

Scuba Diving Calculation Assistant

User Guide

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Introduction

Scuba Diving Calculation Assistant is an GUI application for common dive calculations, which could be useful for Scuba diver to dive safely. The aim to develop SDCA is to automate simple and complex calculations used by the dive industry commonly. The application is divided into two categories: *Simple calculations and complex calculations*.

Through *Simple Calculations*, User can provide input values and SDCA will display the following calculations:

EAD (Equivalent Air Depth) – To avoid the risk of nitrogen narcosis, it is very useful to know EAD which is calculated based upon the gas mixtures containing more than the normal 21% of O_2 .

MOD (Maximum Operating Depth) – This helps the diver to know the maximum safe depth at which it to dive in.

BM (Best Mix) – Best mix of gas is useful to know, using known depth to dive safely.

PPO2 (Partial pressure of oxygen) – partial pressure of oxygen is calculated by limiting the mixture to a safe level which is 1.1 ata-1.6 ata.

SMOD (Standard maximum operating depth) – This can be calculated by using standard PPO2 value 1.4.

Furthermore, through complex calculations, two tables will be produced by SDCA

EAD (Equivalent air depth) table: This will show EAD's for a start and end percentage of O_2 along with start and end depth.

Table of partial pressures: This table will use same requirements as of EAD table with exception that when partial pressure is above 1.6, it should not be displayed.

Besides, *Simple calculations and complex calculations*, there is **Help** menu that should give instructions for how to use the program with acceptable values along with the meaning of the help menu items.

How to use the Scuba Diving Calculation Assistant

The Scuba Diving Calculation Assistant is here to support you with your diving calculations. When you open the application, it should look like this:

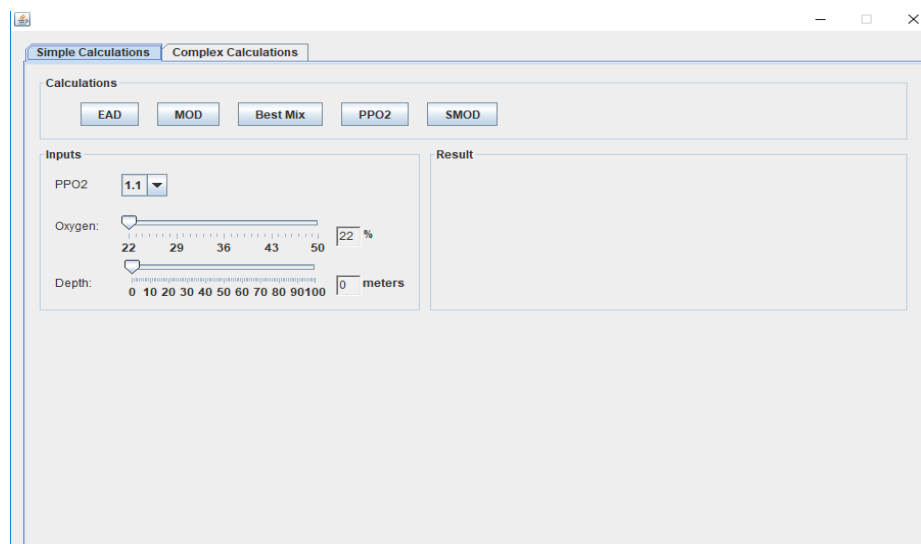


Figure 1: First snapshot of Simple calculations

To pick which calculation you would like to make, *click* the ‘*Simple Calculations*’ or ‘*Complex Calculations*’ tab (only Simple calculations have been implemented yet as a part of Sprint1).

Simple Calculations

The SDCA can calculate five common simple diving calculations. Equivalent Air Depth (EAD), Maximum Operating Depth (MOD), Standard Maximum Operating Depth (SMOD), Fraction of Oxygen (Best Mix), and Partial Pressure of oxygen (PPO₂)

Equivalent Air Depth (EAD)

To calculate the Equivalent Air Depth, enter the percentage of oxygen and depth by using the sliders

