Control Center Driver Software

Quick start (mini USB mode, only one driver)

1.   Solder the laser diode into the driver socket. **Note:** Make sure, the laser pins numbering matches with the imprint on the laser socket.

2.   Power the driver board according to its datasheet. After the power is applied, the Power LED will light up

3.   Connect the mini USB cable.

4.   Run ld_control_center_vXXX.exe.

5.   Click "Settings" to enter the program configuration menu (fig. 1).
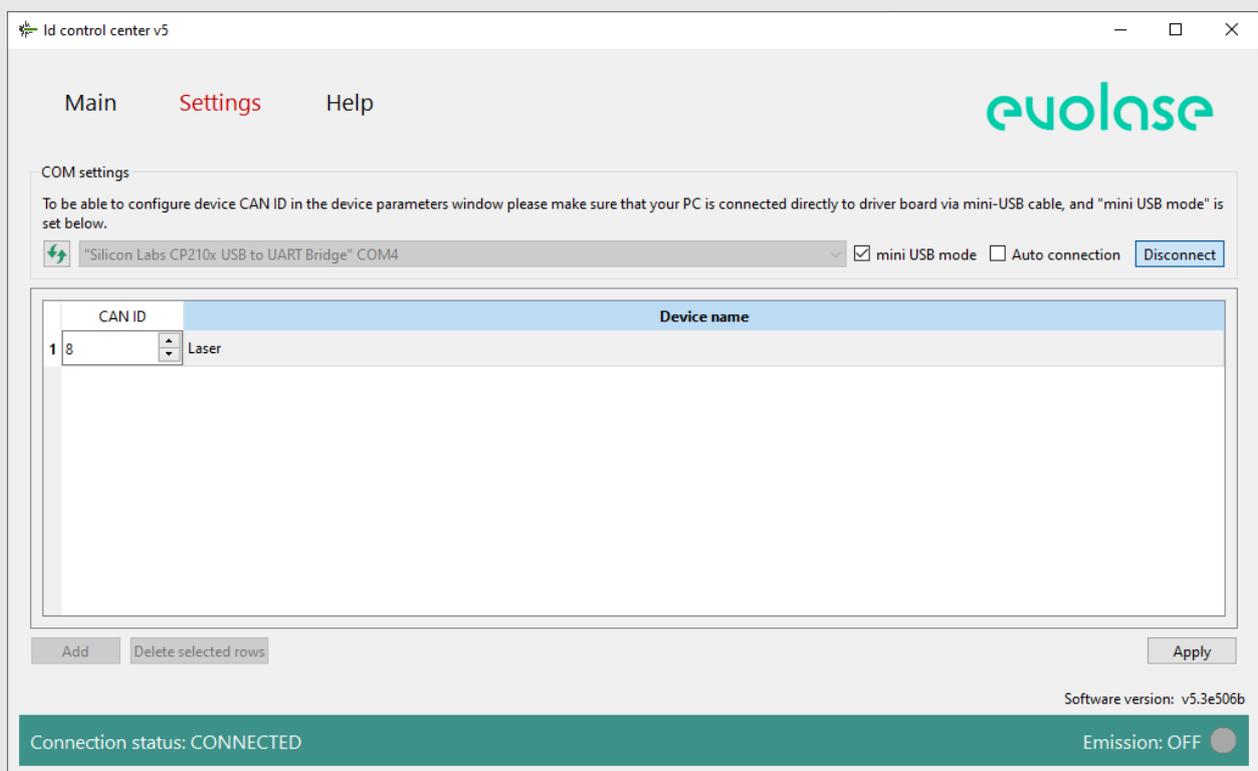

Figure 1: The system configuration menu.

6.   Press ⚡ icon to refresh the list of COM ports and select the COM port the driver is connected to from the drop down menu.

7.   Tick the "mini USB mode" box. The laser diode used is displayed in the channel 1. The user can set the name of the laser in the "Device name" window.

8.   Tick the "Auto connection" box to select the "Auto connection" mode; otherwise click "Connect".

9.   Click "Main" menu panel. The control panel corresponding to the type of USB connected

10.   The driver should appear in the first channel. Click the "Main" menu panel. The shown control panel matches the connected driver type.

