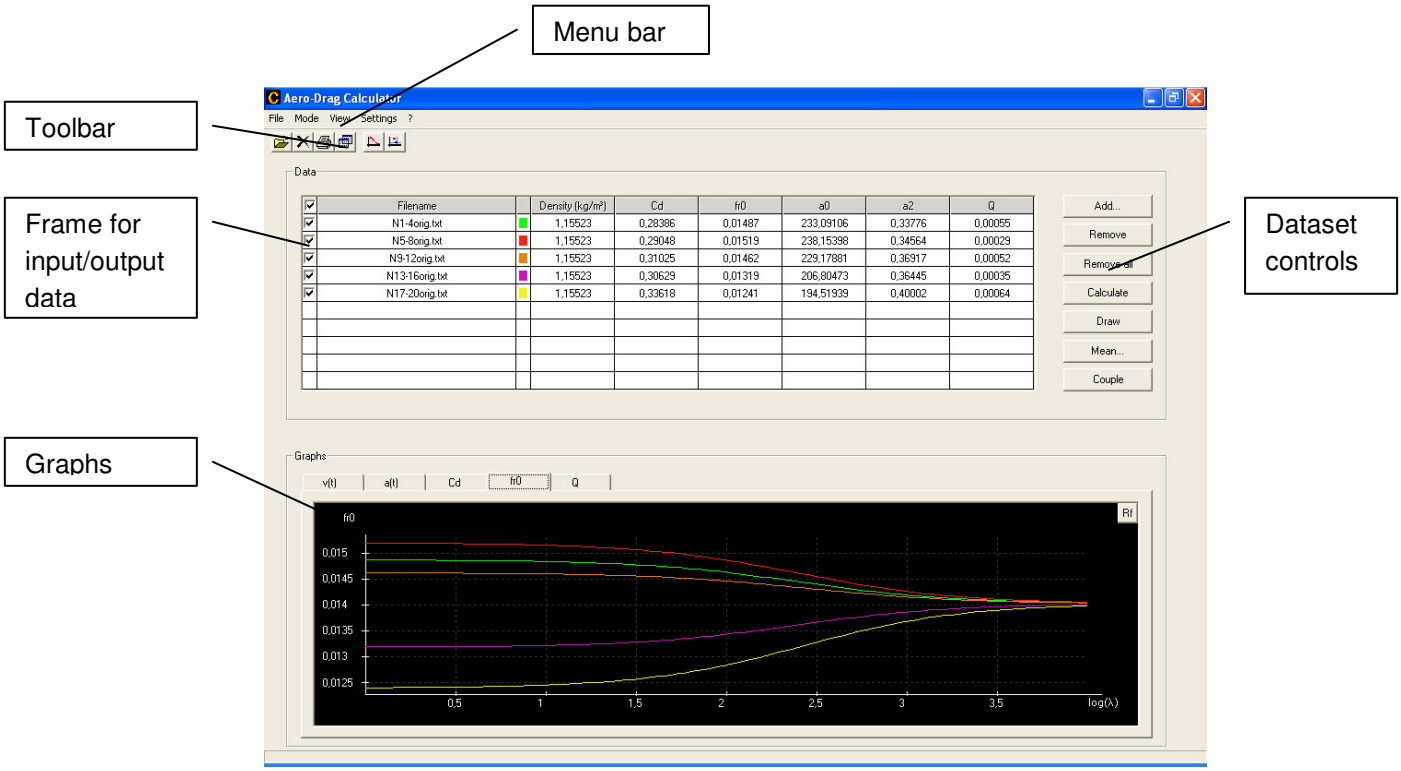
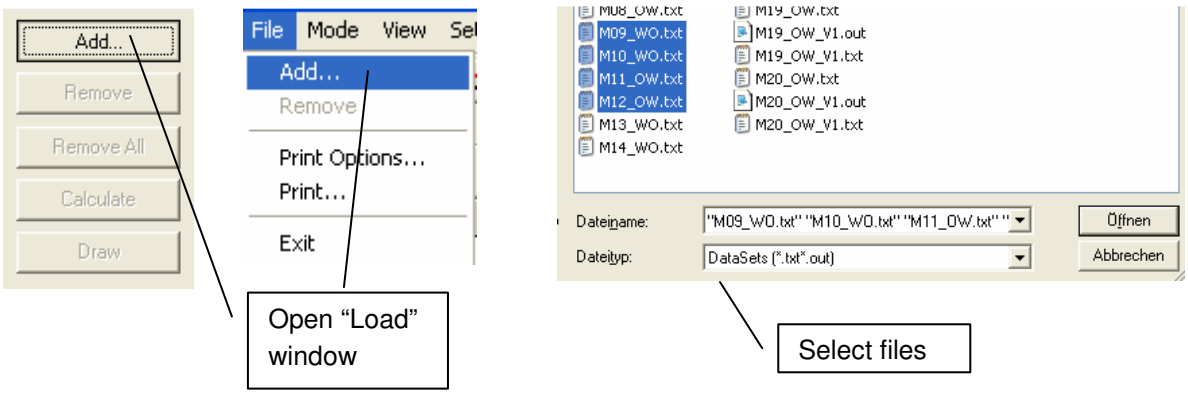
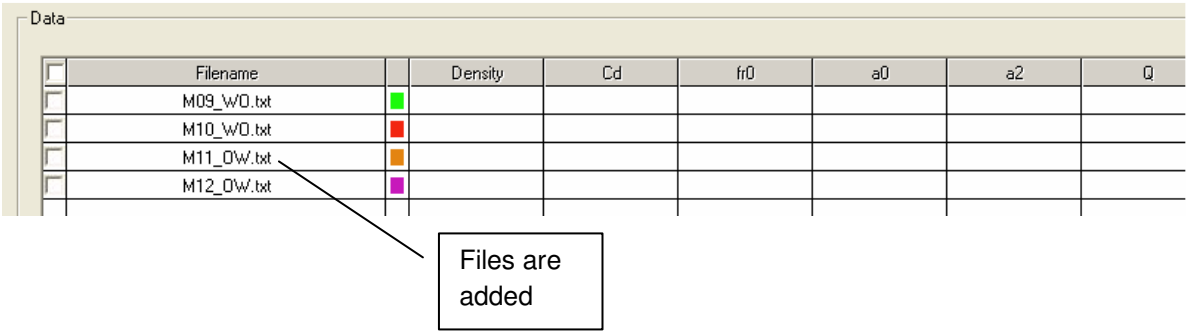
1. Main Window



2. Add Files

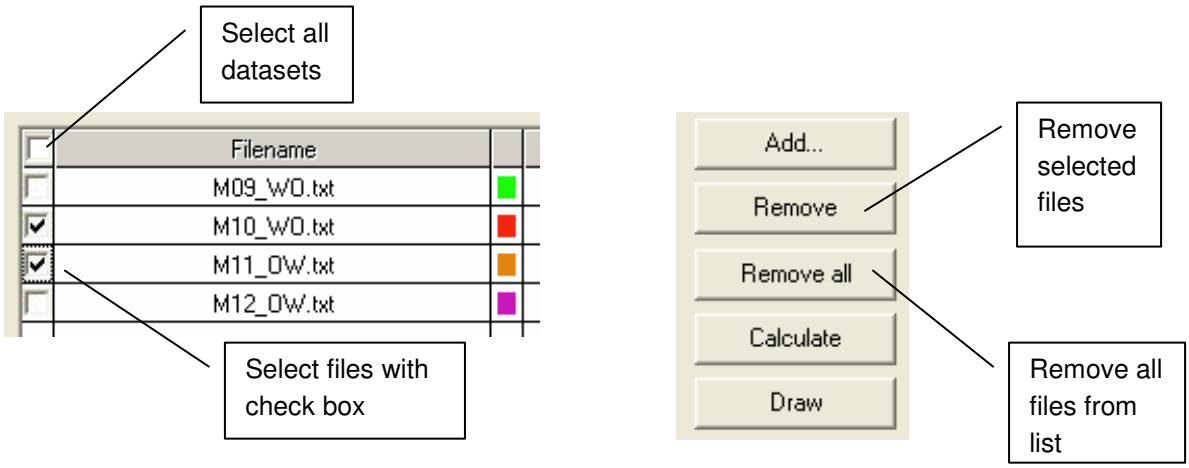
First, check if the right data format is adjusted (see sec. 9.3 Adjust File Format). Use the command button ***Add..*** in the dataset control area or ***File > Add…*** in the menu bar for adding a file to the data grid. Select one or more files in the "Load" window. If the data format of the file is equal to the adjusted data format, the file will be added to the data grid.





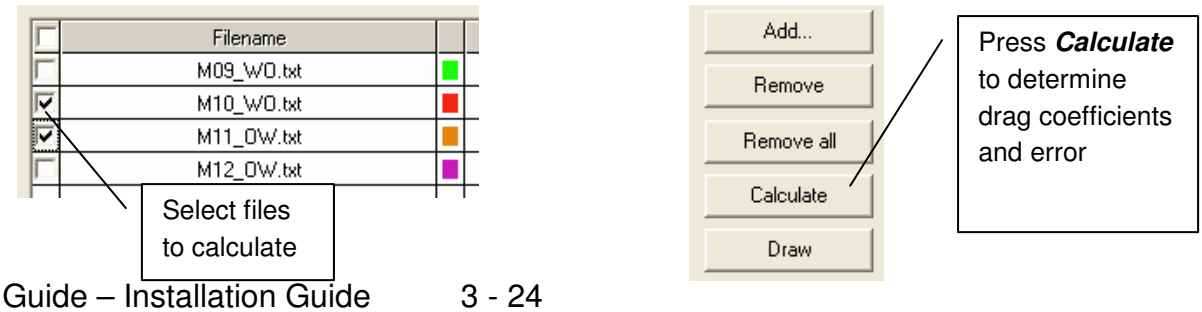
3. Remove Files

For removing files, select the files and click the ***Remove*** button in the control area. For removing all files, use the command button ***Remove all***.

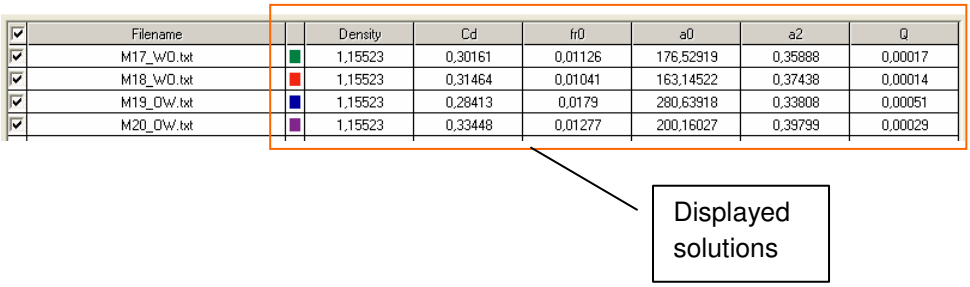


4. Calculate

If the files are added successfully to the list, select the files to calculate and ensure that all input parameters are set for these datasets (see sec. 10 Set Input Parameters). Use the command button ***Calculate*** for calculating the drag coefficients and the deviation Q of the measurement file from the solution of the ODE.