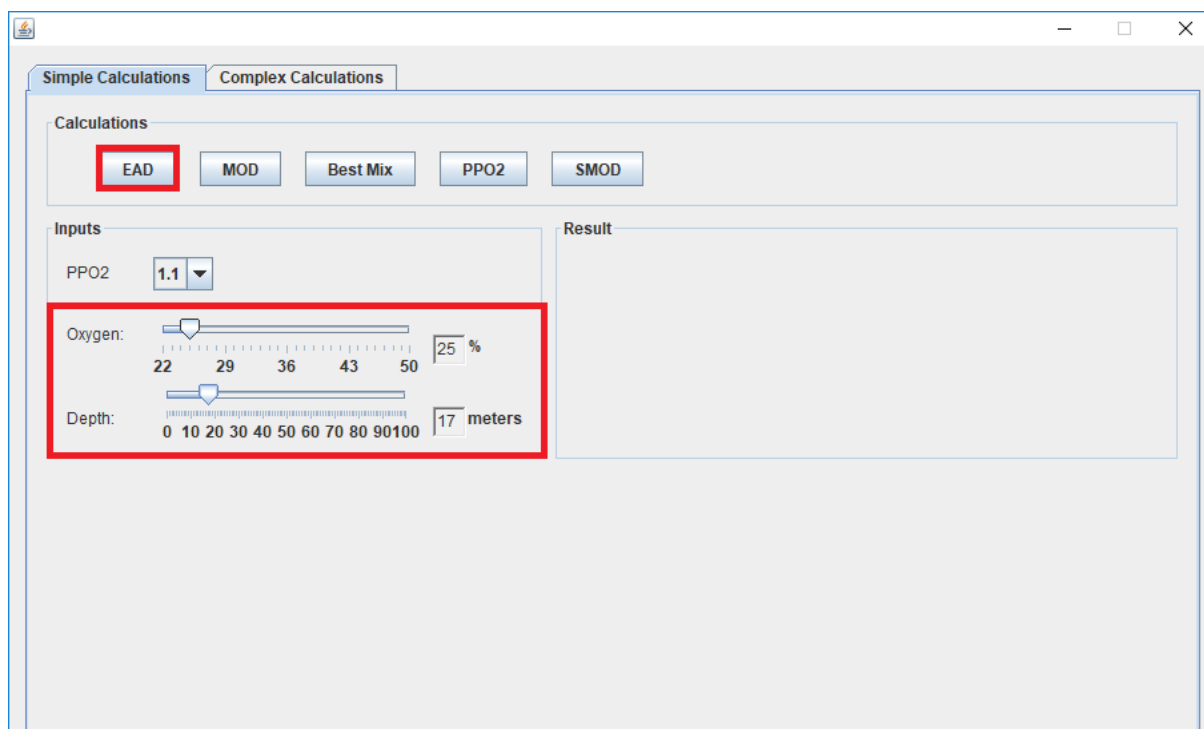
The image shows a software window titled 'Simple Calculations' with a sub-tab 'Complex Calculations'. Under the 'Calculations' section, there are five buttons: 'EAD', 'MOD', 'Best Mix', 'PPO2', and 'SMOD'. The 'EAD' button is highlighted with a red border. Below this, in the 'Inputs' section, there are three sliders: 'PPO2' with a value of 1.1, 'Oxygen' with a value of 25%, and 'Depth' with a value of 17 meters. The 'Oxygen' and 'Depth' sliders are also highlighted with a red border. The 'Result' section is empty.

Figure 2: Getting input for EAD through sliders

When user provide input values through sliders, press [EAD] tab to know EAD value

The EAD is displayed to the right of the window in the 'Result' box.

