located.

For video playback, *ibaAnalyzer* and/or the integrated *ibaCapture* player must have a connection to the *ibaCapture* server where the videos are stored (except for exported dat files with embedded videos). For this purpose, the default settings use the server name which is stored in the data file. If, in the meantime, the name of the *ibaCapture* server has been changed or the video data has been transferred to another server, this option can refer to the new hostname. The videos will then be loaded from the selected server. Also on the new server, the *ibaCapture* server service has to run to be able to play the videos.

The use of the dialog occurs accordingly as with HMI (see above).

Use alternative renderer (only applicable to ibaCapture versions prior to 3.0...):
If you work with Windows 7 operating system and you are still using *ibaCapture*-CAM <v.03, it is recommended enabling the check box to use the Windows graphic library for the screen layout. If you want to use the default mode (usage of the preinstalled iba renderer), maintain the default settings.

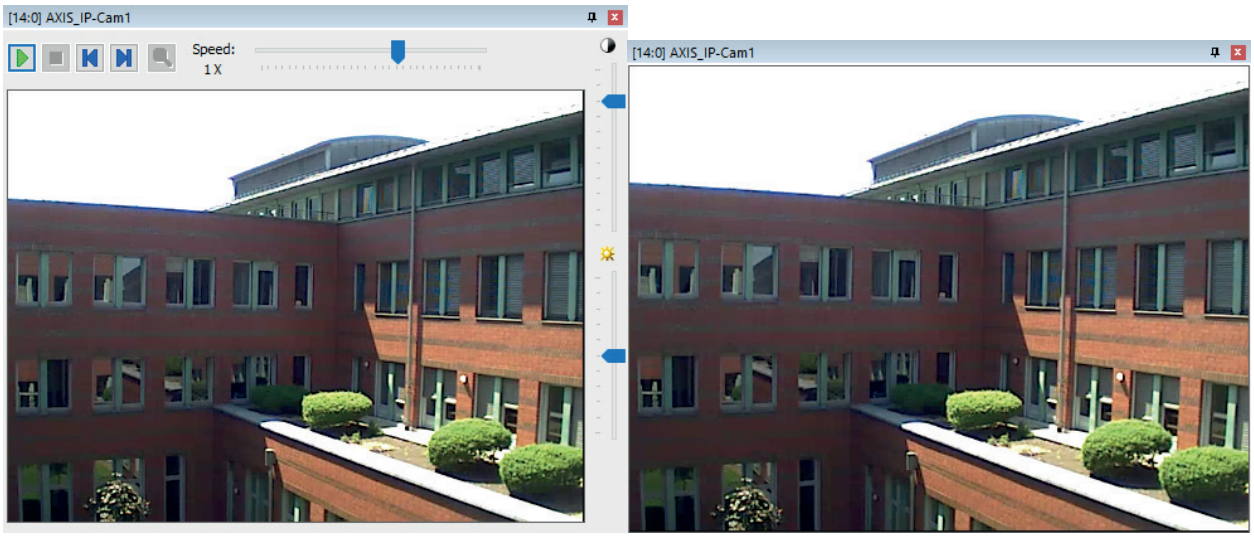
If this option is enabled, *ibaAnalyzer* must be restarted.

Save credentials on this computer
If the user management was enabled in *ibaCapture* and the rights were limited with regard to video viewing, a user has to log in entering his user name and password when opening a camera channel in *ibaAnalyzer.* If this user is not authorized to view videos, no videos will be displayed. This registration is required once per *ibaAnalyzer* session.

If you enable this option, the login information is stored on your local computer; after a restart of *ibaAnalyzer*, it is not required to log in again.

With the <Clear credentials> button, you can remove this information from the computer.

Hide video controls in CAM views, leaving more room for the video itself



With control elements Without control elements

Print options

With these settings, you determine how video images are to be printed if you use the print function in the *File* menu.

The number of columns determines how many images are to be printed side by side on one page. The images are scaled accordingly.

The number of rows determines how many images are to be printed one below the other on one page.

For printing in the portrait and landscape format, these settings can be made separately.

The settings apply to video images of *ibaCapture-CAM* and *ibaCapture-HMI*.

To activate the settings with an analysis being currently open, enable the "Apply to analysis" option and click <OK>.

You can control your settings under menu *File – Print preview*.

5.15 Overview

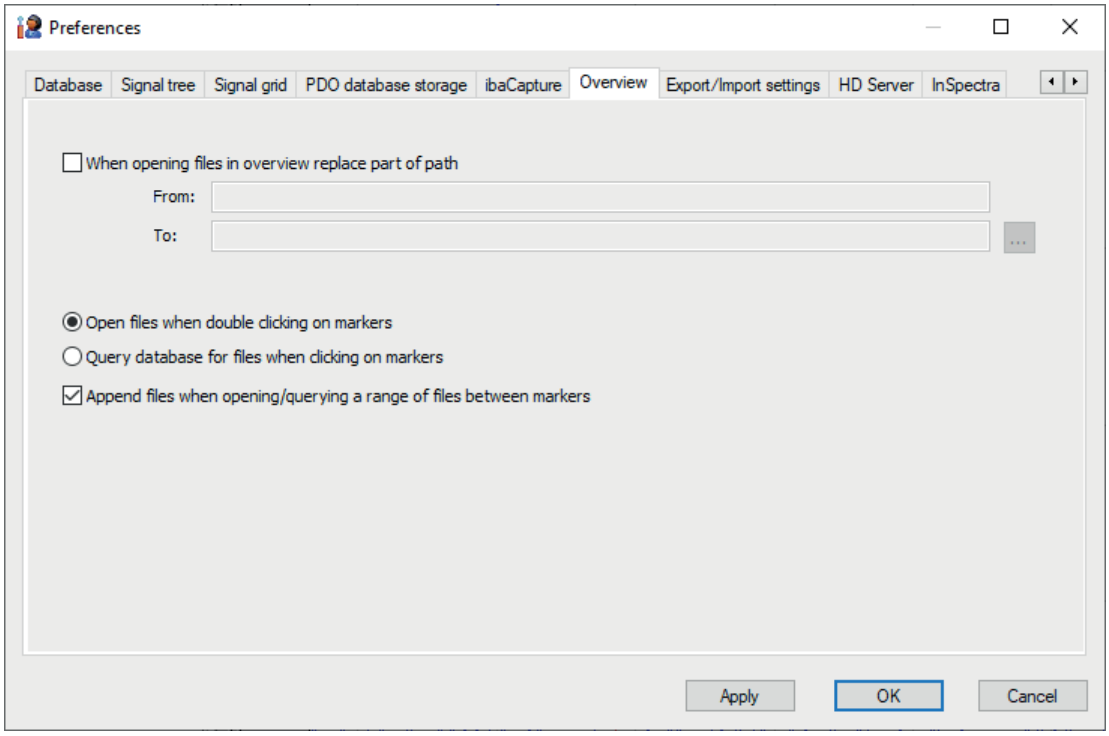


Fig. 54: Overview settings for trend query

The settings in the *Overview* tab refer to a specific form of database trend query. The result of this query is presented in the *Overview* view in the area of the signal table.

For detailed information, please refer to the *ibaAnalyzer-DB* manual.

5.16 Export/import settings

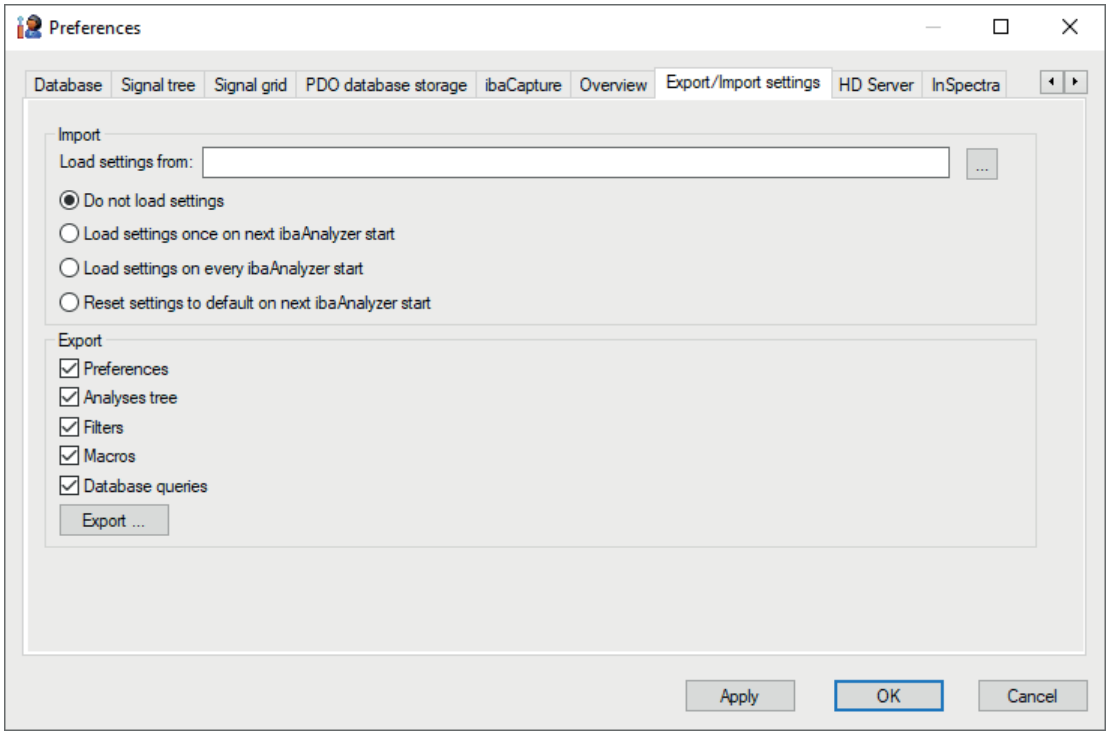


Fig. 55: Settings for import/export of preferences, filters, macros, etc.

By means of this dialog, existing settings can be imported and/or exported. If preferences are exported, they will be exported to a *.zip file which can then be extracted.

Import
If you wish to import settings, there are different options available. The pertinent file can be selected either by making an entry or by means of the browser button. Furthermore, you may select the following options:

- Do not load settings:
  Do not load settings when starting *ibaAnalyzer*.
- Load settings once on next *ibaAnalyzer* start:
  When starting *ibaAnalyzer* the next time, the preferences are loaded from the *.zip file once.
- Load settings on every *ibaAnalyzer* start:
  When enabling this function, the preferences will be loaded every time *ibaAnalyzer* is started.
- Reset settings to default on next *ibaAnalyzer* start:
  If *ibaAnalyzer* is started again, the settings from the initial installation will be loaded.

Note

No matter which option is selected, it is only carried out after re-starting *ibaAnalyzer*.

Export
If the settings are to be saved, use the <Export...> button. After clicking on this button, you can name the *.zip file and determine the file path. By checking the corresponding boxes, you can choose which settings are to be exported:

- Preferences:
  All settings are exported which are not listed separately.
- Analyses tree:
  The settings are saved which were made in the *Analysis files* tab in the signal tree window. Irrespective of this export mode, these settings can be exported and/or imported in the signal tree by right-clicking.
- Filters:
  All filters marked "global" are exported (see ↗ *Dialog window of the filter editor*, page 184)
- Macros:
  All macros marked "global" are exported (see ↗ *Import and export macros*, page 180)
- Database queries:
  All settings made in the query builder or in the query dialog are exported. The import and export functions are also available in the query dialog.

Note

In addition to export/import, all global filters or macros are copied from and/or to the *ibaAnalyzer* master directory, e. g.:

```
C:\Documents and Settings\user name\Application Data\
iba\ibaAnalyzer
```

Macro files are *.mcr files and filter files are *.fil files.

5.17 HD Server

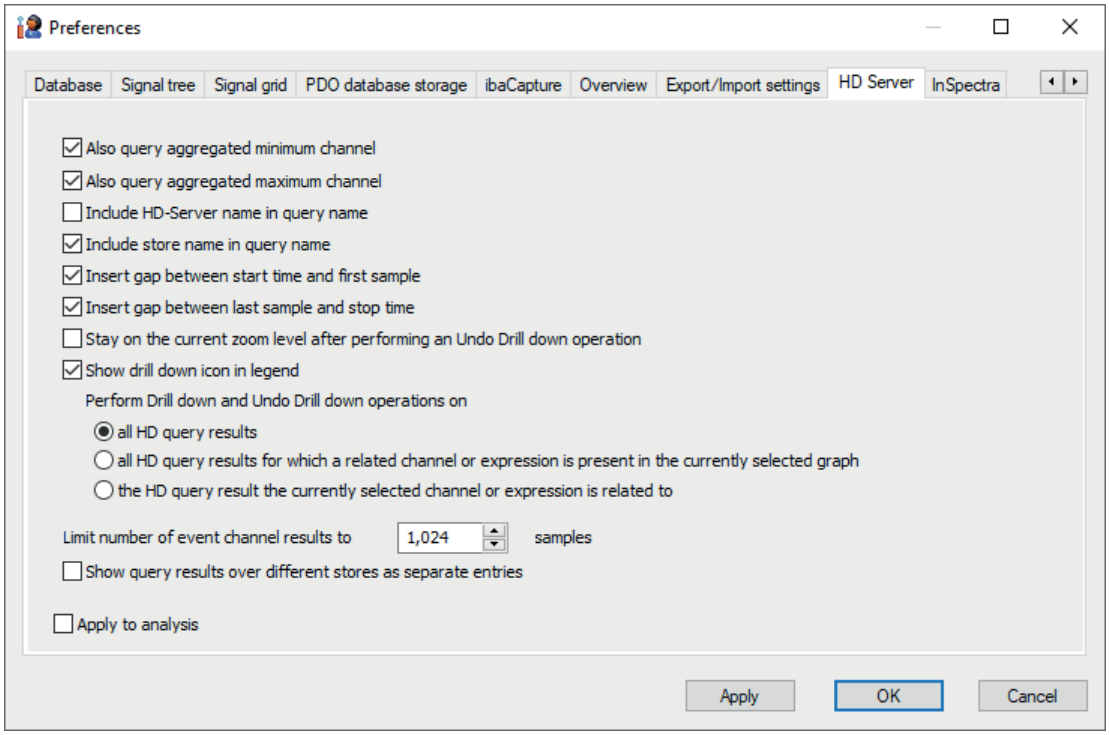


Fig. 56: Settings for HD queries and display

ibaAnalyzer also allows access to data having been stored with *ibaHD* server.

By means of a number of settings, you can decide which signals are contained in the pseudo data file after an HD query and how they are to be loaded and displayed. Changes in the preferences also affect new analyses. If you change the strip settings of a current analysis, where this tab is also available, the HD data is automatically reloaded.

Also query aggregated minimum/maximum channels
When loading a signal, its average value and – if available – maximum and minimum are loaded by default. If you deactivate this option, the corresponding value is not loaded in *ibaAnalyzer*. If this option is deactivated, you can save storage space.

These options are activated by default.

Include HD server name in query name
In principle, the name of the pseudo data file consists of the HD server name, the store name as well as the start and stop time of the queried range. In order to keep the name a bit shorter, you can prevent the HD server name from being used by disabling this option. If you want to see the HD server name in the name of the pseudo data file, you need to activate this option.

This option is disabled by default.

Include store name in query name
Similar as to what is described above, the name of the HD store can also be used in the name of the pseudo data file. If you enable this option in addition to the previous option, the name of the pseudo data file becomes even shorter.

This option is enabled by default.

Insert gab between...
It might happen that there are no values available at the beginning or end of the specified query range.

If you enable this option, there is a gap displayed in the graph between the starting point and the first measuring value and the last measuring value and the stopping time, respectively. The X axis exactly corresponds to the specified time range.

If you disable this option, no gaps will be displayed and the X axis starts with the first value measured and ends with the last value measured.

These options are activated by default.

Stay on the current zoom level after performing an Undo Drill down operation
If you enable this option, then the display remains in the zoom level from which the drill down was triggered after the drill down was undone. By default, this option is disabled and the display shows the entire query range again after the drill down has been undone.

Show drill down icon in legend
By default, this option is enabled and a blue arrow appears in the signal legend as soon as a drill down is possible. Disabling this option switches off the display of the arrow.

Perform Drill down and Undo Drill down operations on...

- all HD query results
- all HD query results for which a related channel or expression is present in the currently selected graph
- the HD query result the currently selected channel or expression is related to.

With this selection, you determine the query results that are to be affected by the drill down function. Default setting: all HD queries.

If, for example, you have included several HD stores in your query and receive a corresponding number of query results, then all of these HD stores would be queried again in the event of a drill down. However, if you are only interested in the drill down for a certain store, then you can limit the effect of the drill down here.

Limit number of results for event channels to...
The number of events in a given HD query period can vary greatly. If a large number of events occur, then the display in the trend graph may quickly become confusing. Use this setting, for example, to reduce the number of events, which are displayed in the graph after an HD query.

Show query results over different stores as separate entries
If you include several HD stores in one HD query and use a signal condition for the query, then you will receive one query result from each HD store for every time the condition applies. All query results are listed in the file group window of *ibaAnalyzer*. Depending on how many stores are involved and how many results are found, the list may be very long. If you disable this option (default setting), then only one row is used per query result in the file group window, which is representative of all HD stores. In this way, the list is somewhat shorter and clearer. If you open a query result, then you will of course again see the HD store structure in the signal tree.

5.18 InSpectra

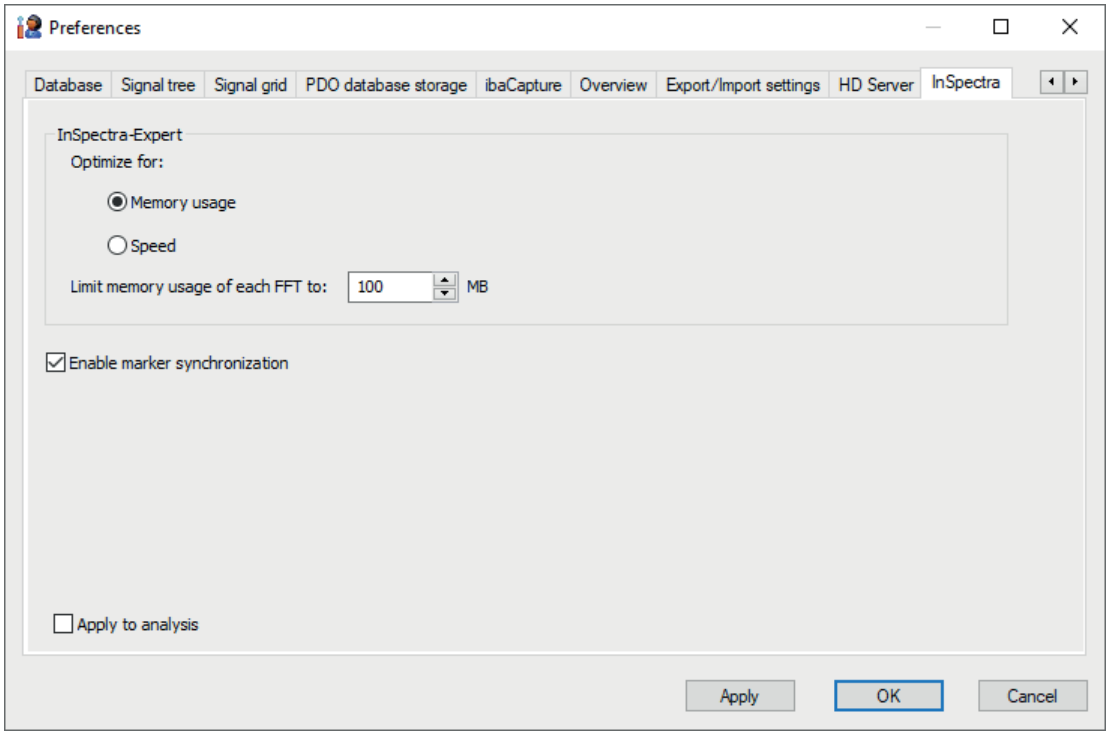


Fig. 57: Settings for memory usage when using InSpectra FFT views

These settings are only relevant for using *ibaAnalyzer-InSpectra* and namely when a corresponding FFT view is opened.

InSpectra-Expert

Optimize for...
You can choose here whether *ibaAnalyzer* should be optimized for memory usage or speed. If you select speed, then *ibaAnalyzer* buffers the signals before they are handed over to the FFT component. This requires more memory, but is much faster.

Limit memory usage of each FFT to...
This allows you to set a storage volume limit for each FFT view. For example, if you want to drag more signals into the FFT view than the memory capacity allows, you will receive a warning message.

6 Presenting signals

6.1 Signal information in the signal tree

The signal tree, below the signal level, includes another branch with information on the signal.

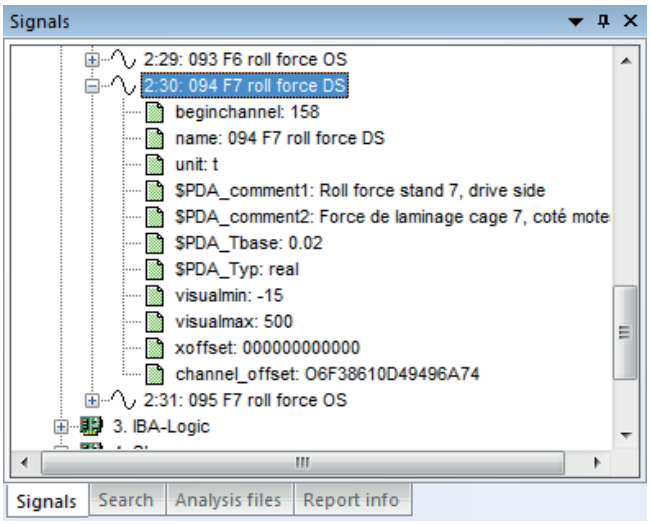


Fig. 58: Signal tree, info fields of the signals

Signal identification:

- Analog signals: , Module:Channel
- Digital signals: , Module.channel

The most important info fields:

- beginchannel: absolute channel number in the PDA system
- name: Channel name acc. to PDA module setting
- unit: physical unit of the signal
- channel_offset: position of the signal data within the data file (service information)
- visualmin, visualmax: scale limit values acc. to PDA module setting (analog values only)
- $PDA_comment1/2 *:* signal comments acc. to PDA module settings
- $PDA_Tbase: time base acc. to recording profile
- $PDA_Type: Data type
- $PDA_filter: filtering (average, maximum or minimum) acc. to recording profile

Depending on the application, *ibaPDA* configuration and type of data file, more information can be contained, e.g. if the file is generated by *ibaQDR* or processed by *ibaDatCoordinator*.

6.2 Selecting and displaying signals

Note

This chapter and the following chapters describe the signal display in the standard recorder window of ibaAnalyzer. The recorder window has the following essential properties:

- fixed position
- signal strips can only be arranged one beneath the other
- one mutual X-axis for all time-based signal strips, one mutual X-axis for all length-based signal strips
- zoom area and positions of the interactive markers are the same for all signal strips of the same X-axis type

For a more flexible signal representation there is a separate trend view available similar to the one of ibaPDA. You can find information about this in chapter .
↗ *PDA trend graph*, page 149

If the data file is open, you can select any signals to be displayed in the recorder window, for example, in order to carry out an analysis.

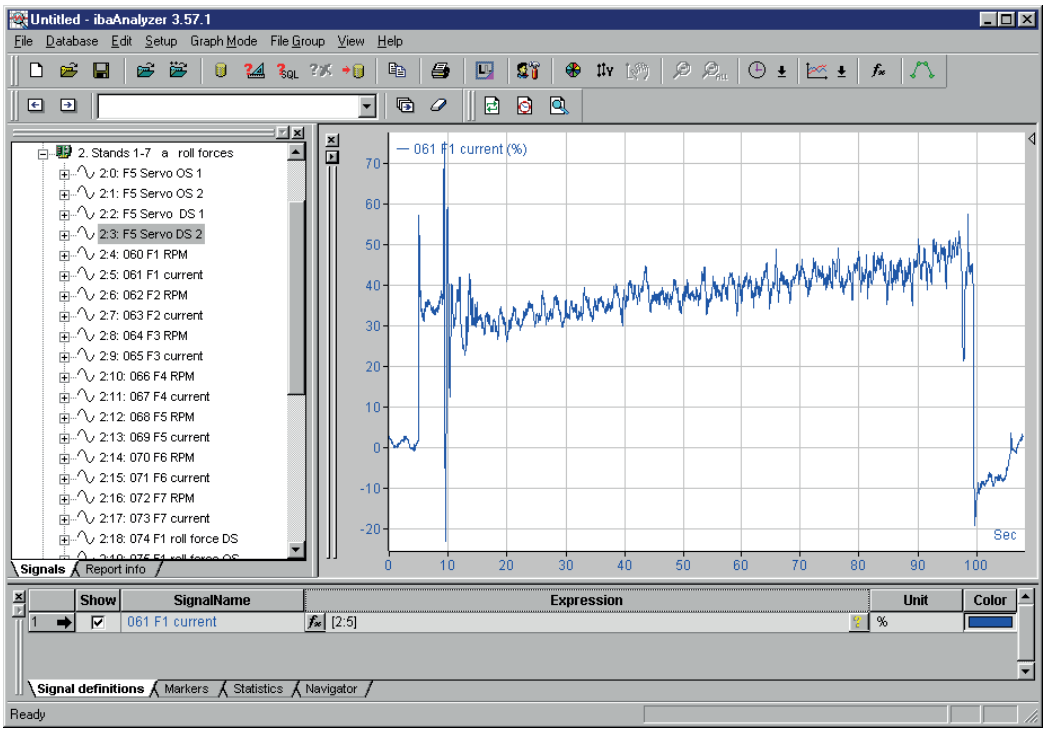
There are three general ways available for selecting a signal.

- Make a right mouse click on the signal you want to display and select Open signal in the context menu.
- Double-clicking the desired signal in the signal tree – this operation then also opens a new signal strip in which this signal is presented.
- Alternatively, you can also use the Drag&Drop function in order to drag the signal into the recorder window (click the signal with the left mouse key and keep the key depressed until the target position is reached).

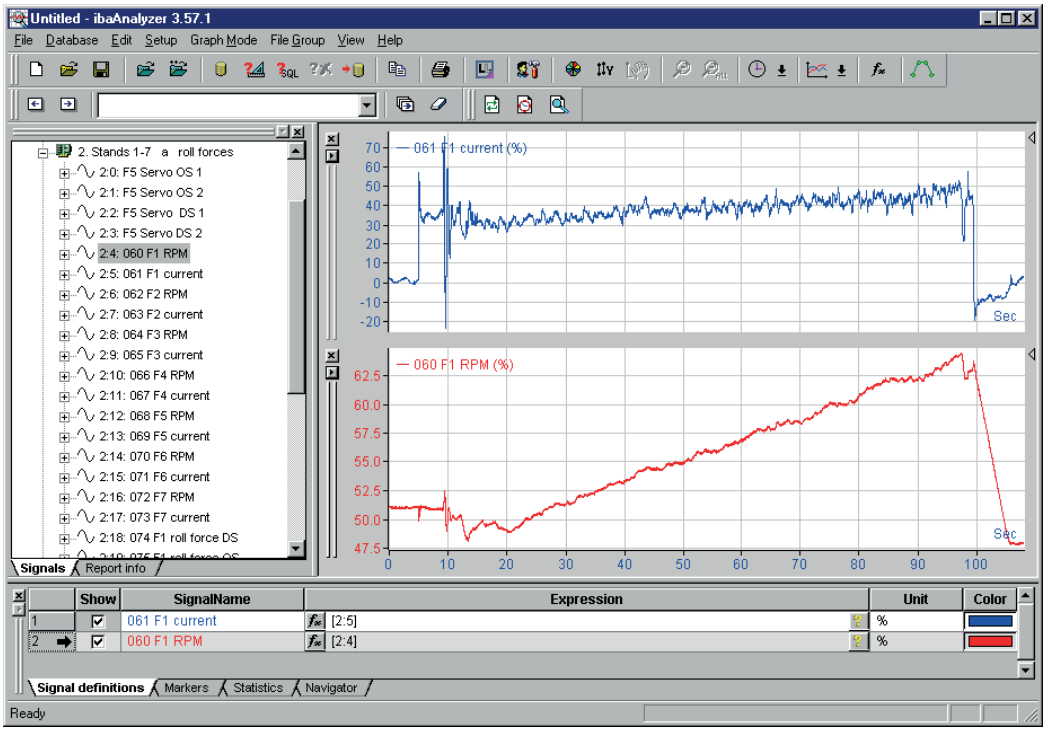
These methods can be further refined in order to address the requirements of day-to-day use even better.

It is, for example, often not helpful to open a separate signal strip for every signal because this would mean that the recorder window is soon full and difficult to read. So, you can position several signals in one trend view and decide whether the signals get their own Y-axis or a joint one.

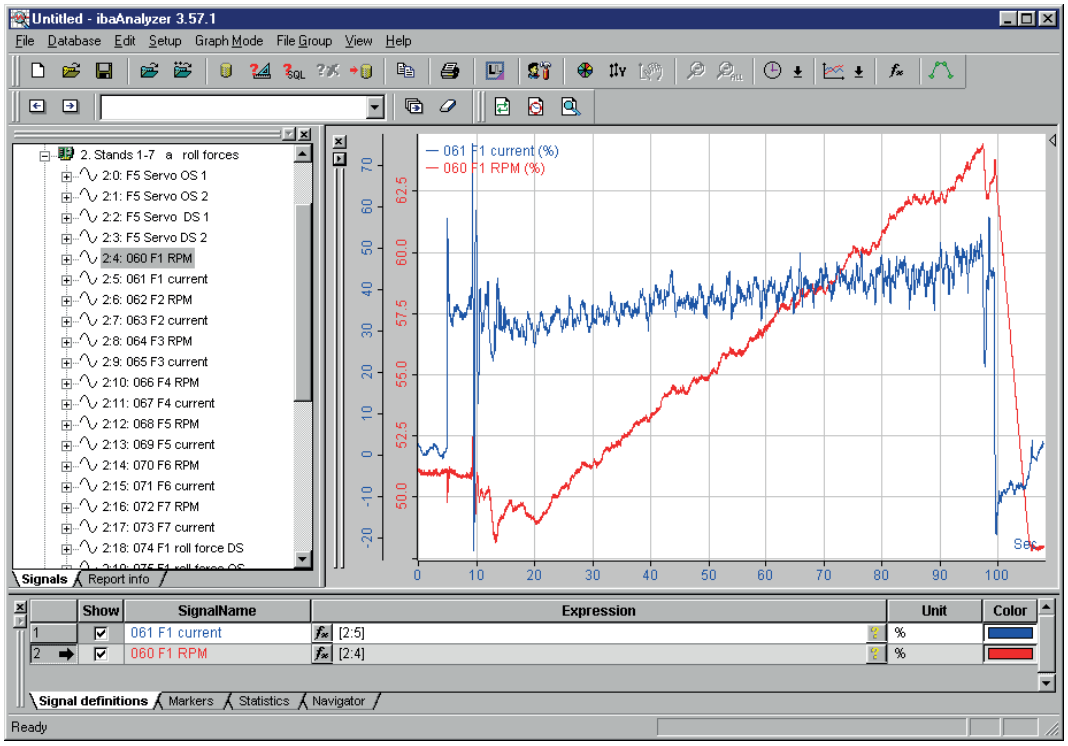
1. Select the first signal: Simply drag the desired signal to a free position in the recorder window.



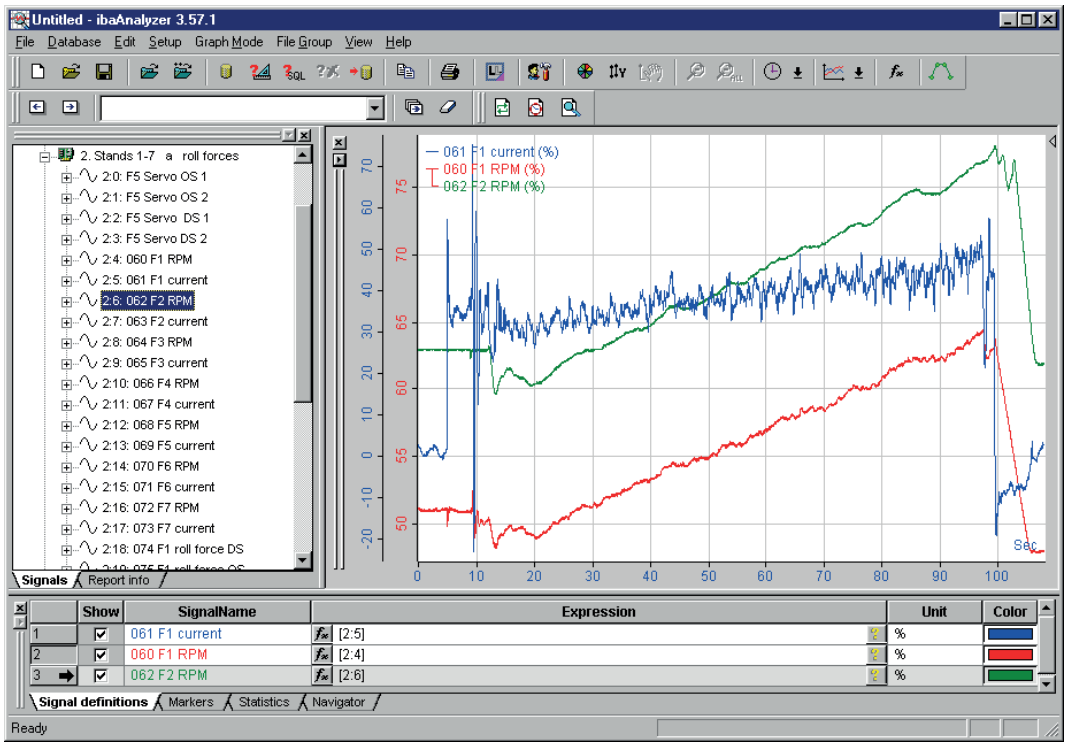
2. Presenting another signal in a new strip: Simply drag the desired signal into the area of the X-axis in the display window, or double-click the signal name.



3. Presenting another signal in an existing graph: Simply drag the desired signal into the area of the desired graph. The signal is displayed in the same graph but with its own Y-axis.



4. Presenting another signal in an existing strip, however, referring to the same axis as the existing signal: Drag the desired signal in the area of the Y-axis of the requested chart. Both signals now use the same Y-axis. A new color is automatically assigned to the new signal. The names of the respective signals are referenced in the upper left area of the strip.



Signals having the same axis are connected by a hyphen.

Tip

If you wish to have several signals presented in one strip with separate Y axes, just double-click the corresponding signal name whilst keeping the <Ctrl> key depressed – this saves time.

Tip

If you wish to have several signals presented in one strip with a common Y axis, just double-click the corresponding signal name whilst keeping the <Shift> key depressed – this saves time. Every further signal is assigned to the Y-axis of the bottommost signal.

You may mark and drag more than one signal into the signal strip. Use the <Shift> or <Ctrl> key together with a mouse click to select multiple signals.

The group of marked signals will be treated as a group when dragging them into a signal strip. A mutual Y-axis will be provided for the entire group.

If there is no signal strip available yet or if the group is dragged on the X-axis the behaviour is as follows:

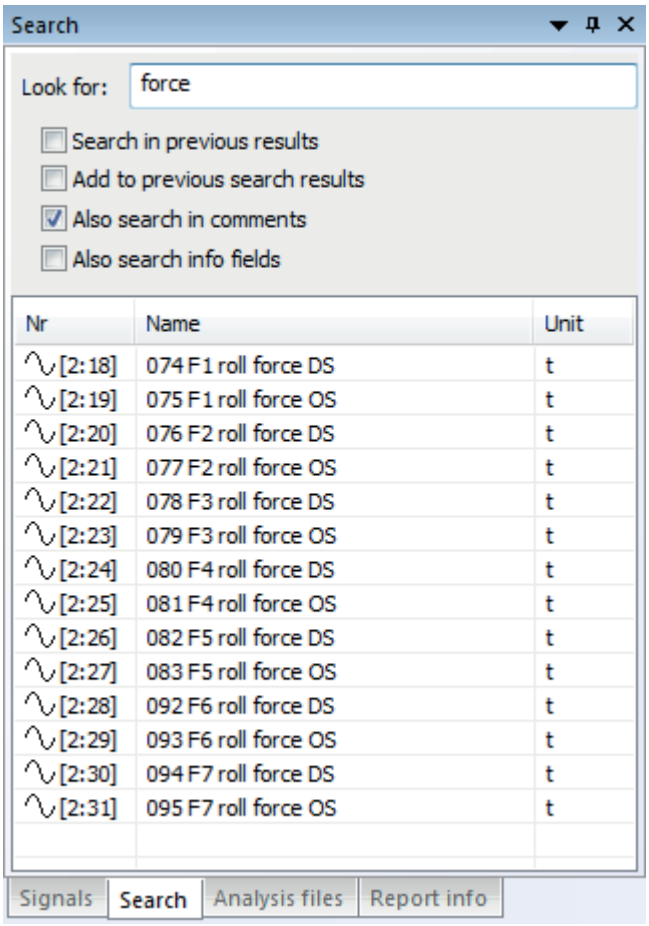
- Dragging the group with depressed <CTRL> or <SHIFT> key
  : The signals will be put into a mutual signal strip.
- Dragging the group only with the mouse
  : Each signal will be displayed in its own signal strip.

6.3 How to search for signals

If a data file contains a very large number of signals (up to 2048 or more signals), it is sometimes difficult to find a specific signal by opening all modules and searching for it. Even with the help of linear numbering it may be very arduous. A search function was hence implemented in the signal tree window, *Search* tab , so that you can search for signal names, expressions, logical signal definitions and markers.

By clicking the *Also search in comments* function, the search will also be performed in the signal-bound comments (in *ibaPDA*, you can add a comment to every signal). After the search is complete, the comments will be shown as tooltip when moving the cursor over the signals in the search results.

The '*Also search info fields*' option refers to the channel info fields which belong to every signal.



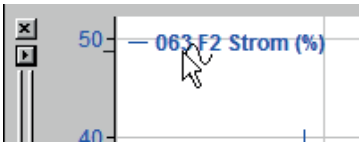
How to search:

1. Click on the Search tab in the signal tree window.
2. Enter a search string in the *Search* field above. The search string may be an entire signal name or just a part of it. The search mode is "full-text search", i.e. the search returns all signals whose names include the character string you have entered.
3. Activate the desired search option.
4. Press the Return key ↵ to start the search process.
5. The signals found are listed in the table. You can put the signals, expressions or markers on display in the recorder window by double-click or drag&drop.
6. You can refine the search by checking the *Search in previous results* checkbox and modifying the search string afterwards. Again press the Return key ↵ . Now, only the search results will be searched for the modified search term. The previous results will be overwritten by the new search results.
7. If you want to add the results of another search to the results of your latest search, then select the *Add to previous search results* checkbox before you start a new search. The previous results will not be overwritten.
   Generally, the results remain in the table until they are overwritten by new results or *ibaAnalyzer* is closed. The search results are not stored in the analysis file.

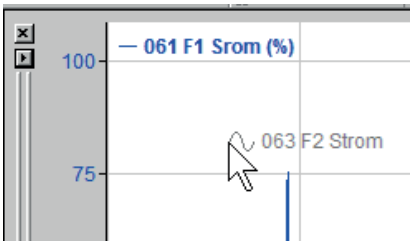
6.4 Move signals

Signals can be moved from one strip to another in *ibaAnalyzer*. This means that you can move a signal from one strip into another strip with an existing signal. Here is how it works:

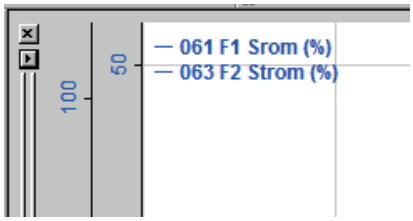
1. In the signal strip, move the cursor to the name of the signal which you wish to move. A wave-shaped line at the cursor indicates that the cursor has gripped the signal.



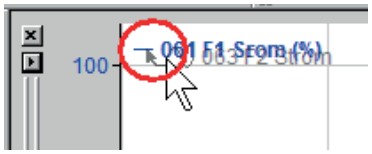
2. Keep the mouse key pressed, drag the signal to the other strip and finally drop the signal there in a free area.



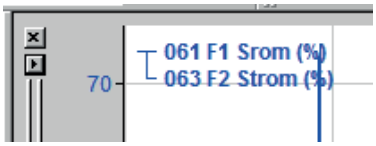
3. The result: two signals with separate Y axes



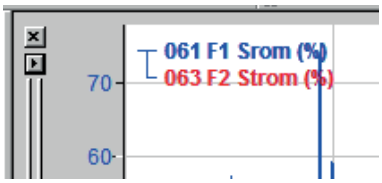
4. If you drag the signal in step 2 to the existing signal until a little gray arrow appears rather than dropping the signal, the moved signal is assigned to the same Y axis



5. The result: two signals with a common Y axis.



6.  The color does not change as a result of the signal being moved. If you wish to have different colors used for the signals, click the icon for automatic color assignment (see icon above).



In order to separate a signal (and open a new strip at the same time), simply use the mouse cursor in order to "grab" the signal in the strip and drag the signal into the free area of the X axis of the recorder window.

6.5 Hide signals

Signals can be hidden for the purpose of display in the strip without being removed from the analysis. This is important if you need signals for calculations (expressions), but when these signals are not supposed to be presented as a curve in order to ensure a clear display.

This is, for example, the case with intermediate results of complex calculations. The "Show" column in the signal table on the "Signal definition" tab can be used for this purpose. If this column is not ticked off, the signal is no longer presented as a curve.

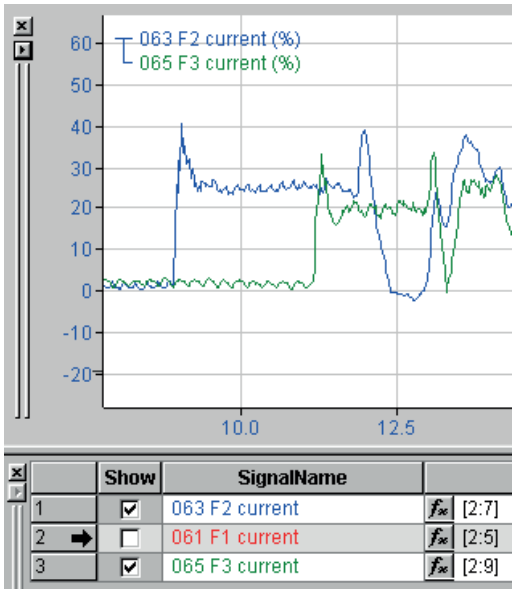
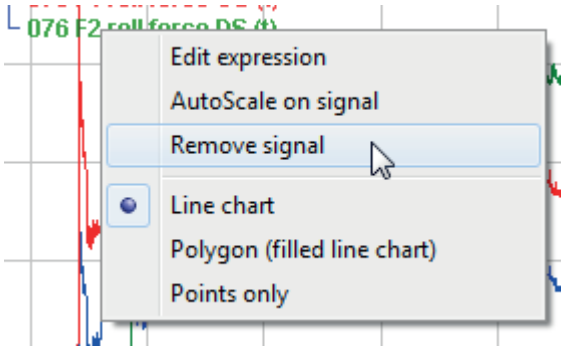


Fig. 59: Hiding signals

6.6 Remove signals

In order to remove a signal, position the cursor in the trend view on the name of the signal to be removed, click it with the right mouse key and finally select the *Remove signal* command from the context menu.



Alternatively, you can also open the context menu on the Y axis of the signal in question and select the "*Remove axis*" command. But remember: When you remove the Y axis, all signals belonging to this axis are also removed.

Another way of removing a signal works via the signal table. For this purpose, mark the row containing the signal to be removed on the *Signal definitions* tab, press the right mouse key in order to call up the context menu and select the *Remove signal* command.

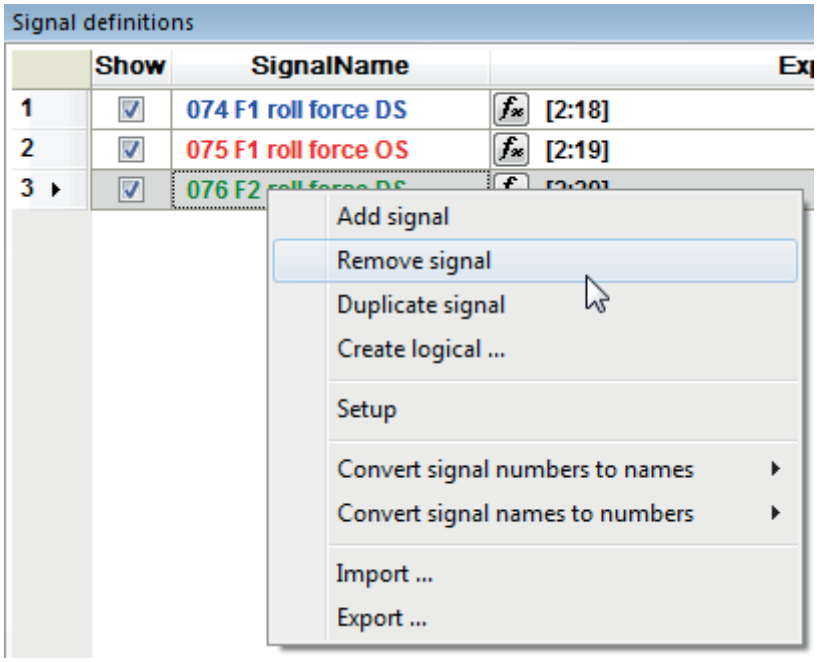
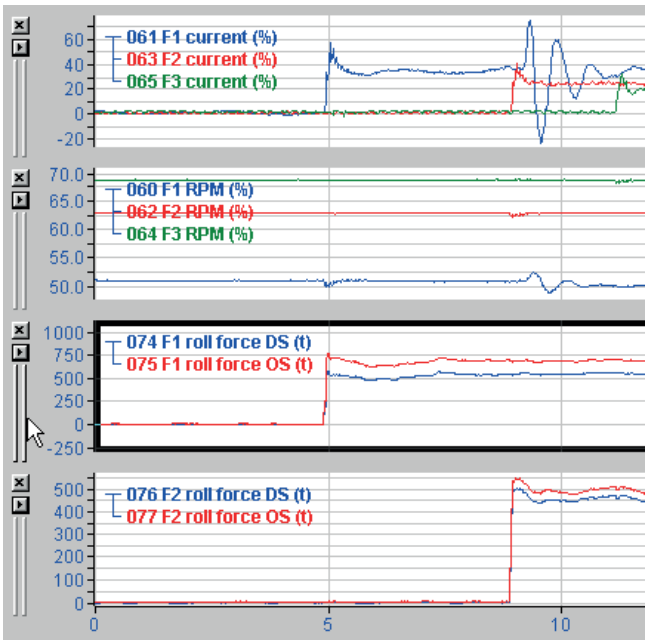


Fig. 60: Remove signals from the signal table

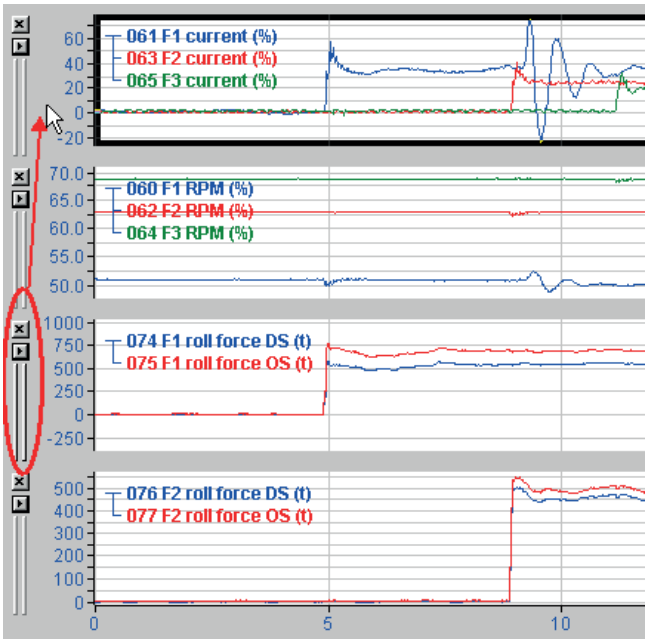
6.7 Moving trend views

You can vary the order of the signal strips from top to bottom.

1. Mark the graph that is to be moved as an active graph (see part 1, chapter "Recorder window"). With the mouse button pressed on the header of the graph to the left of the Y axis, move the mouse a little so that a thick border appears.



2. Now, keeping the mouse key depressed, move the strip, for example, upwards. At first, only the black frame moves and shows above which strip the moved one will be inserted. For example, in order to move the strip to the topmost position, the frame must be appear around the strip which is currently in the top position.



3. Finally, release the mouse key whereupon the strip is inserted on top.

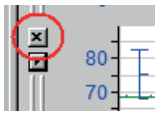
6.8 Hide trend view

In order to ensure a clear display, it may sometimes be necessary to hide strips without removing these (as well as the signals contained therein) from the analysis. In order to hide a strip, just click the small arrow at the **upper right end** of the strip (see above). The small arrow continues to be displayed in the recorder window and, pointing downwards, indicates that there are still hidden strips.

When a strip is hidden, the tick in the "Show" column is removed for all the signals contained in this strip in their signal definitions. This means that you can also hide a strip by hiding all its signals.

6.9 Remove trend view

A strip can be removed in several ways as follows.



- Click the small cross in the upper left corner at the Y axis.
- Click into a free area of the graph with the right mouse key in order to open the context menu, and select *Remove graph* from the context menu.

6.10 Scale signals

The scaling of signals in the Y direction can be changed in the recorder window by moving the scale ends using the mouse (see ↗ *How to shift scales*, page 115), or via the menu *Graph setup* or the context menus (see ↗ *Y-Axis*, page 65).

6.11 Using intervals

The intervals function is a simple way to measure sections on the X-axis and to display the values (in X-axis units) in the trend graph.

Similar to the dimension lines in a technical drawing, an interval consists of two vertical lines between which there is a horizontal line with arrow ends. In the center of this line is a label specifying the distance between the vertical lines in X-axis units. If the spatial conditions do not allow for the central arrangement of the label, this will be placed next to it.

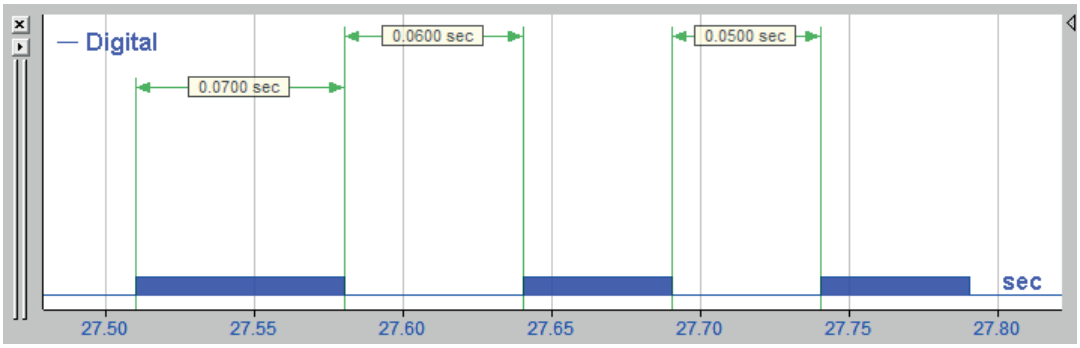


Fig. 61: Intervals for a digital signal

Intervals for digital signals

The simplest version is the display of the on or off duration of a digital signal by double clicking on a trend of a digital signal where the signal is true or false.

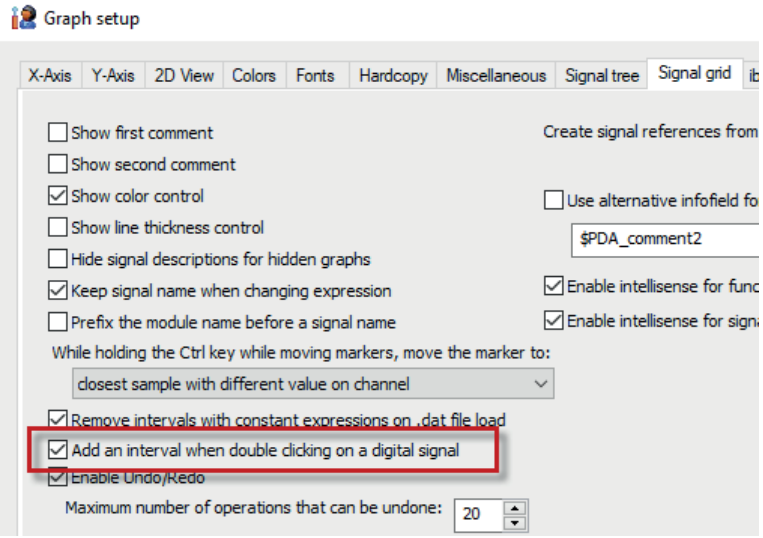
Depending on where you click, the interval is displayed between the rising or falling edge or between the falling and rising edge.

The intervals are always linked to the signal. If you move a signal into a different trend view, then the intervals move as well.

If you make a double-click while holding the <Ctrl> key, then all intervals with the same value (TRUE or FALSE, depending on where you've clicked) will be displayed.

Tip

This function is enabled by default. But you can disable this function in the *Graph setup...*, *Signal grid* tab.



Intervals between markers

The interval function can also be used together with the markers. You can measure any section on the X-axis by positioning markers and then show the interval between the markers. This makes it very easy to measure analog signals and distances between different signals.

The following types of markers can be used:

- Interactive markers X1, X2

If you are in the marker view, then you can use the *Graph mode* menu or the context menu in the trend view to add an interval between the marker X1 and X2 with the command *Intervals - Add between markers*.

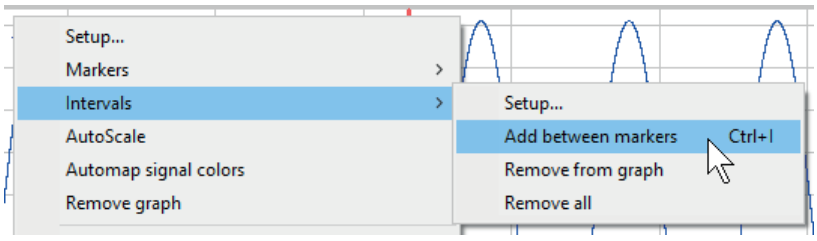


Fig. 62: Adding an interval between markers X1 and X2

Configuring intervals

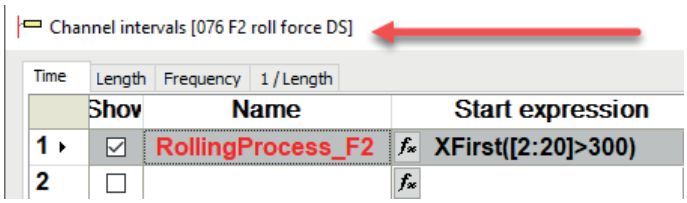
If you perform the command *Intervals - Settup...* in the context menu of the trend view or in the *Graph mode* menu, you will be taken to the configuration dialog for the channel intervals.

In this dialog, you can configure up to 9 intervals per domain (time, length, frequency, 1/length) for each signal. The start and stop positions of the intervals can be defined dynamically depending on any signal as well as constantly.

Note

Note that every signal in the trend view has its own interval dialog! The entries that you make in this dialog always relate to the signal that you last clicked on.

The signal that is affected can be seen in the header of the dialog.



The columns of the interval table have the following meaning/function:

Show
If the interval is to be displayed in the trend graph, a check mark has to be set here.

Name
You can optionally enter a name for the interval here, which is displayed in the label before the value. If you do not want a name, simply leave this empty.

Start expression
Enter an expression here that is to be used to define the beginning of the interval on the X-axis. The expression can also be a constant.

Stop expression
Enter an expression here that is to be used to define the end of the interval on the X-axis. The expression can also be a constant. If the expression is to result in a smaller value than the start expression, the distance is shown negatively.

Color
If necessary, you can assign one of 16 colors to any interval here. By default, the 3rd color (green) contrasts well with other standard colors for markers (red) and signals (blue). The color selection corresponds to the spectrum in the color control (preferences).

Start value, stop value and difference
These values show the currently calculated values for start and stop position of the interval as well as the distance that is then also displayed in the label. For new intervals, the values are first shown once you have clicked on the <Apply> button.

Tip

The font and font size for the label writing can be changed in the preferences or graph setup in the *Fonts - Marker labels* tab.

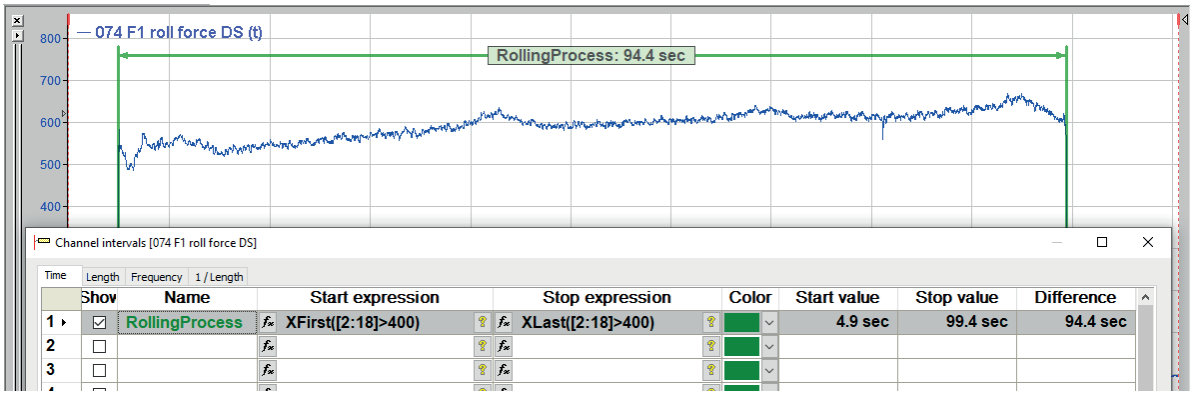
<Show All> and <Hide all> buttons
Use these buttons to set or remove the check mark in all rows of the *Display* column.

<Remove all> and <Remove selected> button
Use these buttons to remove all or the previously marked intervals. You mark an interval in the table with a mouse click on the cell in the first column (number). Multiple selection is possible with the <Ctrl> or <Shift> key.

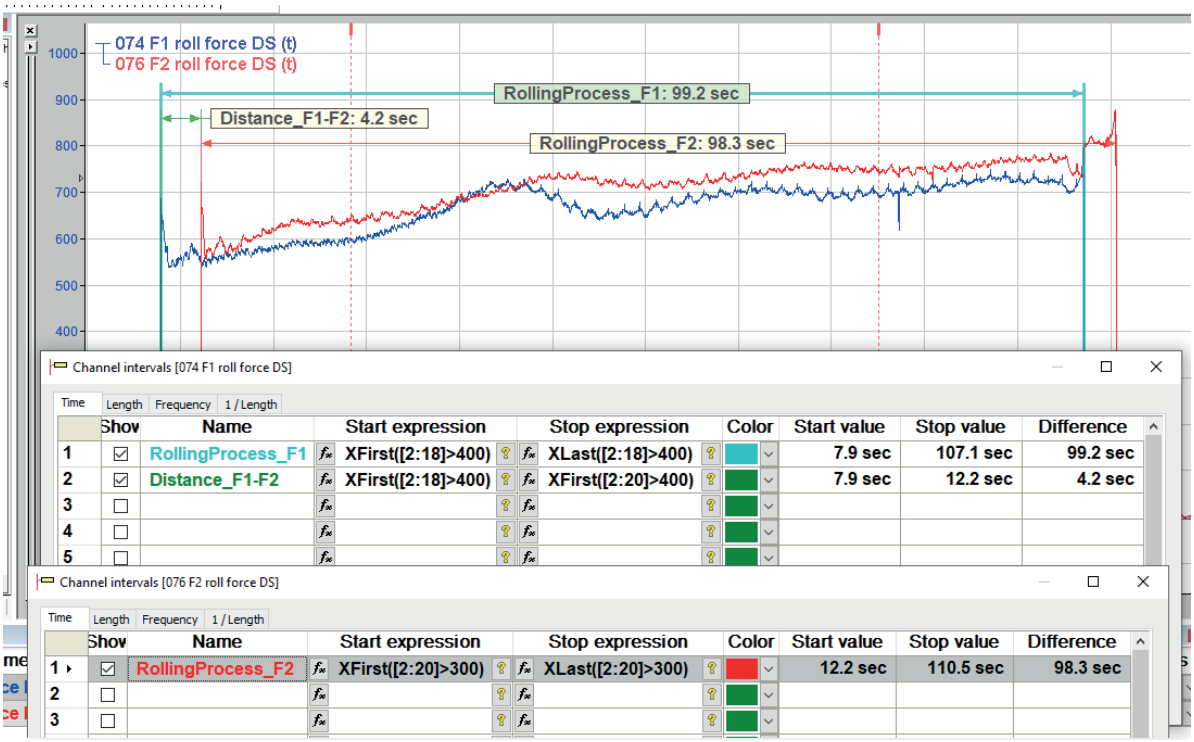
<Add from markers> button
If you press this button, then the positions of the marker X1 (start) and X2 (stop) are applied and entered in the next free row.

<Apply> button
Use this button to apply all changes without the dialog being closed.

Example: Dynamically calculated intervals



The interval shows the duration of the rolling process as a function of certain states of the roll force signal. The advantage: If you view the same type of data files one after the other (e.g. via file group / slideshow), the interval is automatically always positioned in the correct position.