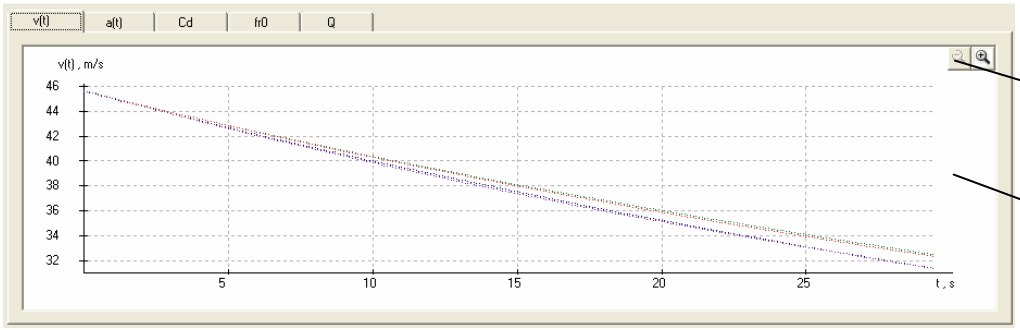
The solutions of the calculation are displayed in the columns beside the filename-column.



	Filename		Density	Cd	fr0	a0	a2	Q
☑	M17_WO.txt		1,15523	0,30161	0,01126	176,52919	0,35888	0,00017
☑	M18_WO.txt		1,15523	0,31464	0,01041	163,14522	0,37438	0,00014
☑	M19_0W.txt		1,15523	0,28413	0,0179	280,63918	0,33808	0,00051
☑	M20_0W.txt		1,15523	0,33448	0,01277	200,16027	0,39799	0,00029

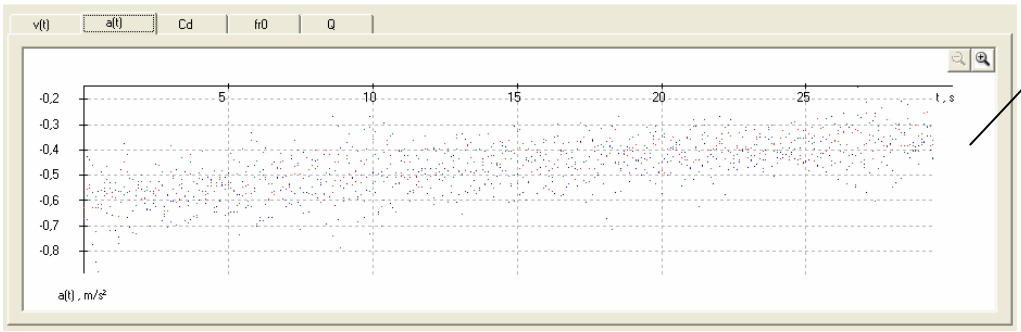
Displayed solutions

The graphs below the filegrid display the velocity-time history, the calculated accelerations and the c_D, f_{r0} and Q values. The ***Zoom*** control works for the first and the second graph (see sec. 12.1 Zoom).
Use the Tab control for selecting the different graphs.

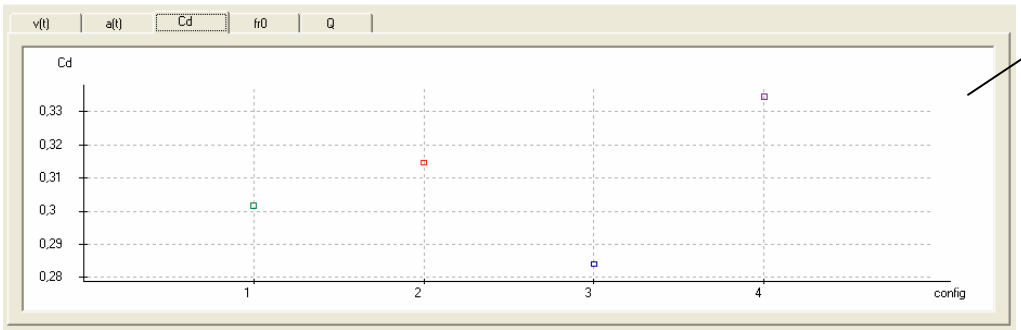


Zoom controls

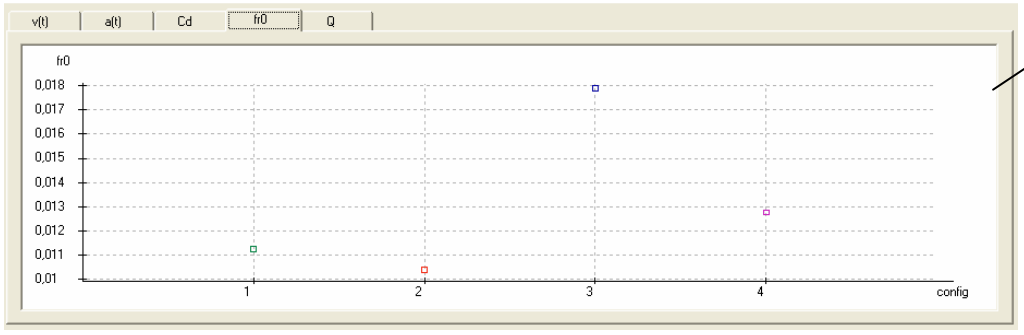
Velocity-time history



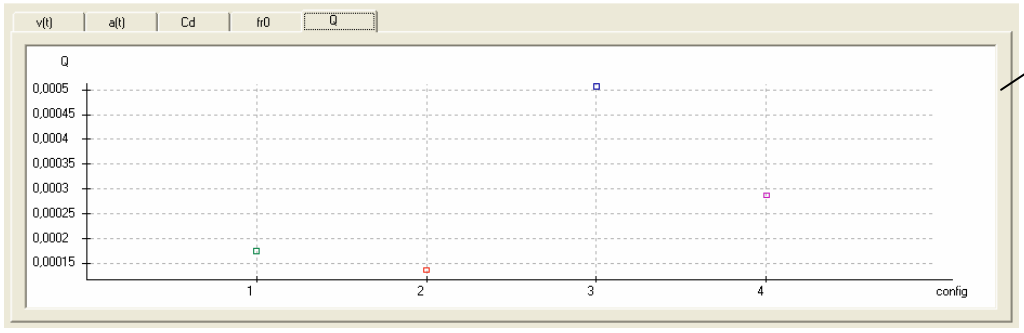
a(t)



c_D – values



f_{r0}- values

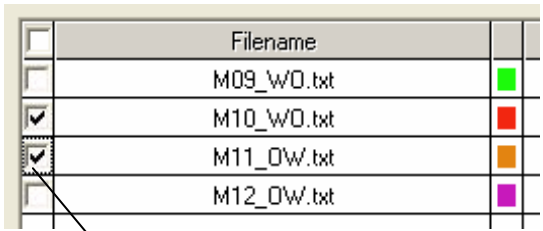


Q - values

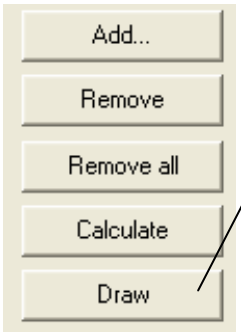
A further possibility to analyze the calculated c_D and f_{r0} data is the "Comparison tool" (see sec. 8 Comparison) and the menu option ***Diagrams…*** (see sec 12.4 Compare Graphs).

5. *Draw*

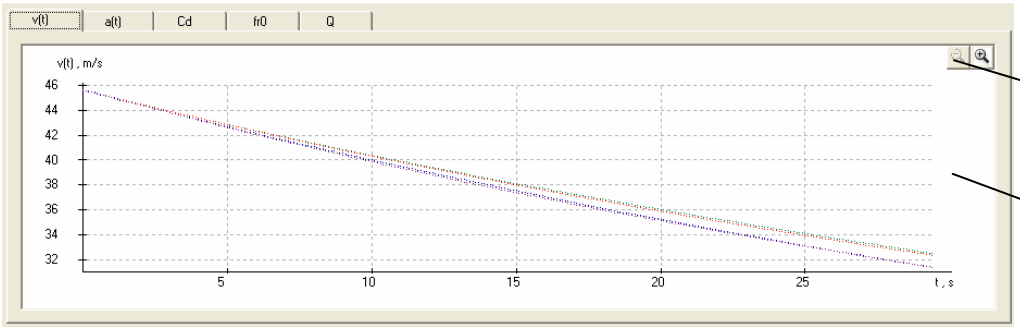
Use the command button ***Draw*** for displaying the different velocity-time histories without calculating.



Select files to draw



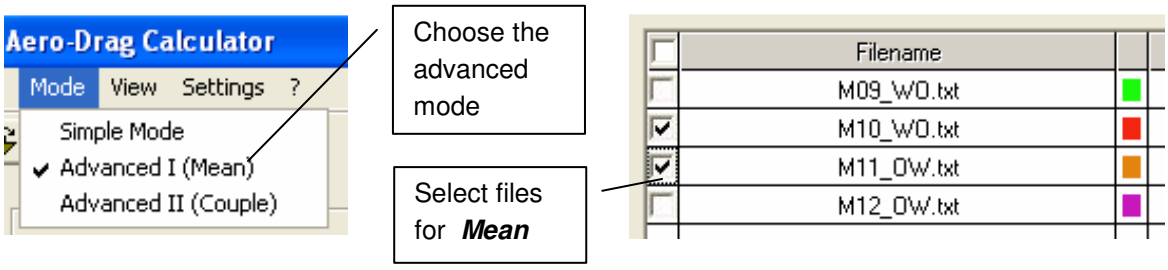
Press ***Draw*** to visualize the velocity-time histories