11.   Click ⚙ icon located in the control panel's upper right corner to enter the driver setting mode. The driver setting mode allows entering laser diode parameters and the permitted range of laser operating conditions (fig. 2).

12.   The middle column shows the current value of the parameters. To change the parameter value, enter each parameter in the settings window and click "Write" to apply the value.

13.   CAN ID for the driver could also be set here for operation as part of the CAN network. The new CAN ID value will be applied only after resetting the driver power supply. See more about the CAN network in the relevant section.

14.   After setting all the parameters, click "Close". The driver is now configured and ready for operation.
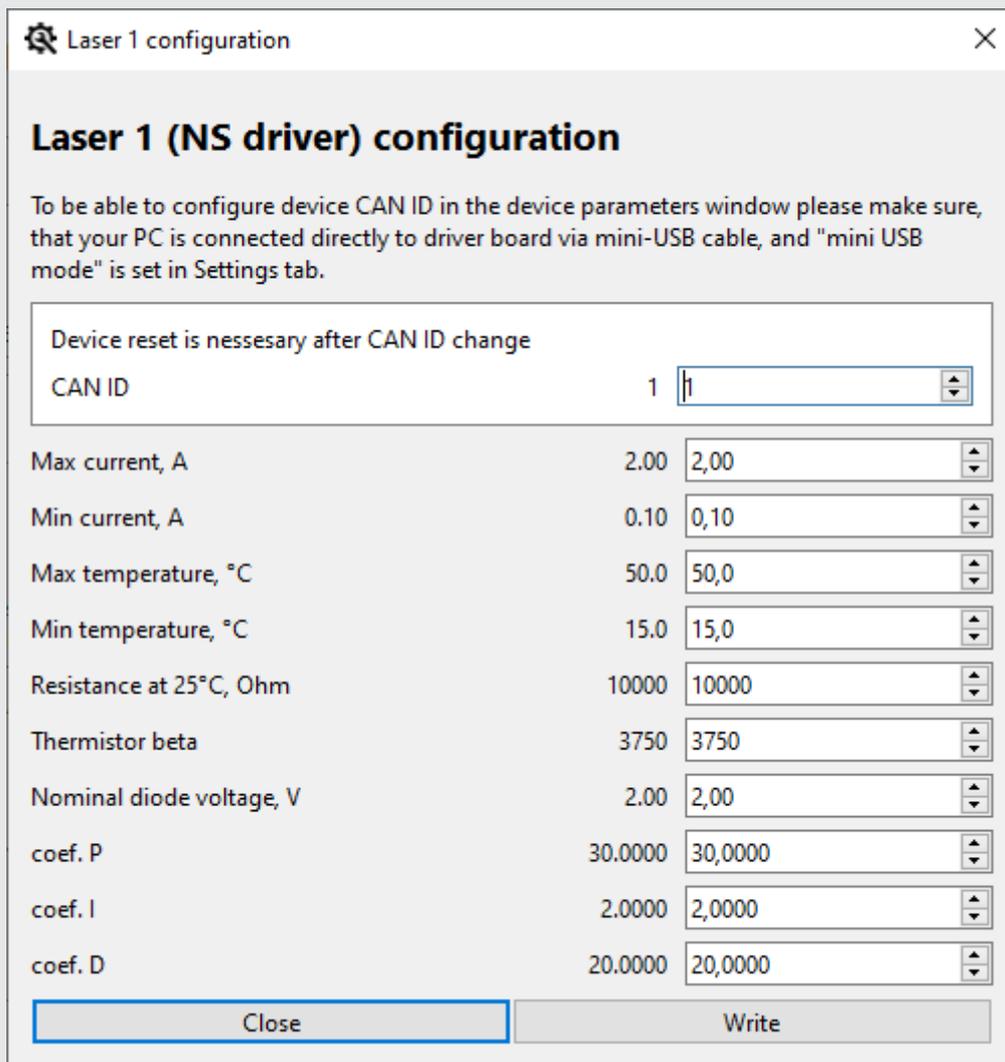

Figure 2: The laser diode setting menu

Laser diode settings and system configuration

The system configuration window (fig. 2) is accessed by pressing "Settings" in the navigation bar. In this window the user can set the number of channels, CAN network ID and the names for the connected drivers.

