

LaserBench

(LDD14CWLASBENXXXXXXXX)

PRECISION CONSTANT CURRENT LASER CONTROL BENCH

Key Features

Built-in

- Unified design for 10/14 pin Butterfly Laser Diode and SOA
- High Precision Constant Current Mode
- Output Current up to 2000 mA
- High Current Stability: 0,01 mA
- Control interfaces USB, RS-232
- Optical power stabilization mode
- On-Board TEC Controller
- Regulated Maximum TEC Current
- Hi precision temperature stability: 0.01 deg
- 12Vdc Input Power

Extension

- Could be extended by additional laser controller boards, both cw and ps/ns, via RS232 interface.



Description

The LaserBench is a constant current laser diode driver for powering 10/14-pin butterfly laser diode modules for applications, which require high precision low ripple constant current regulation.

The driver circuitry operates from a single 12Vdc power source. The driver supplies a bidirectional proportional-integral-derivative (PID) thermoelectric cooler controller (TEC) with current capability of 4A and voltage capability of 4V. Maximum TEC current is regulated by user.

The main parameters of LaserBench (output current, temperature set, maximum TEC current, monitor photodiode signal) are controlled by touch screen.

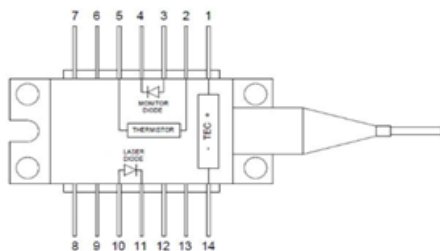
The LaserBench can control multiple Innolume laser controller board via RS232 interface.

Specifications

Parameter	Min.	Typ.	Max.	Units
INPUT				
Voltage	11.8	12.0	12.2	Vdc
Current	-	-	5	A
OUTPUT				
Current	-	-	2000	mA
Current regulation step	-	0.01	-	mA
Current ripple amplitude	-	-	0.1	%
Current stability	-	-	0.1	%
Current set accuracy	-	-	1	%
Compliance voltage	1	-	3	V
TEC current setting range	-4	-	+4	A
TEC voltage	1	-	4	V
TEC temperature set	5	25	50	°C
TEC temperature step	-	0.01	-	°C
TEC temperature accuracy	-	-	0.1	%
TEMPERATURE				
Operating	+10	-	+50	°C
Storage	-20	-	+70	°C
Humidity, Non-Condensing	-	-	95	%
CONNECTIONS				
Power	2 mm / 5.5 mm Jack (PJ-05AH Cui Devices)			
USB	Mini-USB, Type B (1734035-1 TE connectivity)			
Interface connector	DB9 (5-338313-2 TE connectivity)			
MECHANICAL				
Size	217 mm x 144 mm x 90 mm			
Wight, not more	2.5 kg			

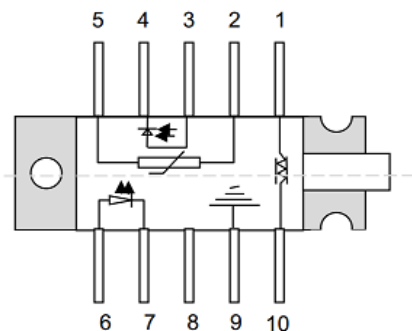
Compatible Laser and SOA Pinout

14 pin butterfly package



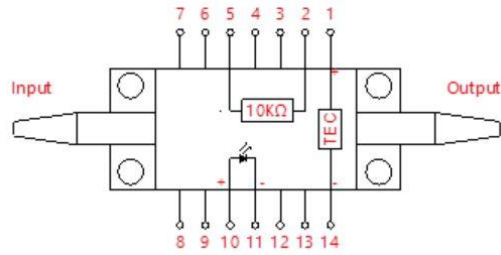
Nº	Description	Nº	Description
1	TEC Anode	14	TEC Cathode
2	Thermistor	13	n/c
3	Monitor PD Anode	12	n/c
4	Monitor PD Cathode	11	LD Cathode
5	Thermistor	10	LD Anode
6	n/c	9	n/c
7	n/c	8	n/c

10pin butterfly package



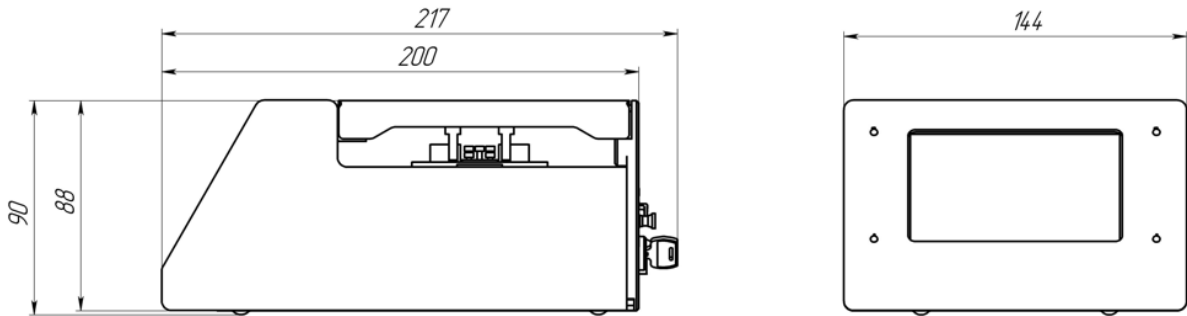
Pin	Description	Pin	Description
1	TEC (+)	6	Laser anode (+)
2	Thermistor	7	Laser cathode (-)
3	Monitor anode (-)	8	NC
4	Monitor cathode (+)	9	Package ground
5	Thermistor	10	TEC (-)