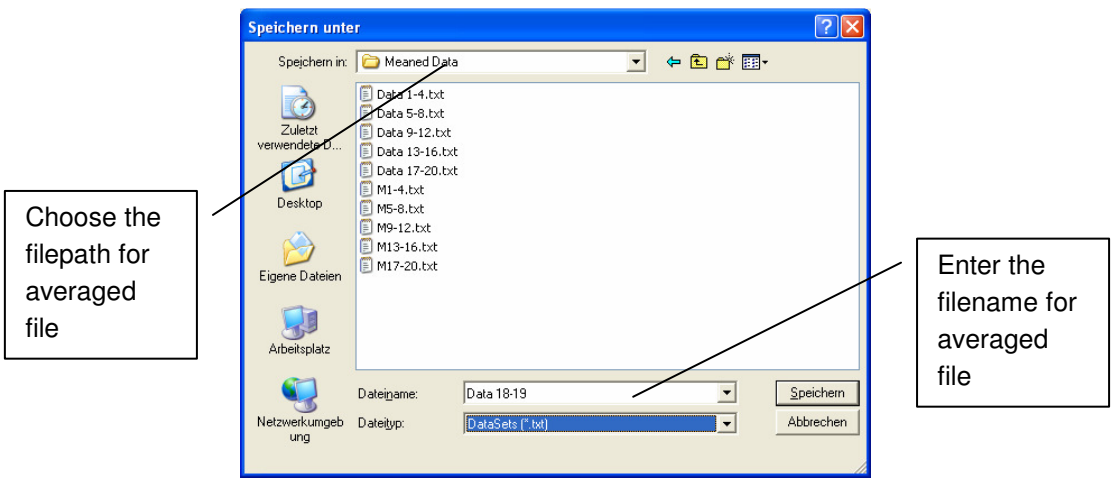


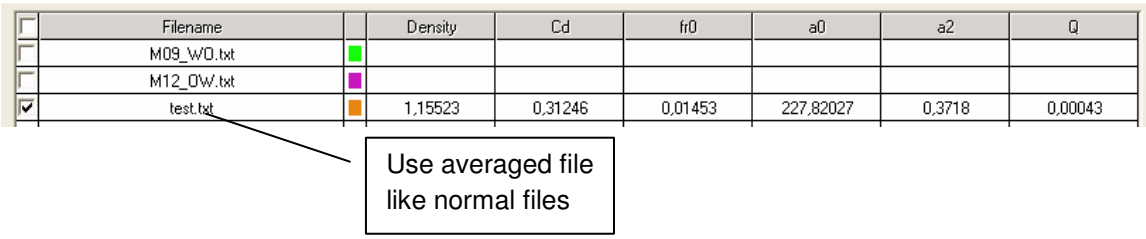
6. Mean

This tool makes it possible to build the average of two or more files, e.g. average the different data points at the same time to one data point. This is useful if it is necessary to compare the different runs of one car-configuration with runs of other configurations.

First of all, select the ***Advanced I (Mean)*** mode in the menu bar. The command button ***Mean*** is then displayed in the dataset control area. Select the files and use the button ***Mean*** to build one average file of the selected. With this command the "Save" window will be opened. Choose the filepath and filename for the averaged file and confirm. The original files will be removed then and the averaged file will be added to the datagrid. Now it is possible to work with this file like the normal input data files.

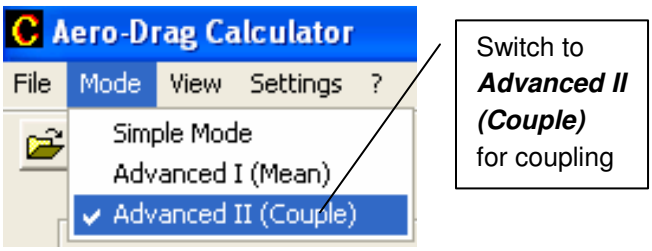




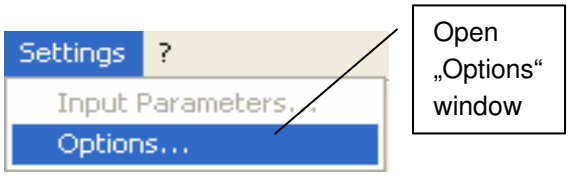


7. Couple

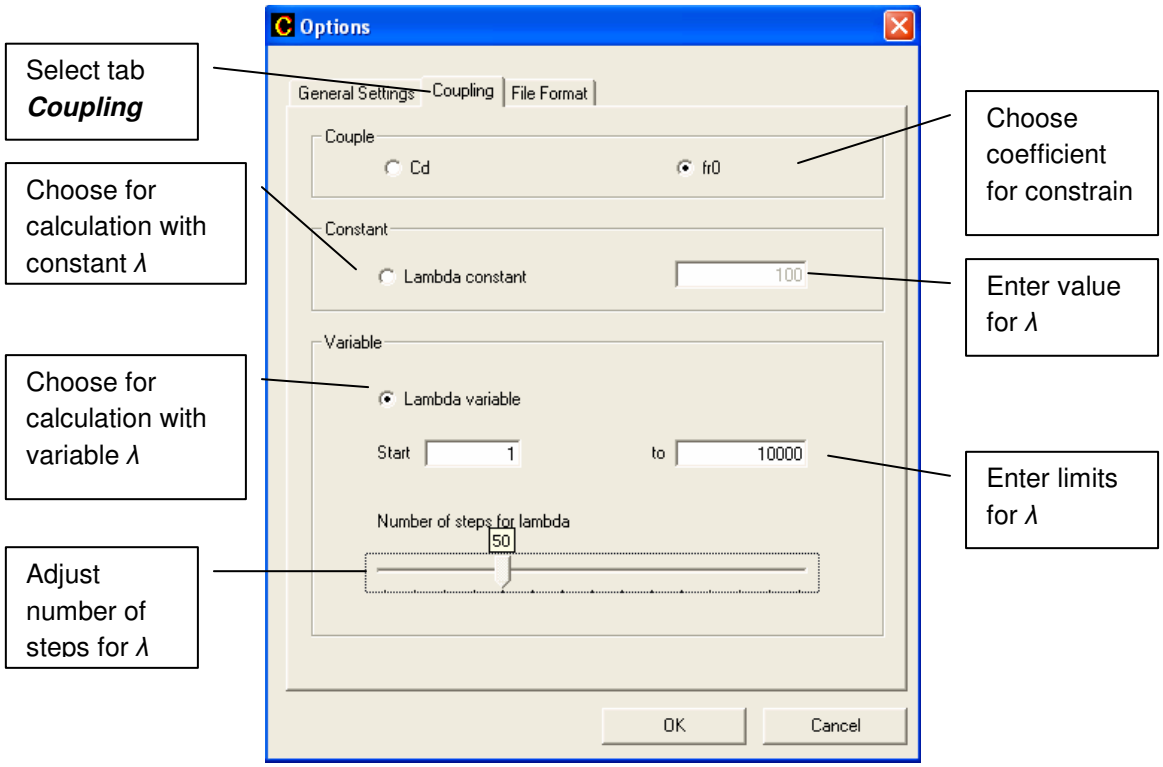
First of all, select ***Mode*** and ***Advanced II (Couple)*** in the menu bar for switching to "Coupling" mode. The command button ***Couple*** is then displayed in the dataset control area.



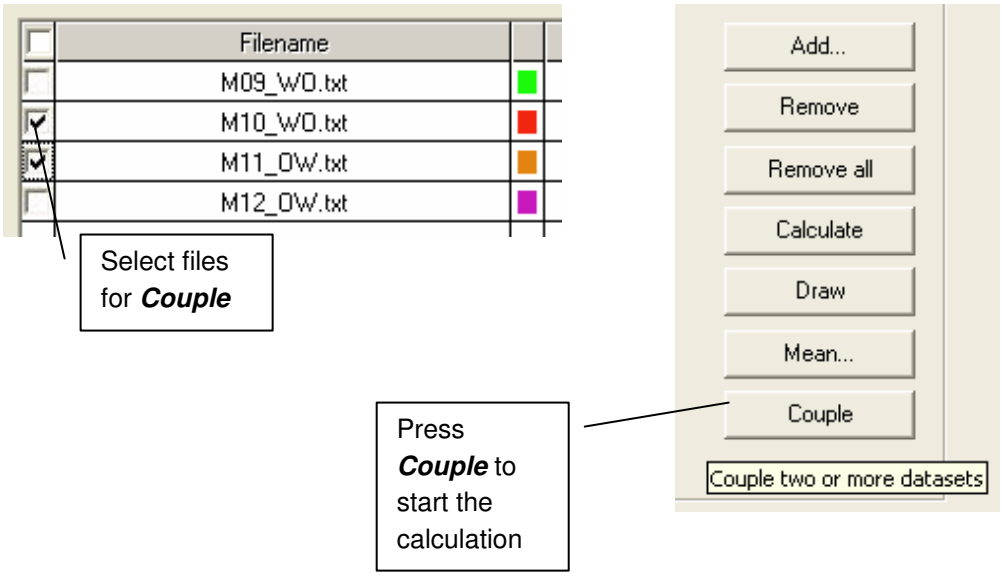
If you would like to use the coupling mode of the program, it is necessary to adjust several settings in the "Options" window. Use ***Settings*** and ***Options…***



to open the "Options" window. Switch to the tab ***Coupling*** to adjust the coupling settings. Select in the first frame which coefficients should be coupled during the calculation. Choose in the second and third frame whether you'd use a constant or a variable coupling coefficient λ. If you choose the mode for calculating with constant λ, enter the value in the text box beside. If you use a variable λ, enter the upper and lower boundary and the number of steps for λ with the slider.

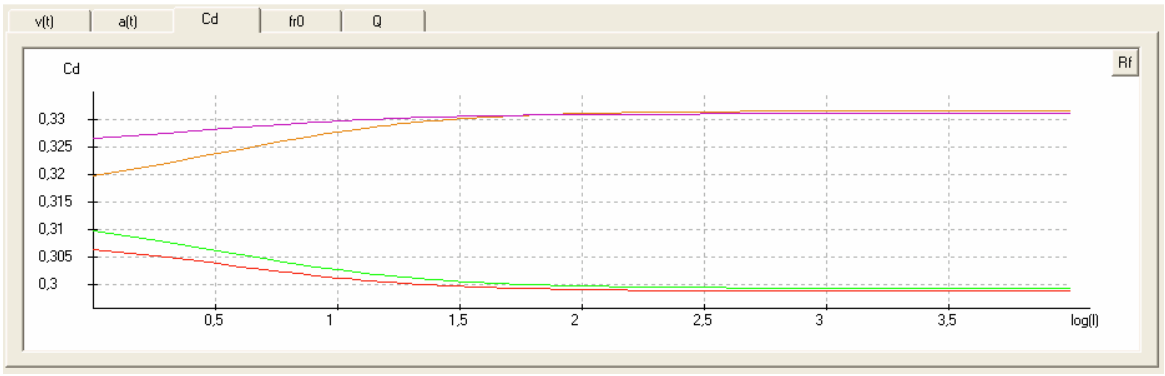


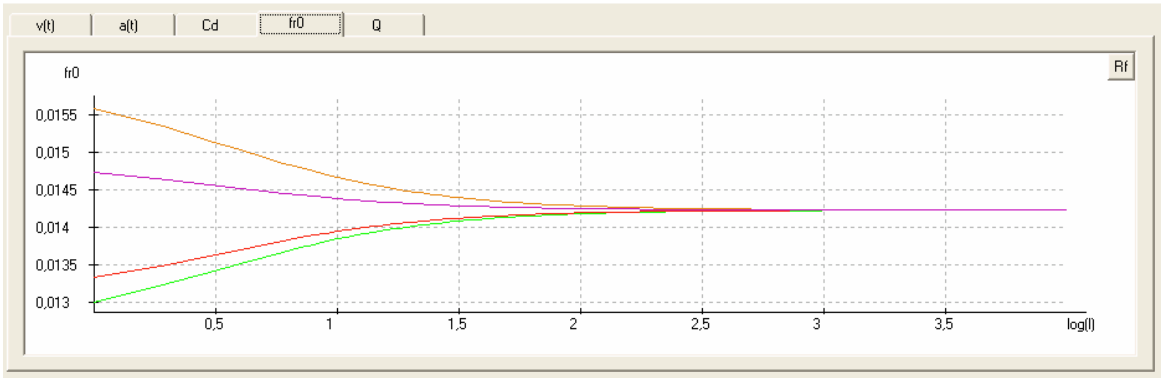
After the successful adjustments of the coupling mode, add the necessary input parameters for the datasets (see sec. 10 Set Input Parameters) and select the files for coupling. Use the command button ***Couple*** to start the calculation.

