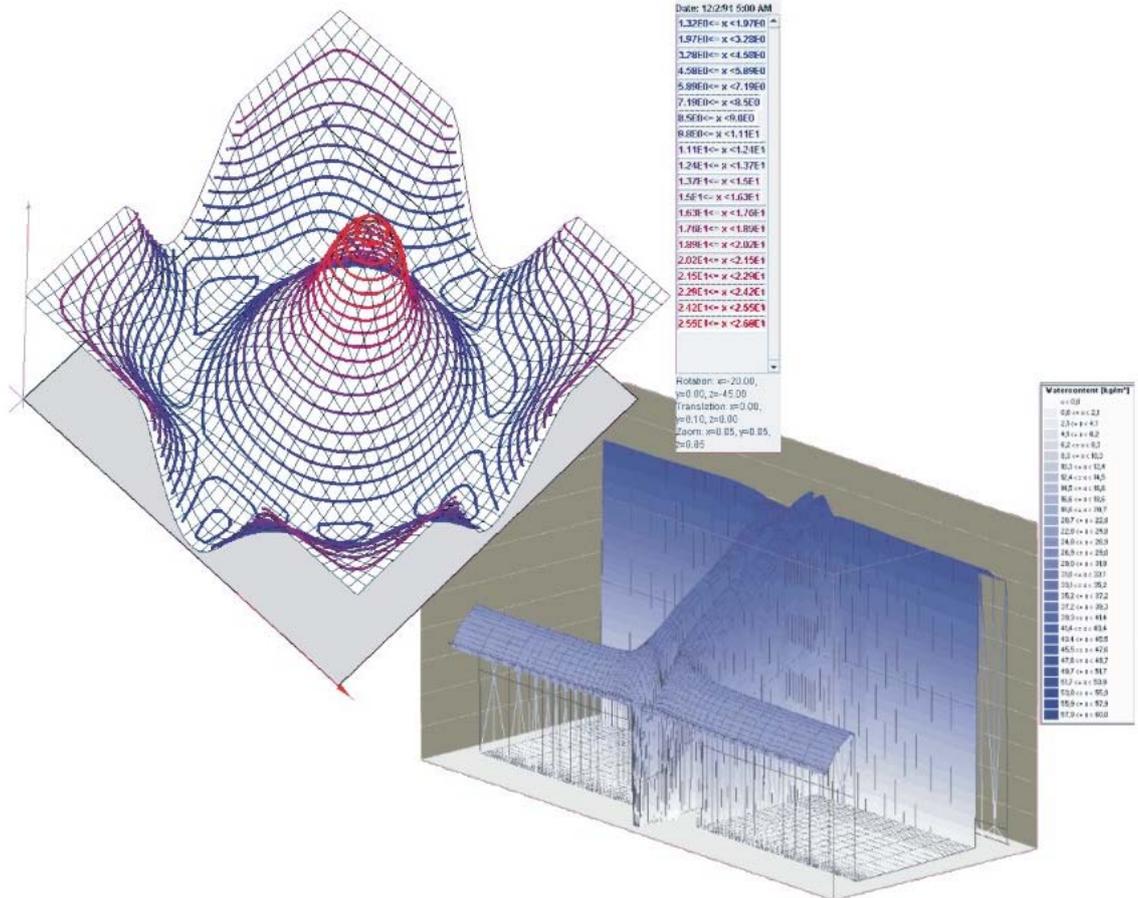




# WUFI<sup>®</sup> 2D

## Installation & Introduction

(WUFI2D, WUFIMotion, WUFIGraph)



WUFI<sup>®</sup> 2D



Fraunhofer Institut Bauphysik

## **PREFACE**

This manual describes the installation of WUFI® 2D, guides the user through the first steps with the program and provides a short overview of its capabilities.

# Contents

<b>1. INSTALLATION .....</b>	<b>4</b>
1.1 System requirements .....	4
1.2 Installation .....	5
<b>2. OVERVIEW OF THE MENUS .....</b>	<b>8</b>
2.1 The Main Window of WUFI 2D .....	8
2.2 The Menu Bar of WUFI 2D .....	10
2.3 The Tool Bars of WUFI 2D .....	19
2.4 The Main Window of WUFI2DMotion .....	20
2.5 The Menu Bar of WUFI2DMotion .....	22
2.6 The Tool Bars of WUFI2DMotion .....	25
2.7 The Main Window of WUFI Graph.....	26
2.8 The Menu Bar of WUFI Graph .....	28

# 1. Installation

## 1.1 System requirements

<b>Processor:</b>	IBM-compatible PC with Pentium processor or higher
<b>Graphics card:</b>	High Color (16 bit) color depth or better
<b>Hard disk:</b>	at least 500 MB free space for program and result files
<b>CD-ROM drive</b>	
<b>Operating system:</b>	Windows 2000 / XP Microsoft Data Access MDAC version 2.5 or higher Current Java version for WUFIGraph ( <a href="http://java.sun.com/javase/downloads/index.jsp">http://java.sun.com/javase/downloads/index.jsp</a> )

## 1.2 Installation

1. Insert the CD into the CD-ROM drive. The installation screen appears automatically (in case it does not, find the file „Install.exe“ in the root directory of the CD and double-click it).
2. Then click on "WUFI® 2D 3.2" to start the installation. Alternatively, you can simply run the file „Install\_WUFI2D-3.exe“ in the root directory of the CD.
3. Close the installation info screen by clicking on „Next“.
4. Enter user name, organization and serial number as specified in the letter accompanying the installation CD or in the e-mail we sent you. Please enter them exactly as given (input is case-sensitive, no leading or trailing blanks). If you received the registration data by e-mail, you may also copy and paste the data. The „Next“ button will be enabled when the registration data have been entered correctly:

Setup - WUFI@2D 3.2

**User Information**  
Please enter your information.

User Name:  
User

Organization:  
Holzkirchen IBP

Serial Number:  
AbcD-eF7u-k1L-ChB

< Back    Next >    Cancel

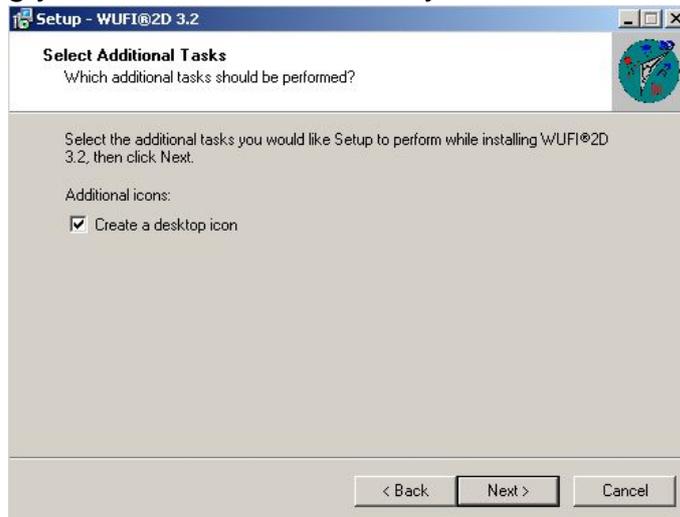
- In the next step, you can specify the location where you want WUFI 2D to be installed. The default location is C:\Programs\IBP-Software and will rarely need to be changed.



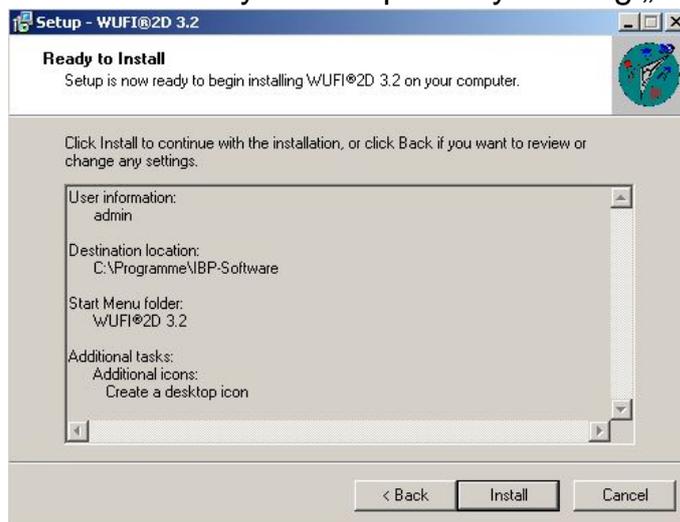
- You can also customize the name of the Start Menu folder where shortcuts to WUFI 2D and its tools will be created.



7. In the next dialog you can choose whether you want a desktop icon created.



8. The last dialog summarizes your input. If you find everything to your satisfaction, install the software on your computer by clicking „Install“.

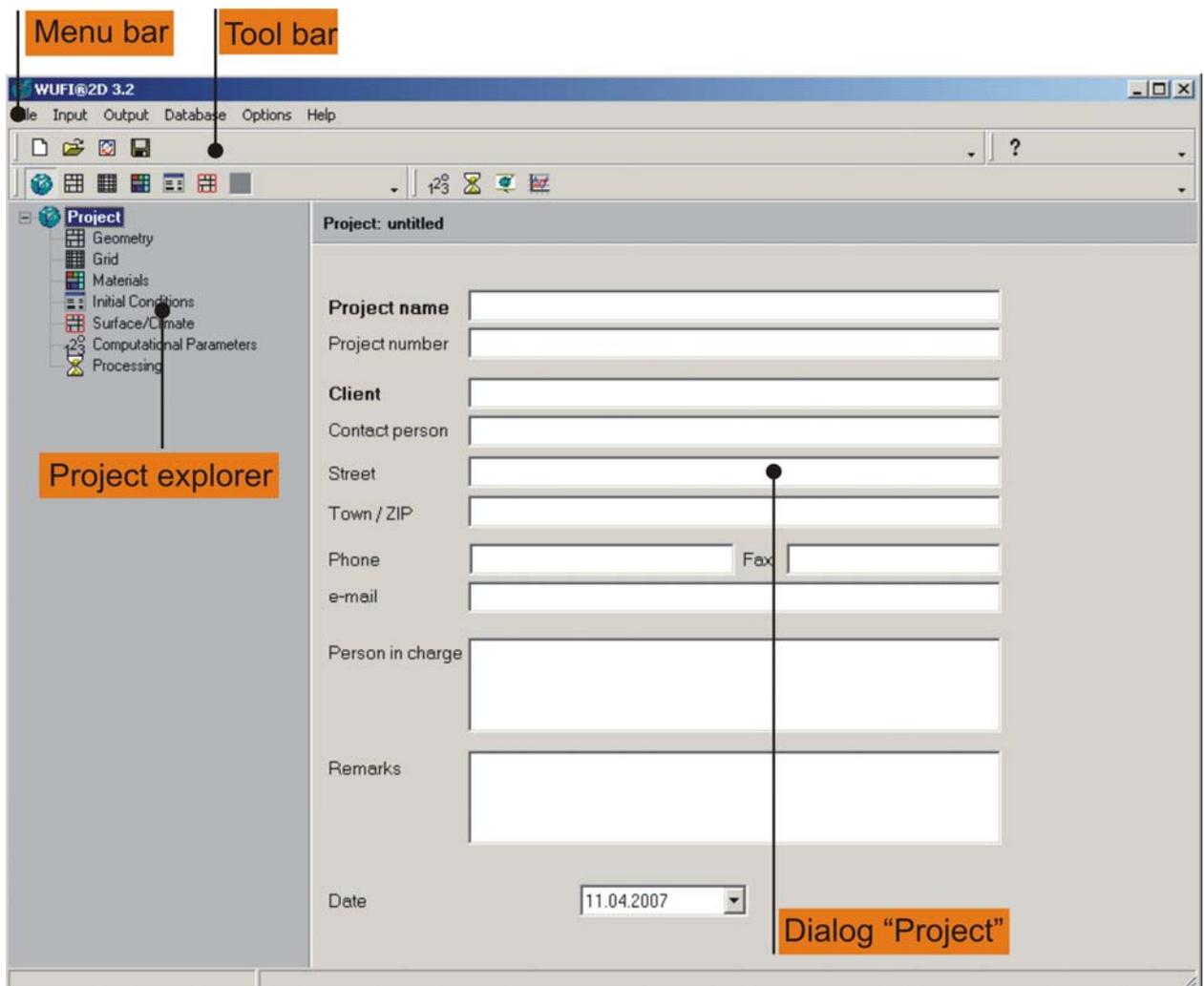


## 2. Overview of the menus

This chapter offers a short overview of the program and its menu structure.