14 pin butterfly SOA package

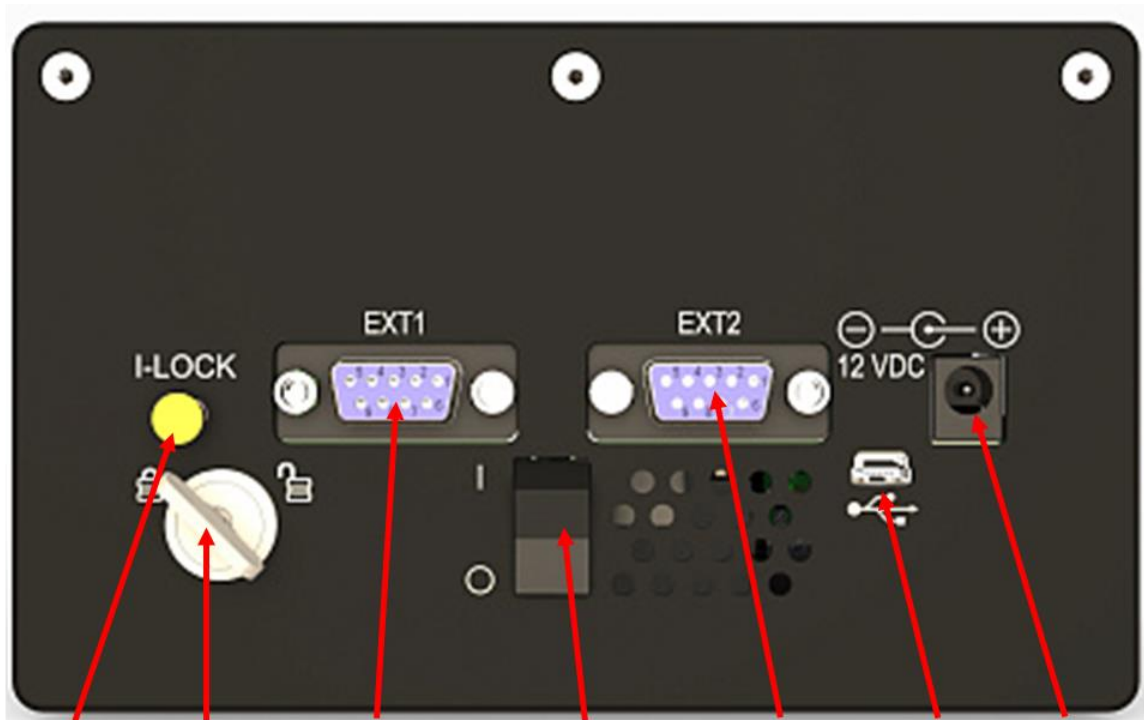


PIN	DESIGNATIONS	PIN	DESIGNATIONS
1	TEC (+)	14	TEC (-)
2	Thermistor	13	Case Ground
3	PD Anode	12	NC
4	PD Cathode	11	SLD Cathode(-)
5	Thermistor	10	SLD Anode(+)
6	NC	9	NC
7	NC	8	NC

Dimensions



Connections





Inter lock Key Lock Output Connector Power Button Input Connector mini USB Power Supply

Input connector pinout			Output connector pinout		
PIN	Function	Description	PIN	Function	Description
1	NC	No connection	1	+5Vdc	Power output
2	RS232-TX	RS232 port transmit	2	+5Vdc	Power output
3	RS232 RX	RS232 port reception	3	+5Vdc	Power output
4	NC	No connection	4	GND	Device ground
5	GND	Device ground	5	GND	Device ground
6	NC	No connection	6	GND	Device ground
7	NC	No connection	7	NC	No connection
8	CANL	CAN bus low	8	CANL	CAN bus low
9	CANH	CAN bus high	9	CANH	CAN bus high

User manual

Basic function – Laser control bench

1. Remove the cover. Install the laser diode into the ZIF socket: Open the ZIF socket clams. Insert the laser into the mount in such way, that the pins fit easily into the slots of the ZIF socket. **Note:** Make sure, the laser pin numbering matches with the imprint on the laser socket. Close the clamps of the ZIF socket.
2. Power the laser bench. After the power is applied, push the power button on the backside of the driver. Turn the key to the unlock position.
3. Select “Precision CW driver” in Main menu on touchscreen (fig. 1), you may return to the main menu by pressing  button.
4. In CW driver menu that appears (fig.2), press  to go to the settings menu

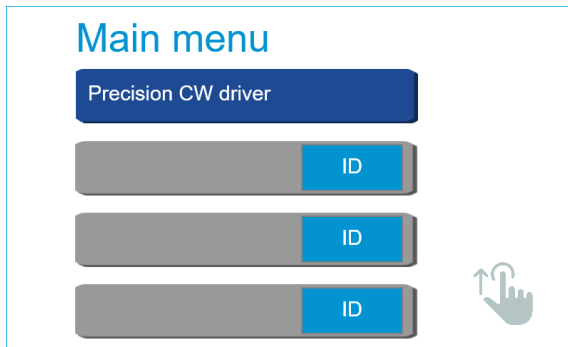


Figure 1 – Main menu

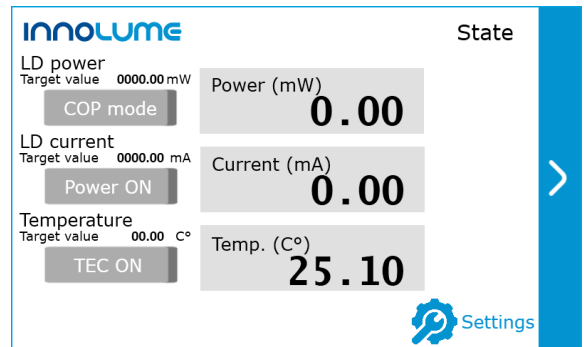


Figure 2 – CW driver menu

5. In the settings menu (fig. 3), set the laser parameters according to its datasheet. The user can set the allowed ranges for the operation temperature and current, the values of thermistor resistance at 25 °C and beta parameter, the maximum current of the TEC and the monitor PD responsivity. **Note:** the correct values of thermistor resistance at 25 °C and beta parameter are necessary for proper thermal stabilization. **Note:** the correct values of monitor PD responsivity are necessary for constant power mode.

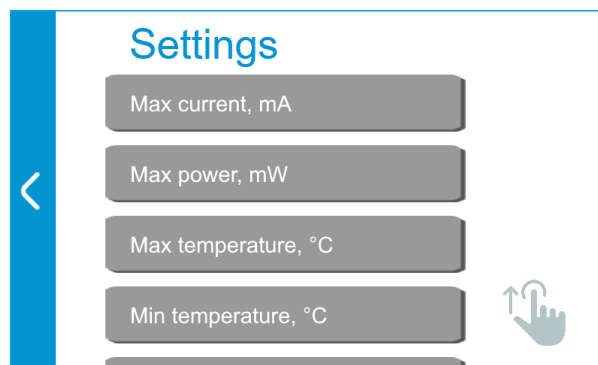




Figure 3 – Settings menu

6. To set the parameter select it from the list. The new window displays the parameter value stored in the laser memory. To change it, tap on the window (fig. 4). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.

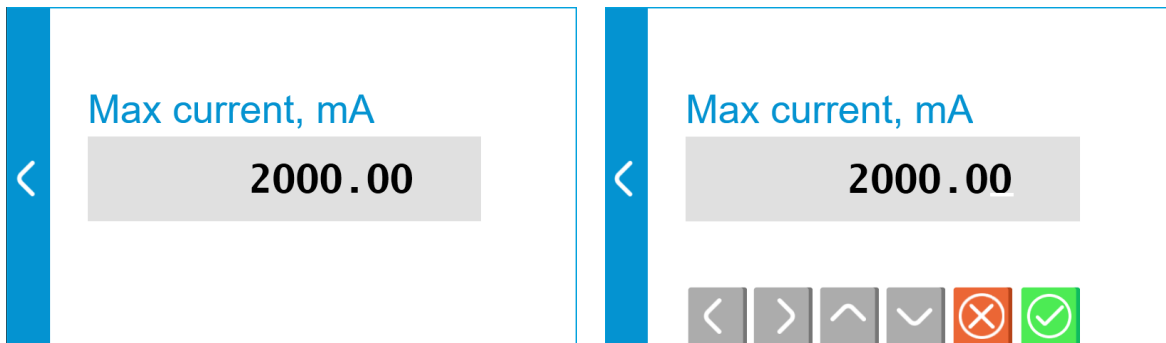







Figure 4 – Setting the parameter

7. After setting all the parameters, click  to return to the CW driver menu.
8. Tap on temperature value to set the laser diode temperature (fig. 5). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.
9. Tap on “TEC ON” button to turn on the thermal stabilization of the laser diode. The button will light up green. The temperature target value is displayed above the button; the current temperature value is displayed to the right of the button.
10. Tap on LD current value to set the laser diode current (fig. 6). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.