A separate interval was defined for a second signal (red). The figure shows that only the intervals of a signal are included in the interval dialog. For the first signal (blue), another interval was finally defined that displays the distance between the beginning of both rolling processes F1 and F2. Any signals and conditions can be used to determine the start and stop position.

6.12 Y-Axis

Shared Y-axes are created when one signal is linked to another as described in section ↗ *Move signals*, page 104. The Y axes are separated again by pulling the signal into the free strip area, thereby detaching it from the other signal.

6.13 How to shift scales

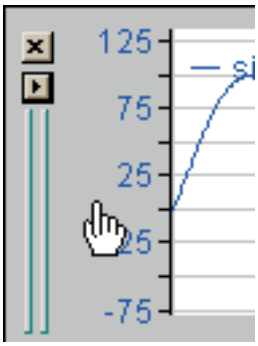


Fig. 63: How to shift scales

Move the mouse cursor to the Y axis until the hand symbol appears. Keep the left mouse key depressed to move the scale up or down. When zoomed-in, the X axis can be moved in the same manner.

6.14 Compress and stretch scales

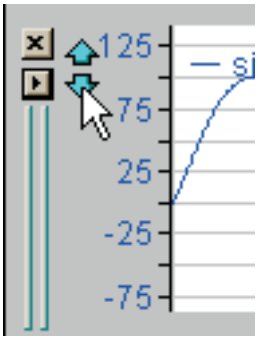


Fig. 64: Compress / stretch scales

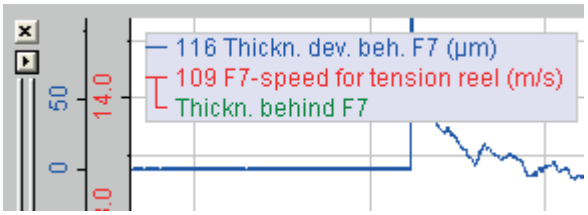
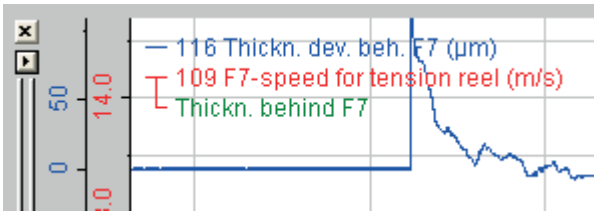
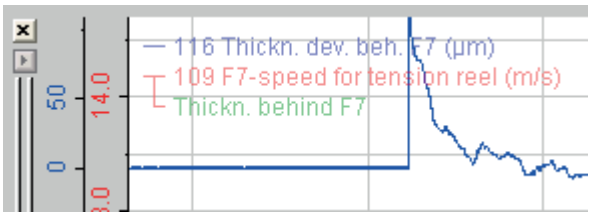
Position the mouse cursor in the upper area of the Y axis until two blue arrows appear.

In order to compress or stretch the Y scale, click the appropriate arrow and keep the mouse key depressed until the desired scaling is reached.

If you are using a wheel mouse you can change the scale by turning the mouse wheel when the mouse pointer is over the Y axis. This works for X axis as well.

6.15 Formatting the legend

The legend of the signals is usually displayed in the upper left corner of a signal strip. You may set an opaque background for better legibility. Sometimes, however, it is more important to see the signals behind the legend. Therefore, you can set the legend transparent.

	Legend without transparency
	Legend with transparent background and 100% opacity (Slide control in the settings on the far right)
	Legend with transparent background and 50% opacity (Slide control in the settings in the middle position)

You may make the settings in the preferences or in the graph setups, 2D view tab (see ↗ *2D View*, page 71).

In addition to the graphical attributes, you can also adjust the content of the legend.

By default, only the signal name is contained. You can also add information to the settings, such as module name, comment, marker values and much more.

You can find information about this in chapter ↗ *2D View*, page 71.

6.16 Zoom in and out

When zooming takes place in a strip, all the other strips which have the same reference axis are zoomed too. Strips having a different reference axis remain unchanged. Exception: the FFT presentation which follows the zoom factor and shows the FFT for the zoomed-in range (while frequency axis remains unchanged).

Zooming in is possible at any point in a strip. Keep the left mouse key depressed and draw a square that encloses the area in which you are interested. Release the mouse key again.

Zooming first applies to the X and Y direction. In the zoomed-in condition, the scale in the Y direction can be changed at any time without affecting the zoomed section of the X axis. Autoscaling in the Y direction applies to the values in the zoomed area.

If you pressed the shift key (<Shift>) at the same time you zoomed with the mouse, the zoom border is kept at the graph height.

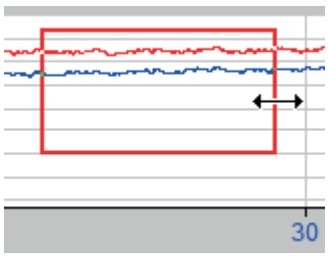
Zooming out can be done gradually using the button  . Every click successively reverses all previous zoom steps. The context menu also offers the same function in the strip in question.

Use the button  to reactivate the original, non-zoomed appearance.

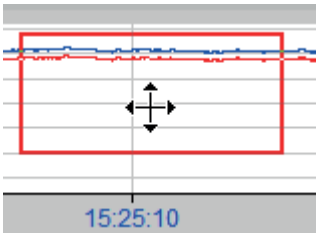
Furthermore, if you are using a wheel mouse you can zoom each axis individually by placing the mouse pointer over the axis and turning the wheel.

6.17 Using the navigator

The navigator window always shows the first (topmost) signal strip in the recorder window with the time or length axis.



The zoom function can also be carried out using the red frame. Just move the cursor on the red frame line until the cursor changes to a double arrow. Then, keeping the mouse key depressed, reduce or enlarge the red frame. Since this also works at the upper and lower margin, it is also possible to change the section in the Y direction too, however, for the topmost signal strip only. When zooming and shifting in the X direction, all the strips having the same X-axis mode as the topmost one will follow suit.



By positioning the cursor within the red frame, you can move it over the curve. The section shown in the signal strip is adjusted accordingly.

Pressing the cursor keys left / right will also move the red frame.

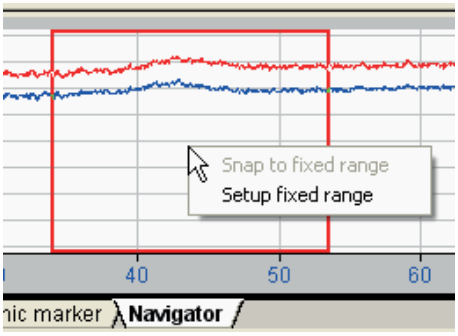
The navigator window will always display the time or length based form of a signal, never a FFT presentation of a signal. If signals are displayed in FFT mode in the recorder window, these representations are adjusted when changing the width and position of the navigator frame because the frame also selects the samples which are used for the FFT calculation.

6.17.1 Navigator X-range

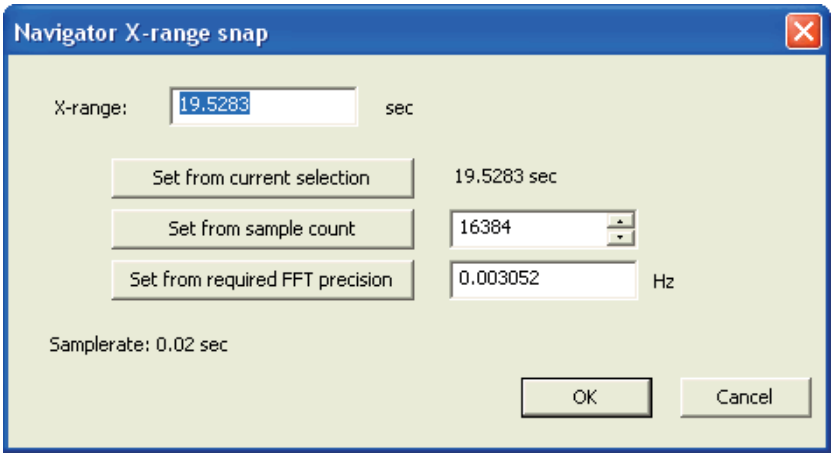
With version 5.0 of *ibaAnalyzer* or higher a new feature for the navigator window is available: setting a fixed width of the x-range. This function has been developed for further support of FFT operations.

When showing a signal in FFT mode, the FFT is actually computed from the number of samples in the current zoom on the time or length axis (rounded to the nearest power of two). Since the navigator is highly suitable for zooming, it makes sense to manipulate the dimensions of the navigator frame in such way that it always contains the desired number of samples.

Right clicking in the navigator window will open a context menu. The second item (*Setup fixed range*) will open the setup dialog for the X-range. After you have set the navigator frame, you may snap the rectangle to the fixed range so that the width of the red frame can no longer be altered.



The setup dialog offers various options:



X-range
If you know the required range, given in seconds or meter, resp. inches, you can enter it in this field.

Alternatively, you may derive the range setting from different parameters.

Set from current selection
Clicking this button will set the X-range according to the width of the current navigator rectangle.

Set from sample count
Specify the number of samples in the entry field on the right and click the button. The width of the navigator rectangle is set accordingly.

Set from required FFT precision
Enter the desired FFT precision in the form of a frequency in the field to the right of this. The width of the border is always calculated in such way that the number of measuring points is sufficient to have FFT data at every multiple of the given precision between minimum and maximum frequency (which are in turn specified in the settings of the FFT axes).

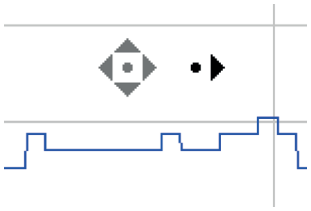
Note

Any value you type can be adjusted so that the number of samples is a power of two or a minimum number of 128 samples is respected.

Also note that only the value set and transferred to the X-range field is retained. The other parameters are reset to their default values as soon as you close and reopen the dialog.

6.18 Autoscrolling

After zooming into a signal curve, the context menu for the relevant strip offers the *Start panning* function.



When the panning function is activated, a compass icon is displayed in the strip in question. This compass forms a reference point. When you now position the mouse cursor to the left or right, above or below the symbol, the graph automatically moves in the corresponding direction. A signal curve can be conveniently traced in this way. Scrolling in the Y direction does not work if an autoscale operation was carried out in the zoomed condition.

The panning function is useful in conjunction with a high zoom factor when it comes to measuring points where repeated zooming out and in would be too great an effort.

6.19 Markers

In *ibaAnalyzer*, there are three groups of markers available which help to analyze the trend views.

6.19.1 Classic markers

These markers exist from the very beginning of *ibaAnalyzer*. They are displayed as soon as the "Markers" or "Statistics" tabs in the window of the signal table are selected or opened as separate windows. You will find more information about this in part 1, chapter "Markers tab".

In the preferences or strip settings (*Setup*... command in the context menu), *Color* tab, you can assign individual colors to the X1 and X2 markers. This can help avoid confusion while reading.

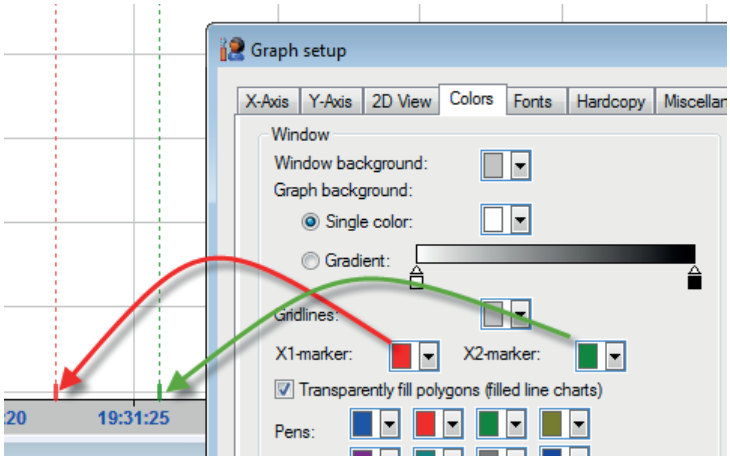


Fig. 65: Color setting for classic X1 and X2 markers

6.19.2 Markers independent of the X axis

If there are several trend views with the same scaling of the X axes (e. g. length-based or time-based) opened in the recorder window (see part 1, chapter "Markers tab"), the marker functions will be performed relating to the X axis, i.e. identically in all trend views.

If several signal strips are opened in the recorder window having different X axis scalings (time, length, frequency or 1/length), a separate pair of markers will be assigned to each signal strip. The marker functions then apply to the respective signal strip.

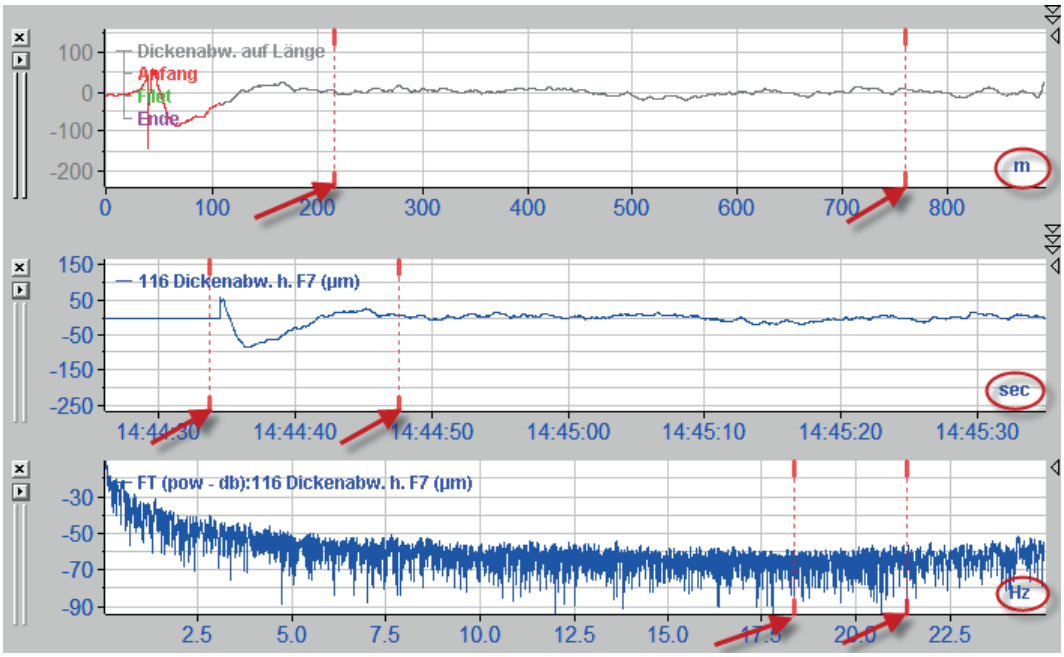


Fig. 66: Axis independent markers

6.19.3 Harmonic markers

The "Harmonic markers" tab has been added to the signal table window for an extended FFT support. Clicking the tab will display in any FFT graph a marker similar to the two markers from the tabs "Marker" and "Statistics".

There are basically two types of harmonic markers, one for frequency based (Hz) and one for inverse length based (1/m) signals. As each of them has its own X axis they can be moved and configured independently.

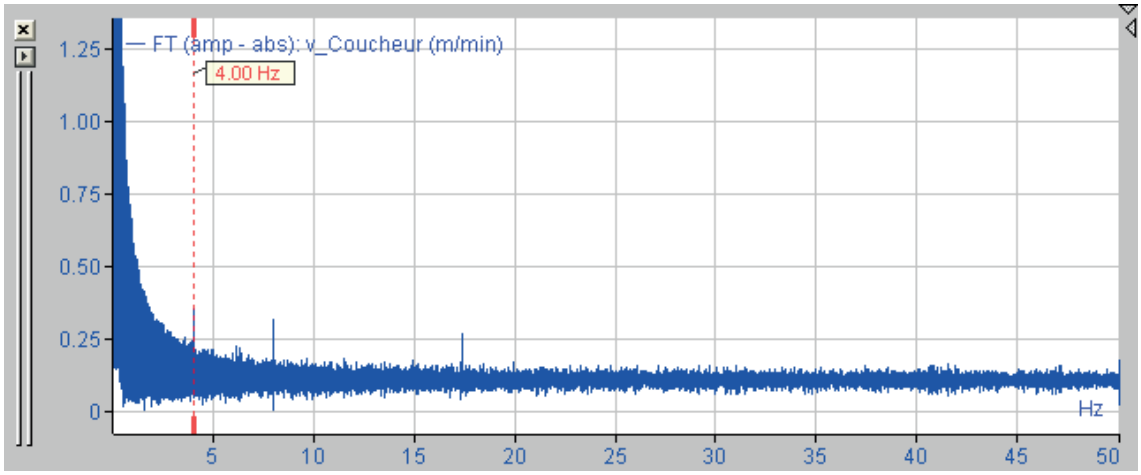
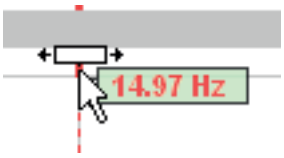


Fig. 67: Harmonic marker, main frequency

The Y-values of each signal will be displayed in the signal table and also the Y-values of the harmonic markers (integer multiples or fractions) and sideband markers if they are available. If no markers are shown, “--“ is depicted in the table.

You can "grab" the marker of the main frequency by its thick ends or at the left side of its legend and move it along its X axis. A symbol at the mouse pointer will indicate the dragging mode:



Inside the marker’s legend (little green box) you find the X-value. Clicking the harmonic marker’s legend will display side band markers and/or harmonic markers, if configured in the setup.

1st click -> harmonic markers

2nd click -> harmonics and sideband markers

3rd click -> sideband markers only

4th click -> main marker only

Harmonic markers are located at the harmonics of the main frequency. They are also indicated by dotted lines, though they have no thick ends. Harmonic markers can not be moved along the X axis as their x-position is determined solely by the position of the main frequency marker (e.g., 2x, 3x,½x). If you move the main frequency marker, the harmonic markers will follow proportionally in the corresponding distance.

A mouse click on the legend of a harmonic marker hides the legend. Another click on the marker will show the legend again.

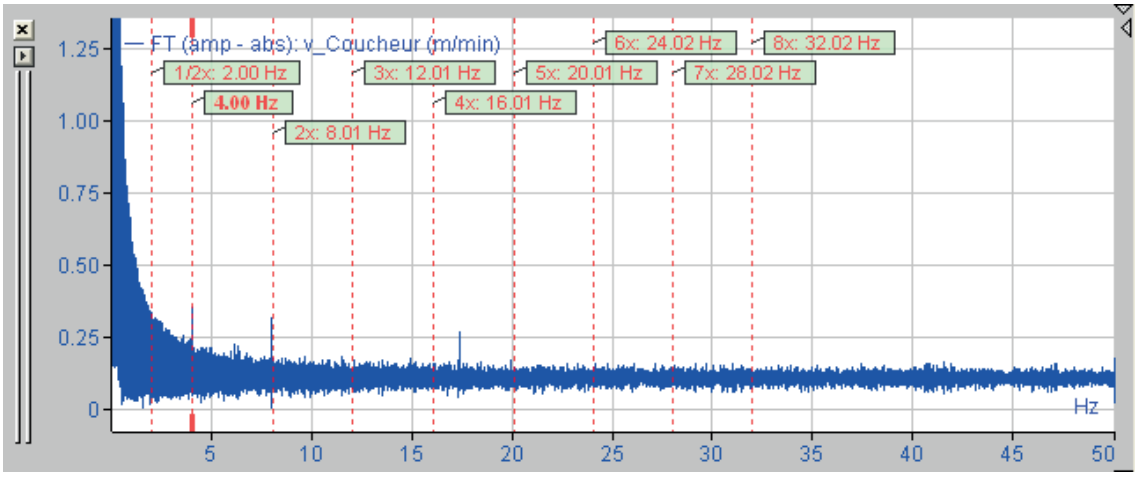


Fig. 68: Main marker and its harmonic markers (up to 8x)

Sideband markers are located at equidistant intervals of the main harmonic marker, are only two thirds the length of any other marker and are connected to each other with a horizontal line at their tops.

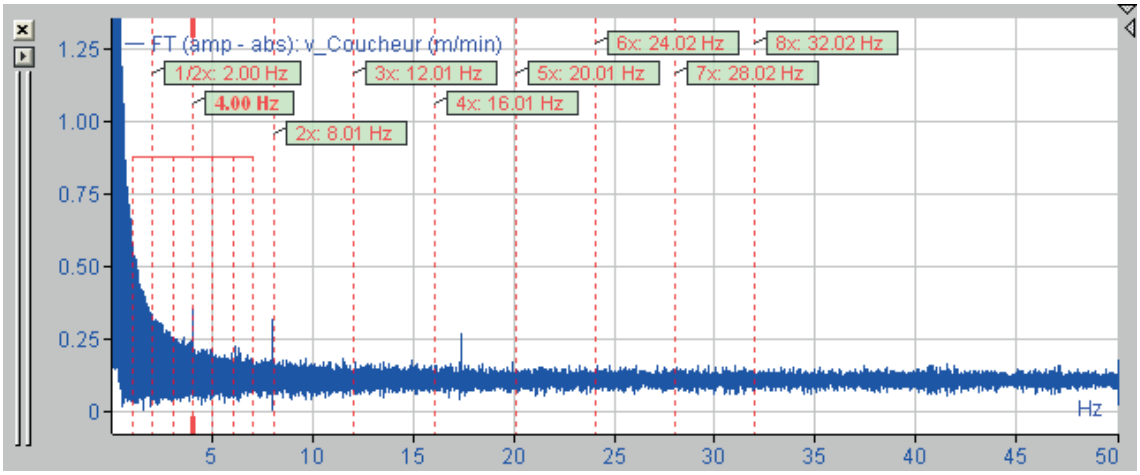


Fig. 69: Main marker with sideband markers and harmonic markers

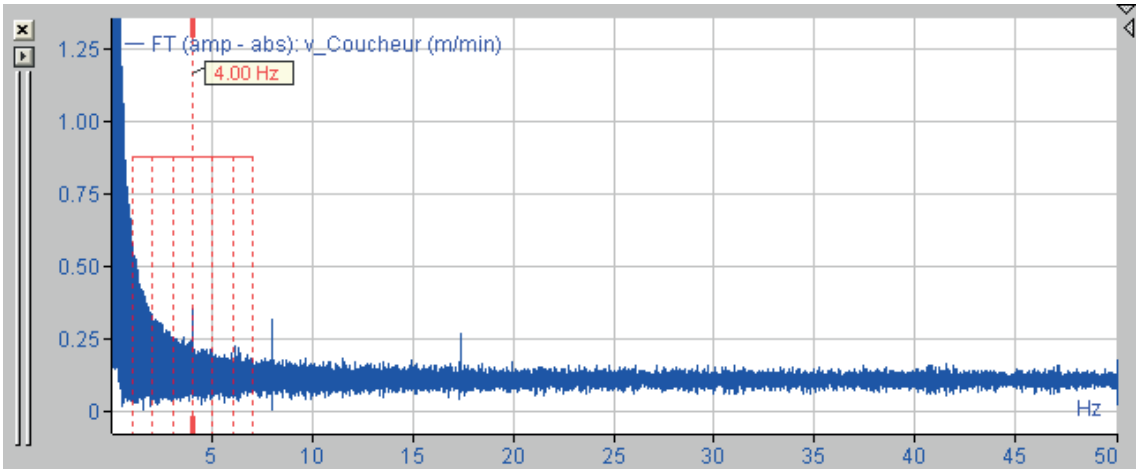


Fig. 70: Main marker with sideband markers only

In the graph settings (right mouse click in the graph in question) or in the preferences you can:

- set the number of harmonic markers to be displayed below and above main frequency,
- enable / disable sideband markers,
- set the distance between the sideband markers (in Hz or 1/m, resp. 1/inch) and
- set the number of sideband markers (symmetrical to main frequency) to be shown.

The number of sideband and harmonic markers as well as the distance between the individual sideband markers can be altered by right clicking the corresponding signal strip. Select then "Setup" in the context menu. In the dialog for the strip settings click the X axis tab and then the *Frequency* or the *1/Length tab*. Altering the number of harmonics (below or above) will also reset the number of harmonics shown in the signal table.

The sideband markers of the harmonic markers can be modified too by dragging the outer sideband marker with the mouse.

6.19.4 X-axis markers (computed markers)

For each signal strip and each X-axis type of a strip (time-, length-, frequency- or 1/length-based) a number of additional markers can be defined. These are then displayed as solid vertical lines in the strip. The default color of the markers is red; however, you can define the color of each marker individually. Each marker is assigned an X-value as a legend.

The idea is to mark special X-values in the graph, e. g. where (on the x axis) a graph has its minimum or maximum, when is a threshold exceeded for the first time or where is the typical rotation frequency of a roll etc.

The markers are saved in the analysis file (*.pdo).

In order to define a marker, right click the relevant graph and select *Markers...* from the context menu. The "X-axis markers" dialog will open.

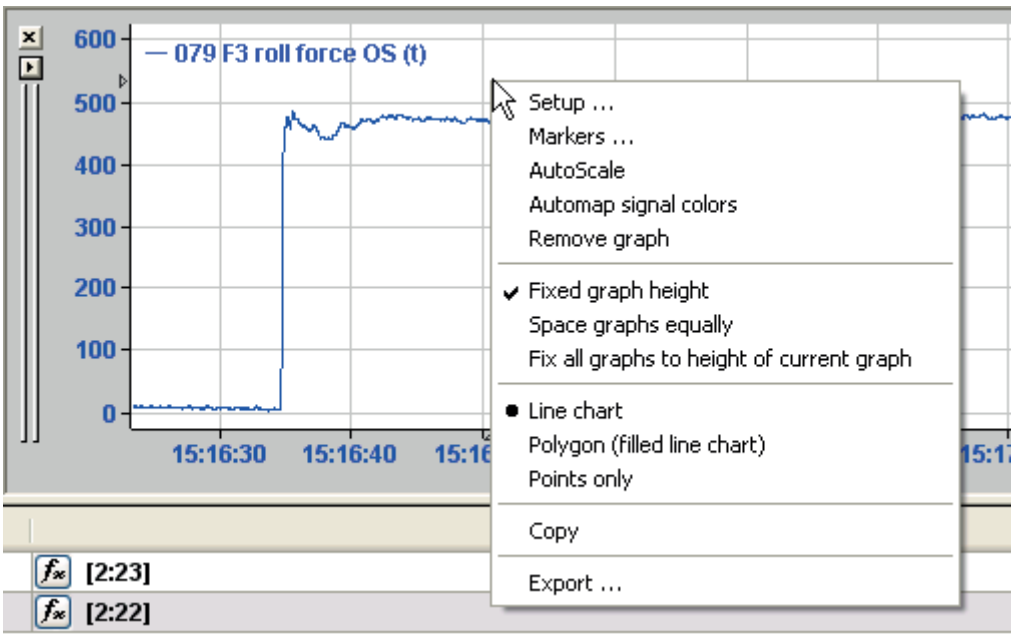


Fig. 71: Open X-axis markers dialog

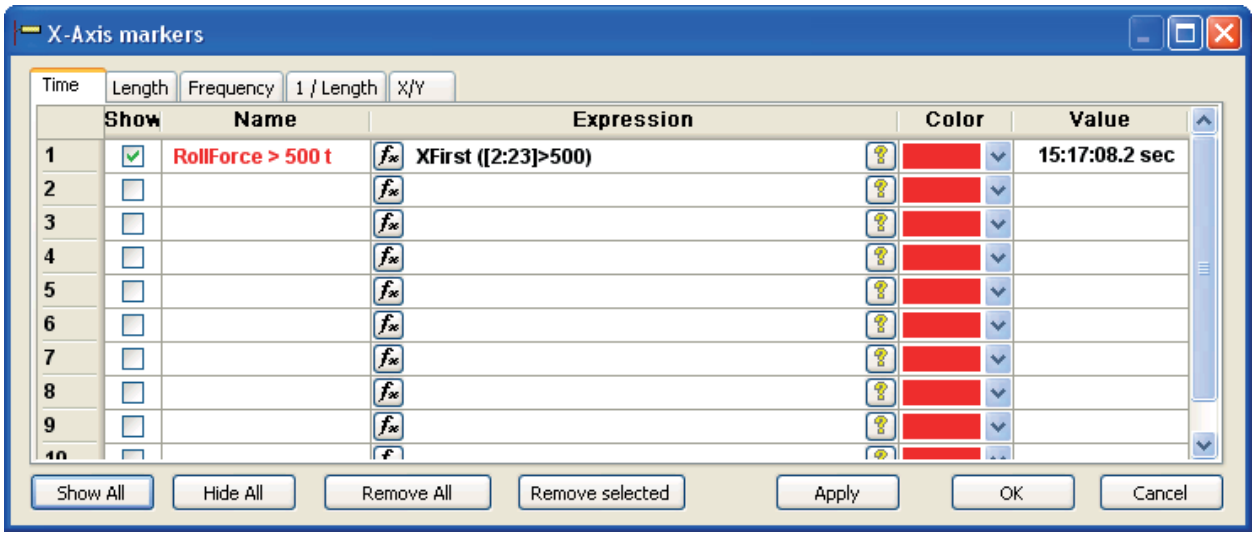


Fig. 72: X-Axis markers dialog

The dialog will open showing the tab that corresponds to the X axis mode of the graph you clicked on (time, length, frequency, 1/Length).

Column Show
Select by checkmark whether a marker should actually be displayed or not.

Column Name
Enter here the name for the marker.

Column Expression
Here you can enter an expression for the computation of the marker position. See for example the expression in the picture “X-Axis markers dialog:” a marker is placed at the position in the trend view where the signal exceeds the shaft speed value of 500 rpm in the loaded data file for the first time. Note that the expression control has two buttons at its sides (like the expression control in the signal table).

The left button opens the expression builder dialog.The right button allows you to check any errors in your expressions.

If you use a marker on a FFT or 1/Length axis, please mind that this marker is affected by the range of the navigator frame, provided that the result of the expression is varying in time and not constant. This means that the marker defining expression must be evaluated over time or length in order to take into account the part of the signal within the rectangle of the navigator. (A time or length based signal must be displayed in the first graph.)

For example, an expression with "XFirst" or "Max" will return a constant value and thus is not permitting navigator control. This is not the case with other expressions which return a non-constant signal curve of frequency or inverse length over time or length axis. When applying such a marker to a FFT or 1/Length axis it is displayed at the point on the X axis which corresponds to the average of the time or length based expression in the navigator frame.

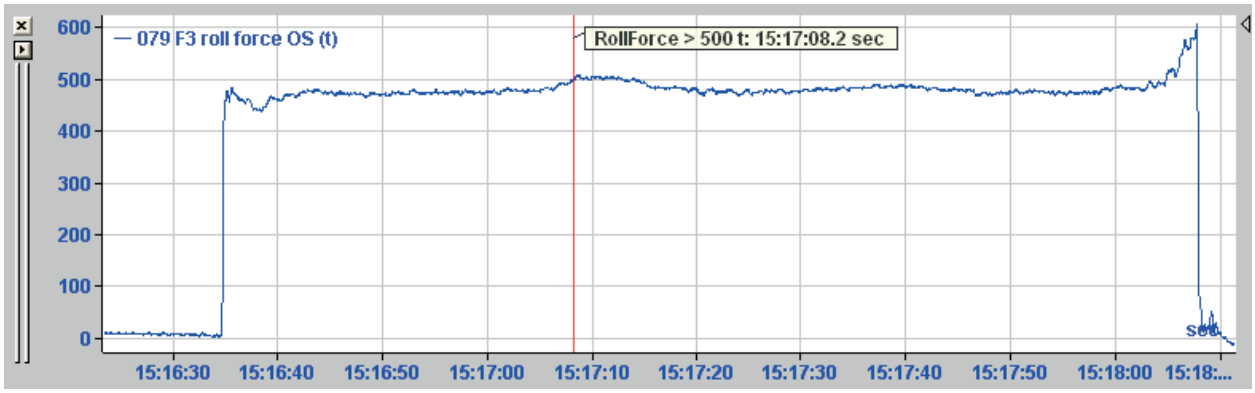
Please keep in mind that the expression you enter must always return a position on the X axis in order to get a marker. At least the result of the expression which defines the marker must comply with the unit of the X axis of the graph the marker should be used in.

For example, if you want to use a marker defined by an expression which returns a frequency over time (e. g. rpm of a motor), this marker can only be used in graphs with a frequency X axis. (convert from rpm to Hz!)

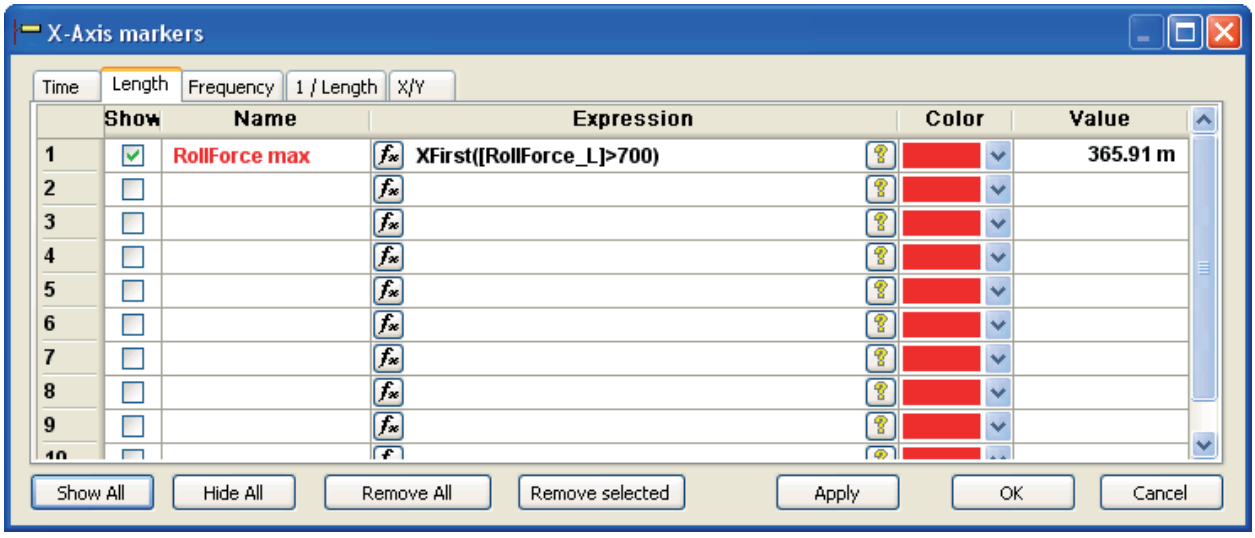
Column Color
Select the color of the marker. Default color is red.

Column Value
If the position of a marker can be evaluated, that value will be displayed in this column after pressing the <Apply> button, provided the "Show" option is checked.

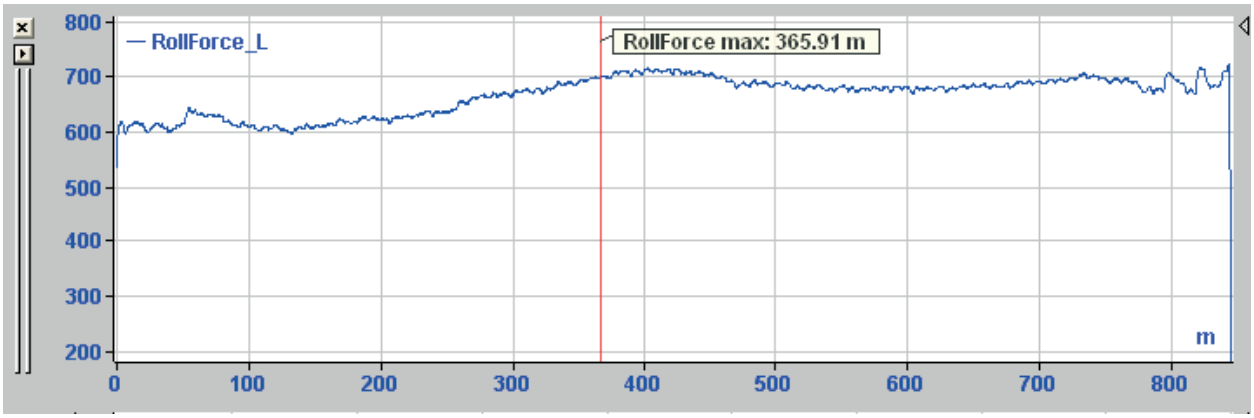
The marker from the example above would be displayed like follows:



It indicates that the shaft speed exceeded 500 rpm at 16:23:43.
Another example for a length based signal:



This marker will be placed at the point on the length axis where the measured roll force exceeds 700 tons for the first time.



An X axis marker cannot be moved unless its defining expression is modified. It is possible, however, to move markers from one strip into another, provided that the strips have the same X axis. You can move a marker by clicking the marker's label and dragging it into the other strip, while holding down the mouse button. The mouse cursor will change accordingly.

All markers are listed in a tree below the signal tree. You can move the markers from the tree in the trend view via drag & drop, provided that the X axis is appropriate.

If you want to remove the marker from the display, simply drag it out of the strip. The marker, of course, will not be removed from the signal tree.

Markers on axes that are either frequency or inversed length based, have the characteristic that when you click on the marker's legend, harmonic markers are shown. The number of markers is the same that you selected for the harmonic marker (see ↗ *Harmonic markers*, page 121).

6.19.5 Dynamic marker labels

Like for the signal legends and tooltips you can create dynamic text for the marker labels by using placeholders. You can enable or disable this function in the *Preferences* or in the *Graph setup*, *2D View* tab.

Distinguished settings for interactive markers (X1, X2) and computed markers (“X-axis-markers”) are available.

When you define the label content you may enter any text and/or use placeholders for signal-specific information.

The selection of available placeholders will pop up when you put the mouse cursor on the entry field.

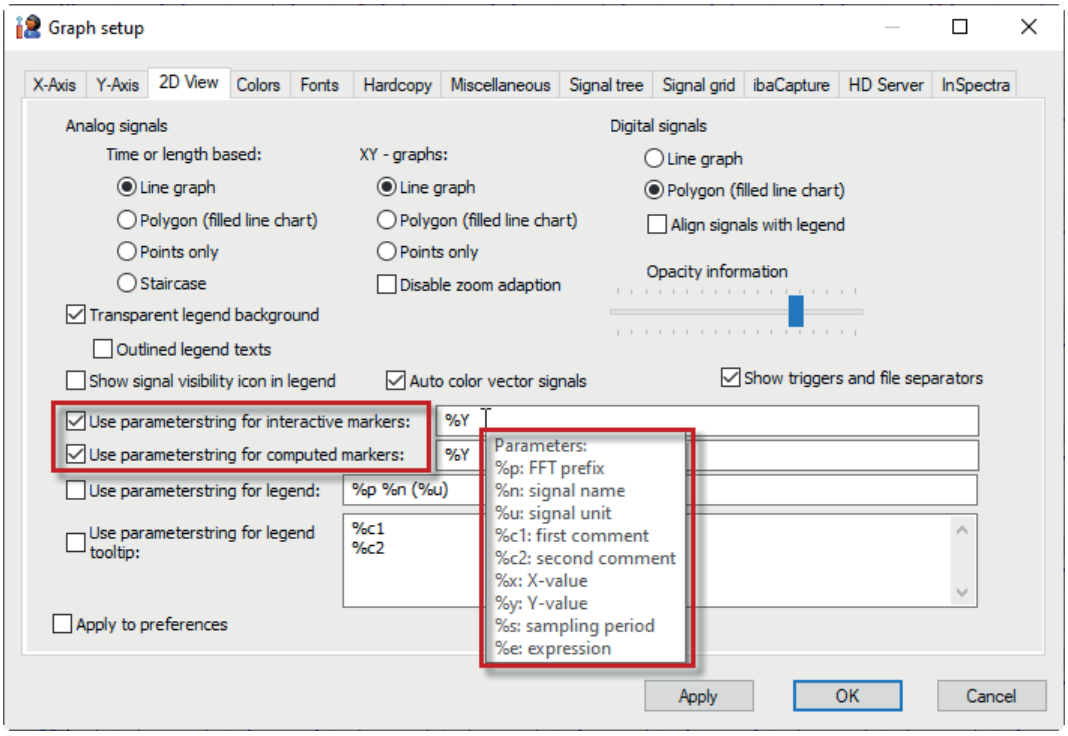


Fig. 73: Options for arranging dynamic label texts

6.20 X axis modes (reference axes)

Several types of reference axes exist which can be enabled via the *Graph mode* menu or by clicking the corresponding button.

- Time axis (s)
- Length axis (m)
- Frequency axis (1/time, 1/length)
- Signal values (X-Y)

The selection in the menu *Graph mode* always refers to the enabled graph.

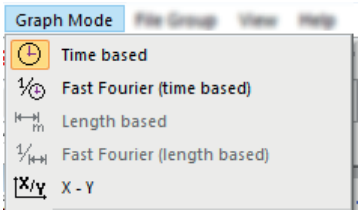


Fig. 74: Selection of the X-axis mode in the main menu

The tool buttons which are offered at the header bar of the strip refer to the kind of signals (time or length based) which are displayed in the strip.

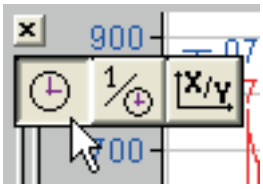


Fig. 75: Selection in a trend view with more than one time-based signal

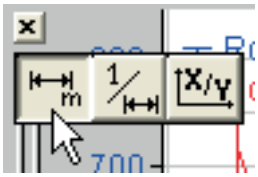


Fig. 76: Selection in a trend view with more than one length-based signal

This means that all the time based signals share the same time axis, all length based signals share one length axis, all time based FFT presentations share one frequency axis (1/s) and all length based FFT presentations share one frequency axis (1/m). The scaling factor of the respective axis is determined by the longest signal of its kind in the recorder window.

The X-Y presentation is a special case which is only offered if a strip contains more than one signal.

6.20.1 Time - Y and length - Y

The time mode is used for time-related signals, the length mode for length-related signals. No curve is displayed if the mode selected does not correspond to the signal reference. The time

mode is the default setting because the measuring data is usually recorded on a time-related basis. Length-related signals do not exist in the regular *ibaPDA* data format (*.dat file). An exception is the *ibaQDR* data format which can, however, only be generated by the *ibaQDR* system.

In order to obtain length-related signals in *ibaAnalyzer*, these must be calculated using special functions, such as "TimeToLength"; refer to part 3, chapter "Conversion from time to length reference".

It is also possible to import length-related signals to *ibaAnalyzer* via a database query. (Only available for *ibaAnalyzer-DB*, refer to manual of *ibaAnalyzer-DB*.)

If strips both with a time and with a length reference are opened in the recorder window, the strips are treated independently in conjunction with the zoom functions and when shifting the X axis. Zooming in the time-related curve does not change anything in the length-related curve. In the *Markers* tab in the signal grid, the correct cursor positions are displayed for every X axis.

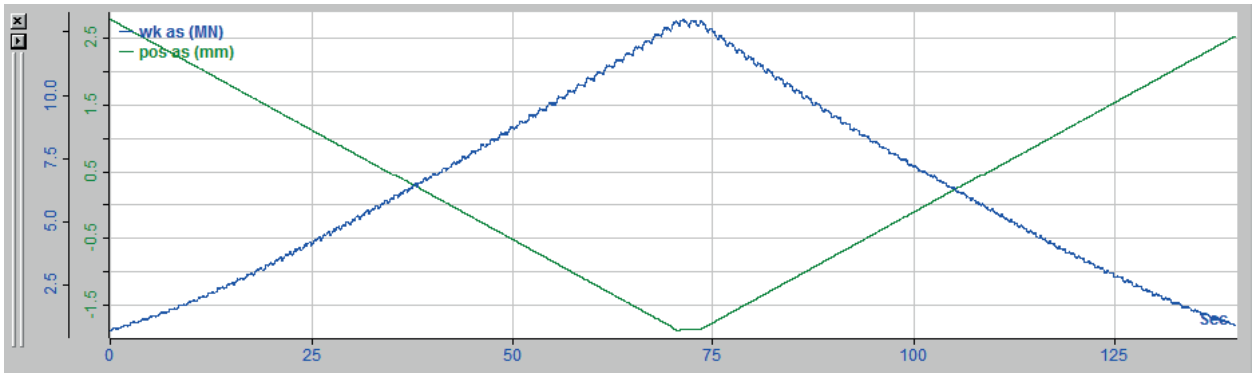
6.20.2 X - Y

The X-Y presentation shows the interdependence of several time-related or length-related signals. The time or length dimension is eliminated during this process. A signal strip must contain at least two signals as a precondition for the X-Y mode to be activated. It goes without saying that mixing of length-related and time-related signals is not possible.

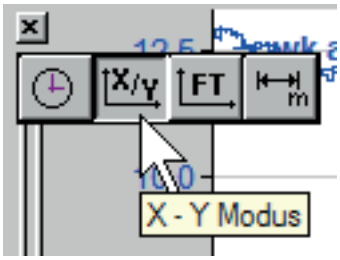
One signal is presented on the X axis, the other signal(s) on the Y axis. The use of one or more Y axes is possible in this case, too. The signals to be presented on the X axis and on the Y axis, respectively, are easily selected by a mouse click.

This selection can be changed at any time. Example: Stand characteristic (roll force vs. position)

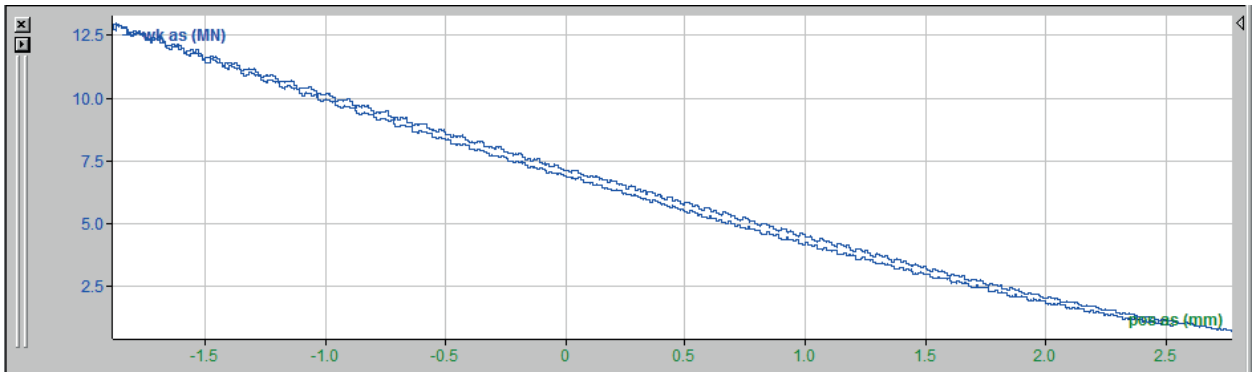
1. Two signals to be presented in their interdependence are to be displayed in one signal strip. In this case, these are the roll force (wk as) and position (pos as) signals. Since both signals are time-related, the X axis is divided into seconds.



2. Then select the strip mode X/Y, for example, via the buttons in the header bar of the strip.

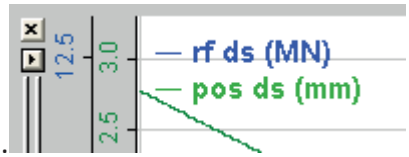


3. Now the X axis is divided into the position unit (mm). The Y axis of the other signal (roll force) remains unchanged. Now, however, the roll force values are no longer entered according to time, but according to the corresponding position values.



Tip

In the X-Y presentation, the signal occupying the bottommost position in the strip is always shown on the abscissa, i.e. in the above example the position (green).



In order to reverse the appearance (position vs. rolling force) simply use the mouse and change the position of the signals in such a manner that the desired signal appears in the bottommost position (see ↗ *Move signals*, page 104).

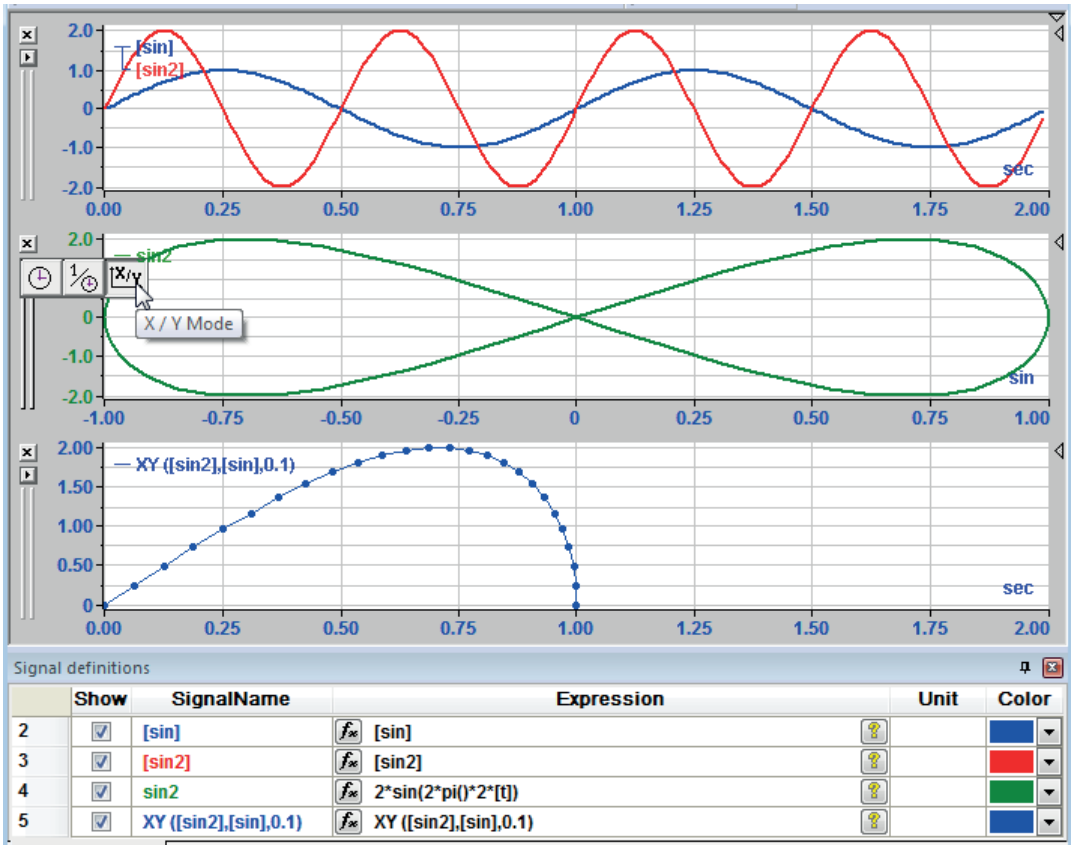


Fig. 77: Comparing X-Y X-axis mode and XY function

6.20.3 FFT

The Fast Fourier Transformation (FFT) is a mathematical method of the Fourier transformation and a faster variant of the Discrete Fourier Transformation (DFT). This method transforms time-related signals into the frequency range. The FFT is used to break down periodic signals into individual sine oscillations which, on their part, are then broken down further into the corresponding spectral frequencies.

The FFT mode generates an FFT analysis for one or more signals within a strip and shows the distribution of the oscillations contained in the signal as the result of the transformation operation. The Y axis becomes the (frequency) amplitude axis, whilst the X axis becomes the frequency axis.

This display mode, however, does not offer the comprehensive analysis functions that are available with an FFT view of *ibaAnalyzer-InSpectra* (see ↗ *FFT view (ibaAnalyzer-InSpectra)*, page 146).

A power spectrum FFT is carried out according to the algorithm of the mean square amplitude (default setting). However, you can modify the calculation basis and the algorithms for the FFT as required both in the preferences and in the strip setup. (also see *Settings* ↗ *Fast Fourier*, page 69)

The results can be compared on the basis of a sine oscillation (f = 10 Hz) in the figure below. All the strips in the example below show the same signal with different FFT settings. The topmost strip represents the time-based signal.

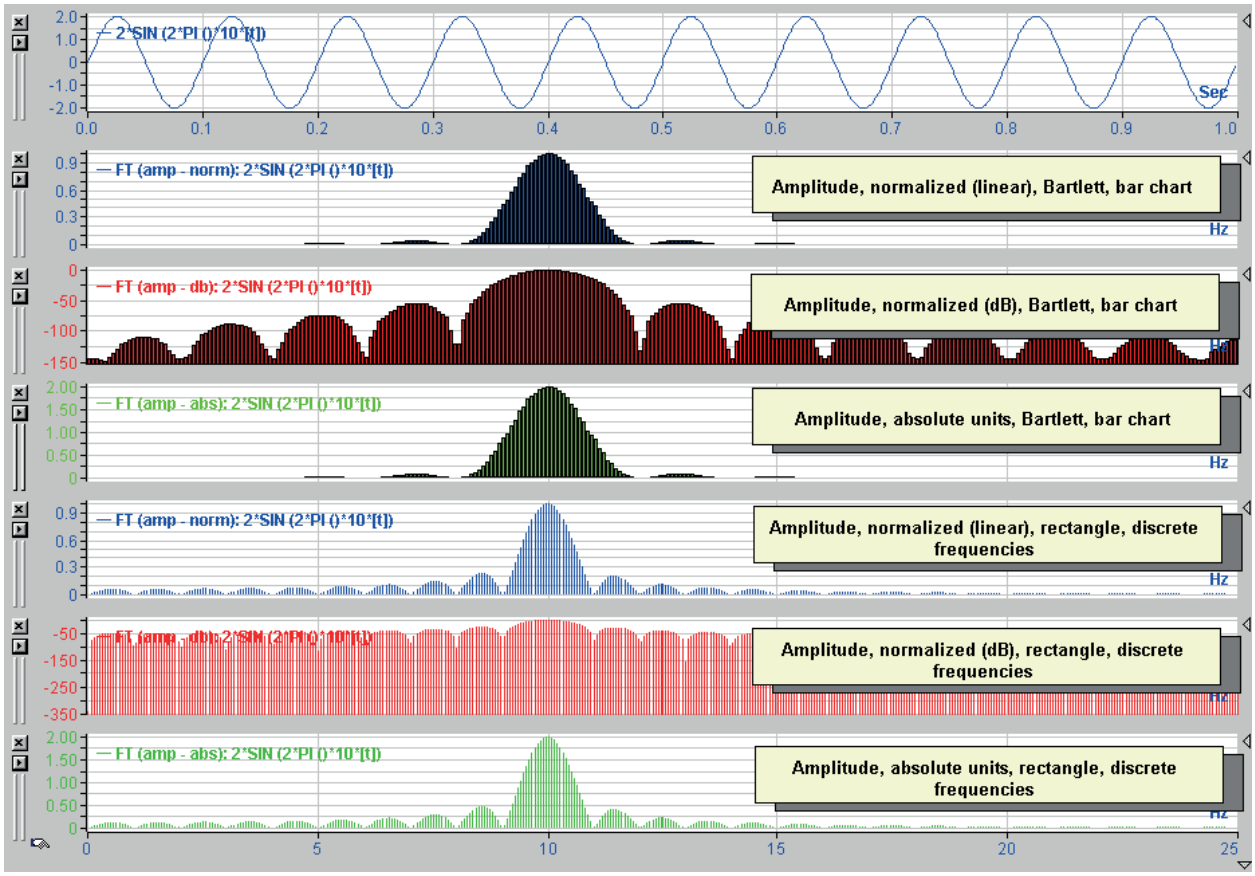


Fig. 78: FFT presentations

Beside the classic time based frequency axis (Hz = 1/s) *ibaAnalyzer* provides since version 5.0 also a “length frequency” axis 1/m (1/inch). The results of the FFT are displayed over an inverse length axis.

This enables *ibaAnalyzer* to display FFTs of length based signals. Such representations are useful when you intend to examine phenomena that reoccur periodically over the length of something, for example irregularities in the thickness of a finished rolled plate.

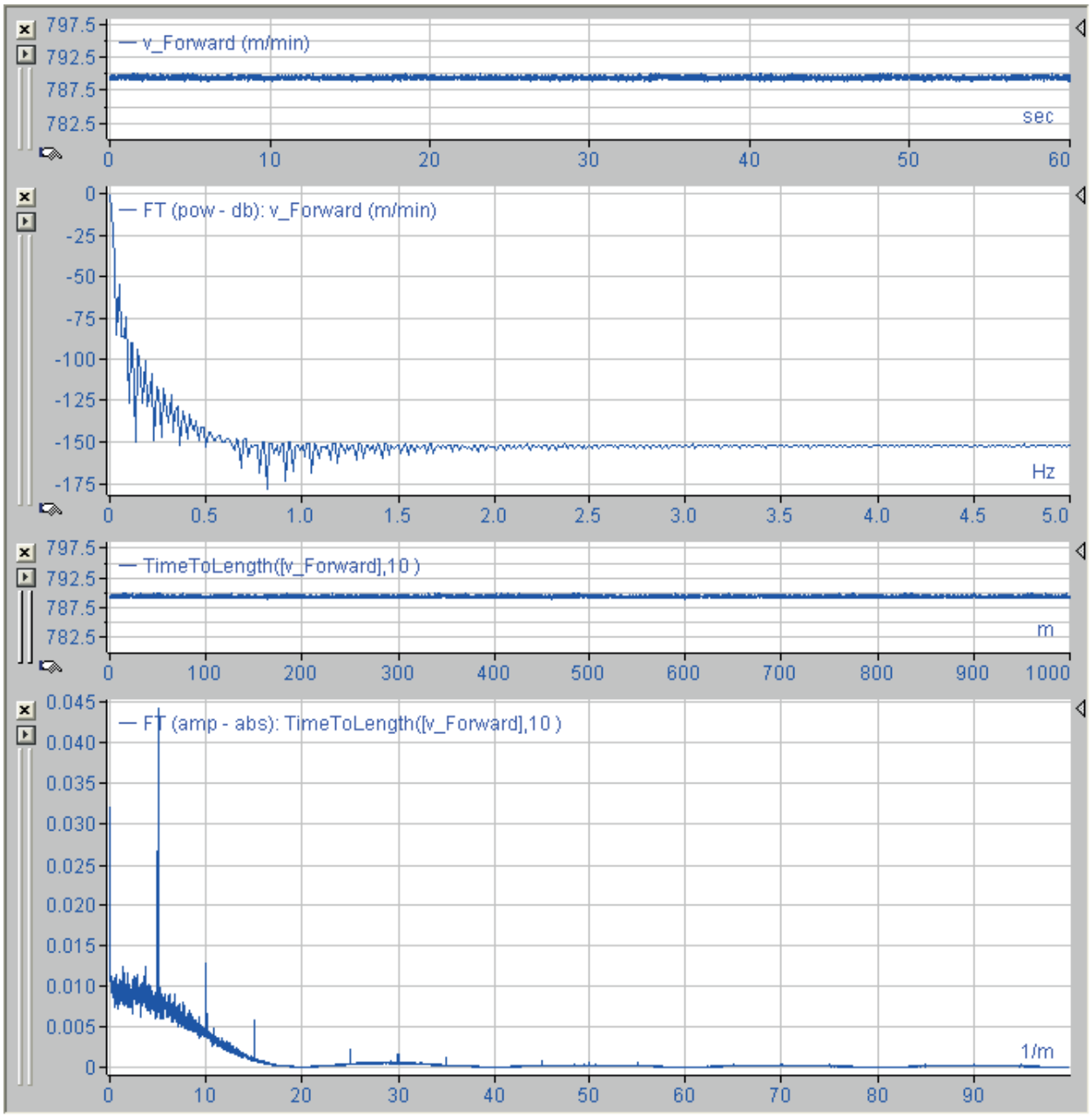


Fig. 79: FFT of a length based signal

The example in the figure above shows the recording of a measured speed signal (excerpt over 60 s) which is “polluted” with a noise or other frequency.

The FFT of the time based signal does not show any reasonable result.

The speed signal, transformed into a length based signal, looks like the original one.

But the FFT of the length based signal shows a prominent spike at 5 1/m, which corresponds to a distance of 0.2 m. Also the harmonics of this “frequency” are easy to spot by their minor spikes.

6.21 Views

6.21.1 Standard view

The term "standard view" refers to the simple, two-dimensional (2D) curve presentation. 2D presentations are typically used for displaying values which change as a function of just a single parameter, such as time or length. The line chart, polygon, points only and staircase presentations are available in conjunction with the graph modes "time" and "length basis". In the FFT analysis graph mode, bars and discrete frequency lines are additionally available.

The type of 2D presentation (line chart, polygon, points only, staircase) is to be selected in the *Preferences* and for the current strip either from the *Setup - Graph setup...* menu or from the context menu for the current strip.