### 2.1 The Main Window of WUFI 2D

When you start WUFI 2D, the main window shown below appears. From here you can access all the other menus and dialogs. The following pages describe the individual elements.



## The Elements of the Main Window

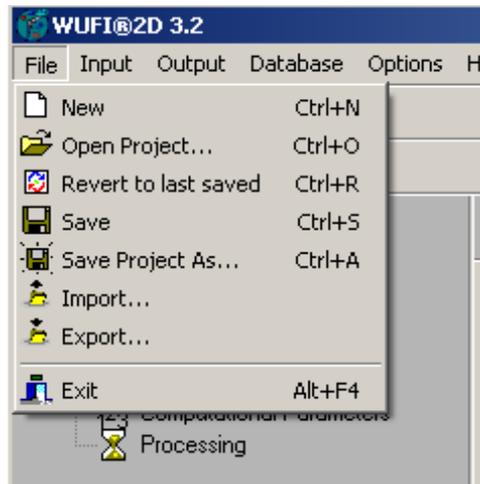
- Menu bar:** The menu bar contains the various menus. If you open a menu with the mouse, it displays the individual menu items (commands and submenus).
- Tool bars:** Frequently used commands can also be invoked via the tool buttons, allowing quicker access.
- Project explorer:** As an alternative to the menu „Input“ in the menu bar, the project explorer provides quick and ready access to the various input dialogs.
- Dialog "Project":** This dialog serves as a memo pad for some useful administrative project information which can thus be kept together with the calculated results. All these inputs are optional; they have just an informative character.

## 2.2 The Menu Bar of WUFI 2D



The menu bar contains the six menus described below. For further information on the various commands and dialogs, please refer to WUFI 2D's online help.

### The Menu "File"



### The Menu Items in "File"

**Note:** A WUFI 2D project consists of several files which reside all in a common directory. The „Open“ and „Save“ commands always access the respective project directory, not individual files. WUFI 2D keeps the project files it is currently working on in the so-called „cache directory“. When a project is opened, all the files (except the result file \*.wfd) are copied from the project directory into the cache directory; when the project is saved, the files are copied back into the project directory.

**New:** Creates a new, empty project. If a project is currently open, it will be closed.

**Open Project:** Displays the standard Windows dialog for opening an existing project directory. Select the desired directory and click „OK“ to copy the project files into the cache directory (except the result file \*.wfd).

**Revert to last saved:** Copies into the cache directory the files that were last saved into the project directory. Existing files are overwritten with the last saved files. This provides a rudimentary undo function.

**Save:** Saves the project. The input data and the calculation results (if any) are copied from the cache directory into the project directory. It is recommended to save the project before starting a calculation.

**Save Project As:** Saves the current project (i.e. the current content of the cache directory) into a different project directory (the original files and the old project directory, if any, continue to exist unchanged under their old names). Also allows to create a new folder if needed.

**Import:** Imports zipped \*.wtz projects.

**Export:** Exports the files of the project as a zipped \*.wtz file for archiving purposes.

**Exit:** Asks whether changes to the project shall be saved and then exits WUFI 2D.

**Note:** Files contained in the project directory are, among others:

wufi2d.xml	the majority of the project input data
input.dat	input file for the numerical core
*.bcli	data files for each of the boundary conditions
[material name].xml	data files for each of the materials used in the project
*.png	various diagrams of the construction

after the calculation:

[project name].wfd	WUFI 2D result file
iter.txt	output of the numerical core

**Note:** When WUFI 2D is closed, it will clear the cache directory.

## The Menu "Input"

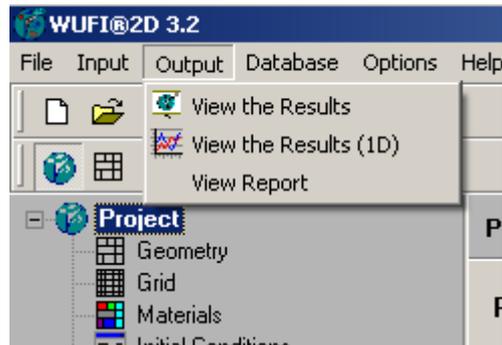


The items in this menu are also accessible via the project explorer.

## The Menu Items in "Input"

- Project:** This dialog panel serves as a memo pad for some useful administrative project information which can thus be kept together with the calculated results. All these inputs are optional; they have just an informative character.
- Geometry:** Use this dialog panel to specify the construction of the building component, building it up from rectangular elements. Simply draw the component in the graphics area of the dialog.
- Grid:** Use this dialog to specify the numerical grid for the component.
- Materials:** In this dialog panel you can assign material data to the different elements of the building component.
- Initial Conditions:** Use this dialog panel to specify the temperatures and moisture contents existing in the different materials at the start of the calculation.
- Surface/Climate:** Assign surface coefficients and climatic boundary conditions to the different surface segments of the component.
- Computational Parameters:** The options offered in this dialog panel allow you to fine-tune the way the calculation is performed.
- Processing:** Start the calculation (accessible only via the project explorer)

## The Menu "Output"



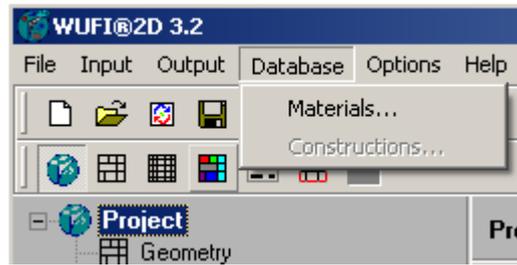
## The Menu Items in "Output"

**View the Results:** Opens the program WUFI2DMotion to display the simulation results as a 2D film.

**View the Results (1D):** Opens the program WUFIgraph for a one-dimensional display of the simulations results, to view time series of the calculated quantities at specified locations and to view isopleths and isolines. In order to use WUFIgraph, you must have Java installed on your computer.

