Title:	Installation and manual guide of the HLX-G-F001		
Department: Prod	**Process Owner:** LARIGAUDERIE Theo	**Document #:** L-PR-10-0005-000	**Revision:** 0
Customer: LDPD			

1. Safety and Ergonomic Information

This is a OEM unit. There is no shutter at the output for the laser and there is also only a small green LED on the front of the electronic controller board supply which shows that the laser is running and delivering >10µJ@532nm**.**
This laser head is not CDRH certified and has to be used as an OEM component.
Therefore, this laser must be only used integrated.
This laser does not comply to 21 CFR 1040-10 standard. This laser complies to IEC60825-1 standard in this environment.
For the use of this laser, the laser safety standard IEC60825-1 recommends using some laser safety eyeglasses with a certified protection of L 7 R at 532 nm.
For any problems, contact contactus@leukos-laser.com **or +335 87 20 00 25**

2. Special Definitions

This system will comply with IEC 61010 only if the customer uses a power limited power-supply (8A max on 12VDC).

3. Tools/Materials/Equipment

- **1x laser head with 0.4 m long "laser" cable for connecting the laser head to its controller board**
- **1x OEM controler unit**
- **Connectors *(if requested)***

4. Work Instructions Steps

Installing the laser head and the controller module:

Needed components:

- Laser head
- Controller module
- "Power" cable *length must not exceed 3m long*
- "Utility" cable
-

Installation instructions:

- Install the laser head by fixing it with three M3 screws (M3x10 mm Stainless steel preferred) on a plate (cf. mechanical drawings for dimensions).
- Connect the "laser ribbon" to the controller module. **The use of an antistatic equipped station is mandatory.**
- Connect the "utility" cable for the interlock (mandatory), the On/Off push button (mandatory for switching On and Off the laser without the RS232).
- Connect a "power" cable with Molex Minifit 2p to a 12 V/6A power supply.

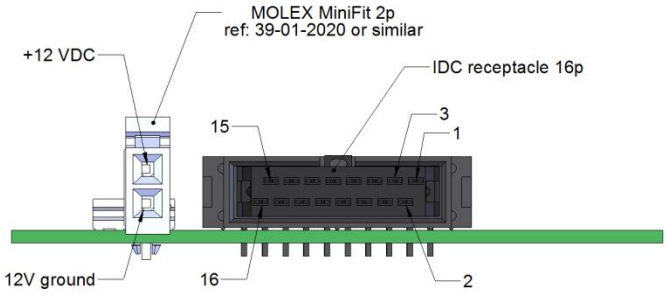
Please, see below for other pin explanations.

IDC connector, 16 positions

IDC receptacle for 16 wires ribbon (1.27mm pitch)

Wiring configuration:

1 TX RS232
2 RX RS232
3 GND
4 OUT photodiode
5 GND photodiode
6 IN modulation
7 GND modulation
8 IN computer ON/OFF
9 GND computer ON/OFF
10 IN push button
11 GND push button
12 OUT Green LED (laser status)
13 OUT Red LED (thermal regulation)
14 GND LEDs
15 IN interlock
16 GND interlock



Note: *External trigger regime needs a TTL compliant electrical signal on "modulation On/Off" entry from IDC.*

1	TX RS232	blue
2	RX RS232	green
3	GND	yellow
4	OUT photodiode	orange
5	GND photodiode	red
6	IN modulation	brown
7	GND modulation	black
8	IN computer ON/OFF	white
9	GND computer ON/OFF	grey
10	IN push button	purple
11	GND push button	blue
12	OUT Green LED (laser status)	green
13	OUT Red LED (thermal regulation)	yellow
14	GND LEDs	orange
15	IN interlock	red
16	GND interlock	brown

Using the system:

Switching on the system:

- Turn on the power supply connected to the laser controller. Both green & red LED are flashing for a couple of seconds.
- Wait less than a minute to reach the red LED's emission.
- Start the laser emission by pushing on a momentary button you had connected on utility cable or start the laser by hyperterminal software by sending command. The green LED emits and the laser is ready to run.
- *For external trigger regime, The laser is ready to run by waiting TTL signal or runs if TTL signal is applied (see § TTL trigger input).*

Switching off the system:

- Push off the button or send command to switch off the laser. The green LED is off.
- Turn off the power supply of the laser controller.
- The cables can be unplugged if needed.

