

DIVING ASSISTANT

Ver: 2.1.180414

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Release Notes to 2.1 Beta2

DRAFT

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This document contains the most important release notes for the Dive Assistant version 2.1. Due to the ongoing development of the application, pay attention to the exact version of the installed libraries and applications.

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1. Changes in the application version 2.

1.1. *New functionalities.*

a) Release 2.1 Beta 2 (2018-04-14)

- A new report panel for the dive profile with the possibility of printing has been made available.
- Application graphics have been updated.

b) Release 2.1 Beta 1 (2018-02-25)

- The user interface has been improvements:
 - mechanism of hiding and activating tabs has been changed,
 - print of advanced charts has been implemented,
 - copy and save of charts data has been added,
 - copy and save of data tables has been added,
 - the application and system info form has been extended,
 - a visible version label has been added to main screen,
 - the menu has been extended by quick open of documentation and charts form.
- Polish user guide has been updated to version 2.1.

c) Release 2.1 Alfa 1 (2017-12-27)

- The user interface has been improved:
 - the configuration page has been changed to a more clear,
 - the formatting of data on individual tabs has been changed,
 - the completely new mechanism of generating the chart of the dive profile on the simulation tab, improved performance, extended the scope of the presented information and improved the scaling mechanisms,
 - the possibility of changing the unit system by clicking the field label was made available,
 - icons for more readable are listed,
 - a number of new tool tips have been added,
 - the layout of information on the tabs has been simplified.
- Improvements have been made to the configuration tab:

- the altitude and atmospheric pressure settings have been simplified,
- saving and reading the configuration stores the recently selected units,
- the configuration of the gas reserve has been improved,
- a section related to the Inert Gas Narcosis has been separated.
- A number of improvements have been made in the cylinder editor:
 - the mechanism for selecting sets for the plan has been improved,
 - added the possibility of selecting the default cylinder,
 - a separate section for oxygen was added,
 - the icons have been changed to a more readable,
 - a context menu was added.
- The possibility of choosing the algorithm for calculating the narcotic effects of breathing mixtures was introduced.
- A new calculation engine was applied:
 - changed data type to dedicated,
 - algorithms have been optimized,
 - computing performance improved,
 - a number of safety mechanisms have been introduced.
- The XML storage formats have been adapted to the new data model, the new format is not fully compatible with older versions.
- The diving simulator has been optimized in a wide range.
- The Diving Simulator tab has been improved:
 - separate columns for data in metric and imperial units have been removed,
 - the data formats for units in various measurement systems have been extended,
 - it is possible to enter values with units of measurement,
 - in the detailed view, an option to view trace information for a given step has been added (by pressing the right mouse button on a cell or a selected row).
- The message system has been expanded.
- A number of improvements in performance and stability have been introduced, and the accuracy of calculations has been improved.
- The application for compatibility with the .NET 4.5 platform and the new runtime environment has been migrated, support for systems older than Windows 7 has been removed.

b) Release 2.0

- Made a number of changes in the user interface, including:

- improved menu,
- new icons,
- new shortcuts,
- possibility to hide tabs,
- added visible grips for ease scaling tables,
- added table view orientation switching.
- Added MOD presentation on config tab.
- Added presentation of vital capacity drop VCdrop.
- Added English translation of license agreement..
- Added new functionality to define user diving cylinder sets. The editor allows to define single, twin or stage sets and mixtures of Nitrox and Trimix.
- Added multi-gas dive planning.
- Changed the handling of web links to more flexible.
- Added redirection button to product registration form.
- A number of changes aimed at improving the responsiveness of the application.
- Added advanced chart showing the M-Values characteristic.
- Added advanced chart showing final tissue saturation.
- Added support for Rock Bottom air spare calculation.
- Added limit of the minimum fraction of oxygen in breathing mix to 10%. Lower values found to be unreasonable at depth up to 100m / 330ft.
- Added support for new dive plan warnings.
- Due to significant extension of application, major version has been changed to 2.0.
- A gas marker bar has been added to the graph of the dive profile. Each type of mix is marked with the appropriate colors. In addition, the cylinder change is marked with a dark line.
- When registering, the e-mail address is no longer mandatory. Nevertheless, we recommend providing a valid e-mail address for communication purposes related to technical and licensing aspects.

