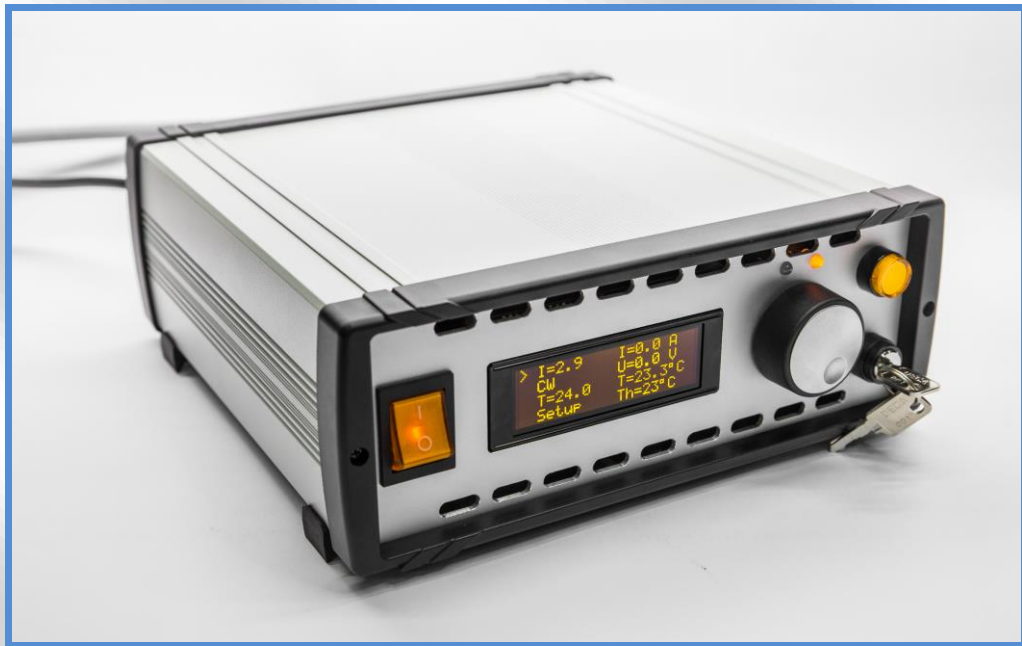


## Combined Laser Diode Pumping Driver and TEC Controller



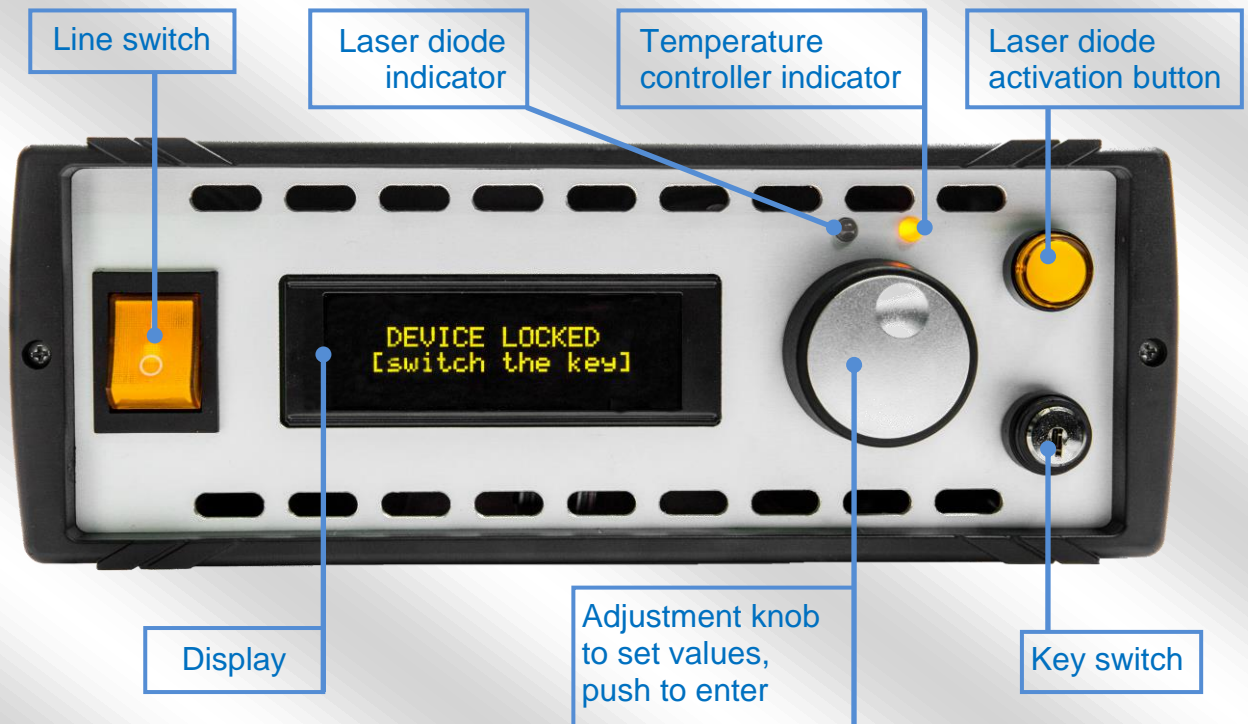
**Fibercom Ltd.**

## Technical characteristics

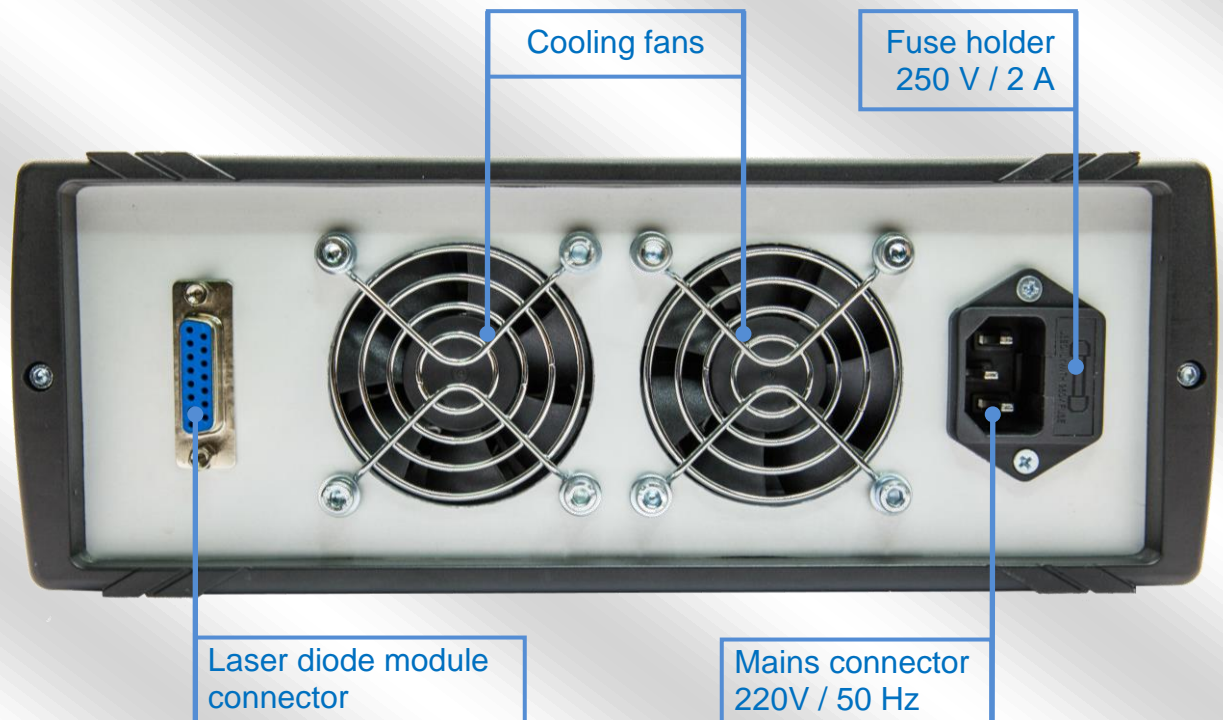
Parameter	Symbol	Typical value	Unit
<b>Main characteristics</b>			
Maximum LD pumping current	$I_{LD}^{max}$	<b>15</b>	<b>A</b>
Minimum LD pumping current	$I_{LD}^{min}$	<b>0.1</b>	<b>A</b>
Pumping current set up discrete interval	$\Delta I_{LD}$	<b>0.1</b>	<b>A</b>
Pumping current stability support accuracy	$\delta I_{LD}$	<b>±20</b>	<b>mA</b>
Maximum voltage in pumping circuit	$U_{LD}$	<b>10</b>	<b>V</b>
Pumping operation mode	<b>CW, Pulse</b>	<b>Continius, Pulsed</b>	<b>-</b>
Impulse period	<b>T</b>	<b>from 5 to 1000</b>	<b>ms</b>
Filling factor in plused mode	$\tau$	<b>from 0 to 99</b>	<b>% of T</b>
Maximum supported temperature	$T_{LD}^{max}$	<b>60</b>	<b>°C</b>
Minimum supported temperature*	$T_{LD}^{min}$	<b>0</b>	<b>°C</b>
Measured temperatures range	$T_{LD}$	<b>-20 - +80</b>	<b>°C</b>
Temperature set up discetete interval	$\Delta T_{op}$	<b>1</b>	<b>°C</b>
Temperature stability support accuracy	$\delta T_{op}$	<b>±0.1</b>	<b>°C</b>
Maximum current in Peltie element circuit	$I_{therm}$	<b>10</b>	<b>A</b>
Maximum voltage in Peltie element circuit	$U_{therm}$	<b>10</b>	<b>V</b>
<b>Management interface</b>			
Indication	<b>-</b>	<b>OLED display, LED-indicators</b>	<b>-</b>
Management	<b>-</b>	<b>buttons, encoder, key</b>	<b>-</b>
Protection systems	<b>-</b>	<b>Complex overheating protection, shortcut and overvoltage protection</b>	<b>-</b>
<b>General characteristics</b>			
System operation temperature range	<b>-</b>	<b>-10... +30</b>	<b>°C</b>
System storage temperature range	<b>-</b>	<b>-40... +80</b>	<b>°C</b>
System feeding	<b>-</b>	<b>220VAV / 50 Hz</b>	<b>-</b>
System maximum feeding current	$I_{AC}$	<b>2.1</b>	<b>A</b>

