DATALOGIC

ULYXE iMARK

USER'S MANUAL

821002681

PATENTS

This product is covered by one or more of the following patents.

U.S. patents: 7,480,318 B2

Printed in Donnas (AO), Italy.

SYMBOLS

The symbols used in this manual along with their meaning are shown below. The symbols are repeated within the chapters and/or sections and have the following meaning:

Generic warning:

This symbol indicates the need to read the manual carefully or the necessity of an important maneuver or maintenance operation.

Electricity Warning:

This symbol indicates dangerous voltage associated with the laser, or powerful enough to constitute an electrical risk. This symbol may also appear on the machine at the risk area.

Laser Warning:

This symbol indicates the danger of exposure to visible or invisible laser radiation. This symbol may also appear on the machine at the risk area.

Fire warning:

This symbol indicates the danger of a fire when processing flammable materials. Because there is a danger of fire, it is indispensable to follow the instructions provided by the manufacturer when commissioning the machine.

Note:

Refer to dedicated user's manual.

REVISION INDEX

Revision	Date	Number of added or edited pages
821002680	02-10-2013	Release
821002681	10-04-2014	10, 21, 48, 49, Appendix E

NOTE:
We sometimes update the documentation after original publication. Therefore, you should also review the documentation on www.datalogic.com for any updates.

FOREWORD

Information included in the following manual are indicated to a qualified installer able to integrate the equipment in a system, accomplishing with all the protection systems required from internationals rules and local legislations.
Following manual is referred to an Ulyxe iMark system in Class 4 configuration.

Personnel assigned to operating the machine, in addition to being professionally trained for their specific job must read the manuals, pay careful attention to safety regulations and the sections pertinent to their job.

Individuals assigned to operating the machine are broken down as follows:

- **OPERATOR**

  assigned to loading the elements to process, visual inspection of the work cycle, unloading of finished product and cleaning of the machine.

- **MAINTENANCE PERSONNEL**

  assigned to electrical and mechanical maintenance of the machine.

NOTE:
Datalogic Automation S.r.l. shall not be held responsible for any non conforming use of equipment of its manufacture.

NOTE:
BEFORE INSTALLING AND USING THE LASER, **READ CAREFULLY** THE **APPENDICES**.

OVERVIEW

We are satisfied of your choice for a Datalogic Automation S.r.l. product and especially for an “ALL IN ONE” compact system made from experience years in laser marking field.

The marking system Ulyxe iMark belongs to a Diode Pumped Solid State (DPSS) Q-switched side pumped laser category.
Its simple and compact design conveys a versatile, intuitive and easy product to integrate due to its advanced technology.
Easy to use, it can be the best investment to entry in the laser world without compromises about performance and to obtain excellent markings.
Ulyxe iMark system includes all necessary to operate, a laser source DPSS Q-switched, a galvanometer scanning head, digital power controls, cooling system and monitoring functions. Entire unit and its mechanical base are covered by a high technology polyurethane plastic top.
The user can easily interacts and monitors laser status and its functions with an easy use of an external LCD touch screen control display (optional).

Ulyxe iMark comprises all safety devices to prevent laser radiation leakage that could be potentially dangerous. These devices actuation is demanded to the system integrator.

NOTE:
Device installation in secure environment is responsibility of the system integrator!

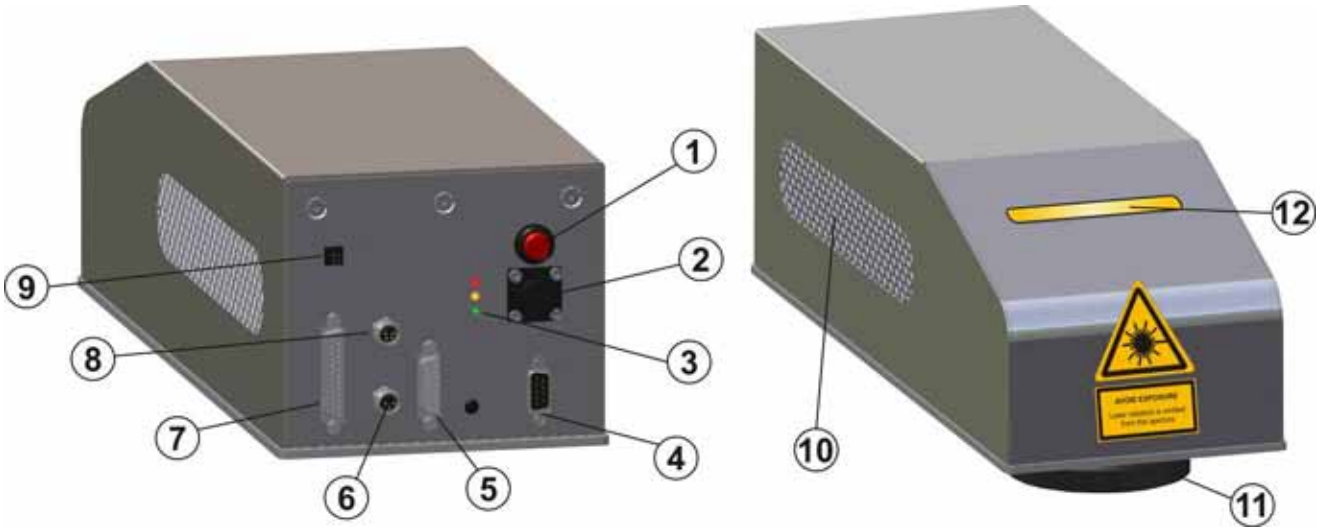


Figure 1: Overview Ulyxe iMark.

1 – Main-switch with led
2 – Power supply plug
3 – Led indicators
4 – iMark laser signals plug
5 – Control Box plug
6 – RS232 plug
7 – iMark scanning head signals plug
8 – CAN plug
9 – Aux Interlock plug
10 – Fan protection grid
11 – Focus lens
12 – System status led panel

IMPORTANT WARNING

Only authorized, qualified, fully-trained personnel and, in any case, only technicians who are fully skilled and aware of the risks inherent in the maintenance of electric, mechanical and optical components, may be allowed to access the internal parts of the electric sections and components of this machinery.
Datalogic Automation S.r.l. declines all responsibility and liability for maintenance and repair work carried out on live parts of this machine by technicians who have not been authorized or trained to perform such.

NOTE:

It's not allowed modify destination use of the system in different way of its functions.

Datalogic Automation S.r.l. declines any responsibility and liability for irregular and improper use of the machinery witch it manufactures.

SUMMARY

1 : TECHNICAL SPECIFICATIONS AND ACCESSORIES

NOTE:
BEFORE INSTALLING AND USING THE LASER, **READ CAREFULLY** THE APPENDIXES.