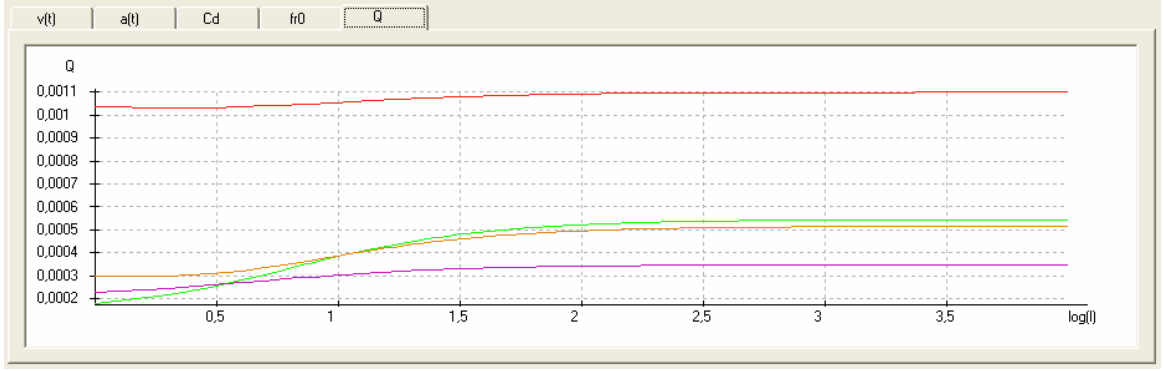


Case 1: constant λ: After the calculation, all calculated values for the entered *λ* are displayed in the datagrid. The output of the graphs is similar to the output of the standard calculate mode.

Case 2: variable λ: After the calculation, the values for the lower bound of the entered range for *λ* are displayed in the datagrid. The output of the graphs c_D, f_{r0} and Q are now dependent of the logarithmic *λ*. The various datasets are drawn with different colours.

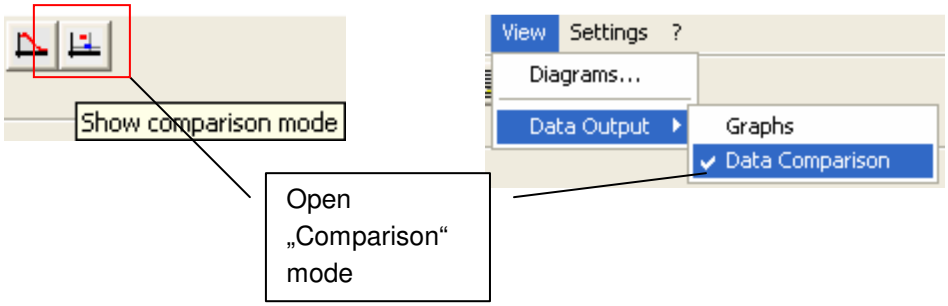




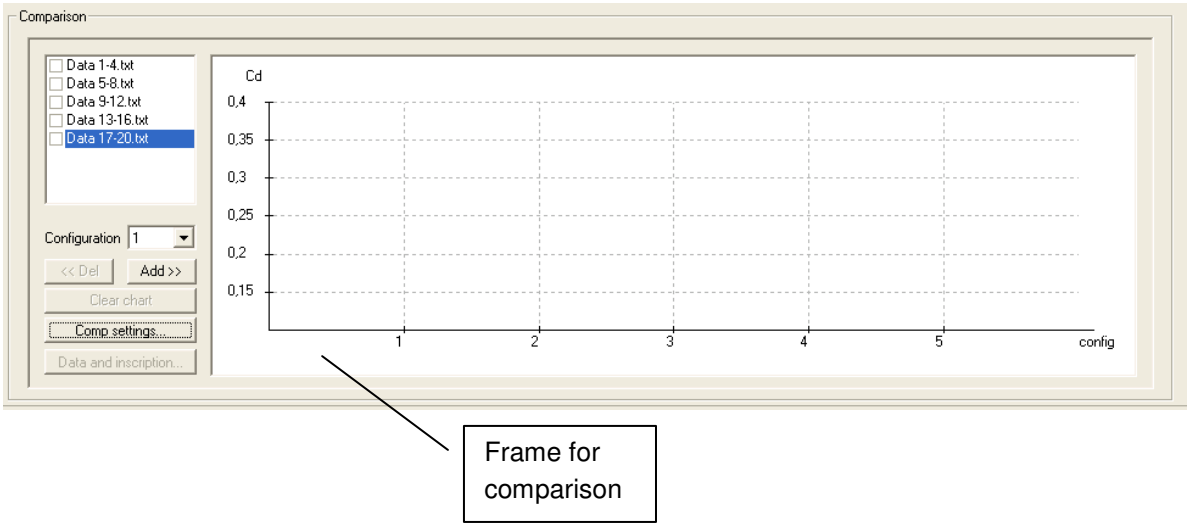


8. Comparison

Use the analysing method “Comparison” to compare the different c_D and f_{r0} values. Precondition for this is that the files to compare are already calculated. Choose the button ***Show comparison mode*** in the toolbar or use ***View > Data Output > Data Comparison*** in the menu bar to switch to comparison mode.

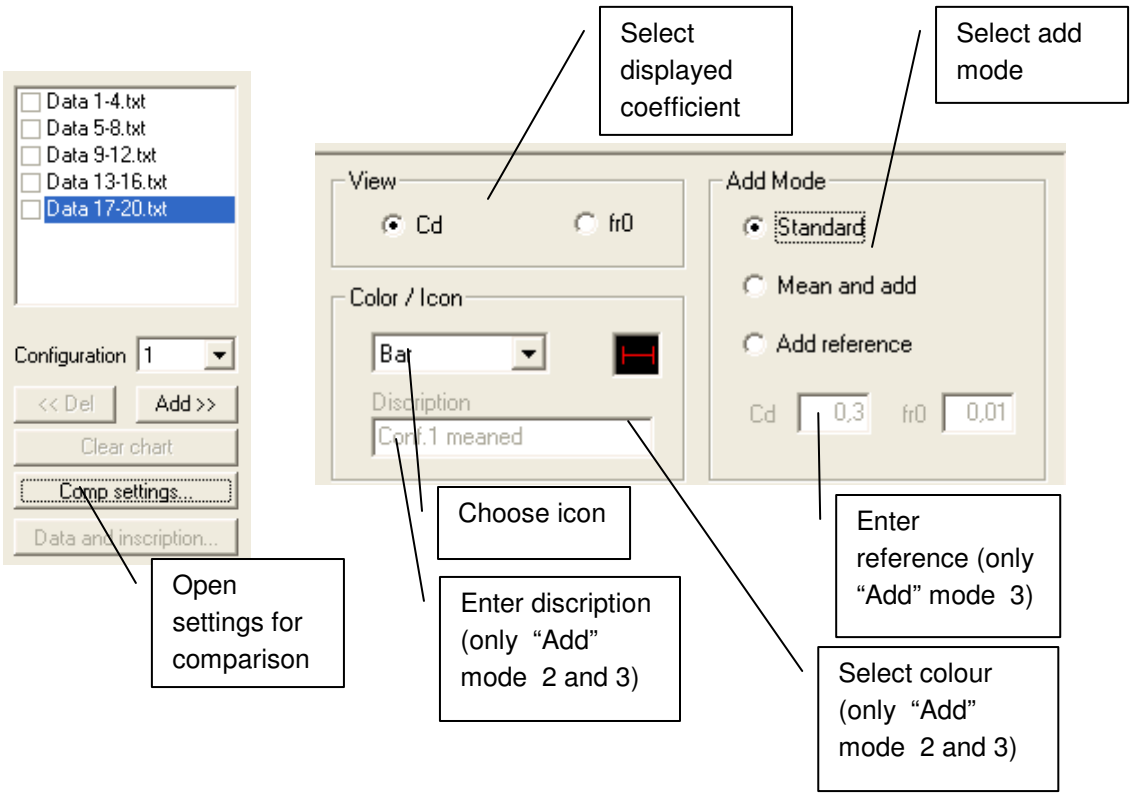


The graphs are hidden then and the frame for the comparison mode is opened.

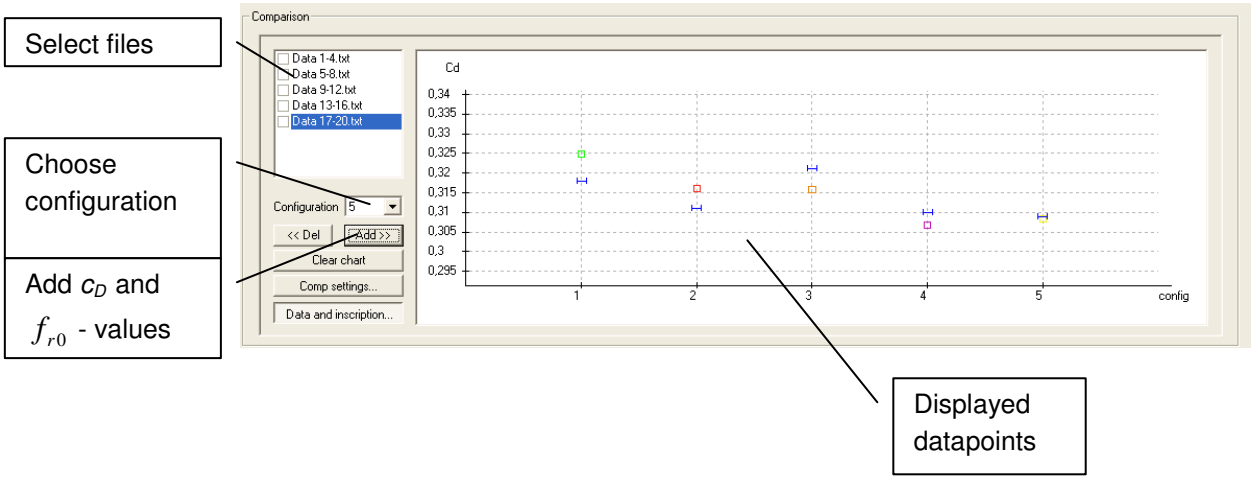


Use the button ***Comp settings*** to open the settings for the comparison. Adjust in the frame ***View*** which type of coefficient should be displayed. Choose in the frame ***Add mode*** how the data should be added: ***Standard*** means that the c_D or f_{r0} values are added directly, ***Mean and add*** means that the values of the selected files are at first averaged and then added, ***Add reference*** means that the values in the text boxes below are added. Select in the frame ***Color/Icon***