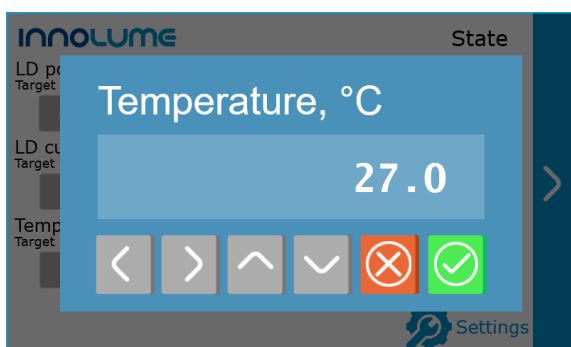


Figure 5 – Temperature setting

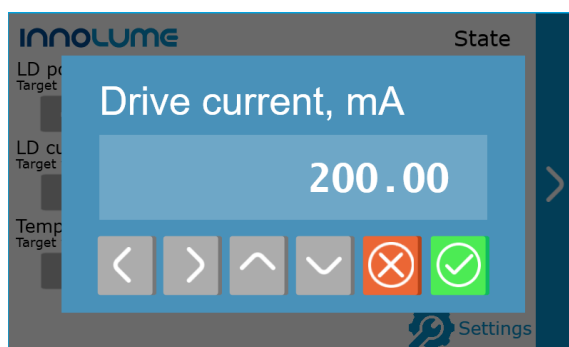




Figure 6 – Driver current setting

11. Tap on “Power ON” button to turn on the laser diode emission. The button will light up green, a laser light icon will appear in the state column on the right side of the screen (fig. 7). The LD current target value is displayed above the button; the LD current value is displayed to the right of the button. The upper window displays the value of the optical power in accordance with

the readings of the built-in monitor PD. **Note:** The monitor PD readings may differ from the actual values of optical power.

12. The user can change the values of the LD current without turning off the laser emission.

13. To turn off laser emission tap on “Power ON” button. The button will light up grey, a laser light icon will disappear.

14. The user can run the laser in constant power mode. To do this, tap on “COP mode” button the button will light up green, than tap on power value (fig.8). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.

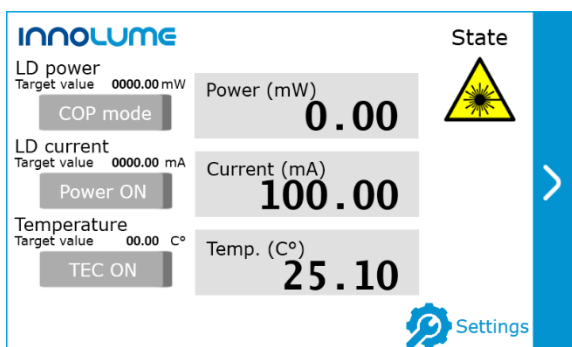


Figure 7 – Emission on state

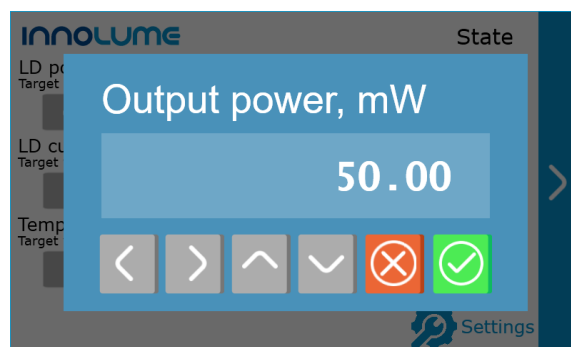


Figure 8 – Power settings

15. To turn on laser emission tap on “Power ON” button. The button will light up green, a laser light icon will appear. **Note.** Since, in this mode, a constant current is maintained on the monitor PD, and the responsivity of the PD changes over the entire range of optical powers, we recommend starting the laser in CW mode first. Then changing the current to achieve the required power value measured by an external power meter, and memorize the Power value in the “State values” section on the right side of the main software window. After that Start the laser in Constant Power mode by setting the stored power value.

16. To turn off laser emission tap on “Power ON” button. The button will light up grey, a laser light icon will disappear.

17. To turn off constant power mode tap on “COP mode” button the button will light up green

18. To turn off the thermal stabilization of the laser diode tap on “TEC ON” button. The button will light up grey. **Note:** Don't turn off the thermal stabilization, while laser emission is on, this can lead to the LD breakdown.

19. The laser emission wouldn't turn on if there is no interlock jack in laser bench. In this case, when the “Power ON” button is taped an interlock icon will appear in the state column on the

right side of the screen (fig. 9). To turn on the laser emission, return the interlock jack to its place and tap the “Power on” button.

20. The laser emission wouldn't turn on if there is no Key in laser bench or the key is in the locked position. In this case, when the “Power ON” button is taped a key icon will appear in the state column on the right side of the screen (fig. 10). To turn on the laser emission, Turn the key to the unlock position and tap the “Power on” button.

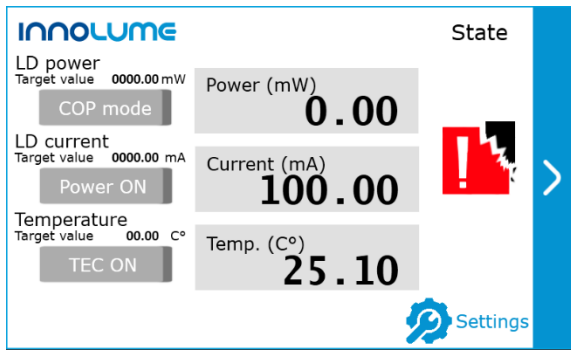


Figure 9 – Interlock

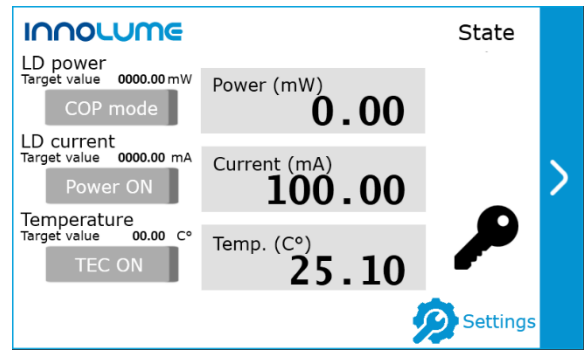


Figure 10 – Key

21. To turn off the driver, press the power button off on the back of the driver and turn the key to the lock position.

Extended function – controller for laser drivers

The user can connect several laser control boards to the Laser Bench and control them using the built-in interface via the CAN bus. The Laser Bench provides power to up to three drivers, the rest must have a separate power supply.