\* This is minimum temperature value that can be set up in the system. Actual minimum laser diode temperature defines by Peltie element power, radiator effectiveness and laser diode operation mode.

## Front panel description



## Rear panel description



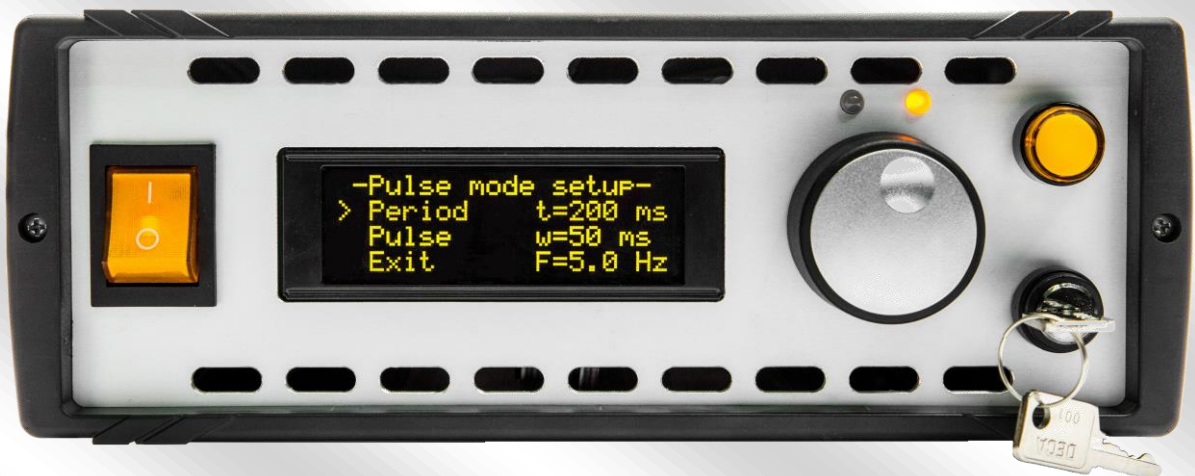
## Menu description

### Main menu



- |                            |                                          |
|----------------------------|------------------------------------------|
| 1 – Pump current set       | 5 – Measured pump current                |
| 2 – CW / Pulse mode switch | 6 – Measured laser diode voltage         |
| 3 – Laser temperature set  | 7 – Measured laser diode temperature     |
| 4 – Setup menu enter       | 8 – Measured module heatsink temperature |

### Pulse mode setup menu



- |                              |                          |
|------------------------------|--------------------------|
| 1 – Laser pulse period set   |                          |
| 2 – Laser pulse duration set |                          |
| 3 – Exit to main menu        | 4 – Calculated frequency |