**View Report:** Creates a summary of the project data in XML format and displays it in the standard XML viewer of your computer.

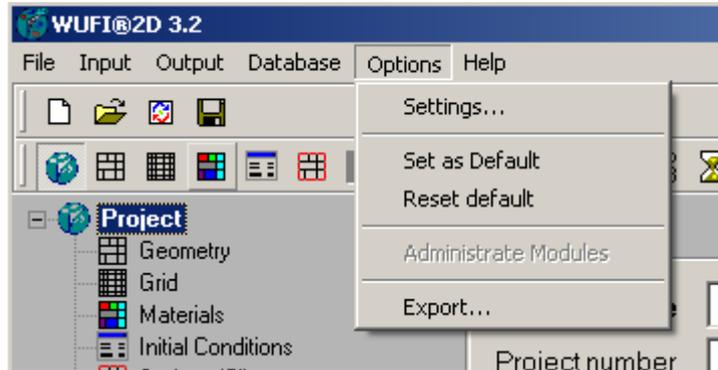
## The Menu "Database"



## The Menu Items in "Database"

- Materials:** Opens the material database. You can view the material data contained in the database. You can also add and edit your own materials (you can not edit the predefined materials).
- Constructions:** Opens the constructions database (not yet implemented).

## The Menu "Options"



## The Menu Items in "Options"

- Settings:** Edit some basic settings of the program.
- Set as Default:** Define the current project as the default project. This project will automatically be opened the next time WUFI 2D is run.
- Reset Default:** Reset a previous definition of a default project. WUFI 2D will then start without opening a project.

## The Dialog „Settings“



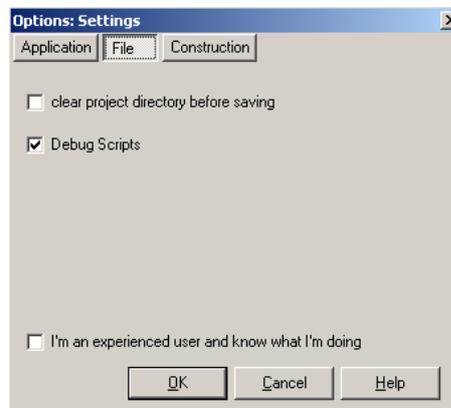
### Application Settings:

**Cache Directory:** Here you can specify the cache directory in which WUFI 2D is working. If you open a project, the files in the project directory are copied into the cache directory (except the result file

\*.wfd, if any). The calculation is performed in this directory. When you save the project, the files in the cache directory (including the result file, if any) are copied into the project directory. When you close WUFI 2D, it will clear the cache directory.

**Home Directory:** Specify the home directory for projects. When opening or saving projects, WUFI 2D always starts with a display of the directory tree below the home directory. If you create the project directories in this tree, this will allow quick access.

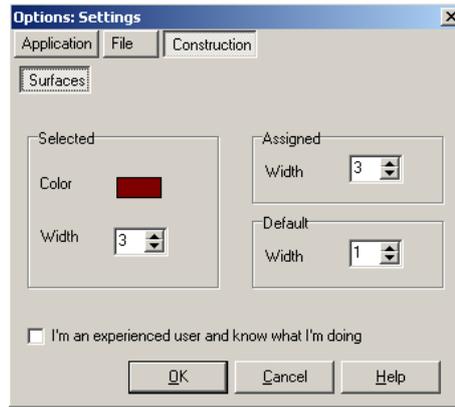
**Database Language:** Set the language in which the database items (materials, constructions) are displayed.



### File Settings:

**clear project directory before saving:** When you save a project then if this option is checked, the project directory will be cleared before the files are copied from the cache directory into the project directory. Please use this option with caution; imprudent use may result in data loss.

**Debug Scripts:** Saves debug information in case of an error.



## Construction Settings:

The parameters specified here determine how the boundary conditions are displayed in the dialog "Surface/ Climate".

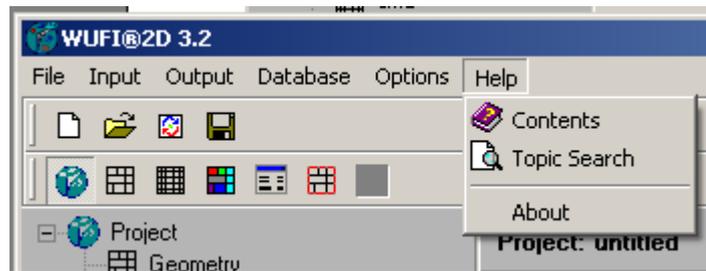
**Selected → Color:** Color used to highlight the selected surface segment of the component.

**Selected → Width:** Line width used to highlight the selected surface segment of the component.

**Assigned → Width:** Line width used to display the assigned boundary condition. The color is specified in the settings for the respective boundary condition.

**Default → Width:** Line width used to display surface segments without assigned boundary conditions. The color is always black.

## The Menu "Help"



The menu „Help“ provides access to WUFI 2D's online help.

## The Menu Items in "Help"

- Contents:** Displays the contents list of the online help. Provides quick access to the different help topics.
- Topic Search:** Opens the keyword search dialog of the online help. Allows you to search for any occurrence of the keyword in the online help text.
- About:** Info about WUFI 2D, including the detailed version number.