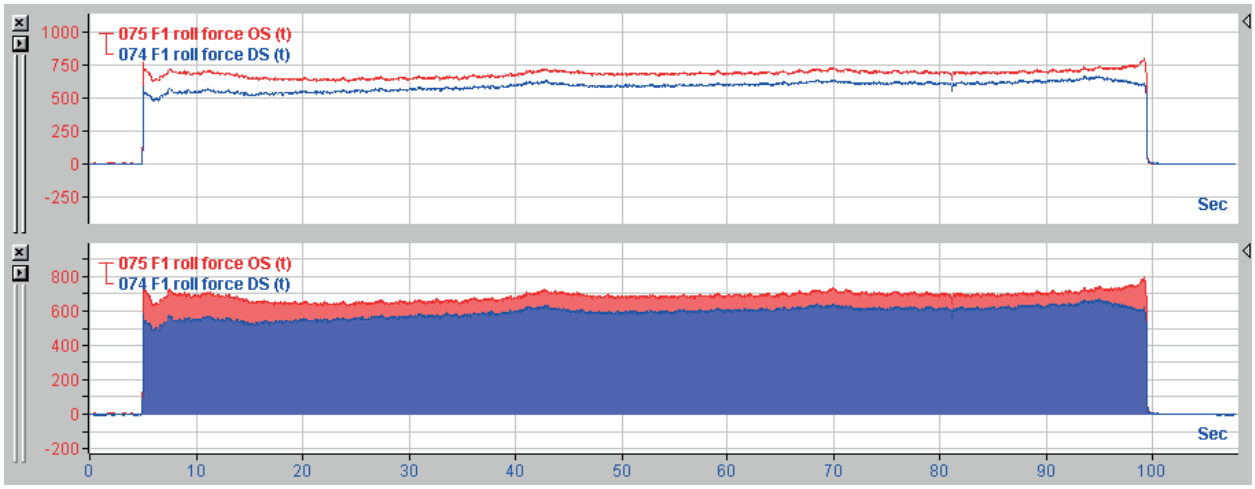


Fig. 80: Standard view, line (top) and polygon (bottom)

In the line chart and polygon presentation the single sample points are linked directly by a straight line, based on interpolation. This may suggest that the measured value changes linearly between two points, which in fact is not necessarily the case.

For displaying batch or product numbers, for instance, which are constant between two points, the line chart presentation is not the best choice. The interpolated connecting line would suggest a continuous change of the value and the markers would show wrong values. In such a case the staircase presentation is more suitable. In the staircase presentation the value of the current sample is drawn as a constant value, i. e. a horizontal line, until the next sample.

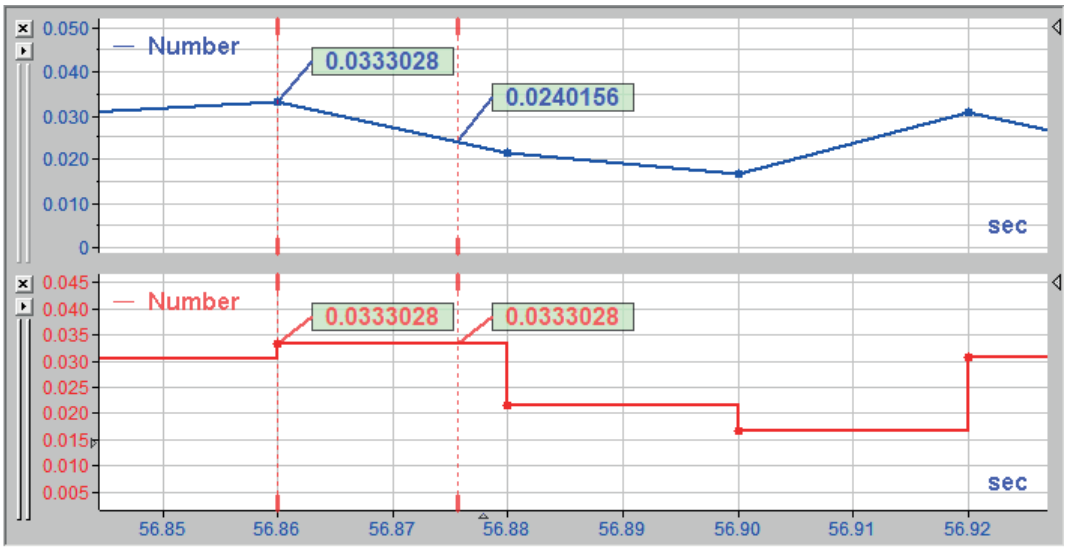


Fig. 81: Line chart (above) - marker X2 shows the interpolated value - and staircase (below)

6.21.2 2D top view

The 2D top view is a special form of 3D presentation. The 3D presentation only makes sense if a signal depends on two parameters.

In the steelmaking industry, for example, temperature, flatness or thickness measuring profiles are suitable applications for a 3D presentation, because the measurement result depends not just on time and/or strip length, but also on strip width. This additional coordinate is typically represented by the position of a traversing measuring instrument or by the different measuring zones of a flatness measuring roll.

As a precondition for presenting the third dimension, *ibaAnalyzer* requires a so-called vector signal (*ibaPDA*), i.e. a special input variable of the vector type, with the number of field cells corresponding to the Z axis. (See ↗ *Logical signal definitions*, page 155)

The following picture shows such a presentation. The part on the left shows the top view as a false-color presentation. The amplitude of the measured values (here: strip thickness) is represented by different colors. Small values are black, violet and blue, whilst high values are orange, yellow and white. The color scale is divided automatically in line with the existing measuring values. However, user-specific adjustment of the color assignment pattern is possible in the preferences or strip settings.

The time or length axis is, as usual, the X axis.

The width of the steel strip corresponds to the width or height of the color strip in the presentation.

In the part on the right, another display field can be opened in order to show the curve of the measured values in a cross-section for two marker positions (X1 and X2). For this purpose, select the menu *Graph mode - Show cross profiles* or use the strip's context menu.

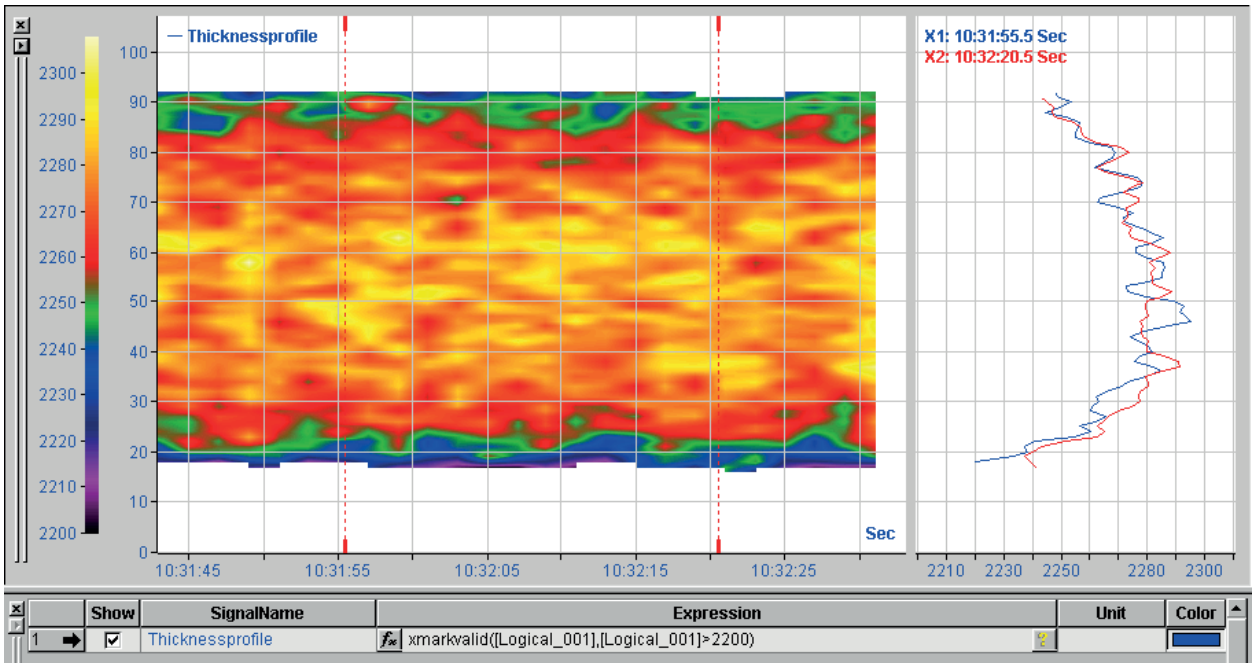


Fig. 82: 2D top view

The zoom function works in the same manner as in the case of the 2D view.

6.21.2.1 Settings

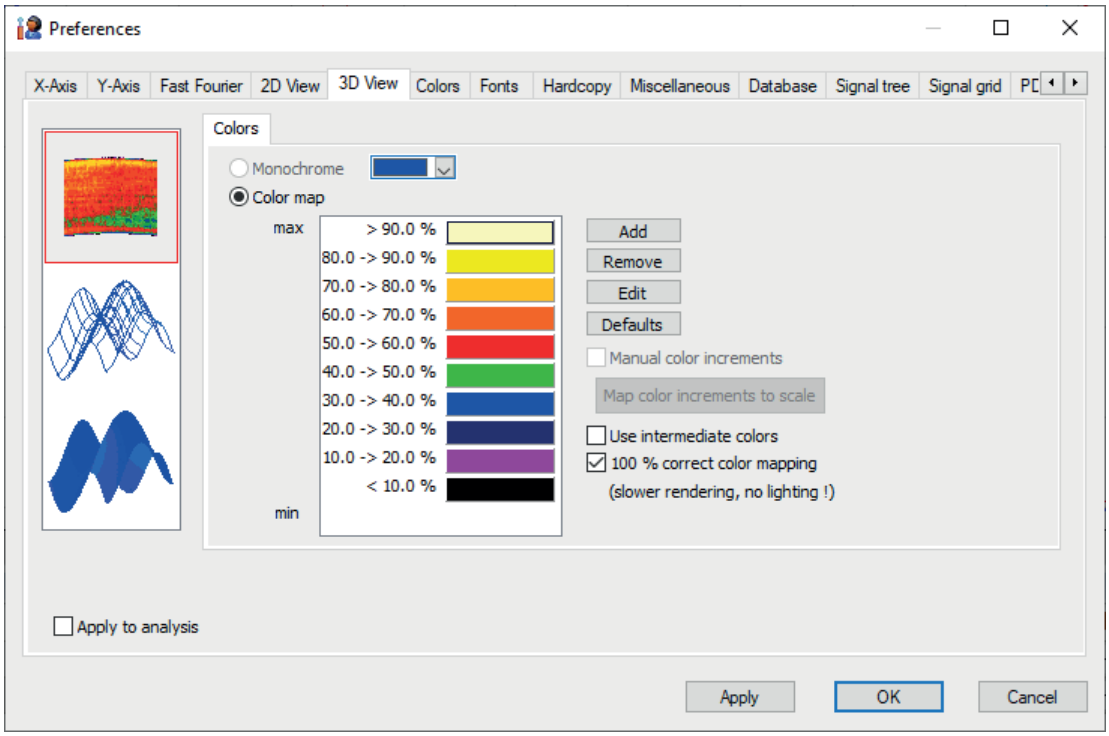


Fig. 83: 2D view, settings

In the 3D view tab of the strip settings, the topmost of the three presentation modes must be selected (see picture above). More settings can be found in the *Colors* and *Color axis* tab.

Colors

You can use the <Add>, <Remove> and <Edit> buttons in order to change the color scale for the presentation of values. Corresponding to the value range of the signal measured, the colors are distributed over ten stages each representing 10% of the maximum value.

In order to obtain, for example, a finer graduation, further colors must be added. For this purpose, click the color bar above which the new color is to be added. Then click the <Add> button. The program automatically adds a new color and re-computes the percentage stages in line with the new number of colors.

Analogously, you can also reduce the number of stages by marking a color bar and subsequently clicking the <Remove> button.

In order to change a color, first use the mouse to mark it and then click the <Edit> button. You can then define any color you like in the dialog which follows now.

If you notice that you made a mistake, click the <Default> button in order to reactivate the default values. However, if you have changed the default values, this option is no longer available, of course.

The "Use intermediate colors" and "100% correct color mapping" options refer to the resolution with which the colors are presented. The "Use intermediate colors" option leads to a significantly smoother presentation of the transitions between colors.

If you click the <Apply> button, you can apply the changes to the current presentation without saving the changes. If the result is insufficient, you can continue changing the settings or you can click the <Cancel> button in order to discard the changes. Click the <OK> button in order to save the settings.

Color Axis

In the *Color Axis* sub-tab, you can set end values, position and division of the color scale. Therefore, check "Manual scale" and enter fixed scale start and end values.
Basically, the settings correspond to the settings in the *Y-Axis* tab for the normal signal display.

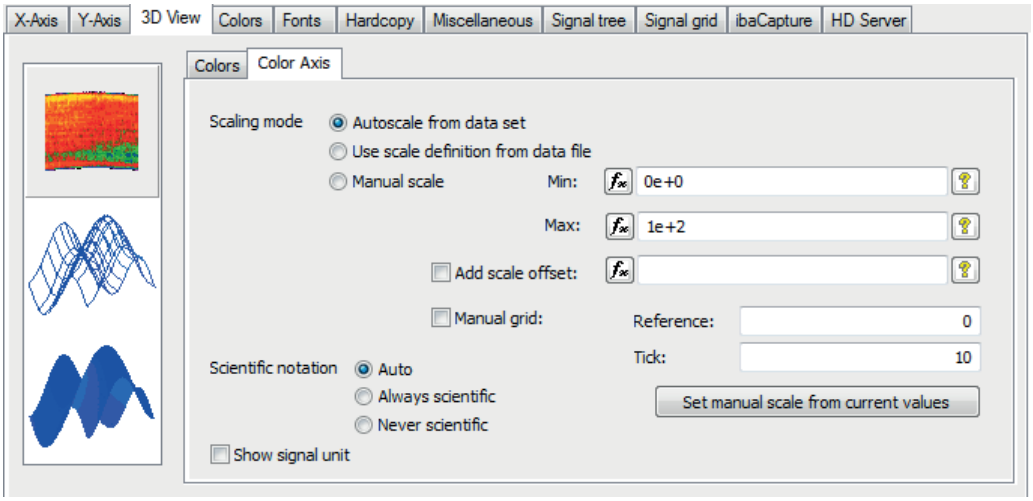


Fig. 84: Setting the color scale for 2D top view

Sometimes, the frames can contain invalid (ranges without data, or the like) when in 2D presentation mode (see marked ranges in the picture below).

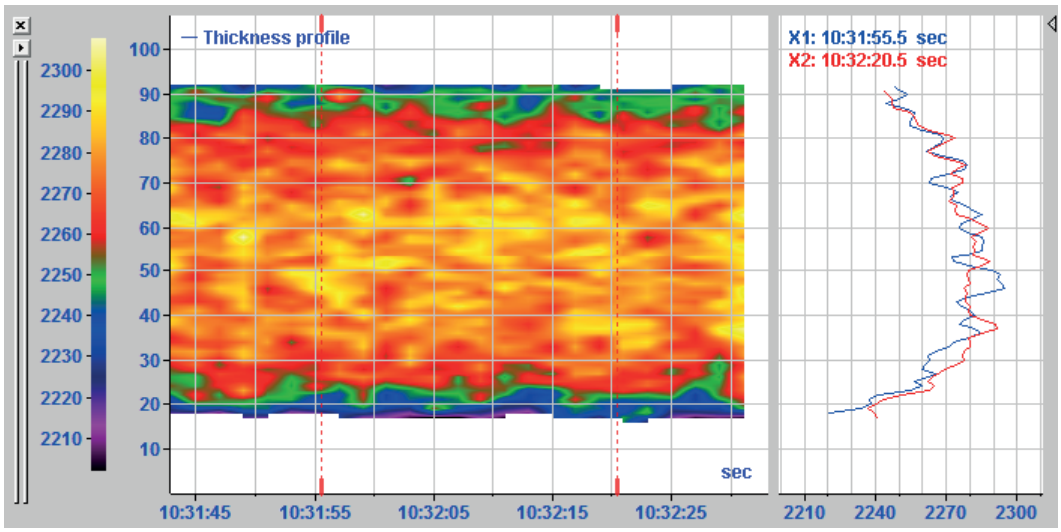


Fig. 85: 2D display with invalid areas

In order to prevent this, you can cut the frames and thus improve the presentation. Therefore, open the "Setup" (right mouse key) menu and select the *Y-Axis* tab. Select *Manual scale* and adjust the minimum and maximum value of the scale in such a way that they comply with the real value.

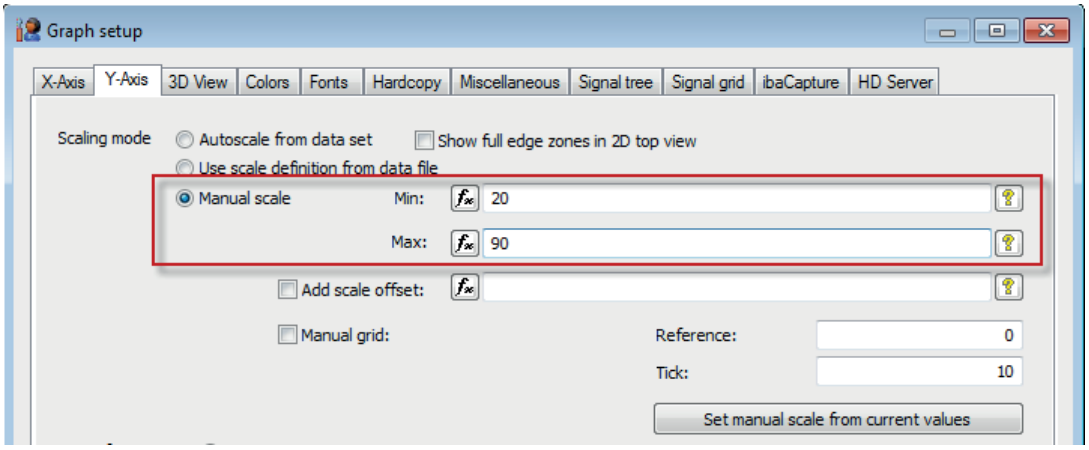


Fig. 86: Crop settings for 2D display

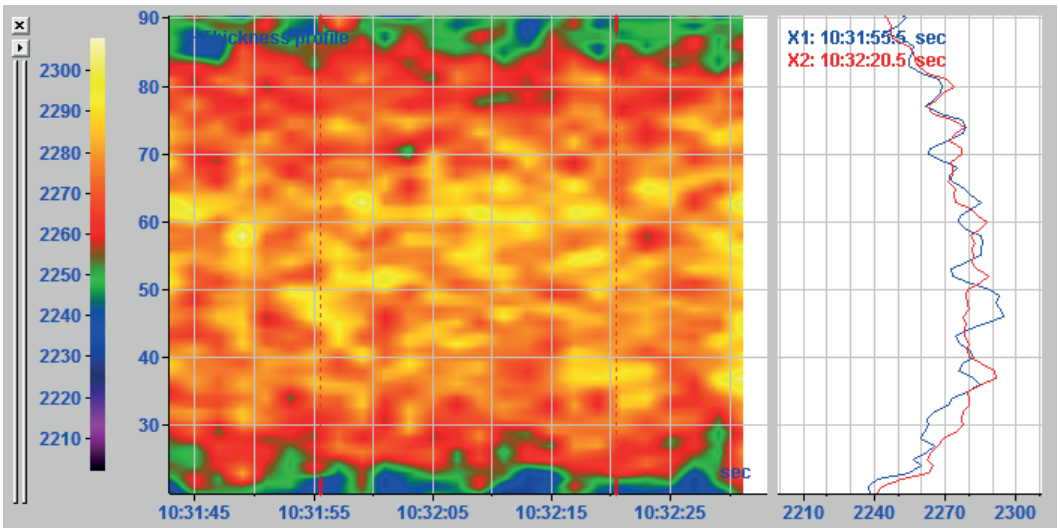


Fig. 87: 2D display after cropping

6.21.2.2 Setting when using zone widths

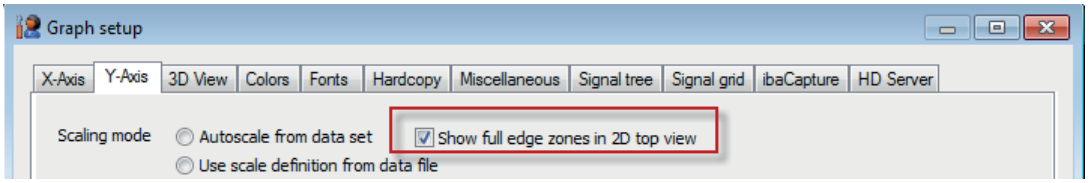
From *ibaAnalyzer* version 6.1 and higher, it is possible to assign a width and physical unit to the individual tracks or zones. This allows an irregular distribution of the values over the width (Y axis) or different weighting provided that this complies with the gauge characteristic.

The zone width is assigned in the logical signal definitions when defining the vector signal.

You can find detailed information about this in chapter ↗ *Zone control with vector signals*, page 163.

For presentation in 2D top view, the following Y axis setting is relevant:

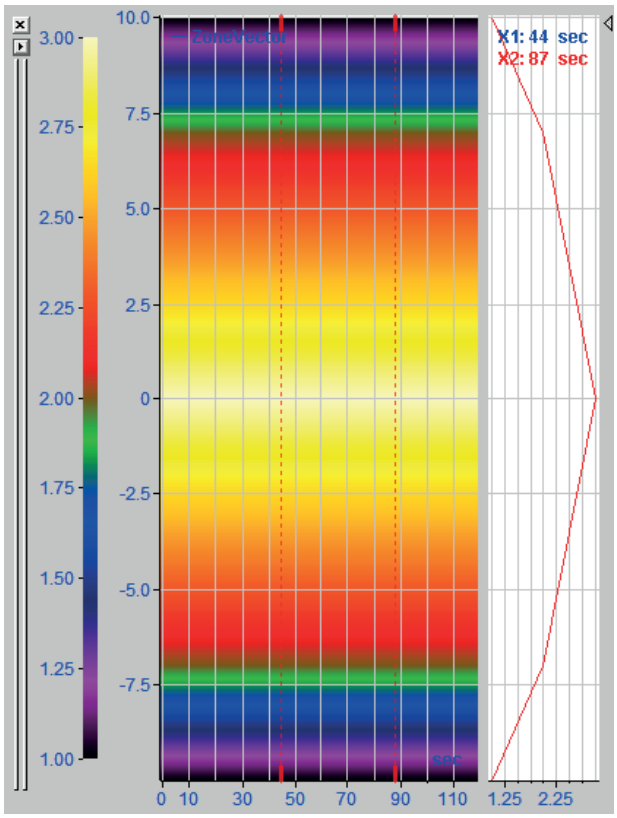
Show full edge zones in 2D top view



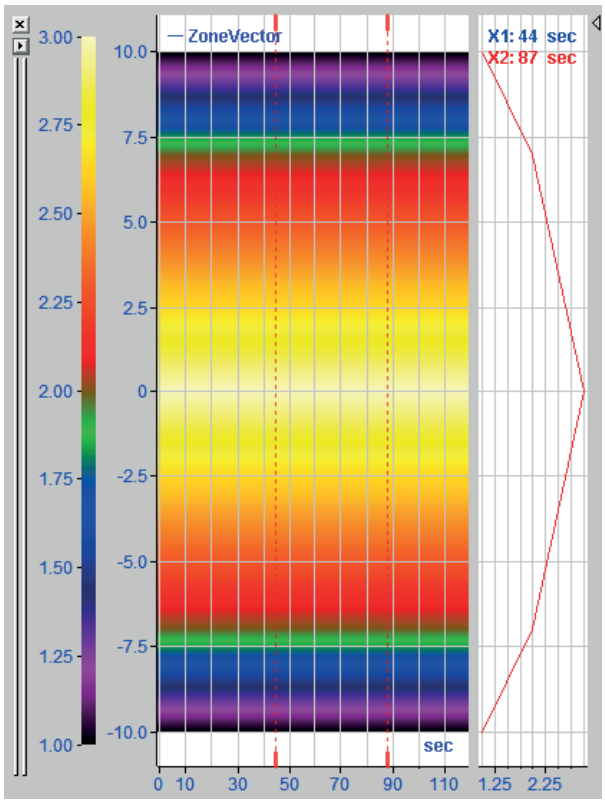
As the measured values are always in the center of a zone and an interpolation regarding the value of the adjacent zone(s) is performed for the coloring, there are empty ranges in the two outermost zones each ranging from the center to the outside margin of the zone. For these margins, an interpolation cannot be performed due to a missing adjacent zone.

When autoscaling, the Y axis is scaled to the smallest and largest valid value by default so that these margins are not visible, see picture on the bottom left at -10 and +10, respectively.

If you activate the above-mentioned setting, the Y axis is scaled to the entire width of all zones as shown in the bottom right picture.



Visibility disabled



Visibility enabled

6.21.3 3D presentation

6.21.3.1 3D wire frame

This view uses a three-dimensional presentation format for the measured values in the form of a wire frame as a "real" 3D presentation.

When you select this mode of presentation, the cursor changes its shape and becomes a small hand symbol as long as the mouse is positioned in the signal strip.

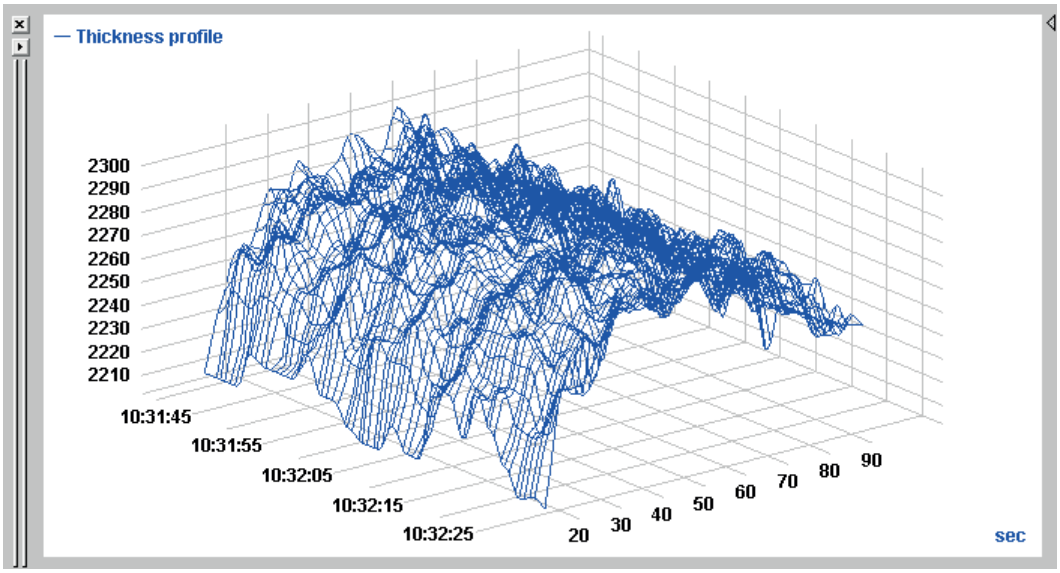


Fig. 88: 3D wire frame presentation

Some special mouse operations are available in this context.

- As long as the hand symbol is displayed, you can move the graph within the strip by keeping the left mouse key depressed.
- Press the <CTRL> key and the left mouse key in order to rotate the graph around the axis enabled for rotation in the setup. The cursor takes the shape of a rotation symbol.
- Press the <SHIFT> key and the left mouse key in order to zoom into the graph, and/or to enlarge or reduce the graph. For zooming out, proceed analogously because the zoom buttons are deactivated on the icon bar.

6.21.3.2 Settings

Colors

The color settings enable the selection of monochrome or color presentation. When you select the multicolor presentation option, the amplitudes of the measured values are additionally presented in different colors. In order to set these colors, proceed in accordance with the description in ↗ *2D top view*, page 135.

In the case of the monochrome mode, you can select the color from a small box next to the "Monochrome" option.

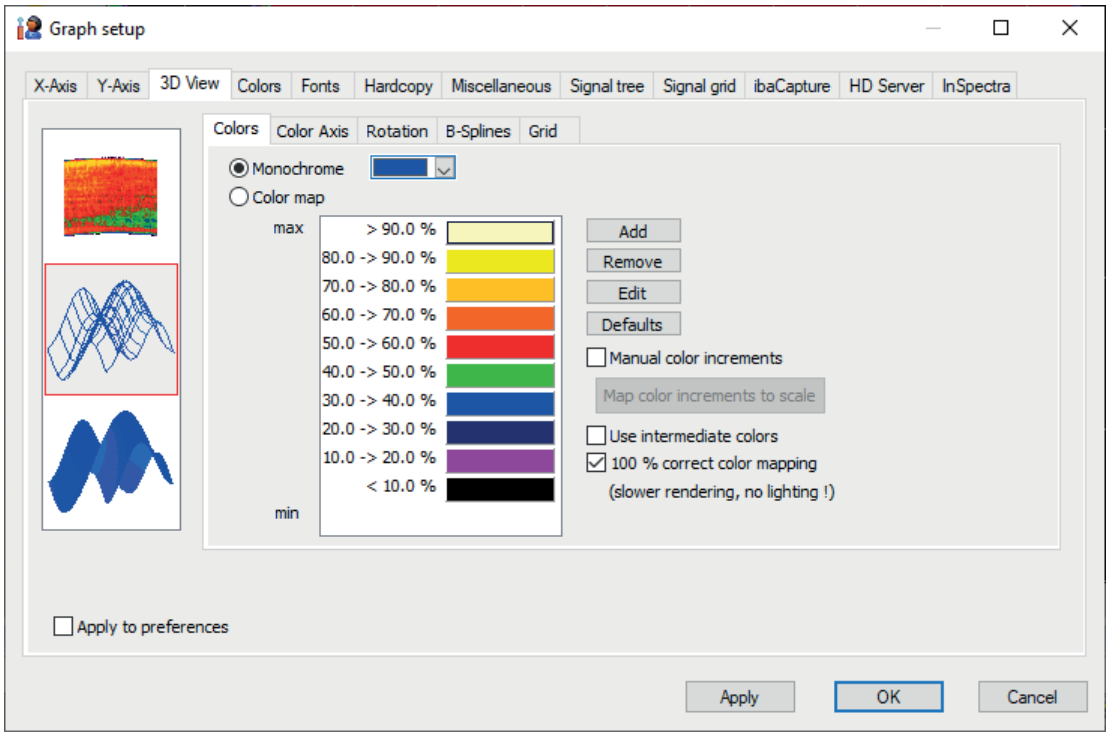


Fig. 89: 3D wire frame presentation, color setup

Color axis

The settings of the color axis correspond to those of 2D top view, see ↗ *Settings*, page 136.

Rotation

Two axes – X and Y – can be enabled or disabled for the rotation function, no matter whether in manual or animated mode. Ticking off the corresponding field blocks the rotation around this axis.

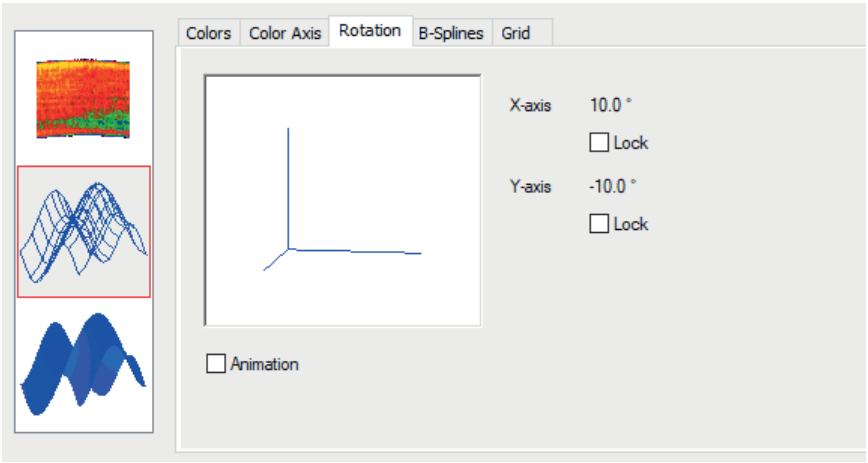


Fig. 90: 3D wire frame presentation, rotation setup

If the "Animation" field is ticked off, the graph is automatically rotated around all the axes that are enabled.

B-Splines

The B-Splines settings can be used to increase or reduce the density of the grid.

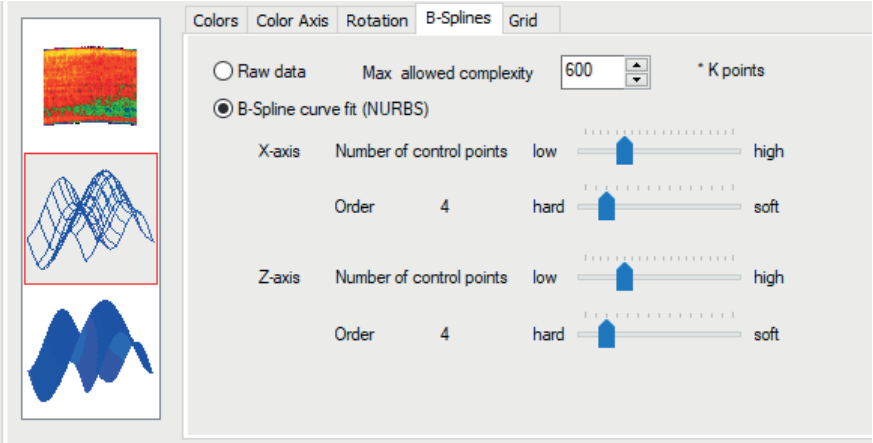


Fig. 91: 3D wire frame presentation, B-Splines setup

When you select the "Raw data" option, the original measuring points are presented and connected by straight lines both in the X direction and in the Z direction.

If the B-spline curve shape is activated, the mathematical fundamentals of the B-spline calculation are used for creating a smoothened or rounded surface. During this process, the lines connecting the measuring points are converted to curves via additional control points.

In the "Max. allowed complexity" input field, you can define the total number of points (10,000 –1,000,000 points).

Finally, you can use the sliders in order to select the point density and the curve character for the X and Z axis.

Grid

In the *Grid* tab, you can activate and deactivate the three-dimensional grid in which the graph is displayed, as well as the scale values for the X and Y directions.

6.21.3.3 3D surface

In the 3D surface presentation, the "skeleton" of the wire frame presentation is covered by some kind of "skin". The setting options of the two presentation modes thus also resemble each other.

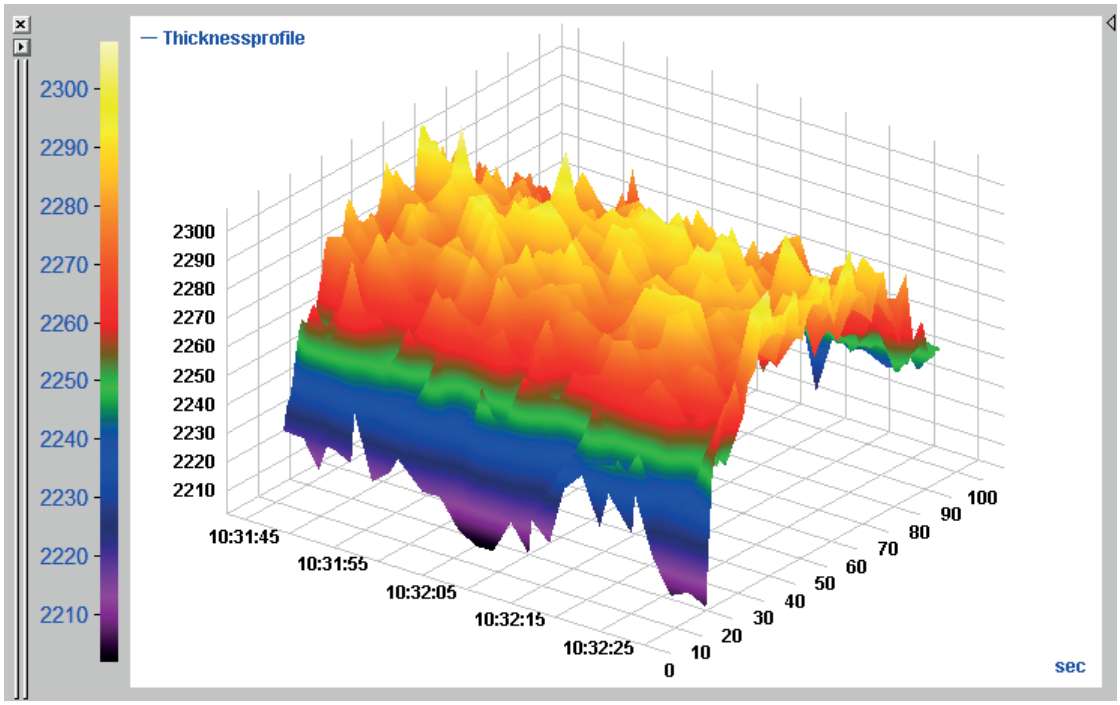


Fig. 92: 3D view, surface

The only special feature to be mentioned here is the lighting function.

The *Lighting* tab is only displayed in the setup dialog window when the "100"% correct color mapping" is deactivated for the colors in the wire frame or surface presentation mode.

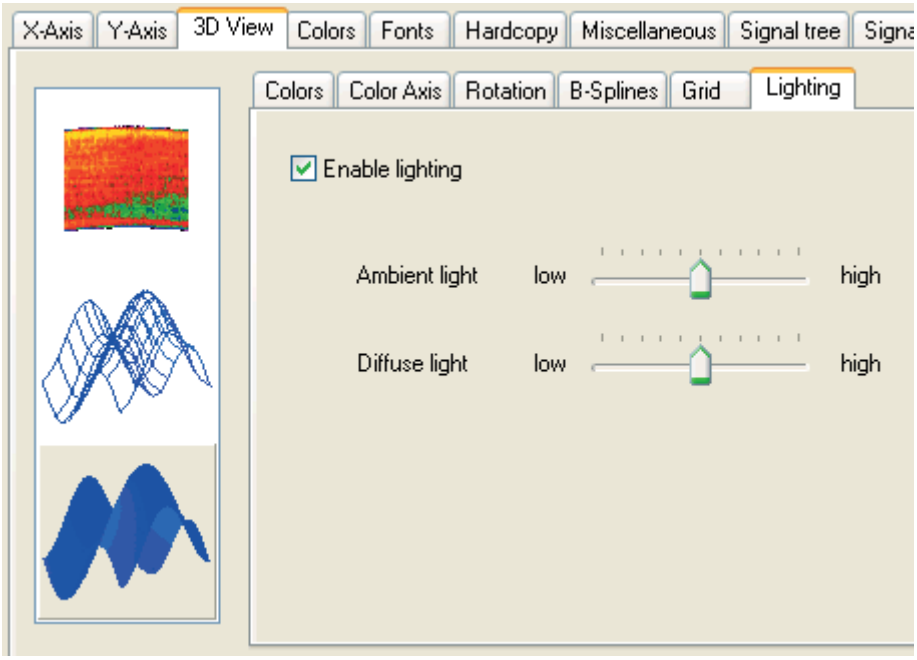


Fig. 93: 3D surface presentation, Lighting setup

If the lighting function is ticked off, the program simulates lateral illumination of the 3D graphic. This option is available both with monochrome and with color presentation.

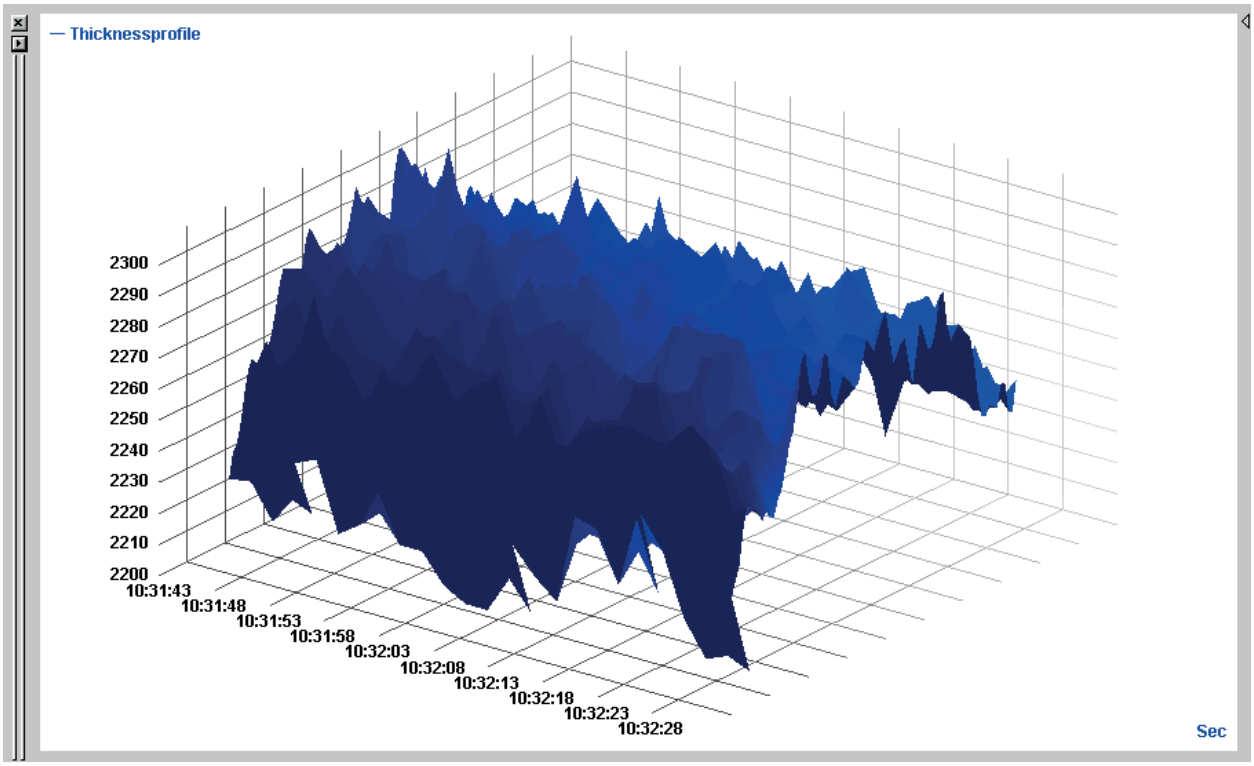


Fig. 94: 3D surface presentation, monochrome with lighting

The only way to find the optimum setting is by trial and error.

6.22 FFT view (ibaAnalyzer-InSpectra)

This FFT view is only available to you if you have a license *ibaAnalyzer-InSpectra*. The view primarily serves to carry out frequency band analyses with data from an *ibaInSpectra* module (*ibaPDA*). The structure and operation of the FFT view are essentially the same as the view in *ibaPDA*. Calculation profiles for the frequency band analysis can be created in *ibaPDA* and used with *ibaAnalyzer* as well. Conversely, calculation profiles can also be determined offline with *ibaAnalyzer* and then imported in *ibaPDA* in order to execute the online analysis in the InSpectra module.

Other documentation

For detailed information about the InSpectra FFT view, see the manual for the product *ibaAnalyzer-InSpectra*.

6.23 Orbit view (ibaAnalyzer-InSpectra)

This Orbit view is only available to you if you have a license *ibaAnalyzer-InSpectra*. The view primarily serves to carry out analyses on the shaft position for plain bearings with data from an *ibaInSpectra* module (*ibaPDA*). The structure and operation of the Orbit view are essentially the same as the view in *ibaPDA*. Calculation profiles for the Orbit analysis can be created in *ibaPDA* and used with *ibaAnalyzer* as well. Conversely, calculation profiles can also be determined offline with *ibaAnalyzer* and then imported in *ibaPDA* in order to execute the online analysis in the InSpectra module.

Other documentation

For detailed information about the Orbit view, see the manual for the product *ibaAnalyzer-InSpectra*.

6.24 Audio player

The audio player can be used to interpret time-based signals as sound signals and to play them back via the system's standard speaker.

The playback function is released for signals that were recorded with at least 100 samples/s, i.e with at least a 100 Hz sample rate.

The acoustic playback may be helpful when analyzing vibration phenomena.

6.24.1 Enable audio player

The audio player is disabled in the default settings of *ibaAnalyzer* and you must enable it to use it. You can do this in the *View - Audio-Player* menu.

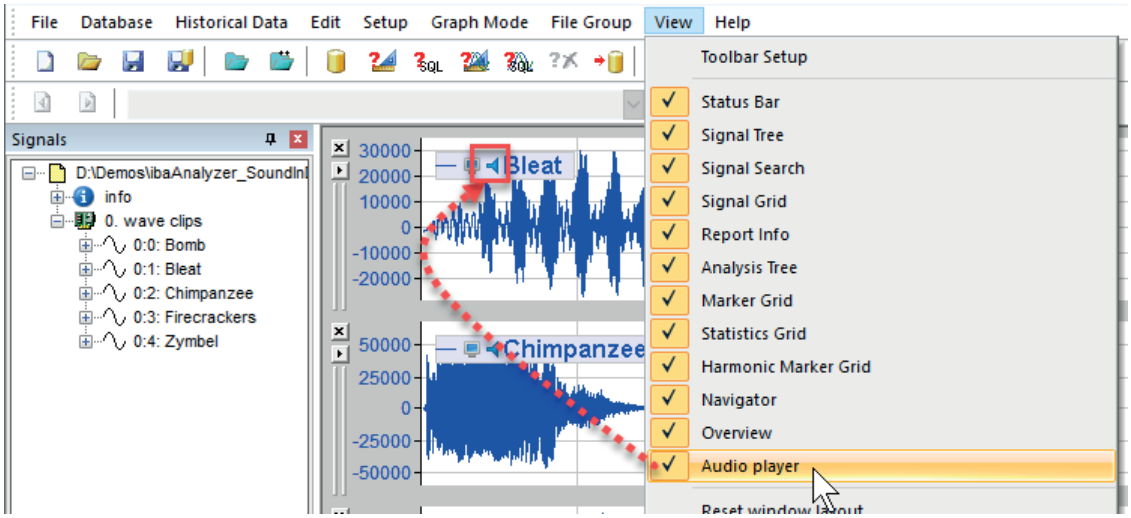


Fig. 95: Enable the audio player

If the audio player is enabled, a speaker icon is displayed in the signal legend of the signals suitable for audio output.

You can use the same menu to disable the audio player again.

6.24.2 Audio player playback

To play back a signal via the audio player, simply click on the speaker icon in the signal legend. The playback starts from the position of marker X1. The marker moves along with the playback until the end of the data file.

During playback, the volume icon changes into a pause sign so that you can stop and continue the playback at any time by clicking on the pause sign.

Fig. 96: Pause/playback controller of the audio player

The audio playback pauses if ...

- ... the pause sign in the signal legend is clicked
- ... the markers are moved
- ... the signals present in the display window are changed, a trend view is added or removed, an expression is changed, etc.
- ... a data file or other data source (trend or HD query) is loaded/reloaded
- ... a video is played
- ... the audio player is disabled in the menu *View*
- ... the playback has reached the end of the data file or
- ... no more data is present

Tip

If you want to listen to more than one signal at the same time, then use an expression (additional signal in the signal table or logical signal definitions) in which you add the respective signals. The “audio tracks” are then superimposed.

6.24.3 Audio player volume

A slide control appears below the signal legend during playback, which you can use to customize the volume.

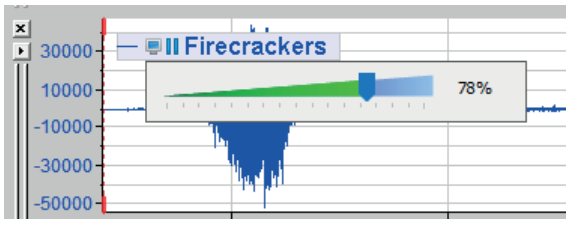


Fig. 97: Volume controller during playback

The volume can also be changed via the Windows sound settings.

You cannot change the volume by scaling the signal with a factor, since the signal data is normalized before it gets to the audio output.

6.24.4 Audio player synchronization with video

If *ibaCapture* videos are contained in a data file, then the videos are played back together with the audio player when the audio player is started. The replay speed of the video is set to the original speed (1x) in this case.

Conversely, video playback does not start audio playback.

6.25 PDA trend graph

A more flexible kind of signal presentation is the so called PDA trend graph, which can be opened with the tool button at the right end of the tool bar. Like for the views FFT and Orbit every click on this tool button opens a new trend graph.

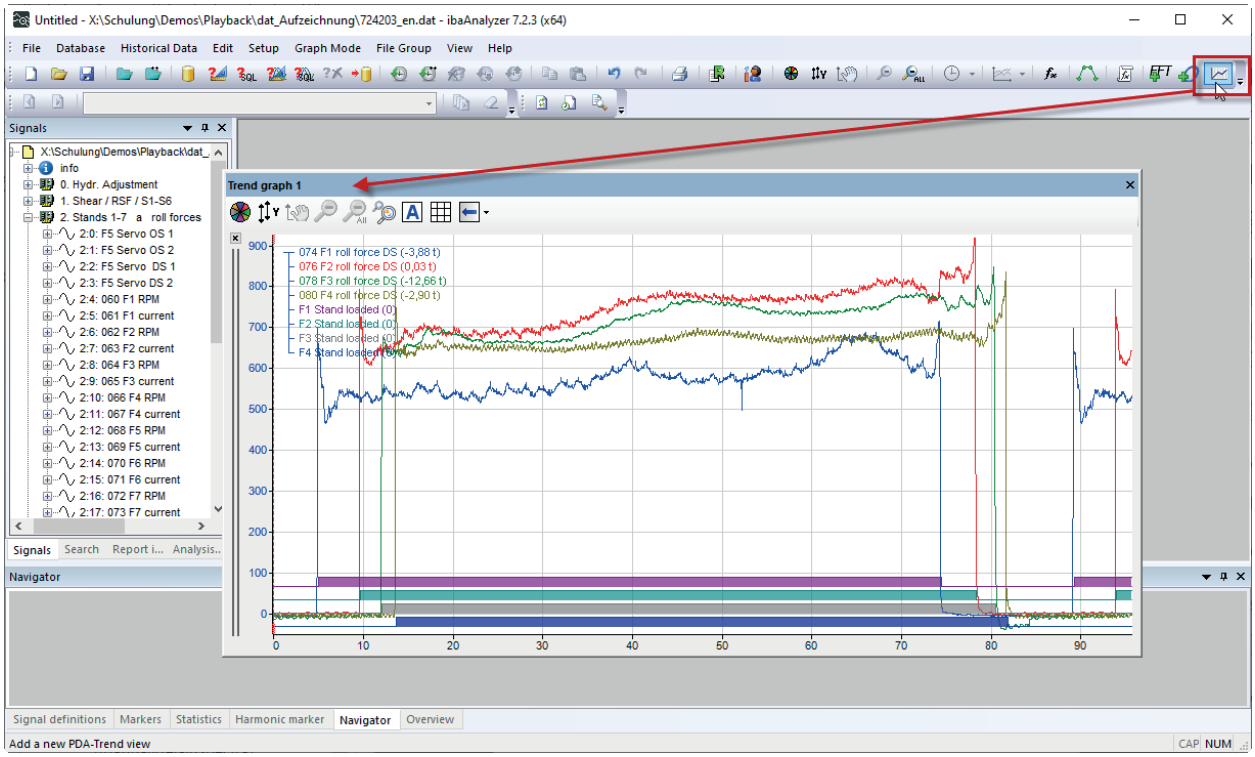


Fig. 98: Opening a PDA trend graph

In the style of the trend graph in the data acquisition software *ibaPDA* the view has the following properties:

- Display of all time-based signals and expressions, incl. vectors, text signals, analog and digital signals
- Each PDA trend graph has its own X-axis and marker grid.
- Relative or absolute time for the X-axis
- Free floating and dockable windows, which can also be arranged as piled tabs or set to “auto-hide” mode.
- Individual zooming or adapting to the zoom area in the recorder window or navigator for each view.
- Nearly the same settings as for the trend graph in *ibaPDA* are available.

6.25.1 View functions

Basically, the PDA trend graph offers the same functions and operations as its model in *ibaPDA*.

Other documentation

You'll find a detailed description of operation and setup of the *ibaPDA* trend graph in the ibaPDA manual, part 6.

However, the following tool buttons have been added to the toolbar for a better integration in *ibaAnalyzer.*

Fig. 99: Toolbar of the PDA trend graph

	Apply the same zoom area as set in the recorder window/navigator pane to the PDA trend graph.
	Show or hide marker grid (toggle).

Note

Signals can be added to the PDA trend graph by drag & drop from the signal tree only. Combined shortcuts like double-click + <Ctrl> or <Shift> do not work.

In the context menu of the view (right mouse click on the view's caption), beside commands for positioning you'll also find commands for renaming and duplicating the view.

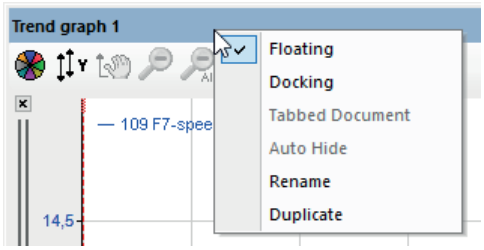


Fig. 100: Context menu of the PDA trend graph

6.25.2 Properties of the view

The dialog for the properties and settings of the PDA trend graph resembles the one in ibaPDA but omitting the options for live view.

You get to the dialog by using the context menu over a right mouse click in the graph area of the PDA trend graph, command *Properties...*.

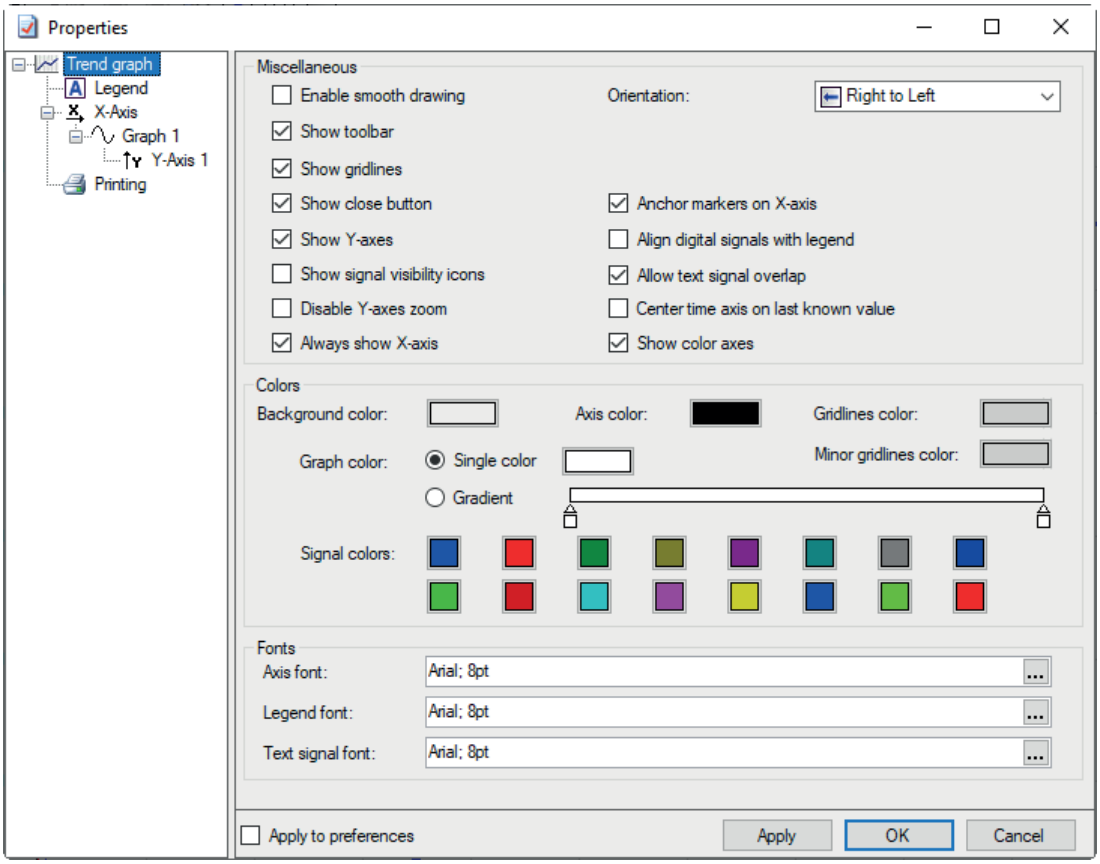


Fig. 101: Properties dialog of the PDA trend graph

As an additional setting you can choose between absolute or relative time expression on the X-axis.

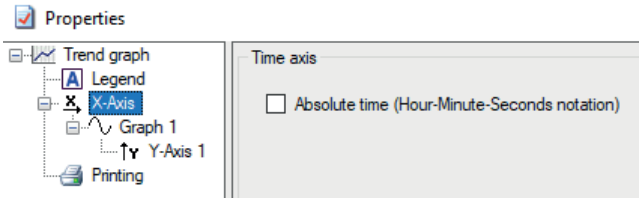


Fig. 102: Enabling the option results in absolute time on the X-axis.

7 Create new signals

If *ibaAnalyzer* would permit the use of the original signals (raw data) only, the analysis options would be very limited. A key precondition for demanding analyses is hence the possibility to create new “signals” and to integrate these into the calculations. There are two methods in *ibaAnalyzer* to do this.

7.1 Add signal in the signal table

New signals can be added at any time on the *Signal definitions* tab. This does not even require a data file to be open.

The easiest way is to click the right mouse key in order to open the context menu while the cursor is positioned in the signal definitions area of the table and to select the *Add signal* command from the context menu.

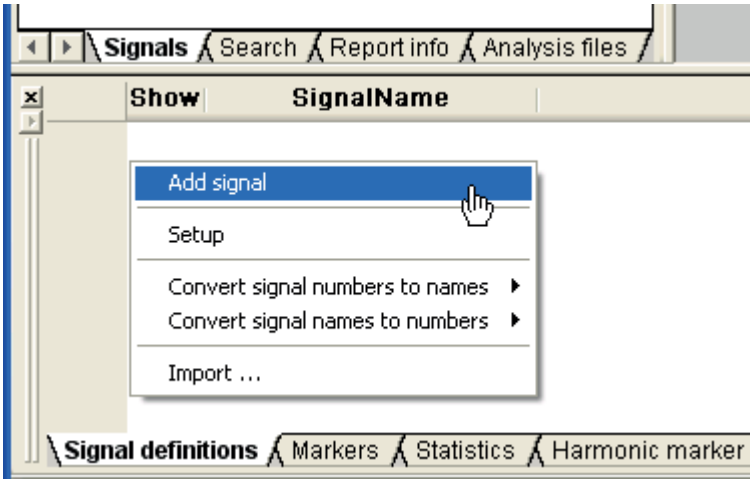


Fig. 103: Add signals, signal definitions 1

This even works if there are already signals in the table.

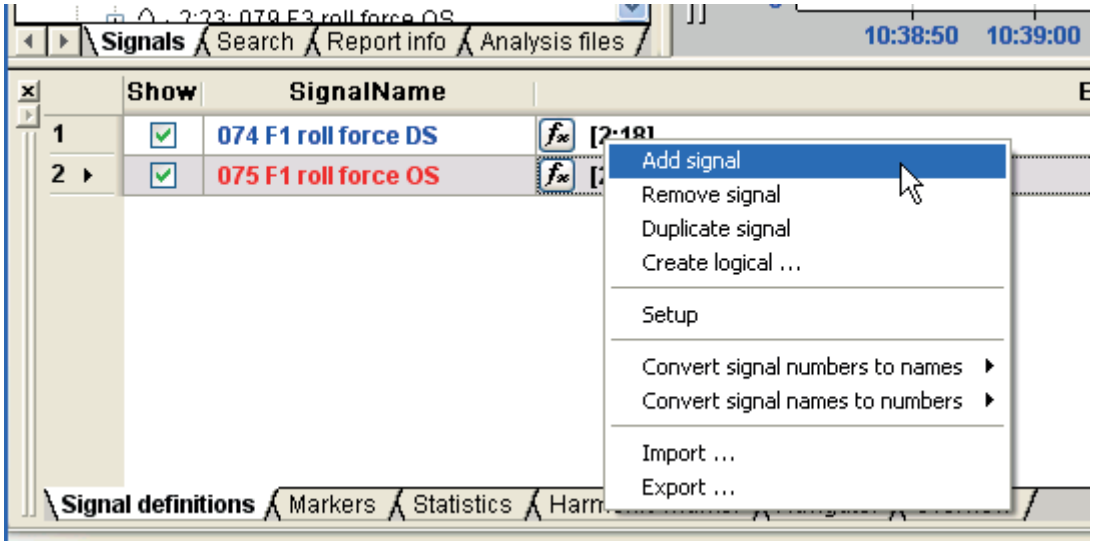


Fig. 104: Add signals, signal definitions 2

The *Add signal* function adds a blank line to the table and a corresponding signal strip in the recorder window.

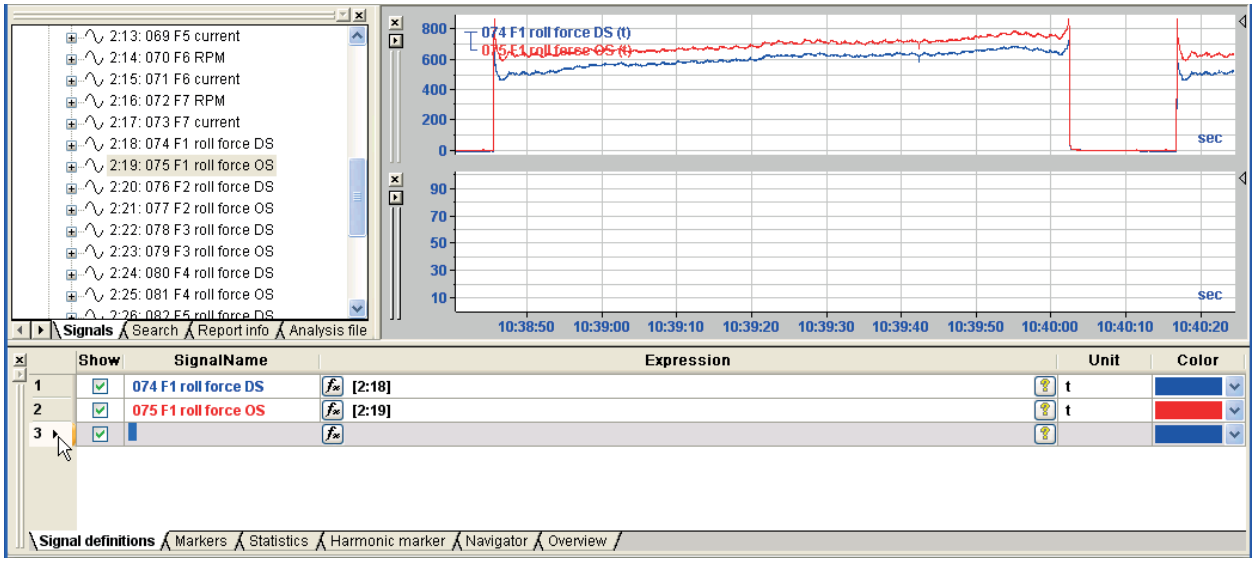


Fig. 105: Add signals, blank line

In the "Expression" column of this line, you can now enter any expressions you like.

