# Laser Calibration Instructions

## General

This document provides instructions for performing laser calibration using MultiSpot software (version 1.06).

## Opening Calibration Window

To open the calibration window, first go to service menu by pressing the "Service" button on the bottom menu bar.

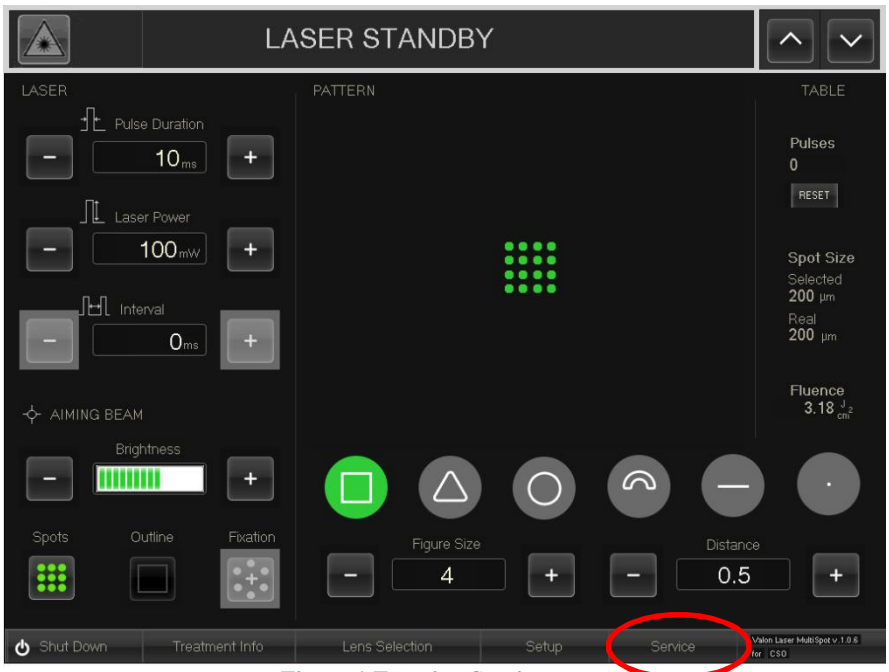


Figure 1 Entering Service menu

After the service window has opened, enter a password (34344) to open full service menu. After service menu items are displayed, press "Calibrate" button to open the calibration window.