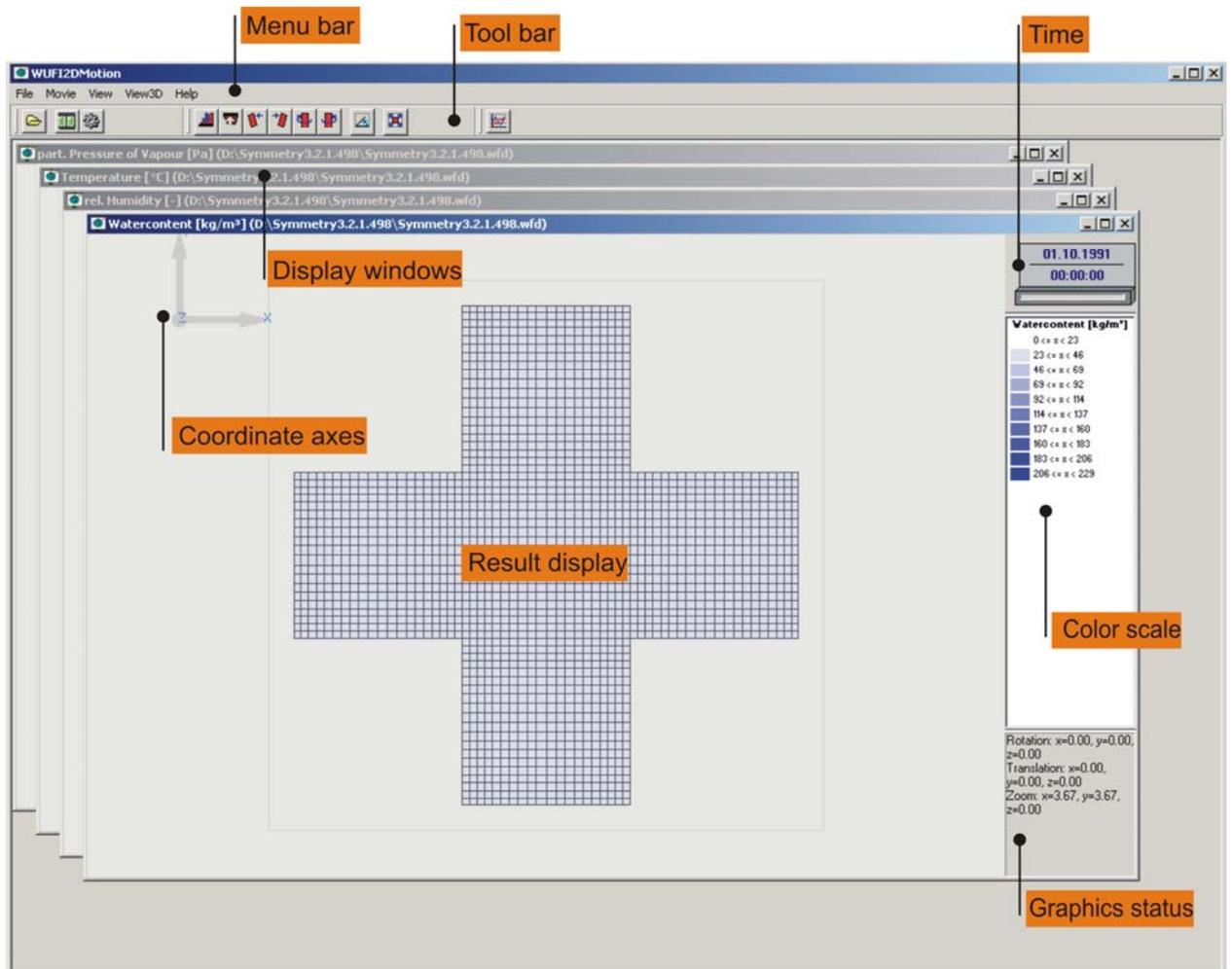
## 2.3 The Tool Bars of WUFI 2D

The buttons in the tool bars provide quick access to the following commands or dialogs:

-  create a new project
-  open a project file
-  revert contents of cache directory to last saved version of project
-  save project
-  open project dialog panel
-  open component geometry dialog panel
-  open numerical grid dialog panel
-  open material data assignment dialog panel
-  open initial conditions dialog panel
-  open surface transfer/climate dialog panel
-  open computational parameters dialog panel
-  open processing control dialog panel
-  launch WUFI2DMotion result viewer (2D)
-  launch WUFI Graph result viewer (1D)
-  display online help topic for the currently active dialog

## 2.4 The Main Window of WUFI2DMotion

After launch of WUFI2DMotion the main window shown below appears. From here you can access all the other menus and dialogs. The following pages contain a short description of the various elements.



The main window contains several document windows, each of which shows one of the computed quantities (e.g. temperature, moisture content etc.) as a two-dimensional color-coded field superimposed on the component geometry. You can rotate the diagrams into a side view so that, in addition to the color coding, the values of the fields are also visualized by their heights along the z-axis. Start the Movie display to see an animation of the hygrothermal processes in the component.

## Elements of the WUFI2Dmotion Main Window

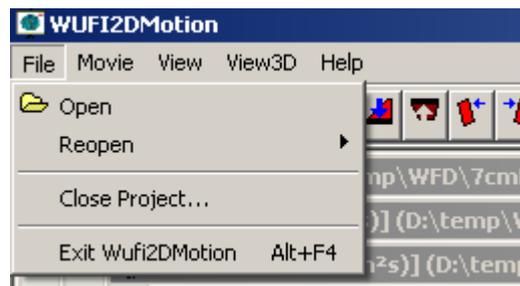
- Menu bar:** The menu bar provides access to the various menus. Open a menu with the mouse to display the individual menu items.
- Tool bars:** Frequently used commands can also be invoked via the tool buttons, allowing quicker access.
- Time:** Date and time of the currently displayed (transient) calculation results.
- Display window:** In these windows the computed results are displayed, either for the selected point in time or as an animation. Each computed quantity is displayed in a separate window.
- Coordinate axes:** The coordinate axes show the current viewing orientation of the component.
- Result display:** The computed quantities are displayed as two-dimensional fields in x- and y-direction, with the field values both color-coded and plotted as heights in z-direction. The display can be rotated freely.
- Color scale:** The color scale shows which colors correspond to which values. Right-click to edit the color scale.
- Graphics status:** The graphics status shows the current settings of the graphical display (rotation angles, zoom etc.), the coordinates of the cursor and the value of the displayed quantity under the cursor.

## 2.5 The Menu Bar of WUFI2DMotion



The menu bar contains the five menus described below.