1.2. Fixed problems.

a) Release 2.1 Beta2.

- minor editorial fixes.

b) Release 2.1 Beta1.

- the scaling of the warning form has been corrected,

- the mechanism of handling numeric controls have been improved, after changing of units if was possible to exceed the limits,
- localization fixed.

c) Release 2.1 Alfa1.

- Corrected a problem that could cause duplication of sets in the cylinder editor.
- Improved compatibility and compatibility with Windows platforms.
- A number of minor problems related to the improved diving engine.

d) Release 2.0

- Fixed handling of the activation keys. As a result of a problem with the application clocks can occur occasionally application crashes.
- Fixed an issue with the display of the information window. Attempted to display some information at the same time could occur an uncontrolled stop of applications and an exception is thrown.
- Fixed refreshing of summary dive information..
- Fixed advanced chart showing tissue saturation. While drawing graph for multi-gas profiles based on nitrox and trimix could occur uncontrolled interrupt of application.
- Fixed handling of Alt-F4. Closing some windows using Alt-F4 could later cause an error and stopping the application.
- Fixed polish localization.

2. Changes in diving engine (2.0.x)

2.1. New features.

- A new dedicated data type for the depth has been defined.
- A new one dedicated to this data for altitude has been defined.
- A new dedicated data type for temperature has been defined.
- A new specialized data type for pressures has been defined.
- A new dedicated data type for the duration has been defined.
- A new specialized data has been defined for the storage of fractional values.
- A dedicated interface for specialized data types in diving has been defined.
- Defined new specialized data type for volume and capacity.
- A new enumeration type has been defined to determine the precision of calculations, conversions and rounding.

- The serialization of the new data model to the XML format has been adapted.
- The complex data model types for new basic types have been ported to new value types.
- A new library for visualizing the data of dives was separated, the way of generating was changed from raster to vector based, efficiency and clearance were optimized.
- New parsing methods have been added for all basic data types.
- A specialized class has been defined to support physical units of measure used in diving.
- Data type support has been extended with new methods of rounding values.
- The user's plan model has been extended to include generic value comparators.
- Data models for gas blends have been extended and optimized, including generic operators.
- A new entity of the set of half-times of gas saturation has been added to the model.
- M-Value collections have been optimized.
- The data model for tissue has been optimized.
- A new container for the tissue set has been defined.
- Localization functions have been extended.
- The internal testing set has been extended.
- Changed models for data chains to generic, which help in significant optimization of the user plan, detailed plan and compact plan.
- The optimization of the compact plan has been optimized.
- Methods of generating a detailed diving plan have been optimized.
- The functions for calculating gas consumption have been extended.
- A specialized generic complex data type has been defined for immersion and ascent rates as well as gas consumption.
- Additional classes were introduced describing the input and output data formats.
- The localization has been entered into the default parsers and data formats.
- The classification of gas mix has been adjusted.
- Rounding of decompression stops has been optimized.
- The determination of safety stops for mountain dives has been improved.
- Additional data description methods have been introduced.
- The functionality of generating the report document in the XAML and XPS formats has been implemented.
- The copying and printing mechanisms for the dive report have been extended.

2.2. Fixed problems.

Release 2.1 Beta 1

- rollback of a temporary workaround for debugging a collection of detail data, a compact plan and a user plan; change possible after updating the programming tools (VS 15.6.0 Prev 3.0).

Up to Version 2.1 Alfa 1

- An issue with non-standard gas mixtures that could cause an exception and a program termination has been resolved.
- Problem with calculating the so-called ambient pressure (Pamb) using gradient values has been fixed. In some cases, the results might not have taken into account the additional margin of safety.
- One of the functions calculating the tolerated ambient pressure has been corrected. Previous results may have been too conservative in some cases.
- A problem with formatting the content of warnings has been fixed.
- Atmosphere support in the functionality of dive sets has been improved.
- ICD detection has been corrected, in some cases the situation could have come from an unexpected exception and program interruption.
- The MOD calculation has been fixed, in some cases the results could have been too conservative.
- The reference pressure has been revised from 1 bar to standard atmospheric pressure.
- The naming of gases has been corrected.