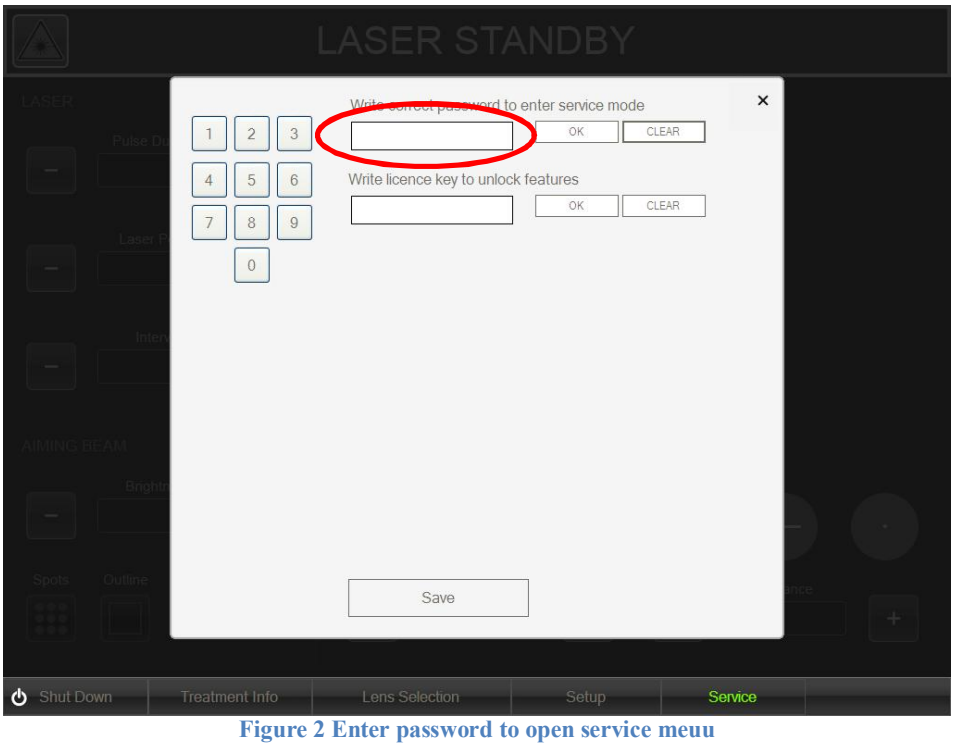


Figure 2 Enter password to open service meuu

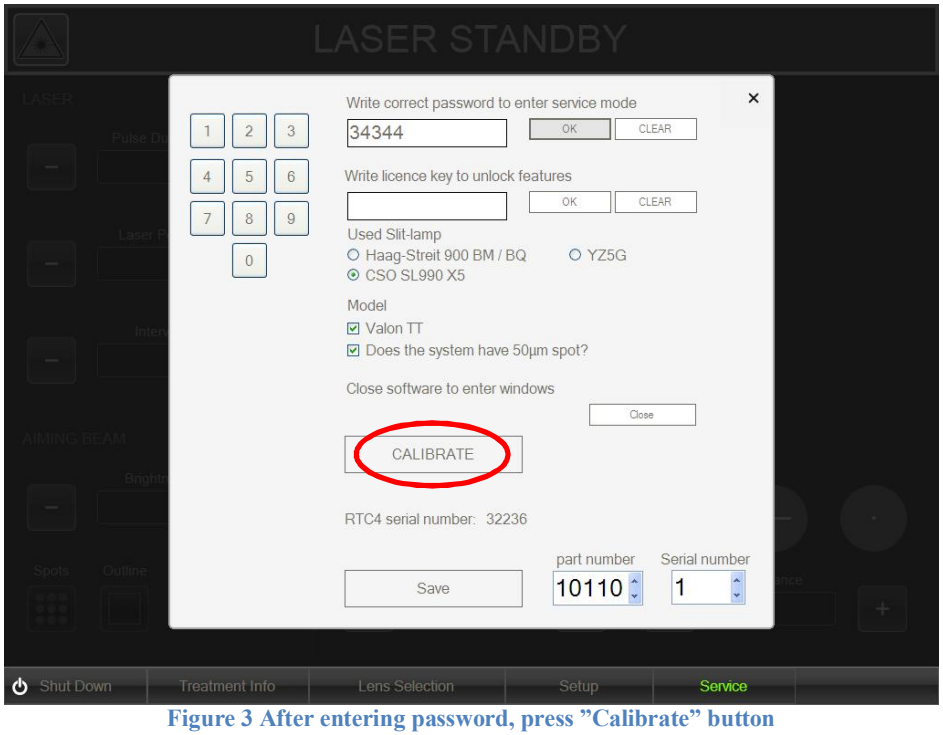


Figure 3 After entering password, press ”Calibrate” button

Pressing calibrate button opens the calibration window.