Connection of additional laser drivers

1. Before connecting the laser driver to the LaserBench, set the CAN ID of the driver as described in the user manual of the driver. **Note.** Don't use CAN ID 3, it's reserved for LaserBench.
2. Connect the laser driver to the output connector of the LaserBench, the connection diagram of the laser controllers to the CAN network is shown in the fig 11. **Note** pinout.

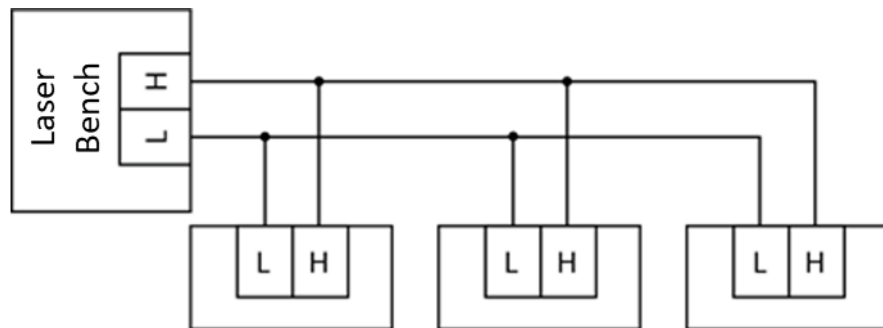




Figure 11 – CAN interface connection scheme

3. Power the laser bench. After the power is applied, push the power button on the backside of the laser bench. Turn the key to the unlock position.
4. Tap the ID button in Main menu on touchscreen (fig. 1).
5. Enter the ID of the connected driver (fig. 12). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes. If the entered CAN ID is already used on another additional device, an error message will appear Fig. 13.
6. Tap the “Additional device” whose CAN ID you entered. The control menu for the driver you have connected will appear.
7. If you tap on an additional device whose CAN ID is not entered, an error message will appear (Fig. 14).
8. If you tap on an additional device whose CAN ID is entered but device with such CAN ID isn't connected, an error message will appear (Fig. 15).

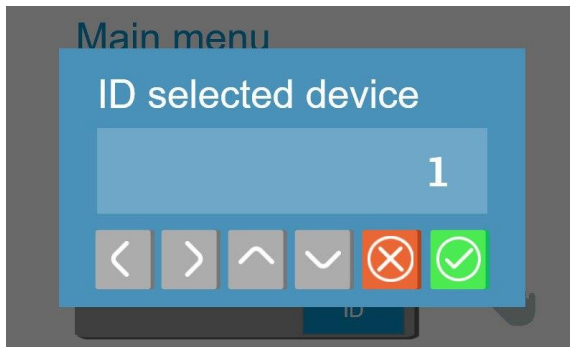


Figure 12 – CAN ID menu

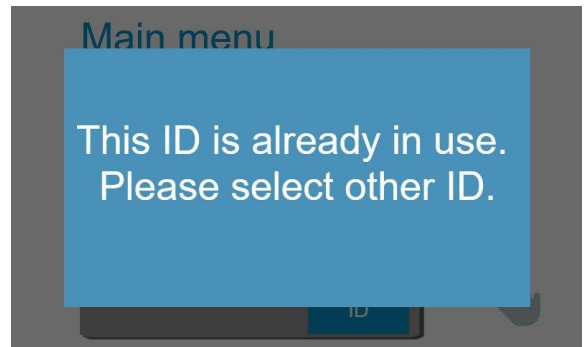


Figure 13 – CAN ID menu

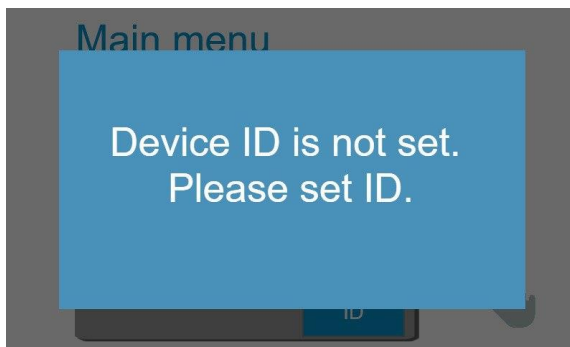


Figure 14 – CAN ID menu

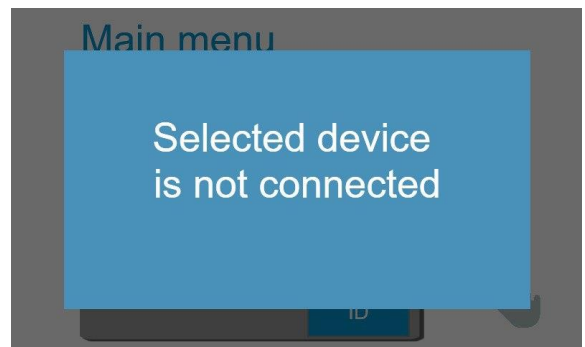




Figure 15 – CAN ID menu


PLD-CW-2000 / PLD-CW-2000-ZIF / PLD-CW-2000(H)-ZIF

The controlling of laser diode in PLD-CW drivers is completely similar to the controlling of laser diode in LaserBench.

1. In driver menu press  to go to the settings menu
2. In the settings menu, set the laser parameters according to its datasheet. The user can set the allowed ranges for the operation temperature and current, the values of thermistor resistance at 25 °C and beta parameter, the maximum current of the TEC and the monitor PD responsivity. **Note:** the correct values of thermistor resistance at 25 °C and beta parameter are necessary for proper thermal stabilization.
3. Set the laser diode temperature, turn the TEC on.
4. Set the laser diode current, turn the laser emission on.
5. The user can change the values of the LD current without turning off the laser emission.
6. The user can control lasers in other control boards without turning off the laser emission. To do this, press the  button in the driver menu and select the device you want to control in the main menu.

- To turn off laser emission tap on “Power ON” button. The button will light up grey, a laser light icon will disappear.
- To turn off the thermal stabilization of the laser diode tap on “TEC ON” button. The button will light up grey. **Note:** Don’t turn off the thermal stabilization, while laser emission is on, this can lead to the LD breakdown.

PLD-PS

- In PS driver menu (fig. 16) press  Settings to go to the settings menu.
- In the settings menu (fig. 17) the user can set the allowed ranges for the operation temperature and operating voltage, the values of thermistor resistance at 25 °C and beta parameter. **Note:** the correct values of thermistor resistance at 25 °C and beta parameter are necessary for proper thermal stabilization.