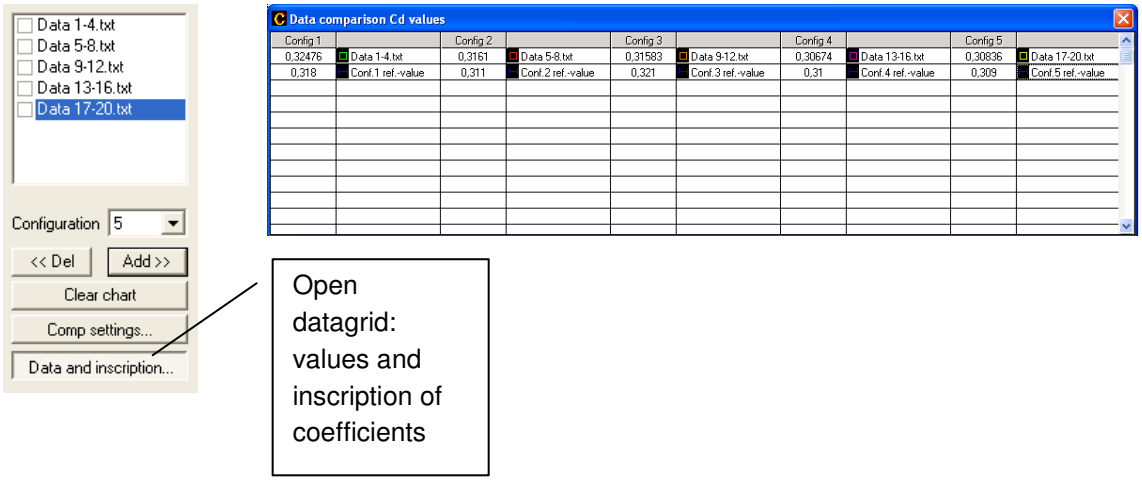
which type of icon should be used for adding. If the two modes ***Mean and add*** or ***Add reference*** are adjusted, it is also possible to select a colour by clicking on the icon or to enter a description for the data point.



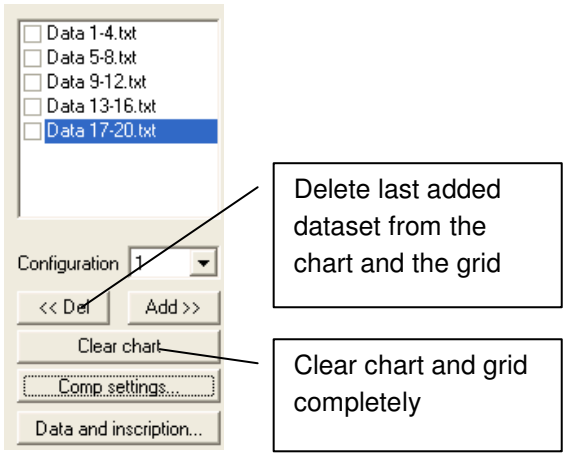
After the successful adjustment of these settings, select the files whose c_D and f_{r0} values should be added. Furthermore use the combo box for adjusting the configuration of the selected datasets. Click ***Add>>*** for adding the coefficients to the chart.



Use the button ***Data and inscription*** to display the values and the inscription of the added datapoints.



Press the button ***<<Del*** for removing the last added datapoint from the chart and the grid. The button ***Clear chart*** clears the chart and the grid completely.



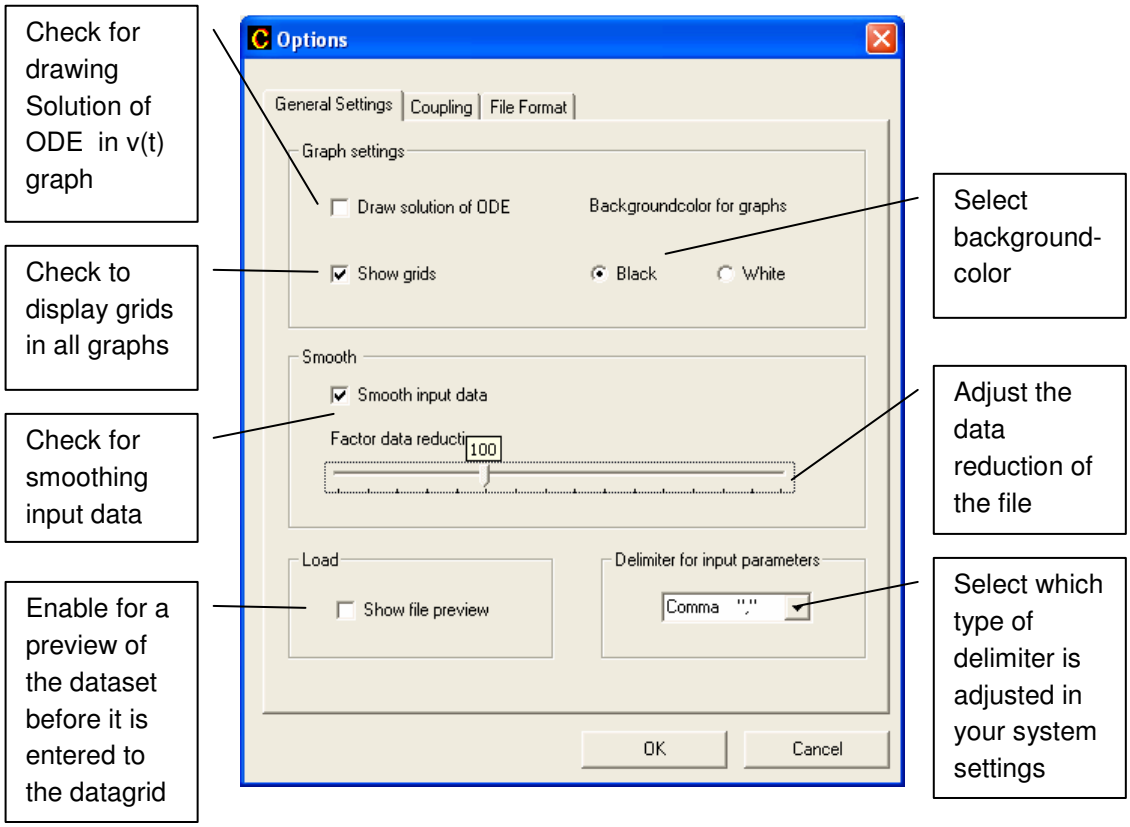
9. Options

Use ***Settings*** and ***Options…*** to open the “Options” window.

9.1. General Settings

9.1.1. Graph Settings

The first frame ***Graph settings*** contains adjustments for the graphs in the software. Enable the checkbox ***Draw solution of ODE*** for drawing the solved differential equation of motion in the “*v(t)*-graph”. Use the checkbox ***Show grids*** to display grids in the graphs. It is also possible to set the background-colour with the two radio buttons beside.



9.1.2. Smooth Input Data

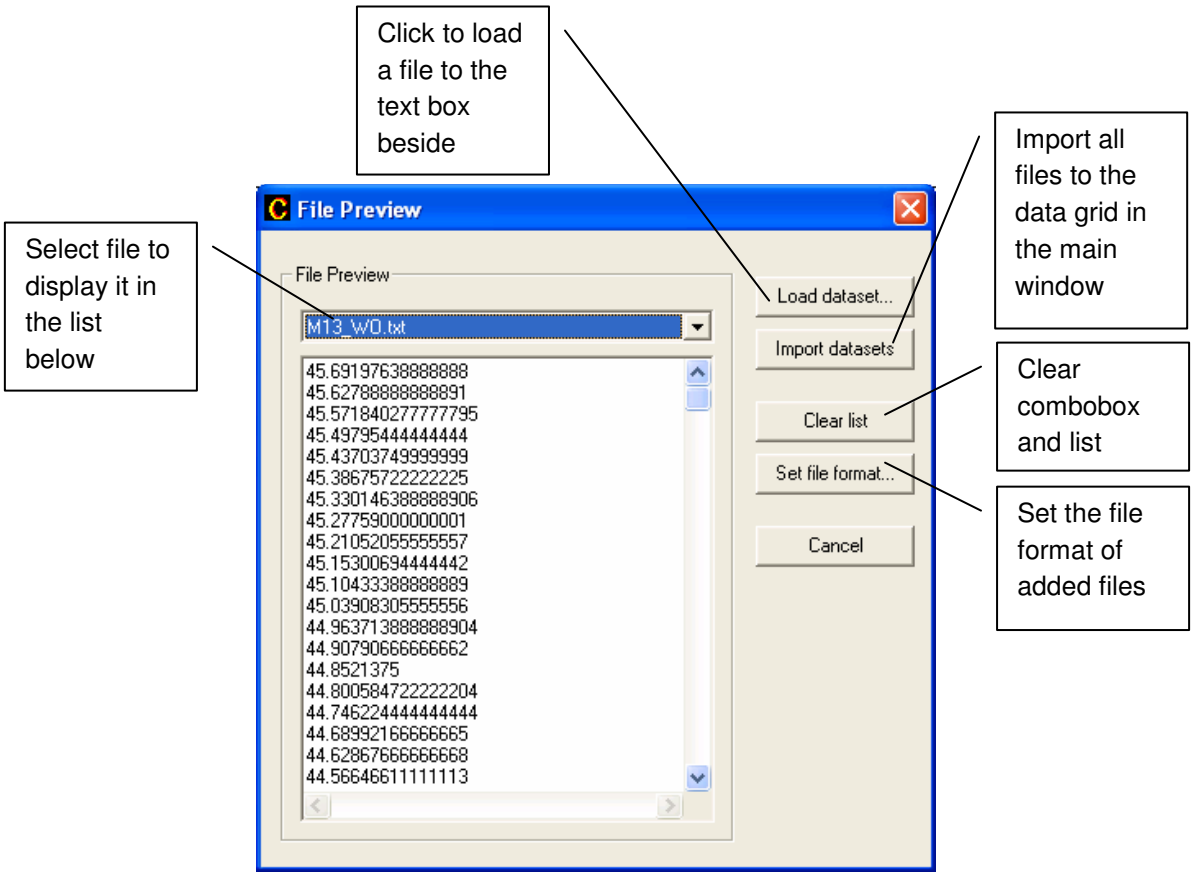
Use the option ***Smooth input data*** for reducing the amount of data points in the file when it is opened for the calculation. With this mode a definite number of data points is averaged to one. Adjust this number with the slider below.

9.1.3. Delimiter for Input Parameters

Select with the combo box which type of delimiter is adjusted in your system settings. All inputs in the several text boxes are then transformed to this delimiter.