1.1 TECHNICAL SPECIFICATION

CABINET INFORMATION

Weight	7.8 Kg
Height	123.5 mm
Width	145.6 mm
Depth	410 mm
IP Grade	21

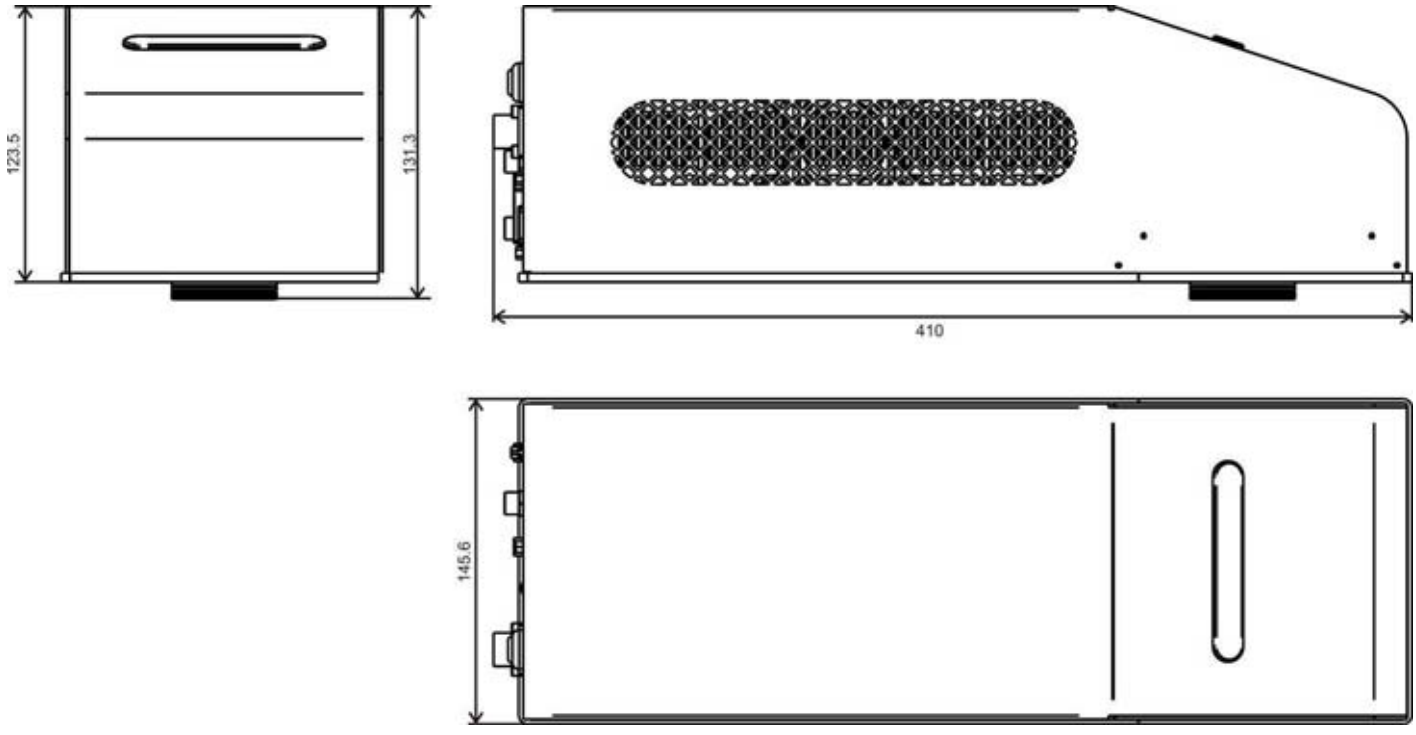


Figure 2: Ulyxe iMark Overall dimensions.

STORAGE

Storage temperature	Min. -5°C (23°F) / Max. +55°C (131°F)
Shock and vibrations	The components are not designed to withstand shocks and vibrations
Maximum sustainable acceleration	0,5 G

ENVIRONMENTAL CONDITIONS FOR OPERATION

Environmental temperature	Min. 15°C (59°F) / Max 35°C (95°F)
Humidity	< 90% without condensation
Altitude	< 1000 m
Suspended matter	< 3 mg/m^3
Vibrations	None

POWER SUPPLY

Input Voltage / Power	24V DC
Current Input	13 A

PERFORMANCE (*)

MARKING LASER	
Laser class	Class 4
Power	6 W @ 50KHz
Laser source	DPSSL (Diode Pumped Solid State Laser)
Active Mean	$Nd:YVO_4$
Wavelength	1064 nm
Modulation	Frequency 15KHz ÷ 200KHz
Emission radiation	Pulsed
AIMING LASER/ OPTIONAL FOCUS LASER	
Laser class	Class 2
Aiming beam	1 mW
Laser source	Solid State
Wavelength	635 nm
Cooling	Air
Noisiness	< 70 dB (A) at 1 meter

** specification at 25°C.*

1.2 SEALS

Ulyxe iMark device has seals in the below indicated areas:

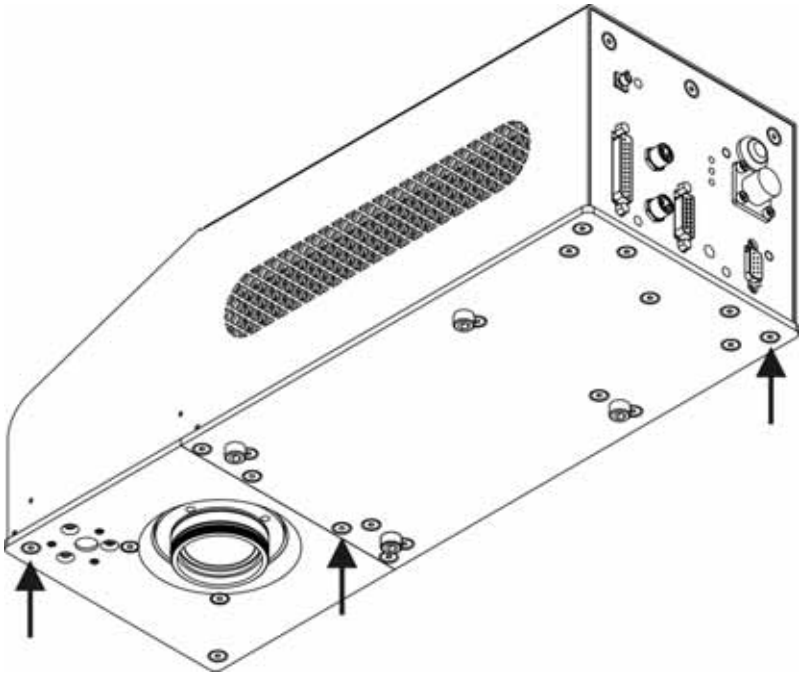


Figure 3: Seals position.

The engraving system has seals in some areas. The seals must not be broken or removed for any reason. The sealed parts may be opened only and exclusively by Datalogic Automation S.r.l. Breakage of these seals by a customer shall result in immediate cancellation of the warranty on the entire engraving system.

NOTE:

If a customer **breaks or removes the seals placed** by the manufacturer on the laser system **the warranty** on the entire laser system will immediately become **null and void**.

WARNING!

The manufacturer shall not be held liable for any **non conforming use** of equipment of its manufacture.

It is **forbidden** to operate the equipment before the machine it is intended for has been **declared in conformance** with statutory Directives.

NOTE:

Access to the internal parts of the electrical equipment is only permitted for **authorized personnel**, who have been trained and instructed on the electrical risks.

Datalogic Automation S.r.l. shall not be held liable for work on electrically charged parts by inadequately trained personnel!

NOTE:

Access to the internal parts of the resonator is only permitted for **authorized personnel**, who have been trained and instructed on the optical risks!

Datalogic Automation S.r.l. shall not be held liable for work on parts by inadequately trained personnel!

1.3 PACKING CONTENT

MAIN HARDWARE

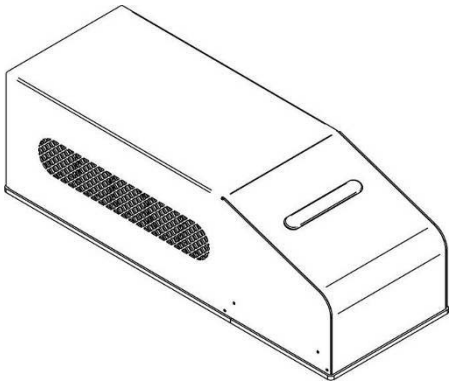


Figure 4: Ulyxe iMark.

Figure 5: Focusing Lens.

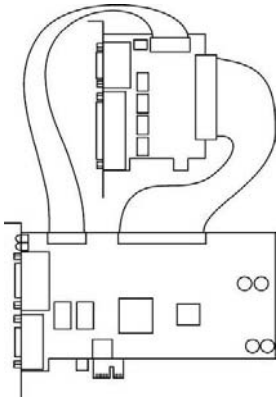


Figure 6: iMark Boards.

CABLES

Figure 7: Power supply cable.

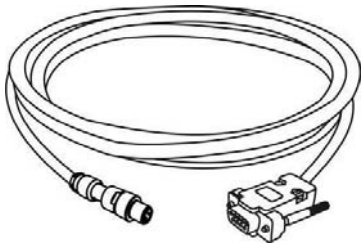


Figure 8: RS232 cable.

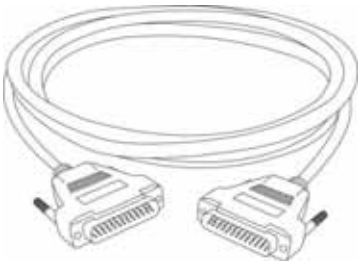


Figure 9: Rack cable.

Figure 10: Head cable.

Figure 11: Head adapter.

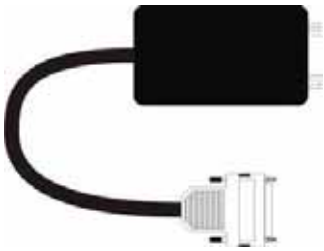


Figure 12: Rack adapter.

OTHER

Figure 13: AUX Interlock.