Stand-by of the system:

- When laser is running, push the laser On/Off button & the green LED and the laser are stopped (stand-by).
- Push again the laser On/Off button & the green LED is lighted.

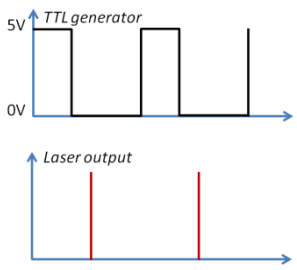
Photodiode signal output:

- Plug a coaxial cable to the photodiode output desktop controller to a scope to have an electrical signal (TTL compliant) as laser pulse replica

TTL trigger input *(only if external trigger mode option applied)*:

- Push again the laser On/Off switch & the green LED is lighted and the laser is ready to emit but waiting for signal.
- Connect the BNC cable to the controller board (TTL trigger input on the back of the controller) and to a TTL generator (it can also work with a switch).

The laser will react with the following behavior:

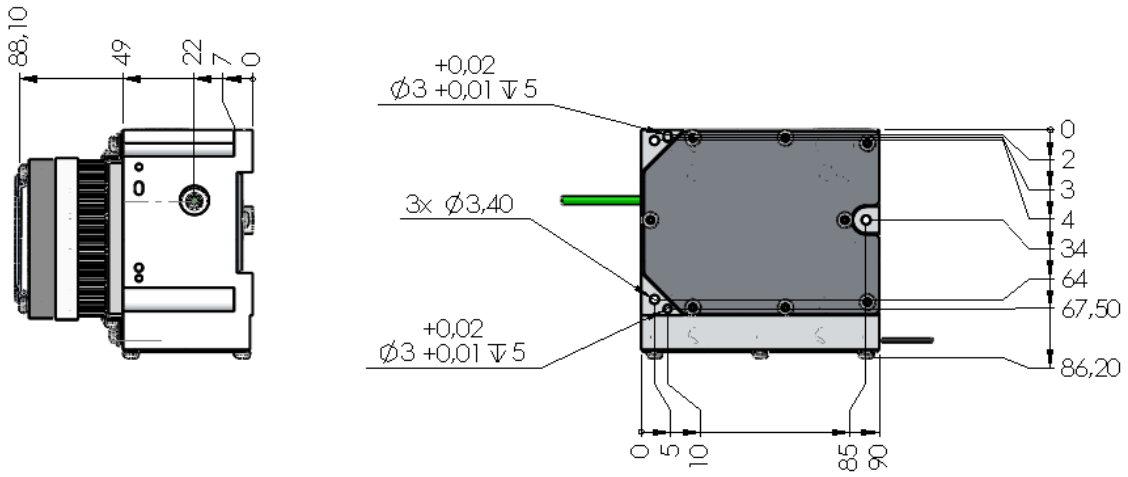


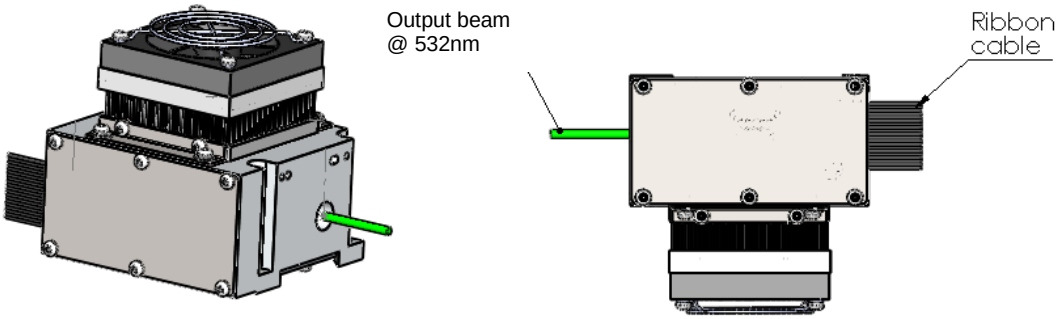
5 V (or open switch): the laser is waiting the signal to run