9.1.4. Load

Enable the checkbox ***Show file preview*** to take a look to the content of the file before it is added to the datagrid. If this mode is selected the window “File Preview” is opened when the user wants to add a file to the data grid.



Click the command button ***Load dataset…*** to load one or more files to the text box. If more than one file is added, select the file which should be displayed in the text box with the combo box. Press ***Import datasets*** to add all files to the

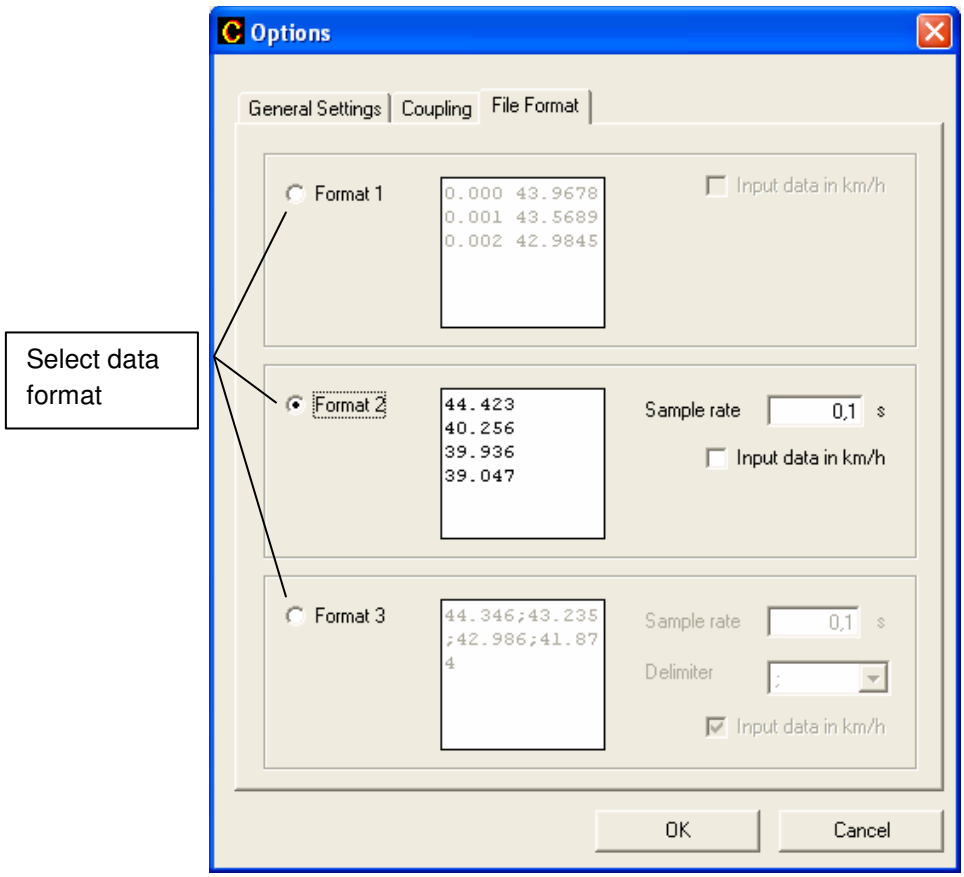
data grid in the main window. Use ***Clear list*** to clear the text box and the combo box. Press the command button ***Set file format…*** for adjusting the file format before the files are added to the data grid in the main window.

9.2. Coupling

See sec. 7. Couple

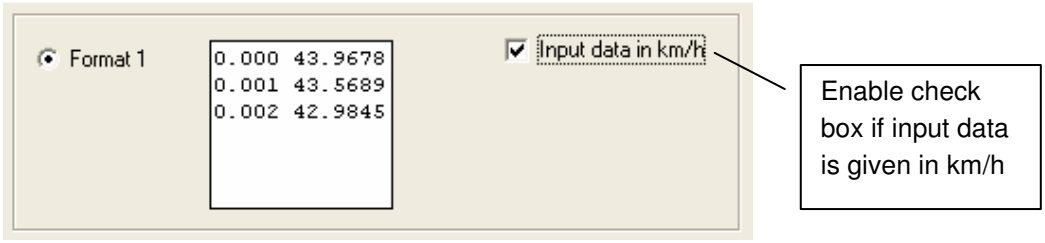
9.3. Adjust File Format

Use the third tab of the “Options” window to adjust the file format of the data sets. There is the option to decide between three different formats.

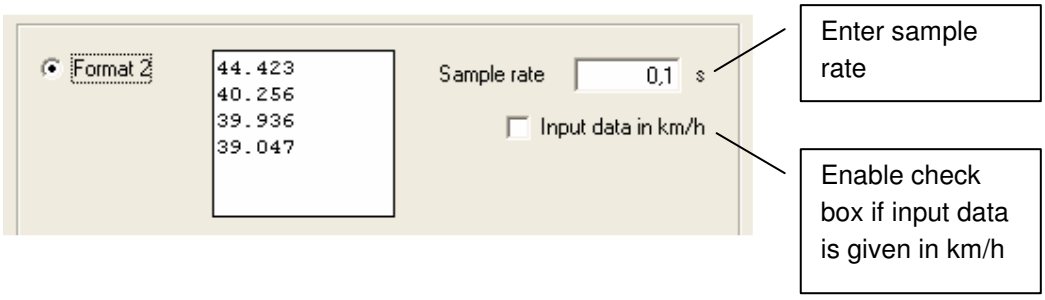


Format 1: Use ***Format 1*** if the file contains information about the time in the first column and the velocity values in the second column. The delimiter

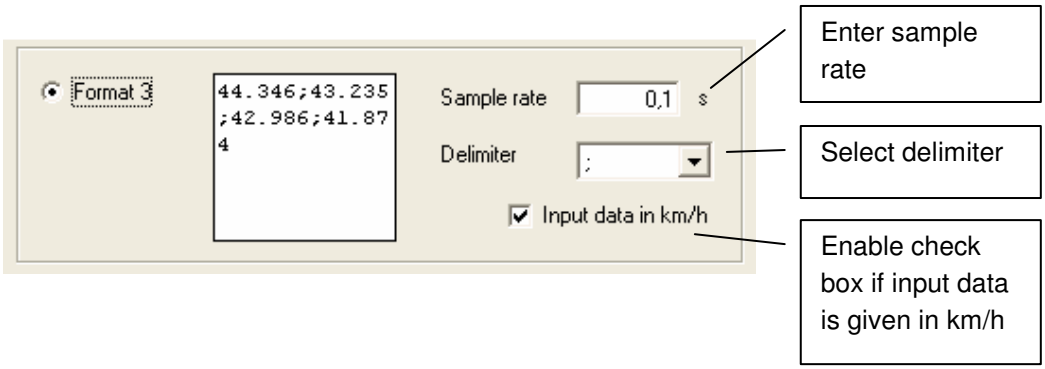
between the time and the velocity has to be a space. Enable the check box if the data is given in km/h.



Format 2: (Standard format). Use this format if the velocity data is saved in one column. Enter the sample rate for the file and enable the check box if the data is given in km/h.

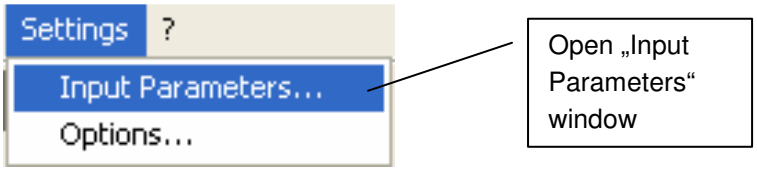


Format 3: Use ***Format 3*** if the velocity data is separated by a semicolon, space or tabulator. Enter the sample rate for the file and enable the check box if the data is given in km/h. Adjust the delimiter with the combo box.

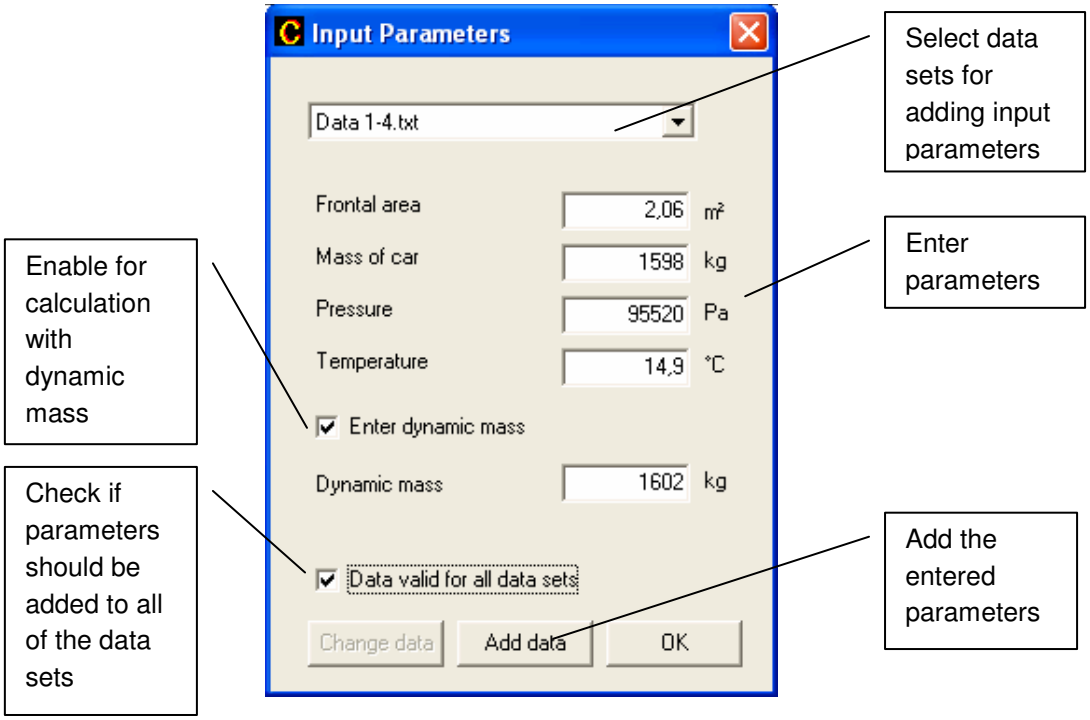


10. Set Input Parameters

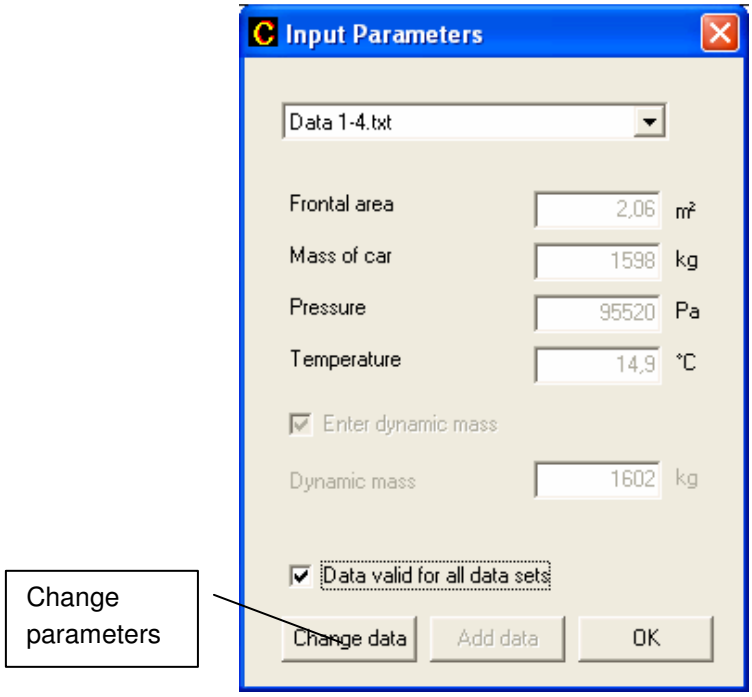
After the successful import of the files it is necessary to add several input parameters for the calculation. Open the "Input Parameters" window with ***Settings>Input Parameters***.