Figure 14: USB key.

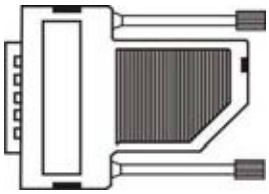


Figure 15: Signal Key.

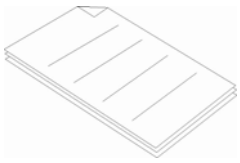


Figure 16: Documents.

1.4 ACCESSORIES

Following accessories are described only for information purpose and they are not intended in basic machine package. Minimal content packaging includes main hardware, cables and keys. For any further information consult paragraph 1.3.

1.4.1 BOXED POWER SUPPLY KIT

AC/DC stabilized power supply with front cover, power inlet plug, power on mains witch and cables.

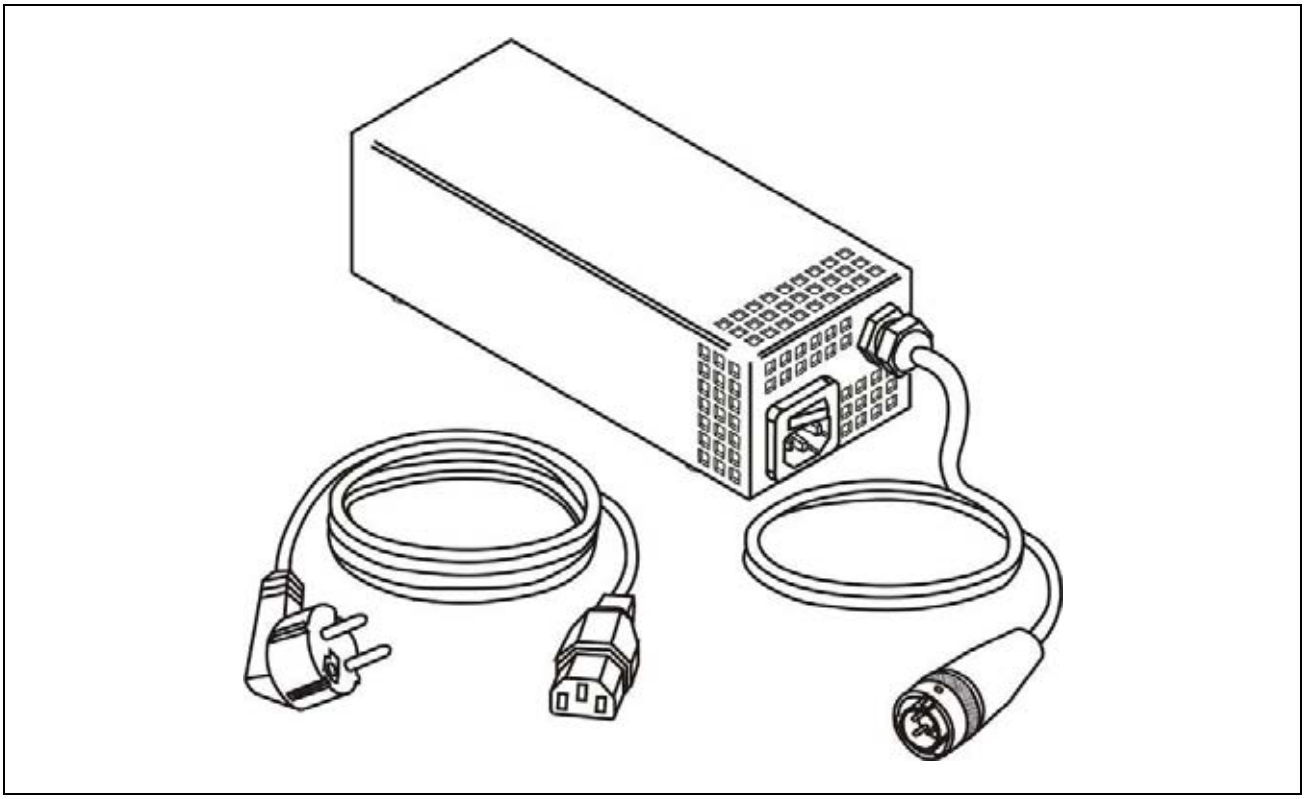


Figure 17: Power supply and cables.

LAMBDA HWS300-24	
Output voltage	24V DC, 14A (≈ 300W), Ripple Noise 150mV
Input voltage	85-265 Vac (47-63Hz)
Size	61 x 82 x 165 mm
Withstand Voltage	Input to ground 2.5kVac, Input to Output 3kVac, Output to ground 500Vac
Isolation voltage	>100MΩ, Output to ground 500Vdc
Mark	CE Mark
EMI compliance	EN55011 / EN55022, FCC, VCCI Class B
Immunity compliance	IEC61000-4-2, -3, -4, -5, -6 (Level 3), -8 (Level 4), -11
Safety Agency Approvals	UL60950-1, CSA60950-1, EN60950-1, EN50178, UL508

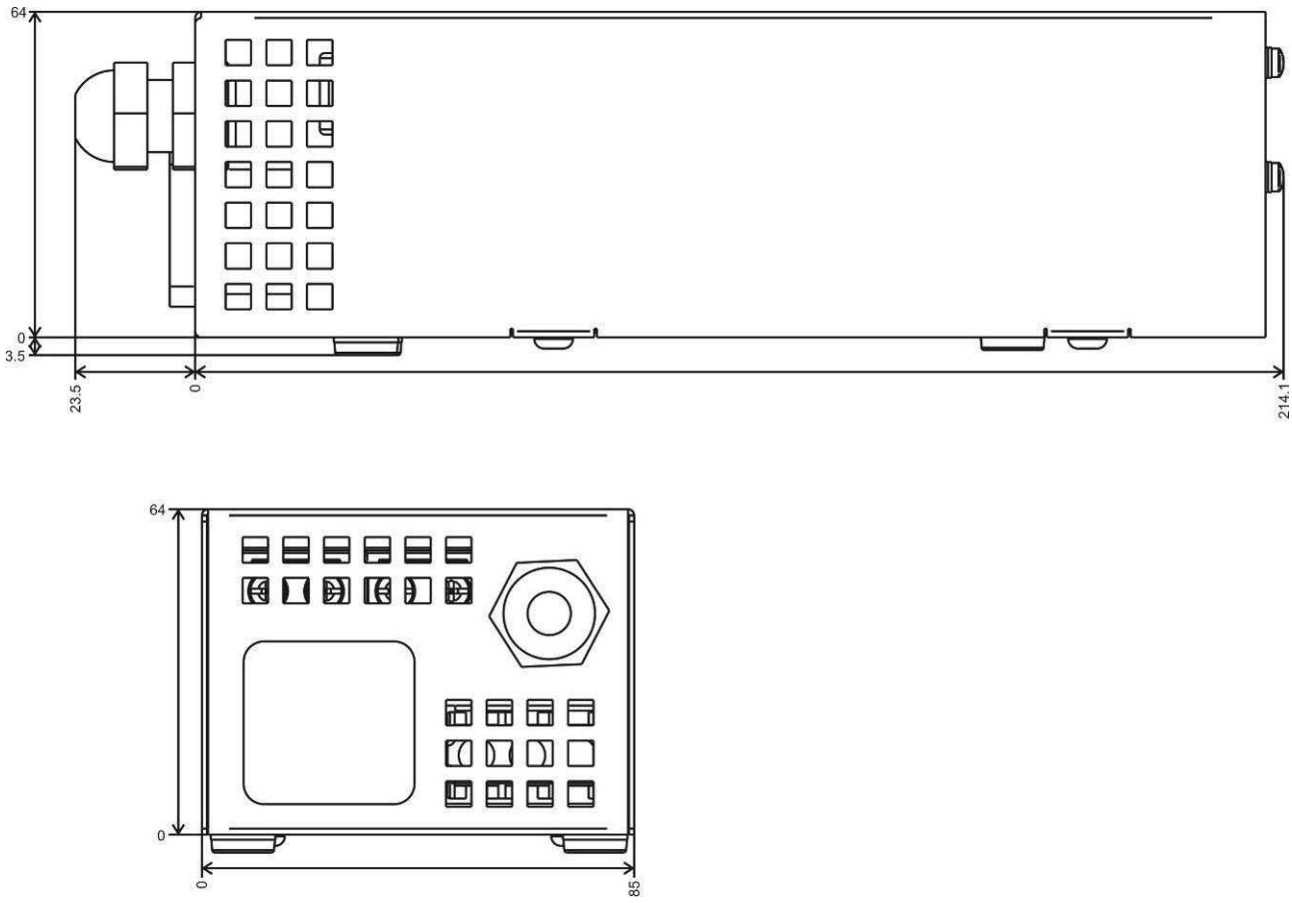


Figure 18: Power supply overall dimensions.