### The Menu "File"



### The Menu Items in "File"

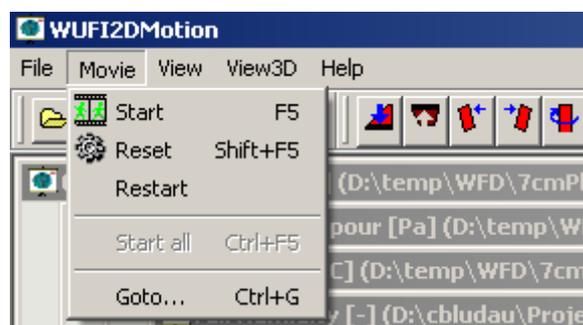
**Open:** Displays the standard Windows dialog for opening existing result files (\*.wfd).

**Reopen:** Displays a list of recently opened files for quick access.

**Close Project:** Closes the result file and all document windows.

**Exit Wufi2DMotion:** Closes the program WUFI2DMotion.

### The Menu "Movie"



## The Menu Items in "Movie"

**Start (F5):** Starts the animated display of the calculation results.

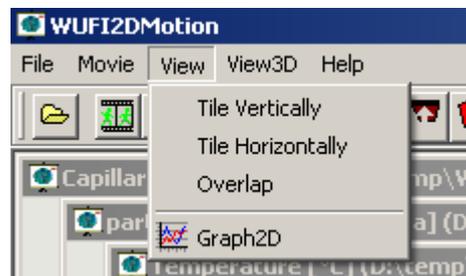
**Reset (Shift+F5):** Stops the animated display and jumps back to start.

**Restart:** Jumps back to start and shows the animation again.

**Start all (Ctrl+F5):** (Currently not implemented).

**Goto (Ctrl+G):** Jumps to a time step entered by the user.

## The Menu "View"



## The Menu Items in "View"

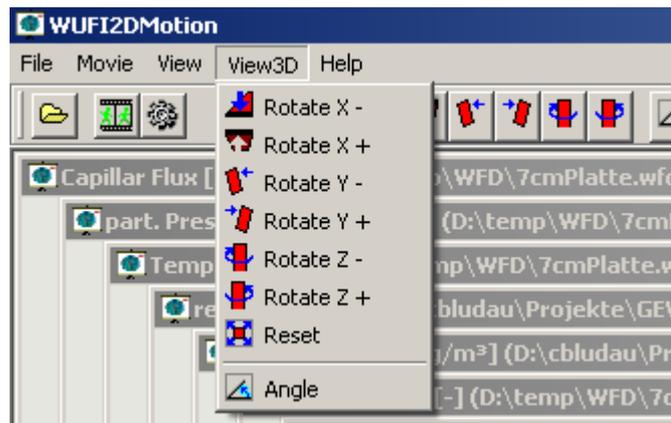
**Tile Vertically:** Rearranges the open document windows side by side and from left to right.

**Tile Horizontally:** Rearranges the open document windows side by side and from top to bottom.

**Overlap:** Rearranges the open document windows in a partly overlapping pattern.

**Graph2D:** Opens WUFIGraph.

## The Menu "View3D"



## The Menu Items in " View3D "

**Rotate X,Y,Z +/-:** Rotates the component display by a positive (counterclockwise) or negative (clockwise) step about the x, y or z-axis. The step width can be specified in menu item "Angle".

**Reset:** Resets rotation and zoom to their initial state.

**Angle:** Specify the step width for the rotations.

## The Menu "Help"



The menu „Help“ provides access to WUFI2Dmotion's online help and ancillary program info.