The user can access the laser diode settings menu by pressing the wrench icon in the expanded main control view. The wrench icon will open a new individual menu for the connected laser diode, and the software applies the new settings only to that single diode. Available settings for nanosecond drivers are

shown in Figure 2.

The user can set CAN ID of the driver, the allowed ranges for the operation current and temperature, nominal diode voltage, the values of thermistor resistance at 25 ^{0}C and beta parameter and the coefficients of the PID controller of the TEC. The middle column shows the current value of the parameters. To change the parameter value, enter each parameter in the settings window or change by up and down arrows and click "Write" to apply the value.

Basic controls and operation

The main software window shows controls (fig. 3) available for the drivers connected to the PC. The control window could be collapsed (fig 4). The software supports up to 200 devices connected to a PC through a USB/CAN adapter. Each laser diode drive current, temperature, drive voltage, repetition rate, and pulse duration can be entered into corresponding window or changed by up and down arrows. The user needs to confirm the value by pressing Enter for changes to take effect

Note: Not all settings are available for each type of driver. The software will only show the available controls based on the recognized driver type.
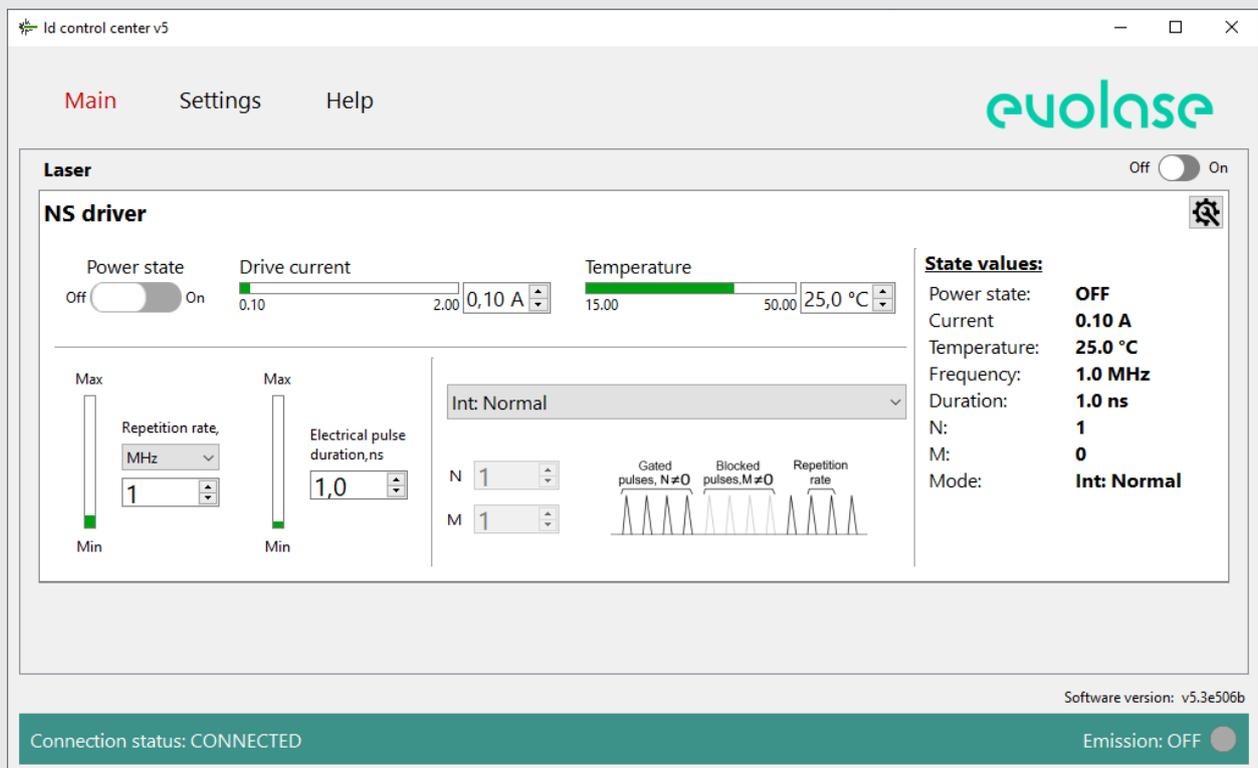

Figure 3: The main control menu.