3. Changes in diving engine (1.1.14353).

3.1. New features.

- Global change of serialization mechanism used when writing data to files.
- Added algorithm for calculating CNS reduction on surface.
- Implementation of vital capacity decrease as a result of the increased oxygen partial pressure VCdrop.
- The implementation of the algorithm that calculates the difference in vital capacity as a result of a higher oxygen partial pressure VCdelta.
- Minor improvements of functionalities responsible for the control of oxygen.
- Extended model of breathing mixtures in order to better control the profiles and the

needs of future development.

- Added an advanced implementation of the gas model to provide a more flexible modeling of mixtures.
- Has been redesigned cylinder set list object. The current implementation is much faster. Also added support for internal events to facilitate integration with the application. Note, the new version is not fully compatible with the previous version of the engine.
- The implementation of an algorithm for approximation ZH-L coefficients for various gases on the basis of tables for nitrogen and the advanced gas model.
- Implemented an additional checkpoints and verification in engine code. The most important changes are:
 - adding to the multiple functions the new control system for the acceptable range of pressure values and the depth of the input and output of the calculations for a faster response to potential errors in the data,
 - compatibility checks of deco algorithms and gas model.
- A number of changes of organizational character in the structure of the source code.
- Added to model a new level of describing a single tissue.
- Added simplified method of calculation of the required supply of breathing air using so called Rock Bottom rule.
- Added functions for calculating the exposure time T_{exp} based on saturation of the tissue compartment.
- Added the function to calculate the speed of tissue saturation at step plan. New functionality can help detect potential counter diffusion (ICD) and the risk of DCS type III.
- Added support for detecting emerging threats when planning:
 - the risk of isobaric counter diffusion ICD,
 - exceeding the rock bottom reserve of breathing gas.
- Due to significant improvements minor version number has been changed to 1.1.

3.2. Fixed problems.

- Fixed rounding problem in diving cylinder model. As a result of rounding errors may occur to the difference between the nominal parameters and the current values, which causes an exception interrupt of applications.
- Fixed functionality for calculating fractions of gas mixtures defined by the user. The previous version worked properly for the build-in set, but can report bugs for a dynamically defined sets in the latest version (after adding the cylinder editor).
- Fixed an issue with the functionality of determining the allowable ambient pressure for a set of tissues. With entering the partial pressure of the missing gas a value 0 instead of NaN was possible to break the application. Currently, the value 0 is not

taken for the calculation (treated the same way as NaN).

- Removed restriction on the auxiliary function that calculates the maximum operating pressure of the breathing mixture. At low oxygen fraction MOD may be higher than the 100m. Limitations when planning remained.
- Extended implementation of the functionality of the determination of the maximum operating pressure MOP and the maximum operating depth MOD.
- Fixed a number of minor, identified problems.
- Improved determination of deep stops. After gas shift could have been forced to increase the depth in GF mode.

4. Known problems and limitations..

- Although we used a number of advanced algorithms and subsequent versions of the application detects more and more potential risks and calculate safer profiles, use of application does not guarantee that during a dive or after the dive there will be no signs of injuries and diseases associated with diving. Remember that serious diving accidents may end up even death. All dives are done always at your own risk.
- No algorithm does not reflect the real processes of diving. Each person also has other physical and mental limitations. So always follow the rules provided for training dive. Profiles should be reviewed in two independent sources (eg. decompression tables and the application or dive computer).
- The current implementation of Rock Bottom was developed for no-decompression dives. For more complex dive profiles, this function may not return results. Status can be checked on detail data tab.
- Dive engine detect potential cases of decompression sickness and isobaric counter diffusion. There is no guarantee, however, that the DCI or the ICD will not occur. Multi-gas diving are extremely complex and can only be performed by trained technical divers.
- The application allows you to plan dives with gas switching. But it is not enough to be the only tool or resource for planning with such dives. Each dive with decompression or gases shifting is technical diving. They are extremely complex and require a lot of experience, and take into account a number of factors, which in this application is not processed. Furthermore, the individual organizations use various recommendations, such as the use of additional detox stops or gas blends used.