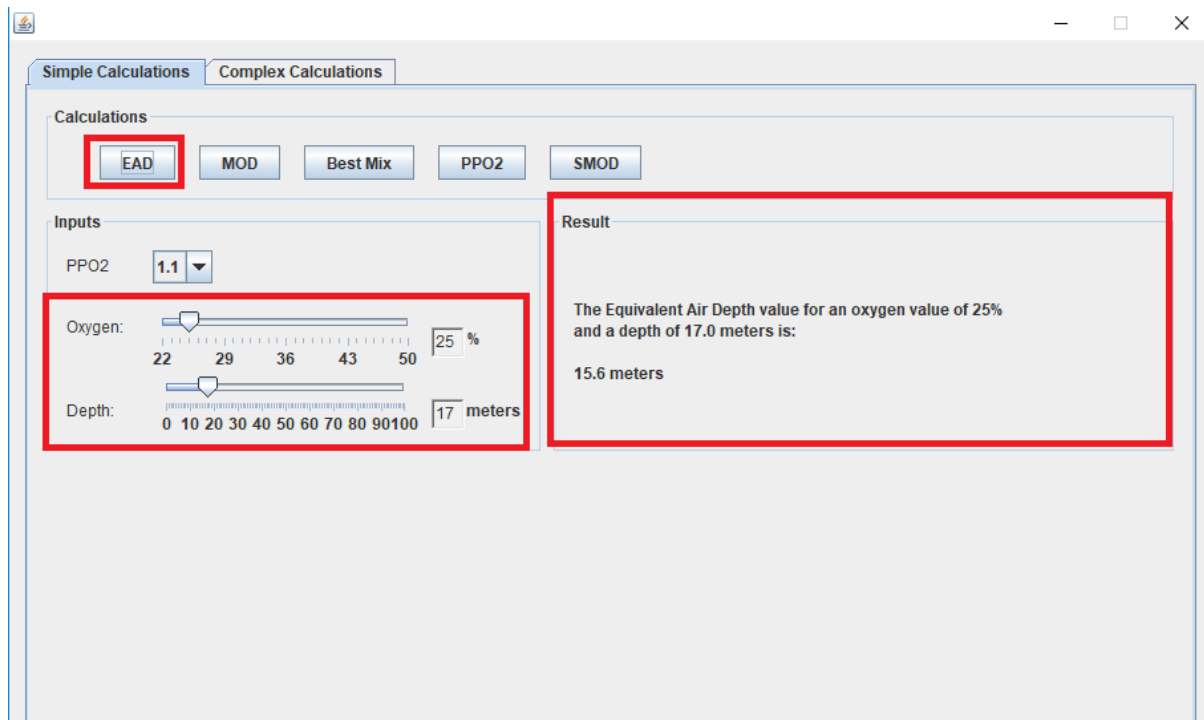


Figure 3: EAD result

Maximum Operating Depth (MOD)

To calculate the Maximum Operating Depth, *click* the 'MOD' button to the left of the window. Enter the Partial Pressure of oxygen and the percentage of oxygen in the mix. The MOD is displayed to the right of the window in the 'Result' box in metres.

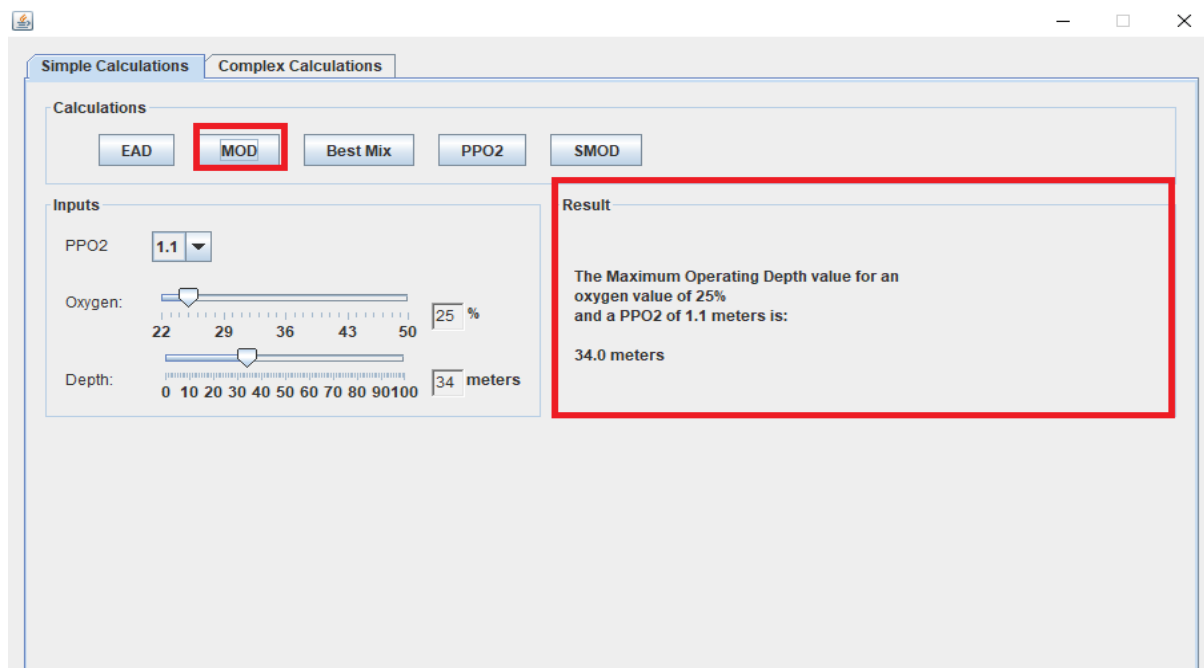


Figure 4: MOD result

Standard Maximum Operating Depth (SMOD)