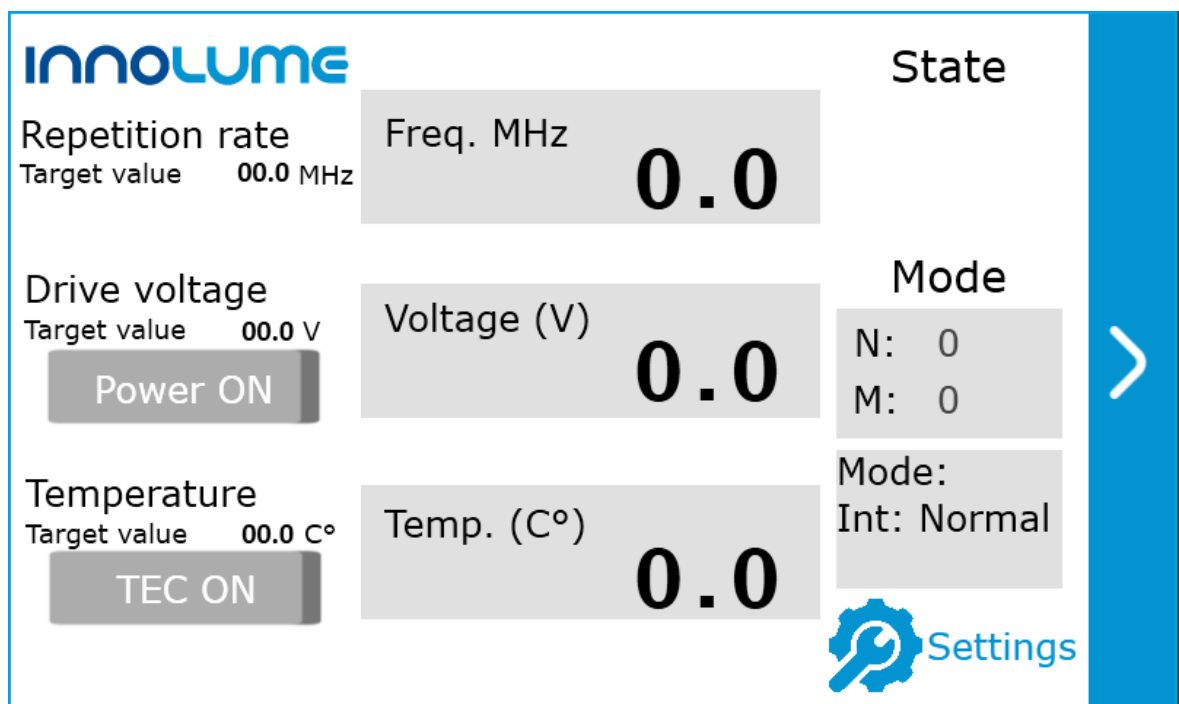


Figure 16 – PS driver menu

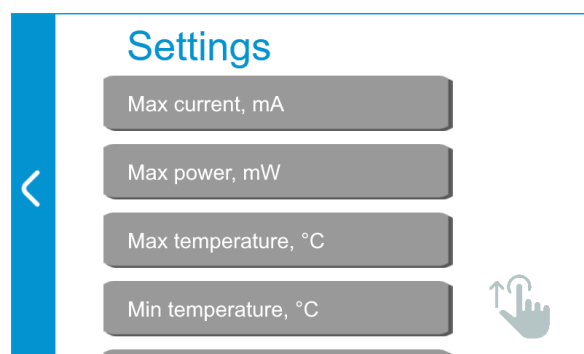



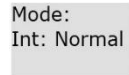







Figure 17 – Settings menu

3. To set the parameter select it from the list. The new window displays the parameter value stored in the laser memory. To change it, click on the window. Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.
4. After setting all the parameters, click  to return to the PS driver menu.
5. PS driver can operate in two 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 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).

Mode:
Int: Normal

To set the mode tap on  button, use the arrows to select the desired mode in the menu (fig. 18). Press  button to save the changes and exit menu. Press  button to exit menu without changes.

N: 0
M: 0

6. To set the burst mode parameters tap on  button, use the left and right arrows to select the parameter to change, use the up and down arrows to change the parameters value (fig. 19). Press  button to save the changes and exit menu. Press  button to exit menu without changes.

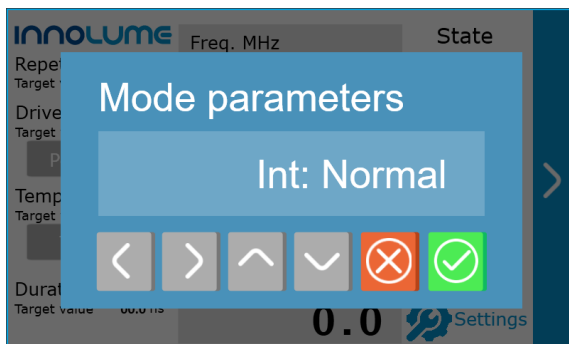


Figure 18 – Mode menu

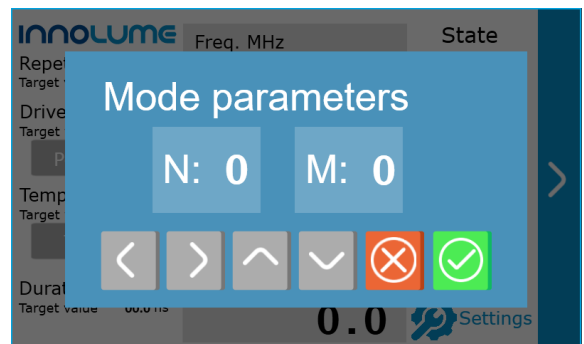






Figure 19 – Burst mode parameters

7. Tap on repetition rate value to set the pulse train repetition rate (fig. 20). Select the frequency range (Hz, kHz or MHz), then use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.

8. Tap on temperature value to set the laser diode temperature (fig. 21). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.

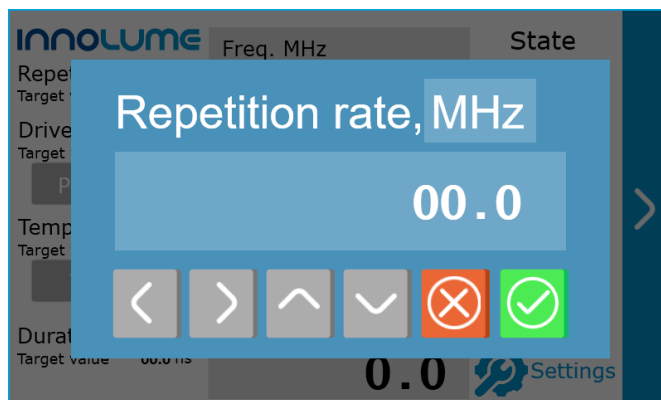




Figure 20 – Setting the repetition rate

9. Tap on “TEC ON” button to turn on the thermal stabilization of the laser diode. The button will light up green. The temperature target value is displayed above the button; the current temperature value is displayed to the right of the button.
10. Tap on driver voltage value to set the laser diode operating voltage (fig. 22). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes. **Note:** The driver voltage is not the laser diode bias. The driver voltage sets the laser diode current.