These include:

- Raw data (original signals)
- Constant values
- Expressions for creating artificial signals using the functions of the expression builder
- Mathematical operations with artificially created signals and/or raw data as operands

The figure below shows some examples: A constant value (7.5), the generation of a time line using the TIME function, and the generation of a sine signal using the time line and the sine function. (For an explanation of the features, see part 3 *Expression builder*)

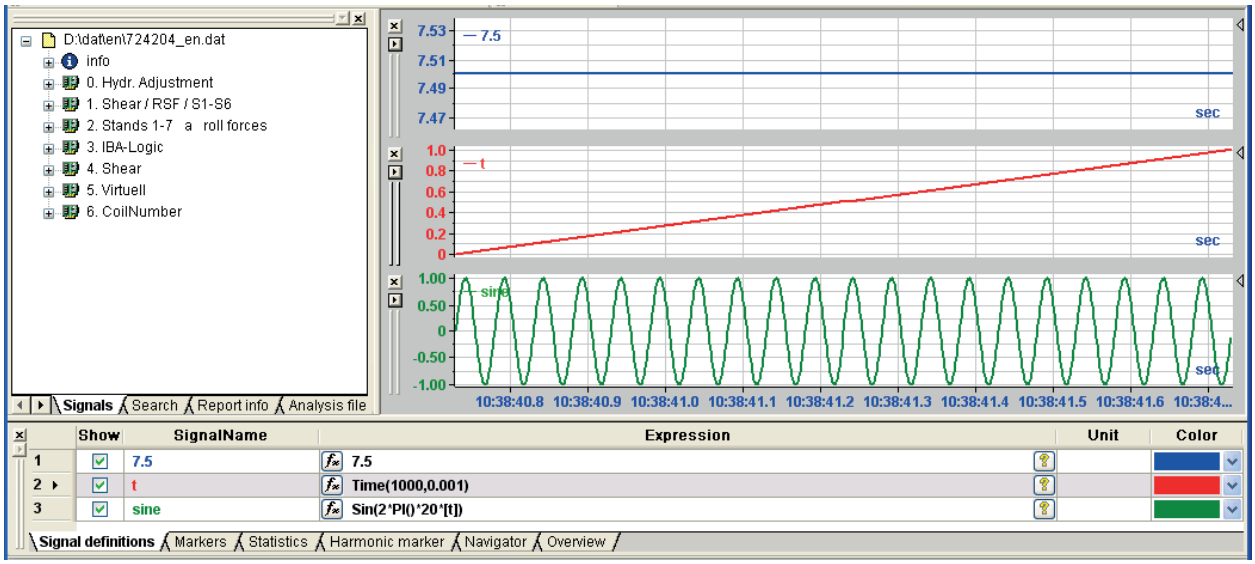


Fig. 106: Add signals, constant, time and sine

However, new signals can also consist of a combination of original signals. This is, for example, shown in the figure below.

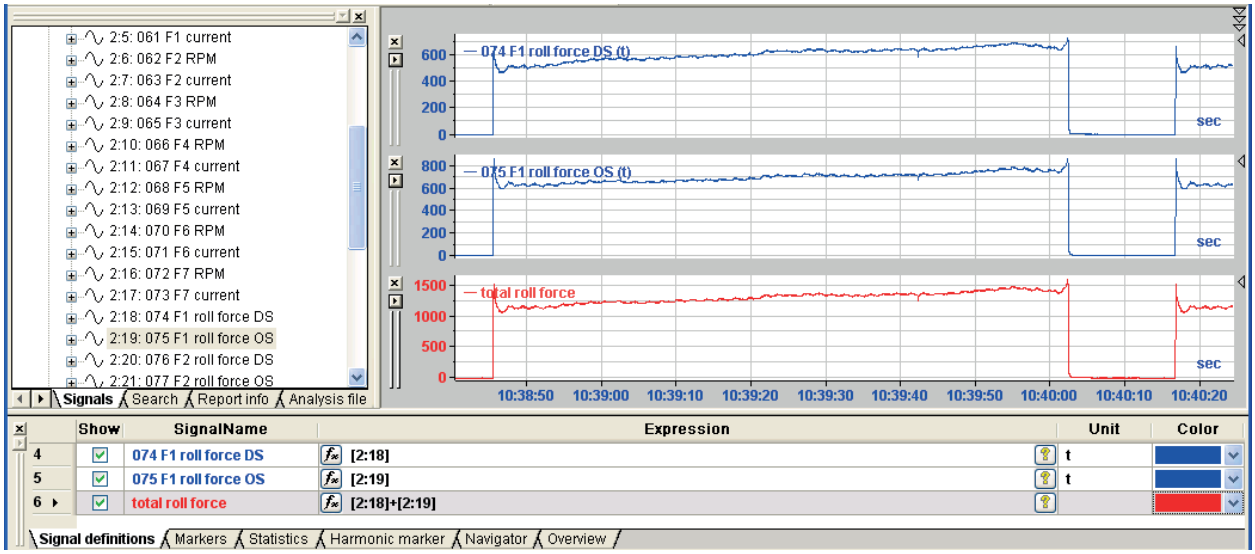


Fig. 107: Add signals, addition of two original signals

In order to add a new signal, select the Duplicate signal function from the context menu of the signal table. This does, however, also mean that the contents of the signal to be duplicated are copied too. This is helpful in the case of minor modifications of an existing, longer expression.

Signals which were created in this way are saved in the analysis (*.pdo). If the analysis is opened without a data file, these expressions are available, however, without any values. They are not filled with values until a data file is opened.

These newly added expressions can, on their part, be operands in other new expressions. This is why they are also offered for selection in the signal tree of the expression builder. They are not displayed in the signal tree window!

Note

Although the signals created in this way are saved in the analysis file (*.pdo) and are thus independent from a data file, these expressions are also irreversibly deleted when a trend view containing these signals is deleted (clicking the small 'x' to the left of the Y scale)!

The deletion is irreversible when the undo/redo function is disabled in the preferences.

7.2 Logical signal definitions

In order to avoid the risk of losing an expression by deleting the signal strip by mistake, it is also possible to define important virtual signals via the logical signal definitions.

Another application of the logical signal definition is the creation of multi-dimensional vector signals (ARRAYs).

An import / export function is provided for an easier configuration of larger amounts of logical signal definitions (see section below).

7.2.1 Dialog window

In order to open the dialog window for the logical signal definitions, click the button (see above picture) on the tool bar.

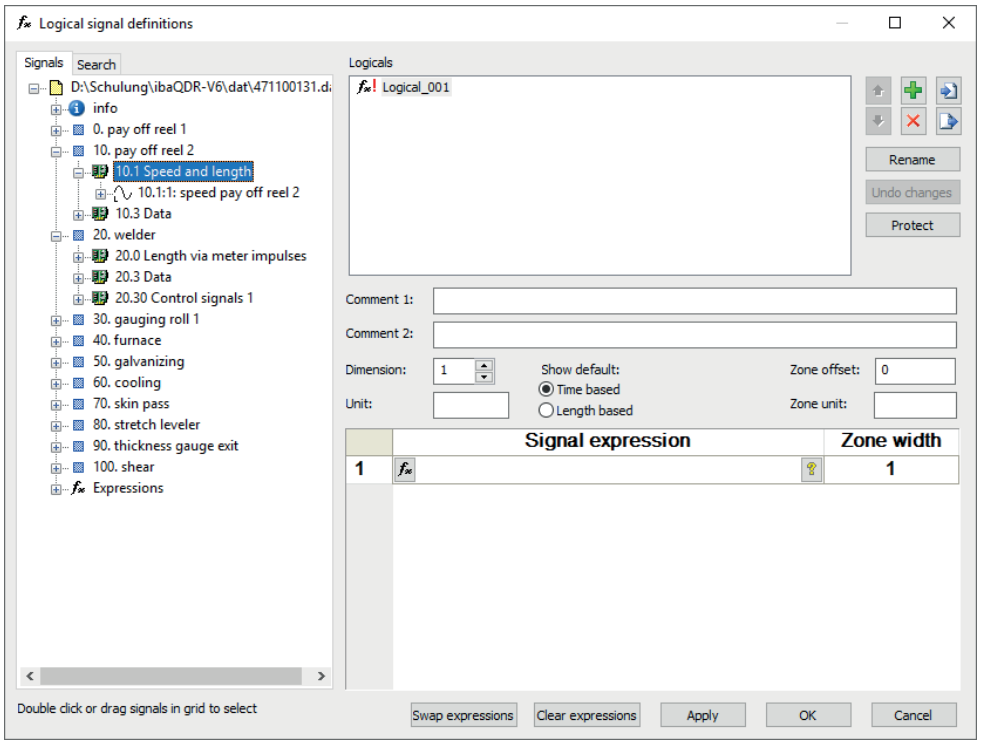


Fig. 108: Logical signal definitions, dialog window

The left part of the dialog window shows a signal tree which, besides the original signals from the data file, also offers the additionally created expressions for selection. As with the normal signal tree, the tab *Search* is available to you here in which you can search for signals. You can drag the search results directly into the configuration table for the signal definition.

The field in the upper right corner shows the logical signals already created (only a blank standard signal in the image).

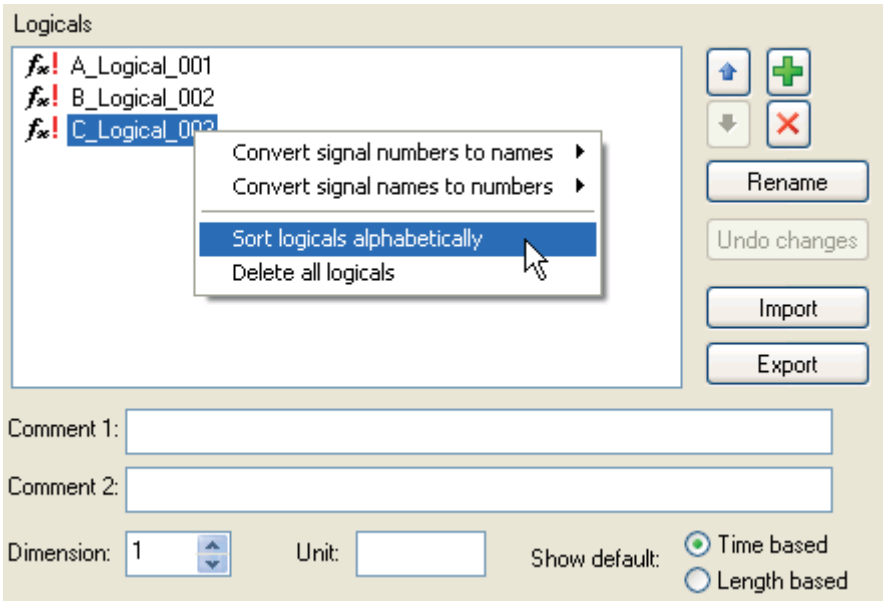
Red symbols beside to each signal indicate a modification (!) or deletion (X) which has not yet been applied by <Apply> or <OK>.

Next to this field are the buttons for adding, deleting, renaming, importing and exporting the signal definitions. <Delete> and <Rename> refer to the signal currently marked. <Import> and <Export> relate to all signals in the list (see section further down).

If you want to delete a logical signal definition by clicking the <Remove> button the intended deletion is just indicated at first. The signal won't be deleted before you click <Apply> or <OK>.

The information shown below refers to the structure and contents of the signal.

A right mouse click in the window of the logical signal definitions list opens a context menu with more commands, e. g. conversion of reference (signal name or number), alphabetical order and deletion of all definitions.



Dimension
In this field a numerical value between 1 and 2048 can be entered. "Dimension" here means the number of related expressions continuous over time or length which can be subsequently displayed in a 3D view.

Regular, simple signals hence have a dimension of 1.

In order to realize a three-dimensional profile presentation, a number of measuring series which are assigned to the third space coordinate must exist for the physical measurand. You'll find more information further below.

Comment 1 and 2
Like for measuring signals of a data file you can enter two comments for logical signal definitions as well which provide more information and can be used in the legend, for example.

Unit
This unit will be used as a caption in the legend and in the signal table.

Default display, time / length-based
Select one of these options in order to determine whether the signal in question is time-based or length-based.

Zone offset and zone unit
These settings provide for a more realistic presentation of profile measurements in case of multi-dimensional signals (vectors).

More information can be found in chapter ↗ *Zone control with vector signals*, page 163

Table of signal expressions
An expression which represents the desired signal must be entered in the line(s) of this table. If you simply wish to use raw signals or existing expressions, you can use the drag&drop function in order to drag them from the signal tree of the dialog window into the expression table, or double-click the desired signal or expression.

In the case of complex expressions using the mathematical functions, click the button  in the table line in order to call up the expression builder. The use of the expression builder is described in part 3 *Expression builder*.

Button <Swap expressions>
A click on this button flips the order of the rows of a multidimensional expression (vector).

Button <Clear expressions>
This button is used for removing the contents from the "Signal expression" column. Other settings of the logical signals like name, dimension, unit etc. remain unchanged.

Buttons <Apply> and <OK>
Clicking the button <Apply> will validate modifications or deletions without closing the dialog. The button <OK> does the same and closes the dialog.

7.2.2 Generating a simple signal

Example

1. Open the dialog for logical signal definitions. The standard signal "Logical001" is offered (see previous picture).
2. Click (mark) the "Logical001" signal (if necessary), then click the <Rename> button and enter a signal name (for example: artificial_sine)
3. Setting: Dimension = 1, no unit, time-based.
4. In the "Signal expressions" table line, now enter the expression for a sine curve or use the expression builder.
   SIN (2*PI()*20(TIME(1000,0.001))) creates a sine-shaped signal with a frequency of 20 Hz and a duration of 1 second.
5. Click the <OK> button in order to exit the dialog. The new signal "Artificial sine" is now available in the signal tree window and in all other signal trees and can be used just like a "real" signal.

The result is shown in the next two pictures.

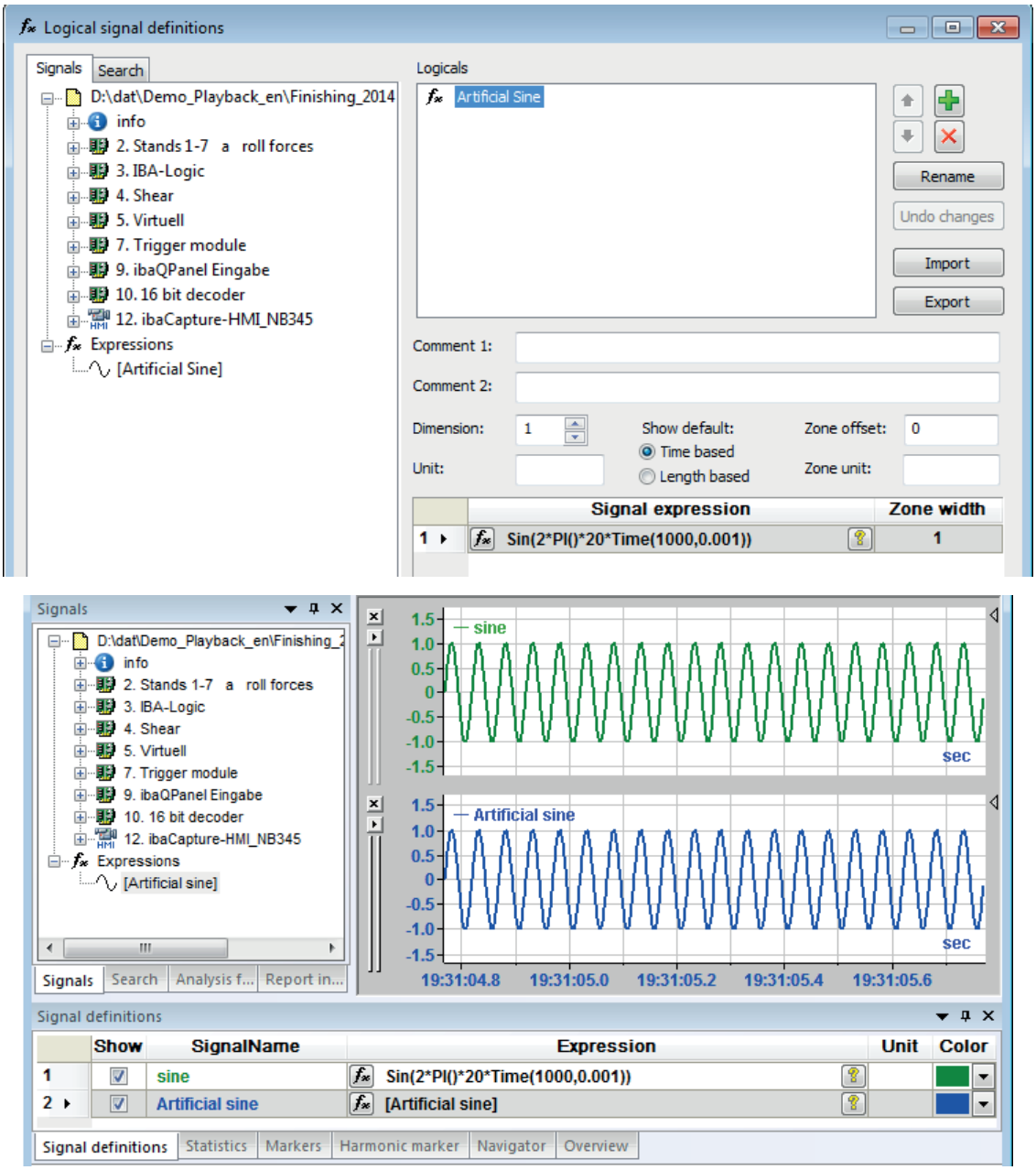


Fig. 109: Logical signal definitions and simple expression

The picture 109, page 158 shows that the "logical signal" [Artificial_sine] appears in the signal tree. However, the expression "sine" - created as described in ↗ *Add signal in the signal table*, page 152 - is not shown.

7.2.3 Creating vector signals (array)

As already mentioned in the section on the dimension, the ARRAY signal type is used to enable three-dimensional visualizations.

This is explained best using an example.

Example of a multi-dimensional signal (strip thickness profile)

The thickness of the strip rolled in a rolling mill is measured. In order to achieve a good strip quality, the strip thickness should, of course, be the same at all points of the strip. This means that the thickness is measured over the full strip width and length rather than at a single spot. In this example, the gauge meter supplies 108 thickness measuring signals which are distributed over the strip width. This means that the strip width is divided into 108 measuring zones, with each measuring zone supplying thickness measuring values as long as the strip passes below the measuring device. The duration of all the signals has the same length because they are all distributed over the entire strip length.

When you open the data file in *ibaAnalyzer*, you will only see a string of modules and signals which, when shown individually, are not very informative.

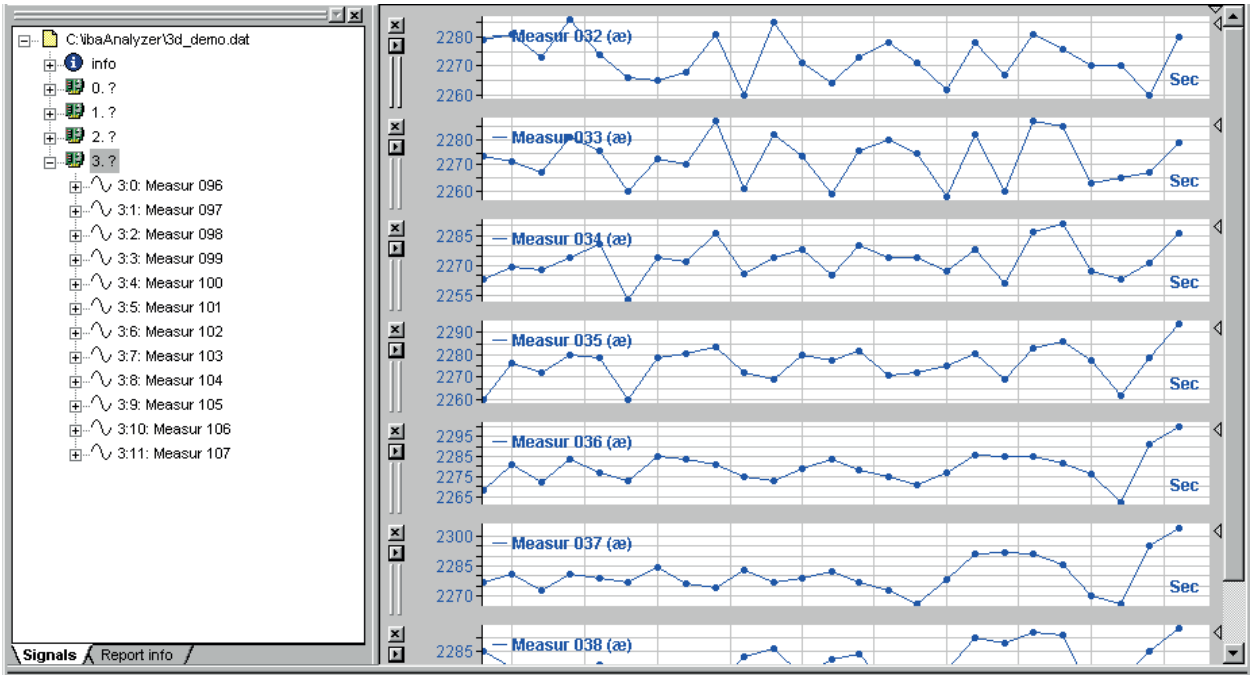
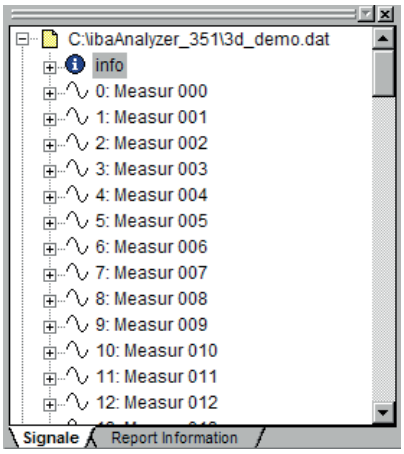


Fig. 110: Logical signal definitions, example thickness measurement 1

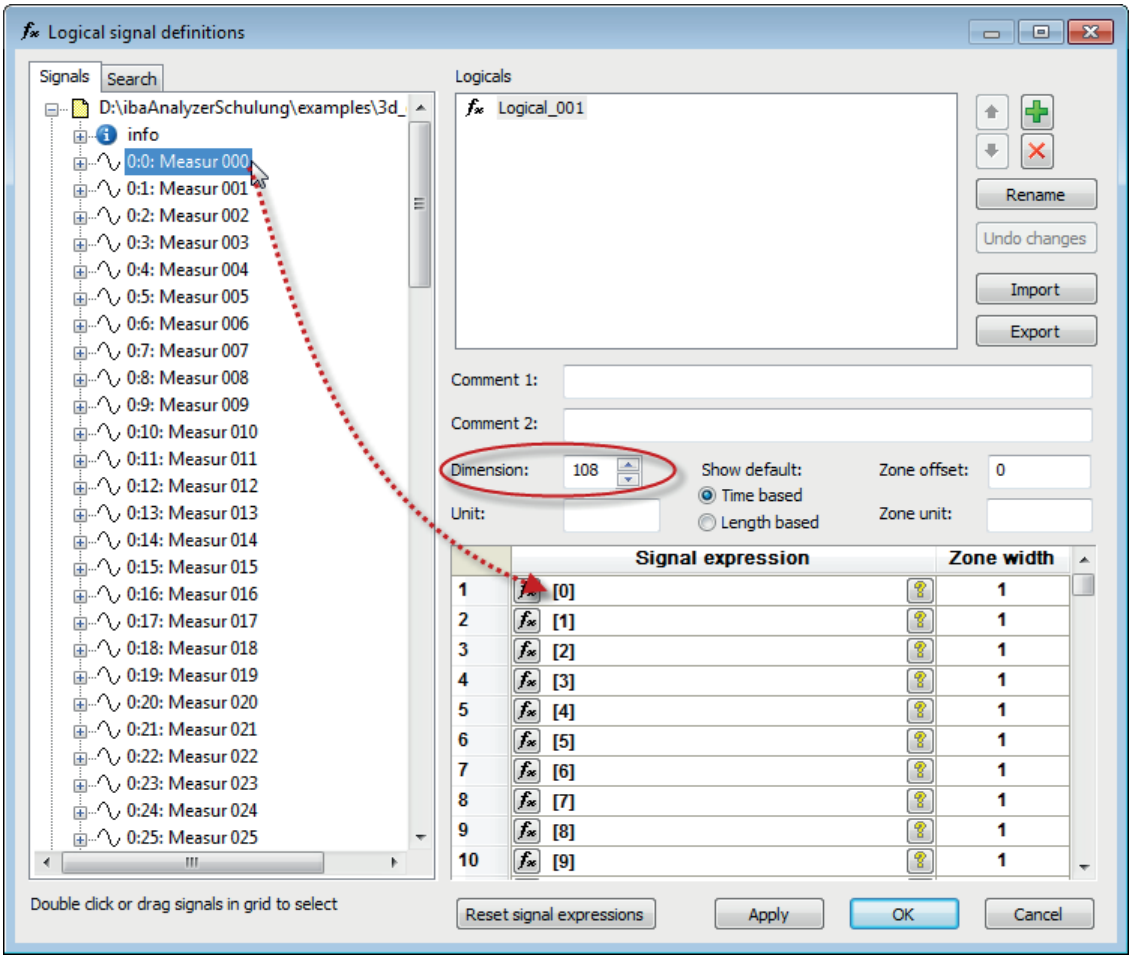
The figure above shows that the last signal has the number 107. Modules 0 to 3 hence contain the signals "Measur 000" to "Measur 107".

The consecutive list of signals in the signal tree window is the more favorable basis for the following explanations. Thus proceed as follows.

1. Select the "Linear numbering" option from the context menu of the signal tree window. The signals are now shown without modules in the signal tree. Furthermore, the signals are no longer identified by [Module number:channel number] but by consecutive numbers from 0 to 107.

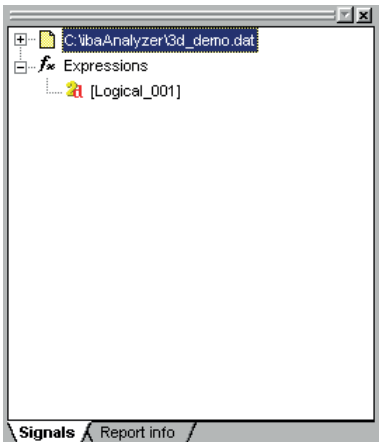


2. Open the dialog for the logical signal definitions. A signal named "Logical_001" is offered.
3. Enter the number 108 in the "Dimension" box. As a result, 108 lines (0...107) are created in the "Signal expressions" table.
4. Click the first line of the table in order to mark this line (gray).
5. Double-click the first signal (Measur 000) in the signal tree of the dialog window. All the 108 signals are thereby imported to the table.

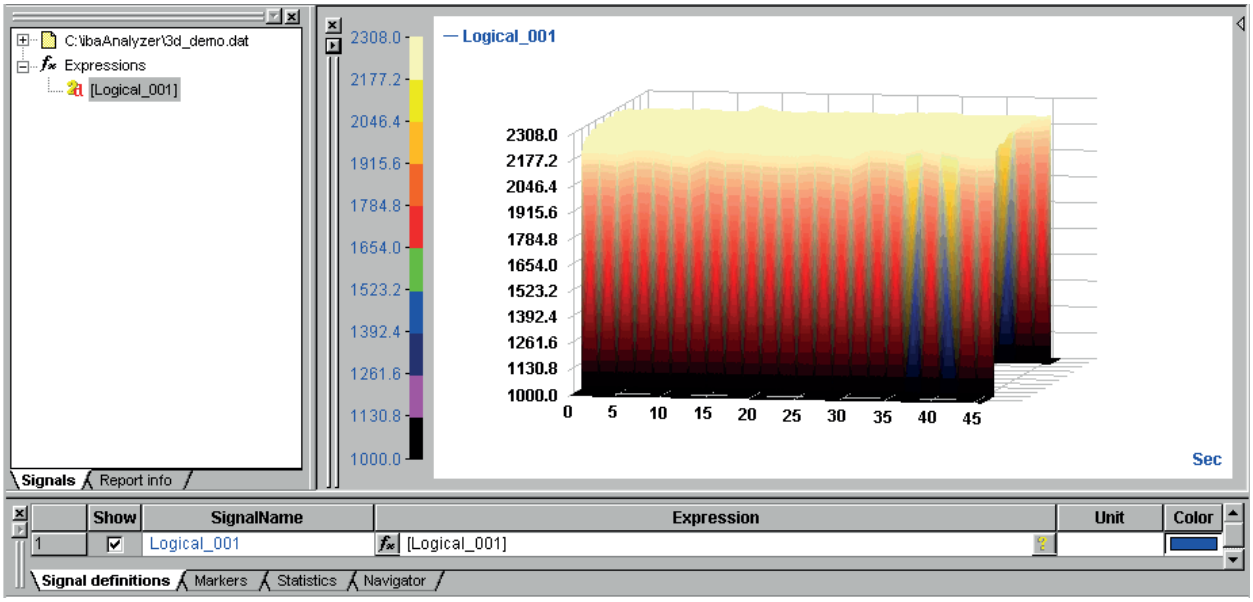


6. Click the <OK> button in order to exit the dialog.
7. Close the signal tree of the data file in the signal tree window. The new signal is now dis-

played there in the "Expressions" branch.



8. Now double-click the new signal or use the Drag&Drop function in order to open the new signal in the recorder window. Due to the multi-dimensionality of the signal, *ibaAnalyzer* automatically activates the 3D surface mode for the signal strip.



The full value range is, of course, initially displayed. In practical applications, however, it is often more interesting to see the thickness fluctuations in the range of the setpoint. This corresponds to the upper, horizontal plane in the display.

In order to obtain a more relevant visualization in this respect, you can use the "XMarkValid" function of the expression builder (see part 3 *Expression builder*) in order to cut out the relevant part of the measured values. This is shown in the lower part in the image below.

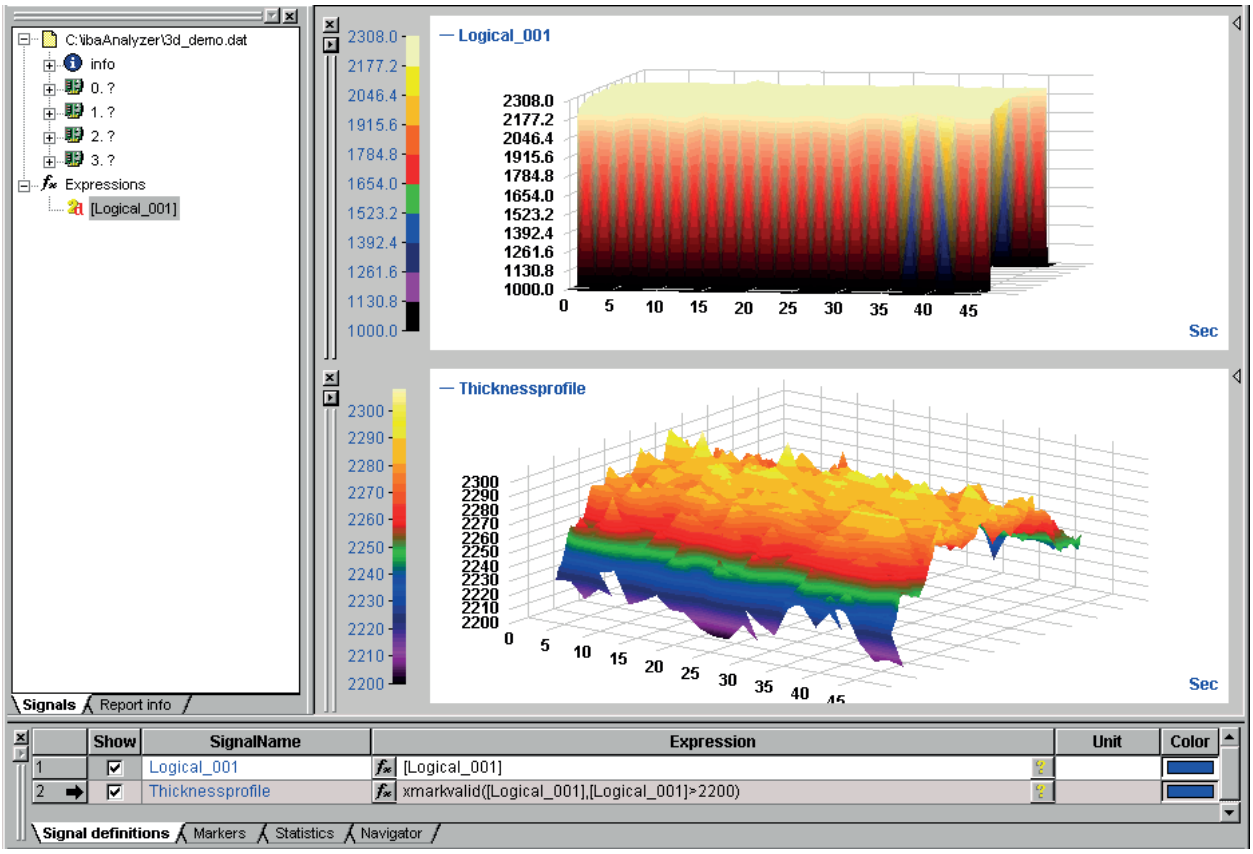
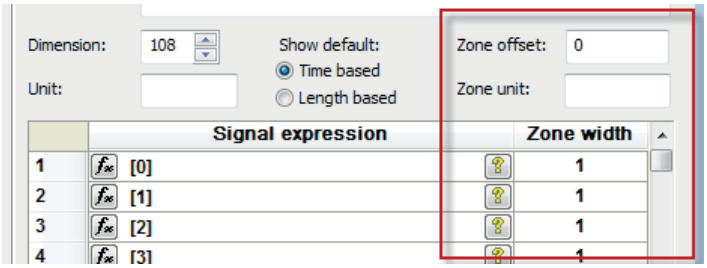


Fig. 111: Logical signal definitions, example thickness measurement 2

7.2.4 Zone control with vector signals

In the example described in the previous chapter, only "1" is entered in the *Zone width* column. This means that all zones have the same width and the measured values are always at equal distance, respectively. The geometrical width is not important for this and the scale at the Y axis in the 2D top view virtually only shows the number of zones.



By indicating a zone width according to the geometrical width and a physical unit, such as mm or cm, you get a geometrically correct representation of the strip width on the Y axis.

Moreover, there are measuring devices having measuring zones of different width. To get a realistic representation of the measured values in such a case, the indicated zone width can be adjusted individually for each zone. The results of both the 2D top view and the 3D view show a geometrically correct distribution of the measured values along the Y axis.

For the zone width, only numerical, positive values can be entered.

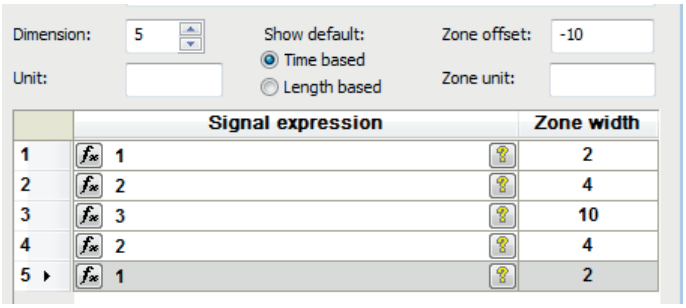
By default, the zone widths are set to 1. You can overwrite these values. If many zones are to obtain the same values, you can enter the value and click on the caption of the zone width column. All cells below the cell where the cursor is placed are filled with this value.

When using the zone width, the measured values are considered to be in the center of each zone.

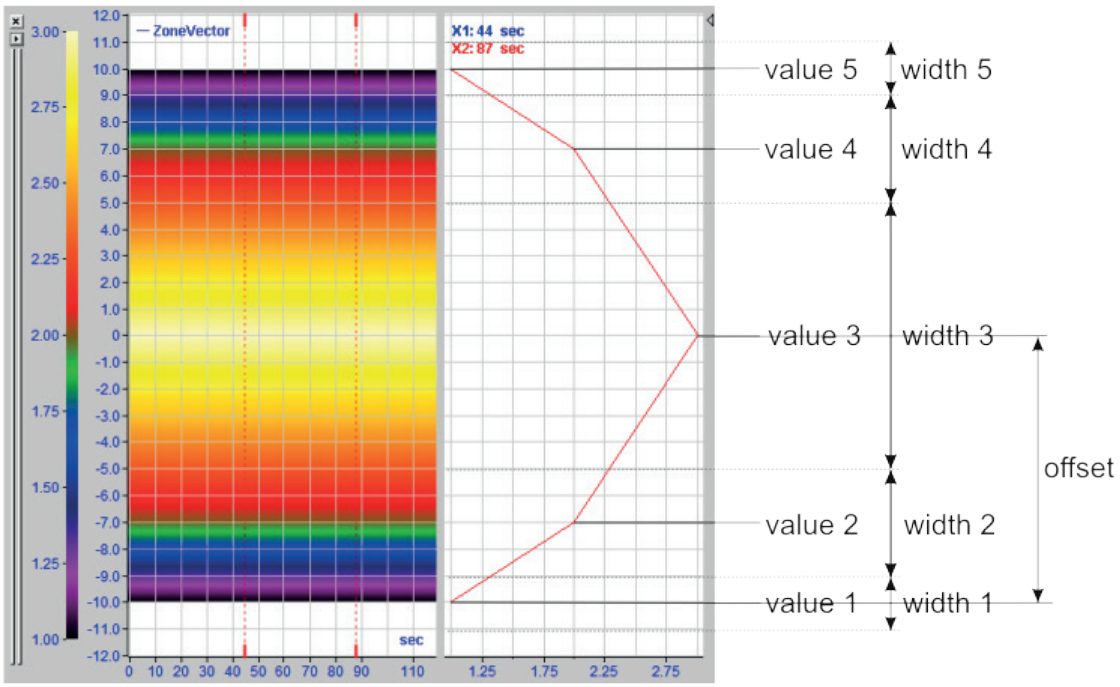
For a correction of the position relative to the zero line, you can enter an offset between zero line and the center of the first zone. The offset can be a positive or negative value.

Example: Vector signal with 5 zones

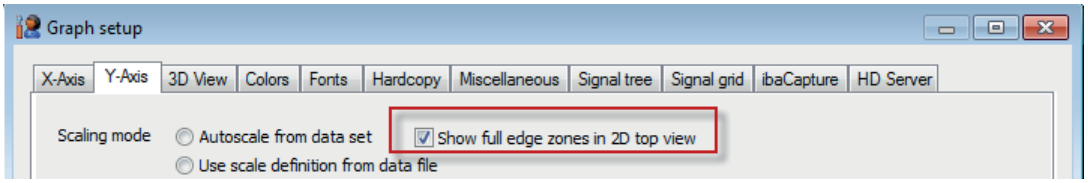
The following example shows the connections based on a vector signal with 5 zones:



Display:



The first signal positioned according to the *Offset* (here at -10). The sum of the zone widths amounts to 22 so that the last signal is displayed at +10. The distance of the other signals to each other results from the average of the respective zone widths. *ibaAnalyzer* calculates the gradients using linear interpolation between neighboring signals. In the outer half of the outermost signals, there are no colors, as an interpolation is not possible. In the Y-axis settings, you can decide whether or not the empty ranges are to be displayed when autoscaling the graph.

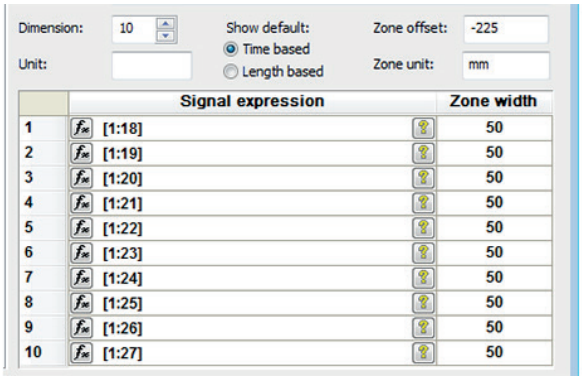


Example: Visualization of different zone widths
Another example is to show the difference in presentation when using different zone widths.

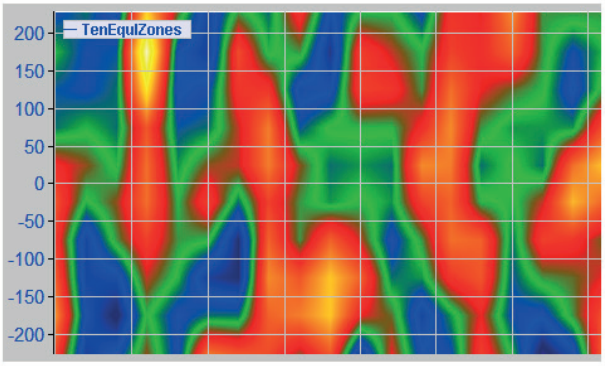
A vector signal with 10 zones is configured for a measuring width of 500 mm:

- With 10 equal zones at a width of 50 mm
- With 10 different zones between 10 and 150 mm

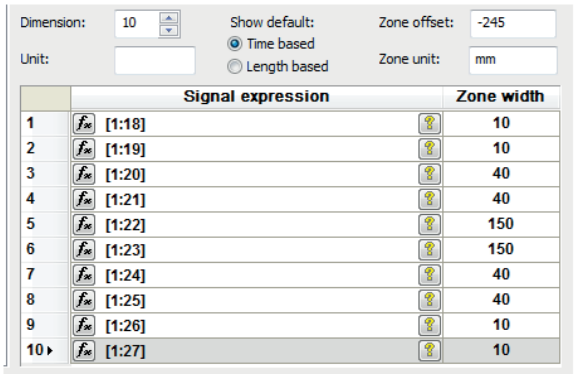
Influence of equal zone widths:



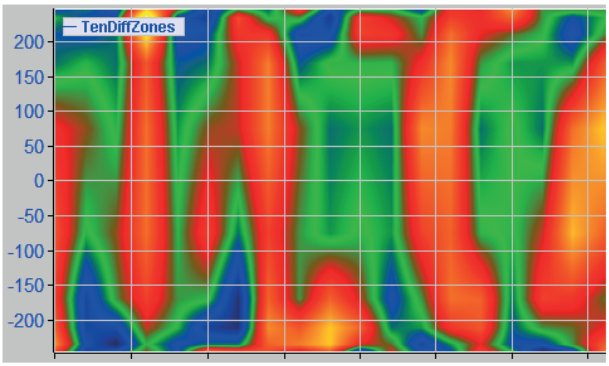
	Signal expression	Zone width
1	[1:18]	50
2	[1:19]	50
3	[1:20]	50
4	[1:21]	50
5	[1:22]	50
6	[1:23]	50
7	[1:24]	50
8	[1:25]	50
9	[1:26]	50
10	[1:27]	50



Influence of different zone widths:

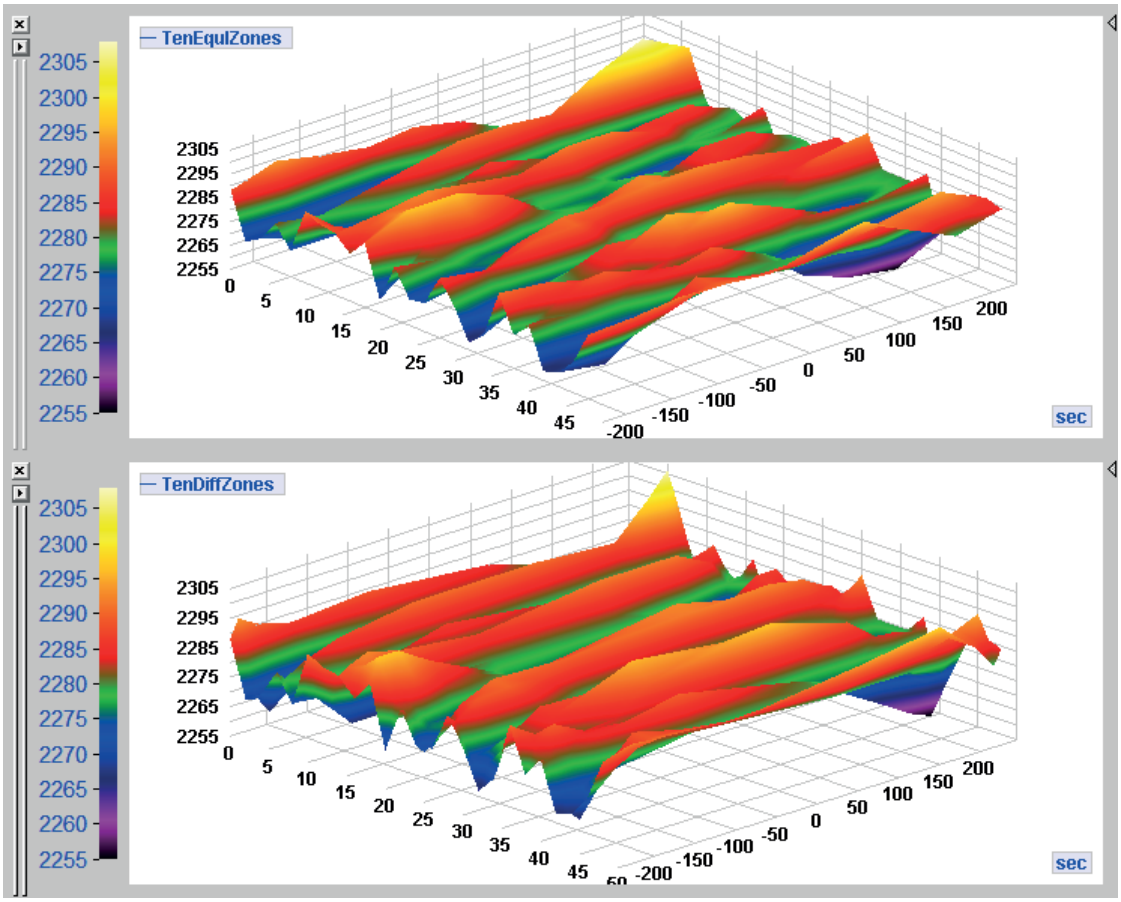


	Signal expression	Zone width
1	[1:18]	10
2	[1:19]	10
3	[1:20]	40
4	[1:21]	40
5	[1:22]	150
6	[1:23]	150
7	[1:24]	40
8	[1:25]	40
9	[1:26]	10
10	[1:27]	10



The figure with different zone widths clearly shows the widening of the middle range (-150 to 150).

Example: 3D presentation
Also in the 3D presentation, the zone widths are taken into consideration. The following figure shows a vector signal with the same (top) and different (bottom) zone widths.



7.2.5 Import / Export function

The import / export function is a very useful feature if you have to configure many or complex expressions as logicals. Furthermore, it is a good way to save your work and make it available for other users or computers.

 Import button

 Export button

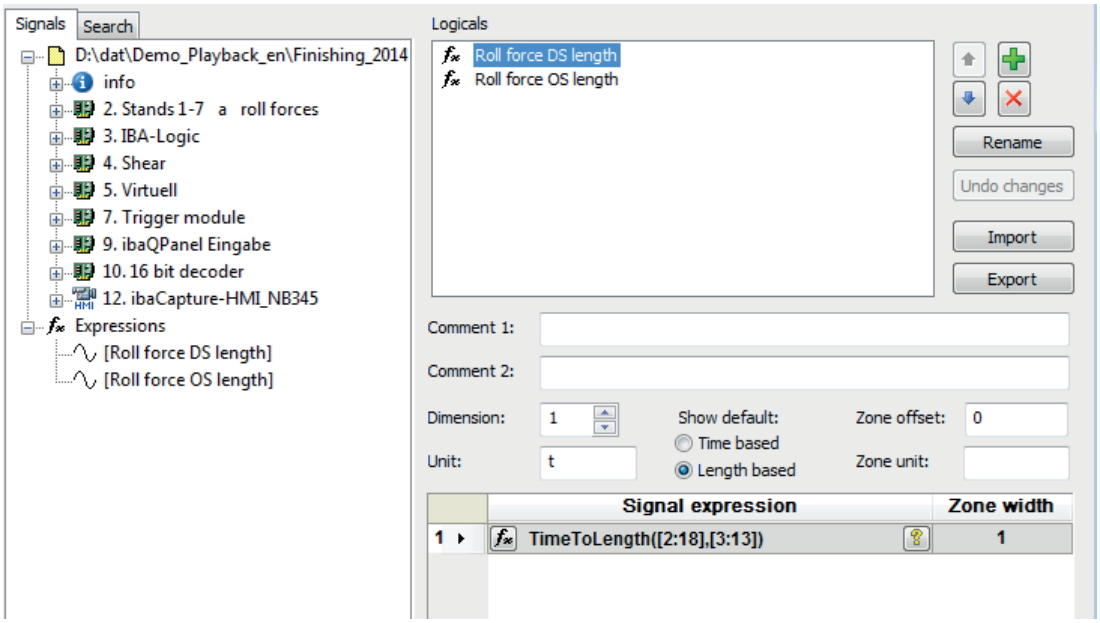
Like in the signal grid you can export configured logicals into a text file which can be processed by an usual editor or e. g. MS Excel.

Sometimes it's easier and more efficient to configure vast amounts of data in a spread sheet program than in a configuration dialog.

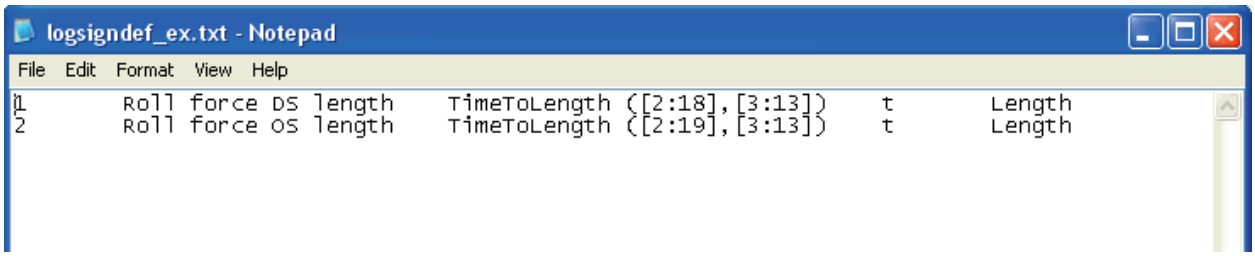
Just make a sample configuration in the logical signal definitions dialog, in order to get the correct formatting of the text file. *ibaAnalyzer* creates text files with tab separated values.

Example
Define one or two signals and then click on the <Export> button.

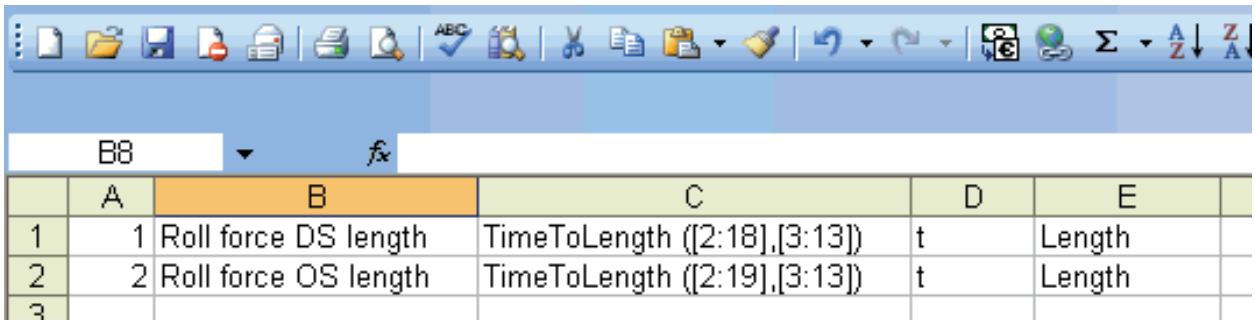
The import / export buttons always refer to all logical signal definitions.



In a text editor, e. g. Notepad, the export looks like that:



Or, in MS Excel:



As long as you keep the formatting, you can edit the text file according to your needs. After you have then saved the file as a text file again, you can import it into the logical signal definitions.

8 Macros

By using the macro function (macro designer), the user can define and save extensive and standardized analysis functions as so-called macros. The macros are generated with the familiar functions of the expression builder. They can be universally used, as the input and output parameters can be replaced by placeholders. Macros can be globally stored and thus be made available for other analyses, too. Macros can be exported and imported for exchange. Using macros, analyses can be created more clearly and comprehensibly.

Via the macro designer, you can generate and/or change macros. This is opened by clicking the macro function in the tool bar (see the below picture) or via menu *Setup – Macro design...*.

In the macro designer, all functions of the expression builder are available. By using macros, the following advantages arise:

- If calculations have to be carried out repeatedly for different input signals, the effort for generating the expression functions can be significantly reduced
- Complex calculations can be hidden in a macro so that short and comprehensible expressions are displayed in the signal table of the *ibaAnalyzer*.
- General calculations can be stored as macros in a library being available for other analyses, too.
- Macros can be exported and imported. Thus, other users can use macros as well. Exchanging complete analyses is sometimes difficult, since usually the analyses are applicable to specific dat files only.
- Using macros does not require any programming skills.
- You can protect macros from unauthorized changing by means of a password.

8.1 Generating a macro

Generating a macro is carried out in a special macro designer which is opened via the main menu *Setup – Macro design...* or by simply clicking the symbol in the toolbar.

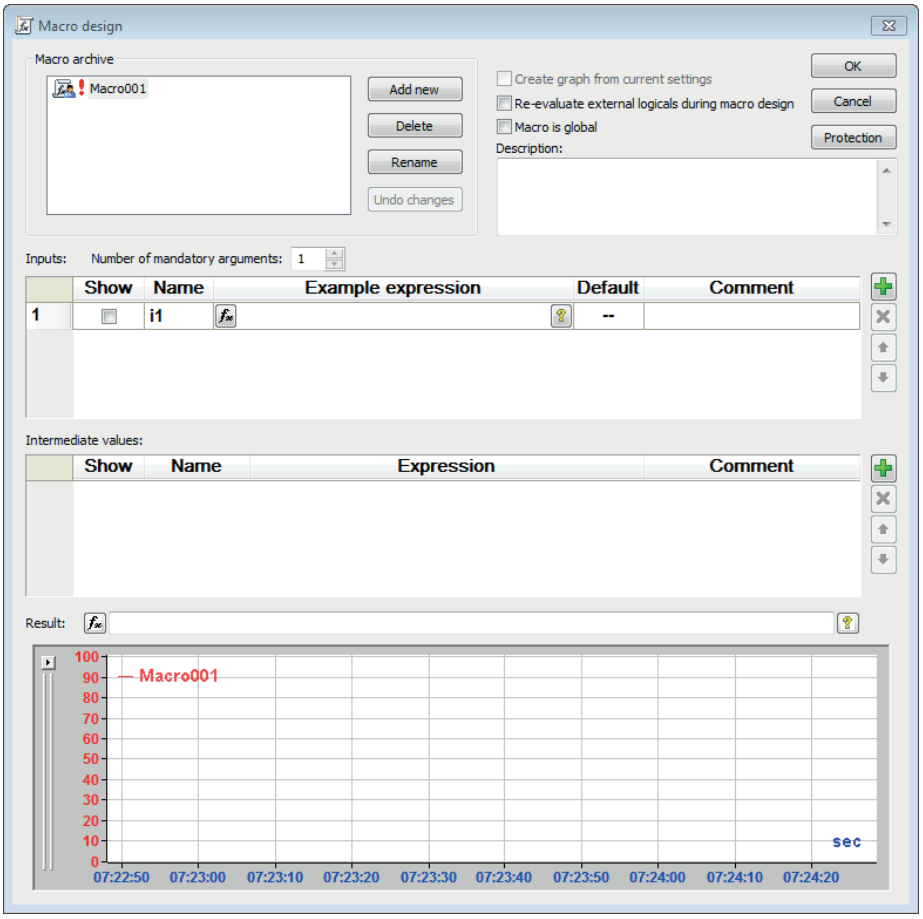
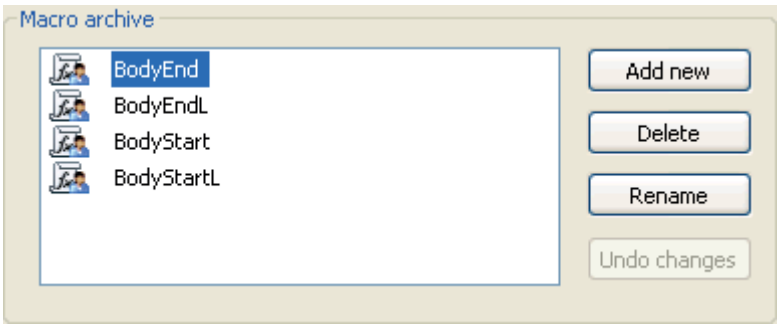


Fig. 112: Macro designer dialog

The designer contains the following elements:

Macro archive

This lists all macros already existing for the selected analysis. You can generate new macros, change or delete or rename already existing ones. Macros belong to the analysis and are hence saved together with the analysis.



Tip

Individual macros can be specifically exported from the macro archive and/or imported in the archive.

To import macros, right-click in the pane of the macro archive, select "Import macro" in the context menu and browse the requested *.mcr file.

To export macros, right-click on the macro to be exported in the macro archive and select "Export macro" in the context menu. You then save the macro as *.mcr file at a location of your choice.

"Create graph from current settings" option

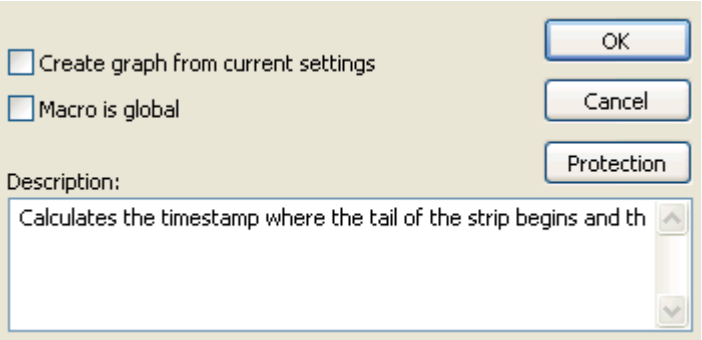
If this option is enabled, the generated macro is immediately executed and displayed as new signal strip in the recorder window of the ibaAnalyzer. You can also find a similar option in the filter editor. This option is not available (shaded in gray), if the entries in the expression builder are invalid or if you did not define arguments in the "Inputs" dialog.

"Macro is global" option

If this option is enabled, the generated macro is generally available beyond the analysis. It is characterized by the global symbol (globe). The global macros can be imported/exported. This is done via the "Export/Import settings" tab in the *Setup - Preferences...* menu. (See ↗ *Export/import settings*, page 93)

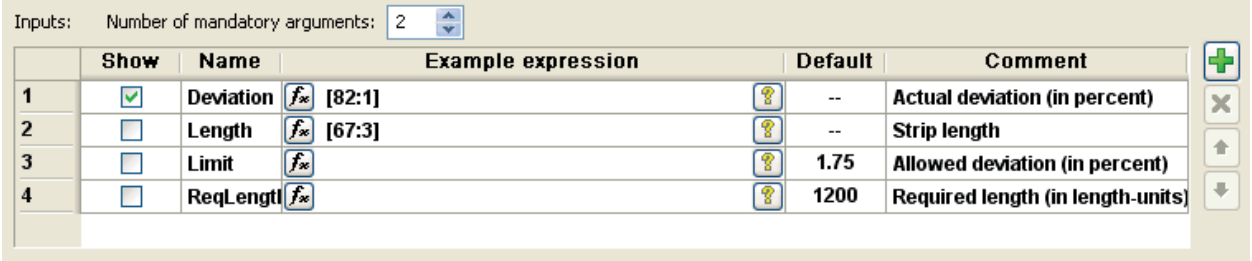
Description

Here, you can briefly describe the macro. The description later appears in the expression builder.



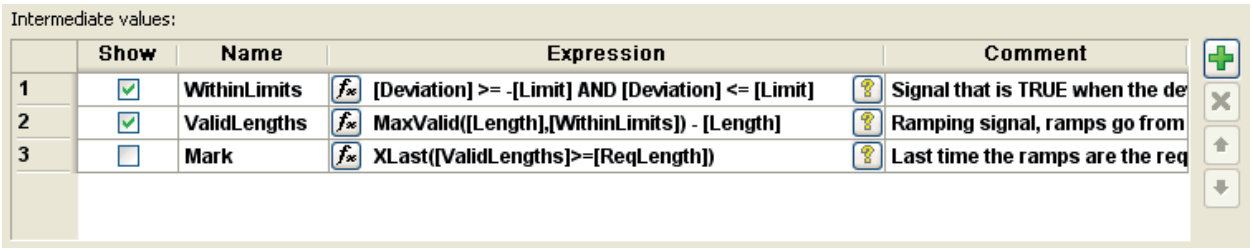
Inputs

Here, the required parameters of the macro are entered. Please refer to the subchapter ↗ *The input dialog*, page 172 for a more detailed description.