To calculate the Standard Maximum Operating Depth, *click* the ‘SMOD’ button to the left of the window. In SMOD the PPO₂ is fixed to 1.4. Enter the percentage of oxygen, then click on “SMOD”

The SMOD is displayed to the right of the window in the ‘Result’ box.

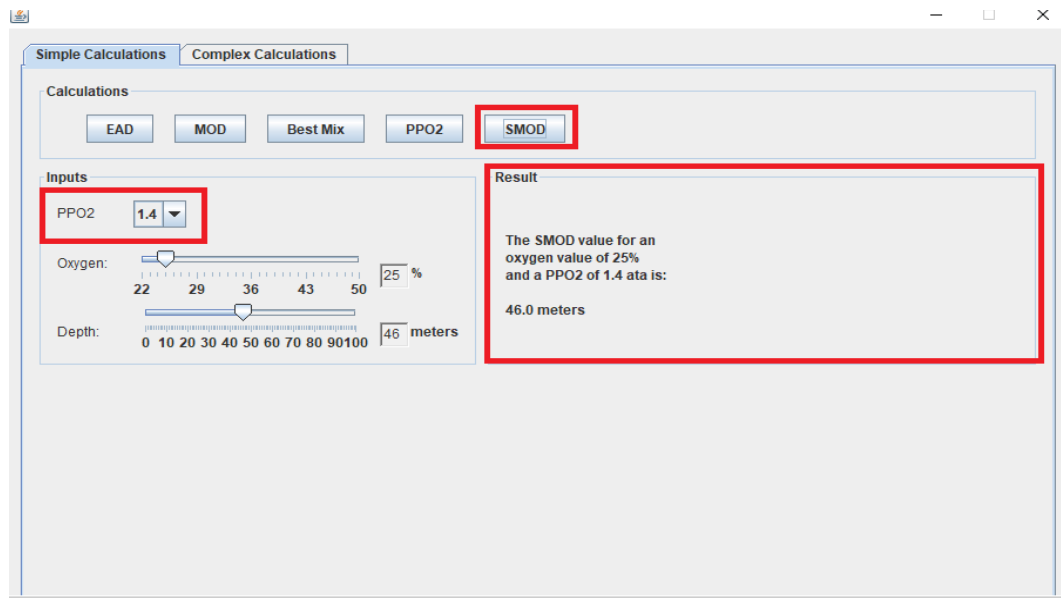


Figure 5: SMOD result

Fraction of Oxygen (Best Mix)

To calculate the Best Mix, *click* the ‘Best Mix’ button to the left of the window.

Enter the partial pressure of oxygen and the depth, then click “Best Mix”. The Best Mix is displayed to the right of the window in the ‘Result’ box.