1.4.2 CONTROL BOX BASIC

Ulyxe iMark control and command device to manage laser power on, to open shutter and laser enable.

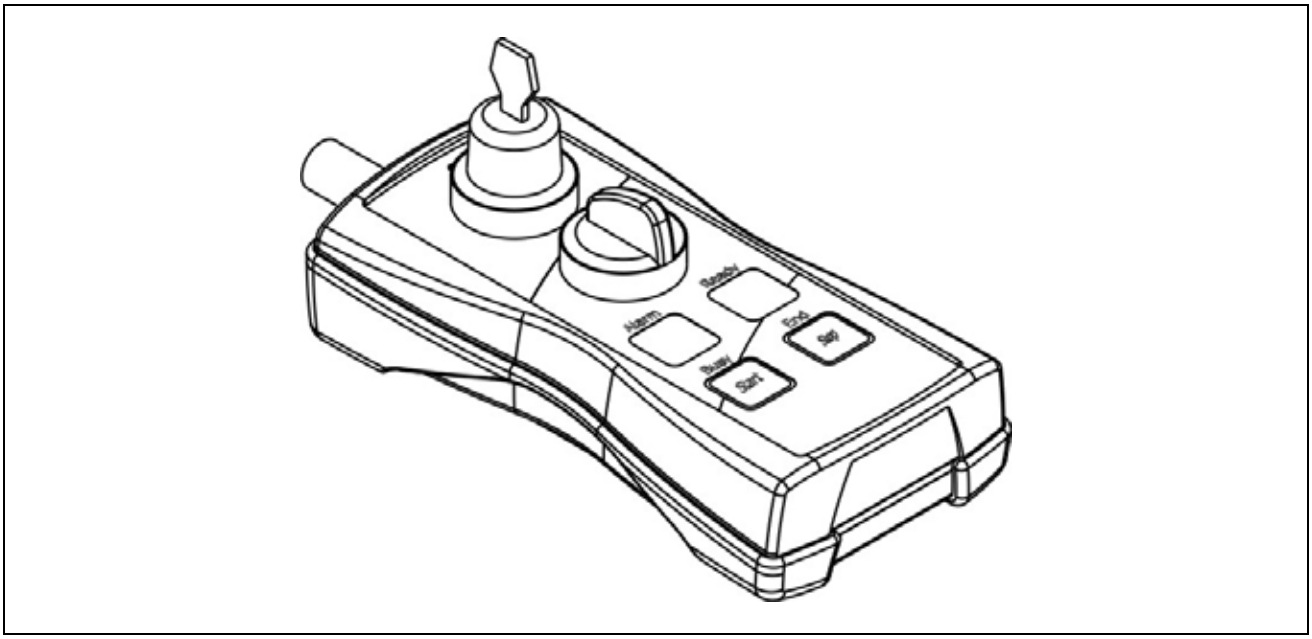
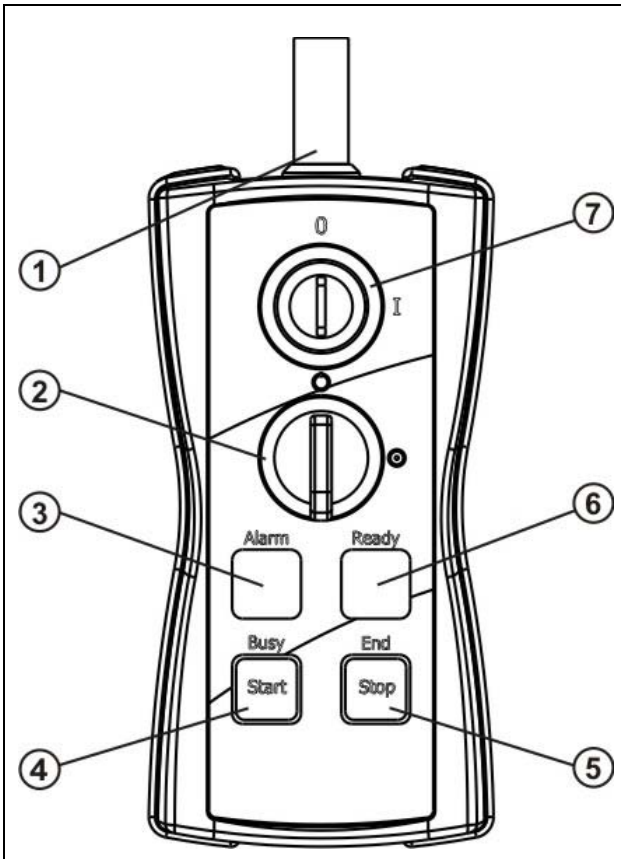


Figure 19: Control Box Basic.



1	***I/O connection***
	Connection to *Ulyxe iMark* I/O signals connector
2	***Shutter Enable***
	Selector switch with led indicator to open shutter and laser enable
3	***Alarm / System OK***
	Led indicator for shutter opened
4	***iMark Busy & Start marking***
	NOT AVAILABLE ON *Ulyxe iMark*
5	***iMark End & Stop marking***
	NOT AVAILABLE ON *Ulyxe iMark*
6	***iMark Ready***
	NOT AVAILABLE ON *Ulyxe iMark*
7	***Key***
	Selector key to enable the system

Figure 20: Control Box Basic.

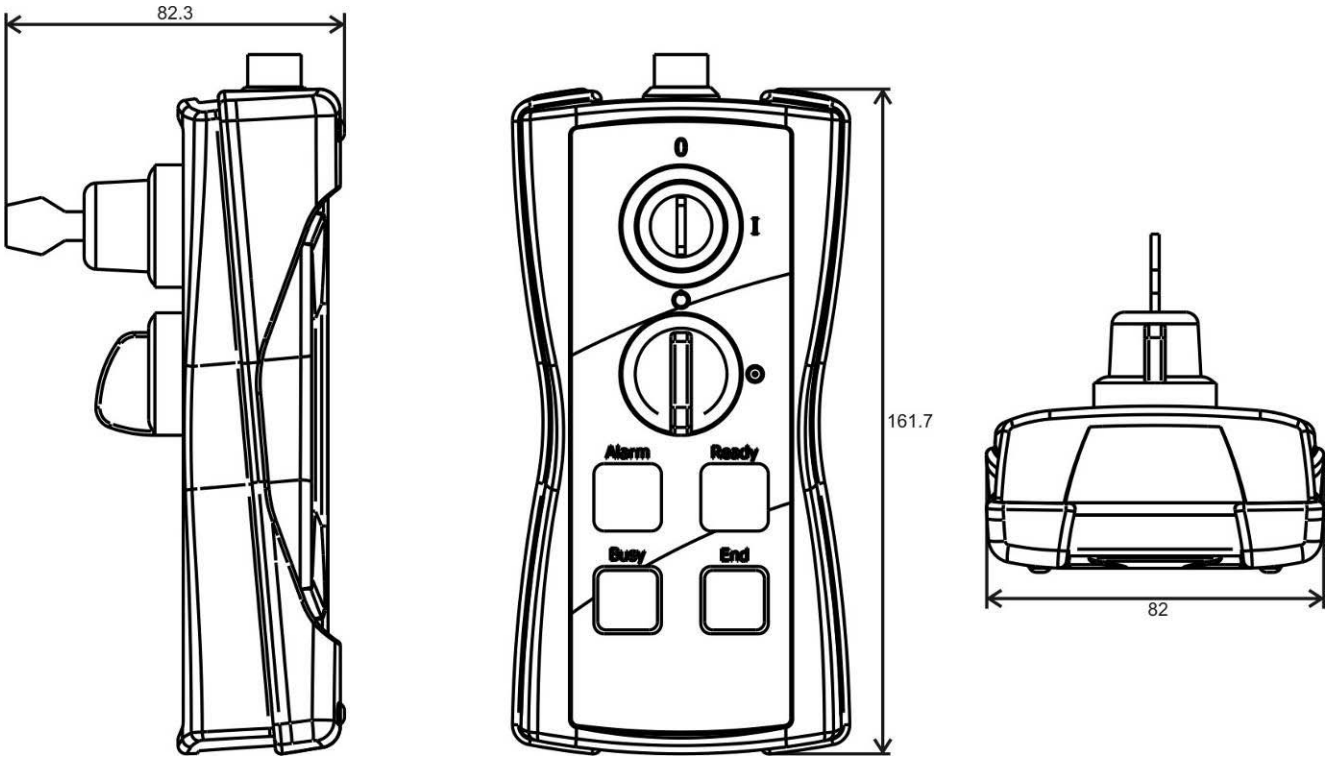


Figure 21: Control Box Basic overall dimensions.