0 V (or closed switch): the laser is emitting one pulse and wait for another fall edge to emit

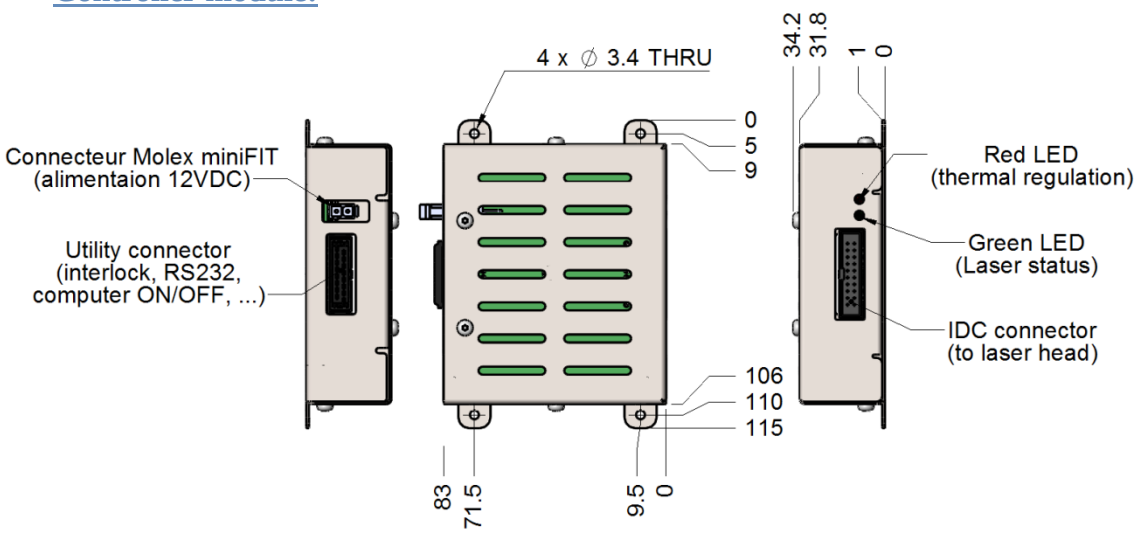
5. Mechanical and implantation drawings:

Laser head:





Controller module:



Control LED's explanations:

LED 1: green

- Lighted: the laser is On and emitting pulses.
- Off: the laser is Off.
- Flashing: interlock open
  - Close the interlock circuit
  - Turn off the key, and disconnect the power supply
  - Connect back the power supply, and turn on the key

LED 2: red

- Lighted: the thermal regulation is stabilized.
- Off: the thermal regulation is not stabilized.

LED 1+2:

- The 2 LED's are flashing at the same time: error with the "laser" cable.
  Unplug the "power" cable,
  try to connect again the "laser" cable to the laser head and the controller module,
  connect back the "power" cable,
  the error should stop, if not please contact +33 (0)5 87 2000 21 or contact@horuslaser.com.

6. RS232 control:

- **RS232 parameters:**
  - **Baud rate: 19200**
  - **Data bits: 8**
  - **Parity: none**
  - **Stop bits: 1**
  - **Flow control: none**

- **Write frame:**
  - **Blank character between the order and the data (*lase| |1 example for start on laser by computer)**

- **Read end of frame:**
  - **CR LF >**

LASER ON/OFF			**lase**
READ/WRITE Status laser			
READ	*lase	N:	0: Laser Off
WRITE	*lase N		1: Laser ON
Data	N		

STATUS OF LASER		**regi**
READ the full status of the laser system		
READ	*regi	A: Interlock 0:no problem 1:problem interlock (reboot needed) B: Laser head communication 0:no problem 1:problem (reboot needed) C: Laser temperature 0: Ok 1: outside the running range D: Peltier regulation status 0: Laser non thermalized 1: Temperature Ok EE: Status of laser diode - 00: Off - 01: Computer Off - 10: Fully On - 11: Modulation On
WRITE	NA	
Data	ABCDEE	

Other commands available on request.