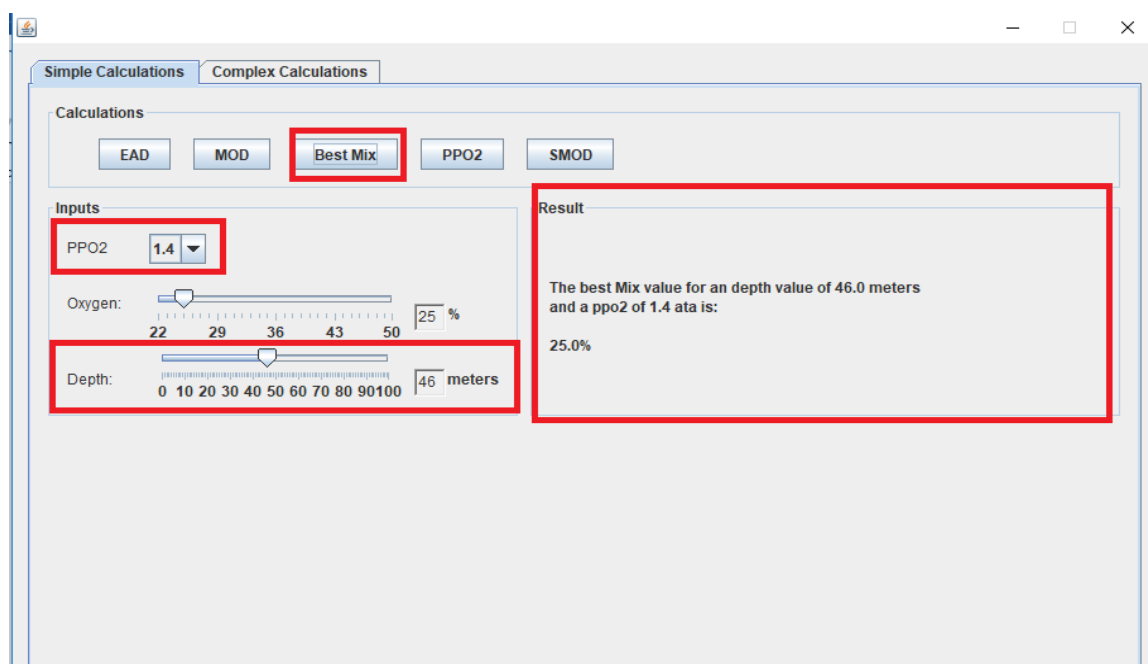


Figure 6: Best Mix result

Partial Pressure of Oxygen (PPO₂)

To calculate the Partial Pressure of Oxygen, *click* the 'PPO₂' button to the left of the window.

Enter the input values from the sliders to calculate PPO₂, the PPO₂ is displayed to the right of the window in the 'Result' box.

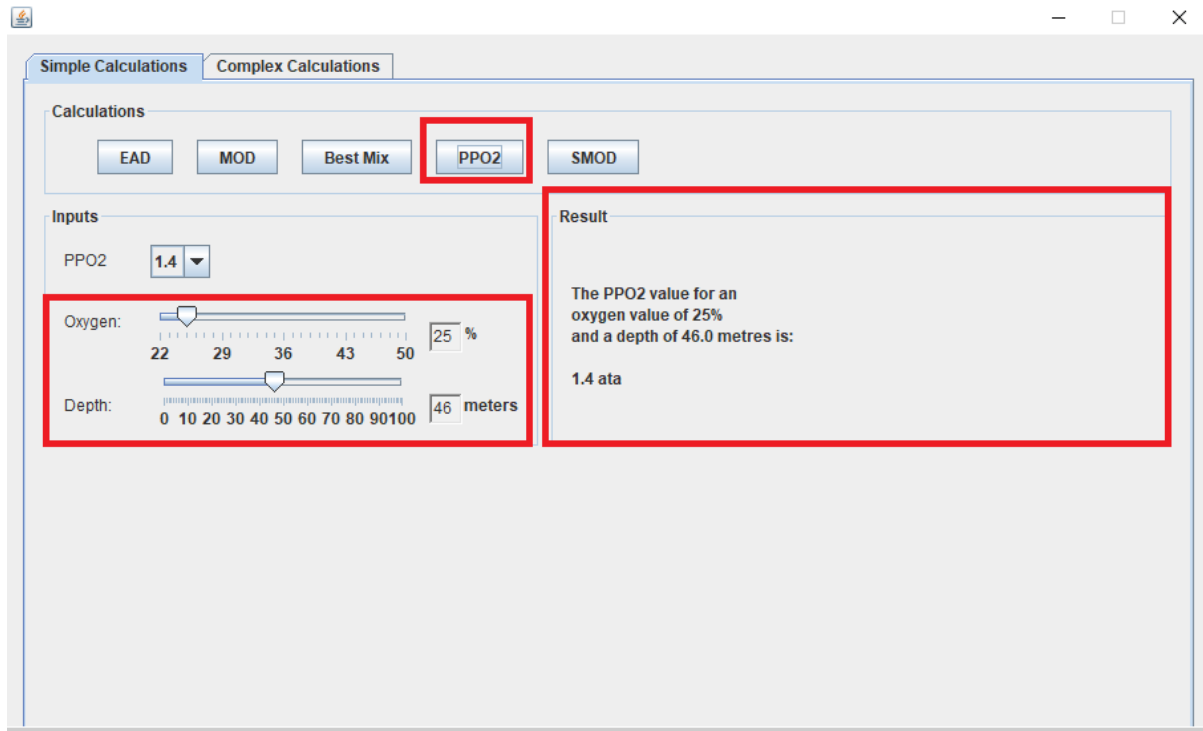


Figure 7: PPO2 result

Error Handling

The Scuba Diving Calculation Assistant application has been designed in such a way that if user provide invalid values which are not in the acceptable range, program will display errors/warnings through GUI to inform users about the mistakes and give them a chance to correct the values so that application produce correct calculations.