NOTE:
For other connections of available signals on **iMark** (for example *start* or *stop*) refer to **related installation manual**.

1.4.3 CONTROL BOX EVO

Ulyxe iMark control and command device to manage laser power on, to open shutter and laser enable.

This device contents also remote LCD, with encoder pushbutton control, and allows to view laser parameters and to set up aiming and focusing laser beams like remote lcd display with touch screen (optional).

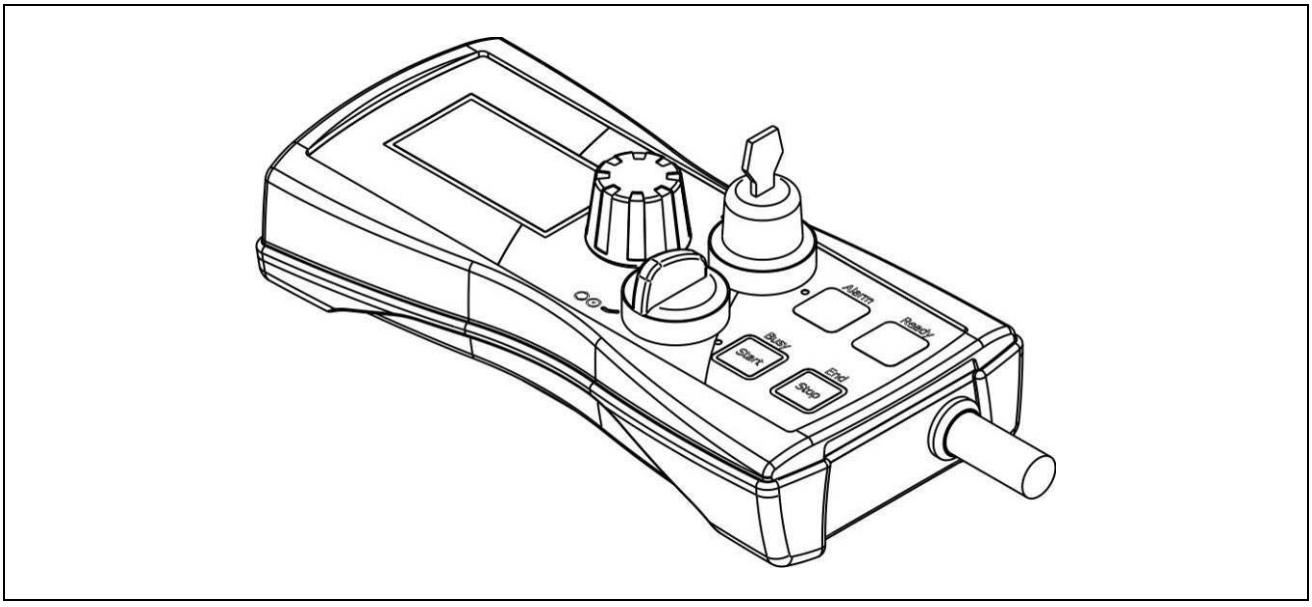
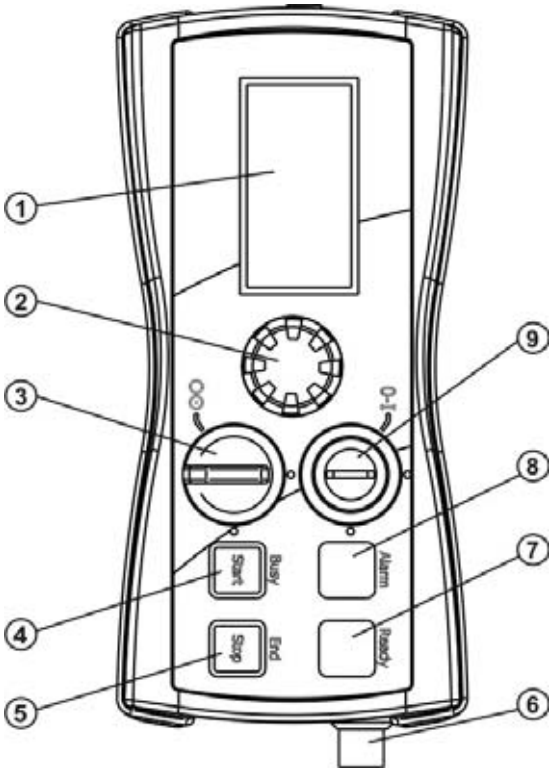


Figure 22: Control Box Evo.



1	***LCD Display***
	Operative parameters and system status view
2	***Encoder***
	To select voices on LCD display
3	***Shutter Enable***
	Selector switch with led indicator to open shutter and laser enable
4	***iMark Busy & Start marking***
	NOT AVAILABLE ON *Ulyxe iMark*
5	***iMark End & Stop marking***
	NOT AVAILABLE ON *Ulyxe iMark*
6	***I/O connection***
	Connection to *Ulyxe iMark* I/O signals connector
7	***iMark Ready***
	NOT AVAILABLE ON *Ulyxe iMark*
8	***Alarm / System OK***
	Led indicator for shutter opened
9	***Key***
	Selector key to enable the system

Figure 23: Control Box Evo.

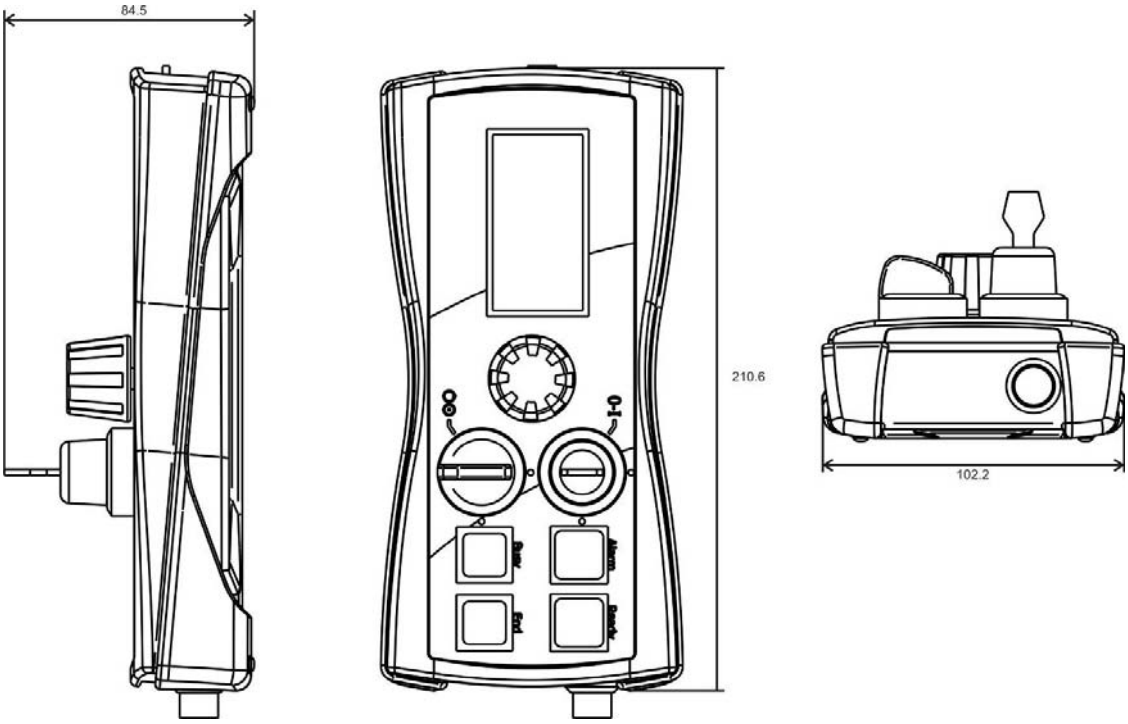


Figure 24: Control Box Evo overall dimensions.

NOTE:

For other connections of available signals on **iMark** (for example *start* or *stop*) refer to **related installation manual**.