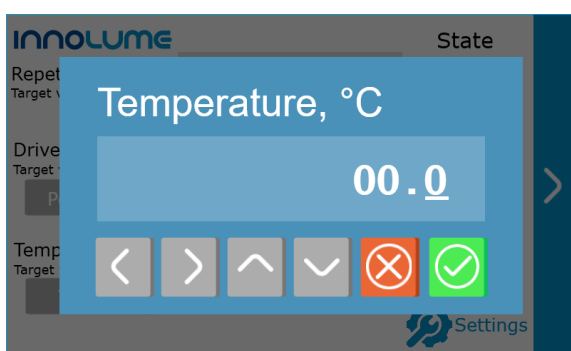


Figure 21 – Temperature setting

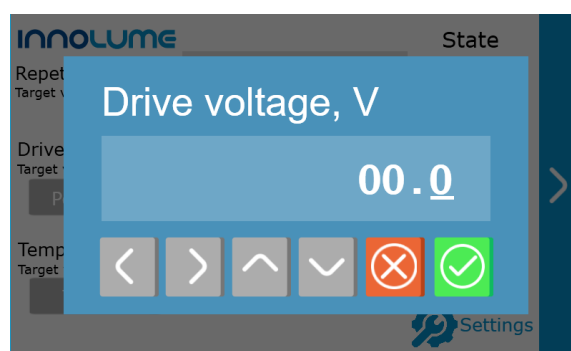



Figure 22 – Driver voltage setting

11. Tap on “Power ON” button to turn on the laser diode emission. The button will light up green, a laser light icon will appear in the state column on the right side of the screen (fig. 23).

12. The user can change the values of the driver voltage without turning off the laser emission, but couldn't change the operation mode and the frequency range without turning off the laser emission.
13. The user can control lasers in another control boards without turning off the laser emission. To do this, press the  button in the driver menu and select the device you want to control in the main menu.

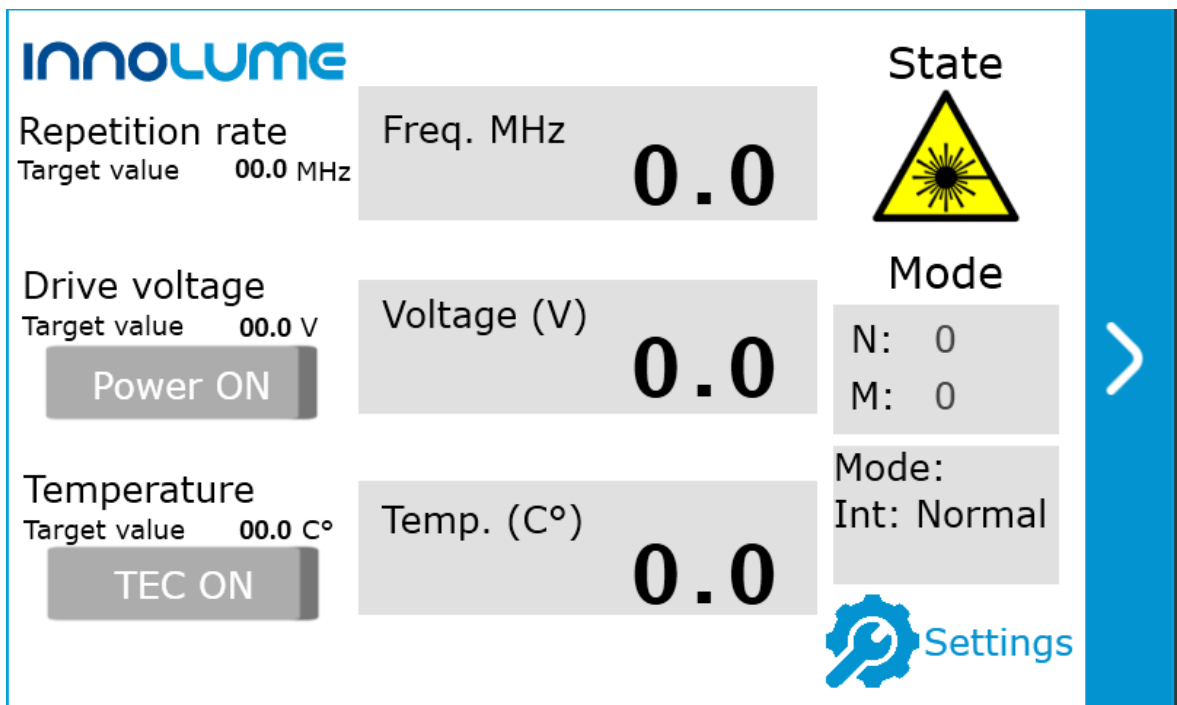



Figure 23 – Emission on state

14. To turn off laser emission tap on “Power ON” button. The button will light up grey, a laser light icon will disappear.
15. To turn off the thermal stabilization of the laser diode tap on “TEC ON” button. The button will light up grey. **Note:** Don't turn off the thermal stabilization, while laser emission is on, this can lead to the LD breakdown.

PLD-NS

1. In NS driver menu (fig. 24) press  to go to the settings menu.
2. In the settings menu (fig. 25) the user can set the allowed ranges for the operation temperature and current, nominal diode voltage, the values of thermistor resistance at 25 °C and beta parameter. **Note:** the correct values of thermistor resistance at 25 °C and beta parameter are necessary for proper thermal stabilization.