For NS driver, the user can set the temperature of the laser diode, the driver current, pulse width, pulse

train repetition rate, the number of pulses in the bursts and the number of skipped pulses between the bursts in burst mode (fig. 3). The "Power state" toggle turns on and off the laser diode emission.

The section "State values" on the right side of the main panel displays the current measured values of the corresponding parameters of the laser diode. The same information is displayed in the status bar, when control window is collapsed. The number before the slash symbol "/" shows the value, set in the control window. The number after the slash symbol "/" shows the measured actual value from the driver. The power state toggle is also duplicated on the right side of the status bar. This allows the user to monitor the corresponding parameters of the laser diode and turn its radiation on and off while the main window is collapsed.
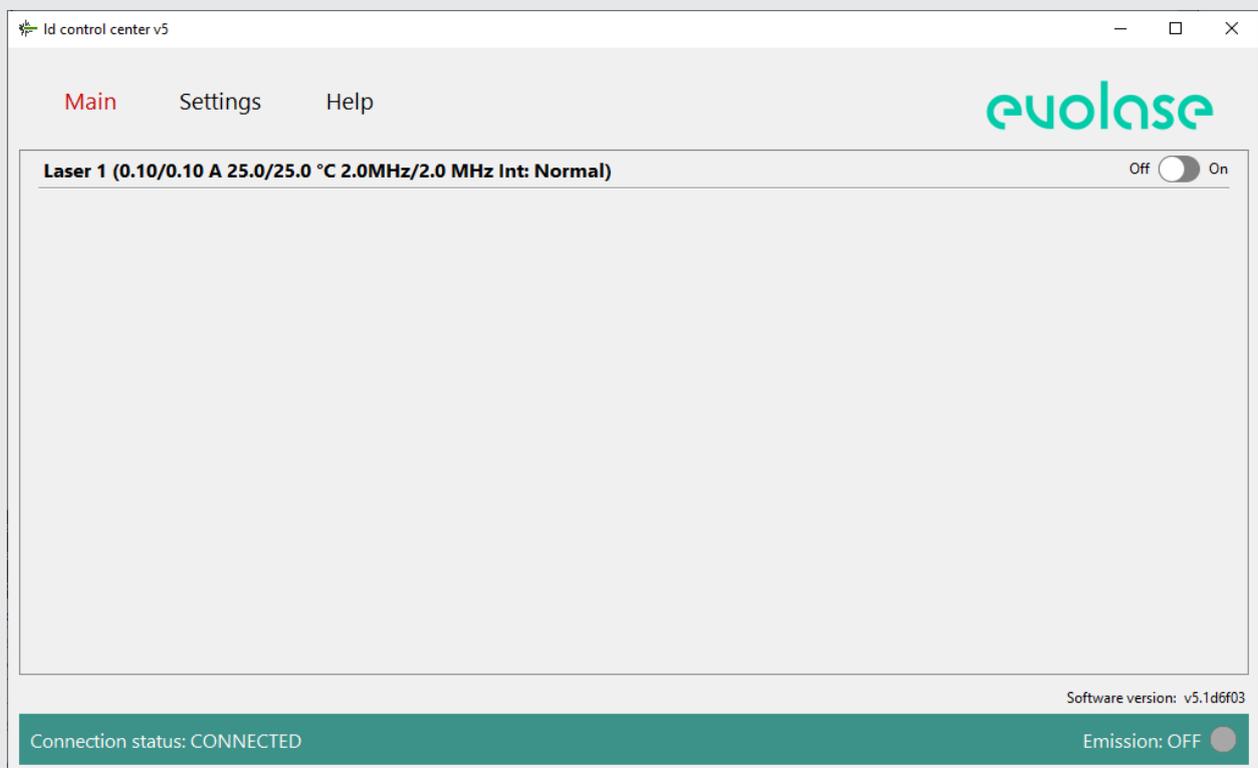

Figure 4: The main control menu.