1.4.4 FOCUS LENS

On request are available various focus lens models to permit different marking areas in order to your best solution (consult chapter 2.7 for more details).

Figure 25: Focus lens.

Focus (internal fixing)	Marking Area
63 (**Ø 47mm**)	35x35 mm
100 (**Ø 47mm**)	50x50 mm
160 (**Ø 47mm**)	100x100 mm
254 (**Ø 47mm**)	140x140 mm
330 (**Ø 90mm**)	220x220 mm

1.4.5 FOCUS BEAM LASER DIODE

In order to have the right focus on Z axis is possible to request a focusing beam laser diode in addition to aiming beam laser diode.

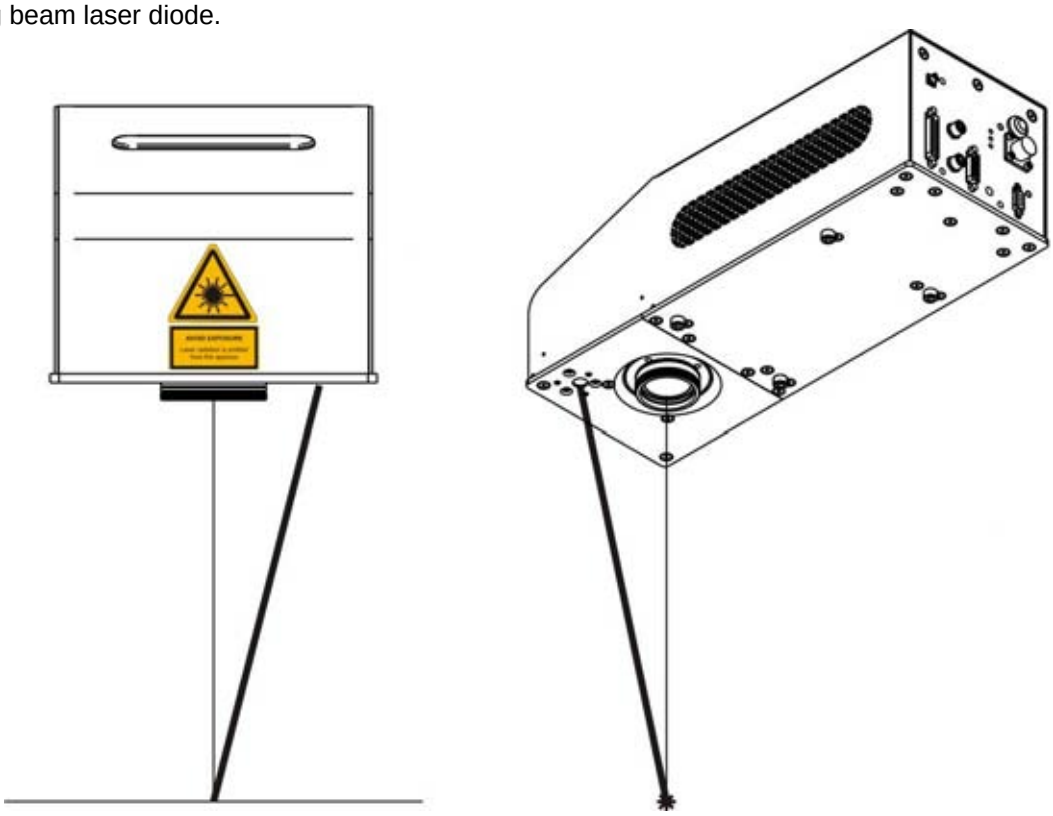


Figure 26: Focus beam laser diode.

1.4.6 REMOTE CAN DISPLAY

Ulyxe iMark doesn't have LCD display inside but it is possible to request remote kit option. In this way it is feasible to check system status, operative parameters, error messages and to setup aiming beam and focusing beam diodes functionality. See paragraph 4.3 for more details about it.

It is comprehensive of touch screen display, connection cable for Ulyxe iMark with 2 mt length and a metal cover with fixing elements.

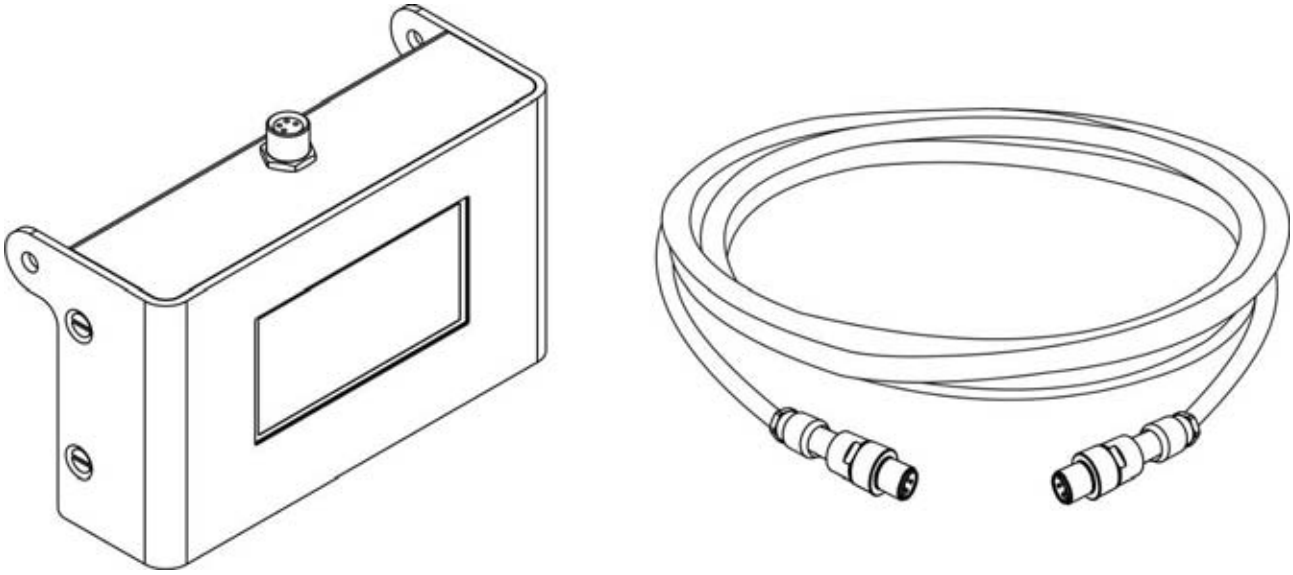


Figure 27: Remote CAN display and cable.