## Operating elements

Table 2 – Device control elements

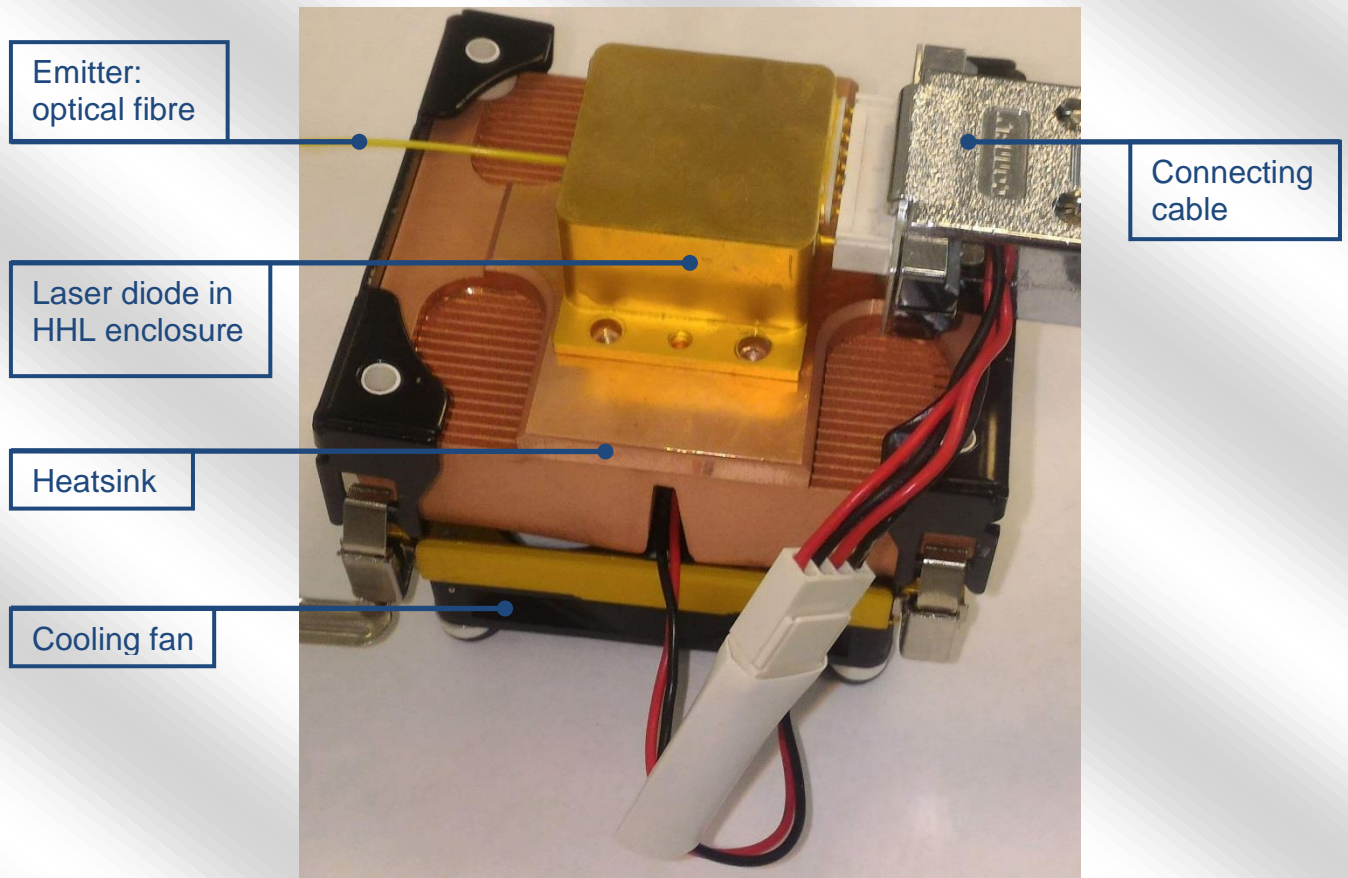
Operating element	Functionality
Key switch	Insert the key and switch it clockwise to unlock the device
Laser diode activation button	Laser diode pump turn on and off The button LED lights when the laser is on
Laser diode indicator	green constant light – the laser is on, CW mode green constant light – the laser is on, pulse mode red light – error
TEC indicator	green light – the laser temperature is within $\pm 0.15$ °C of the set value yellow light – the temperature controller is operating but the laser temperature doesn't correspond the set value red light – overheat error, the temperature controller is off

### Menu system

Adjustment knob is the main control element providing menu system navigation and setting the values.

- 1) Turn the knob to select the desired line; the arrow > points the present position.
- 2) Push the knob to enter the line. The arrow turns into rectangle. A numeric value is then set via turning the knob: clockwise to increase the value and counterclockwise to decrease it. The mode (CW or pulse) is switched also via turning the knob.
- 3) Push the knob again to confirm the set value and return to the line selection.