Selection of driver operation mode:

NS driver can operate in five modes:

• **Int: Normal** – the standard mode. The driver generates a pulse train with a constant repetition frequency set in the driver's control panel.

• **Int: Burst** – the internal burst mode. The driver generates bursts of pulses at a predefined frequency from the onboard pulse generator. The user can set the number of pulses in burst (N) and the number of pulses skipped between the bursts (M).

• **Ext: Normal** – the standard external mode. The driver starts to generate pulses at a preset frequency as a response to an external TTL trigger signal. The change of trigger signal level from LOW to HIGH starts pulse generation. Change of trigger signal from HIGH to LOW stops pulse

generation.

- **Ext: Burst** – the same as Ext: Normal, but bursts of pulses are generated as a response to an external trigger signal.

- **Pulse on Demand** – external trigger signal (change of trigger signal level from LOW to HIGH) generates a single pulse.

To set the operating mode of the laser diode, select the required operating mode from the drop-down menu (fig. 5). **Note:** In order the driver to work in external modes, it must be connected to an external source of synchronizing pulses via the SMA "EXT TRIG" connector using a coaxial cable.
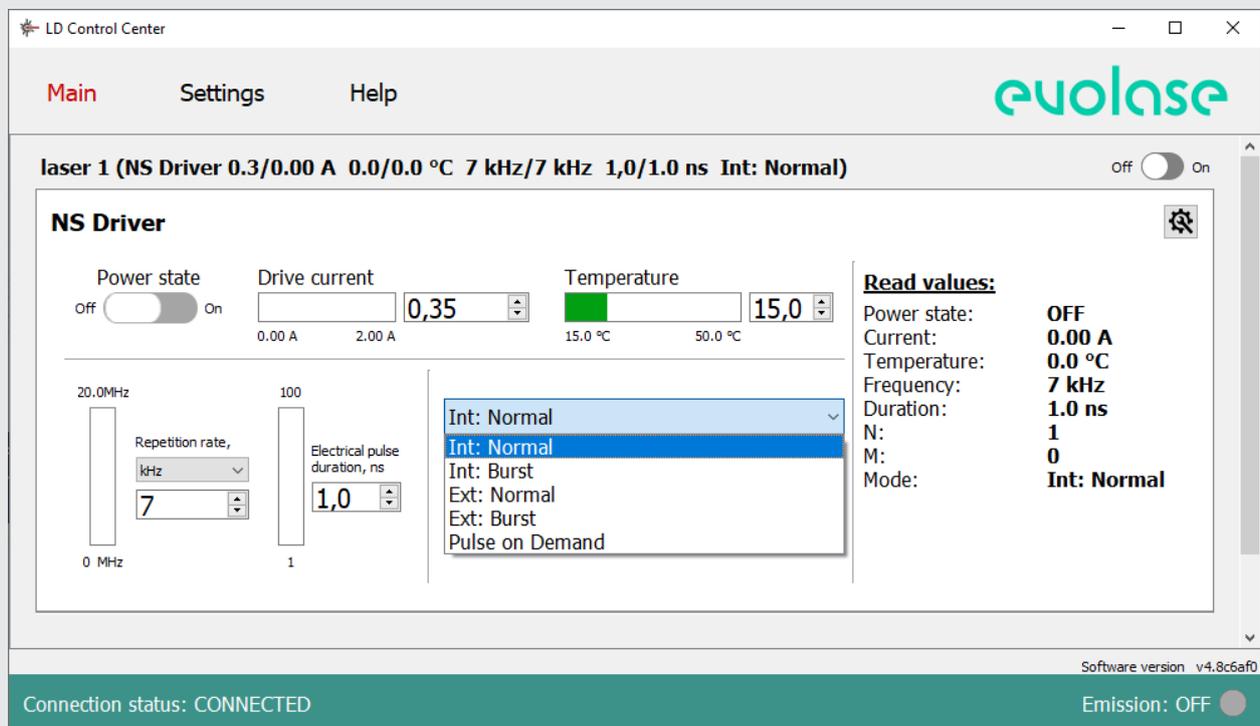

Figure 5: The main control menu. Operation mode.