## The Menu Items in "Help"

**Contents:** (There is as yet no online help for WUFI2Dmotion.)

**Search Help:** (There is as yet no online help for WUFI2Dmotion.)

**About:** Info about WUFI2Dmotion.

**Contact:** Opens the standard e-mail program to send mail to WUFI support.

**IBP on the Web:** Opens the IBP website in the standard browser.

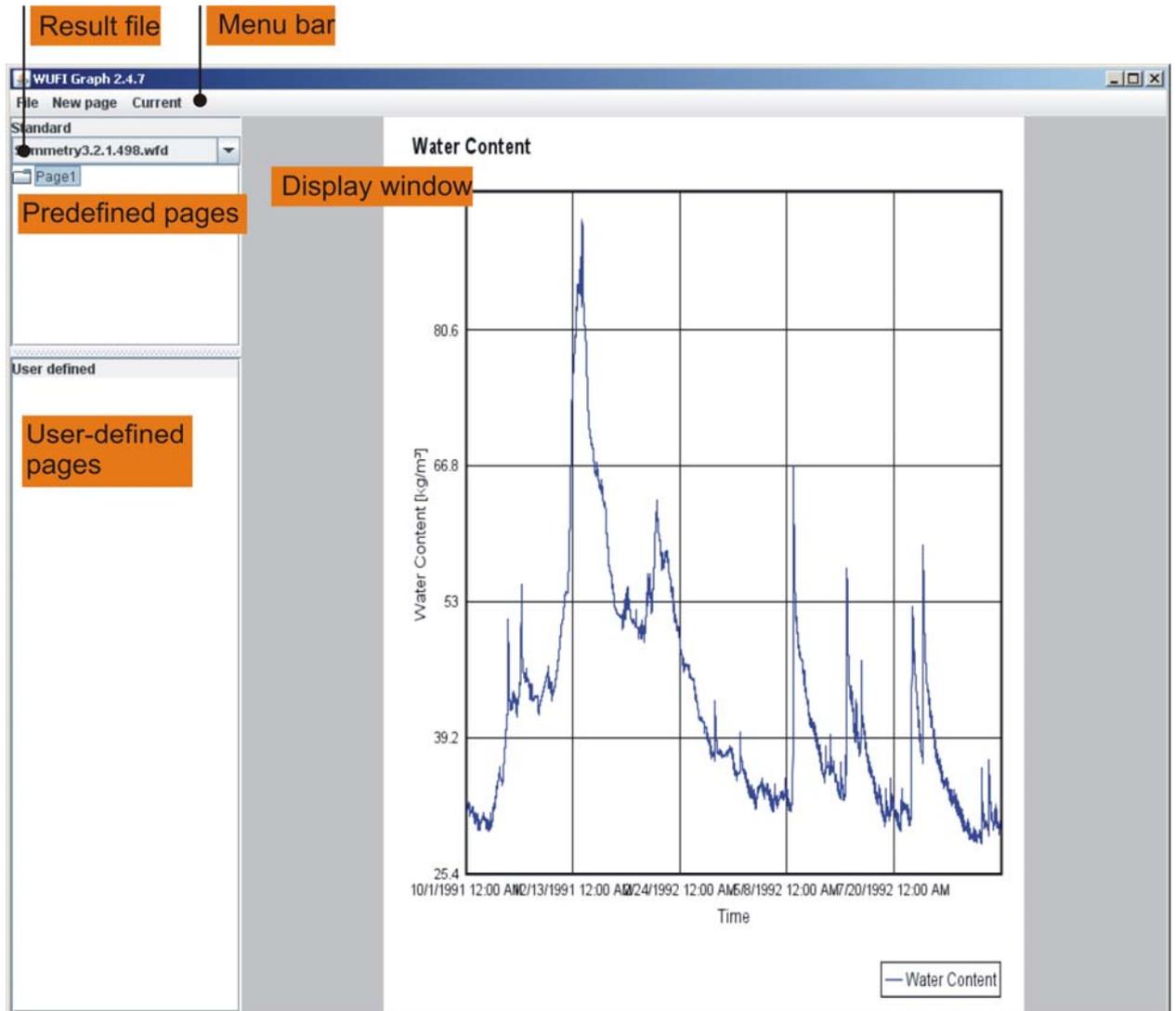
## 2.6 The Tool Bars of WUFI2DMotion

The buttons in the tool bars provide quick access to the following commands or dialogs:

-  open a result file
-  start the film
-  stop the film
-  reset the film
-  rotate clockwise about x-axis
-  rotate counterclockwise about x-axis
-  rotate clockwise about y-axis
-  rotate counterclockwise about y-axis
-  rotate clockwise about z-axis
-  rotate counterclockwise about z-axis
-  specify rotation step width
-  reset display
-  launch WUFI Graph

## 2.7 The Main Window of WUFI Graph

After launch of WUFI Graph the main window shown below appears. From here you can access all the other menus and dialogs. The following pages contain a short description of the various elements.



## The Elements of the Main Window

**Menu bar:** The menu bar provides access to the various menus. Open a menu with the mouse to display the individual menu items.

**Result file:** Shows the name of the active result file. If more than one result file is open, you can select one of them here. If WUFI-Graph opens a project and then displays the corresponding result file name in red, this means that the result file could not be found (see note below).

**Predefined pages:** Displays a list of predefined diagram pages. Currently the list only contains the total water content of the construction ("Page 1").

**User-defined pages:** Here you can create a list of user-defined diagram pages. The diagrams may show the evolution in time of computed quantities (averaged over user-selected regions of the construction), or isopleths, or isolines.

**Display window:** The display window shows the diagram pages or individual diagrams you selected in either of the two lists on the left side of the screen.

A diagram page contains one or several diagrams. A diagram contains one or several curves. Double-click on one of these list items to display the respective sub-items in the list. Single-click on a list item to display it in the display window.

Right-click in the empty space of the "User-defined" list area or on one of the list items to open a pop-up menu with the available options, such as creating new pages, adding a new diagram to a page etc.

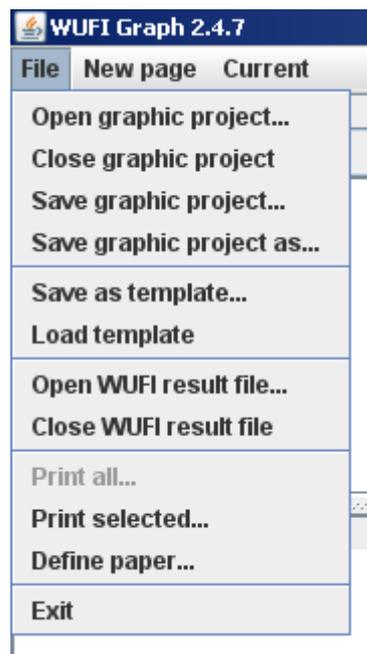
**Note:** If you open a project and WUFI-Graph cannot find the corresponding result file, the result file name will be displayed in red. As a workaround, you can open the graphics project file (SomeName.w2g.xml) with a text editor and edit the path pointing to the WUFI2D project. The path can be found in the third line of the graphics project file, following the element „resultfile filename=“. Please note that the edited file must be saved in UTF-8 encoding; otherwise WUFI-Graph cannot read it.

## 2.8 The Menu Bar of WUFI Graph



The menu bar contains the four menus described below.

### The Menu "File"



### The Menu Items in "File"

**Open graphic project...:** Displays a dialog for opening saved graphic projects \*.w2g.xml (see note below).

**Close graphic project:** Closes the current graphic project.

**Save graphic project...:** Saves the current graphic project (see note below).

**Save graphic project as...:** Saves the current graphic project under a new name. The original project (if any) continues to exist under the old name (see note below).

**Save as template...:** Saves the configuration of the user-defined diagram pages as a template for other WUFI2D result files (for example, re-

peated calculations with variations of material or climate parameters).

**Load template:** Opens a template and then asks for a result file which shall be displayed using the parameters saved in the template.

**Open WUFI result file...:** Opens a WUFI2D result file (\*.wfd) for analysis.

**Close WUFI result file:** Closes the result file displayed in the "result file" text box.

**Print all...:** This function is not yet available.

**Print selected...:** Prints the currently selected page or diagram.

**Define paper...:** Opens the page setup dialog. You can specify paper size, page margins, orientation etc.

**Exit:** Closes WUFIGraph.

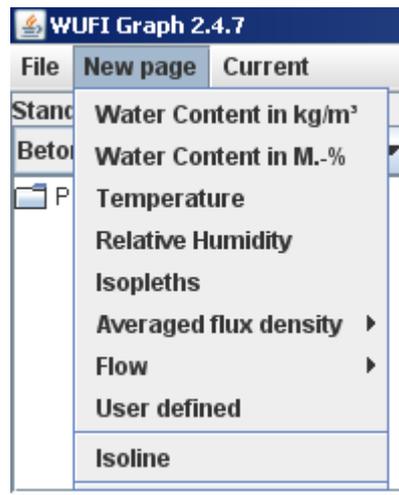
**Note:** When WUFIGraph has been launched by WUFI2D (after a calculation is finished) and you wish to save a graphic project, you must keep in mind that the result file displayed by WUFIGraph currently resides in the cache directory of WUFI2D.

If you save the graphic project into a different directory than the cache directory used by WUFI2D (which contains the WUFI2D result file), the path pointing to the result file will be saved as an absolute path in the graphic project file (SomeName.w2g.xml). However, as soon as WUFI2D is closed, this path is not valid any more, since WUFI2D clears its cache directory before closing.

You should therefore save the graphic project *into WUFI2D's cache directory*. If the graphic project is saved into the directory where the result file resides, WUFIGraph saves a *relative path* pointing to the result file. When the WUFI2D project is subsequently saved, the graphic project file is copied into the WUFI2D project directory along with all the other WUFI2D files, and there it can be re-opened with WUFIGraph whenever needed.

If you open a graphic project and WUFIGraph cannot find the corresponding result file, the result file name will be displayed in red. As a workaround, you can open the graphics project file (SomeName.w2g.xml) with a text editor and edit the path pointing to the WUFI2D project. The path can be found in the third line of the graphics project file, following the element „resultfile filename=“. Please note that the edited file must be saved in UTF-8 encoding; otherwise WUFIGraph cannot read it.

## The Menu "New Page"



This menu allows you to create a new diagram page for the selected quantity. When you select a menu item, WUFI Graph displays a diagram of the building component where you can determine the region over which the selected quantity shall be averaged. Of course, only those quantities can be selected which WUFI2D has written to the result file (see the "Computational Parameters" dialog of WUFI2D).

If you select "Isoline", WUFI Graph creates a 3D-diagram where the desired quantities are displayed as two-dimensional fields in x- and y-direction, with the field values both color-coded and plotted as heights in z-direction, similar to WUFI2DMotion. Each isoline plot must be on a separate diagram page.

## The Menu Items of "New Page"

**Water content in kg/m<sup>3</sup> or M.-%:** Adds to the user-defined pages a new page with a diagram showing the water content in kg/m<sup>3</sup> or M.-%, respectively.

**Temperature:** Adds to the user-defined pages a new page with a diagram showing temperature.

**Relative Humidity:** Adds to the user-defined pages a new page with a diagram showing relative humidity.

**Isopleths:** Adds to the user-defined pages a new page with a diagram which plots relative humidity against temperature for all computed time steps. In addition, the growth curves for mold as determined by Sedlbauer are shown in the diagram to allow assessing the mold growth risk.

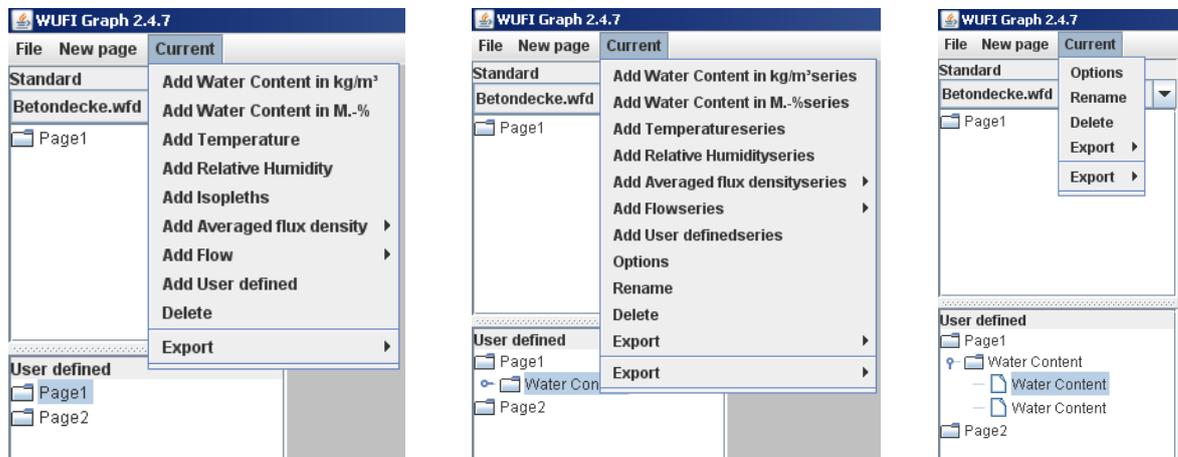
**Averaged Flux Density [W/m<sup>2</sup>][kg/sm<sup>2</sup>]**

**Flow [W][kg/s]:** Adds to the user-defined pages a new page with a diagram showing a flux density or a flow. WUFIGraph displays a diagram of the building component where you can define a "flux detector line" representing a cross-sectional area over which the flux/flow is evaluated. A flux is the average over this area, a flow is the sum over this area. You can choose between heat flow/flux density, diffusion flow/flux density and capillary flow/flux density.

**User-defined:** Adds to the user-defined pages a new page with a freely user-defined diagram. You can choose between water vapor partial pressure, relative humidity, temperature and water content.

**Isoline:** Adds to the user-defined pages a new page with an isoline diagram. You can choose between isoline diagrams for water vapor partial pressure, relative humidity, temperature and water content.

## The Menu "Current"



The contents of the menu "Current" depend on which list items are currently selected in the user-defined pages list. If nothing is selected, it is identical to the menu "New page". If a page is selected, it allows to add a diagram to that page. If a diagram is selected, it allows to add another curve to that diagram (with a new axis if needed). If a curve is selected, its properties can be edited. Most of the various functions are the same as in the menu "New page", thus only new functions are explained in the following.

## Some Menu Items of "Current"

**Options (if a diagram is selected):** Opens a dialog for editing diagram settings.

**Options (if a curve is selected):** Opens a dialog for selecting the grid elements to be evaluated and for editing the curve settings.

**Rename (if a diagram or a curve is selected):** Allows to edit the title of the selected diagram or curve.

**Delete:** Deletes the selected page, diagram or curve.

**Export:** Offers various options to export the data to an ASCII file or as a graphics file.