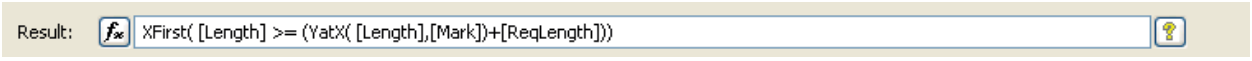
Intermediate values:

This dialog defines expressions serving as interim results and being available for other operations. Please refer to the subchapter ↗ *The intermediate values dialog*, page 173 for a more detailed description.



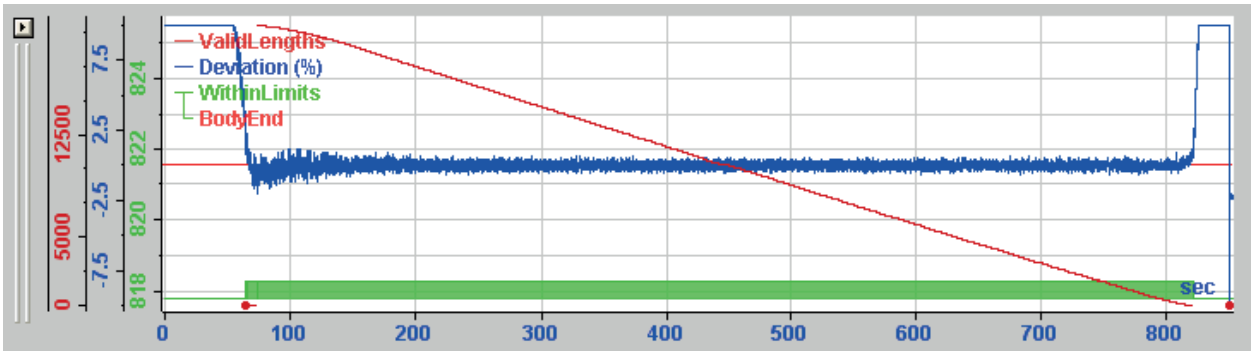
Result

Here, the function is entered which is to lead to the result of the macro. The result function can be generated from the familiar expressions of the expression builder or by using further macros. If you want to use other macros, please make sure that they are valid. If you use intermediate results, you have to put them in square brackets ([intermediate results]), as is the common practice in the expression builder. You can also use additional channels (other signals of the loaded dat file, logical signals, results from database queries, etc.). However, it has to be guaranteed that the selected channels are always available and valid, as otherwise the macro cannot be executed.



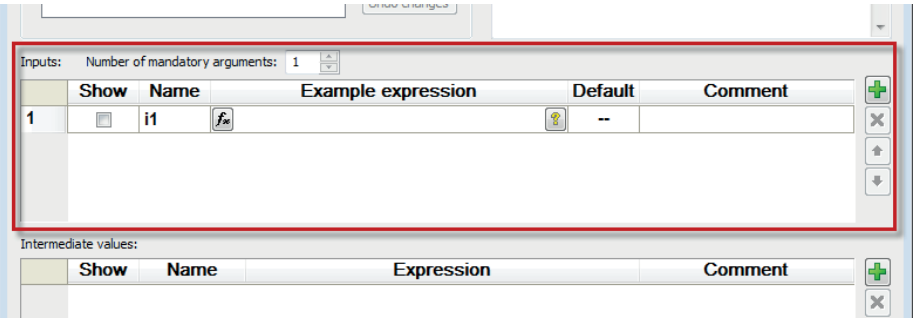
Preview window:

The preview window shows all valid input arguments, intermediate results and the macro result itself. You can suppress the preview function by not enabling the selection fields in the "Show" column. The preview window offers the same operations as a signal strip in the recorder window.



8.1.1 The input dialog

The input dialog defines all input variables (arguments) necessary for the macro generation. You can choose from optional and mandatory arguments. Mandatory arguments are entered in the example expression field (signals, functions, etc.). The number of the mandatory arguments has to be selected in the related selection field. The optional arguments are no expressions but defaults which are entered as value in the default column. For mandatory arguments, default values cannot be specified.



The input dialog contains the following elements (columns):

Show
When enabling the selection fields, the result of the selected expression or, in case of an optional argument, the constant value in the preview window is displayed.

Name
Here, you can enter the freely selectable name of the argument. You must not use the same name for other arguments or intermediate values.

Example expression
Expression functions for each argument can be entered in this column. The entry is mandatory for mandatory arguments. It is not possible to refer to other arguments or intermediate values in the expression builder.

Default
For optional arguments, a numerical value is to be entered here. When applying the optional argument, this value is used for generating a macro.

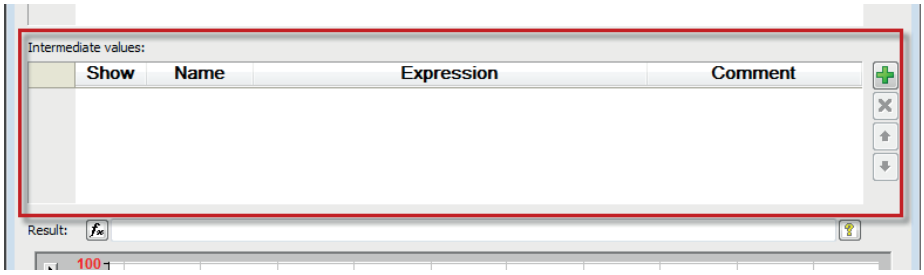
Comment
Here, you can briefly describe the selected argument.

There are 4 buttons on the right-hand side:

	insert an empty line for a new argument
	delete line and argument
	move the argument upwards in the table
	move the argument downwards in the table

8.1.2 The intermediate values dialog

This dialog can be used for intermediate calculations and/or for determining partial results being necessary for any further macro generation.



The dialog contains the following elements (columns):

Show
When enabling the selection fields, the result of the selected expression is displayed in the preview window. The following conditions must be met:

- The expression must be valid
- If in the intermediate value, it is referred to a mandatory argument, this argument has to be valid
- If in the intermediate value, it is referred to other intermediate values, they have to be valid (the first two conditions must be met)

Name
Here, you can enter the freely selectable name of the intermediate value. You must not use the same name for arguments or other intermediate values.

Expression
In this column, enter the function with which the intermediate value is to be generated. The function can be generated from the familiar expressions of the expression builder or by using further macros. If you want to use other macros, please make sure that they are valid. If you use intermediate results, you have to put them in square brackets ([intermediate results]), as is the common practice in the expression builder. You can also use additional channels (other signals of the loaded dat file, logical signals, results from database queries, etc.). However, it has to be guaranteed that the selected channels are always available and valid, as otherwise the macro cannot be executed.

Comment
Here, you can briefly describe the intermediate value.

The buttons on the right have the same functions as already described (see ↗ *The input dialog*, page 172).

When generating the intermediate values, make sure that no contradictions arise between the individual intermediate values (avoiding circular references). Otherwise, the macro might not be executed correctly. There will be no review and/or warning whether there is a circular reference.

8.2 Applying macros in the expression builder

Macros finally generated are available in the expression builder and can be used like conventional functions there. They are represented in the function tree.

As you are accustomed to from using the functions in the expression builder, you will receive the corresponding explanations in text form as soon as you started to enter the macro description. The same applies if you added the macro to the command line by double click and then put the cursor by mouse click in a random position in the macro description.

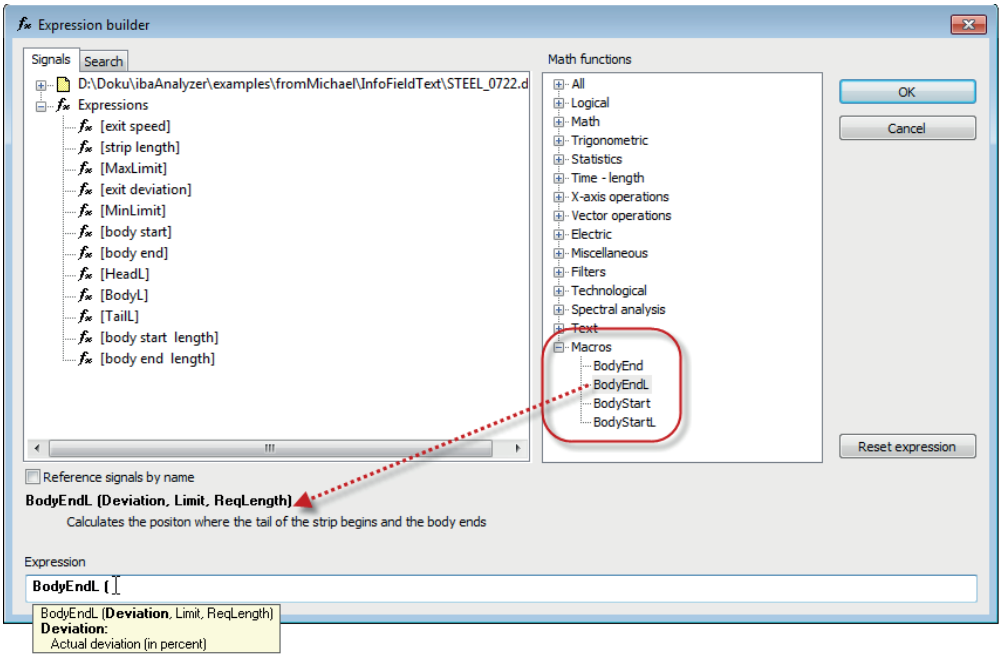


Fig. 113: Macros available in the expression builder

8.2.1 Example 1: Calculating the area within a hysteresis curve

This example explains the generation of a macro for calculating the area within the hysteresis curve (X-Y presentation):

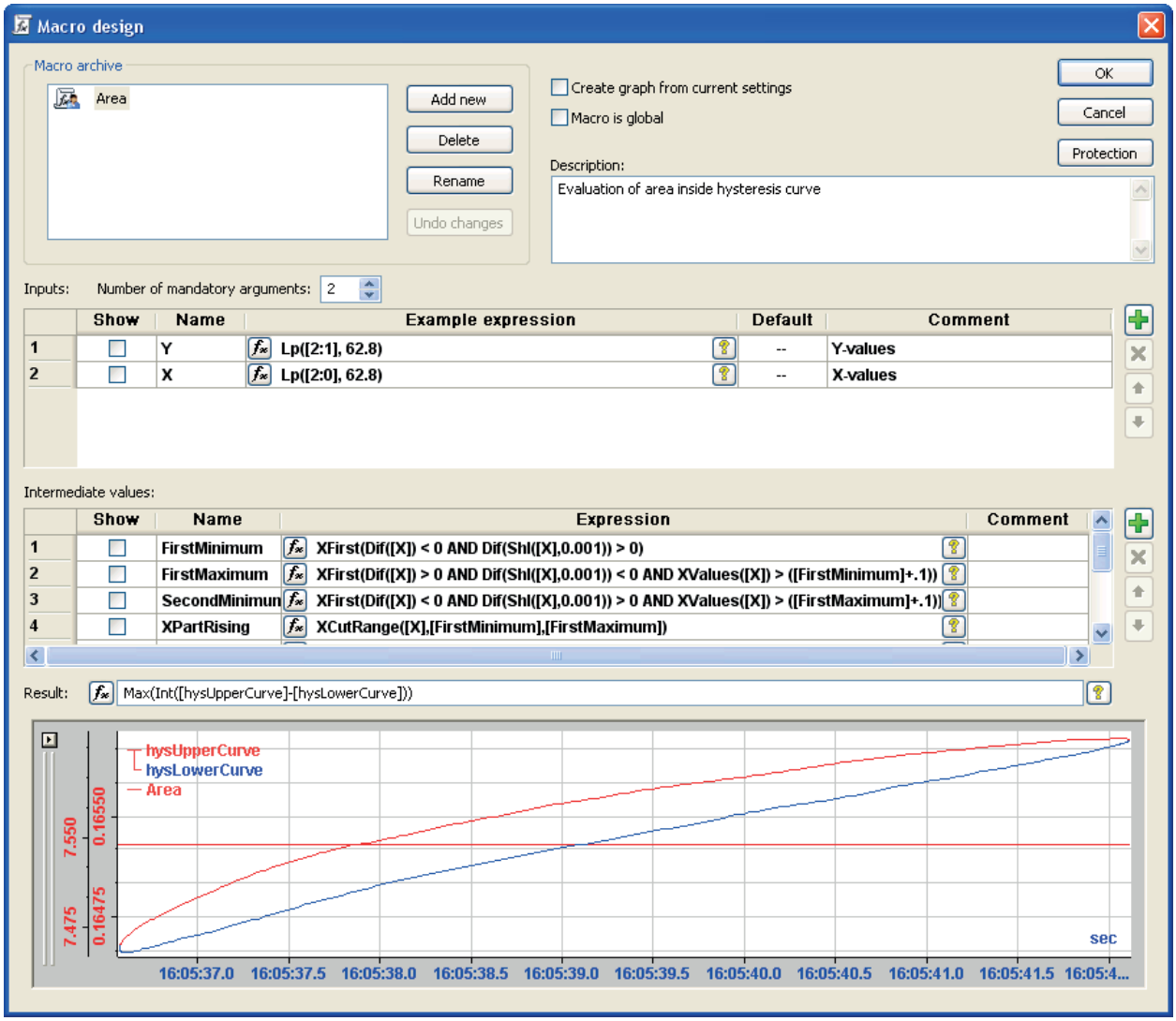
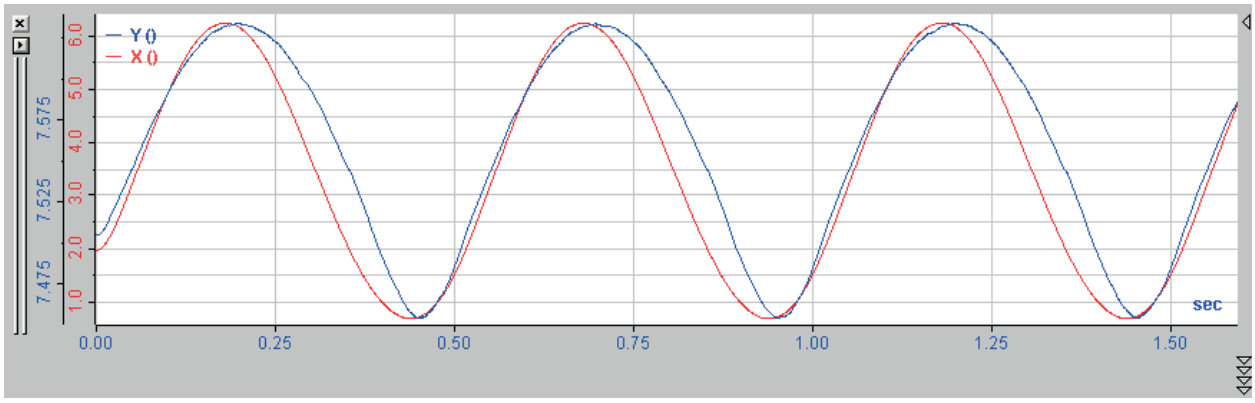


Fig. 114: Creating a macro - Example 1

First, 2 is selected as number for the required arguments. Then, the input signals are selected (X and Y values). As input signals of the macro, only two time-based signal curves of a position (Y) and force measurement (X) are used. Input signals for macro



Interim calculations are required for generating the macro. These interim calculations are entered as intermediate values:

- FirstMinimum:
  Calculation of the signal point where the input signal has its reversal point (the input signal starts to decrease). This point is determined by means of the functions *XFirst* and *Dif* (the derivation changes from a negative to a positive value).
- FirstMaximum:
  Calculation of the signal point where the input signal again has its reversal point and starts increasing again. Again, the calculation is made by means of the functions *XFirst* and *Dif* (the derivation changes from a positive to a negative value).
- SecondMinimum:
  The signal point is calculated where the input signal goes into reverse again. This calculation again is made by means of the functions *XFirst* and *Dif*, the signal point is determined after *FirstMaximum* .
- XPartRising:
  By means of the function *XCutRange,* the area between *FirstMinimum* and *FirstMaximum* is determined for the input signal.
- YPartRange:
  By means of the function *XCutRange,* the area between *FirstMinimum* and *FirstMaximum* is determined for the output signal.
- XPartDropping:
  By means of the function *XCutRange,* the area is calculated where the input signal between *FirstMaximum* and *SecondMinimum* decreases.
- YPartDropping:
  By means of the function *XCutRange,* the area is calculated where the output signal between *FirstMaximum* and *SecondMinimum* increases.
- hysLowerCurve:
  The lower curve of the hysteresis curve is determined by means of the *XY* function (here *YPartRising* vs *XPartRising*).
- hysUpperCurve
  The upper curve is determined by means of the *XY* function (here *YPartDropping* vs *XPart-Dropping*). Usually, the *XY* function requires the X argument (here *XPartDropping*) to always increase. Since this is not the case in the example, it is corrected with the function *XMirror* for *XPartDropping* and *YPartDropping* first.

The area to be determined between the two curves is then easily determinable by integrating the difference *hysUpperCurve* and *hysLowerCurve* .

8.2.2 Example 2: Calculation head - fillet - tail of an aluminum strip

In general, rolled metal strips, so-called coils, can be divided into three different sections, the head, the fillet and the tail, with the fillet being far the greatest section of the strip.

First, the particular areas are to be defined:

The head section is defined as the section where significant quality parameters (e. g. thickness, width, mechanical properties) are not yet homogeneous within acceptable tolerances. The head is always at the beginning of the strip (the section which is reshaped first when rolling).

The definition also applies to the tail, however this section is the last to leave the rolling stand (reshaping is completed).

The fillet section is between head and tail, i. e. the significant quality parameters should be homogeneous in this section.

The two following macros calculate the beginning as well as the end of the fillet section.

Macro for calculating the beginning of the fillet section - macro name BodyStartL

The following input signals are determined:

- Deviation:
  Quality parameter (here thickness deviation) which has to be within a specified tolerance. This is a length-based signal, the deviation is given in percentage).
- Limit:
  The tolerance limit is given as a constant value. Here, it is an optional argument with a default value (here 1.75 %).
- ReqLength:
  Specification of the required length where the thickness deviation has to be within a given tolerance. Here, it is also an optional argument with a default value (here 1.200).

The following intermediate results are required for calculating the macro:

- Length:
  With the function *XValues,* the length-related signal points of the thickness deviation are determined.
- WithinLimits:
  This expression determines whether the thickness deviation (*Deviation*) is within the tolerance. The expression is TRUE if: *–Limit ≤ Deviation ≤ Limit.*
- ValidLengths:
  By means of the function *MinValid,* the smallest value is determined where the condition *WithinLimits* is met, i.e. is TRUE (in cases where the tolerance conditions are met for the first time).
- Mark:
  By means of the function *XFirst,* both the point is determined where the condition *ValidLength* is met for the first time and the point where the range of validity of *ReqLength* is exceeded.

The difference between *Mark* and *ReqLength* is the result of the calculation, the macro respectively (beginning of the fillet section).

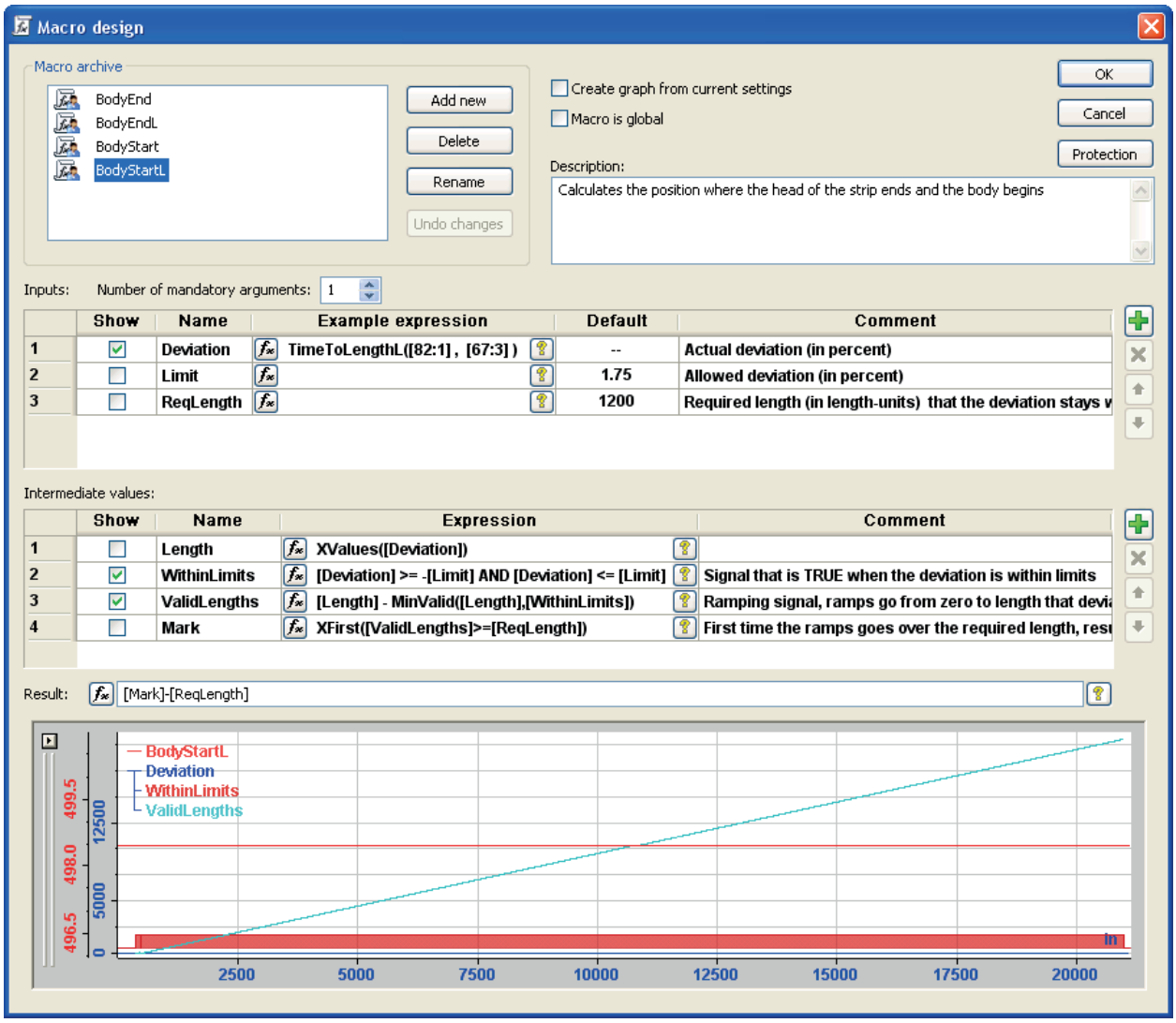


Fig. 115: Creating a macro - Example 2a

Macro for calculating the area where the fillet ends - macro name BodyEndL

The same parameters are selected as input signals as in the previous example.

The following intermediate results are required for calculating the macro:

- Length:
  Same expression as in the previous example
- WithinLimits:
  Same expression as in the previous example
- ValidLengths:
  By means of the function *MaxValid,* the value is determined where the condition *WithinLimits* is met for the last time, i.e. is TRUE, (where the tolerance conditions are ultimately met).
- Mark:
  By means of the function *XLast,* both the point is determined where the condition *ValidLength* is ultimately met and the point where the range of validity of ReqLength is exceeded.

The sum of *Mark* and *ReqLength* then is the result of the calculation, the macro respectively (end of fillet section).

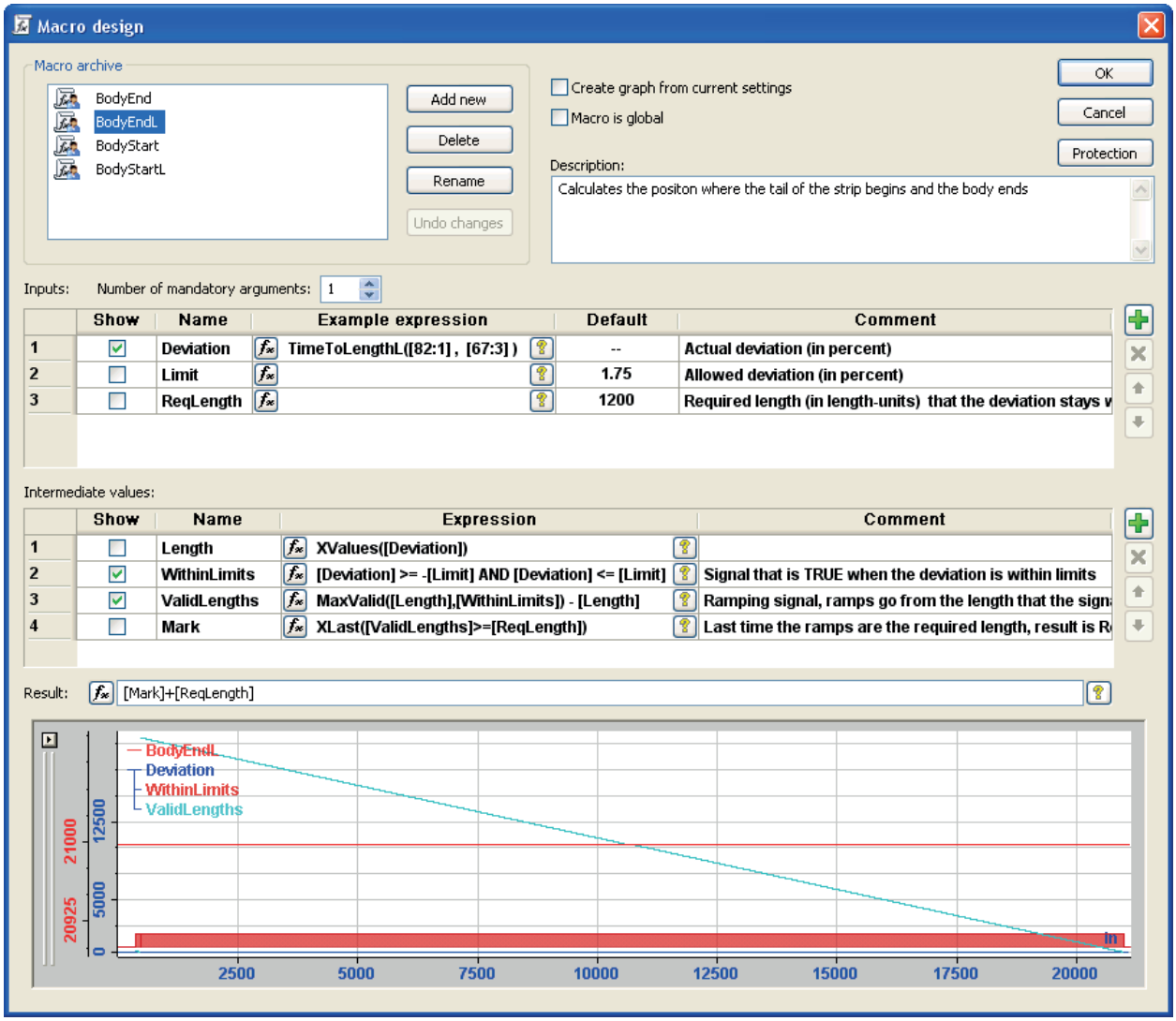


Fig. 116: Creating a macro - Example 2b

8.3 Import and export macros

Macros are part of the analysis (*.pdo). However, they can be exported or imported in several ways.

Here, it is distinguished between local and global macros.

Local macros are macros having been generated for an analysis and where the "Macro is global" option was not enabled in the macro designer.

To generate a global macro, just enable the "Macro is global" option in the macro designer for a generated macro.

An export means saving a macro as *.mcr file.

All global and local macros of the current analysis are also available in the "Macros" branch of the expression builder.

8.3.1 Export and import global macros

Global macros can be exported by means of the "Export" function in the *Import/export settings* tab, in the "Preferences" dialog (*Setup - Preferences...* menu). This function exports various elements and settings to a *.zip file.

In order to export the macros, enable the "Macros" option for the export, click on <Apply> and then on <Export...>.

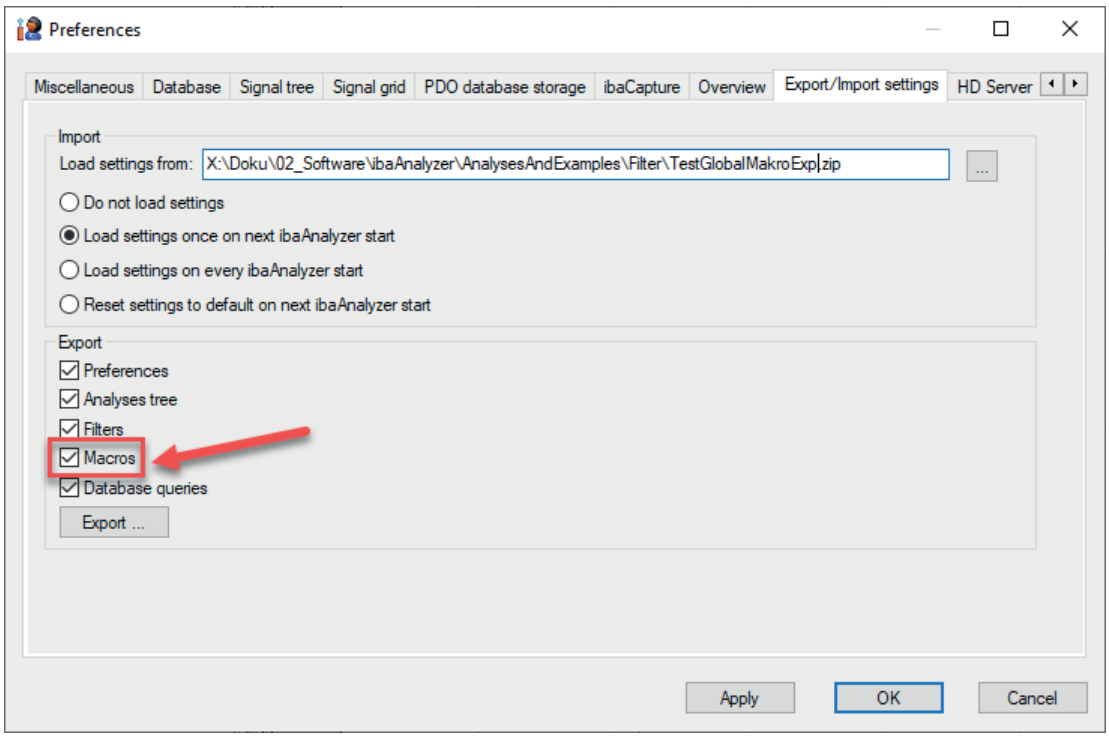


Fig. 117: Enabling the export of global macros

You can then set the path and file name of the *.zip file.

After importing the file, macros contained in an export file are available as global macros.

You can import global macros by selecting a suitable *.zip file in the "Import" section of the dialog and enabling the second or third method for loading the settings. Then exit the dialog by clicking the <OK> button and restart *ibaAnalyzer*.

Moreover, there is an *.mcr file in the "C:\Documents and Settings\user name\Application Data\iba\ibaAnalyzer" directory for every global macro. Also, these macro files can be imported in an analysis and/or a macro archive. (See ↗ *Import and export macros*, page 180).

8.3.2 Export and import local macros

At first, local macros are only available in the analysis where they were defined.

Individual macros can be specifically exported from the macro archive and/or imported in the archive.

By doing so, you can exchange macros with other users or between different computers.

To import macros, right-click in the pane of the macro archive, select "Import macro" in the context menu and browse the requested *.mcr file.

To export macros, right-click on the macro to be exported in the macro archive and select "Export macro" in the context menu. You then save the macro as *.mcr file at a location of your choice.

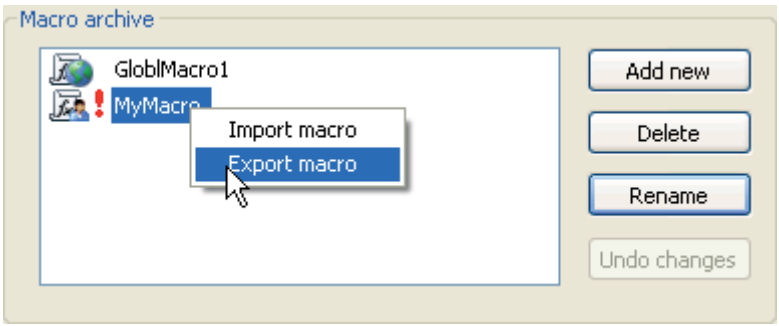


Fig. 118: Export of a local macro

Basically, you can also apply this method to global macros in the macro archive. However, the global status gets lost then and the macro is entered as local macro first when imported in another analysis.

8.4 Protect macros

You can protect a macro from unauthorized or unintentional changing by providing it with a password. You can also condition the execution of the macro on dongle numbers.

Open the corresponding dialog by clicking the <Protection> button.

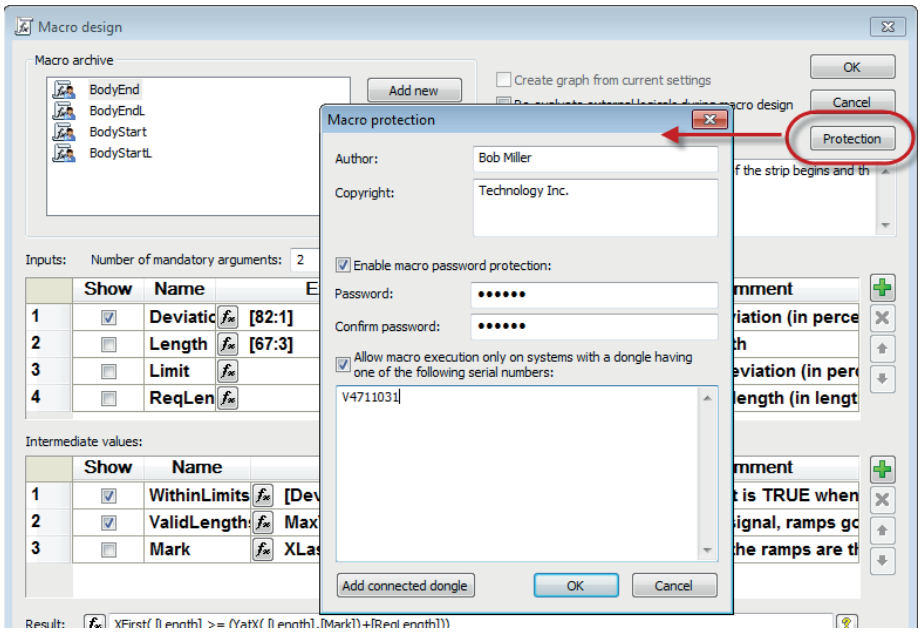


Fig. 119: Activate macro protection with password

For activating the protection function, proceed as follows:

- Author
  Enter the name of the author who created the macro.
- Copyright
  If required, enter information on the copyright or other information, e. g. contact information of the author.
- Enable macro password protection
  If this option is enabled, enter a password in the *Password* field and confirm it by entering it again in the field below.
  After the password activation (after exiting the dialog by clicking <OK>), the macro is protected from changes when opening the macro editor the next time and the calculations are hidden until the correct password has been entered.
- Allow macro execution only on systems,...
  If you enable this option, you can limit the macro's feasibility by entering one or more iba dongle number(s) in the field below. The macro can only be executed on a system having a dongle with a listed number.
- <Add connected dongle> button
  By clicking on this button, the license number of the currently connected dongle is added to the list.

If you want to open a protected macro in the macro editor at a later time, enter the correct password in the password field and click <Next>.

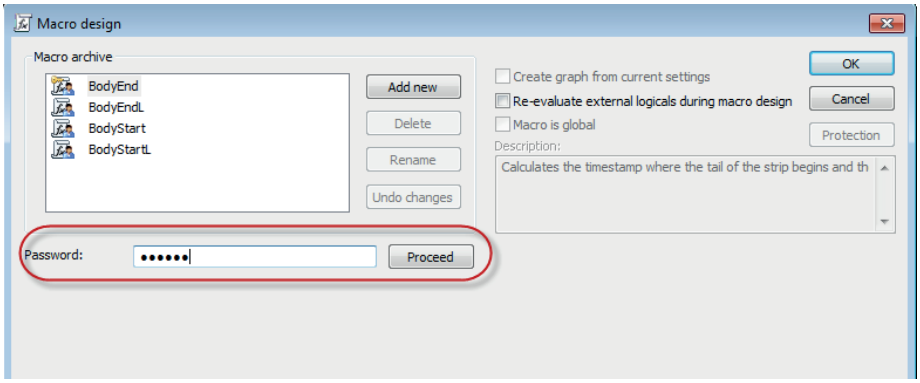


Fig. 120: Open macro with password for editing

To remove the macro protection, just disable the options in the *Macro protection* dialog.

Note

From version 5.22.0 and higher, macros are saved in encrypted form in the analysis or in the .mcr files in the program folder of *ibaAnalyzer* (e. g. global macros). This is to prevent macro information from being tapped by means of Hex editors. One consequence of this is that macros having been generated with *ibaAnalyzer* versions 5.22.0 or higher cannot be processed by older versions (<5.22.0) anymore. Older macros, however, can be easily used with new *ibaAnalyzer* versions.

9 Filter editor

9.1 Creating digital filters using the graphic editor

The functionality of "creating digital filters" is one of the most powerful areas of *ibaAnalyzer*. Filters can be graphically created, saved or renamed in this context.

In order to open the dialog window, click the button on the icon bar shown above.

9.1.1 Dialog window of the filter editor

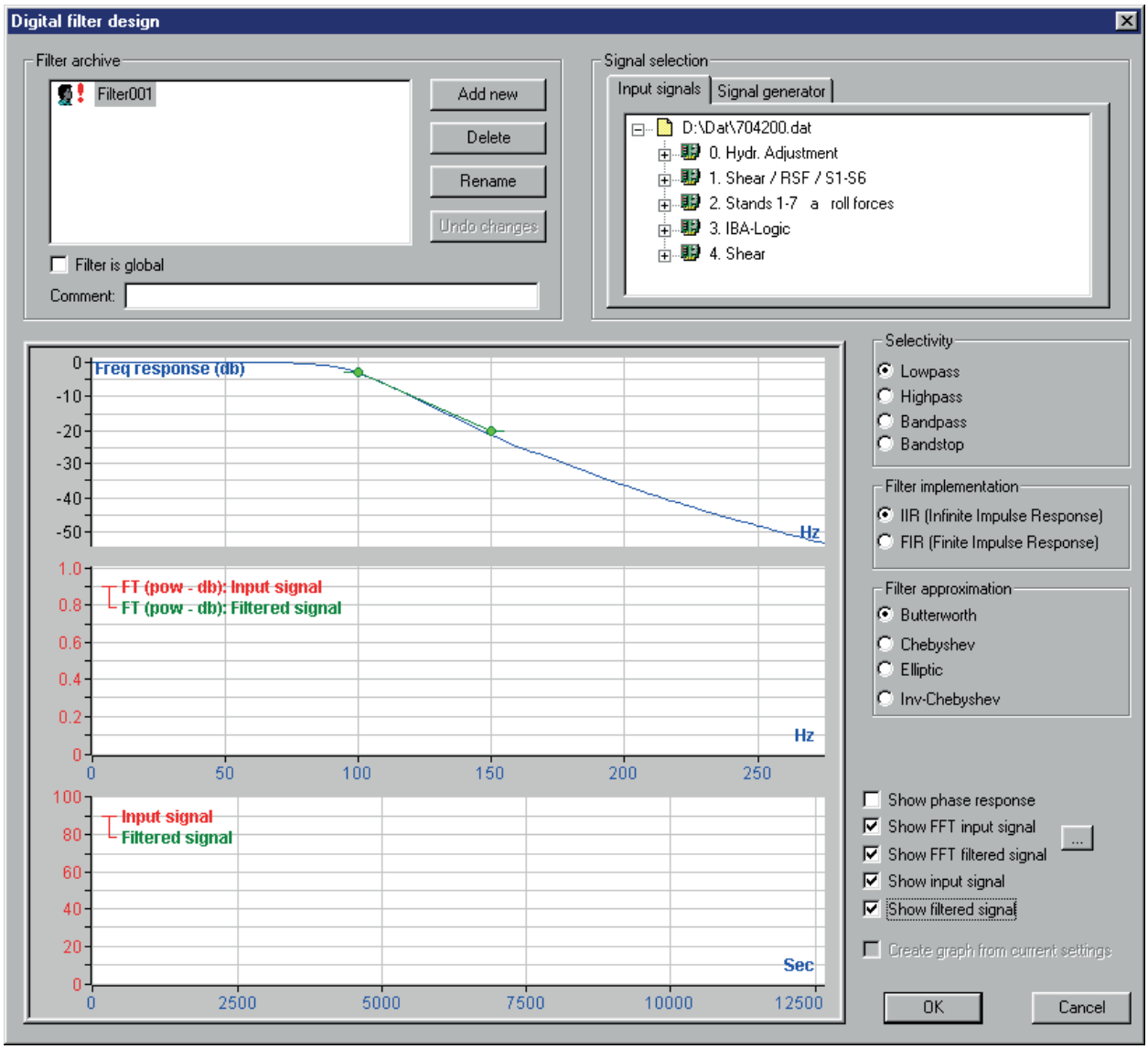


Fig. 121: Filter editor, dialog window

9.1.1.1 Filter archive

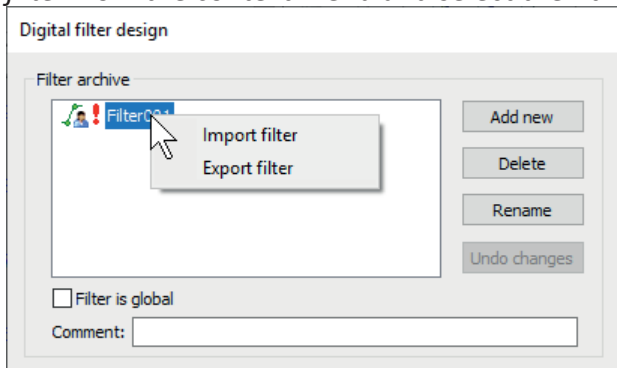
This field shows the filters which already exist. Filters belong to the analysis and are hence saved together with the analysis. If filters are to be always available irrespective of this, select the filter and activate the "Filter is global" tickbox. The filters are also displayed in the expression builder in the "Filter" branch where they can be used for signal calculations. Local filters are marked with the symbol while global filters are marked with the symbol . In order to create a new filter, click the <Add> button, whereupon a default name is displayed behind the symbol for a local filter . Click the <Rename> button in order to rename the filter. In order to remove a filter, select the filter and click the <Remove> button. You can enter a comment for every filter in the "Comment" box. This comment should include a short reference to the function of the filter. The comment will be displayed in the expression builder when the filter is selected.

The local filters are saved in the analysis (*.pdo file), the global filters in additional files with the extension *.fil (for filter) within the *ibaAnalyzer* work folder.

Tip

Individual filters can be exported specifically from or imported into the filter archive.

In order to start the import, right-click in the filter archive window, select *Import filter* from the context menu and select then the desired *.fil file in the browser.



To export filters, right-click on the filter to be exported in the filter archive and select *Export filter* in the context menu. You then save the filter as *.fil file at a location of your choice.

9.1.1.2 Signal selection

Input signals

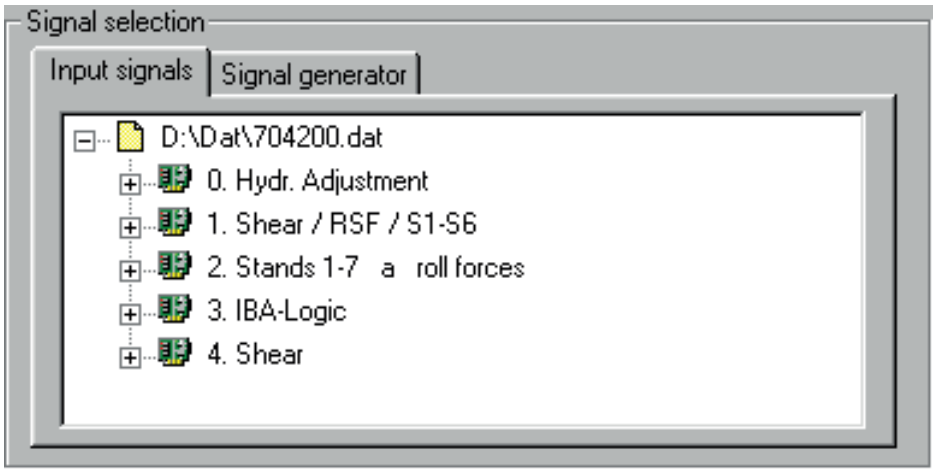


Fig. 122: Filter editor: input signals

The following signal sources can be filtered by the filters created:

- Input signals, i.e. all signals within a data file
- Virtual signals which were created using the expression builder or logical signal definitions

If a data file is loaded, this tab shows the input signals with the familiar signal tree.

Signal generator

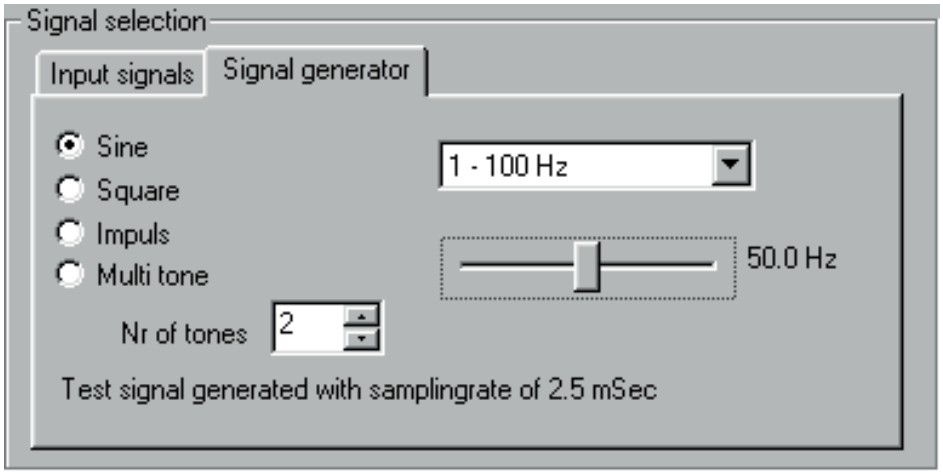


Fig. 123: Filter editor: input generator

The signal generator can generate several test signals, such as sine, square, impulse and multi-tone (frequency mixture). The signal shape and frequency range can be selected on this tab, and the frequencies can be selected using a slide control.

The multi-tone signal is composed of individual basic frequencies (tones). A multi-tone with one tone corresponds to a sine tone. A multi-tone with two tones corresponds to the addition of two sine signals, one basic frequency (lower frequency) and a second sine with a higher frequency. If more than one tone is selected ("No. of tones" >1), a second slide control is displayed. The upper slide control is used to set the basic frequency, the lower one to set the higher frequency. The higher frequencies result from the bandwidth set (upper frequency minus basic

frequency) divided by the number of tones. Every additional tone is considered in the addition with half the amplitude compared to its predecessor. The lower slide control cannot have a lower frequency than the upper one and vice versa.

9.1.1.3 Selectivity

Lowpass
Lowpass, allows lower frequency to pass and eliminates high frequencies.

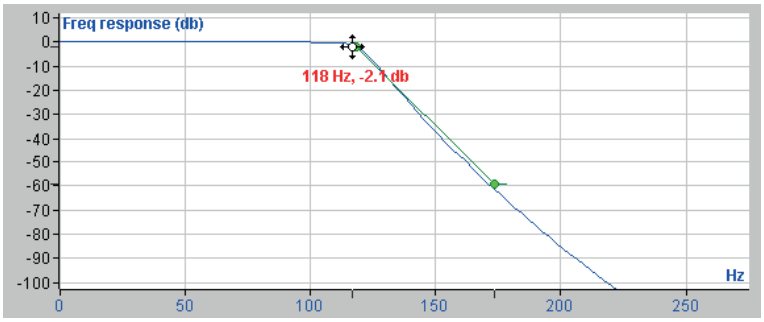


Fig. 124: Lowpass filter

Highpass
Highpass, eliminates the lower frequency components and allows the high frequency components to pass.

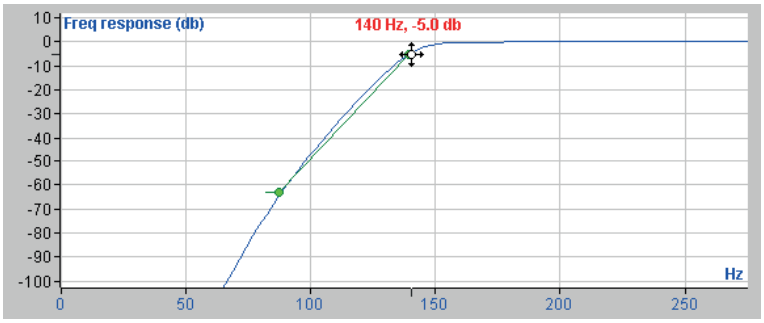


Fig. 125: Highpass filter

Bandpass
Bandpass allows frequencies within the frequency range set to pass and eliminates the lower and higher frequencies.

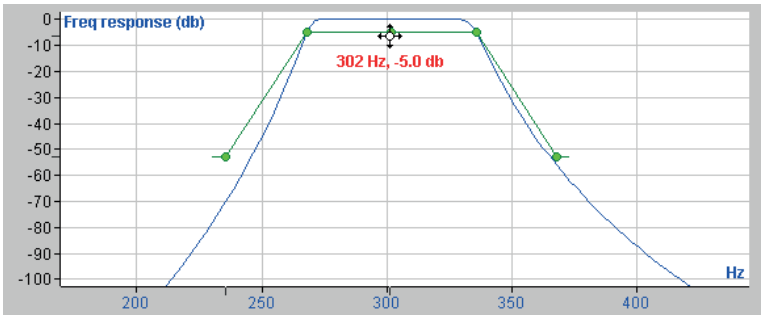


Fig. 126: Bandpass filter

Bandstop
Bandstop, eliminates the frequency components within the specified frequency range and allows lower and higher frequencies to pass.

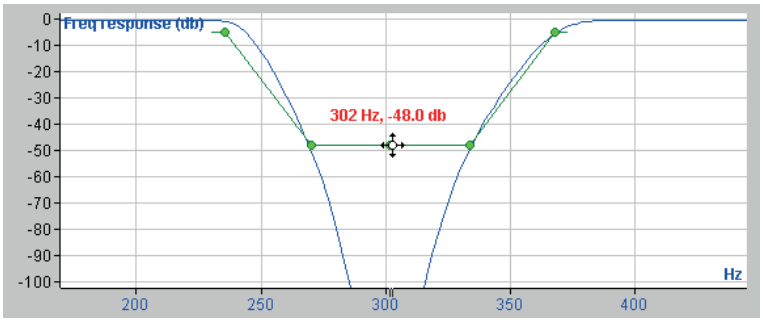


Fig. 127: Bandstop filter

9.1.1.4 Filter implementation

Filters can be implemented in two ways. The way of implementation to be adopted depends on the particular application.

IIR (Infinite Impulse Response)
IIR filters are often the preferred option in practical use because they calculate faster and require less RAM capacity.

FIR (Finite Impulse Response)
FIR filters, in contrast, offer a better control of phase and amplitude shape.

9.1.1.5 Filter characteristic

Four filter characteristics (approximations) are available, featuring different calculation methods.

- Butterworth
- Chebyshev
- Elliptic
- Inv-Chebyshev

The characteristic to be selected depends on the particular application.

9.1.1.6 Curve field and display options

The dialog window of the filter editor shows the preference of two display graphs: The freq response (db) and the phase response (deg.) The graphs used last in the filter editor are always displayed.

These graphs feature the same behavior as the graphs in the recorder window of *ibaAnalyzer*. The scales can be varied by pulling the XY-axes. Zooming is also possible here by opening a zoom window. Pressing the right mouse key opens the context menu which, for example, offers an autoscale function.

In the frequency response graph, the filter can be adjusted at the green points which are connected by straight lines. In order to adjust the filter characteristic, use the drag & drop function in order to move the green points. The cursor then changes its shape to become a compass icon, with the corner frequency and the damping being displayed at this point. The typical procedure is as follows.

- In the case of a lowpass or highpass filter, first move the topmost point to the desired corner frequency and subsequently move the lower point until the damping reaches the desired rate of rise and strength. A steep connecting line between the two points dampens even frequencies with only a minor deviation from the corner frequency, whilst a flat connecting line means a smoother function of the filter.
- In the case of a bandpass or bandstop filter, first adjust the desired frequency band by horizontally moving one of the two points left or right of the middle of the frequency band. When the frequency bandwidth and hence the corner frequencies are adjusted, you can move the center point and thereby the entire frequency band along the frequency axis in order to position it at the frequency to be filtered. The two outermost points once again determine the damping of the undesired frequencies. You only have to move one of these two points because they always behave symmetrically.

The lower right corner of the dialog window contains six checkboxes as follows.

- *Show phase response*: shows the phase offset of the filter in degrees (deg).
- *Show FFT input signal*: shows the FFT of the input signal in red. Use the button  in order to open the configuration dialog for the FFT setup for this visualization.
- *Show FFT filtered signal*: shows the FFT of the filtered signal in green in the same graph as the FFT input signal.
- *Show input signal*: shows in a separate graph the original signal (input signal or signal generator) in red that has been marked in the signal selection in the upper right corner.
- *Show filtered signal*: shows the filtered input signal in green in the same graph.
- Create graph from current settings: This option creates a new signal strip in the recorder window of *ibaAnalyzer* which shows the filtered signal as soon as you click the <OK> button and exit the dialog. This function is important if filtered signals are to be added to the analysis.

9.1.2 How to create a filter

Filters can be created in a host of ways using the filter editor. How you approach this task will certainly depend on the particular application and your knowledge of filters.

Let us use a simple example in order to introduce the different methods. On the basis of this information, you should then try out the options and operations of the editor and deepen your knowledge.

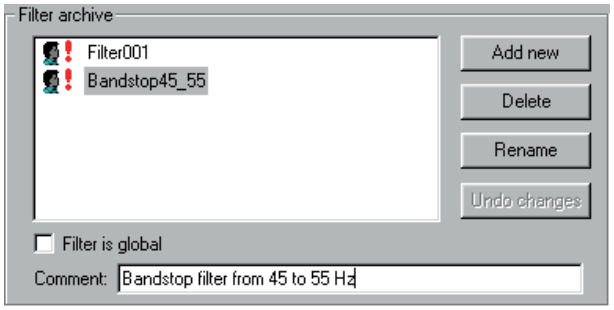
9.1.2.1 Example: implementing a bandstop filter for 50 Hz

The test signal to be used here is generated using the integrated signal generator. You can, of course, also use a clean input signal from the data file or a signal that is artificially generated using the expression builder.

Of course, the view which you select for the strips is dependent on the given requirements. A tried-and-tested approach in practical operations, where certain frequencies are to be filtered out of real signals, is to deactivate the phase response display because this feature is seldom and hardly needed. Instead, we recommend activating both FFT displays as well as both signal displays.

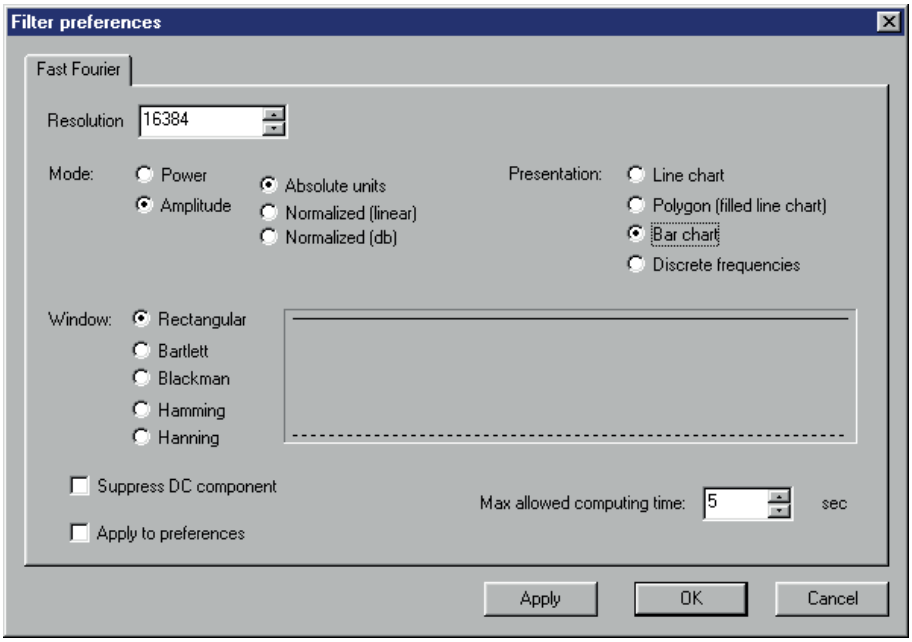
Procedure

1. First create a new filter. For this purpose, click <Add new> in the "Filter archive" area. A new filter is displayed in the list. Mark the filter and subsequently click the <Rename> button. Now enter a new name, such as Bandstop45_55, as well as a comment. Press the <RETURN> key in order to complete the entry.

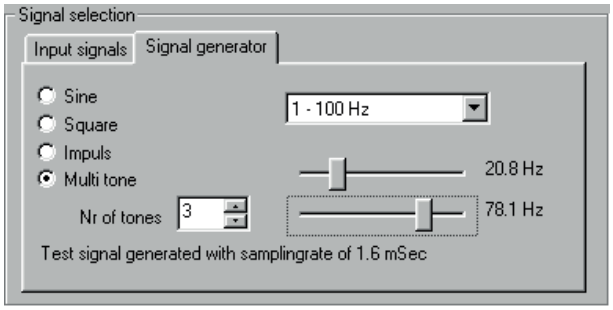


2. Initially, only activate "FFT input signal" and "Input signal" for the graph presentation. The shape of the input signal which is now to be generated using the signal generator can be checked via these displays.

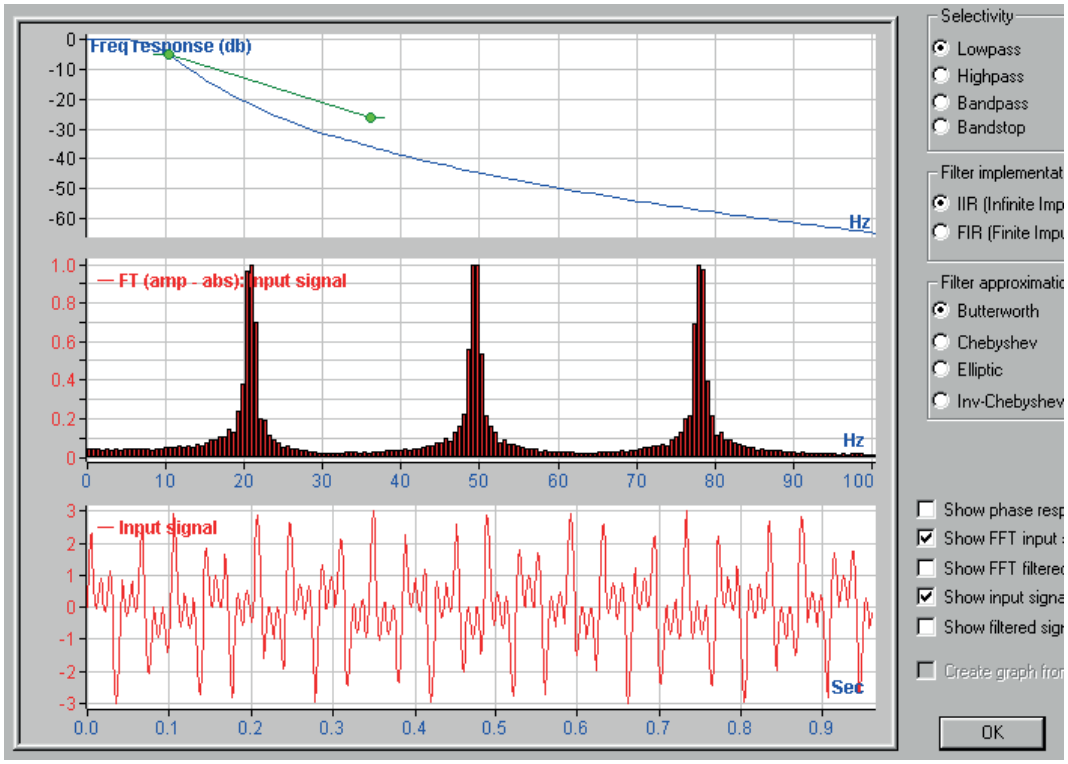
3. In order to improve the display of the FFT, change the FFT setup ( ) as follows:



4. In order to generate a test signal, now open the *Signal generator* tab in the "Signal selection" area. The test signal should contain several frequencies, including one at around 50 Hz. Numerous settings can be chosen to generate such a signal. This is just one option:

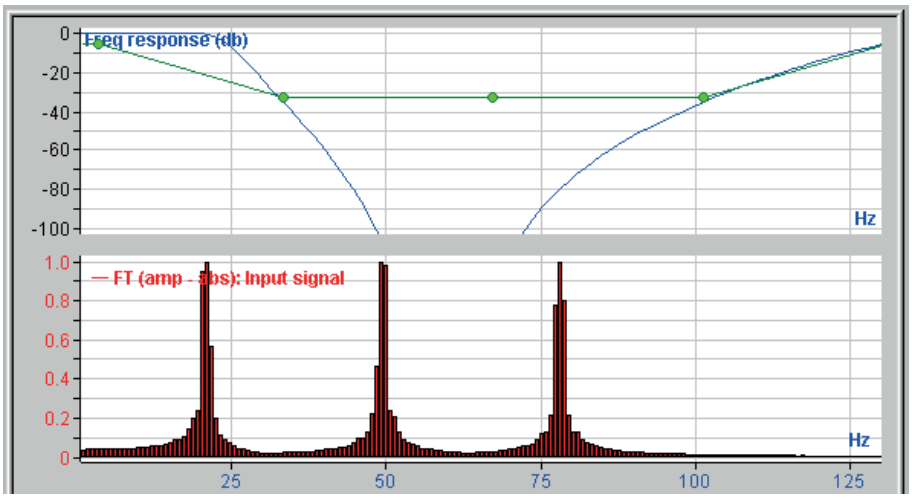


5. Using the FFT display for the input signal, adjust the slide controls of the signal generator until a distinct increase in amplitude is observed at 50 Hz. In the event that the frequencies are too close to each other or too far on the left, simply call up the context menu by pressing the right mouse key in the graph, and select *Autoscale frequency axis in signal range*. The scaling of the frequency axis is now improved. It should look as follows:



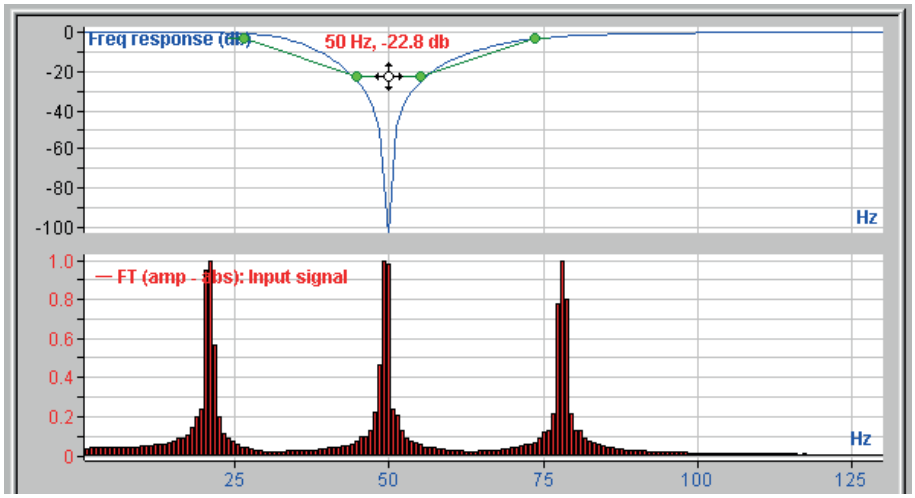
The test signal thus contains chiefly the frequencies of 20, 50 and 78 Hz. The bottommost strip shows the time curve of the signal.