Setting up operation parameters of laser diode:

- To set the laser diode temperature, enter the required temperature value in the temperature setting window and press "Enter" on PC keyboard. After that, the thermoelectric cooler (TEC) will turn on, bringing the temperature of the laser diode to the set temperature, and the indicator TEC LED will light up. Green indicator bars show the actual set value relative to the minimum and maximum allowed. The user can change the allowed range in the driver settings menu (⚙).

- To set the driver current, enter the required current value in the driver current setting window and press "Enter" on PC keyboard.

Note: In pulse mode the laser diode current can significantly exceed the CW operating current, however, this can lead to accelerated degradation of the laser diode.

\-   To set pulse train repetition rate, select the required repetition rate diapason from the drop-down menu, then enter the required repetition rate value in the repetition rate setting window and press "Enter" on PC keyboard.

\-   To set pulse width enter the required pulse width value in the setting window and press "Enter" on PC keyboard.

> **Note:** The maximum pulse duration depends on the selected pulse repetition rate and the dirty cycle value cannot exceed 2 % to avoid overheating of the driver high current components.

\-   To set the parameters of the burst mode, chose, select external or internal burst mode in the operating mode drop-down menu, after that enter the required number of pulses in the birst in the "N" setting window and press "Enter" on PC keyboard, then enter the required number of pulses skipped the pulses between bursts in the "M" setting window and press "Enter" on PC keyboard.

\-   To turn on the laser diode emission, click the "Power State" switch. The switch will move to the "On" position and change the color to green, the indicator LASER LED will light up. To turn off the laser diode emission, click the "Power State" switch. The switch will move to the "Off" position and change the color to grey, the indicator LASER LED will go off. The laser diode emission can be turned on and off even when the main control panel is collapsed.

The driver can be disconnected from the USB port during operation and the device will preserve the last known status.

The driver stores the settings in the onboard memory, and after reconnection, the software reads driver settings and displays them in the control panel. When trying to close the software with at least one laser running, a dialog window opens prompting the user to select whether to switch off the laser or to keep it running.

Operating in CAN network

1. Before connecting several drivers into a CAN network, the user needs to set a CAN ID for each driver by connecting the driver through the mini USB port and following the procedure described in the Quick Start section. The set CAN ID for each driver should be recorded.
2. Connect up to 200 drivers into the CAN network (fig. 7) by using the CAN hub (fig. 8).
3. Click "Settings" to enter the program configuration menu (fig. 6).
4. Press ⚡ icon to refresh the list of the COM ports and select from the drop down menu the COM port the driver board is connected to.
5. Untick the "mini USB mode" box.
6. Tick "Auto Connection" box to select the "Auto Connection" mode. Otherwise, click "Connect".
7. The software has a lot of channels for connecting and controlling devices. To connect a new

river, click "Add", enter the CAN ID of the driver in the appeared row. You can rename the drivers to better keep track of them. Click "Apply" to apply system configuration.