7. Operating mode:

Switching ON from cold start:

- 12 VDC ON:
  - Test of the 2 controller module:
    - OK: no flashing LEDs
    - Error: the 2 LEDs flashes (no regi flag on this version) → need full reset

3 s

  - Test of the interlock: (also done all the time when the laser is running)
    - OK: no flashing LEDs and **A=0**
    - Error: the 2 LEDs flashes and **A=1** → need full reset

1s

  - Thermal regulation:
    - Not regulated: Red LED OFF and **D=0**
    - Inside the regulation range: Red LED ON and **D=1** → ready to operate

< 4min

  - Laser ON/OFF:
    - "Push button" pushed or *lase 1: green LED ON and **EE=10**→ the laser emits
    - "Push button" pushed again or *lase 0: green LED OFF and **EE=00**→ the laser is stopped
  - Computer ON/OFF (when the laser emits)
    - 0 VDC on the computer ON/OFF input of the utility connector or *copo 0: the laser is in stand-by and **EE=01**
    - 5 VDC on the computer ON/OFF input of the utility connector or *copo 1: the laser emits and **EE=10**

Running scenario:

Errors:

- Interlock is opened: **A=1** and the laser is fully stopped
- Temperature of the laser package outside the running range (overheating or overcooling): **C=1** and the laser diode is stopped
- Bad thermal regulation of the laser crystals: **D=0** but the laser continues to emit
    - can appear during a short time when the diode switches from ON to OFF and opposite

Normal running:

- The laser is running and computer is switched to OFF: **EE=01**
- The laser is running and computer is switched to ON: **EE=10**
- regi should be like (**0b) 000110**

8. Input and output compliance:

- **Power supply:**
    - **Molex Mini-Fit 2p ref: 39-01-2020 or equivalent**
    - **12 VDC: 10-14 VDC**
    - **Maximum needed current: 5 A**
    - **Protected input with:**
        - **Polyswitch resettable, ref: RGEF1000**
        - **Transient voltage suppressor, ref: SMBJ15CA**

- **IDC "utility" connector:**

IDC connector, 16 positions

IDC receptacle for 16 wires ribbon (1.27mm pitch)

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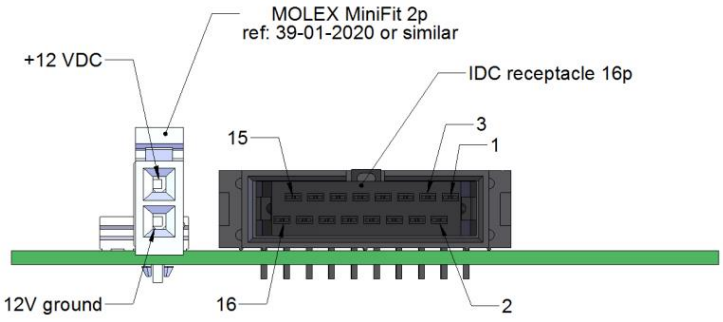

Work Instructions

- **RS232 input: standard serial interface**
- **Photodiode output: TTL compliant signal with a delay of ~200ns in respect with the optical pulse.**
- **Computer ON/OFF input: TTL compliant or use of a switch (voltage level normally pulled to 5V).**
- **Push button input: must be momentary normally open contact.**
- **Green LED output:**
  - **Status of the laser diode:**
    - **Lighted: the laser diode is ON,**
    - **Off: the laser is OFF**
  - **12 VDC with 100mA capability**
- **Red LED output:**
  - **Status of the thermal regulation:**
    - **Lighted: the laser thermal regulation is ready,**
    - **Off: the laser is not thermally regulated.**
  - **12 VDC with 100mA capability**
- **Interlock input:**
  - **A short circuit must be applied for running the laser.**
  - **An opened circuit will stop the laser and a full reset (switch Off / On the 12 VDC power supply) of the module is needed to start again.**