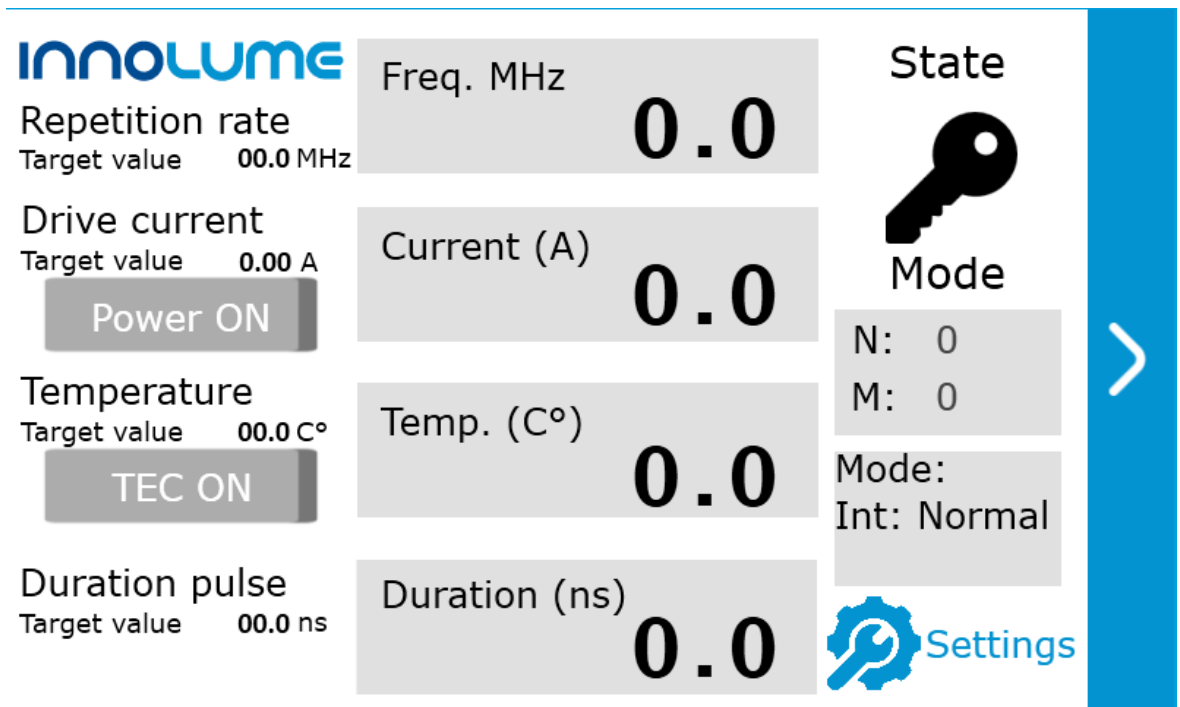


Figure 24 – NS driver menu

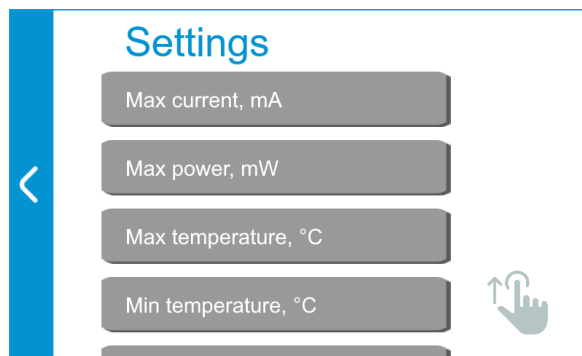




Figure 25 – Settings menu

- To set the parameter select it from the list. The new window displays the parameter value stored in the laser memory. To change it, click on the window (fig. 26). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.

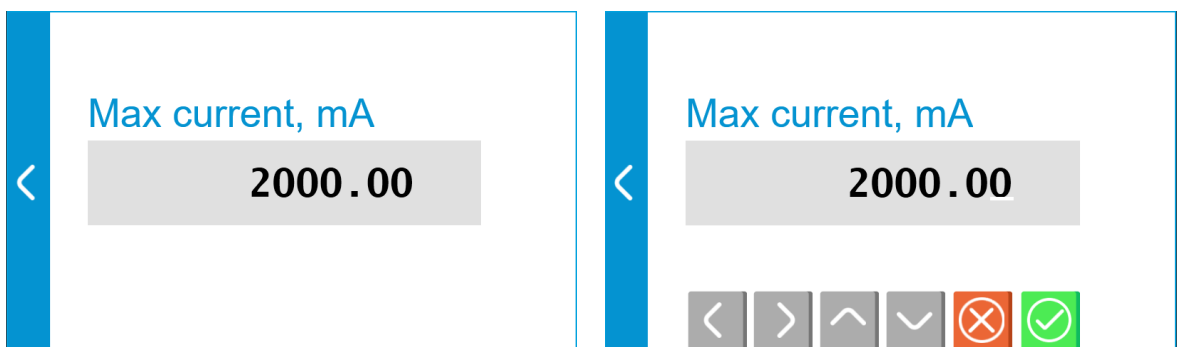

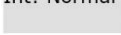







Figure 26 – Setting the parameter

4. After setting all the parameters, click  to return to the PS driver menu.
5. NS driver can operate in two 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 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).

Mode:
Int: Normal

To set the mode tap on  button, use the arrows to select the desired mode in the menu (fig. 27). Press  button to save the changes and exit menu. Press  button to exit menu without changes.

N: 0
M: 0

6. To set the burst mode parameters tap on  button, use the left and right arrows to select the parameter to change, use the up and down arrows to change the parameters value (fig. 28). Press  button to save the changes and exit menu. Press  button to exit menu without changes.

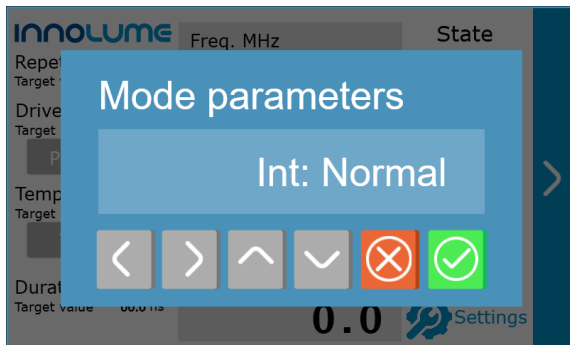


Figure 27 – Mode menu

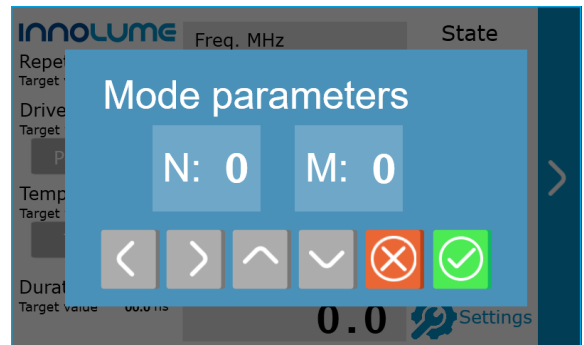






Figure 28 – Burst mode parameters

7. Tap on repetition rate value to set the pulse train repetition rate (fig. 29). Select the frequency range (Hz, kHz or MHz), then use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.
8. Tap on duration pulse value to set the pulse width (fig. 30). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press  button to save the changes and exit menu. Press  button to exit menu without changes.

Note: The pulse width is limited by repetition rate; the dirty cycle is less than 2 % to avoid overheating of the driver high current components.

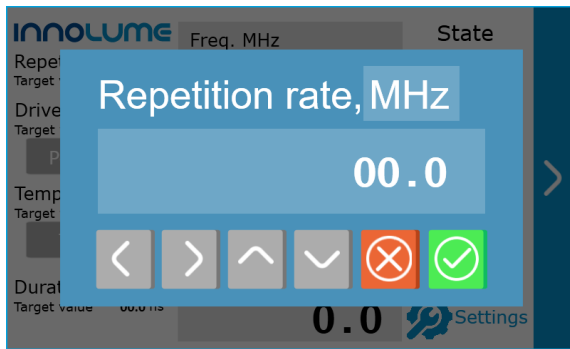


Figure 29 – Setting the repetition rate

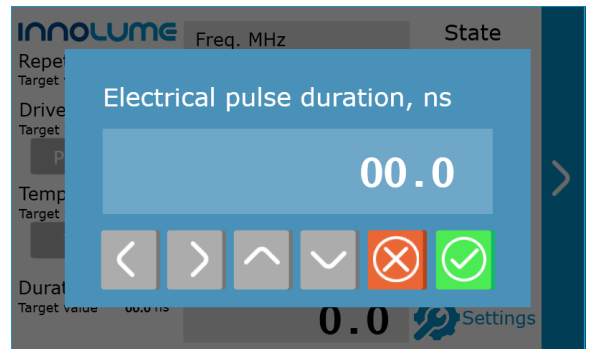


Figure 30 – Setting the pulse width

9. Tap on temperature value to set the laser diode temperature (fig. 31). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press button to save the changes and exit menu. Press button to exit menu without changes.
10. Tap on “TEC ON” button to turn on the thermal stabilization of the laser diode. The button will light up green. The temperature target value is displayed above the button; the current temperature value is displayed to the right of the button.
11. Tap on driver current value to set the laser diode operating current (fig. 32). Use the left and right arrows to select the digit to change, use the up and down arrows to change the value. Press button to save the changes and exit menu. Press button to exit menu without changes. **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.