8. To remove drivers, select the rows with these devices and click "Delete selected rows", then click "Apply" to apply system configuration.
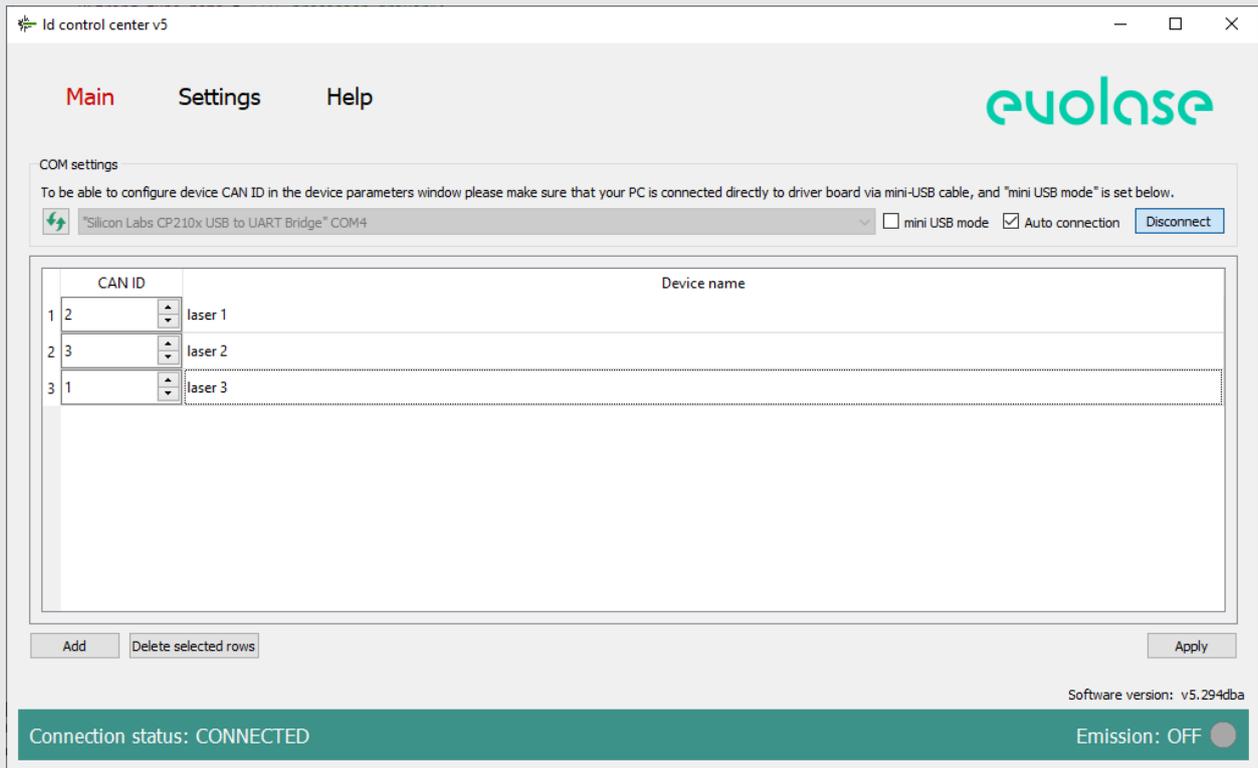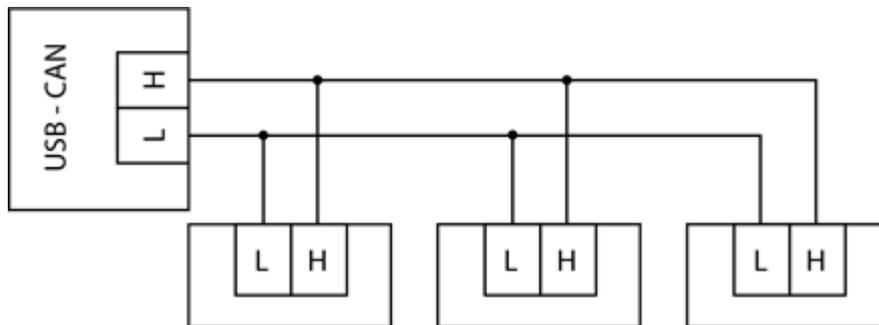
Figure 6: The system configuration menu.
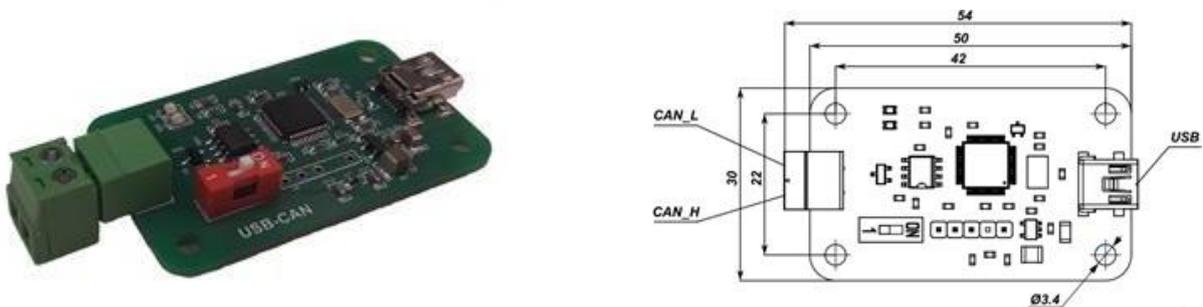

Figure 7: CAN interface connection scheme

Figure 8: USB-CAN hub