First of all use the combo box to select a file. Enter the parameters for the selected file in the text boxes. Choose with the check box ***Enter dynamic mass*** if the calculation should be fulfilled with a dynamic mass. If the check box is not enabled, the dynamic mass is automatically set to 103% of the mass of the vehicle. Enable the check box ***Data valid for all data sets*** if the adjusted parameters are the same for all files. Use the command button ***Add*** to connect the values with the selected data set.

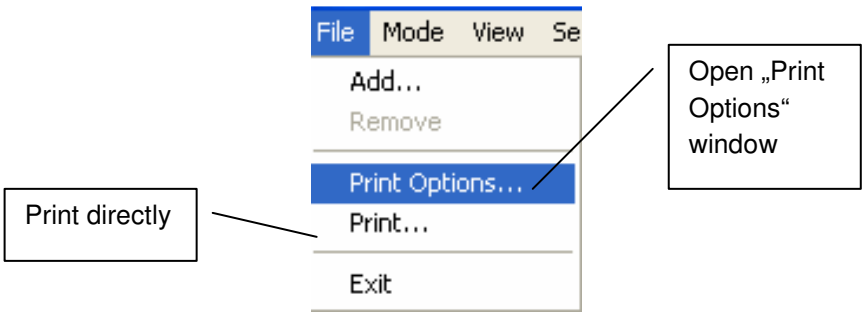


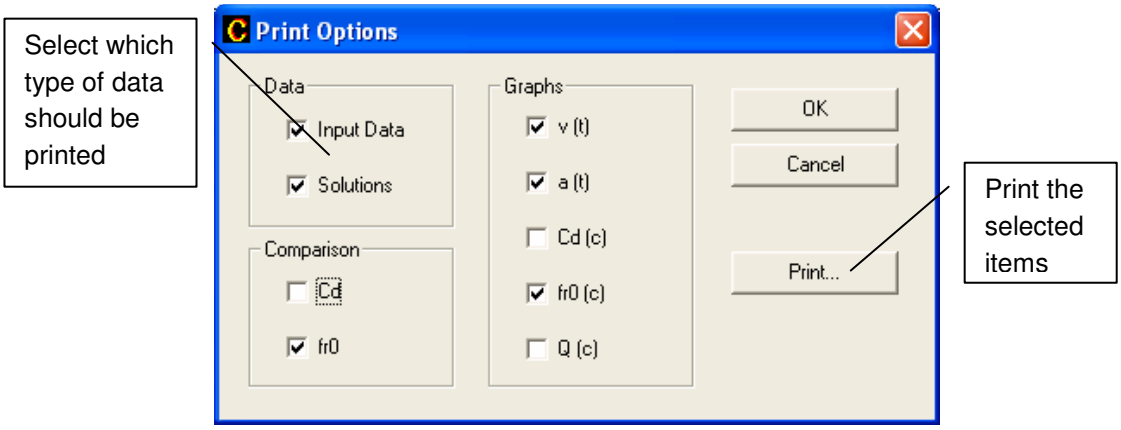
After the successful connection of the input parameters with the data set, all text boxes are inactive. Use the button ***Change data*** if it is necessary to change one or more of the parameters.



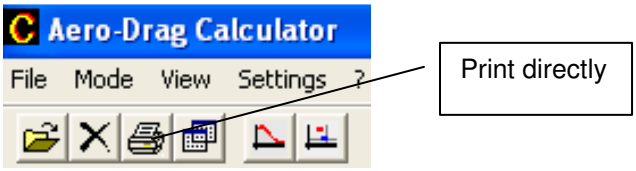
11. Print

The software makes it also possible to print all input/output parameters and the displayed graphs. Open the "Print Options" with ***File > Print Options…*** in the menu bar.





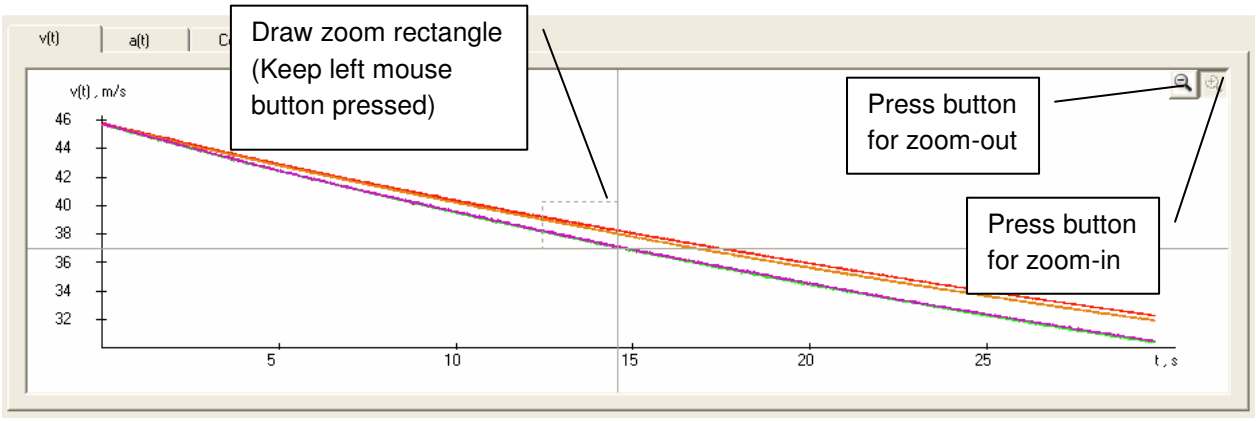
First of all select which type of data should be printed. Use the command button ***Print*** for printing the selected items.
It is also possible to print without adjusting the print options. Use the button ***Print*** in the toolbar or select ***File>Print*** in the menu bar to print directly.



12. Further Tools

12.1. Zoom

In the “v(t)” and “a(t)-graph” it is possible to zoom into the chart. Use the button  to switch on the zoom mode. Click into the chart and keep pressing the left mouse button while drawing the zoom-rectangle. The selected area is then expanded to the size of the graph. Press the  button to zoom-out to the original size.

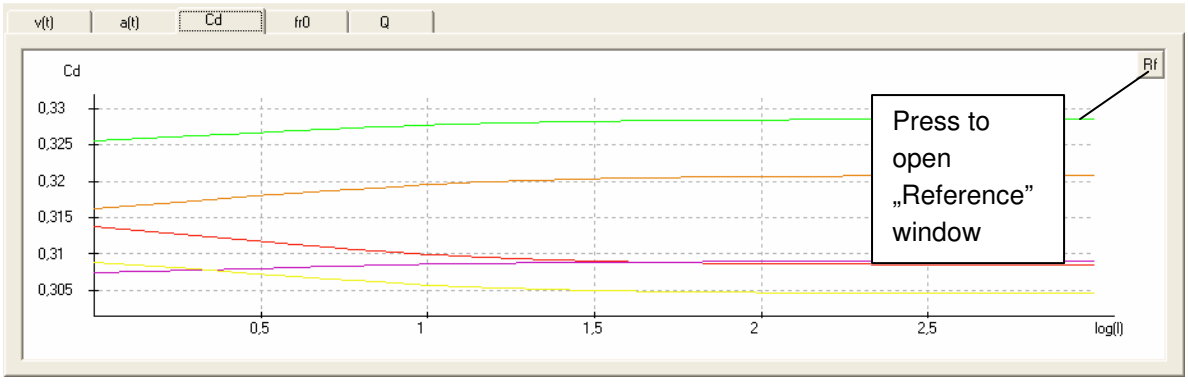


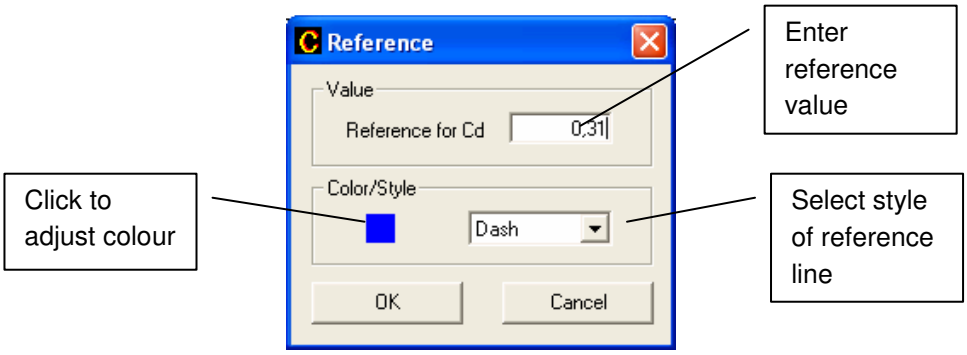
12.2. Adjust Colour for Datasets

Click on the coloured shape beside the filename in the data grid to open the "Colour" window. The selected colour will be the new colour for the data set.

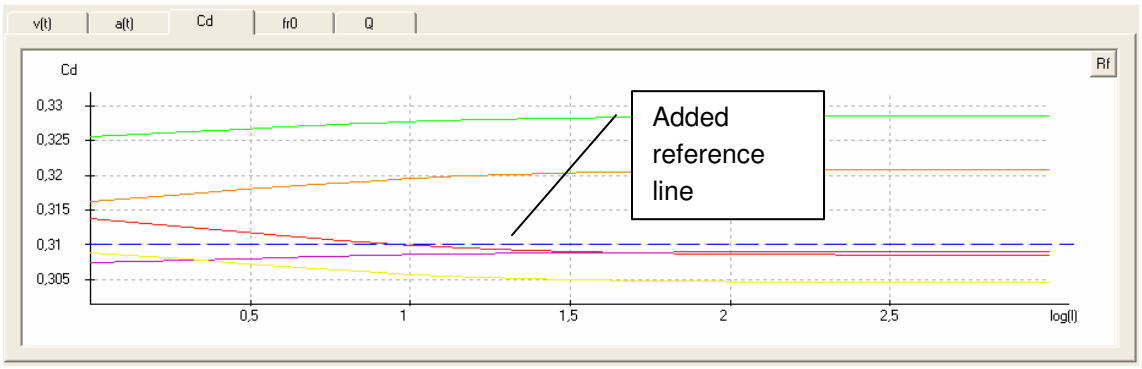
12.3. Reference

If the "Advanced II (Couple)" mode is activated, it is possible to add reference lines in the c_D and f_{r0}-graphs, e.g. wind tunnel data for c_D. Click the ***Rf*** button to open the "Reference" window.