6. Now select the "Bandstop" filter type. In the event that the green points in the graph with the frequency response are incomplete or not shown at all, we recommend re-scaling the graph via the context menu, this time via the *Autoscale frequency axis in filter range* option.
7. Push the outermost points and the frequency band in such a manner that a compact, but still manageable (movable) characteristic is obtained. Now use the mouse in order to seize the filter points at the center point and move them towards the frequency amplitudes of the input signal.
8. Now use the *Autoscale frequency axis in the signal range* option again in order to re-scale the graph until you obtain a better resolution of the area of interest.

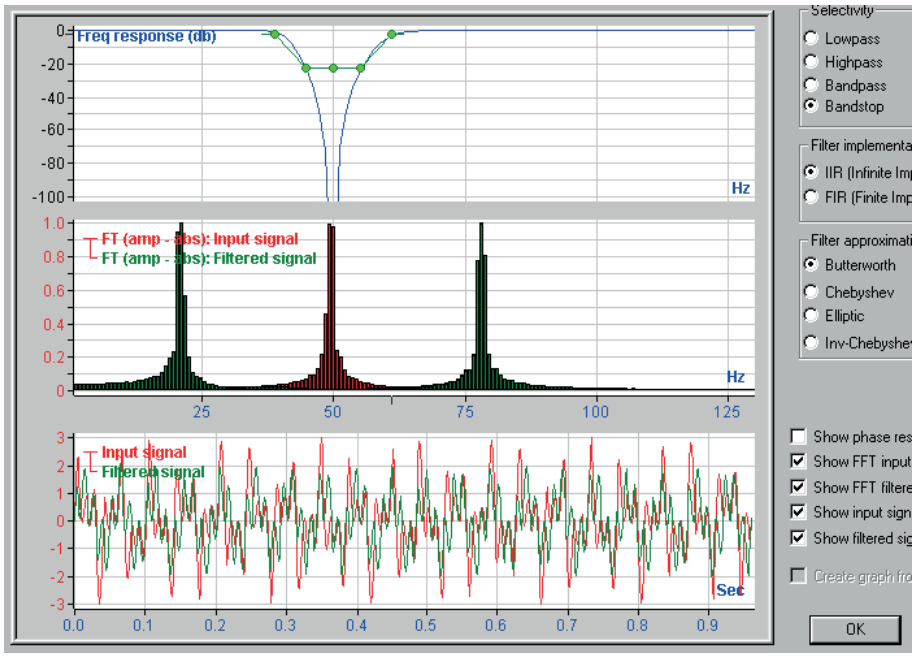


9. You can now move the points for the corner frequencies to the desired points. For this pur-

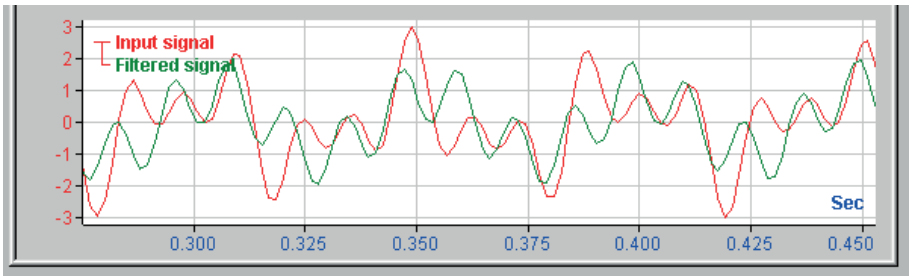
pose, move the center point to the 50 Hz position and then shift the neighbouring points in order to adjust the frequency band in such a manner that the corner frequencies are located at 45 and 55 Hz. Now, the filter is already almost complete.



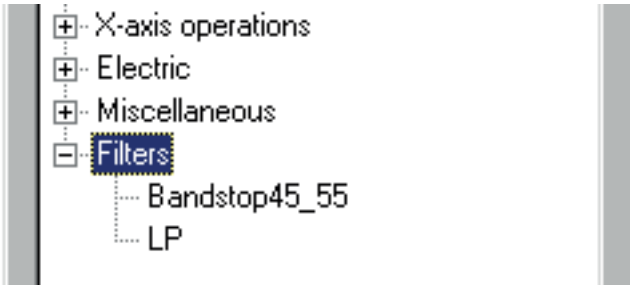
10. In order to check the result, you can now have the filtered FFT signal (use the same FFT settings as above!) and the filtered signal displayed. As you can see, the frequencies around 50 Hz are completely missing in the filtered signal. The filter behaviour can still be slightly modified by adjusting the damping via the two outer green points.



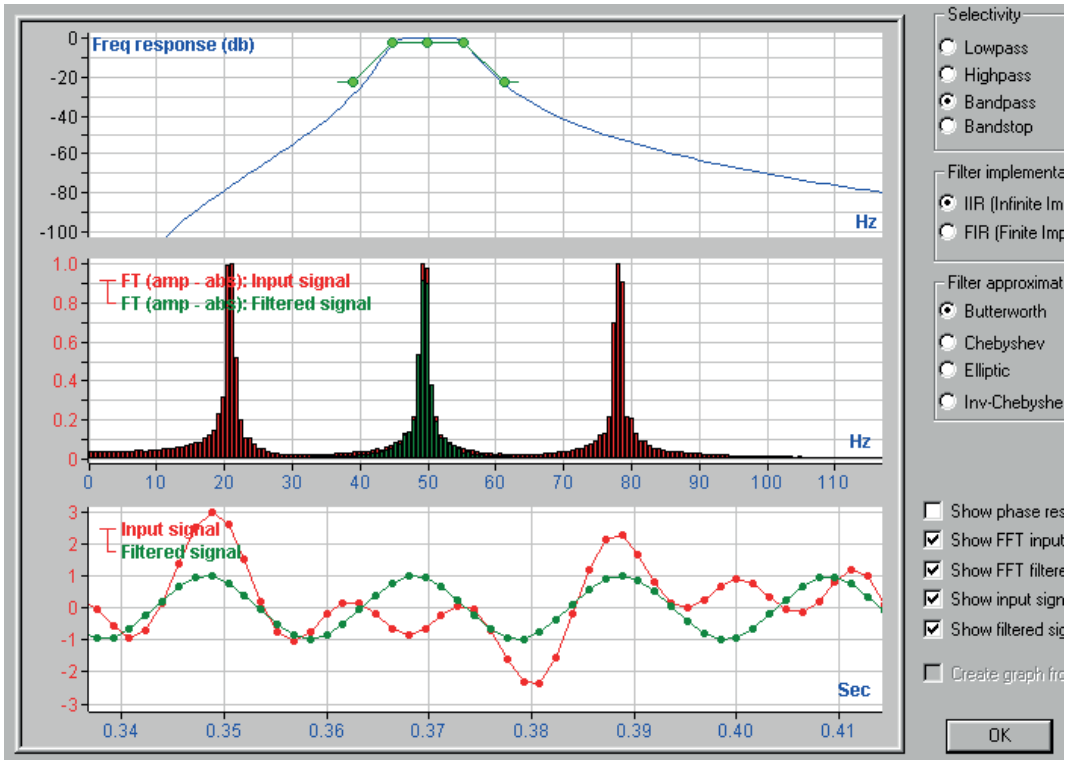
11. By the way: Zooming is possible in the bottommost strip in order to see the signal curve more clearly.



12. If you think that the filter is ok and should be saved, just click the <OK> button in order to exit the dialog. In order to make sure that the filter is not lost when *ibaAnalyzer* is exited, also save the analysis once again. If the filter is to be available even to applications other than the current analysis, tick off the "Filter is global" box before you exit the dialog.
13. No matter whether local or global – with immediate effect, the filter is now available in the expression builder and can be used for filtering out 50 Hz oscillations from all kinds of signals.



14. By changing the filter type, you can now easily test or create other filters. If you switch to the bandpass filter, for example, the frequency band remains in force, and all frequencies other than 45-55 Hz are filtered out now. What remains is a perfect 50 Hz oscillation.



9.2 Exporting and importing filters

Filters are part of the analysis (*.pdo). However, they can be exported or imported in several ways.

Therefore, a distinction is made between local and global filters.

Local filters are filters created for an analysis where the "Filter is global" option has not been activated in the filter editor.

In order to create a global filter simply activate the "Filter is global" option for a generated filter in the filter editor.

"Export" means saving a filter as a file with the extension *.fil.

By the way, all global and local filters of the current analysis are also available in the expression builder in the "Filter" branch.

9.2.1 Exporting and importing global filters

Global filters can be exported by means of the function "Export" in the *Import/export settings* tab in the *Preferences* dialog (Menu *Setup - Preferences*...). This function exports various elements and settings to a *.zip file.

In order to include filters you have to check the "Filters" option for export. Then click on <Apply> and finally click on <Export>.

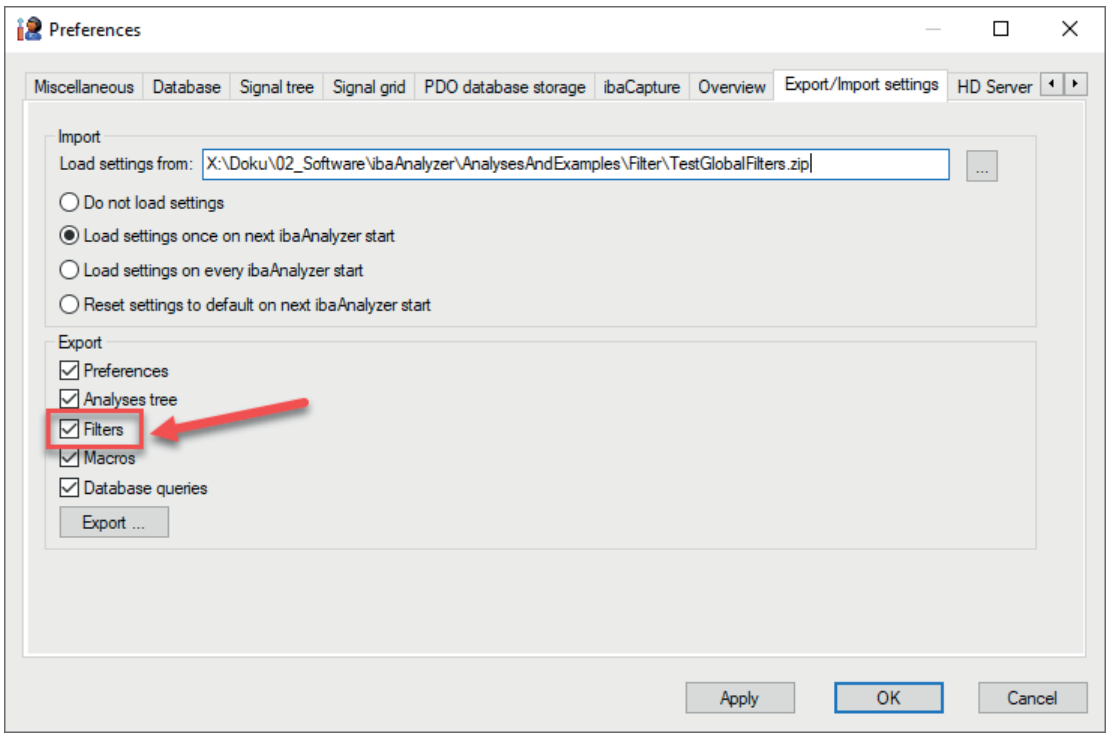


Fig. 128: Export of a global filter

You can then set the path and file name of the *.zip file.

Filters included in an export file are available as global filters after the file import.

You can import global filters by selecting a suitable *.zip file in the "Import" section of the dialog and activating the second or third method for loading the settings. Then exit the dialog by clicking the <OK> button and restart *ibaAnalyzer*.

Furthermore, a *.fil file is generated for each global filter in the directory "C:\Documents and Settings\user name\Application Data\iba\ibaAnalyzer". These filter files can also be imported specifically into an analysis or a filter archive. (see ↗ *Exporting and importing local filters*, page 196).

9.2.2 Exporting and importing local filters

Local filters are initially available only in the analysis in which they were defined.

Individual filters can be exported specifically from or imported into the filter archive.

In this way, you can share filters with other users or between different computers.

In order to start the import, right-click in the filter archive window, select *Import filter* from the context menu and select then the desired *.fil file in the browser.

In order to start the export, right-click the filter you want to export in the filter archive window and select *Export file* from the context menu. Finally, save the filter as a *.fil file to a location of your choice.

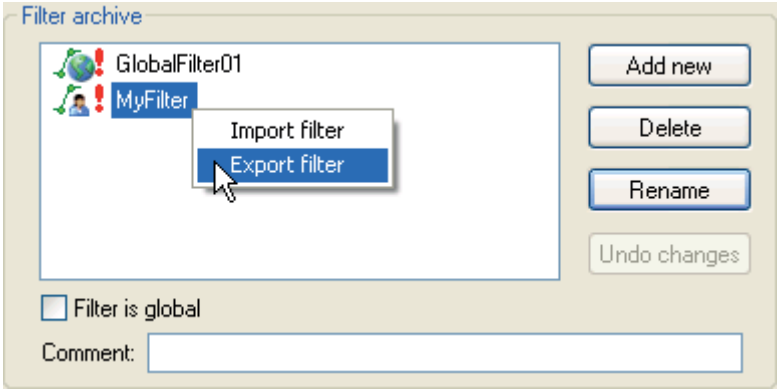


Fig. 129: Export of a local filter

It is generally also possible to apply this method to a global filter in the filter archive. When imported into another analysis, however, the filter loses its global status and is initially entered as local filter.

10 Text signals

Text signals can be configured in *ibaPDA* and saved in the data file. Depending on the configuration of the data storage in *ibaPDA*, you will find text signals in the signal tree and/or in the info area of the data file (info fields).

10.1 Appearance

In *ibaAnalyzer*, text signals can be found in the signal tree of the data file and can like any other signal be dragged into a trend view or opened by a double click.

The positions of text signals displayed in a trend view correspond to their positions in the data file. They appear as a vertical line with a label, in which the value or the text is displayed.

In the following image, for example, the product number (Coil no.) was created as a text signal in *ibaPDA* and saved again whenever a value changed. For comparison, the product number is also displayed as numerical value with the red curve above.

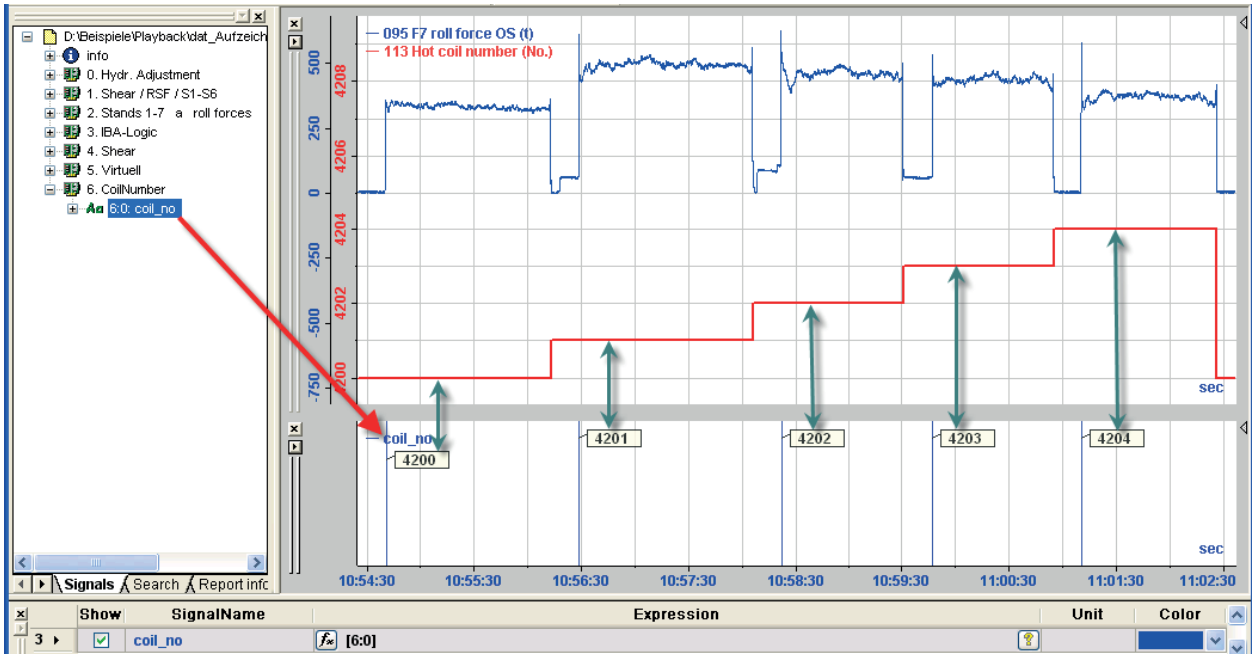


Fig. 130: Displaying a number as a text signal

10.2 Processing

It is also possible to export text signals into a binary file (*.dat).

The functions SHL and SHR (move signal/expression to the left or right) do also support text signals.

10.3 Text signal functions

Special functions in the expression builder of *ibaAnalyzer* allow for conducting text signal operations in the context of an analysis.

- *InfofieldText, ChannelInfoFieldText, ModuleInfoFieldText*: Generates a text signal from an info field
- TextCompare: Compares lexicographically the field content of two text signals and indicates whether the texts are identical or non-identical.
- *ToText, FromText*: Creates a text signal out of a numerical value with the numerical value as an ASCII character (ToText) or reverse (From Text).
- *TrimText:* Removes spaces from the texts of a text signal.
- *ConcatText*: Puts the content of several text signals together to form one long text

You will find more information about the features in the *ibaAnalyzer* manual, part 3 in the text features chapter.

10.4 Application with ibaCapture

While videos from *ibaCapture* are opened in *ibaAnalyzer*, text signals can be dragged and placed over the video images in the form of overlay text. Each video window can contain one text signal only.

Fig. 131: Text signal as overlay text in the video window

After you dragged the text signal over the video, you can set the position and the presentation mode via the context menu *Setup overlay text*.

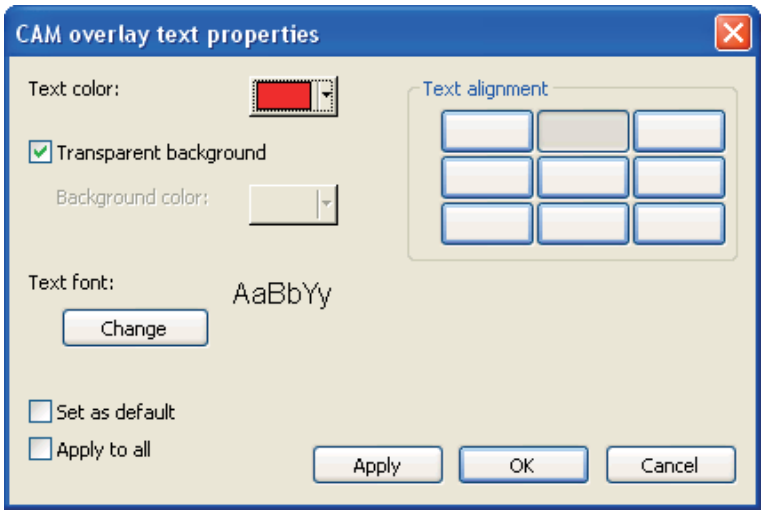


Fig. 132: Setup dialog for overlay text properties

11 Access to HD data with ibaAnalyzer

It is possible to provide access to data with *ibaAnalyzer* which were recorded with the *ibaHD server*. In *ibaAnalyzer*, a special HD query dialog is available providing the following functions:

- Configuring the connection to one or several HD server(s)
- Signal preview
- Limiting the query period by specifying the desired acquisition time
- Formulation of a signal-based query condition

The result of an HD query is a so-called pseudo data file which is structured similarly to a regular iba data file and with which the same operations can be executed as is the case with regular data files (show signals, executing calculations, creating reports, extracting, etc.).

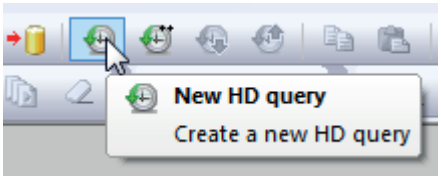
Other documentation

You can find detailed information regarding the handling of *ibaAnalyzer* and the analysis function in the *ibaAnalyzer* manual.

11.1 Menu and tool bar

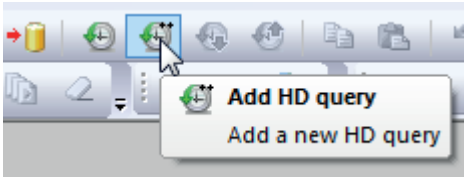
The functions in the *Historical data* menu are described in *ibaAnalyzer* manual, chapter *The menu - Historical data*.

If you want to start a new HD query, click on *Historical data – New HD query* in the menu or the corresponding button.



Files or HD queries in the signal tree are replaced by the new query.

If there already is an HD query or a data file in the signal tree and you want to add an HD query, click *Historical data – add HD query* in the menu or click on the corresponding button.



The context menu of the signal tree window also contains some commands for adding, replacing or appending:

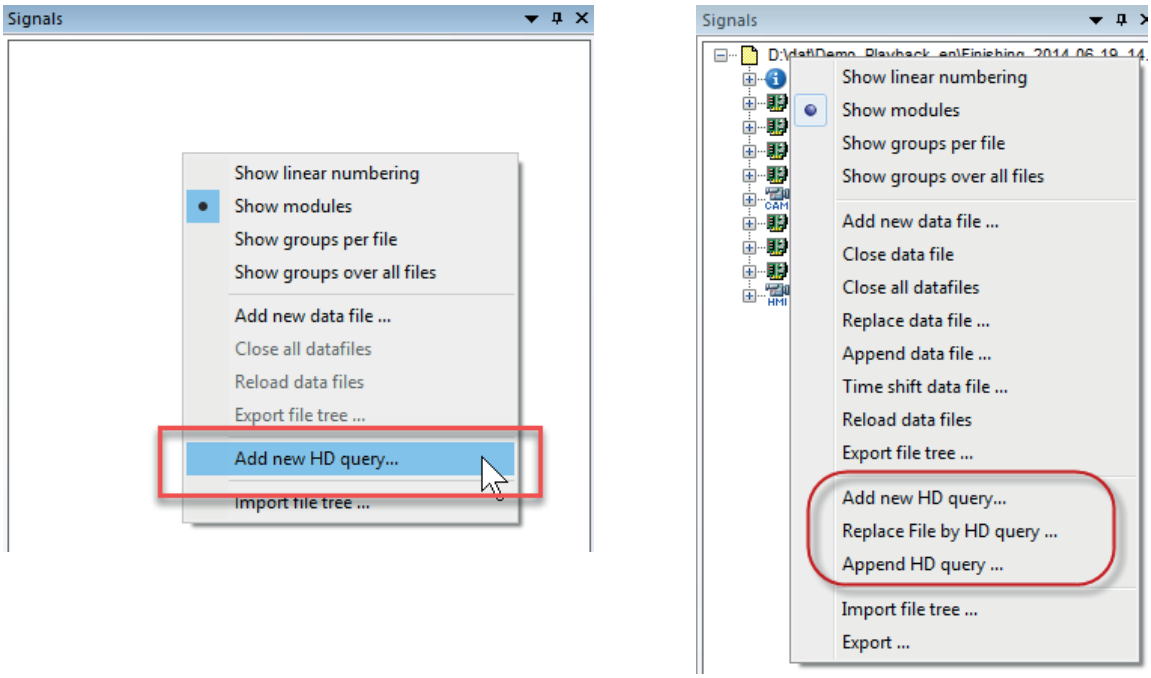


Fig. 133: Context menu in the signal tree window, left without data file, right with data file

11.2 The HD query dialog

After clicking on one of the above-mentioned menu commands, the HD query dialog opens.

If you use the HD query function for the first time, you first need to establish a connection to the HD server and the desired HD store(s). You can then configure and execute the query.

If required, you can later change the connection settings at any time.

You can configure several different HD stores and provide them with an unambiguous name. The HD stores are listed to the left in the dialog. You can enter a description for each HD query and you can determine whether the HD query should be saved in the analysis rule.

The configuration of an HD query is divided into the following steps:

- Establishing the HD server connection
- Setting the query time range for the query
- Formulating the signal condition for the query (optional)

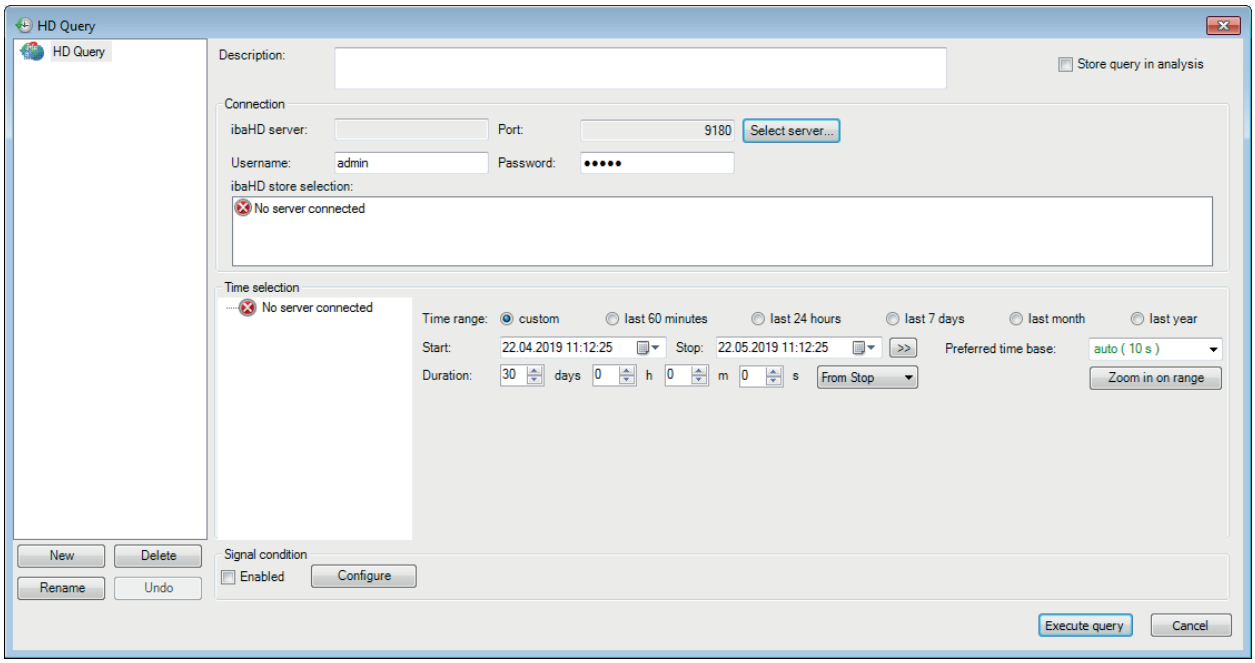


Fig. 134: HD query dialog

11.2.1 Configuring HD server connection

If not yet opened, click on the button <Select server...> in the HD query dialog window.

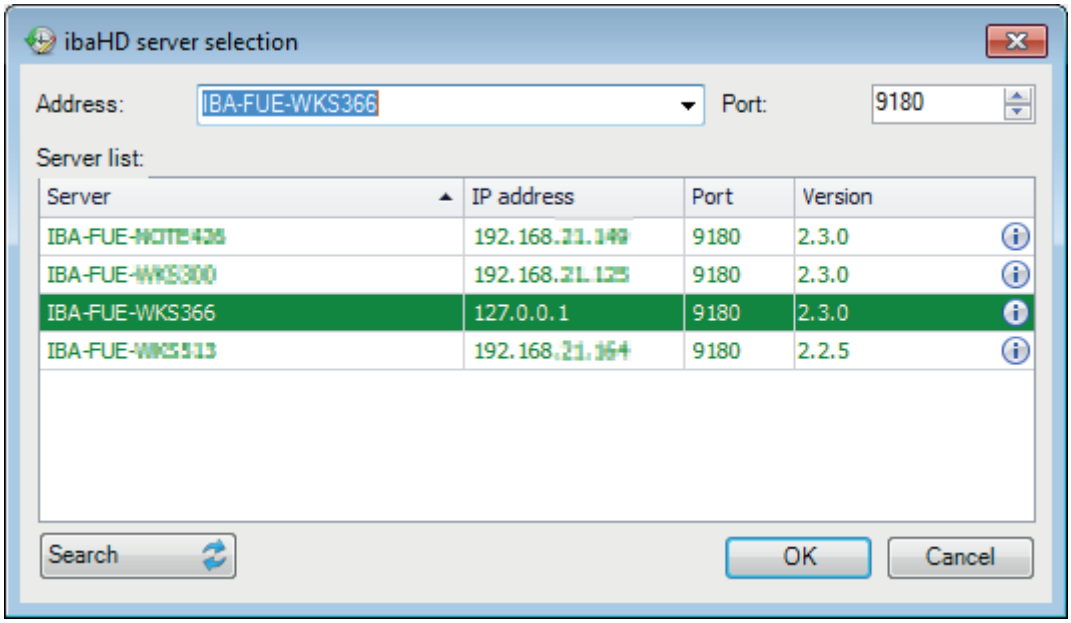


Fig. 135: Select HD server

This dialog shows a table including the computers recognized in the network running an HD server (service). If required, you can update the table by clicking on <Search>.

Green entries indicate HD servers with existing stores and data. Red entries indicate HD servers of an incompatible version.

Select the desired HD server in the table and the name is displayed in the "Address" field at the top.

Alternatively, you can manually enter the computer name or IP address in the field.

The port number must comply with the setting of the selected HD server service, which is usually the case. Confirm your selection by clicking on <OK>.

If an ibaHD server with enabled user administration is selected, the username and password must still be entered.

In the next step, select one or several HD store(s) to be taken into consideration when querying.

Time based and event based HD stores are offered in the area *Select ibaHD store*.

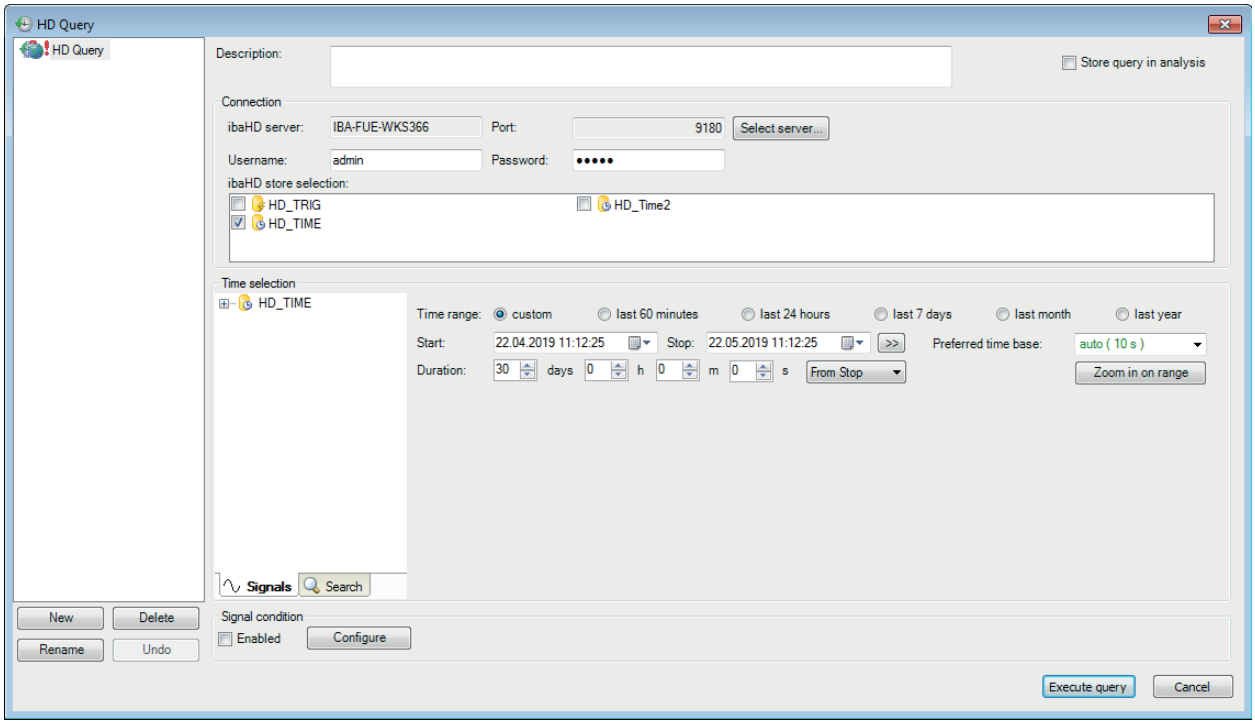


Fig. 136: HD query dialog, select HD store

Set a check mark for the stores that you want to use for the query. In the query result, a separate pseudo data file appears for the selected storage in the signal tree. If you do not select a store, separate pseudo data files are created for all stores.

If you have completed these settings, select the time range.

11.2.2 Select time range for the query

The *Time range* tab includes all control elements to select the time range for which the query is to be executed.

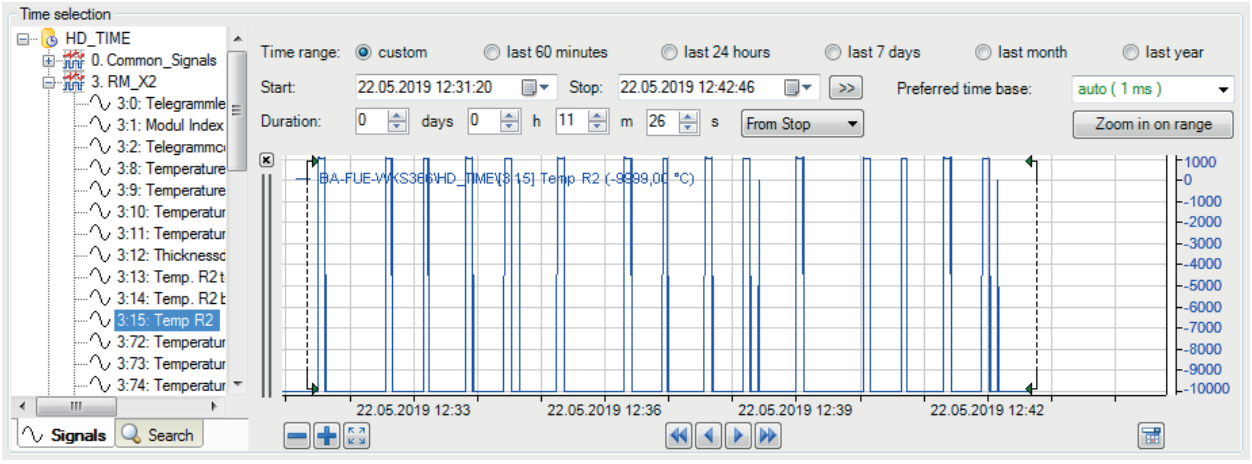


Fig. 137: HD query dialog, time range

Options fields facilitate the selection of the time range:

- *Custom:* Select this option if you would like to select the time range manually with markers in the preview window or with the time control elements.
- *last 60 minutes:* Select this option to query a time range that starts one hour before the current time and lasts until the current time.
- *last 24 hours*: Select this option to query a time range that starts one day back from the current time and continues until the current time.
- *last 7 days*: Select this option to query a time range that starts one week before the current time and continues until the current time.
- *last month*: Select this option to query a time range that starts on the same day and at the same time as one month before the current time and lasts until the current time. The length of the time range corresponds to the number of days of the month before the current month.
- *last year*: Select this option to query a time range that starts on the same day and at the same time as one year before the current time and until the current time. The length of the time range corresponds to the number of days of the year before the current year.

With all options except *custom,* the time range at the time of query execution is re-evaluated.

The toolbar is hidden in the signal view by default in order to create more room for the preview. It can be displayed again by clicking on the graphic with the right mouse key and selecting “Display toolbar” in the context menu.

Signal tree

The signal tree is located in the left area of the dialog. There, you will find the HD stores that you marked before under *Connection*. Under each HD store, you will find the signals saved by the HD server.

In the signal tree window, the context menu provides different commands for the display mode and filtering of the signals.

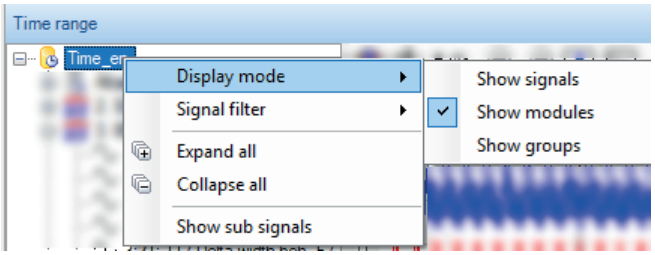


Fig. 138: Setting the display style via the context menu

The display mode determines how the signals should be displayed in the tree.

Note

The setting selected for the display mode is taken over for the normal signal tree in *ibaAnalyzer* and vice versa.

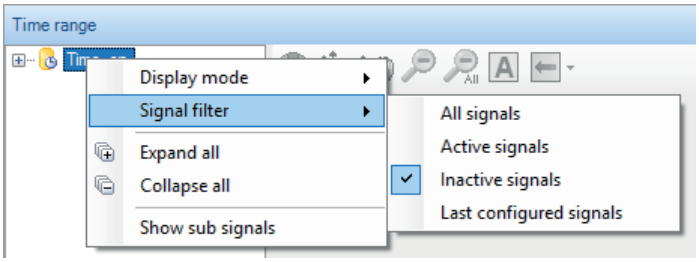


Fig. 139: Setting the signal filter via the context menu

The filter settings define which signals are displayed. Active signals are signals which are currently also being written in the HD store. Inactive signals are signals which have been recorded, but are currently not being written.

Moreover, the signal tree window offers a search function in order to search for particular signals. The function is equivalent to the search function in the normal *ibaAnalyzer* search window.

HD trend graph view

The big part on the right of the dialog can display signal curves. You can display the desired signals via drag & drop or double-click as usual.

The control elements for navigating basically equal those known of the HD trend graph in *ibaPDA*:

- Zooming in and out of the time axis with the mouse wheel
- Zooming in and out by configurable factors with the plus/minus buttons
- Navigating towards the past or future with configurable step buttons
- Navigate to a certain date using the calendar function
- Moving the time axis towards the past or future with the mouse

Only a "Live" mode is not available.

In addition to this, there are means for limiting the desired section. If you have found the point in time or time range you want to request with the navigation tools, you need to set the start and end point of the time range.

- Start and stop markers

As soon as a signal is displayed, there are two green markers on the signal strip. You can move the markers using the mouse and thus very easily set the start and end time by setting the relevant time period to be within the green arrow tips.

The cursor changes as follows:

- if the mouse is on the start marker
- if the mouse is on the stop marker

If you hold down the <SHIFT> key during shifting, both markers are shifted in the same distance.

- Entering starting/stopping time and length of time

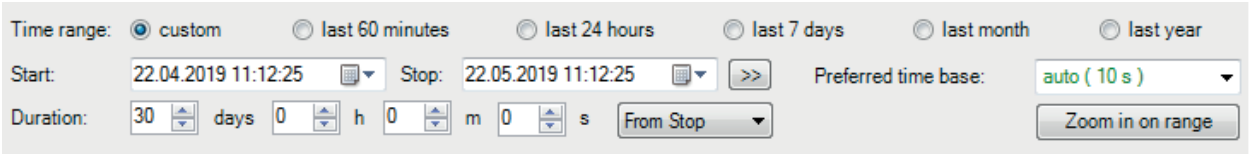


Fig. 140: Setting the time range by input

In addition to the markers, there are also other means for limiting the time range.

- Selection of an option field
- Input fields or calendar function for date/time from start and stop time if the option *Custom* has been selected:
  If you move the markers, the values in the fields will be updated accordingly. You can also enter date and time directly. The markers are then positioned accordingly.
  If you click on the >> button on the right side of the date field of the stop marker, the stop marker is automatically positioned on the current point in time whereas the signal values currently being available in the HD store are loaded.
- <Zoom in on range> button
  As the markers are always bound to the point in time set on the X axis, they are not repositioned when zooming in or out or when moving the X axis. Also moving the markers or changing the start and stop time values does not induce an automatic adjustment of the zoom factor. Thus, they can be very close to each other or they can be outside the window. By clicking on the button, the zoom factor and position are set in such a way that the selected time range is displayed in the center of the signal strip. Start and stop markers are always positioned at one quarter and three quarters of the visible X axis segment.

- Duration input fields
  The duration, i.e. the width of the time range, is displayed in these fields. The values are adjusted accordingly while shifting the markers. However, you can also directly enter the time in days, hours, minutes and seconds. If you change the time values by entering or using the up and down buttons, the markers will be positioned according to the button nearby.
  - “From stop:” stop marker fixed, start marker is shifted
  - "From start": start marker fixed, stop marker is shifted
  - "Centered": the center of the selected range is stationary, both markers are shifted symmetrically to this.

  If you change a time value using the up and down buttons while holding down the <Ctrl> key, the other values are set to zero.
  If you directly enter the numerical values, hold down the <Ctrl> key and press <Enter> to apply the value and to set the other values to zero.
- Preferred time base
  You can select from the preferred time base drop-down list a time base with which the data is to be loaded if possible. The ibaHD server automatically tries to find the optimal time. There is more information on this topic in the next chapter.

11.2.3 Formulate signal condition

Using the function of the conditional query, you can limit the query to certain events or signal states within the time period set under *Time range*.

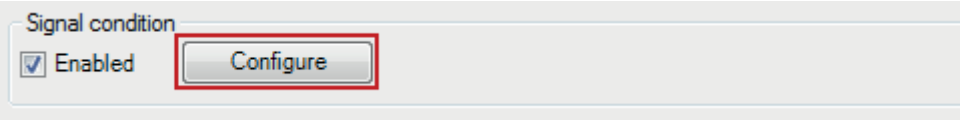


Fig. 141: Enable the search using signal conditions

Enable the function in the *Enabled* field. Signal conditions are configured in a separate dialog, which you open with the <Configure> button.

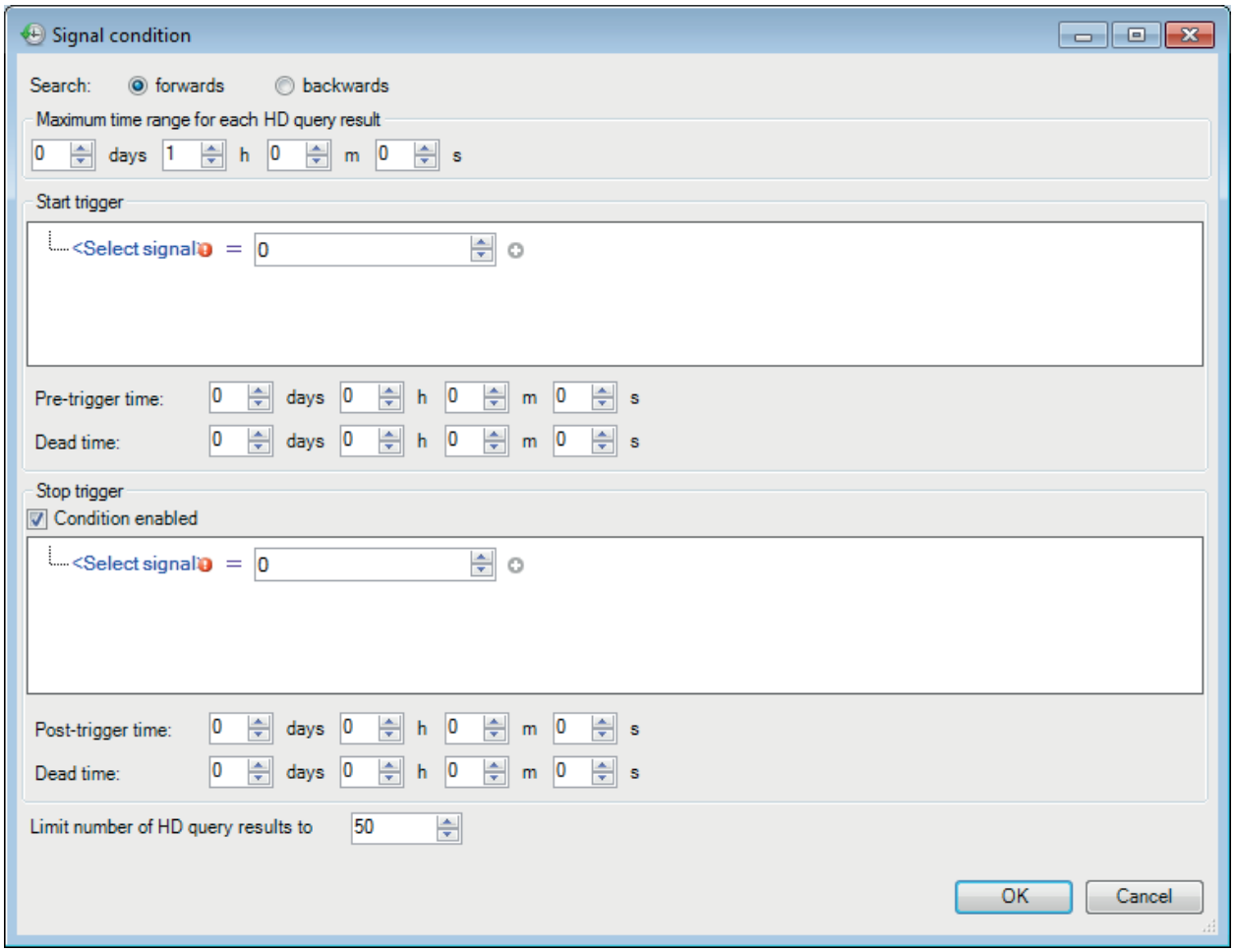


Fig. 142: Configuration dialog for the signal condition

You can choose whether you would like to search for conditions forwards or backwards in time. If *forwards* is selected, *ibaAnalyzer* starts to search for events of the specified condition, starting from the start time to the end time. If *backwards* is selected, *ibaAnalyzer* starts the search from the end time to the start time (i.e. backwards in time).

Maximum time range for each HD query result

The query for a particular signal condition can provide several events, because a pseudo dat file is created every time the condition is met. The maximum length of these query results can be set here.

If you want to use a stop trigger (see below), this setting limits the length of the query result if the stop trigger is to fail.

Start trigger

By configuring the start trigger, you configure the condition that defines the event or the signal state to be searched for. The time of occurrence of the event is the start of the query result or the pseudo dat file. The end of the query result is either determined by a stop trigger (see below) or the setting for the maximum time period (see above).

Various editor functions are available in the *Start trigger* field for formulating the signal condition.

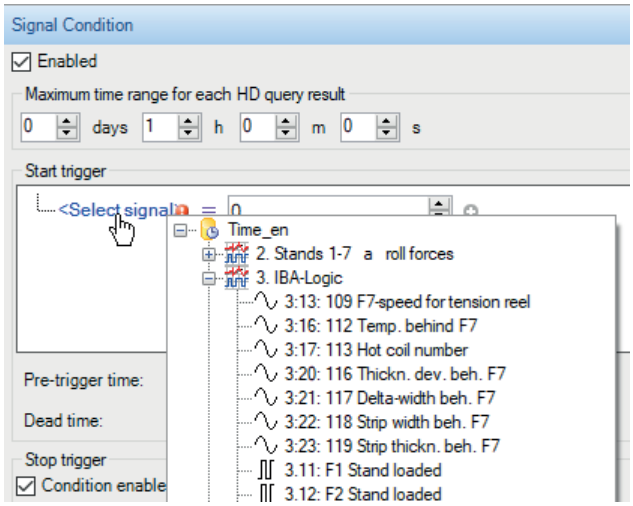
Legend

1	Blue font	Signal tree for the signal selection
2	Operator	Comparison operators to choose from
3	Comparison value	Digital signals: True / False Analog signals: Value input or spinner
4	Remove expression	The entire expression or group is removed.
5	Add expression group	Indented with a separate logical link, additional expressions can be added, which are first linked within the group. The group result then leads to the result with the superordinate link.
6	Logical link	Default = AND, can be toggled to OR with a mouse click.
7	Add expression	

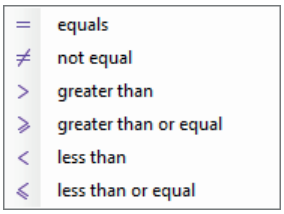
The start trigger is fired when the overall result of the condition is met.

The following example shows the procedure for creating a condition.

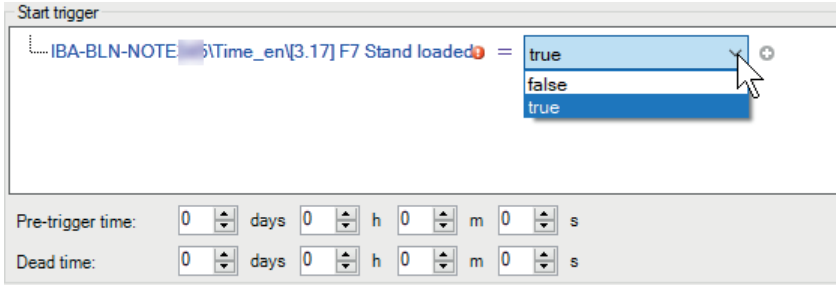
1. Click on the blue text “Select signal” and select the desired signal for the condition in the signal tree, such as a digital signal.



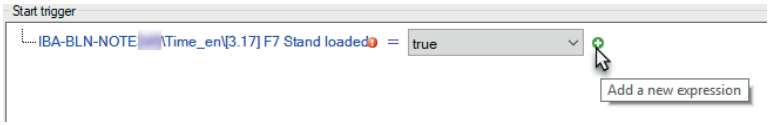
2. Click on the operator sign and select the operation. For example equal or unequal for a digital signal.



3. Click on the field for the comparison value and select one, e.g. “true” for a digital signal.

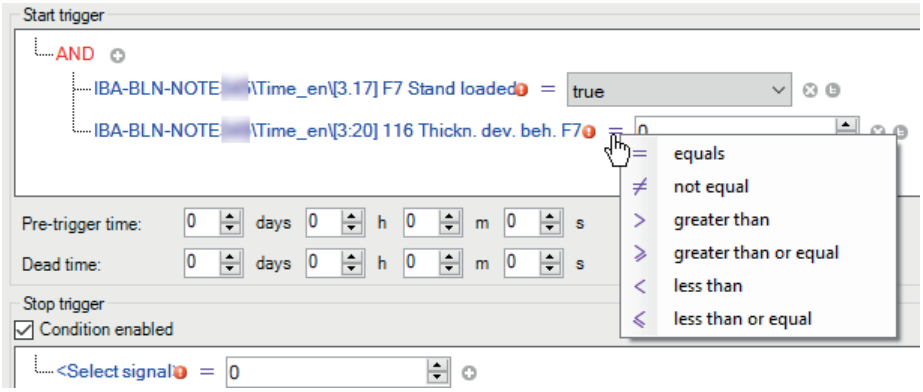


4. If you want to add another condition, click on the icon.



A new expression is created and logically linked to the previous one with AND.

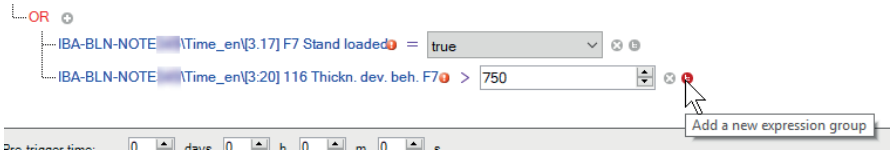
5. Formulate a second expression, for example with an analog signal, that you compare with a limit.



6. Enter the desired limit that should fire the trigger if exceeded by the selected analog signal. Here in the example it is 750 µm.

7. Both expressions must be “true” with the AND link so that the trigger is fired. If you want the trigger to be fired already when only one condition is met, then click on the red AND in order to switch to the OR link.

8. You can also cascade conditions by grouping expressions. To create a group, click on the icon in the expression that should be the first member of the group.



9. The expressions of the group are combined with their own logical link, default = AND.

To add additional expressions to the group, use the icon at the group level.

Pre-trigger time
The pre-trigger time setting determines how much time should be included in the query before the start trigger.

Dead time (reaction time)
By setting the dead time, you determine how long the time period after a start trigger is before a new start trigger is detected again.

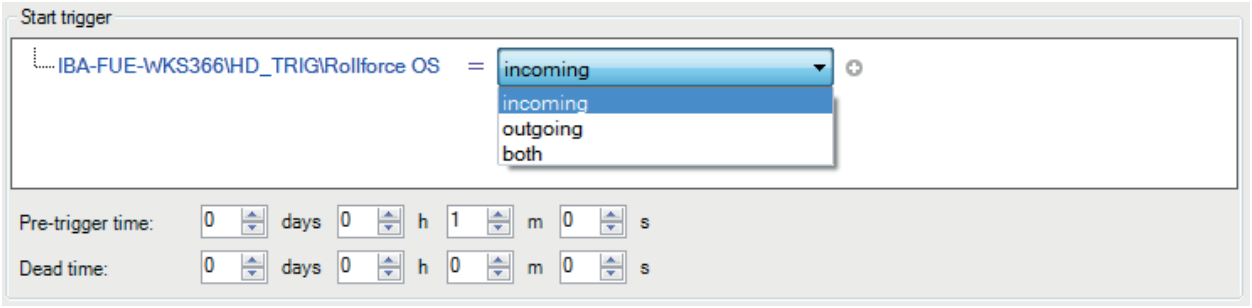
Stop trigger
You can specify the end of a query range with the stop trigger. The settings for formulating the condition, the post trigger time and the dead time logically correspond to those for the start trigger.

Limit number of HD query results to...
You can limit the number of query results here, which are loaded in *ibaAnalyzer* as a file group.

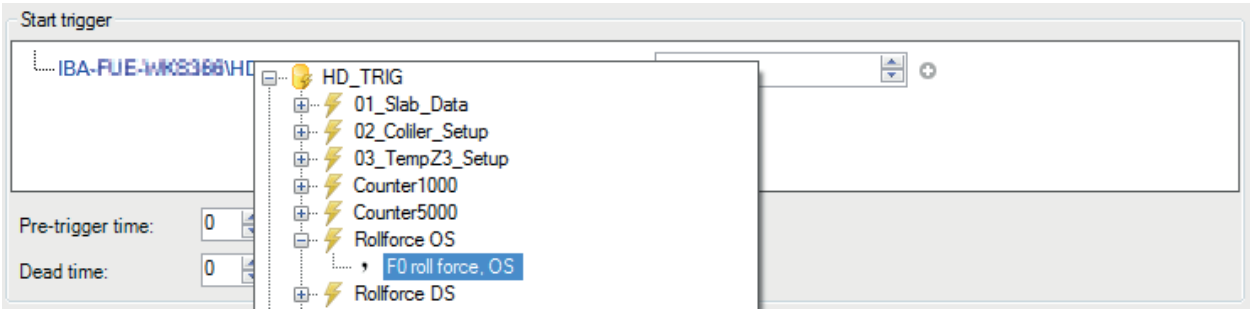
11.2.4 Formulating conditions for events

The queries based on a condition can also contain events. The following options are available:

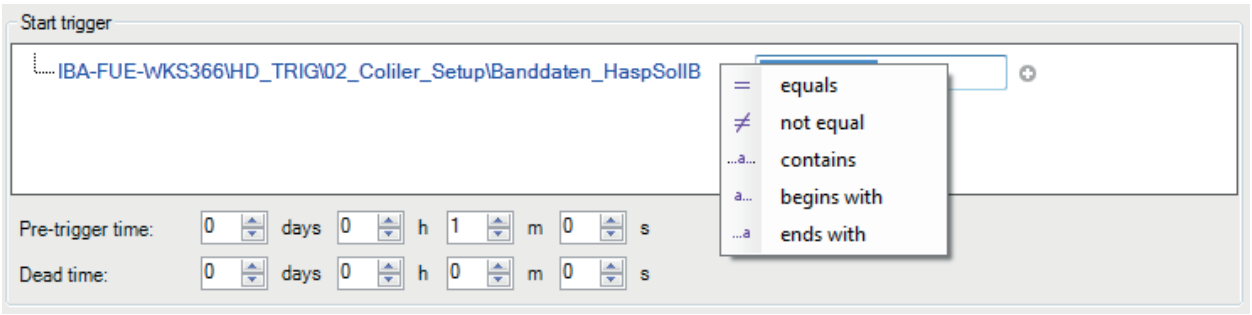
- It is possible to specify the event itself so that the condition is met each time when the event is triggered. In addition, it can be specified that the condition is met if the trigger comes in, goes out or both.



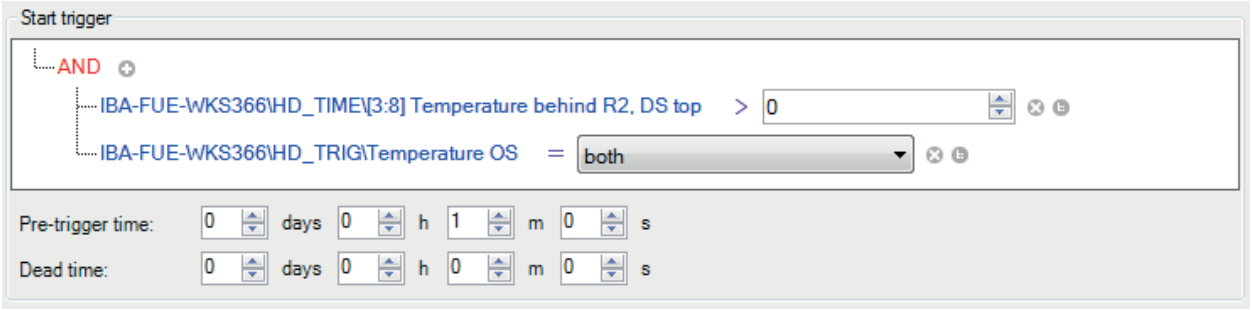
- It is possible to use a numeric field of the event and to check for a limit value. This is comparable to applying a condition to an analog ibaHD signal.



- Text fields of an event can be checked to see whether they are the same or partially the same as a certain text.



- The conditions for events can be linked with other event conditions or with conditions for normal ibaHD signals with the Boolean operators AND or OR.



11.2.5 Select the preferred time base

At the bottom right of the time selection tab, there is a drop-down field for setting the preferred time base.