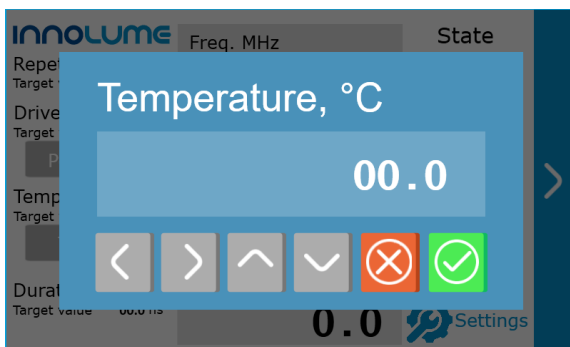


Figure 31 – Temperature setting

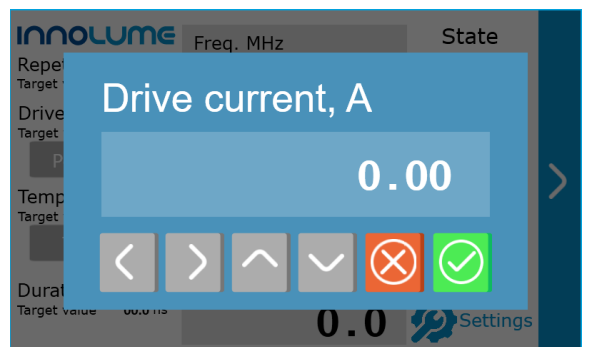


Figure 32 – Driver current setting

12. Tap on “Power ON” button to turn on the laser diode emission. The button will light up green, a laser light icon will appear in the state column on the right side of the screen (fig. 33).

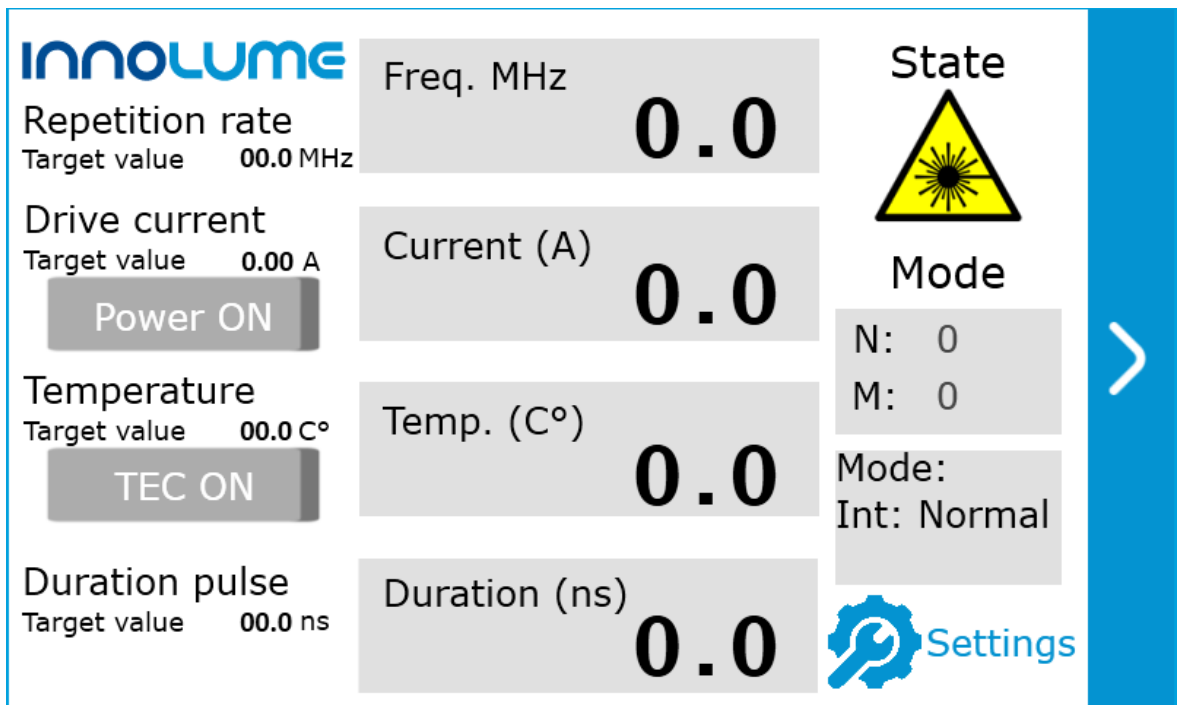



Figure 33 – Emission on state

13. The user can change the values of the driver current and pulse width without turning off the laser emission, but couldn't change the operation mode and the frequency range without turning off the laser emission.
14. The user can control lasers in another control boards without turning off the laser emission. To do this, press the  button in the driver menu and select the device you want to control in the main menu.
15. To turn off laser emission tap on "Power ON" button. The button will light up grey, a laser light icon will disappear.
16. To turn off the thermal stabilization of the laser diode tap on "TEC ON" button. The button will light up grey. **Note:** Don't turn off the thermal stabilization, while laser emission is on, this can lead to the LD breakdown.

PC control

LaserBench PC control


1. Power the LaserBench. After the power is applied, push the power button on the backside of the driver. Turn the key to the unlock position.
2. Connect the mini USB cable.
3. Return to the LaserBench's main menu on the touch screen
4. Run `ld_control_center_vXXX.exe` on PC.
5. Click "Settings" to enter the program configuration menu (fig. 34).
6. 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.
7. Untick the "mini USB mode" box.
8. The Laser bench's CAN ID is 3.
9. Tick "Auto Connection" box to select the "Auto Connection" mode. Otherwise, click "Connect".



Figure 34 – The system configuration menu.

10. The control of the laser diode with the software is described in PLD-CW-2000H-ZIF driver's manual.

Connection of additional laser drivers

1. Before connecting the additional laser driver to the LaserBench, set the CAN ID of the driver as described in the user manual of the driver. **Note.** Don't use CAN ID 3, it's reserved for LaserBench.
2. Connect the laser driver to the output connector of the LaserBench, the connection diagram of the laser controllers to the CAN network is shown in the fig 11. **Note** pinout.
3. Power the laser bench. After the power is applied, push the power button on the backside of the laser bench. Turn the key to the unlock position.
4. Run `Id_control_center_vXXX.exe` on PC.
5. Click "Settings" to enter the program configuration menu (fig. 34).
6. 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.
7. Untick the "mini USB mode" box.
8. The software has a lot of channels for connecting and controlling devices. To connect a new driver, 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.
9. To remove drivers, select the rows with these devices and click "Delete selected rows", then click "Apply" to apply system configuration.
10. Controlling the laser driver using the PC software is described in the instruction manual for the corresponding driver