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MESYS Hertz Calculation

Introduction

MESYS Hertz Calculation (Version 11/2014) calculates the Hertzian stresses and subsurface stresses for point or line contact.

The following results can be found in the report:

- Major half axis of contact ellipsis a
- Minor half axis of contact ellipsis b
- Approach of both bodies
- Contact stiffness R
- Hertzian stress
- Maximal shear stress
- Maximal octahedral shear stress
- Depth for max. shear stress
- Depth for max. octahedral shear stress
- Equivalent stress (Tresca)
- Equivalent stress (Mises)

In addition to the report the results are shown in several graphics. Report and user interface are both available in metric or US customary units. Supported languages for user interface and report are English, German, French, Spanish and Korean.

Installation

When running the installer the installation directory can be selected. The default location is "\Program Files\MesysHertz". All files are installed into that directory. Also an entry in the start menu is created.

The uninstaller can be called from the start menu. This deletes the installation directory and the entries in the start menu.

Without a license file the software runs as demo version. In the demo version it is not possible to save or load files and a Demo message is shown on each calculation. The demo version may only be used for evaluation of the software.

The license file 'license.dat' has to be placed in the installation directory (in the same directory as MesysHertz.exe). The name of the license file may not be changed since it will not be found by the software.

Configuration with INI-File

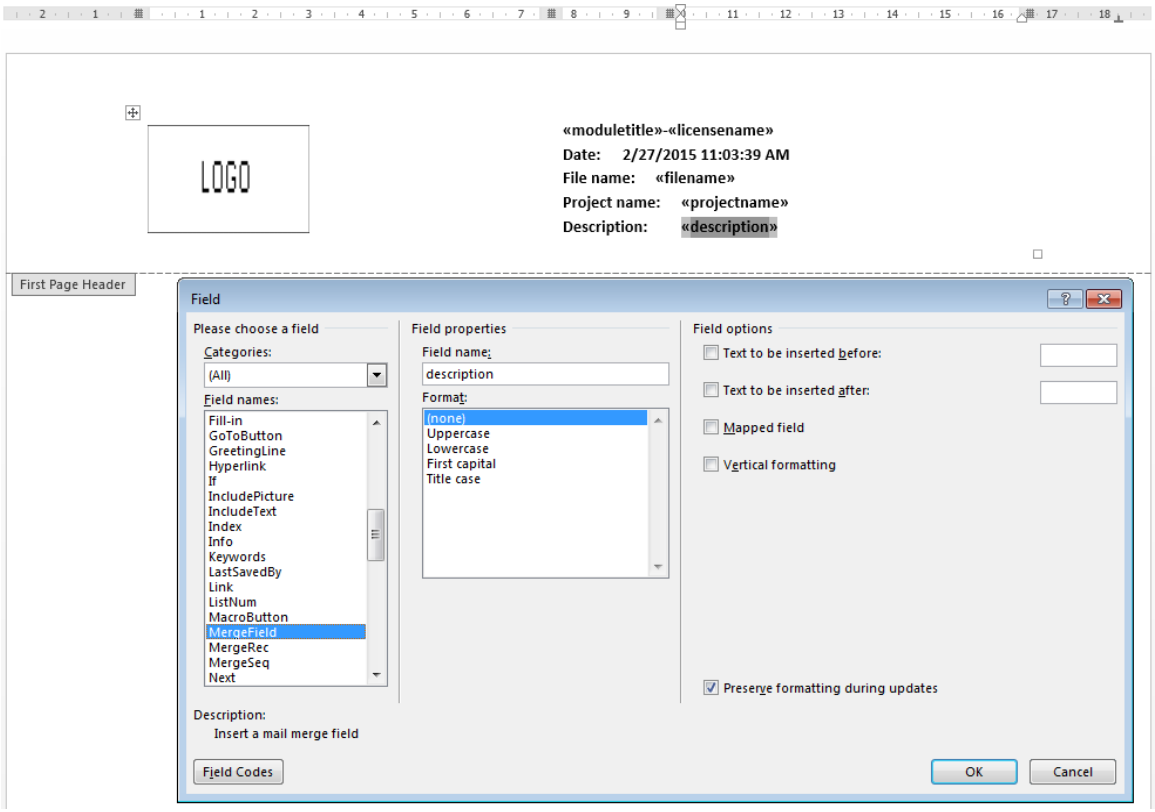
Some configuration of the software can be done using 'mesys.ini' in the installation folder. Currently the settings are used for database access and formatting of the report.

Section	Value	Description
general	recentfilenumber	Number of recent files shown in the file menu of the software
	floatinglicense	Path to the licensing file for floating license. It will be written by the software but might be copied to other installations. Format: \\\\Server\\Share\\path\license.lic Note: each '\' has to be doubled
database	path	The path to the database file can be defined. The database can be copied onto a server, so all software users share the same database. If the filename is given without path, it is opened from the installation directory. For path separators either use '/' or '\\' but not '\'.
	iswritable	Set it to true if the database may be changed. If set to false no changes are made to the database by the software.
hertz	defaultinputs	Path to a xml-file with default settings For path separators either use '/' or '\\' but not '\'.
report	format	The outputted report file can have different formats. By default, this value is equal to "INTERNALPDF", but it can be set to "DOCX", "DOC", ODT" or "PDF" (without quotes)
	tableformat	The format of the outputted results table can be also set; namely, to "CSV", "XLSX", or "XLS"
	topmargin	The top margin for the report in mm
	bottommargin	The bottom margin for the report in mm
	leftmargin	The left margin for the report in mm
	rightmargin	The right margin for the report in mm
	papersize	The size of the paper for the report. Available values are A4 and Letter
	template	Path to the created template file used for the report creation. Supported file formats: "DOCX", "DOC" or "ODT"
report	marginbox1\active	The marginbox is used if set to true, else set it to false
	marginbox1\rect	The size of the marginbox is defined with values in mm.The format is @Rect(x1 y1 width height). The parameters x1 and y1 describe the upper left corner of the box. Positive values are measured from the top/left negative velues from the bottom/right. For example @Rect(-35 -20 30 20) is a rectangle at the right bottom.
	marginbox1\text	The text for the margin box. It has to be set in quotations marks (like in "Text"). Either normal text or HTML can be used. Some placeholders are defined: #page, #pageCount, #data, #datetime
	marginbox1\angle	A rotation angle of the margin box can be set in degrees. The orientation of the angle is clockwise if positive.
	marginbox1\isHtml	Either set it to true or false dependent on the type of text.
	marginbox1\drawBox	If set to true a rectangle id drawn indicating the size of the marginbox. Else set it to false.
	marginbox2\...	Like for margin box 1 additional boxes can be defined with increasing numbers.

Please note that the listed options for margin boxes (marginbox1\...) are only valid if format is equal to “INTERNALPDF”.

Template

As detailed in the table above, a template in (.docx) format can be created so that it is used when generating the software report. For the current version, only the information contained in the header and footer can be edited, in which it is possible to link information to the software such us as ‘module license’, ‘license name’, ‘date’, ‘file name’, ‘project name’ or ‘description’ by means of the text fields option in Microsoft word. Additionally, a company logo can be included, instead of the MESYS logo that it is shown by default at the report:



Update

If the software is updated with a new version the database ‘mesys.db’ should not be overwritten. Either the new installation is done in a new directory or the database file is copied to a different location.

After the new version is started the database can be updated by choosing menu ‘Extras’->’Database’->’Import from old database’. All custom entries will be updated. Changes to default data will be lost as only custom data will be copied.

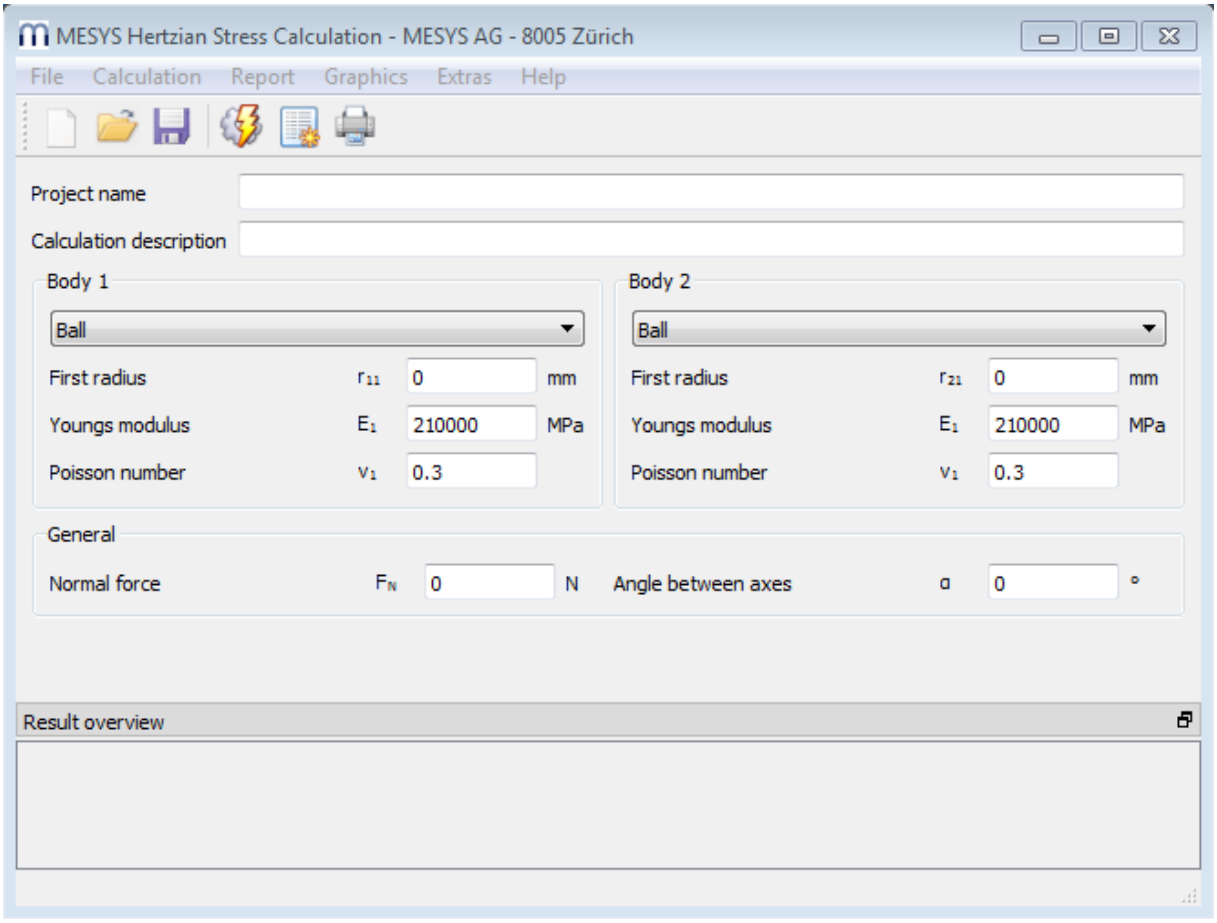
Requirements

The rolling bearing calculation is available as 32bit windows program running on Windows XP, Vista, Windows 7 or Windows 8. In addition to the 32bit version which can be used on 32bit or 64bit operating system also a 64bit version is available. The minimum required processor is Intel Pentium 4 or above.

About 80MB of hard disk space is required. All dependencies of the software are available in the installation directory. Therefore it can just be copied to other machines or started from network or removable disks.

Input Parameters

On the input page looks like as shown below:



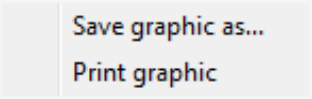
The input parameters are all shown at a unique page. After all data is defined, the calculation is run by clicking the button  or pressing F5.

The unit system for the input and output can be selected on the menu ‘Extras->Unit system’ either as metric or US units. The language can be selected in menu ‘Extras’.

Using the context menu for the units of input fields, the current unit can be changed. These setting are not saved in the current version, so the change is only valid for the current session.

Pressing the right mouse button on an input field a window for an input of a formula is shown. This can be used for quick calculations.

All graphics can be printed or exported as PNG file using the context menu (right mouse button) in the graphic window. For the export the size of the graphic can be specified.

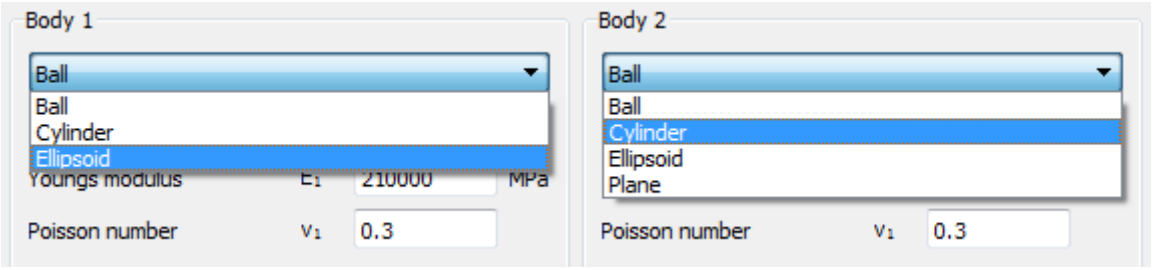


Project name and calculation description

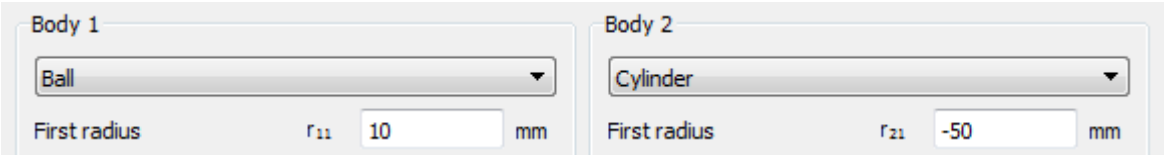
The project name and the calculation description are just inputs which are shown in the report header. They can be used to enter information about the purpose of the calculation for documentation.

Bodies in contact

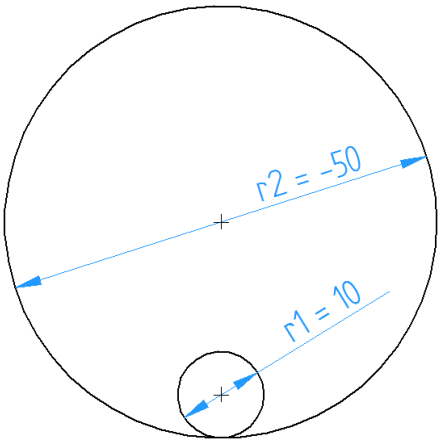
Body types such as ball, cylinder, ellipsoid and plane are available on the drop-down lists corresponding to the 'Body 1' and 'Body 2' sections. All combinations are possible, apart from the plane-plane contact for obvious reasons.



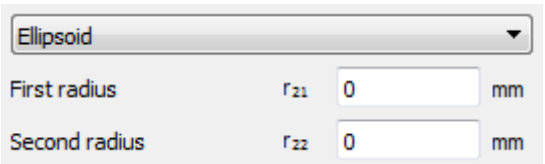
Body radii



Only one radius is needed for balls and cylinders. Note that concave surfaces have to be defined by means of negative values.



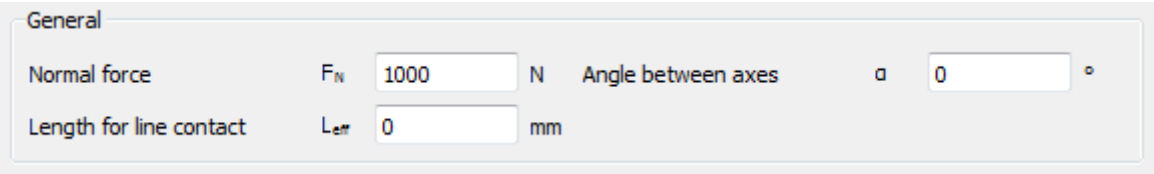
It will be necessary to specify the two radii of an ellipsoid, so the input is activated when selected:



Material properties

Only young modulus and poison's ratio are needed for the bodies in contact. The stresses for both properties are the same for equal materials, for different materials they can differ.

General

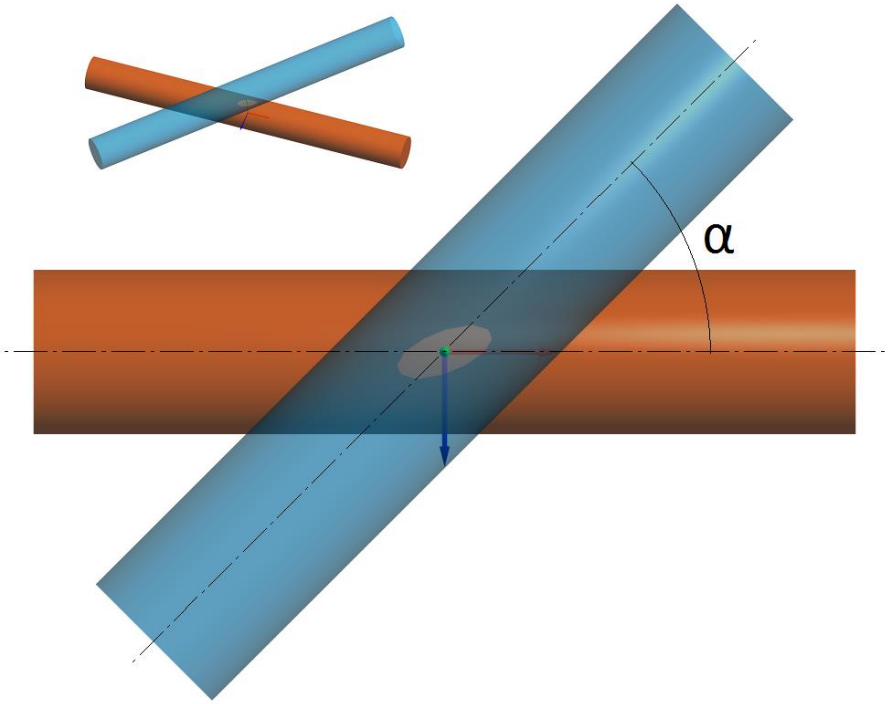


Normal force

Here the contact load is specified as normal force.

Angle between axes

The radii of curvature for two bodies can be given in two planes and an angle between these planes can be specified. The angle is defined between the lines which are normal to the planes where the radii r11 and r21 lie, as shown in the picture:

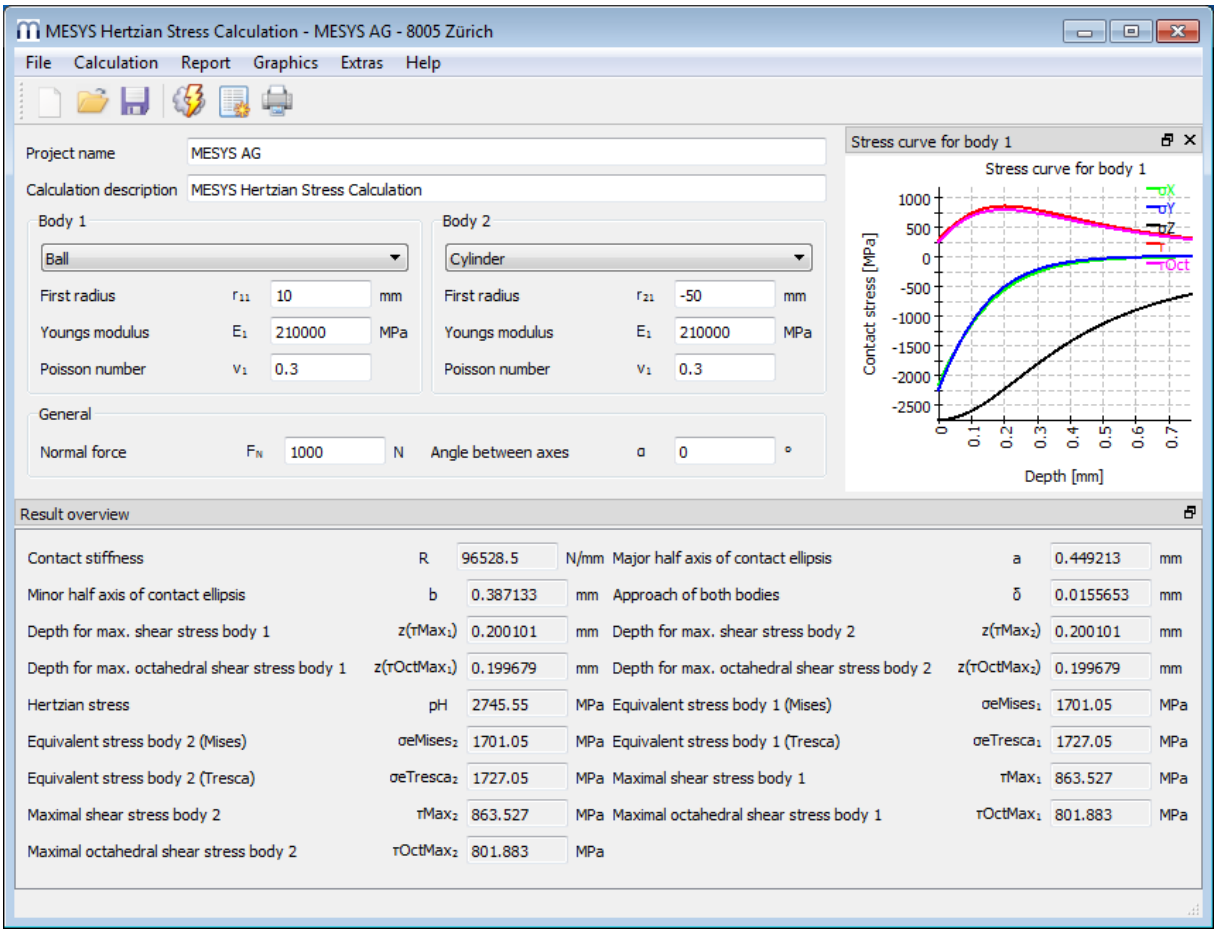


Length for line contact

For the case of two cylinders in contact it is required the length for line contact, so the corresponding input field will be activated under 'General' as shown in the picture above.

Results

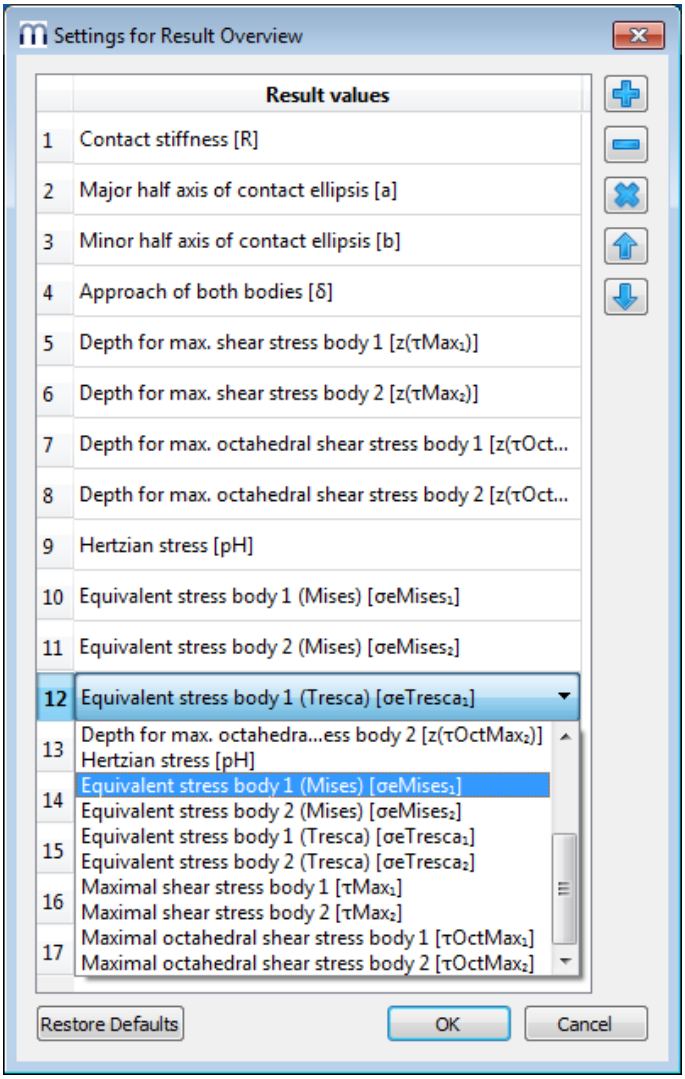
Results are provided as a small result overview directly in the software, a main PDF text report, a tolerances report and separate graphics windows. Graphic windows can be docked onto the main program interface and are automatically updated on each calculation.



Result Overview

Each and every one of the results can be chosen to be displayed at the results overview window of the software. Under the menu “Extras->Result overview” all the items are listed in a table called ‘Result values’. By doing a double click on the table items a drop-down list allows the user to select the result to be shown. By using the ✚ and ▬ buttons any item of the table can be added or removed, as well as it is possible to clear the whole table with ✖-button or rearrange it with the up and down arrows.

The settings for the result overview are saved in the windows user profile not in the calculation file. So they will be the same for different calculations.



Main Result Report

The text report is provided in PDF format.

In the menu Report->Options the contents of the report can be configured. The graphics to be included can be selected and some sections of the report could be discarded if not of interest. The legend for all the table parameters can be shown in the report.

Saving main report

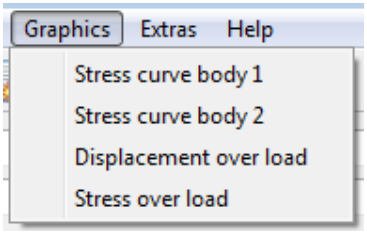
The main report can be saved using the menu “Report->Save Report As” in different formats. It can be saved as PDF, DOC, DOCX or ODT (Open Office) format.

Customizing report logo

As default a MESYS logo is shown on top of the report. This can be customized by placing a ‘logo.png’ into the installation directory. The logo should be created using a size, so that it fits into the header table. The DPI setting in the logo is considered, so that a high resolution image could also be used. Additionally, it also exists the possibility to create an own template of the supported file formats (DOC, DOCX and ODT) and generate the report from it, thus having the chance to customize the logo.

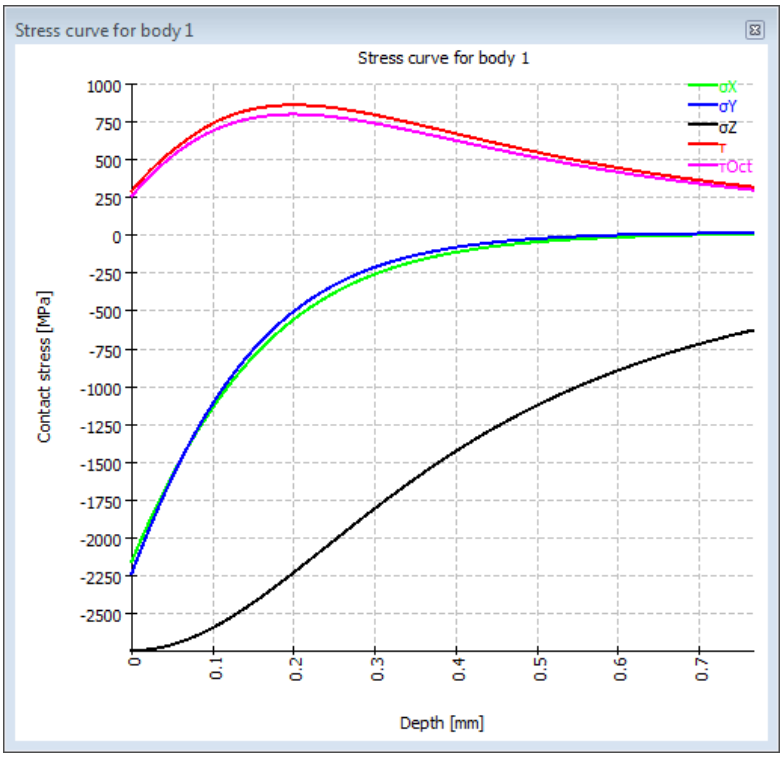
Result Graphics

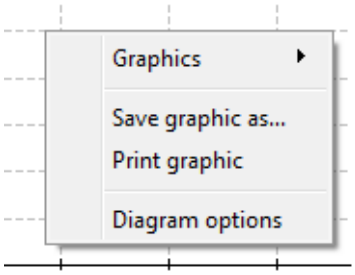
All the available charts are under the menu 'Graphics'. For the current version, the stress curves for both bodies as well as displacement over load or stress over load can be analyzed.



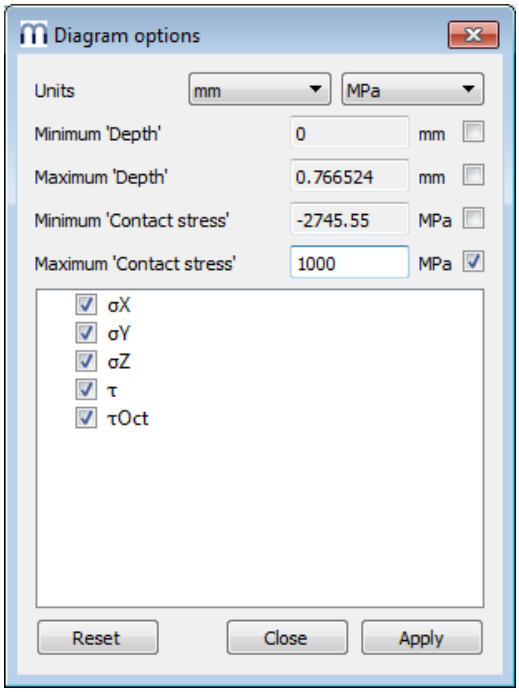
Stress curves for body 1 and body 2

Maximum principal stress (σ_{xx} σ_{yy} σ_{zz}), maximum shear stress (τ) and maximum octahedral shear stress (τ_{Oct}) are represented for at the line of contact under the surfaces.



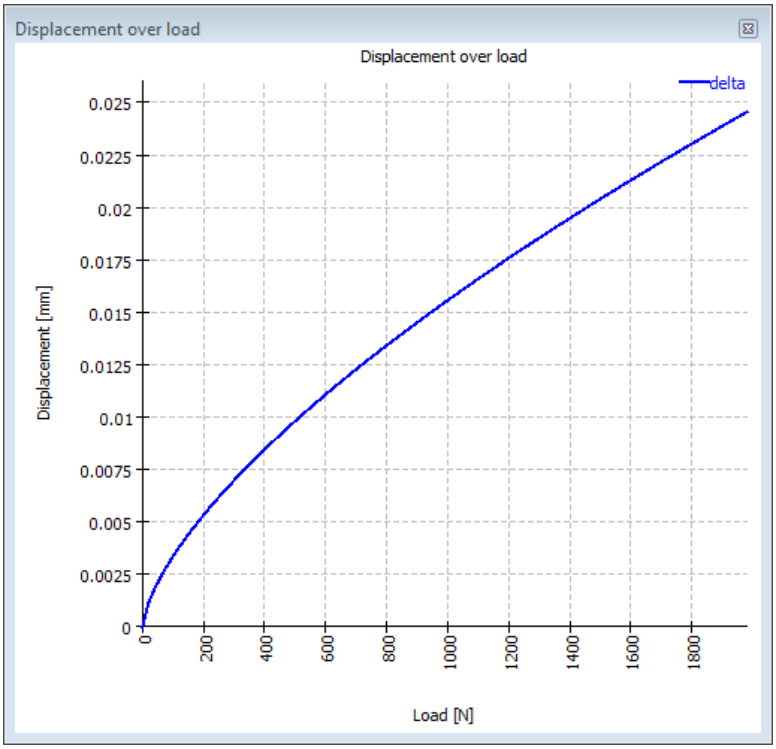


By doing a right mouse-click on the graphic area, a context menu pops out allowing the user to set up some diagram options like units and bound values:



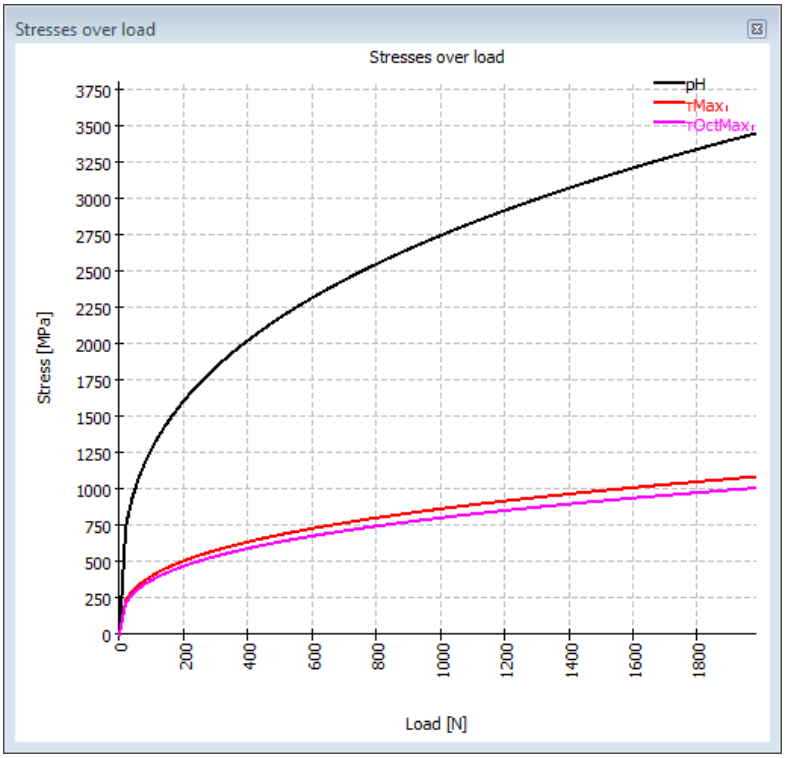
Displacement over load

This chart represents how the bodies (1 and 2) move towards each other by amounts of δ1 and δ2 as the load increases. Therefore, delta is the total decrease of distance by an amount δ=δ1+δ2 between points on the bodies not affected by the local deformation near 0.



Stress over load

Here the Hertzian stress, maximum shear stress and maximum octahedral stress are represented against the load.



Bibliography

Boresi, Arthur P. and Schmidt, Richard J. 2005. *Advanced Mechanics of materials.* s.l. : John Wiley&Sons, 2005.