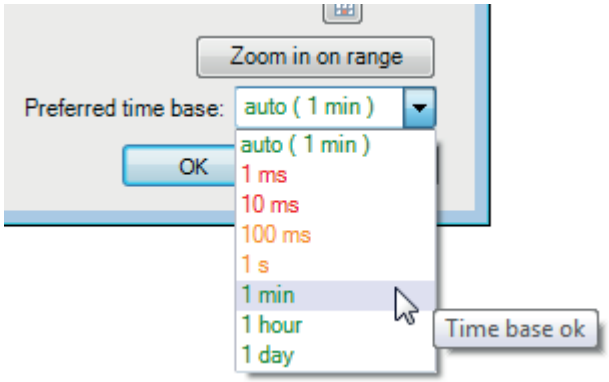


Fig. 143: HD query dialog, selection list for preferred time base

Using this selection list, a time base can be selected with which the loaded signal values are to be displayed later on. Depending on the time resolution of the requested data, select a small time base (high resolution) or a larger time base (lower resolution).

The values contained in the list are integral standard values and are usually only approximations. The actual time base with which the data can be loaded is determined by the storage in the HD server. Only the original time base (highest resolution) and the automatically determined time bases of the different consolidation levels are available.

When selecting the preferred time base, the following cases can occur:

Selection	Result
Preferred time base equals an existing time base in the HD store	The data will be loaded with this time base.
Preferred time base is smaller than any time base in the HD store	The data is loaded with the smallest time base available.
Preferred time base is between a smaller and larger time base in the HD store	ibaHD server makes the decision as to which available time base will be loaded based on the following formula: The larger time base will be loaded if $\frac{sample\ period\ of\ coarser\ level}{preferred\ time\ base} < \frac{preferred\ timebase}{sample\ period\ of\ finer\ level}$ Otherwise, the smaller time base will be loaded.

Depending on the time range set, the selected time base has significant impact on the data volume.

In the HD query dialog, you can only set the time range for the query, but you cannot select particular signals. For an HD query, all signals contained in the HD store in question are loaded for the set time range.

If the set time base is very small and the time range very large, the data volume to be loaded can exhaust the storage capacity so that further processing or analyzing the data is only possible to a limited extent, if any. The ibaHD server thus calculates the data volume to be expected depending on the set time range and indicates the borders with the help of a color change of the time base values in the drop-down list. The "Auto" setting always selects the optimum time base automatically.

In addition to this, a tool tip points to possible difficulties if the relevant time base is selected nonetheless.

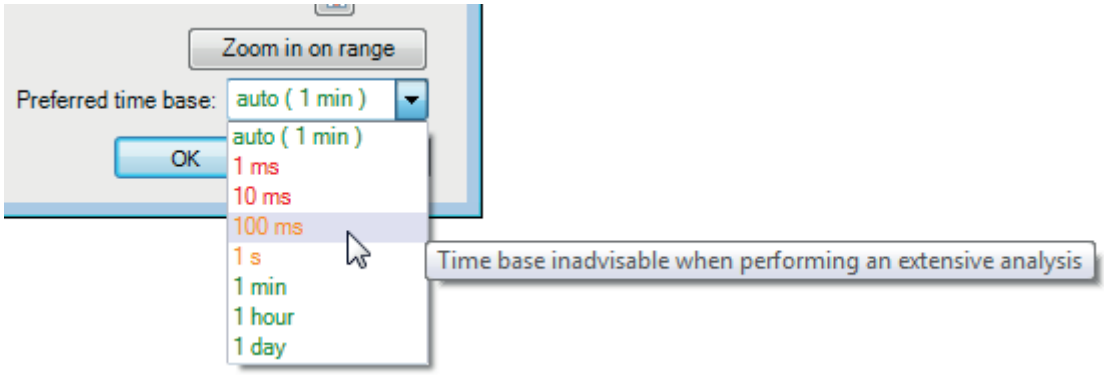
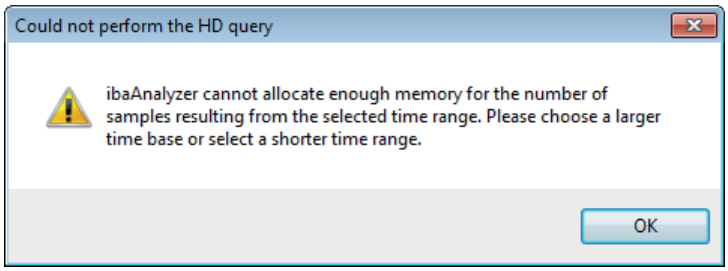
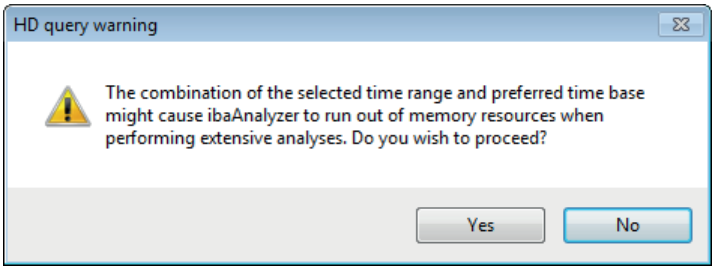


Fig. 144: Preferred time base, tool tip example

Color	Meaning
Red	Adjusted time range and this time base would require more storage capacity than *ibaAnalyzer* is able to provide. When selecting this time base without minimizing the time range, an error message occurs if you click <OK> for exiting the dialog.  After acknowledging the message, you will be redirected to the *Time selection* tab.
Orange	Due to the adjusted time range and this time base, *ibaAnalyzer* can provide sufficient storage capacity. However, only limited analysis functions are available or only few signals can be displayed. When selecting this time base without minimizing the time range, an error message occurs if you click <OK> for exiting the dialog.  After acknowledging the message, the query will be executed.

Color	Meaning
Green	With the adjusted time range and this time base, no problems are expected also with extensive analysis. If you click <OK> to exit the dialog, the query will be executed.

11.3 HD query results (pseudo data files)

The result of an HD query over a time range is entered in the signal tree of *ibaAnalyzer* just like a data file (pseudo data file).

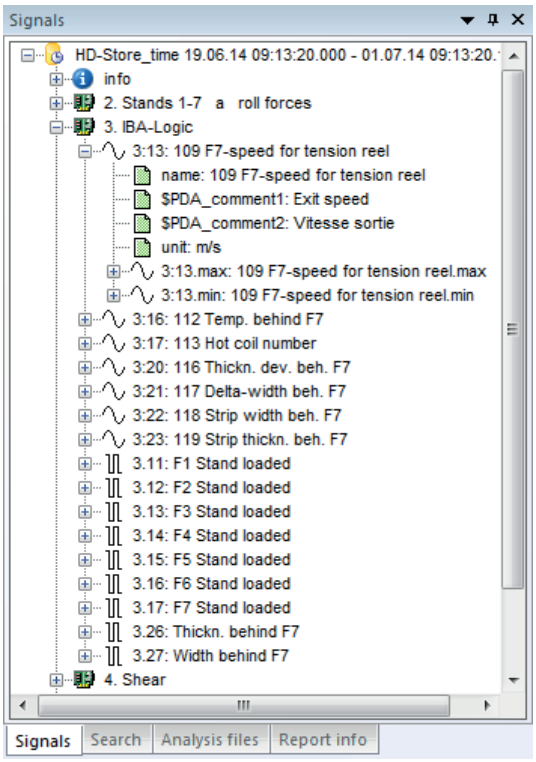


Fig. 145: Query result in the ibaAnalyzer signal tree window

In general, the signals of an HD query are treated the same way as the signals from a normal data file.

In principle, analyses created by means of a data file can also be applied to the HD query results and vice versa.

If you want to save the HD query in a separate file independently of the analysis (pseudo .dat file with ending .hdq), then use the export function *Export HD query file...* In the context menu of the signal tree.

Depending on the selected options in the *HD server* tab in the strip settings or preferences, the maxima and minima of the aggregated values of a signal are queried as sub-channels. This can be particularly interesting when selecting a large time base or with regard to data of a higher consolidation level. "Outliers" can thus be easily identified.

Results of an HD query with signal condition are listed in the file group field, as there is typically more than one result. By default each result will be represented by one line in the file group field, even if there are multiple HD stores involved.

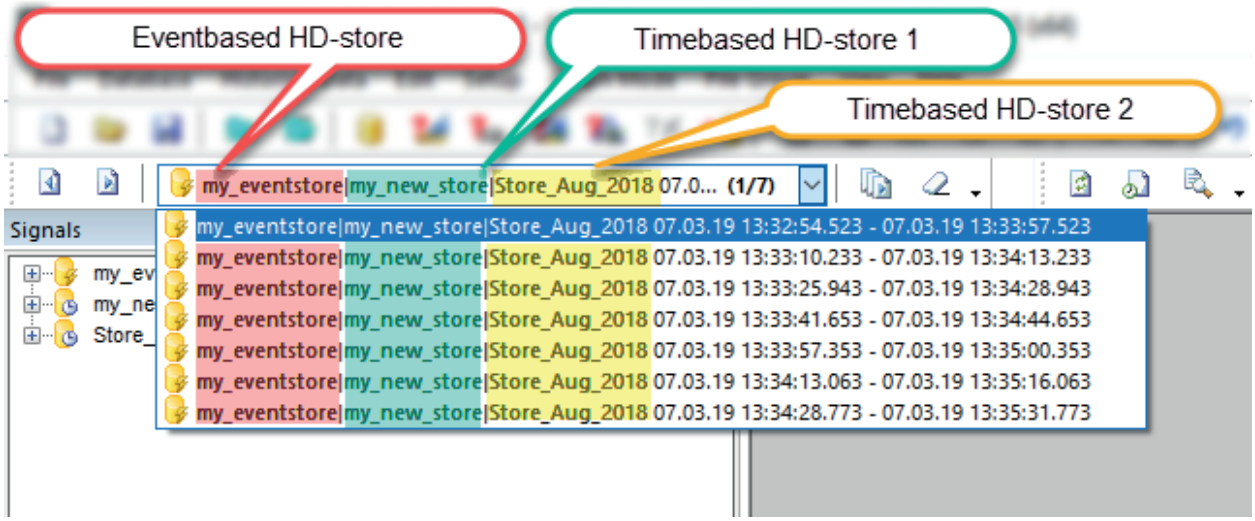


Fig. 146: Results of an HD query with signal condition in the file group field, comprising 3 HD stores

If you want the results being listed separated by HD stores in the file group field, you have to enable the option *Show query results over different stores as separate entries* in the preferences, *HD Server* tab.

11.4 HD query results of an event based HD store

In *ibaAnalyzer*, events are available as text channels. If numeric fields are defined for the event, these events are available as analog, non-equidistant subchannels of the event text channel. All text fields of the events are also available as subchannels of the event text channel.

Three additional signals are present for each event:

- The **.Ack* signal: a non-equidistant digital signal that is true for each event that has been confirmed and false for each event that has not been confirmed.
- The **.Trigger* signal: a non-equidistant digital signal. For an event that can be both incoming and outgoing, this signal is true if the event is incoming and false if the event is outgoing. This signal is always true for a signal that is never outgoing.
- The **:AckComment* signal: A text channel containing the confirmation comments.

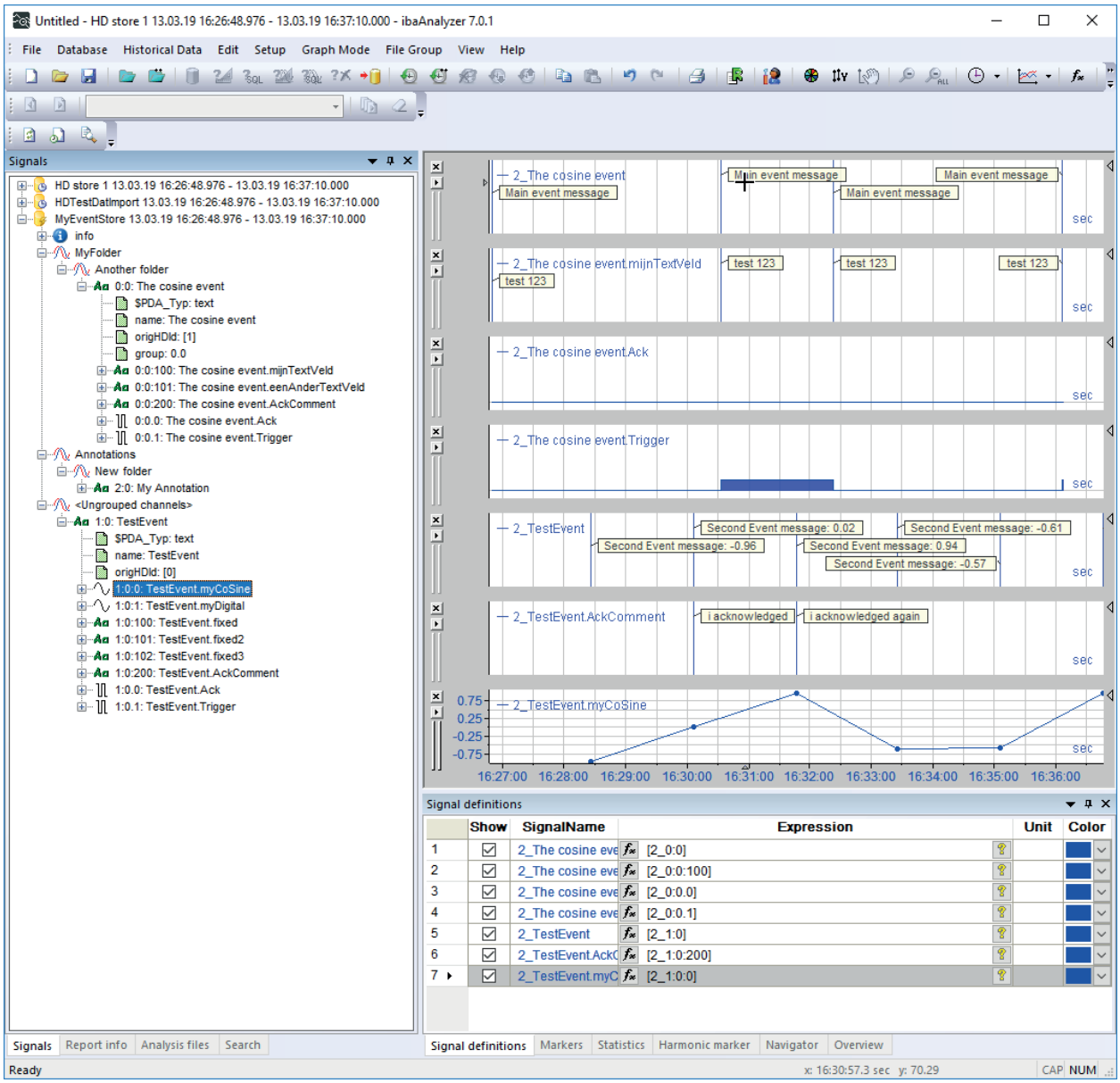


Fig. 147: Display of the results in ibaAnalyzer

If you select the display option *Shows groups per file* or *Show groups over all files* in the signal tree (by right-clicking on the signal tree), then the groups displayed correspond to the folders in which the results are organized on the ibaHD server.

11.5 Drill-down function

Unlike the HD trend graph in *ibaPDA*, data is not reloaded when using the zoom function in *ibaAnalyzer*. The number of samples and thus the resolution of the signal curve remains unchanged.

If, for example, an HD query with a time base of 1 min was executed, because the time range was sufficiently large, the distance of 1 min is kept also in case of zooming in. So, there is no new information due to zooming in.

Thus, a drill-down can be executed in the zoomed-in presentation.

In case of a drill-down, the time range and time base are re-calculated according to the set zoom level and the data is requested accordingly from the HD server.

For executing a drill-down, you can use the corresponding button or the command in the *View* menu:

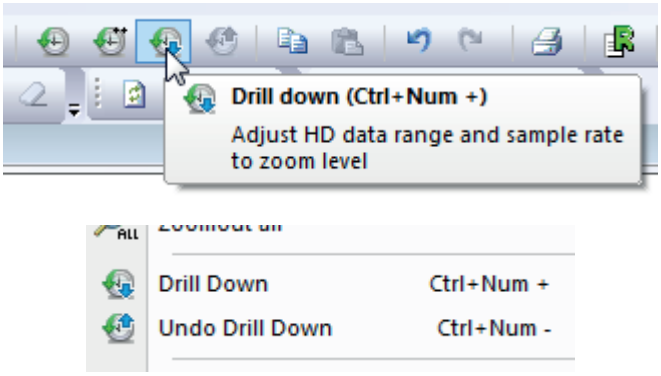


Fig. 148: Drill-down is possible

Button and menu command are only available if it was zoomed in before. If you want to execute another drill-down, you have to keep on zooming in.

The executed drill-down operations are saved in a stack and can be undone individually. The button and the menu command for *Undo drill-down* are available if at least one drill-down had been executed.

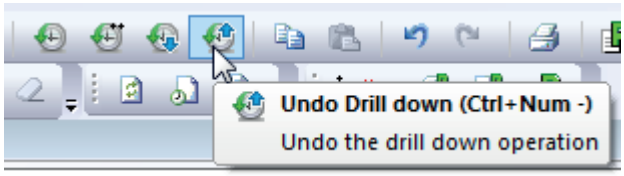


Fig. 149: Both another drill-down as well as a reversal of the first drill-down is possible

Drill-down operations are only applied to pseudo data files whose signal(s) is/are displayed in the currently selected signal strip or used in an expression, which is displayed in the currently selected signal strip.

According to this, a drill-down can only be undone for pseudo data files to which the displayed signals or expressions relate.

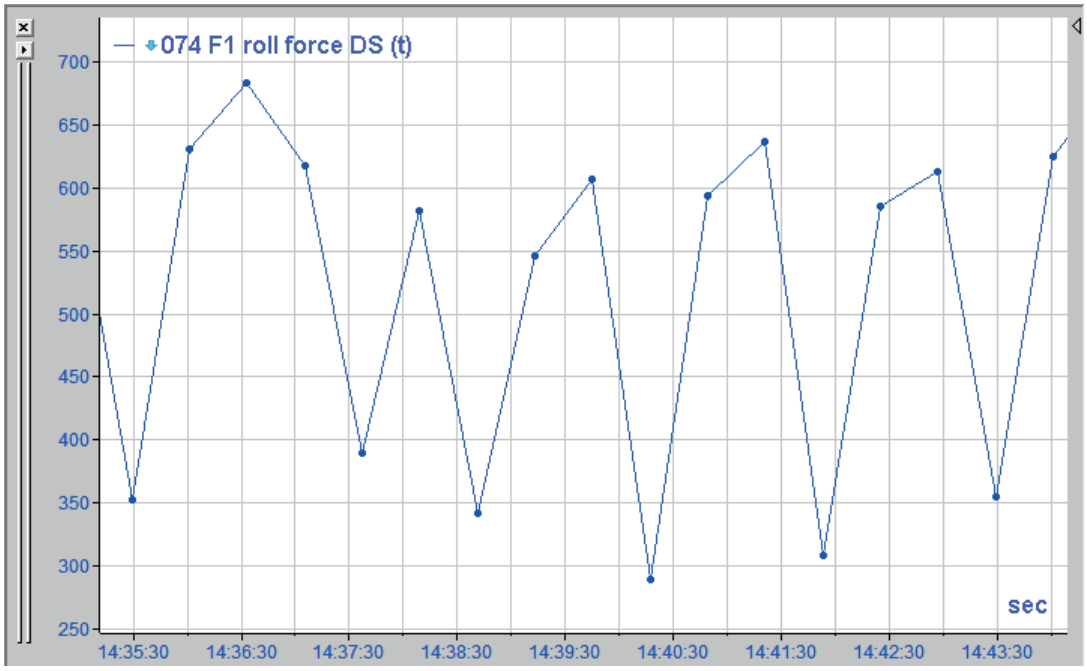
If you execute a drill-down, you practically execute a modified HD query. The original pseudo data file in the signal tree is overwritten accordingly. The HD query generated by a drill-down has the following characteristics:

- Same HD server and same HD store
- Time range in accordance with the zoomed X axis range
- A preferred time base, calculated according to the following formula:

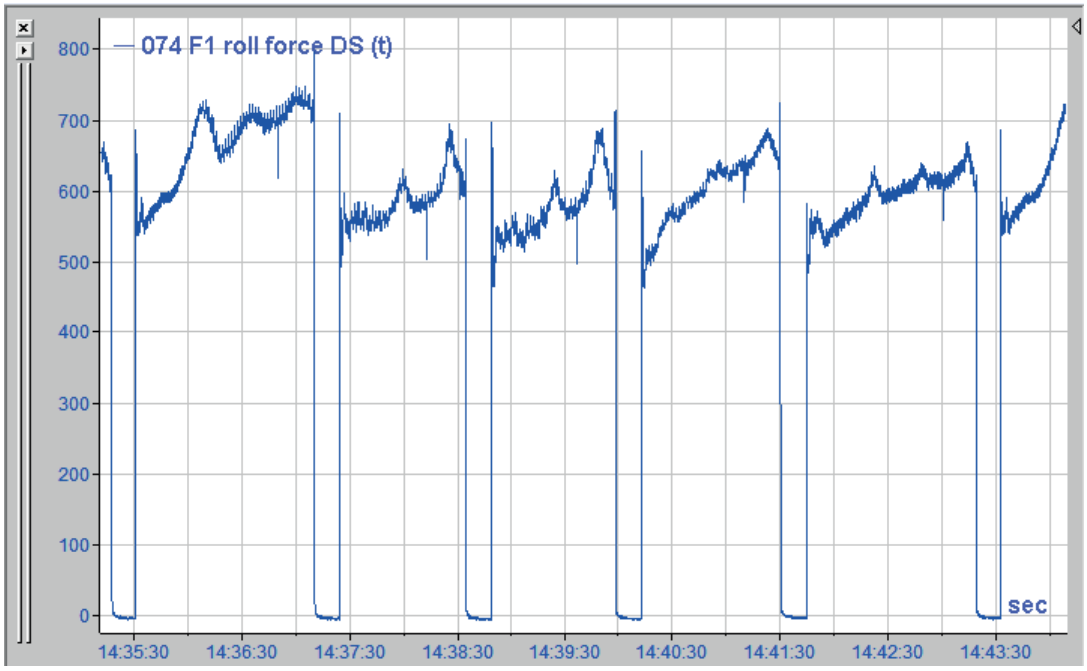
$$new\ preferred\ time\ base = \frac{zoomed\ time\ range\ length}{old\ queried\ time\ range\ length} \times old\ preferred\ time\ base$$

Example

An HD query over a time range of 2 days and 8 hours with a time base of 30 s provides the following picture after zooming in to a time range of only 8 min:



Only the execution of a drill-down provides sufficient information for a meaningful curve. The zoom factor remains unchanged.



11.6 Sub-channels min/max

If you have not enabled the options *Also query aggregated minimum channel* and *Also query aggregated maximum channel* in the default settings of *ibaAnalyzer*, tab *HD server*, these channels will automatically be loaded as sub-signals for each analog signal in the event of an HD query.

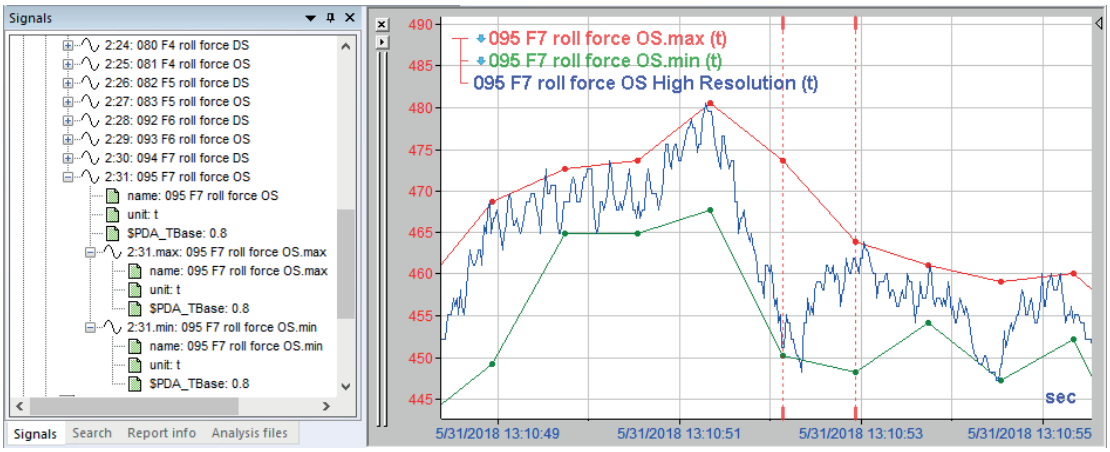


Fig. 150: Measured value and sub-signals for max. and min. in the signal tree on the left, the magenta, red and green curves on the right; the blue curve shows the high-resolution data for comparison

The calculation of the maximum and minimum values always relates to the determined time basis of the query. This means that the maximum and minimum values are not stored in the HD store, but rather are dynamically determined first with the HD query, with respect to the preferred or calculated time based for display in *ibaAnalyzer*.

In this way, you receive information about which maximum and minimum values occurred in the time base intervals for aggregation. The “outlier” measured values are therefore not lost.

The following figure is intended to illustrate how the maximum values are determined, for example.

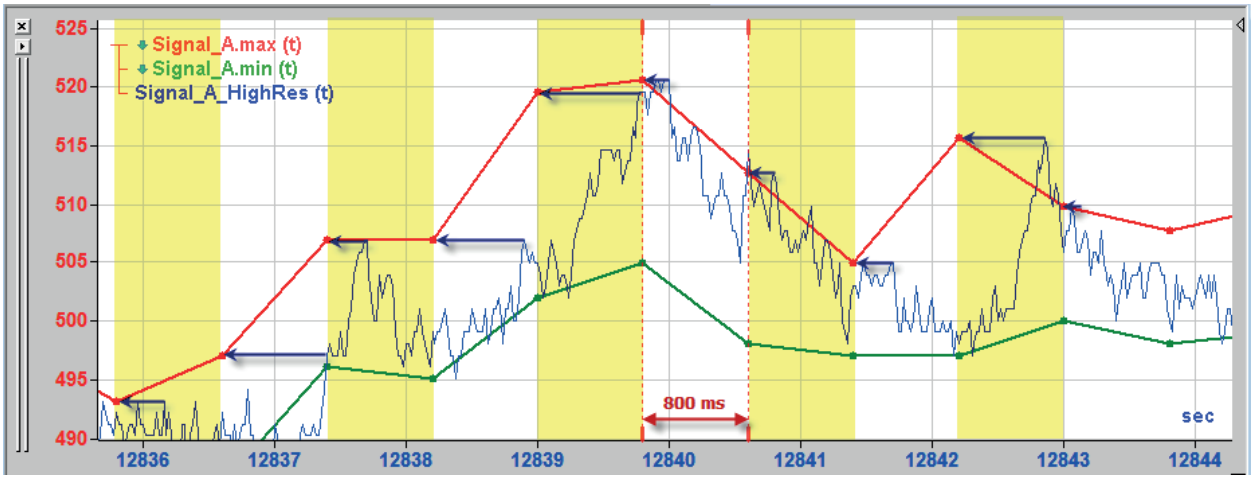


Fig. 151: Relationship of the maximum values to the underlying high resolution values

In this example, the preferred time base for the HD query is 800 ms. The aggregated values for the measured value (cannot be seen here) as well as the maximum and minimum values are written in this grid.

The blue curve in the background shows the measured values in the highest resolution as they would appear after a drill-down. It can easily be seen how the maximum value of the blue curve from the 800 ms interval is drawn on the red curve.

If you perform a drill-down in a display with maximum and minimum signals, then the curves get closer to each other until they are congruent at the smallest time base that the HD store offers.

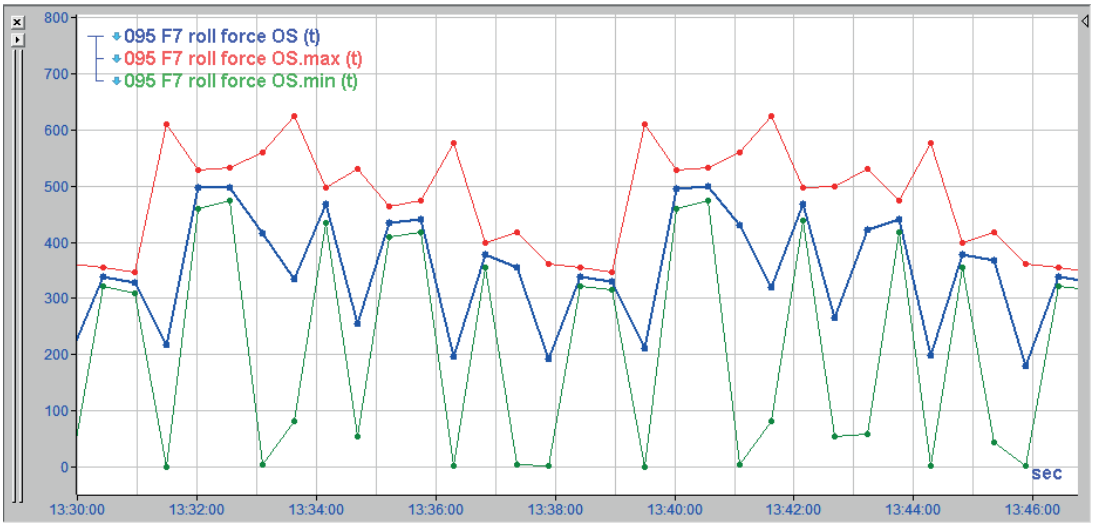


Fig. 152: Curves after zooming into an HD query with a time base of about 30 s

Fig. 153: Curves for the same time range after an initial drill-down

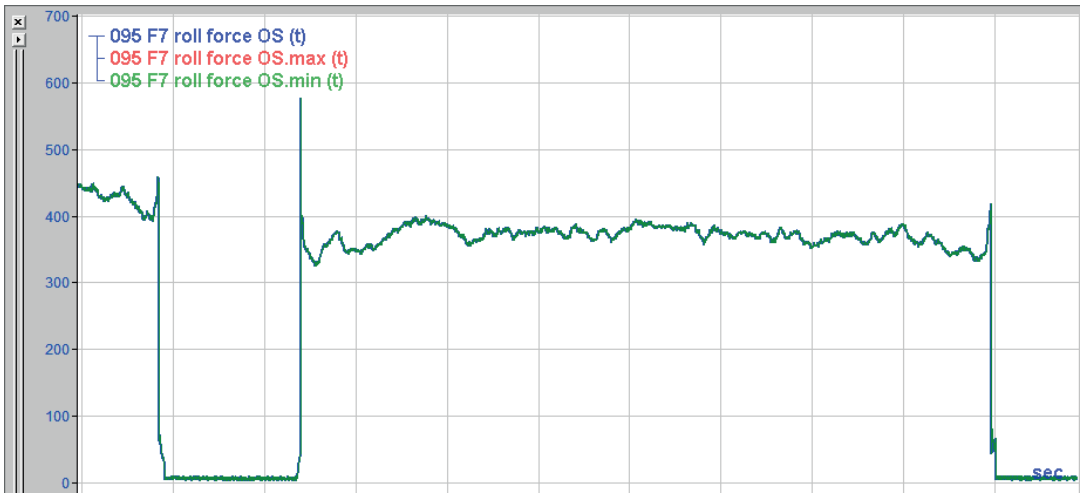


Fig. 154: Curves after zooming in and drilling down again (highest resolution); in this example, you can only see the green curve still, because it is in the foreground and covers the others.

11.7 Export/import of an HD query

An HD query can be exported and imported in a file form.

If you have carried out an HD query, to export click in the signal tree window with the right mouse button and select *Export HD query file...* in the context menu.

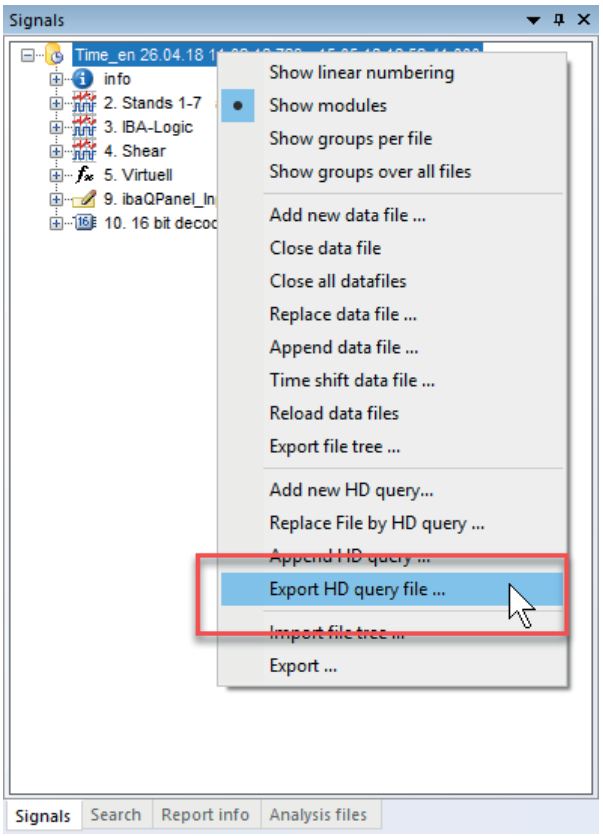


Fig. 155: Command to export an HD query in the context menu of the signal tree window

The dialog *Save data file* opens where you can select the destination path and enter a file name. The file contains the ending .hdq and can be re-opened like a dat file:

- with the dialog *Open data file*
- by double clicking in Windows Explorer
- by drag & drop from Windows Explorer into the signal tree window
- by drag & drop to the desktop icon of *ibaAnalyzer*

Since the file only contains the query parameters and no measured values, a connection to the corresponding HD server needs to exist in order to open the hdq file.

The exported HD query (hdq file) can be edited with a text editor.

Example of an exported HD query:

Content	Description
`[HDQ file]`	`Identification HD query`
`portnumber=9180`	`Port number`
`server=HD-Computer`	`HD server name`
`starttime=31.10.2013 10:15:50.336000`	`Start of the time period that is to be read out`
`stoptime=31.10.2013 10:19:25.758000`	`End of the time period that is to be read out`
`store=HD-Ablage_Time`	`HD store where the data is stored`
`timebase=0.001`	`Time base of the measured data`
`type=time`	`Time-based or length-based data`

A ‘duration’ can also be specified in seconds instead of ‘starttime’ or ‘stoptime.’ The value ‘now’ can be specified as ‘stoptime.’

In this way, queries for a consistent time period can be formulated, e.g. for the last 7 days, always from the time when the query is executed or the hdq file is opened.

HD-Abfrage letzte KW.hdq

```
1 [HDQ file]
2 portnumber=9180
3 server= HD-Computer
4 duration=604800
5 stoptime=now
6 store=HD-Ablage 1
7 timebase=60
8 type=time
```

Fig. 156: Example of HD query for the last 7 days from “now”

The HD-query files with suffix *.hdq* can be used like normal data files in the command line execution of *ibaAnalyzer* too.

11.8 Append HD query

Just like normal data files, HD queries can also be attached to already-opened HD queries or data files in oder to display longer time periods.

It only makes sense to append it to a data file if the signal structure of the data file and the HD data store is the same.

You will find the function either in the *Historical data* menu or in the context menu of the signal tree window:

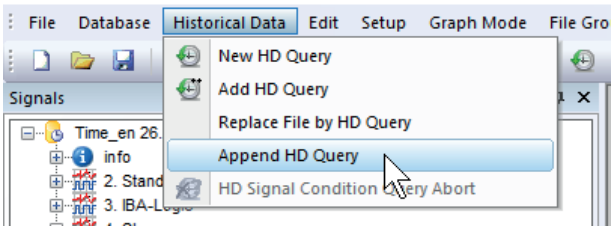


Fig. 157: “Append HD query” menu

When you execute the command, the configuration dialog for the HD query opens where you can set another query time range. After executing the query, the new query result is now nested in the signal tree.

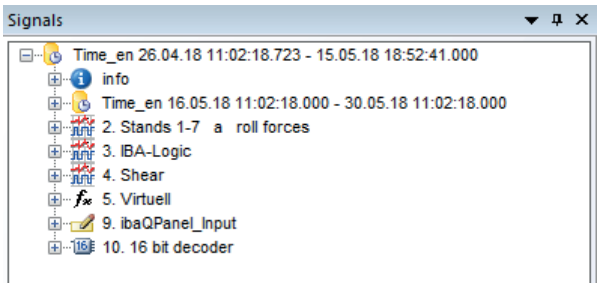


Fig. 158: Example of two HD queries appended to each other

Note

To ensure a timely appearance in the trend views, make sure that *Synchronize files on recording time* is enabled in the X-axis settings.

11.9 Replace file by HD query

You will find the command *Replace file by HD query...* both in the *Historical data* menu as well as in the context menu of the signal tree window.

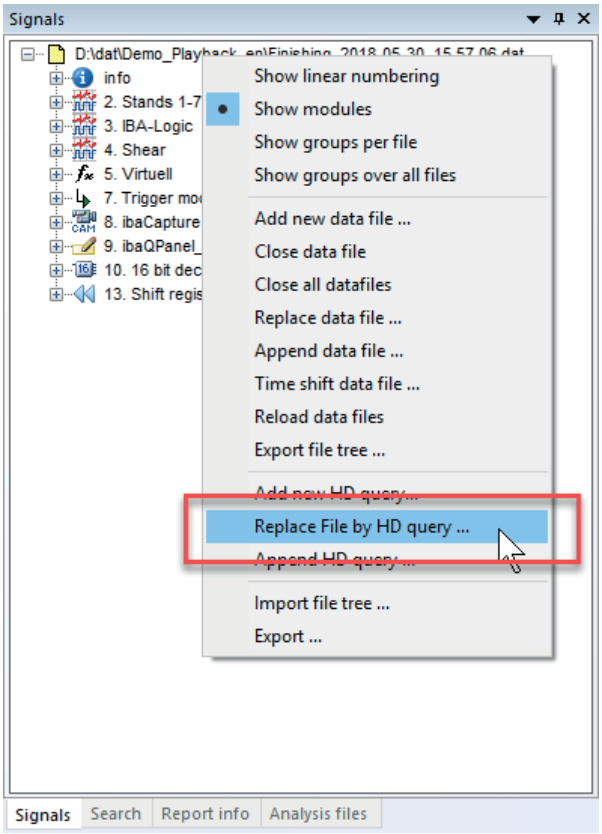


Fig. 159: Command in the context menu

This command opens the configuration dialog for the HD query where you can set a new time range and/or a new condition. After executing the query, the existing data file or HD query is overwritten by the new HD query result.

If there are several data files or HD queries in the signal tree window (next to each other or appended), then the 'replace' command will affect the marked file or query.

11.10 Export of an HD query in a standard measuring file

If an HD query (pseudo data file) is loaded to *ibaAnalyzer*, a normal iba data file with the extension .dat can be created with the usual export function (menu *file – export...*). With this method, an HD query can also be provided to other users who do not have a connection to the HD server.

11.11 Automation of HD analyses

For regularly recurring analyses of HD data, e.g. for the creation of day or shift reports, an automation of the HD query with the help of *ibaDatCoordinator* is suitable.

In contrast to the usual *ibaPDA* storages, where the execution of the *ibaDatCoordinator* jobs are triggered with the creation of new data files, this possibility is not available for the “endless” HD recordings.

The application *ibaDatCoordinator*, however, has the possibility to execute planned jobs and tasks from version 1.22 on. Thereby, the execution of analyses can be made independently from the creation of new data files.

This is how a planned, i.e. a time-controlled job, that cyclically executes an HD query, can be defined with the *ibaDatCoordinator*. So, any evaluation and further steps such as the creation of reports or the extraction into a data base can be automated with the according configuration of HD query and analysis (*.pdo).

12 Analyze ibaCapture videos

12.1 ibaCapture

General

ibaCapture makes it possible to display measuring signals together with synchronously recorded image data (HMI monitor display, camera images).

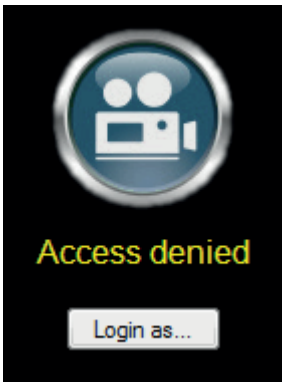
Movie files recorded with *ibaCapture* are loaded together with the related *.dat file. The video sources and the related measuring signals are displayed in the signal tree of *ibaAnalyzer*. In addition to the video signals, also event-driven signals (triggers) are displayed. The relevant preferences can be made in the *ibaCapture* system (see manual *ibaCapture*).

Video signals are listed in the signal tree just like usual measuring signals, marked as camera.

User management

ibaAnalyzer supports the user management of *ibaCapture*. If the user management is enabled in *ibaCapture*, a user needs to authenticate for viewing videos in *ibaAnalyzer*. This ensures that no viewing rights are infringed.

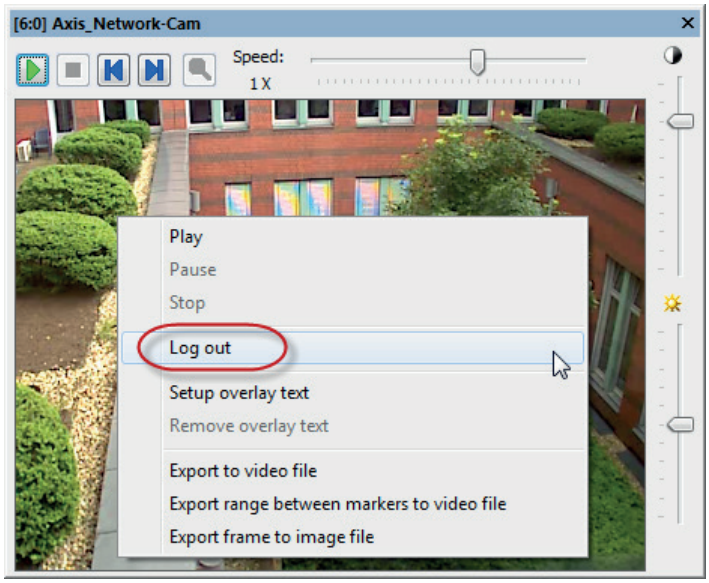
In case of a protected camera view, the following message appears:



Click on <Login as> and enter the required login data.

If several camera views of an *ibaCapture* server are opened, you only need to log in once. If the login is successful, all camera views are activated according to the permissions set.

To restore the protection, you do not need to close all camera views, but you can log out via the context menu.



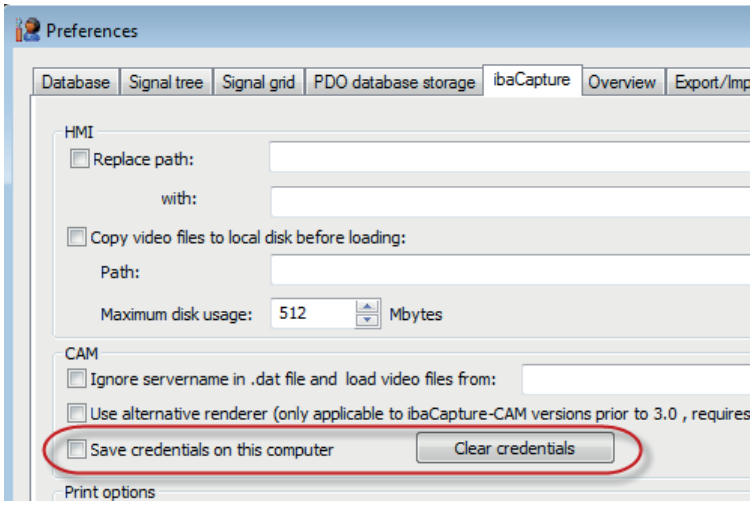
Tip

The login information can be stored in the analysis (encoded), too. For this purpose, enable the *Save password* option in the login dialog. If the analysis is saved afterwards, the login information is saved, too.

If such an analysis file is loaded, also the video permissions are immediately available. For reasons of safety, this only works on the computer where the analysis is saved.

This is particularly useful if, despite activated user management, automatic reports with video still images or video exports are to be generated.

You can also save the *ibaCapture* permissions on the computer by enabling the *Save credentials on this computer* option.



Thus, you can guarantee access to the protected videos on this computer independent of the loaded analysis file.

Clicking on the <Clear credentials> button removes the login data from the computer.

Opening video signals

A data file can refer to one or more video recording(s) in which several video signals (cameras) are saved. As reference is made to the files stored on the *ibaCapture* server, a connection to the *ibaCapture* server is required.

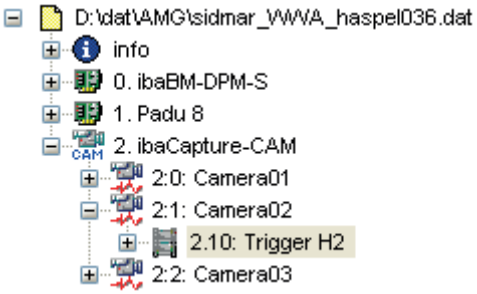


Fig. 160: Video trigger in the signal tree

The video signals contained in the video file can be loaded into the recorder window by a double click or drag & drop. Each video, i.e. each camera, is displayed in its own window.

When opening a video trigger signal, a binary time signal and the X1 marker are opened simultaneously. This gives you a quick overview about when the trigger-driven recording is going to end. You can open the related video by double-clicking on the trigger signal. If you have opened video signals in addition to the trigger signal, you can modify the video image by moving the X1 marker.

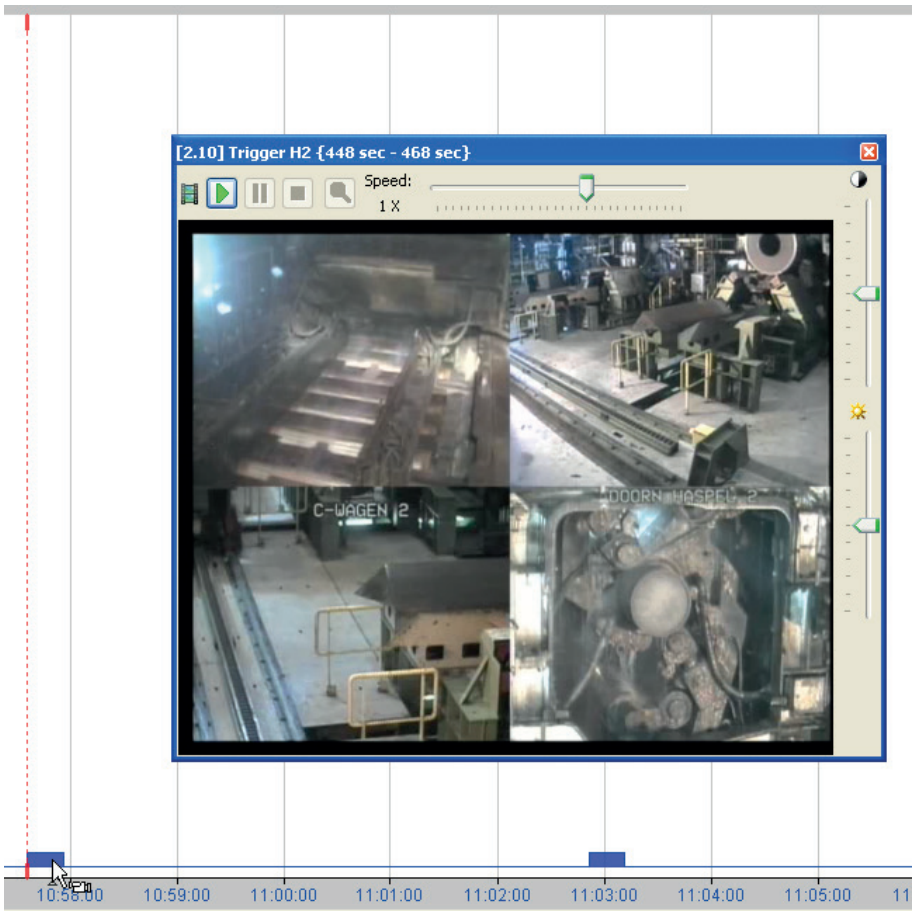


Fig. 161: Video window and related trigger signal with marker

Description of the functions

Each window offers several functions. Top left is the <Play> button. Clicking <Play> will start the video. Clicking <Play> again will pause the replay (pause function). If more than one window is opened, the videos in these windows are played simultaneously to the currently activated video. If, in addition to the video windows, also the corresponding signal curves and marker view are opened, the X1 marker will always show the current position of the video in the signal curve. Clicking <Stop> will stop the playback or end it. The X1 marker will jump back to its original position.

Speed (fast/slow or back/forward), brightness and contrast can be set with the sliders at the top or right side of each video. The sliders can also be moved during playback.

If you want to enlarge a detail in the video, draw a rectangle around this object using the mouse or just scroll the mouse wheel with the cursor on the image. You can zoom out either by using the scroll wheel of the mouse or by clicking on the magnifier icon.

When zoomed in, you can pan the image detail by moving the mouse keeping the <ALT> button pressed. The cursor changes to an index icon.

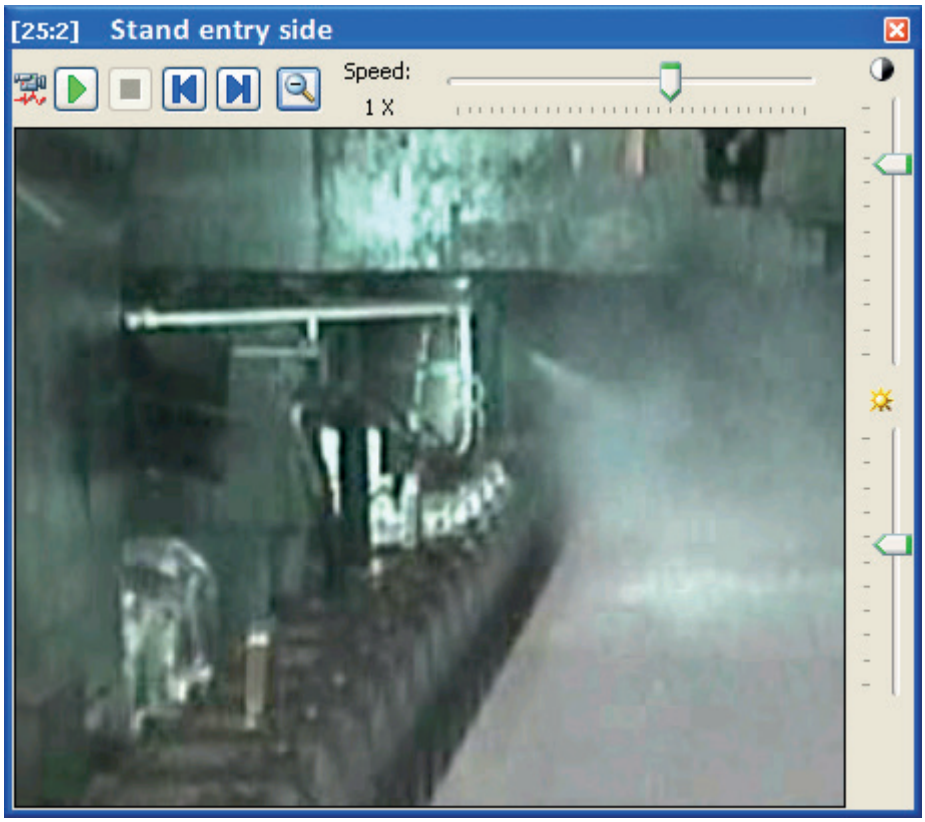


Fig. 162: Control elements of the video window

The opened video windows can be docked as well as positioned freely floating at any place, even outside the program window, using drag & drop. The same rules apply as for all other docking windows (see manual *ibaAnalyzer*, part 1).

The size of a video window is variable. Simply move the cursor over either one of the margins or over one of the corners of the window. When the cursor changes to resizing arrows, left-click and resize the window as desired. No matter where you click, the preset aspect ratio cannot be changed.

If you have several video windows of different size arranged in tiled windows and/or in tab cards and want to arrange them having the same size, the context menu provides the same function for resizing as do the other docking windows.

For more information about this, see the manual *ibaAnalyzer*, part 1.

Every video can be started or paused by a combined <start/pause> button. The buttons <next frame> or <previous frame> allow for playing the video reverse or forward frame by frame (1 frame = 1 click).

If you click on the buttons for more than 1 second, the frame rate will increase to 5 frames per second. Via the "Speed" slider, you can reduce the frame rate of integrated windows with a originally high frame rate.

Export videos and video signals

One option for exporting videos was already explained in chapter *Export data*, with regard to the general export function. When exporting a data file into binary format (dat file), you can export the videos as part of the data file or as separate video file. If a part of a data file is to be exported, the relevant video sequences will be compressed and saved in a new data file.

Opening such an exported file with *ibaAnalyzer* will extract the videos first, before they can be watched. If you want to export a video sequence or particular images without the measuring data, the context menu of the video file provides the following functions:

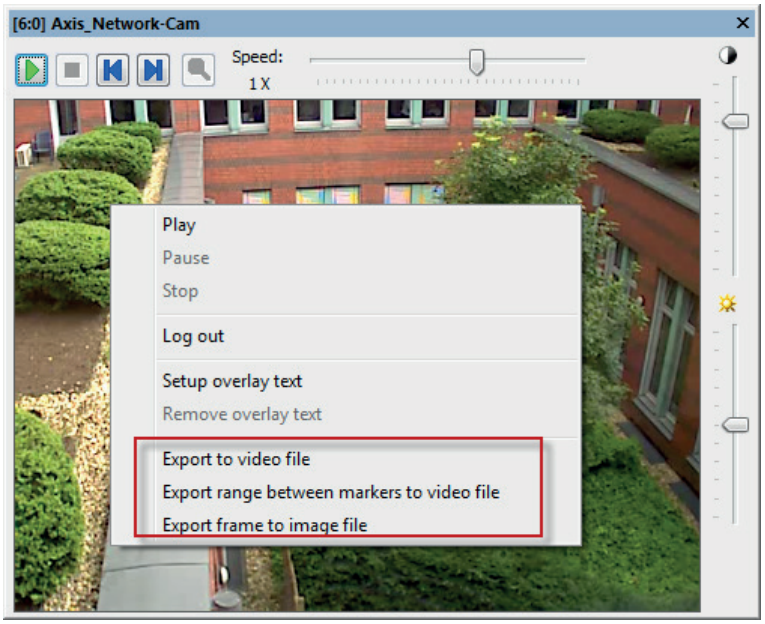


Fig. 163: Context menu of the video window, export functions

Export to video file

Use this command to generate a video file corresponding to the complete period of the data file. You only need to specify the path and name for the file. The output format is always Mpeg-4 (.mp4).

Export range between the markers to video file

If you do not need a video over the entire period of the data file, first set the markers in the recorder window to the desired time range and then click on this command. This is helpful to export only really relevant video sequences. Even if there are empty ranges without images due to triggered video recordings, the size of the exported video file can be reduced with this.

Export frame to image file

This command generates a snapshot of the current frame. This also works while the video is running. However, it is better to first move the X1 marker to the position of interest and, if required, make the setting using the <Next frame>/<Previous frame>. Enter the path and file name and select a file format. The following file formats can be selected: BMP, JPEG, GIF, TIFF and PNG.

12.2 ibaCapture-ScreenCam

To record videos of screen content, it is necessary to have the additional program *ibaCapture-ScreenCam* on the respective computers. The videos are recorded with a so-called virtual camera and are generally to be handled in *ibaAnalyzer* just as normal videos from *ibaCapture*. The videos are indicated with a camera symbol in the signal tree and can be opened in a separate video window via double click or drag&drop. Chapter ↗ *ibaCapture*, page 227 describes the use.

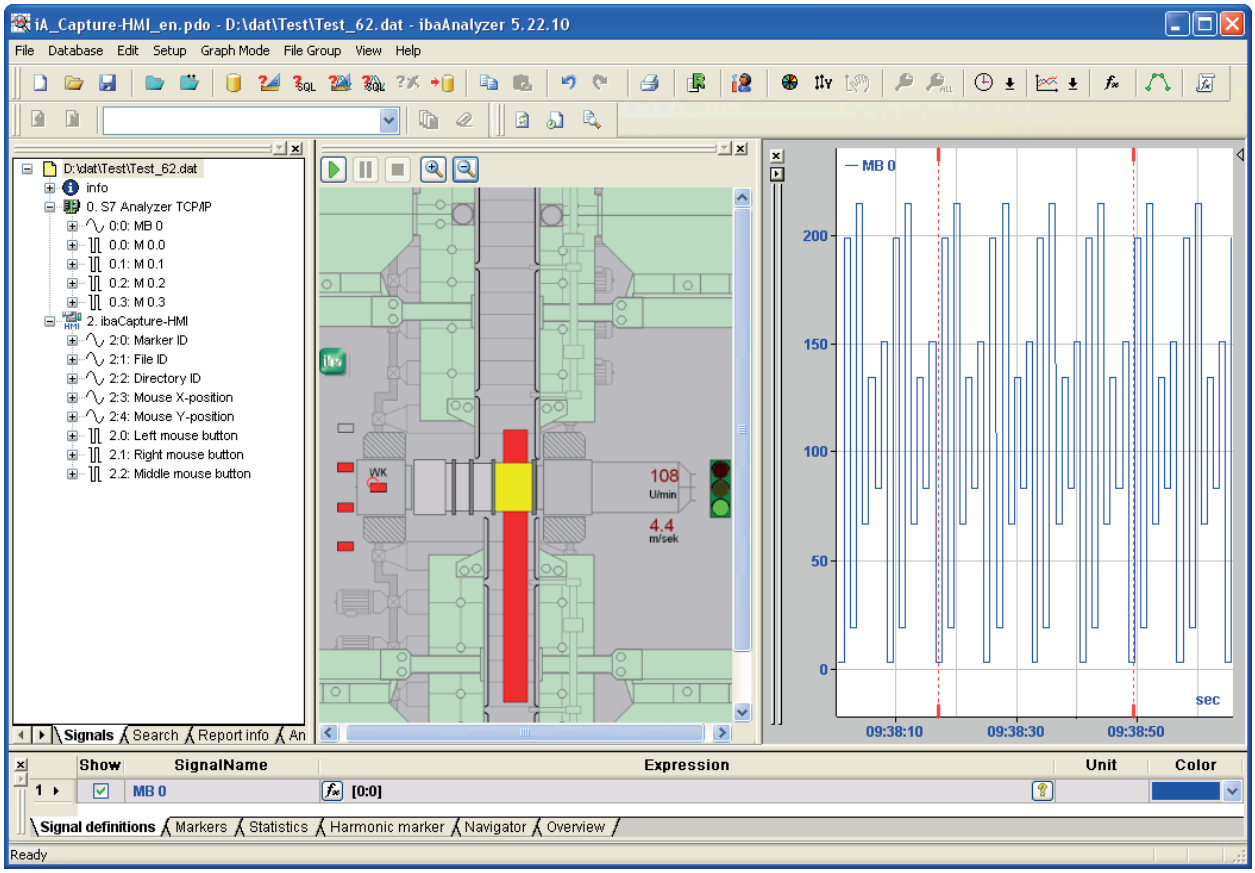


Fig. 164: ibaAnalyzer with ibaCapture-ScreenCam video window

Different elements are available for the control of the video display.

	Start: Start playback
	Pause: Pause playback
	Stop: Stop playback and go back to the beginning of the video.
	Zoom in: Enlarge video image
	Zoom out: Reduce the image

There are no settings available for brightness and contrast.

Zooming with the mouse and the usage of overlay text are not possible.

With the help of the marker X1 in the signal strip display individual frames can be traced manually.

In contrast to the movie files generated with *ibaCapture*, no enabled video server is required in order to play the videos. Therefore, it is possible to copy and paste or to move the files to a new location. Corresponding settings can be made in the *ibaCapture* tab in the preferences or the graph setup. You will find a description in ↗ *ibaCapture*, page 88.

In case you want to print *ibaCapture-HMI* videos, particular settings are available. You will find a description in ↗ *ibaCapture*, page 88.

If you want to integrate *ibaCapture-HMI* videos in a report, proceed the same way as when working with *ibaCapture* videos. (see manual *ibaAnalyzer-Reportgenerator*).

If you want to export *ibaCapture-HMI* videos from a dat file, activate the "Free selection" module in the signal selection of the export mode. Subsequently mark the relevant video signals. If you tick off the "Export video as part of a data file" option in the export mode and subsequently reload the exported file, the "Replace path..." and "Copy video files to local disk before loading" options in the Preferences/Signal strip settings will be ignored (see picture above for setting items).

For more information, please see ↗ *ibaCapture*, page 88.

13 Print function (hardcopy)

Before the report generator was integrated into *ibaAnalyzer*, this simple print function was the only print function available.

It continues to make sense because complex reports are not always needed and because this function enables the generation of a hardcopy of the current analysis within a very short time.

The print function always prints the signal strips currently displayed as well as the signal table which is currently displayed. In contrast to the report generator, it is also possible to use the "Markers" and "Statistics" tables for the hardcopy.

Since the Windows standard print function is used, you can use any standard printers or PDF generators (such as Acrobat PDF-Maker) on condition that these are entered as printer drivers.

13.1 Requirements and setup

As a precondition for the print function to be available, a printer must be installed and connected to the computer or network. At least one valid printer driver must be installed on the analysis computer as a precondition for using the print preview.

Use the menu *File* - *Print setup* for the print setup. The customary Windows printer setup dialog is opened.

Further settings can be made in the preferences on the *Hardcopy* tab. The procedure is described in ↗ *Hardcopy*, page 77.

13.2 Creating an analysis report using the printer preview

The main purpose of the print preview is to enable a check of the document before it is printed. However, the print preview also enables the inserting into the hardcopy and formatting of further information as objects, such as comments or file information.

Note

The print preview function only works if a local or network printer is installed under Windows.

In order to open the print preview, select the *File - Print Preview* menu.