There could be many instances where results could be invalid but following are examples of some screenshots when values entered by user are not valid:

1. For Best mix, Oxygen value must be between 22% and 50%, when this value is out of range, warning will be displayed to user as shown below:

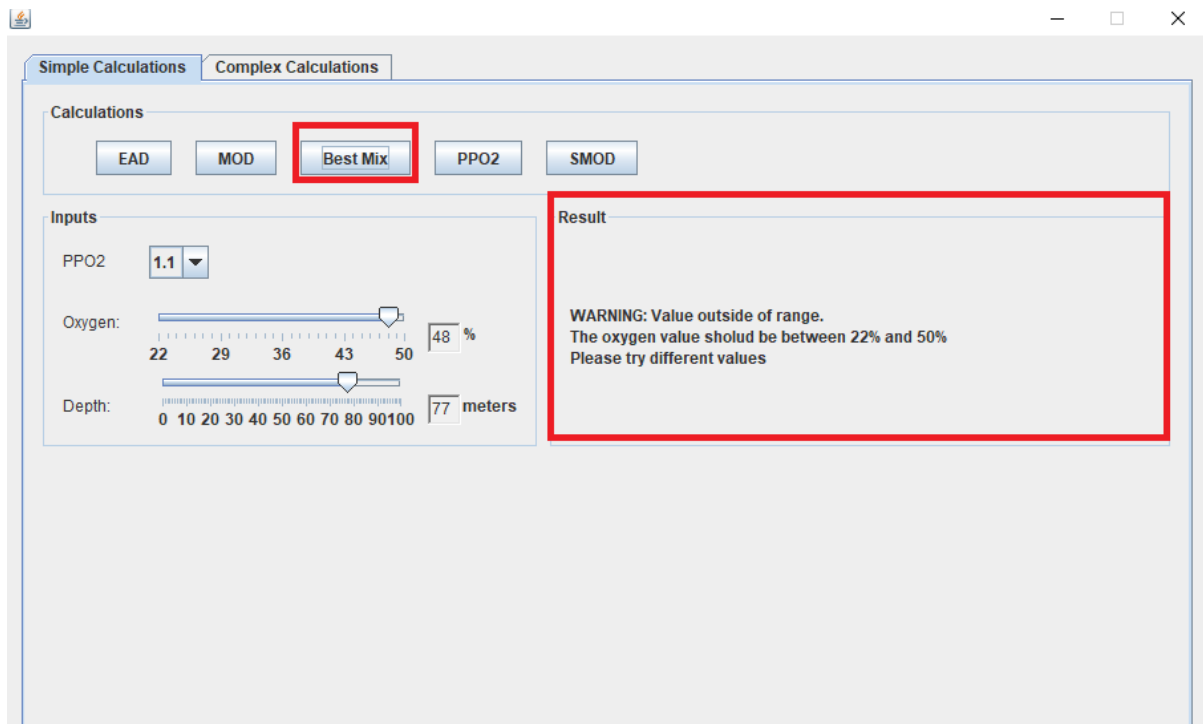


Figure 8: Warning for Incorrect Best mix

2. When PPO2 exceeds recommended range of 1.1-1.6, warning will be displayed as following:

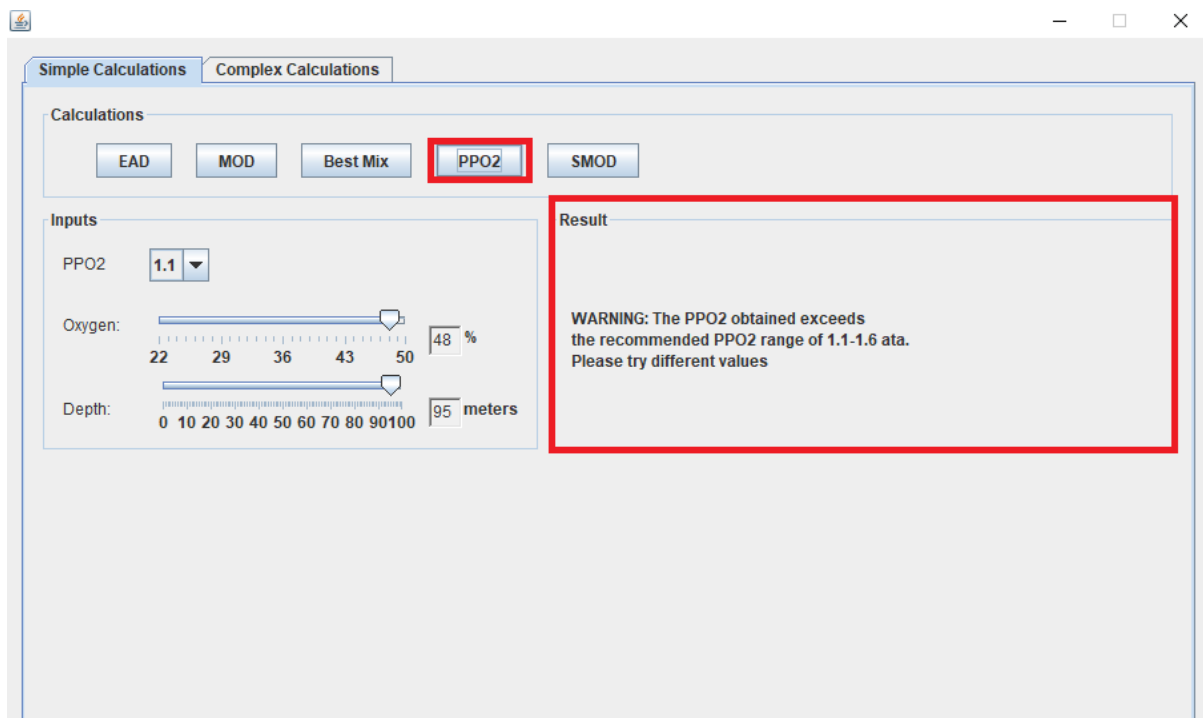


Figure 9: Warning for incorrect PPO2

Complex calculations

Complex calculations component in SDCA is used for producing two tables: EAD table and table of partial pressures.

To calculate complex calculations, click on the *complex calculations tab* at the top left-hand side.

Simple Calculations **Complex Calculations**

Complex Calculations

Generate EAD Table Generate PPO2 Table

Inputs

Oxygen

Start: 18 22 26 30 34 38 42 46 50 18 %

End: 18 22 26 30 34 38 42 46 50 18 %

Depth

start: 3 13 23 33 43 53 63 3 meters

End: 3 13 23 33 43 53 63 3 meters

Results

Depth\Oxygen

Figure 10: Complex calculation

EAD table

For this, user needs to input values for oxygen and depth where, oxygen values must be between 18%-50% or any combination between these values whereas depth values should only range between 3m to 70m. Any value out of these range is not acceptable by the system.

Simple Calculations **Complex Calculations**

Complex Calculations

Generate EAD Table Generate PPO2 Table

Inputs

Oxygen

Start: 18 22 26 30 34 38 42 46 50 29 %

End: 18 22 26 30 34 38 42 46 50 34 %

Depth

start: 3 13 23 33 43 53 63 15 meters

End: 3 13 23 33 43 53 63 34 meters

Results

Depth\Oxygen

Figure 11: Getting inputs for EAD table

After providing inputs for EAD table, click on *generate EAD table tab*. Table of EAD's will be generated with increment of 1 in oxygen values and increment of 3 in depth values. This is shown in the following snapshot:

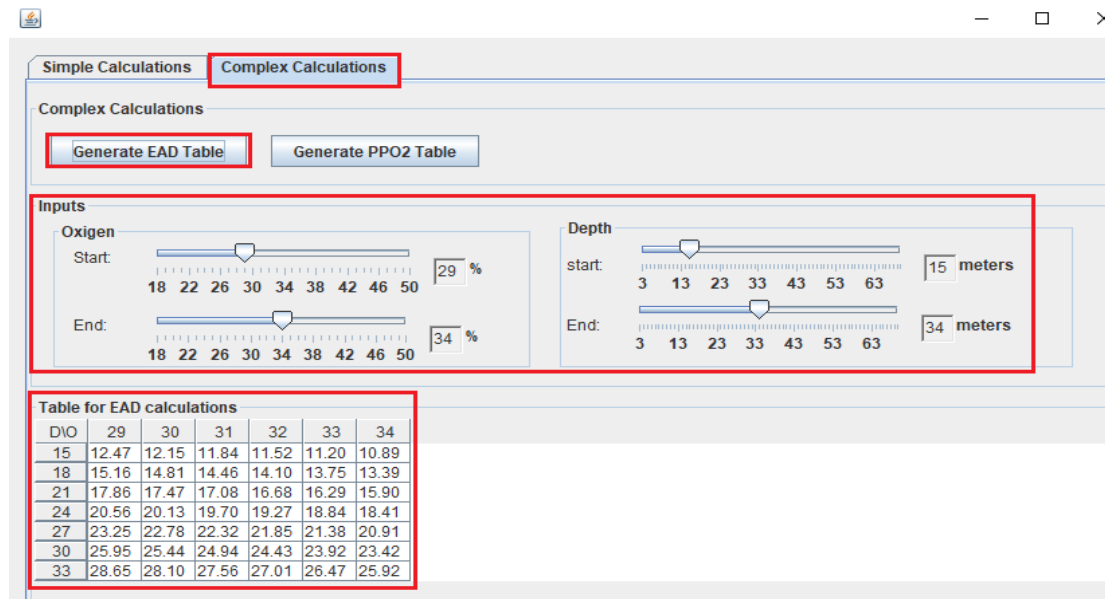


Figure 12: Final EAD table

PPO2 table

For PPO2 table, input requirements are same as of EAD table mentioned above, but the partial pressure above 1.6 will not be displayed. User will give input to the system, click on *generate PPO2 table tab*, PPO2 table will be generated as shown in the snapshot below:

Blank boxes in the table represent value of PPO2 is more than 1.6

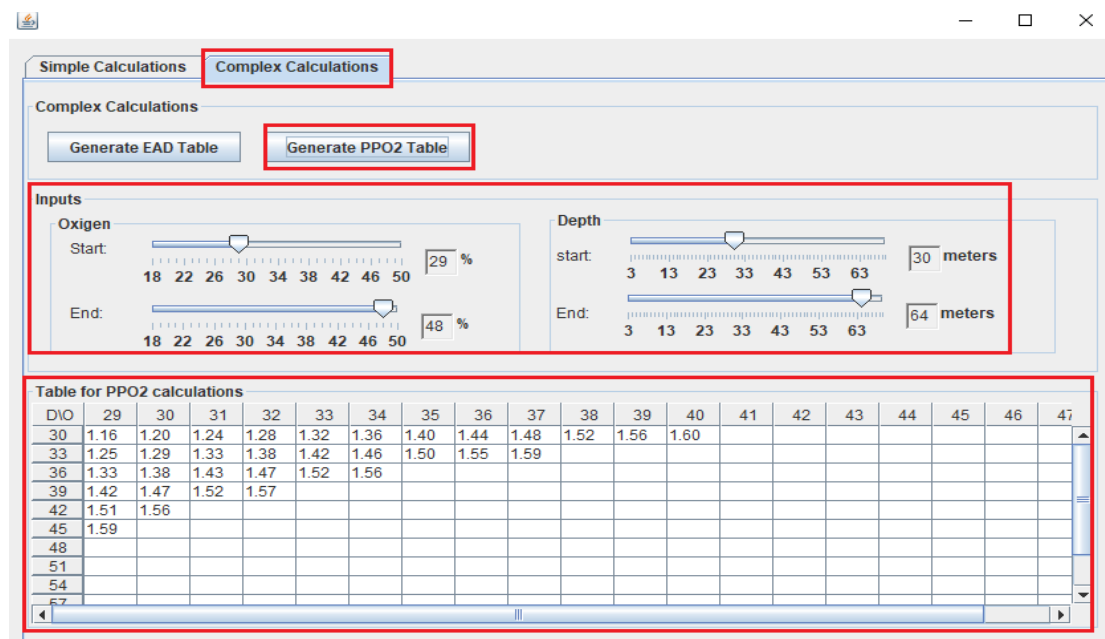


Figure 13: PPO2 table