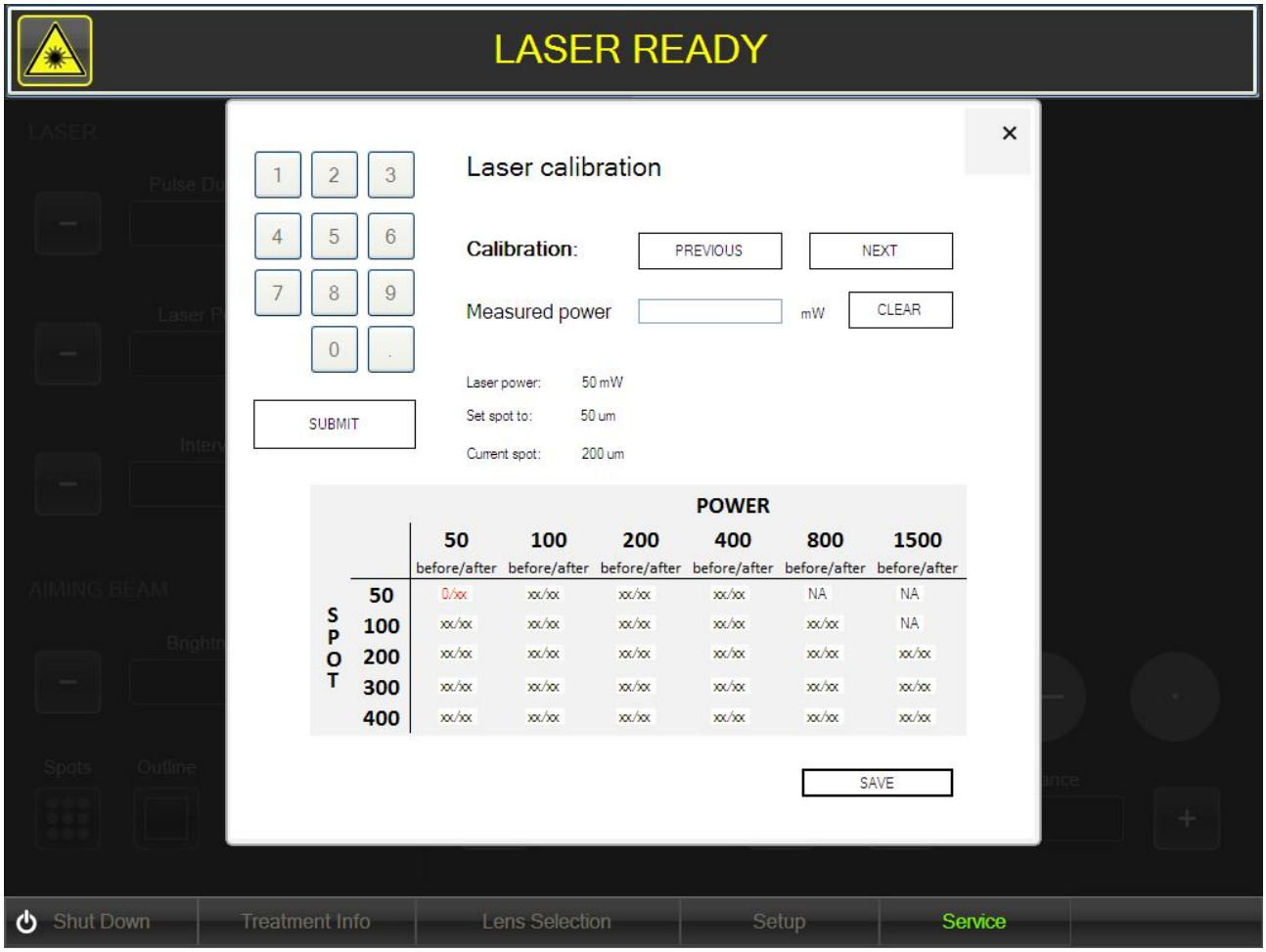


Figure 4 Calibration window

## Calibration

Remember to use eye safety goggles when performing calibration! Laser is automatically enabled when entering calibration mode. A press of foot switch will emit laser light.

During calibration, measurements with laser power meter are taken with different spot sizes and different laser powers. The calibration starts from 50 µm spot size and 50 mW power. The combination of spot size and power that is being calibrated is shown in red on the calibration table. En empty calibration table will show xx/xx in all cells. Current spot size selected using the revolver is also shown on calibration window. To start the calibration, turn the revolver to select correct spot size.

Set the laser power meter in the beam path and align the beam to the power sensor. Set the power meter to measure pulse energy (J) and select a suitable energy range from the power meter. Now you are ready to take the first measurement.

Press the foot switch and keep it pressed until the beep stops. During calibration, 500 ms laser pulses are used and the foot switch has to be pressed for at least half a second in order not to interrupt the pulse prematurely.

After pressing the foot switch, the laser power meter will display a reading. Type the number using the key pad on calibration window and press “Submit” button (below key pad). The measured power value will appear on the calibration table multiplied by two (due to 500 ms pulse), replacing the xx/xx by YY/xx, where YY is the measured value multiplied by two. For good calibration, the value should be as close as possible to the ideal value (for example, in case of first power/spot size combination 50 mW). If the value is within 5 % of the desired value, press “Next” to move to next power (or spot) setting. If the value is far from the desired value, repeat the measurement by pressing the foot switch again. Enter the new value and press “Submit”. A new value is calculated and appears on the table. The sequence of measuring and entering the value can be repeated as many times as desired and the calibration algorithm will fine tune the calibration at each cycle. However, due to errors in measuring laser power, it is not always possible to achieve 100 % accurate calibration even if repeating the sequence many times. The target should be to achieve a measured value that is within 5% of the ideal power. If 5% cannot be reached, the absolute minimum target should be to achieve a measured value within 20% of the ideal value as this is the limit set by the laser standard IEC 60825.

After pressing “Next”, the calibration moves to the next power/spot size setting. Repeat the same for each power setting until you have reached good calibration for all power and spot size combinations.

Note that you have to manually set the spot size using the revolver each time the calibration progresses to a new spot size!

Once all the calibrations are done, press “Save” button to store the calibration data.

A calibration check should be run after performing a full round of calibration to verify that the calibration is good. During calibration check the measured values will be entered in the same table and appear as YY/ZZ, where YY is the value entered during the calibration and ZZ is the value entered during the calibration check.