The header of the preview includes several buttons and input boxes with the following functions:

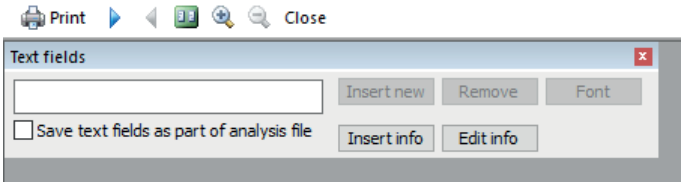


Fig. 165: Print preview, buttons

Print
Opens the printer dialog and starts printing.

Next page
Open the next page
This button is only enabled if one page only is displayed but if more than two pages exist, or if two pages are displayed and if more than two pages exist.

Previous page
Open the previous page
This button is only enabled if one page only is displayed but if more than two pages exist, or if two pages are displayed and if more than two pages exist.

One page / two pages
This toggle function can be used to decide whether the print preview is to show one or two pages.

Zoom in
Slightly enlarges the page displayed (by one step).

Zoom out
Reduces the page displayed until it is completely displayed in the window, or until two pages are displayed in the window, respectively.

Close
Closes the print preview and returns to *ibaAnalyzer*.

Text field
In this input box, you can enter any text and comment you like. Just click into the field and then enter the text. Thereafter, click <Insert new>. The text is added to the sheet and the input line is cleared for the next entries.

Insert new
Entering the text line on the sheet.
The text inserted is initially positioned in the middle of the first page or of the sheet displayed. Use the mouse in order to move the text to wherever you like.

Remove
Removes a previously marked object from the print sheet (text and information only).

Font
Opens a dialog window where you can select the font to be used for a previously marked object (text and information only).

Insert info
You can use this button in order to select information from the "Info" branch of the data file and to insert this information in the hardcopy, for example, the start time of the recording process.

Just mark the desired information and click < OK >.

Edit info
This function is similar to the "Insert info" function, however, with the difference that, following selection of the desired information, you can additionally select characters or parts of this information to be added to the hardcopy.

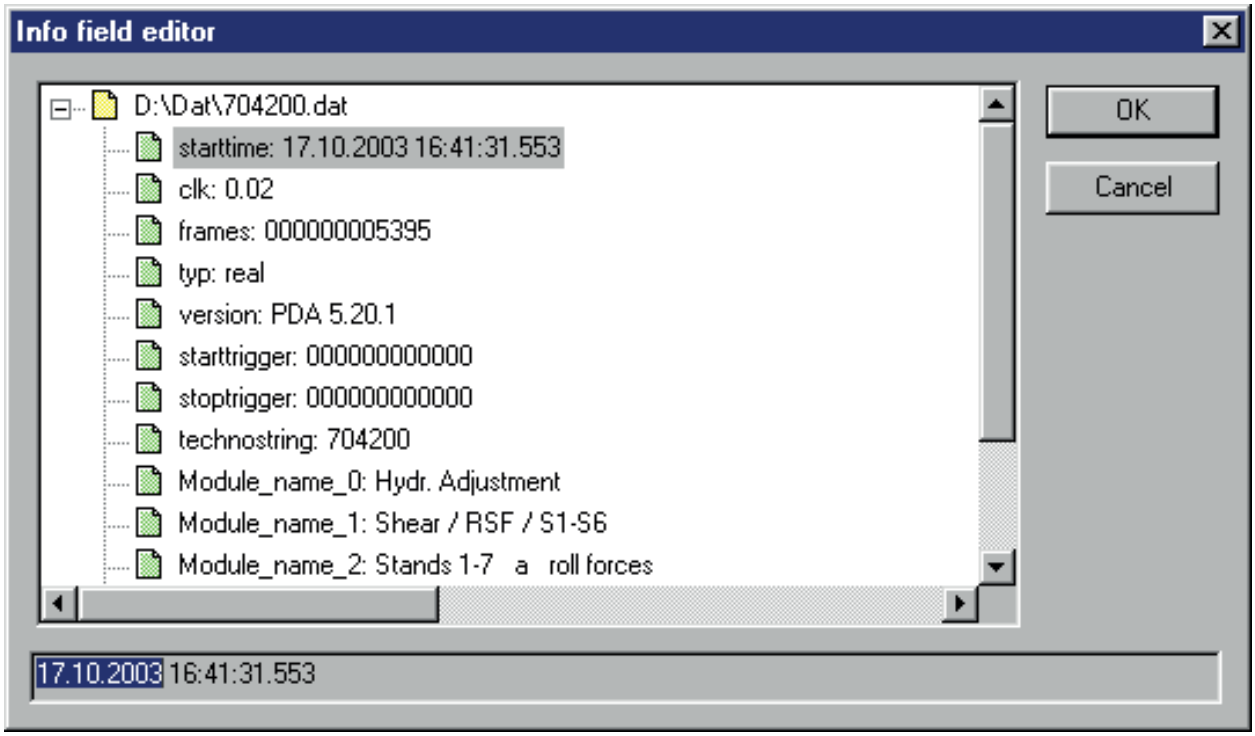


Fig. 166: Print preview, edit info

The example in the figure above shows how the date can be extracted from the start time, so that the date only is printed (i.e. without the time information). Use the mouse to mark and select the desired information.

Save text fields as part of analysis file
If you need the text, comments and information inserted not just for this single hardcopy, but if you wish to regularly apply these elements to data files of all kinds, we recommend ticking off this box.

This is especially important and vital for the automatic generation of reports too. All amendments are then saved in the analysis file (*.pdo) and are hence available again as soon as this analysis is used again. After you have entered the tick and exited the print preview, save the analysis once again.

14 Documenting with HTML and graphic objects

14.1 Exchange of curves and tables via the Windows clipboard

Note

ibaAnalyzer supports only the HTML-format instead of OLE objects for the clipboard function.

It is sometimes helpful if an analysis view is not just printed as a report or written into a separate file but if this view can also be made available to other Windows programs. Use the menu function *Edit* to copy a current trend view (all trend views and visible tables) onto the Windows clipboard. From there, it can be inserted to any other program, such as MS Word or MS Excel.

The same *Copy* function is available in the context menu of the signal strip.

The special feature in this case is that the view is copied as collection of HTML objects. This means that the objects can be used in other programs.

This offers an easy way to document process or fault analyses. When executing the function, the current view in *ibaAnalyzer*, including all visible trend views and table windows, is copied as a collection of HTML objects into the Windows clipboard.

It is possible to position all tables, which arranged as tabs by default, in separate windows.

These include:

- Signal tables including the signal definitions
- Statistics
- Markers
- Harmonic markers

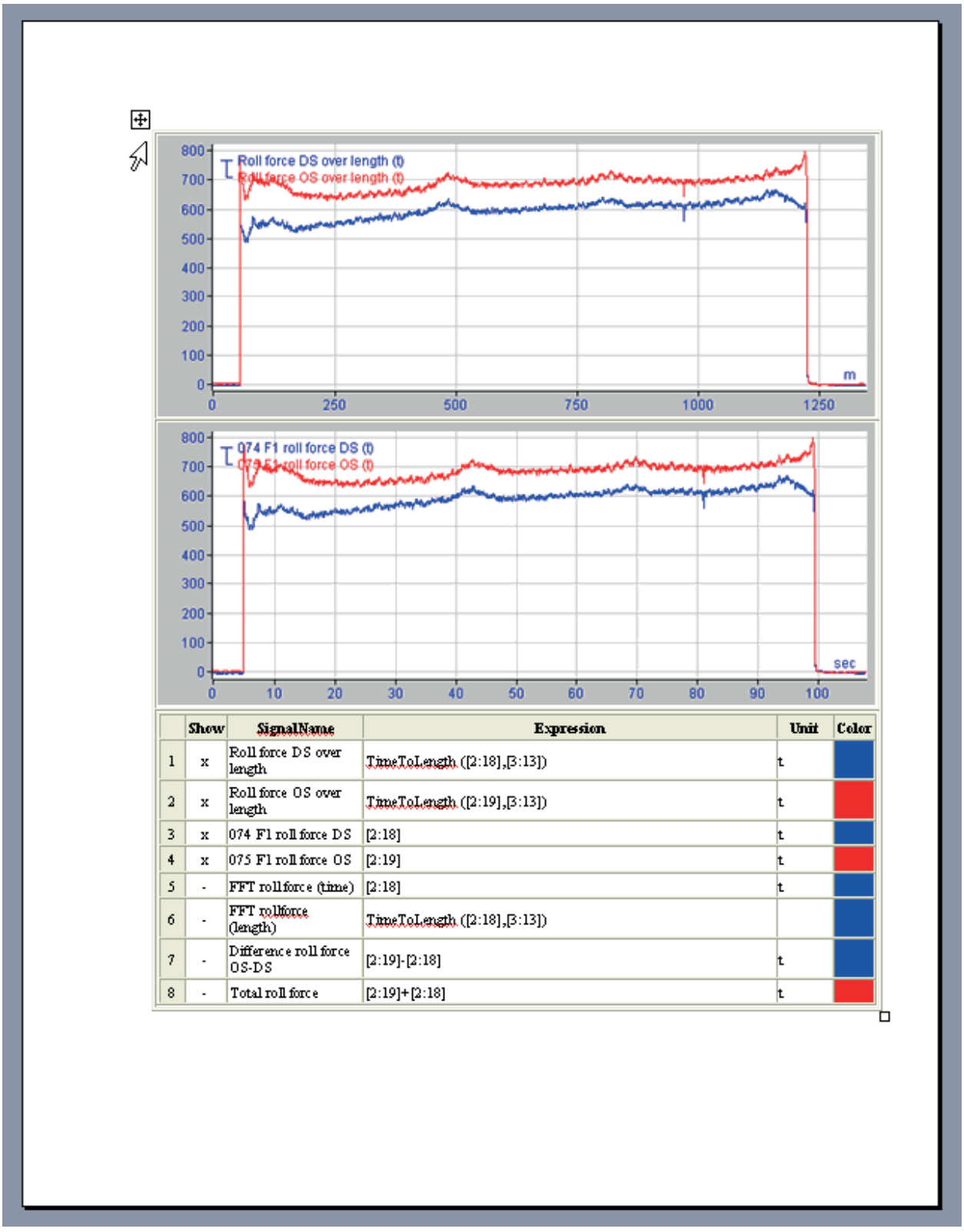
If you arrange these tables as separate windows in the user interface, they are also copied as separate objects into the clipboard.

If you paste the clipboard into an MS Word file, for instance, you will see that the graphs are arranged as graphic objects in a table and the tables (signal definitions, markers, statistics or harmonic markers) are copied as table objects. Please note that all signals and expressions in the signal table are copied, even the ones hidden in *ibaAnalyzer*.

The navigator view and the trend overview will not be copied to the clipboard.

The following picture shows an example how the objects are pasted into an MS Word file. As you can see, the graphs and the signal table are arranged in a table. However, you can mark the graphs, move and resize them or change their properties like for any other image.

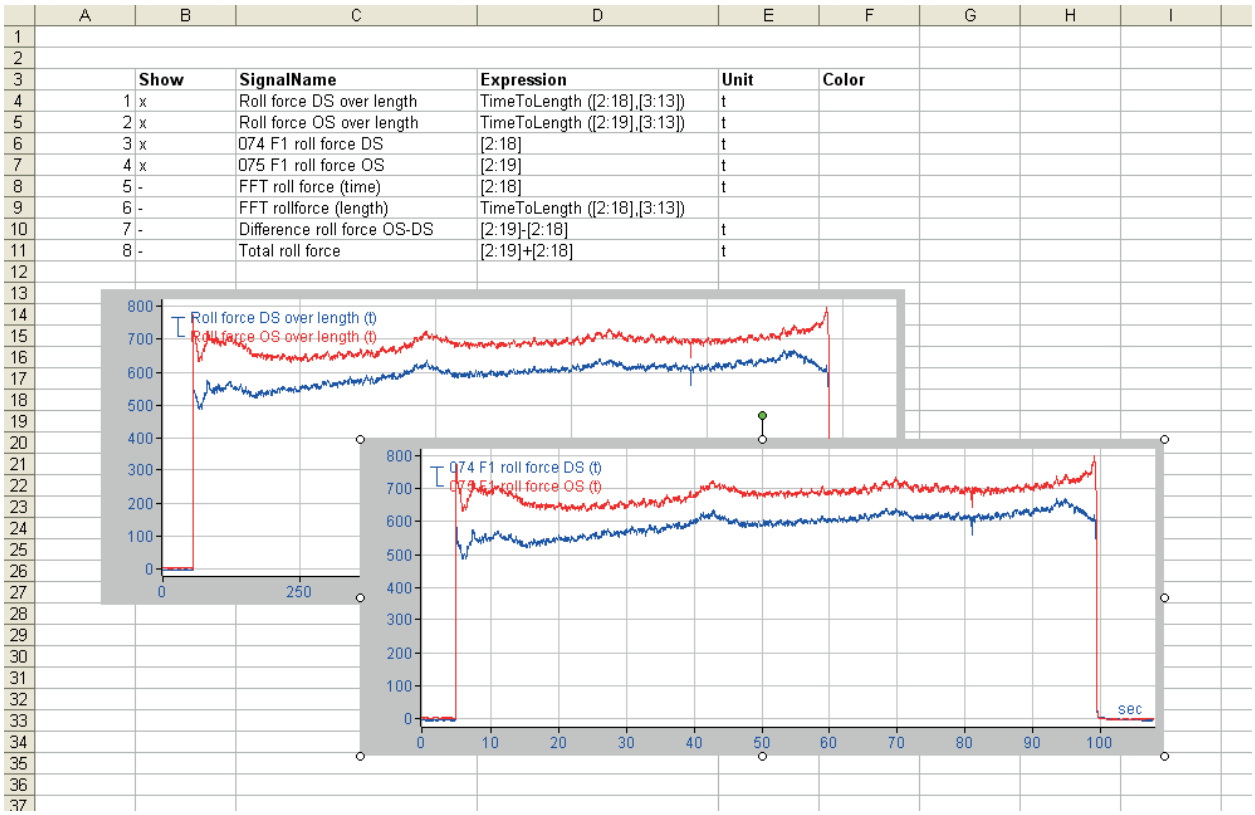
The signal table can be configured and formatted with the standard table functions in MS Word (frames, color, size, alignment etc.)



	Show	SignalName	Expression	Unit	Color
1	x	Roll force DS over length	TimeToLength ([2:18],[3:13])	t	
2	x	Roll force OS over length	TimeToLength ([2:19],[3:13])	t	
3	x	074 F1 roll force DS	[2:18]	t	
4	x	075 F1 roll force OS	[2:19]	t	
5	-	FFT rollforce (time)	[2:18]	t	
6	-	FFT rollforce (length)	TimeToLength ([2:18],[3:13])		
7	-	Difference roll force OS-DS	[2:19]-[2:18]	t	
8	-	Total roll force	[2:19]+[2:18]	t	

Fig. 167: HTML objects pasted into MS Word

The following picture shows how it looks if you paste the clipboard into MS Excel.



	Show	SignalName	Expression	Unit	Color
1	x	Roll force DS over length	TimeToLength ([2:18],[3:13])	t	
2	x	Roll force OS over length	TimeToLength ([2:19],[3:13])	t	
3	x	074 F1 roll force DS	[2:18]	t	
4	x	075 F1 roll force OS	[2:19]	t	
5	-	FFT roll force (time)	[2:18]	t	
6	-	FFT rollforce (length)	TimeToLength ([2:18],[3:13])		
7	-	Difference roll force OS-DS	[2:19]-[2:18]	t	
8	-	Total roll force	[2:19]+[2:18]	t	

Fig. 168: HTML objects pasted in MS Excel

The cells of the signal table are converted into cells of the spread sheet. The graphs are inserted as images. You can mark the graphs, move and resize them or change their properties like for any other image.

14.2 Exchanging graphs as image file

There are two other commands available via the context menu in a signal strip.

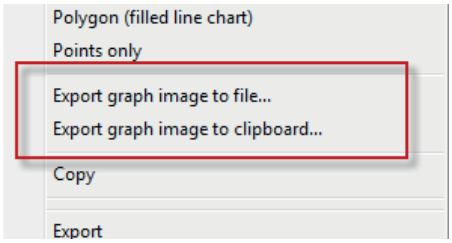


Fig. 169: Context menu of a signal strip

Note

These commands only refer to exactly the signal strip the context menu was opened upon. If you have several signal strips in the recorder window and want to export them, you have to do this for each strip separately.

Export graph to file...
This command allows you to export the graph (curves, scales and signal legend) into an image file.

Enter a path and file name in the corresponding dialog, preferably by using the button <...>.

Following this, select a file format. The following file formats can be selected: BMP, JPEG, GIF, TIFF and PNG.

If required, you can change the size of the file in pixels. In order to prevent distortion of the picture, enable the *Maintain aspect ratio* option.

Export graph image to clipboard...
With this function, the trend view is copied as bitmap to the Windows clipboard and can then be used at will. Before the export, you can change the size here.

15 Exporting data

15.1 Intended use

Exporting data from an analysis offers many advantages. The most important advantage is probably the focus on the key elements of an analysis, especially in cases in which the analysis is to be documented or passed on to other users.

Since the recipients of such data do not necessarily or not exclusively use *ibaAnalyzer*, you can use the export function in order to convert the measuring data to a generally readable standard format, such as a text file. The ASCII file which is generated by the export function can be imported by practically every other program, no matter whether spreadsheet (such as MS Excel), analysis (such as MatLab), database (such as MS Access) or word processing (such as MS Word).

Furthermore, the COMTRADE format was created for special evaluations, for example, in the field of energy technology.

The column-oriented saving format Apache Parquet and the MatLab format (*.mat) are also supported.

If the further analysis is to be carried out with *ibaAnalyzer* again, select the option of exporting the data to a *.dat file. Users of this export data can then use the full functionality of *ibaAnalyzer* for the further processing of this data. Furthermore, it is also possible to add the analysis to the export file, so that the recipient has the correct display immediately on opening the data file.

If, for example, a malfunction in a plant is analyzed and if you have finally identified and analyzed the cause of the problem, including all its boundary conditions, then it may be very helpful if the relevant measuring data and/or time intervals can be singled out from many thousand irrelevant measuring points and saved in a new file. This form of data reduction obviously also drastically reduces the size of the file which can hence be easily sent by e-mail.

Any original signals, expressions and virtual signals visible in *ibaAnalyzer* can be exported.

When using *ibaCapture* in conjunction with *ibaAnalyzer* even the relevant video sequences can be exported either as part of the new data file or as separate video file.

Note

The export function described in this chapter can only be used manually, i.e. each export procedure must be configured and triggered manually.

For an automated export, e.g. with *ibaDatCoordinator*, there is a so-called data extraction function available. This function requires a license and can be configured in the same dialog like the data base extraction. Instead of a database the export target is just a file.

Similar options like for Export and more functions are available for extraction. The product name of the extractor license is *ibaAnalyzer-V7-File-Extract*.

The export dialog is accessible from the *File* - *Export* menu.

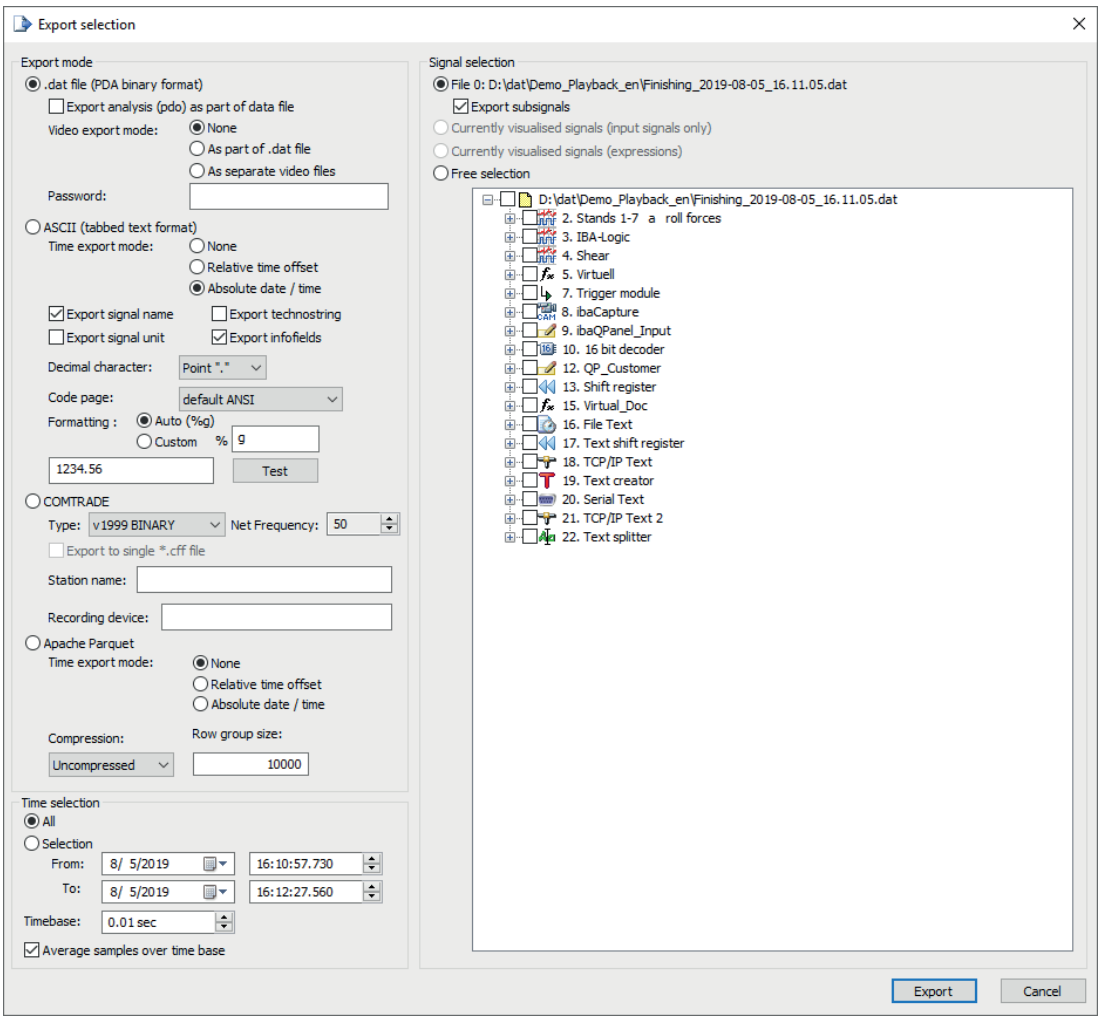


Fig. 170: Export function, export selection dialog

15.2 Selecting the export mode

15.2.1 Binary (PDA compressed file format *.dat)

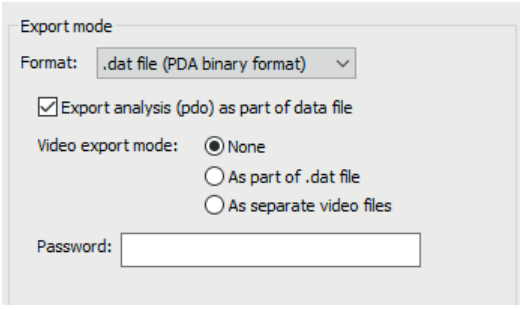


Fig. 171: Export mode .dat file (previously "Binary")

Select the *.dat file (PDA binary format)* export mode in order to create a new .dat file in the iba default format.

Export analysis (pdo) as part of data file*
If you activate this option, the current analysis will be saved in the export file. When opening the export file with *ibaAnalyzer* later on, the data is immediately presented in exactly the same way.

Video export mode
If you wish to export *ibaCapture* videos, this option has to be enabled. In this case, all videos which are selected in the signal tree will be exported.

Moreover, you can choose whether the video sequences are stored in the export file (.dat) or as separate video file (.mp4). A separate video file is stored in the same directory as the export file.

Note

For exporting the videos, *ibaAnalyzer* needs access to the video files. Therefore, make sure that *ibaAnalyzer* is connected to the *ibaCapture* server.

Password
You can enter a password here to protect the export file. The exported .dat file can then only be opened if the same password is entered in the 'Open data file' dialog.

Furthermore, please note the information about the grouped export by means of backslashes in the signal names of expressions. See ↗ *Grouping of exported/extracted expressions*, page 260

15.2.2 ASCII or text file

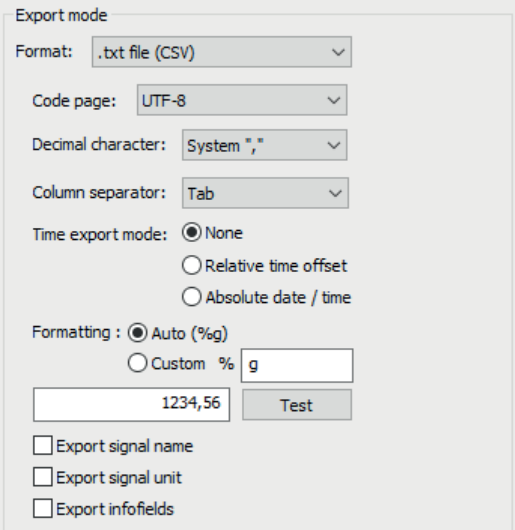


Fig. 172: ASCII export mode

In order to export the data to a text file, select the *ASCII (tabbed text format)* mode.

ibaAnalyzer automatically uses a tab-based text format. This means that the measurement series (= signal channels) are separated from each other by tabs (<TAB>) in the text file.

UTF-8 encoding and other character set tables are supported during export.

Further options are available as follows:

Time export mode
This option determines whether or not a column for the time stamp of the recording process is to be created in the export file. If time information is to be exported too, you can choose between the relative time offset (0...x s) or the absolute date and time.

Export signal name
Tick off this option if you wish to have the signal names of the measured values to be exported, too. The signal names then appear in the header of the measured value columns.

Export signal unit
Tick off this option if you wish to have the signal units of the measured values to be exported, too. The signal units then appear in the header of the measured value columns.

Export technostring
Enable this option if you want to export a technostring from a data file ("technostring" info field). However, this option refers to older data files (<ibaPDA-V6.8) for reasons of downward compatibility.

From ibaPDA-V6.8 and higher, technostrings are treated and stored just like info fields. It is thus necessary to enable the next option (*Export infofields*) if you want to export one or several technostrings.

Export infofields
Use this option to enable the export of technostrings from data files that were created with *ibaPDA*-V6.8 or higher or the export of text signals that were created with *ibaPDA*-V7 or higher as an info field in the data file.

From version v7.0 of *ibaPDA*, there are no longer any technostrings. Text signals and other signals can be configured as export-capable info fields (*ibaPDA* data storage configuration, *data storage - Files - Info fields*).

Other info fields from the data file, in particular the internal info fields automatically generated, are not exported.

Other exportable info fields can only be written into the data file with other applications, e.g. *ibaFiles*, *ibaDatCoordinator*-DTS (Update Task) or *ibaAnalyzer-DAT-Extractor*.

Decimal character
Select here which decimal mark should be used with the floating point values: Period, comma or according to the system settings.

Codepage
Both *ibaPDA* as well as *ibaAnalyzer* not only support ASCII coding, but also UTF-8 and other character set tables. Select the character set table here that the export should be based on. If characters are used in the data file that are not included in the ASCII character set (e.g. special characters, symbols, Cryllic and Asian characters, etc.) and/or texts of different languages are included, then it is best to select UTF-8.

Formatting
Use the formatting setting to determine how character values are converted during export. The selection of possible formats corresponds to the printf-function for C++ (see C++ reference on the Internet).

- Auto (%g)
  Standard setting, converts numerical values into numbers with 6 digits, plus decimal point character, if they are floating point numbers with a maximum of 5 places before the decimal point.
- Custom %
  If you choose this option, you can enter your own formatting string (according to printf C++).

<Test>
To be able to check your formatting settings, enter a numerical value in the input field in front of the <Test> button and then click on the <Test> button. The conversion is performed according to the setting.

Note

For parameters that are used, for example, in the signal legend or in tooltips and that have a numeric value (%x1, %x2, %dx, %y1, %y2, and %s), you can specify the formatting (length and precision) directly when configuring the legend or tooltip. Enter length and precision separated by a dot between '%' and parameter name.

The length determines the minimum total number of digits of the numerical value and the precision specifies the number of decimal places.

Example:

%4.2y1' means that the value of a signal at the position of marker X1 is output with at least 4 digits and 2 decimal places.

If you do not use this parameter formatting, the format from the export settings is used.

15.2.3 COMTRADE

COMTRADE is an abbreviation that stands for *IEEE Standard Common Format for Transient Data Exchange (COMTRADE) for Power Systems*. This is a definition of a particular format for the exchange of data files as documented in the IEEE Std C37.111-1999 or -2013 standard. The standardization applies to both the format of the data files and the type of media to be used for exchanging fault signal, test or simulation data of energy supply systems.

ibaAnalyzer supports the COMTRADE versions 1999 and 2013 during export. An export into the old format 1991 is not supported.

ibaAnalyzer generates a *.dat file during the COMTRADE export according to version 1999, which contains the measured values, as well as a *.cfg file with configuration data, such as channel information (signal number, signal name, info allocation), the start and end time, etc.

During export according to version 2013, it is also possible to write measured and configuration data in a single .cff file.

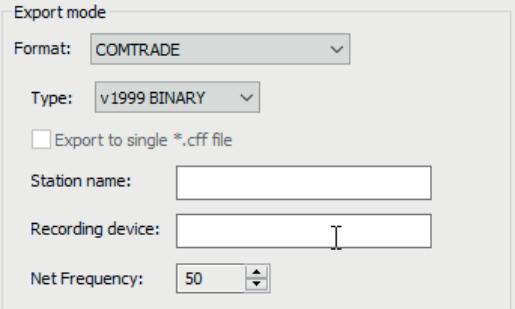


Fig. 173: COMTRADE export mode

Type
Here select the file type of the export file.

- Standard 1999: ASCII or BINARY
- Standard 2013: ASCII, BINARY, BINARY32 or FLOAT32

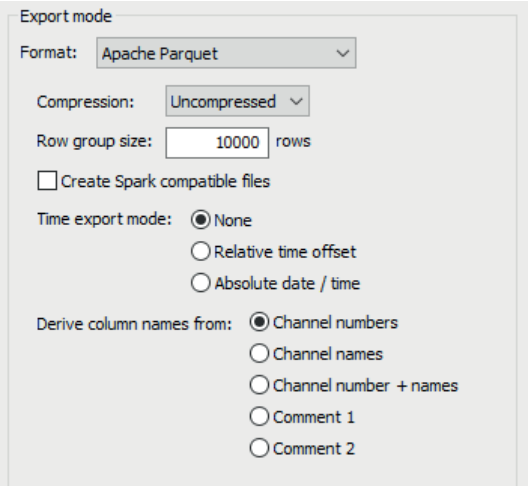
Net Frequency
Setting of the correct net frequency (50 / 60 Hz)

Export to single *.cff file
If you enable this option, then only a single .cff file will be exported instead of the separate .cfg, .inf, .hdr and .dat files.

Station name and recording device
According to the COMTRADE convention, information concerning the station name and the recording device must be entered here. This information is stored in the cfg-file which *ibaAnalyzer* generates during the export process in addition to the data file.

15.2.4 Apache Parquet

Apache Parquet is a column-oriented, binary data format which provides efficient data compression and different encodings. Due to its columnar structure and the possibility to add meta data the file format, it resembles the iba dat file format. Also due to the comparable storage size we recommend these files as an interchange format to external systems.



The data in the output file will be structured as follows:

- A channel (or expression) corresponds to a Parquet column
- The module structure available in iba dat files has no direct pendant in Parquet and is therefore mapped using meta data (see below)
- All info fields are stored as Parquet meta data

Note

All extracted (numerical) data is converted to the FLOAT Parquet data type. This can cause a loss of precision for some data types. STRING and BOOL will have the same corresponding Parquet data type.

Compression
The Apache Parquet format offers different compression methods. *ibaAnalyzer* supports plain encoding (Uncompressed), Snappy, Gzip, Brotli, LZ4 and ZStandard.

Row group size
The Apache Parquet format has an additional row-wise structure mechanism called “column chunks” or “row group”. In *ibaAnalyzer* you have the possibility to choose the row group size according to your needs. The input corresponds to the number of rows per row group.

Create Spark compatible files
The Apache Spark framework can be used to work with Parquet files. Since several characters are not allowed as column name within this framework this option replaces all such characters by underscores.

Time export mode
Similar to the text file extract it is possible to export an additional time column.

- None

  No timestamp data are exported, however the start time and sampling rate are still available as meta data

- Relative time offset

  Begins with “0” and counts the seconds from the file start. The column contains FLOAT values in this case.

- Absolute date/time

  In this case the additional column will contain the absolute date and time. The Parquet data type TIMESTAMP is used.

Derive column names from
The column names for the Parquet file can be selected here. It is possible to use the channel numbers, the channel names or one of the comments. Note that when using a comment, this information needs to be available.

When selecting the channel number, the names will be formatted as

- [M:C] for analog channels
- [M_C] for digital channels (dots are not allowed for channel names in the Parquet format)
- [M:C:S] for subchannels

With "M" as the module number, the signal (or channel) number is "C" and the subchannel number is "S".

The Parquet format does not allow non-unique column names. If this is the case in the original data, *ibaAnalyzer* automatically adds a corresponding suffix like “_1”, “_2”, etc.

Meta data
If data are exported from iba dat files several meta data (or info fields) are available. These data are also written to the Parquet format, where only one level of meta data exists. Therefore, these data are structured as follows:

- File level information (the standard info fields) are stored as normal key value pairs with the info field name as key
- For computed columns and info columns the specified name is used as key
- Module level information use a key of the form “M[x]y” where x is the module number and y the field name
- Channel level information use a key of the form “[x]y” with x being the channel name and y the field name

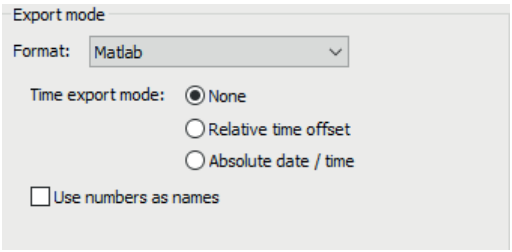
This structure of data also enables *ibaAnalyzer* to restore the complete file structure, when opening the extracted Parquet file.

Length-based and ibaQDR data
You can extract length-based data or *ibaQDR* files to the Parquet format. If the correct length-based profile is used for the extract, *ibaAnalyzer* writes additional meta data to the file to indicate this. The following fields are used:

- “Lengthbased” to indicate that the column contains length-based data
- “LengthBase” which contains the sampling rate in m.

15.2.5 Matlab

The software Matlab distributed by MathWorks provides its own (binary) data format with file extension ".mat". In order to better support the Matlab integration it is possible to create .mat files with *ibaAnalyzer*. These files can be opened directly with the Matlab software.

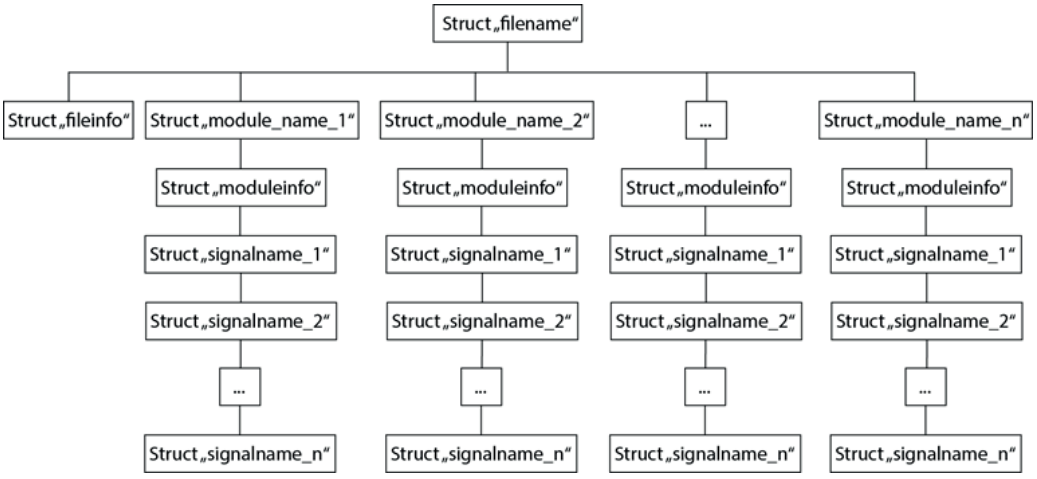


Time export mode
Similar as for other formats, it is possible to export an array containing the timestamps either as relative time offset or as formatted string. The time array will be added to the "fileinfo" structure which is described below.

Use numbers as names
With this option it is possible to not use the module and signal names for the names of the "struct" objects (see below). In this case the module or signal number is used with some prefix "M" for modules and "S" for signals.

In order to display the correct name when opening the file again with *ibaAnalyzer*, the original names are stored in an additional field "name" within the structure.

Data structure
The Matlab software supports different data types and structures. *ibaAnalyzer* supports .mat files, which contain so called Struct objects. *ibaAnalyzer* creates embedded Struct objects as follows:



This structure is used to resemble the internal structure of the iba dat files.

The struct "filename" is the root structure. It contains only other structures containing info fields or modules. The name of the structure is derived from the filename displayed in the *ibaAnalyzer* signal tree.

The file-level info fields are stored as key-value pairs in a fixed structure “fileinfo”. The field “clk” containes the sampling rate of the signal data. Further, a field “starttime” contains time stamp of the first data point. Several other info fields will automatically be added to this structure.

The individual modules are present in form of structures having the name of the module. In case the “Use numbers as names” option is set, the structures are named as “Mx” where x is the module number.

Every module has a fixed structure “moduleinfo” which contains module-level info fields as well as a field “name” containing the module name, and a field “ModuleID” containing the module number.

Like for the modules, the individual signals within one module are present as structures using the signal name or a string “Sx” with x being the signal number.

Every signal structure contains an array “data” which holds the signal values. Other key-value pairs are written representing the signal-level info fields. The most important fields are:

- “SignalID”

  the signal number within the module

- “name”

  the signal name (will be displayed in *ibaAnalyzer*)

- “unit”

  the unit (if present) as displayed in the signal grid

- “PDA_Comment1”

  the comment 1 displayed in the signal grid. Similar for comment 2

- “PDA_TBase”

  this field is present in case the sampling rate is different from the global “clk” value

- “Lengthbased”

  the presence of this field indicates that the column contains length-based data

- “LengthBase”

  in case of length-based data the sample rate in meter is specified here

Naming conventions
When extracting to .mat files, the nested structs are given names automatically. If the option “Use numbers as names” is enabled, the signal ID will be used.

15.3 Selecting the time criteria

15.3.1 Time selection

It is not always necessary to export the full length of the recording time ("All"). It is instead possible to define the desired export time very precisely. For this purpose, you must select the "Selection" option first.

The date specification (from, to) is taken from the info part of the data file or HD query. You can change this by entering the desired date. A date picker is available for your convenience. Respectively, you can specify the range more precisely in hours, minutes and seconds (down to ms) by entering the time values or using the spinner buttons.

Using the markers is another convenient method. For this purpose, you must have activated the presentation of markers prior to opening the export dialog in the analysis view. Here you can then position the markers at the desired time limits. When the export dialog is then opened, the corresponding time span is already entered under the time criteria.

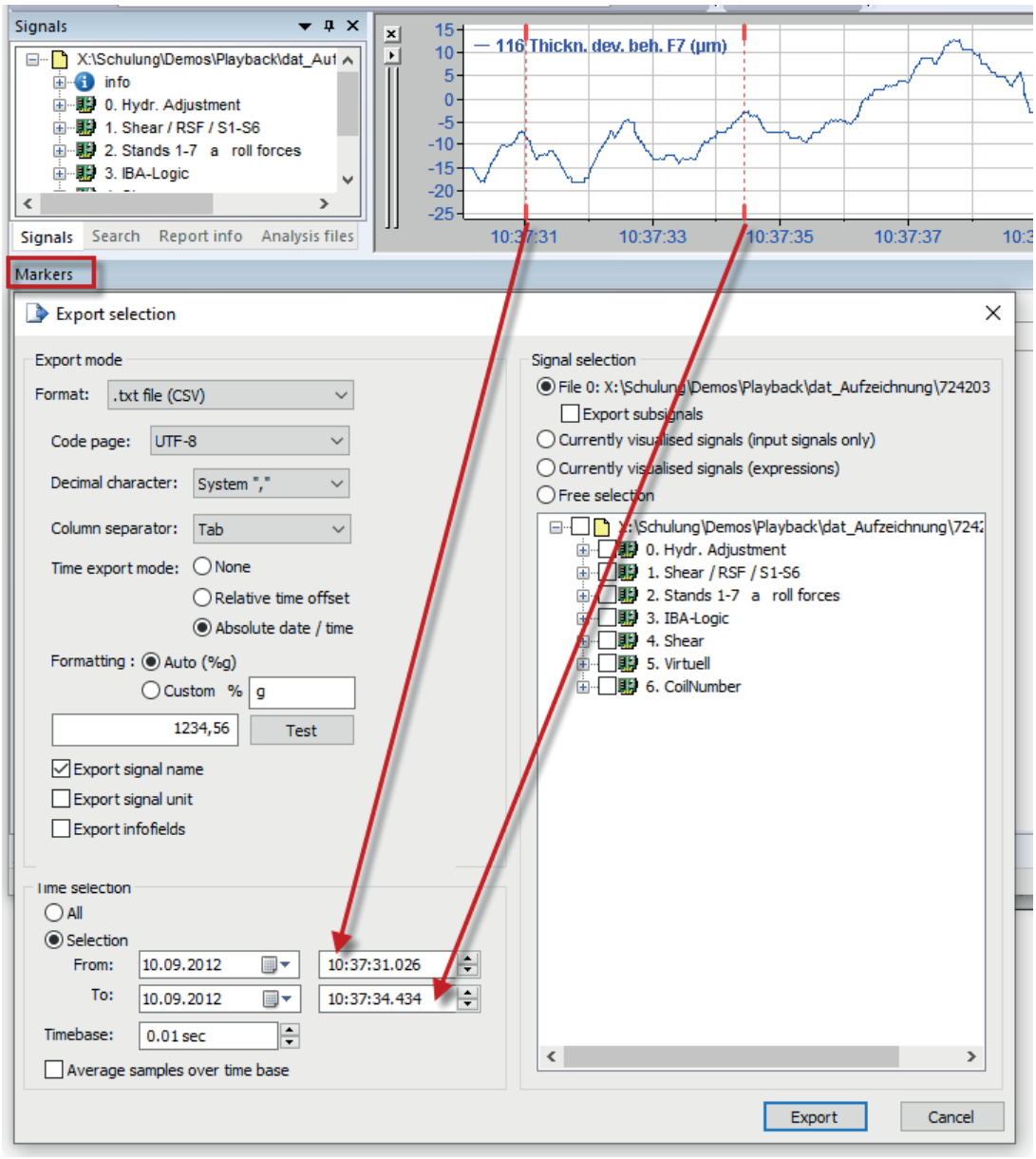
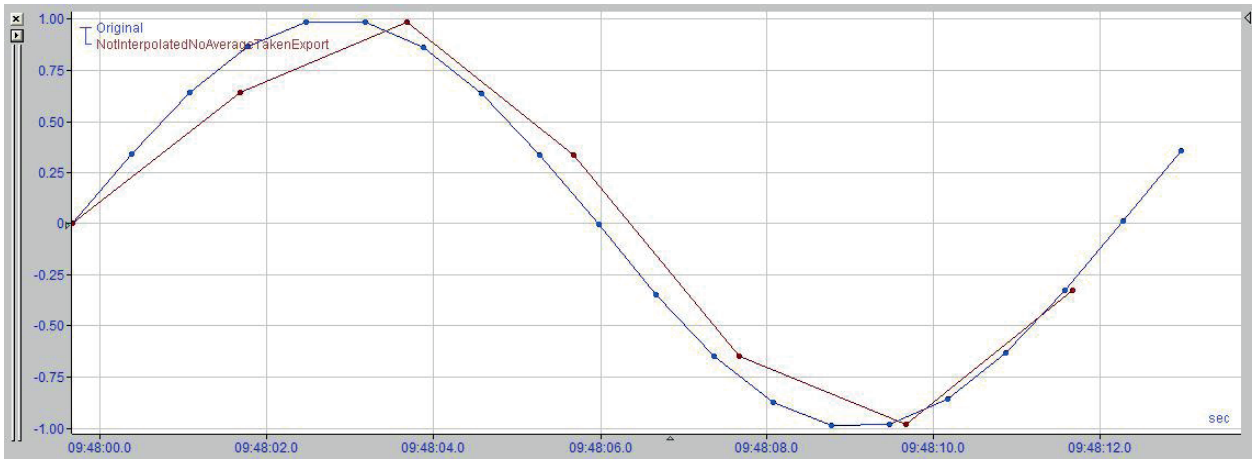


Fig. 174: Export, setting the time span by marker position

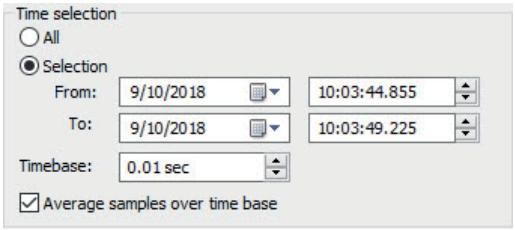
15.3.2 Time base

The time base is another time criterion. The time base from the data file is displayed by default. This time base is also used when the values are exported, i. e. the values in the export file are subject to the same time resolution.

If this precision is not necessary or not desired, you can increase the time base whereupon the values are then exported at larger time intervals. This also means that the number of exported values is smaller. No mean value is computed for the values skipped.The momentary values are exported. The values are interpolated linearly.
You can disable linear interpolation under *Setup - Miscellaneous* (see image).



Average samples over time base
In order to compute an average value on the basis of a modified time base you have to check the *Average samples over time base* option.



You can use the arrow buttons in order to adjust the time base by increasing it by multiples of the original time base.

The export time base can never be smaller than the original time base.

15.4 Signal selection

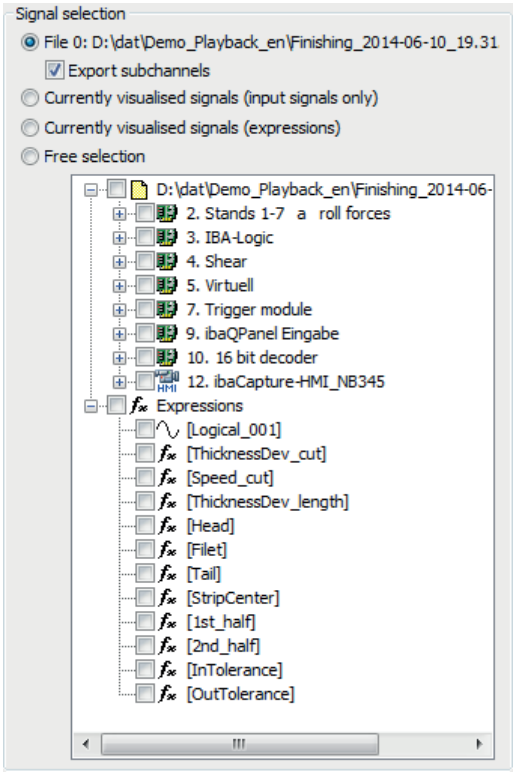


Fig. 175: Export function, signal selection

Several groups with the following functions are available for selecting the signals to be exported.

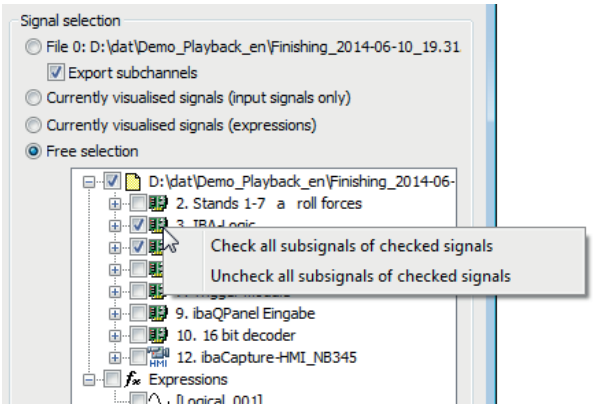
File no.:
If you select this option, all signals of the data file are exported. The number behind the word "File" specifies the data file that will be exported if several data files are opened. This is always the file which is marked in the signal tree window.

Export subchannels
By enabling this option, the subsignals of each signal – if available – are also exported. Subsignals are, for example, maximum, minimum, average value or standard deviation. They can occur under the following conditions:

- With *ibaAnalyzer-DB* following a database query if the additional channel information was activated when extracting the data. After the database query, these values are stored as subsignals below the main signals in the signal tree. Enabling this option, these subsignals are also exported both to binary and ASCII files. Each subsignal gets its own column which is marked accordingly.
- After an HD query, which is based on the information of a time base by nature, the minimum and maximum value of the signals are provided as subsignals in the signal tree by default.

Tip

If you do not wish to export the complete signal content of the file, but, e.g., freely select signals to be exported, the option of the subsignals is available in the context menu of the signal tree



Currently visualised signals (input signals only)
If you select this option, all the input signals are exported which are displayed in a trend view in the current analysis.

Currently visualised signals (expressions)
If you select this option, all the input signals and expressions which are currently displayed are exported.

Free selection
If you select this option, the signals and expressions which are marked in the signal tree in the field below are exported.

In order to mark signals for free selection, simply click the boxes, so that the box is ticked off. Tick = export, no tick = no export. If you tick off a module icon, all the signals of this module are selected for export. In order to select individual signals of a module, first click the small plus sign before the module icon. The module is then opened up and the signals are to be seen. Now tick the desired signal. As soon as at least one signal of a module is ticked off, the module icon is also ticked off, so that you can identify the modules from which signals will be exported.

In order to deselect a signal, simply set the tick again.

If all signals are selected and all other export settings are correct, click the <Export> button in order to start the export process.

15.5 Export of text signals into an ASCII file

In addition to numerical measured and analysis values, also text signals can be exported to an ASCII file. Text signals are – as is the case with other signals, too – contained in the signal tree and can be selected for export.

In the exported ASCII file, every line corresponds to a particular time stamp. Each time stamp differs to the first time stamp by an integer multiple of the time base set. In case of text signals, the time stamp is rounded down and the text is written into the line with the time stamp being smaller or equal to the time stamp of the text sample. As there are usually more time stamps than text samples, columns with text signals are mostly empty.

Example
The following example of an exported ASCII file shows an analog signal, a text signal and a digital signal exported with a time base of 1 s.

Time	[0:0]	[0:1]_text	[0.0]
time	Sine	Text_signal	Digital_signal
sec			
30.08.2010 16:52:43.070000	0		0
30.08.2010 4:52:44 PM.070000	0.587785		1
30.08.2010 4:52:45 PM.070000	0.951057	"Extremum 1"	1
30.08.2010 4:52:46 PM.070000	0.951056		1
30.08.2010 4:52:47 PM.070000	0.587785		1
30.08.2010 4:52:48 PM.070000	-8.74E-08		0
30.08.2010 4:52:49 PM.070000	-0.58779		1
30.08.2010 4:52:50 PM.070000	-0.95106	"Extremum 2"	1
30.08.2010 4:52:51 PM.070000	-0.95106		1
30.08.2010 4:52:52 PM.070000	-0.58779		1

The corresponding presentation in *ibaAnalyzer* looks as follows:

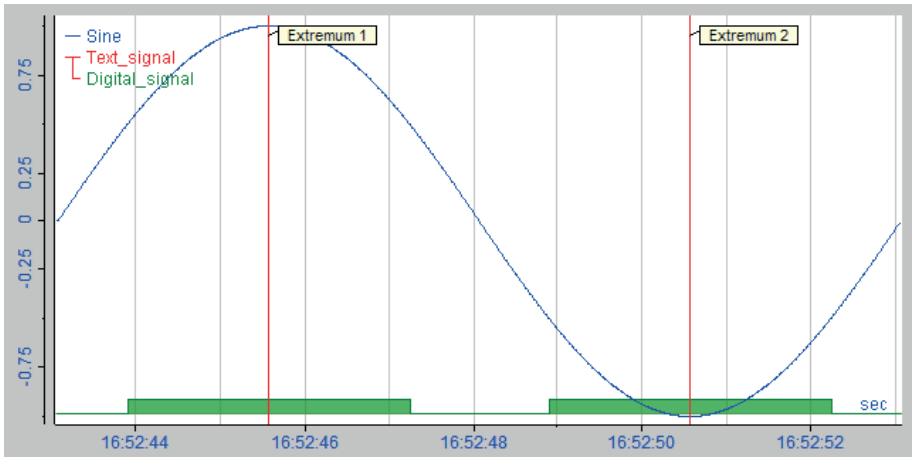


Fig. 176: Display of the exported ASCII files

15.6 Export curve signals to text file

Similar as to with an export into a file via the menu *File - Export...*, you can also export signal values directly from a trend display to a text file. In this file, the signal values are stored column by column - separated by TAB.

Unlike with the export function via the menu *File - Export...*, you can also export the data if the trend view is length, frequency or inverted length-based.

For this purpose, use the right mouse button to click in the trend view whose signals you want to export and in the context menu select *Export graph signal data to file...*

A dialog opens in which you can make the necessary settings.

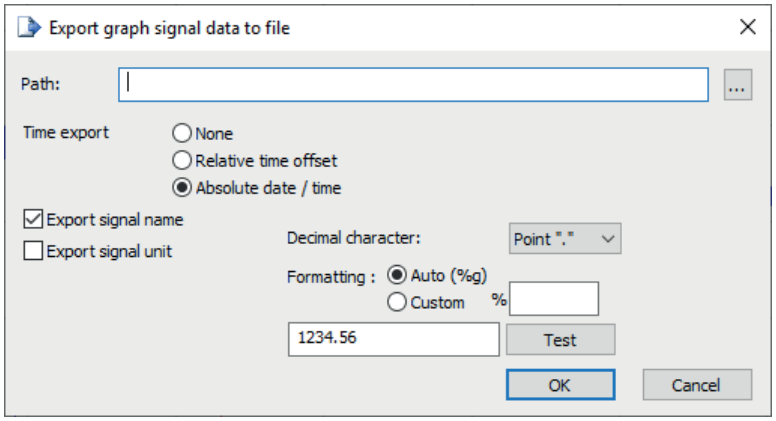


Fig. 177: Export dialog for time-based trend view

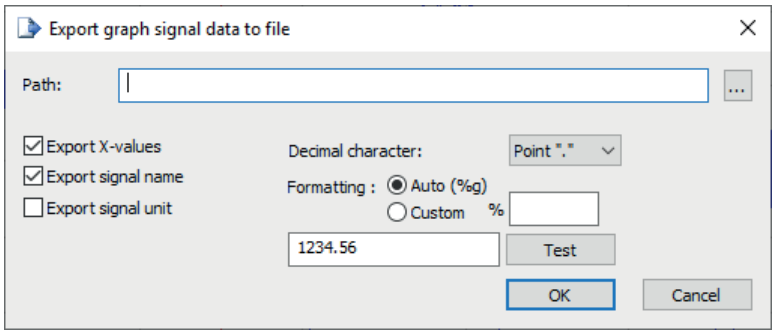


Fig. 178: Export dialog for trend view with length, frequency or inverse length-based X-axis

Path
Enter the target directory and file name of the export file here.

Time export
This selection only appears if the trend view has *Time* as an X-axis unit. Selection as described in chapter ↗ *ASCII or text file*, page 244.

Export X-values
This option only appears if the trend view has *length*, *frequency* or *1/length* as the X-axis unit. If you enable this option, an additional column will be created in the export file with the X-axis values.

For all other options and settings, see ↗ *ASCII or text file*, page 244.

15.7 Export curve signals to clipboard

In addition to the export into a text file, you can also export the curve values from a trend view into the Windows clipboard. You can therefore very easily transfer the signal values from a trend view to different applications, such as MS Excel.

You can also export the data here if the trend view is length, frequency or inverted length-based.

For this purpose, use the right mouse button to click in the trend view whose signals you want to export and in the context menu select *Export signal data to clipboard...*

A dialog opens in which you can make the necessary settings.

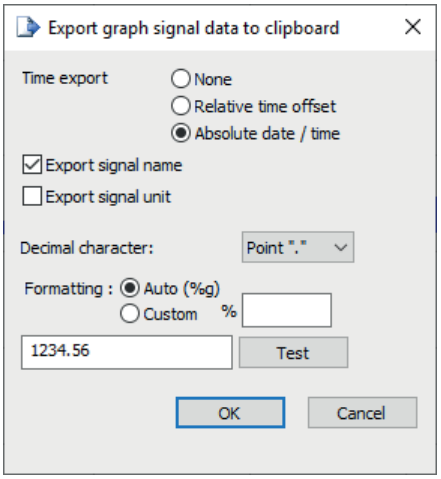


Fig. 179: Export dialog for time-based trend view

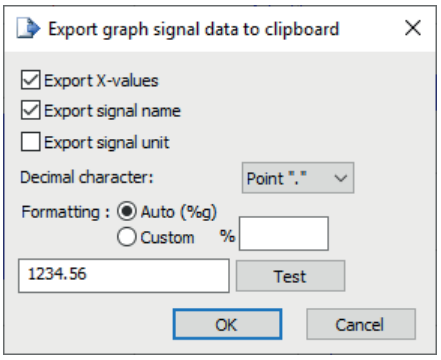


Fig. 180: Export dialog for trend view with length, frequency or inverse length-based X-axis

Except for the missing path specification, options and settings correspond to the export into a text file (see ↗ *Export curve signals to text file*, page 258).

15.8 Grouping of exported/extracted expressions

When exporting/extracting expressions to a binary dat-file, a group structure can be arranged for the extracted expressions by adding backslashes ('\') in their names. When you open the exported file with *ibaAnalyzer* the corresponding expressions will be displayed in grouped order in the signal tree.

This is especially useful, when result signals of *ibaAnalyzer-InSpectra* views are exported/extracted. These results are automatically grouped per view because all result channels have the view name and a backslash prepended.

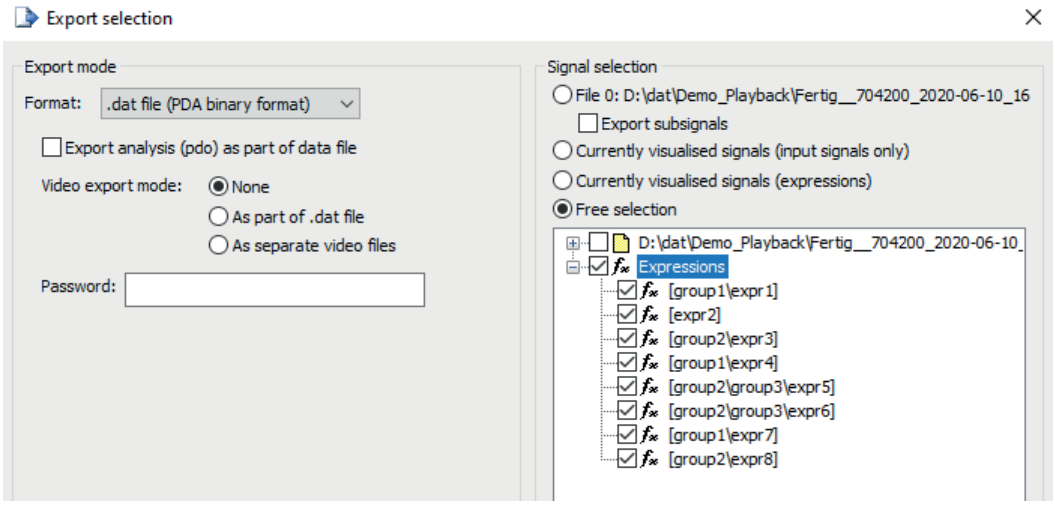


Fig. 181: Signal names of the expressions without, with one or with multiple backslashs

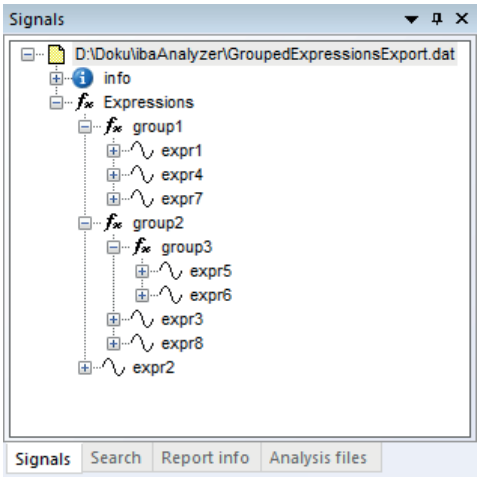


Fig. 182: Result in the signal tree of the exported file

16 Reportgenerator

ibaAnalyzer-Reportgenerator is an integral part of the software *ibaAnalyzer* and provides the user with tools to create individual reports. These tools allow you to freely design and create analysis, quality, production and error reports in various output formats.

An analysis report can be used to display the trend view from *ibaAnalyzer* as well as various process data (such as text channels, calculated values, etc.). Graphical objects (squares, circles, images, etc.), editable text fields, barcodes as well as diagrams and tables can also be created.

A report can be created for each workpiece and then printed or exported to a file. (e.g. PDF format). In addition, the automatic generation and output of a report is possible with *ibaDatCoordinator* or via a post-processing command from *ibaPDA*.

Other documentation

You can find a detailed description of the data interface for the reportgenerator and the report design in the manual *ibaAnalyzer-Reportgenerator*.

17 Support and contact

Support

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Note

If you require support, indicate the serial number (iba-S/N) of the product or the license number.

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