## Laser module description (optional)



## Operating the device

- 1) Put the laser diode driver and the laser diode module on a flat firm clean surface. The distance between the device and other units or walls should be no less than 20 cm.
- 2) Provide the setup with laser beam blocking system: screens, filters and so on.
- 3) Connect the laser diode driver to the laser module with the connecting cable. Tighten the screws of the connectors.
- 4) Connect the mains to the device and check the protective earth ground. Device enclosure is the device earth ground.
- 5) Turn the mains switch on.
- 6) Set the desired temperature and the desired current. Wait until complete temperature stabilisation.
- 7) Turn the laser pump on. Wait until complete temperature stabilisation.
- 8) During the laser operation regularly check its parameters via the laser diode driver menu.
- 9) Turn the laser pump off.
- 10) Turn the mains switch off.
- 11) To reset the device (if needed) switch the mains off, wait and switch it on.

### **Important notes:**

To change the laser temperature pulse period and duration it is better to turn off the laser, adjust the desired parameter and turn the laser on again.

It is not recommended to set the laser temperature below dew point temperature as it can cause laser failure.

## Safety systems

The integrated safety systems were designed only to offer user-comfortable operation conditions.

**The device is not capable of operating for a long time without supervision.**

**In any emergency situation the device should be switched off via the line switch.**

For software protection there is a small probability of false alarm.

Table 3 – Safety system elements

Protection	Type	Operating threshold
<b>Overheat</b>		
Pump current unit overheat	hardware and software and	+55 °C
Temperature controller unit overheat	software	+60 °C
Laser module heatsink overheat	software	+65 °C
Laser diode overheat	software	+45 °C
<b>Supply</b>		
Laser pump current	software	8 A
	hardware	15 A
The mains overcurrent	fuse	2 A
Supply power converter overload	hardware	110-150% power

The device can be locked with the key switch on the front panel. When the lock is initiated:

- the laser diode is off;
- the menu system is locked;
- the temperature controller is running and providing the last set temperature value;
- all the protection systems are running.



## Safety precautions

### 1) DANGEROUS HIGH-POWER LASER RADIATION

USE PROTECTIVE GLASSES, SCREENS AND FILTERS TO AVOID EYE DAMAGE AND RISK OF FIRE

### 2) DO NOT HEDGE THE COOLING FANS

### 3) CHECK THE PROTECTIVE EARTH GROUND BEFORE OPERATING.

Device enclosure is the device earth ground.

IMPROPER GROUNDING CAN CAUSE ELECTRIC SHOCK RESULTING IN DAMAGE TO HEALTH OR EVEN DEATH

### 4) IN CASE OF INCORRECT OPERATION TURN THE LINE SWITCH OFF, WAIT A MINUTE AND TURN IT ON

### 5) DO NOT TOUCH THE LASER MODULE WHILE THE LASER IS OPERATING



## Troubleshooting

<b>Error</b>	<b>Possible reason</b>	<b>Recovery</b>
The line switch is on but the device doesn't operate	The fuse is blown.	Try to change fuse. If it doesn't help return the device to the developers.
When the line switch is on the device is continuously switching on and off	Intrinsic short circuit.	Return the device to the developers.
In the main menu the heatsink temperatures is $-230^{\circ}\text{C}$ or less	The laser module is not properly connected.	Check the connection cable and plug it according to the manual.
The menu system doesn't respond	Microcontroller unit error.	Reset the device by turning it off.
<b>[Laser] overheat</b> Laser diode temperature exceeded $45^{\circ}\text{C}$	The laser thermal power is too high for Peltier element. Probably the ambient temperature is too high.	Switch the device off and wait until the system cools down. Try using lower power.
<b>[Laser] overcurrent</b> Laser diode current exceeded 15 A	Laser short circuit or internal pump unit error.	Restart the device. If it still doesn't operate return it to the developers.
<b>[Heatsink] overheat</b> Laser module temperature exceeded $65^{\circ}\text{C}$	The ambient temperature is too high.	Wait until the system cools down. Restart the device and check the laser module cooling fan.
<b>[Tec unit] overheat</b> Temperature controller unit temperature exceeded $60^{\circ}\text{C}$	An internal laser diode driver overheat error. Possibly the ambient temperature is too high.	Wait until the system cools down. Restart the device and check operation. If it still doesn't operate return it to the developers.
<b>[Pump Unit] overheat</b> Pump unit temperature exceeded $55^{\circ}\text{C}$		