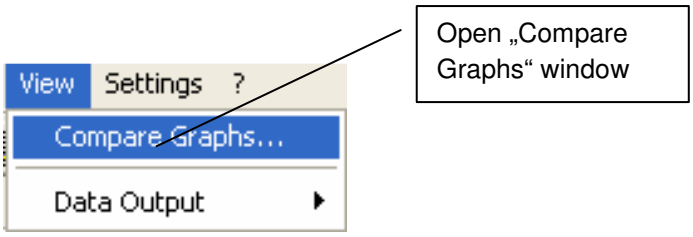


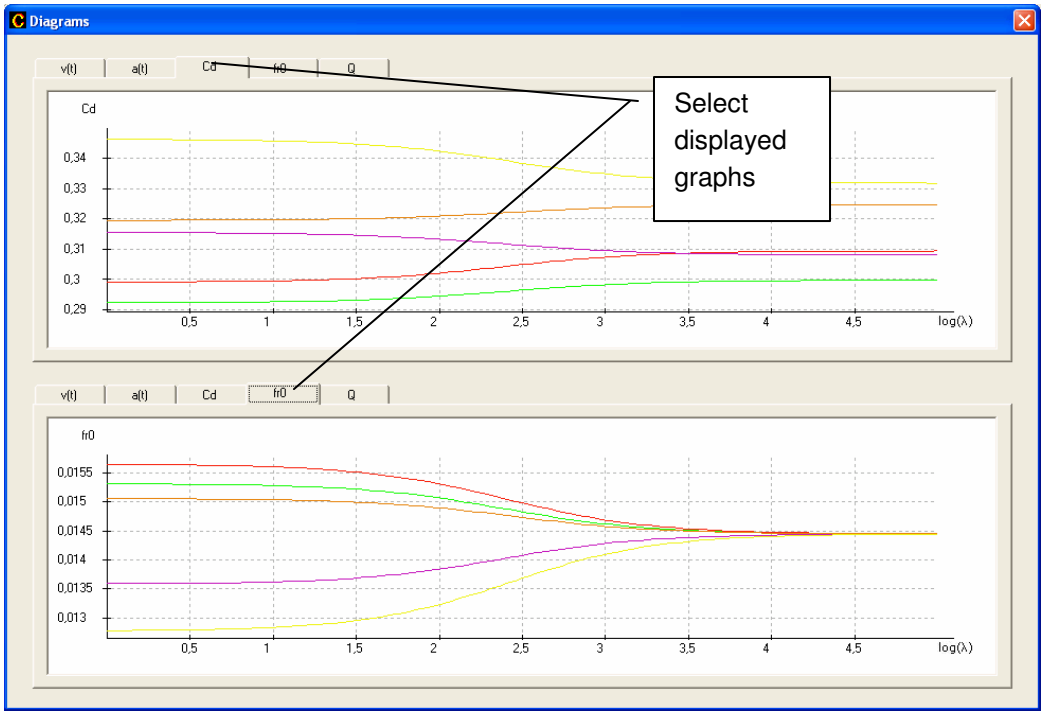
Enter the reference value in the text box. Use the combo box to select the line style and click on the shape to choose a colour for the reference line. Confirm with ***OK*** and the line will be added to the graph.



12.4. Compare Graphs

Use ***View>>Compare Graphs…*** to open the "Compare Graphs" window. Select with the Tab control which graphs should be displayed.

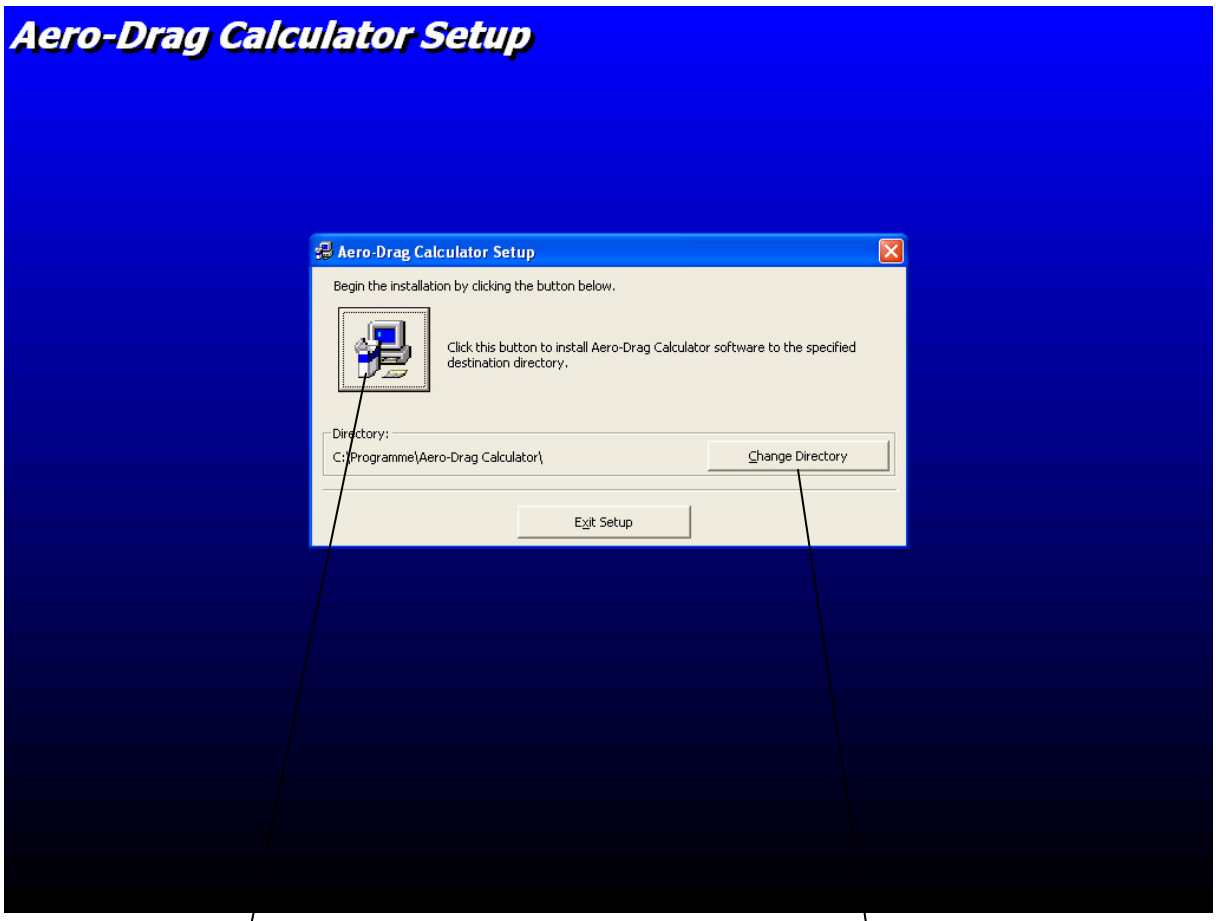



Diagrams
v(t)
a(t)
Cd
fr0
Q
Cd
0,34
0,33
0,32
0,31
0,3
0,29
0,5
1
1,5
2
2,5
3
3,5
4
4,5
log(λ)
Select displayed graphs
v(t)
a(t)
Cd
fr0
Q
fr0
0,0155
0,015
0,0145
0,014
0,0135
0,013
0,5
1
1,5
2
2,5
3
3,5
4
4,5
log(λ)

13. Installation Guide

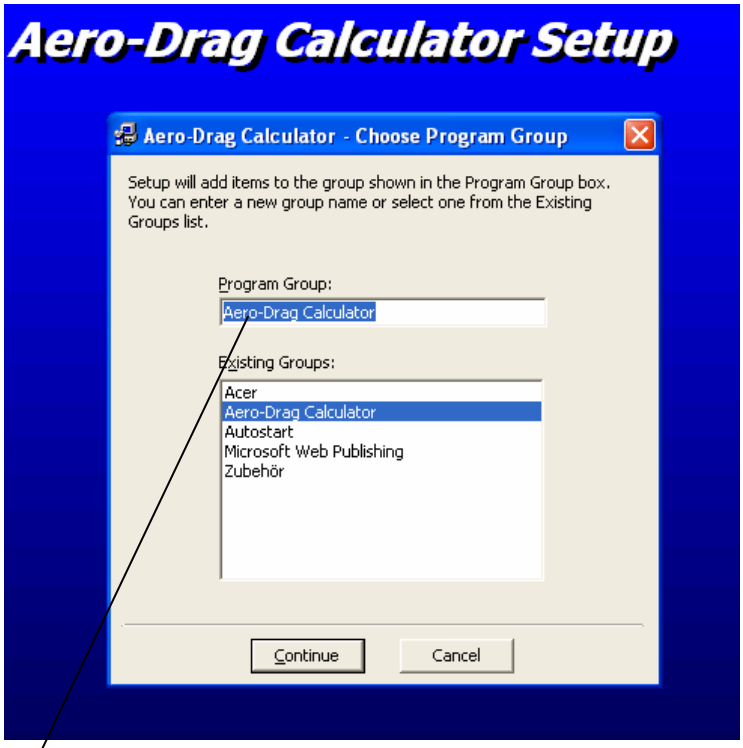
Double click “setup.exe” in the installation directory.

The installation wizard is started. Follow the instructions of the wizard.



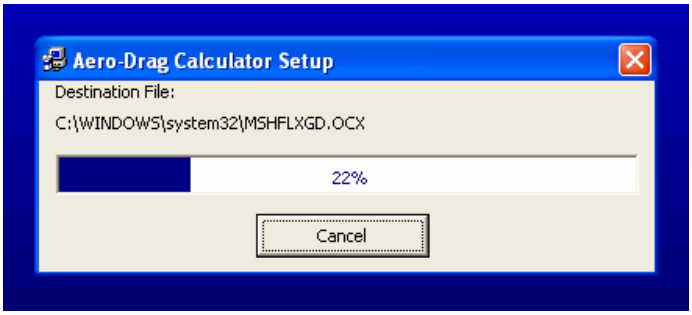
Click here to start the installation

Click here to change the target directory



To change the start menu entry, enter a new name here

After clicking ***Next*** the application will be installed:



The wizard will indicate, when the installation is finished: