

DeepLines™ 4.4

Service Pack 2 Release Notes

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1 Introduction

Welcome to the installation and release guide for DeepLines Version 4.4 Service Pack 2.

DeepLines™ is a powerful software developed by Principia and IFP, which is designed to analyze the behavior of marine slender structures such as flexible and rigid risers, umbilicals, cables and moorings lines.

This short guide will provide licensed users with all the information required to properly install the software. It also provides full details about the technical enhancements and improvements to the graphical user interface since the previous release of the program.

This guide is for the latest release of DeepLines Version 4.4.3.3 Service Pack 2. This release replaces Version 4.4.2.2 released February 2010.

2 How to install the software

2.1 Upgrading to Service Pack 2

A complete, first-time deployment of DeepLines Version 4.4 is required prior you upgrade to Service Pack 2.

If you have not installed the earlier Version 4.4, refer to DeepLines Version 4.4 Installation and Release Guide.

If you have installed the earlier version 4.4, you can upgrade to this latest Version 4.4.3.3 by replacing the previous executable files used for the user interface and the finite elements solver by the new ones.

These updated executable files may be downloaded from PRINCIPIA's website at www.principia.fr/deeplines.

2.2 License files

DeepLines is protected through license files that may be either installed on the end-user machine or on local networks. Each license file includes a number of protection keys that define which features you are allowed to run within the GUI. The keys are either attached to the GUI or to the solver, as detailed in the next table.

Key name	Key activated from	Functionality enabled with the key
DEEP_IHM	GUI	Access to the GUI and handling of model components Running static analyses (step 0 only) Open any existing .DSS file
DEEP_POST	GUI	Standard post-processing
DEEP_CLASH	GUI	Clash-check post-processing
DEEP_RAO	GUI	Computation of RAO for any variable based on time-traces
DEEP_QS	Solver	Quasi-static analyses
DEEP_DYN	Solver	Time-domain dynamic analyses
DEEP_MOD	Solver	Modal analyses
DEEPVIV	Solver	VIV analyses based on DeepVIV's modal approach
DEEP_FAT	GUI	Fatigue analyses
DEEP_DRR	GUI	API RP 16Q and iso-angle curves post-processing for drilling risers
DEEP_ZON	GUI	Zones post-processing module for flexible pipes
DEEP_FREQ	Solver	Frequency-domain dynamic analyses
DEEP_SOIL	GUI	Access to pipe/seabed predefined interaction models and suct

DEEP_TRE	GUI	Access to Trelline™ hose type modeling (restricted access submitted to Trelleborg's authorization)
DEEP_SLUG	GUI	Access to Internal content variations of risers (including temperature, weight & pressure variation)
DEEP_VDP	GUI	Van Der Pol oscillators to model fluid/structure interactions
DEEP_LMRP	GUI	Additional module used to model kill and choke flexible lines connected to Lower Marine Riser Packages.

License files are distributed by Principia when purchasing the software. Using multiple protection keys allows to tailor your installation depending on your needs. The different modules from the GUI may be accessed provided that the corresponding facilities are enabled through your license file.

It is advised that you check out with your network administrator or IT department which licenses keys are actually available within your installation.

2.3 Before you start

Once you have successfully installed the software on your machine, there is a recommended check list to review before you actually start working with the latest release.

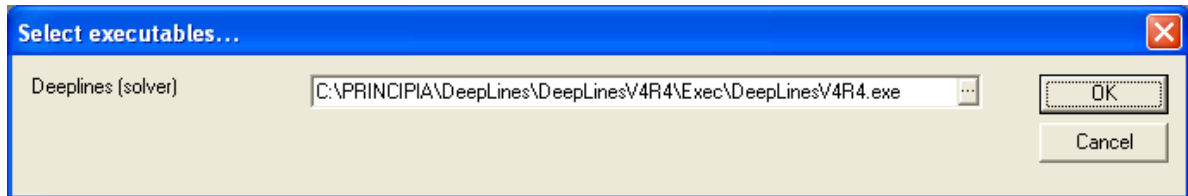
- **Check the availability of your license file :** When started, the GUI will automatically check that a license file is available either on your hard drive or through your local network. Most of the installations are based on network licensing, which means that the license file is located on a local server. The path to access your license file must be specified through a system variable named LM_LICENSE_FILE. If you were not given administrator privileges, then contact your network administrator to check the content of this variable and modify it when necessary.

- **Reduce the hardware acceleration :** The hardware acceleration is a parameter that controls whether the graphics will display on your screen using the main processor or the graphics driver. Using the latter allows better performances when displaying complex 3D graphics. A few compatibility problems have however been observed with the previous release between particular graphics drivers and several OpenGL subroutines used by the GUI to display the objects in the 3D View window. This bug has now been fixed for most of the graphics drivers available on the market, but could however persist on particular instances. This bug would cause the GUI to close abruptly without displaying any error message. We therefore strongly recommend that you set the hardware acceleration to zero. This operation is perfectly safe and has no effect at all on the performances of the main processor.

- **Files compatibility :** Both GUI and solver programs support backward compatibility. This means that you can re-open any model file (.DSK) or simulation results file (.DSS) created with a previous version of the GUI, using this latest release of the GUI. You can also re-run the solver with any analysis input file that used to run with a previous version of the solver. However we do not support forward compatibility. You will not be able to re-open with a previous release of the GUI any model file or simulation results file that was generated from scratch or saved using the Version 4.3 of the GUI. Should you try this, then an error message would display, indicating that the file format is not correct. Similarly, there is no guarantee that you will be able to run an analysis input file (.LOG) using a previous version of the solver, in case the file was created with the latest release of the GUI. It is however worth noting that most of the existing keywords can be properly interpreted by the latest version of the solver and the previous one.

- **Open, save and re-open the model files created with a previous release :** As you open a model file that was created with a previous release of the GUI, it is recommended to save the file, then close the file and finally re-open this newly saved file. This operation will ensure full compatibility of the files and specifically of the analysis input files (.LOG) that will be created with the latest version of the GUI. For instance, the blank spaces in the support vessels names will be automatically replaced with underscore characters. This further ensures that the hydrodynamic database file name used to store the RAO data will contain no blank space as required: a blank space in the .HDB file name would indeed cause an error as the solver reads the analysis input file.

- **Update the path to the solver executable file** : Once you have installed the GUI, you must check that the path to the folder containing the executable file for the solver is correct. This can be done from the Settings menu by selecting the Path to executable item. The following dialog box will display, from which you can specify the correct path.



This path will then be stored within the registry keys as you close the GUI. In case the path is not correct, you will not be able to run the solver. Should the path refer to an older version of the solver, then compatibility problems might occur when reading the analysis input files (.LOG).

3 What's new in this Service Pack

This Section lists all bug fixes and enhancements brought to Version 4.4 through Service Pack 2.

3.1 Model Set-Up

- **Environment Set :**
 - The number of wave components to be considered within an Environment Set can now be directly input in dedicated data boxes. This avoids having to add all wave components one by one with the Insert New Wave button.
 - The number of Floater components can be defined from the General tab allowing for several Floater component to be included in the combination matrix. This would for instance enable applying different offsets to two Floaters within the same set of cases.
 - Low frequency motion can be input to Environment Sets as series of dynamic harmonic motions.
- **Cylindrical coordinates :** Position of fairleads and hang-off points can now be defined using cylindrical coordinates, in addition to rectangular coordinates.
- **Azimuth between end nodes :** The azimuth angle between two end nodes belonging to the same line is now automatically reported in the Edit Line window. Azimuth data display aside the distance between end nodes.
- **Advanced split of a line:** It is now possible to defined spring/flexjoint type connections between automatic splits of a line.
- **Fatigue panel definition:**
 - Several load cases may now be selected and deleted at once.
 - When based on the rainflow method, probabilities are now defined with a dot and not a coma.
- **Trelline feature:** DSK size has been optimized when using Trelline type lines. The external Excel files are not stored any more in the DSK file and update of these excel files is therefore automatic.

3.2 Post-processing

- **Fatigue analysis of moorings:**
 - The Maximum Breaking Load was not correctly used during a fatigue analysis based on the spectral method.
 - In addition, the number of section point is now by default set to 1.
- **Automated export of statistics:** In an AnalysisSet, the statistic tables summarizing all the requested results may now be exported to Excel or CSV format.
- **Batch Export of results:** All results may be exported in batch to Excel or CSV type files. Command lines are as such:
 - DeepLinesGUI.exe -excel (or -csv) filename.dsk : export of statistics associated with AnalysisSets
 - DeepLinesGUI.exe -excel (or -csv) filename.dss : export of results associated with one specific analysis
 - DeepLinesGUI.exe -excel (or -csv) filename.zs : export of zone study results
- **Zones study enhanced set of results:**
 - Zone study requests have been extended to a larger range of output including stresses, DNV checks as well as displacements, velocities and accelerations.
 - A main result and the associated variables may refer to different zones. Example : The maximum riser top tension and the associated bending moment in the Touch down area.
- **Improved definition of zones for Zones Study:** Abscissa ranges defining a zone of interest may be directly entered and modified in the definition table.
- **Envelopes plots :** Envelope plots could only be required along the whole line. These plots may now be asked for along user defined sections of Lines, e.g. touch down point area.
- **Operating pressure included in DNV checks :** The pressure design P_d to be used for DNV checks may now be defined in the internal fluid panel.
- **Horizontal offset :** The horizontal displacement and the associated azimuth of a floater may now be post-processed.
- **RAOs for springs/flexjoints :** RAOs may now be requested on spring/flexjoint type elements.

3.3 Analysis

- **Low frequency motion in frequency domain:** Frequency domain analysis capabilities have been extended to solve low frequency response of coupled systems. This allows running random seas analyses in the frequency domain to derive maximum excursion of vessels as required within extreme mooring analysis.
- **Model components links check:** Links between model components included in the same analysis can be checked before the analysis is run. This ensures that models components to which other components connect are actually included in the analysis.
- **Yaw damping (coupled analysis):** Dynamic loads induced by wind, current and waves on Floater components were previously based on the instantaneous heading of the vessel resulting from low frequency and wave frequency motion response. Contribution of wave frequency motion to the heading was identified as a potential source for yaw motion instabilities. Dynamic wind, current and wave loads is now based on filtered wave frequency motion which reduces such instabilities.

3.4 Bug fixes

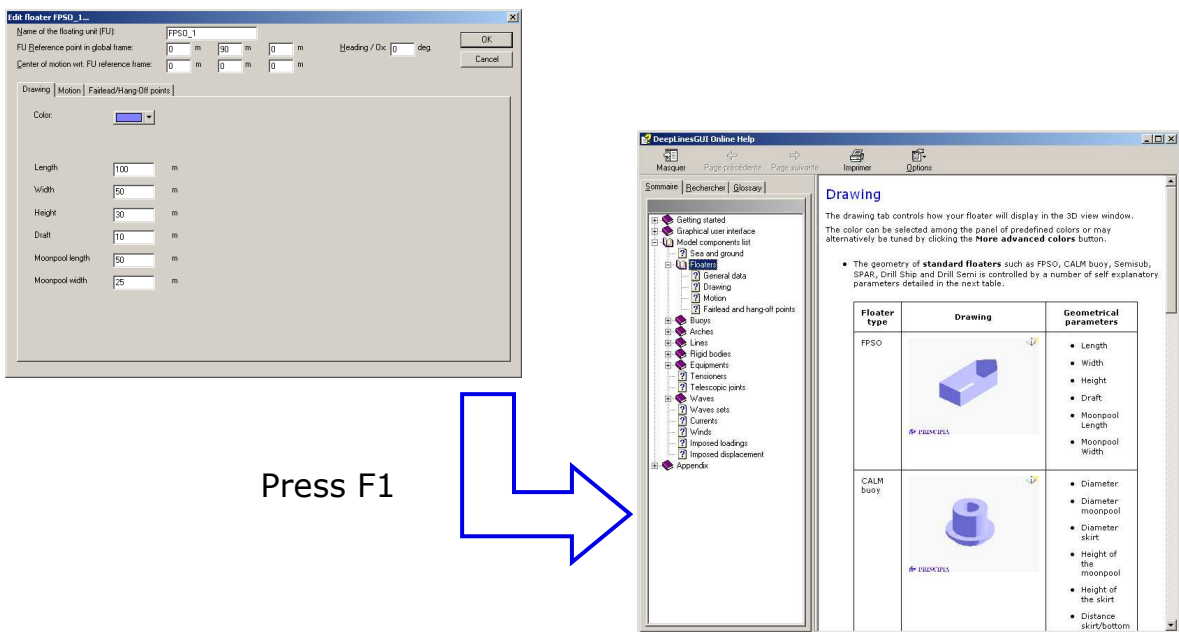
- **Keyword *SPRINGPRO:** The reading of SPRINPRO failed when the characters string was too long.
- **Master-slave connections:** Transfer of stiffness between successive master-slave relationships has been improved.
- **Contact with non-linear stiffeners:** The contact of a non-linear stiffener with a surface was checked using the external diameter of the inner riser and not the stiffener external diameter. The stiffener OD is now used.
- **Line/surface contact:** The contact with a surface now takes into account the pipe orientation with respect to the surface. In the previous version, the line external radius was systematically retrieved from the gap.
- **Copy/paste of equipments:** GUI crashed when an equipment (X-mas tree, LMRP...) was copied.
- **File *DAY display:** For very fast simulations, users may lose control on GUI during display of the DAY file. This has been corrected.
- **Ballast loadings visualization:** Ballast loadings associated with an external mesh are now moving with the model animation.

4 Getting help

4.1 Documentation & On-line help

The documentation provided with the installation is a good source of information to help you to solve any problem you might experience. Check first the recommendations listed in Section 2.3 "Before you start" of this guide to ensure that the software is properly installed on your system.

When using the GUI, you may access the HTML standard based online help system either through the Help menu or by hitting F1 key to display context sensitive parts from the help.



4.2 Hotline support

If you do not find how to solve your problem by reading the documentation or online help, we will be pleased to answer your queries.

Our technical support team may help you in troubleshooting your installation or assist with any problem you might have when using the software.

Please contact us by email at deeplines@principia.fr or call us at :

- Head office (France) : +33 (0) 4 42 98 11 80
- Houston office : +1 281 556 11 15