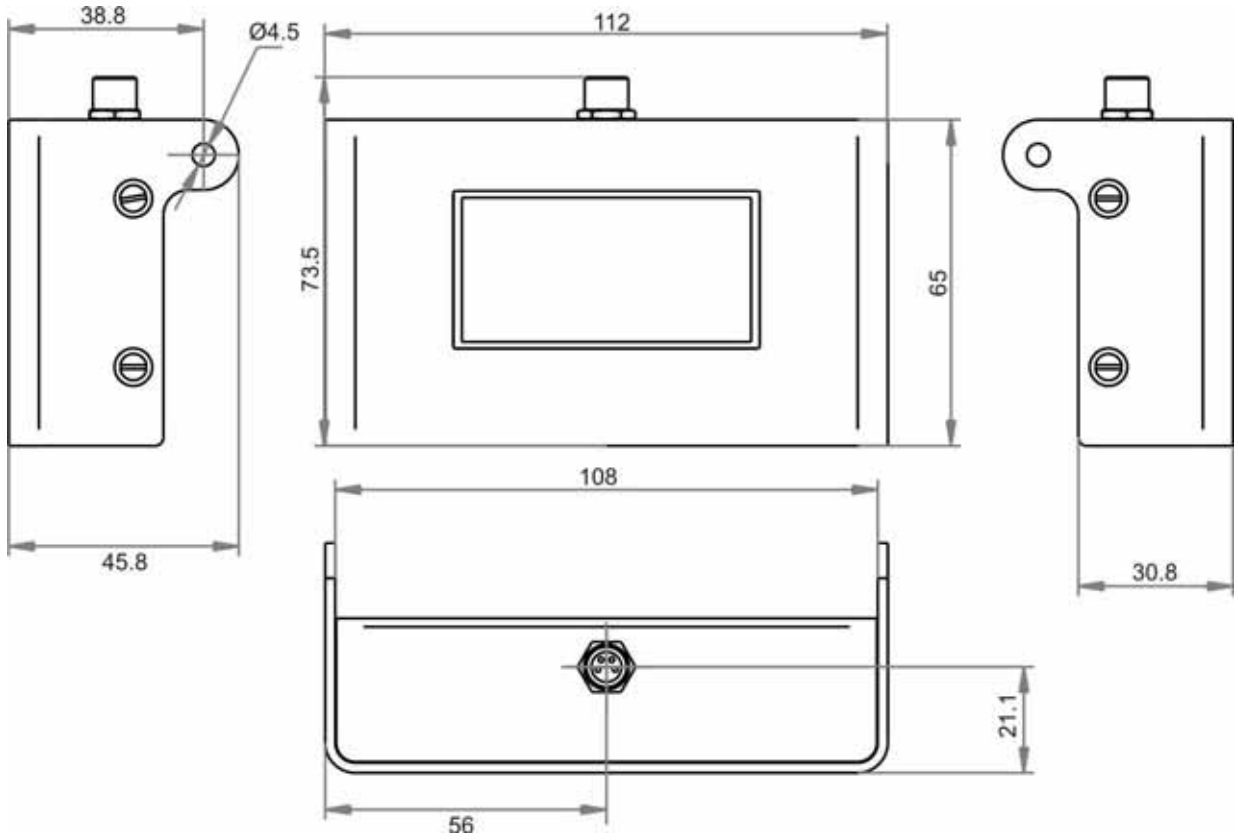


Figure 28: Remote CAN display overall dimensions.

2 : INSTALLATION AND SET UP

NOTE:
Ulyxe iMark is a class 4 laser. For a right operation in safety mode it's necessary to convert the system to a class 1.

Ulyxe iMark need to be installed in an appropriate environment, dedicated to laser operations. Laser Safety Officer must to isolate that area from others work areas and shows with appropriated danger warnings to inform about access denied to unauthorized personnel to laser marking area. See appendix for more details.

2.1 PREREQUISITES FOR INSTALLATION

To be able to work it is necessary to have available:

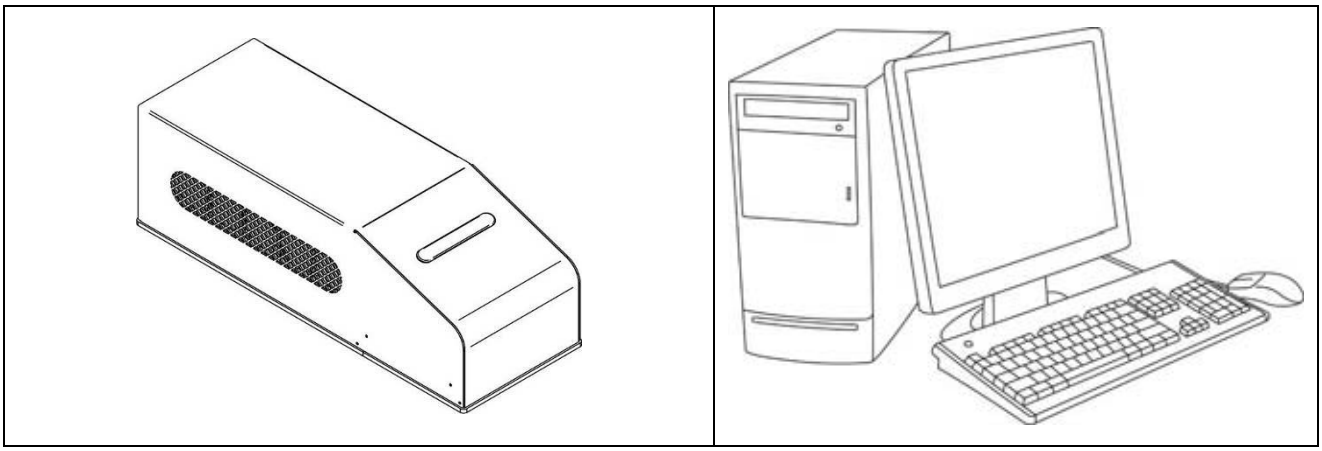


Figure 29: Prerequisites for installation.

Lighter software need to be installed on a PC that will be used with Ulyxe iMark by iMark cables connection. See chapter 2.6 for installation procedure. To be able to install and operate with Lighter on PC following minimal requirements are needed:

Processor	32 bit (x86) processor or 64 bit (x64) at 1GHz or highest
Operative System	Windows® XP SP2 Professional; Windows® Vista Business, Enterprise or Ultimate; Windows® 7 Professional or Enterprise, Windows® 8 Pro or Enterprise
RAM Memory	1 Gb (32 bit) or 2 Gb (64 bit)
Hard Disk	1 Gb of free space on hard disk (32 bit) or 2 GB (64 bit)
Graphic card	Minimal resolution 800 x 600 (1280 x 1024 recommended)
USB	USB 2.0
Power Supplier needed	450W

2.2 ULYXE iMARK TRANSPORT

To be able to positioning and wiring Ulyxe iMark will be necessary its movement. Ulyxe iMark can be easy raised and transported by a single person thanks to its small dimensions and contained weight.

Figure 30: Ulyxe iMark transport.

Be careful to don't damage the system during the movement. Don't shake.

2.3 FIXING AND POSITIONING

Ulyxe iMark marker need to be positioned in safety mode and fixed and fixed on an appropriate plan, parallel to floor and absolutely with no vibrations. To prevent marker distortions, install a vibrometer on marking base plate and check vibrations absence during marking process.

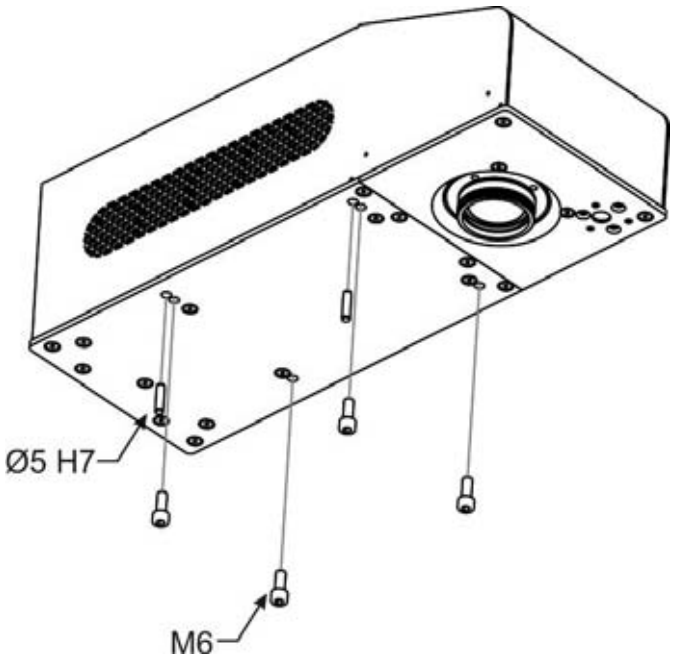


Figure 31: Ulyxe iMark fixing points.

It's very important to fix the machine first of begin to marking because a not capable fixing or positioning can causes serious damages.
Don't fix the system in different as shown in figure.

Ulyxe iMark is equipped with 4 threaded holes and 2 fixing pins.

Screws	M6
Fixing pins	Ø5 H7

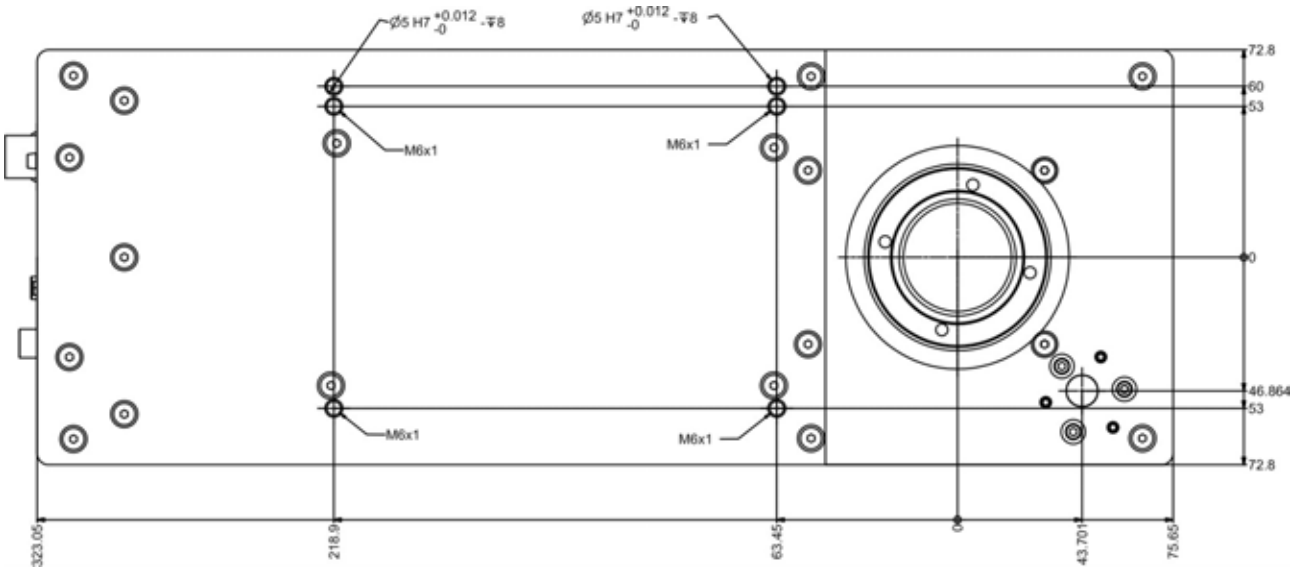


Figure 32: Measures, distance threaded holes and fixing pins drivers.

2.4 INSTALLATION ENVIRONMENT

Ulyxe iMark need to be installed in an appropriate environment to be able a right air flow on the system and for a correct cables passage as shown in figure.

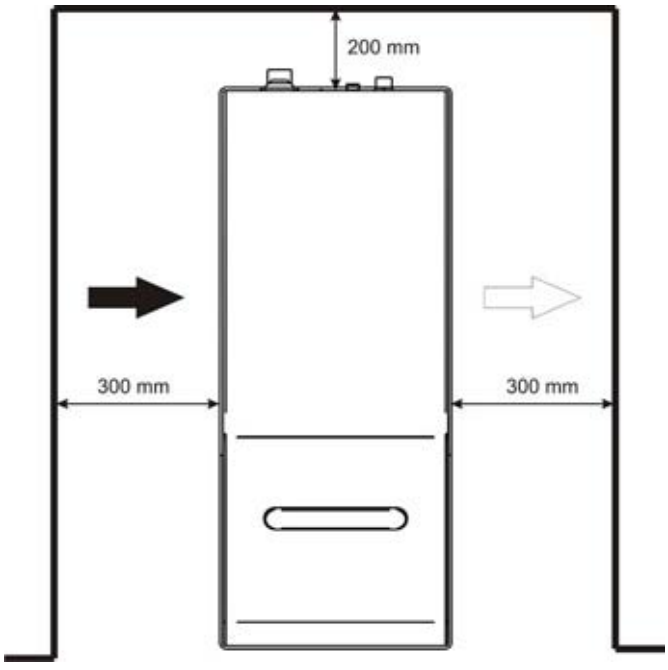


Figure 33: Installation environment.

2.5 CONNECTIONS

2.5.1 PLUG-IN AUX INTERLOCK CONNECTOR

Plug Aux interlock connector to Ulyxe iMark. Connector absence defines a stop of the system.

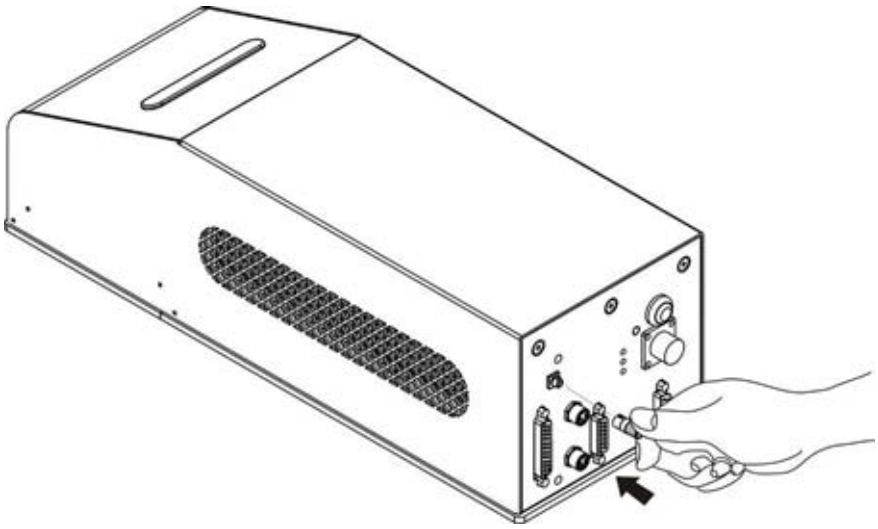


Figure 34: Aux interlock connector plug.

2.5.2 POWER SUPPLY CONNECTION

Connect power supply cable to Ulyxe iMark. Check connector right orientation and plug in. Once plugged in check also right coupling between two connectors parts.

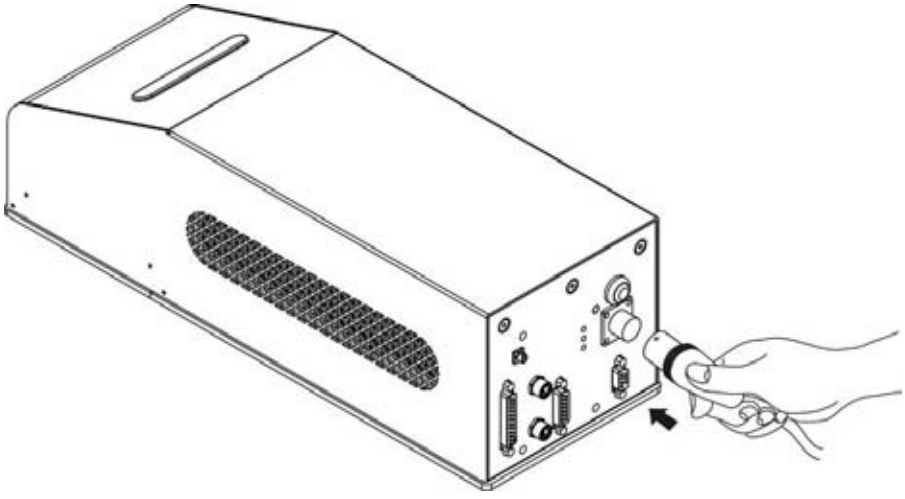


Figure 35: Power Supply cable plug in.

NOTE:
Ulyxe iMark needs a **safety circuit** for emergency. Consult chapter 2.8 for more details.

NOTE:
Ulyxe iMark needs a 24V DC stabilized supply voltage 13A max current absorption. It is suggested to use **BOXED POWER SUPPLY KIT** option. See following chapter for further information.

2.5.3 CABLING BOXED POWER SUPPLY KIT (OPTIONAL)

BOXED POWER SUPPLY KIT contents a switching power supply with 85÷265Vac (47÷63Hz) voltage input and 24V DC, 14A output and a main lead. For any further information on available accessory options follow dedicated chapter 2.5.5.

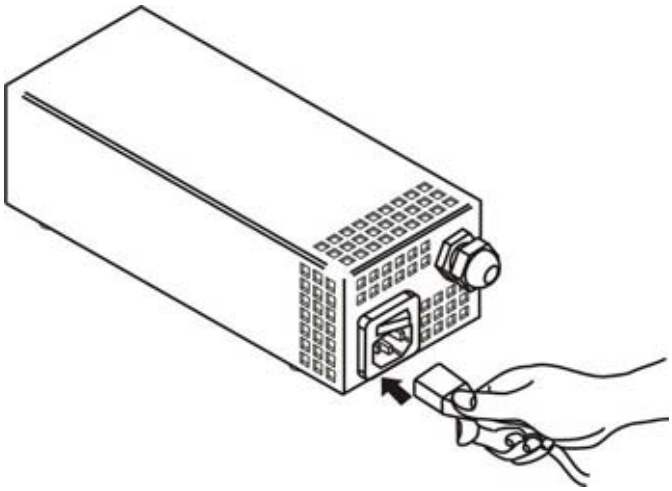


Figure 36: Main lead connector insertion.

2.5.4 PLUG IN SIGNAL KEY CONNECTOR

Connect Signal Key (laser signals control key) to Ulyxe iMark device as shown in figure. In the case of Control Box Basic or Control Box Evo option is not available consult following chapter.

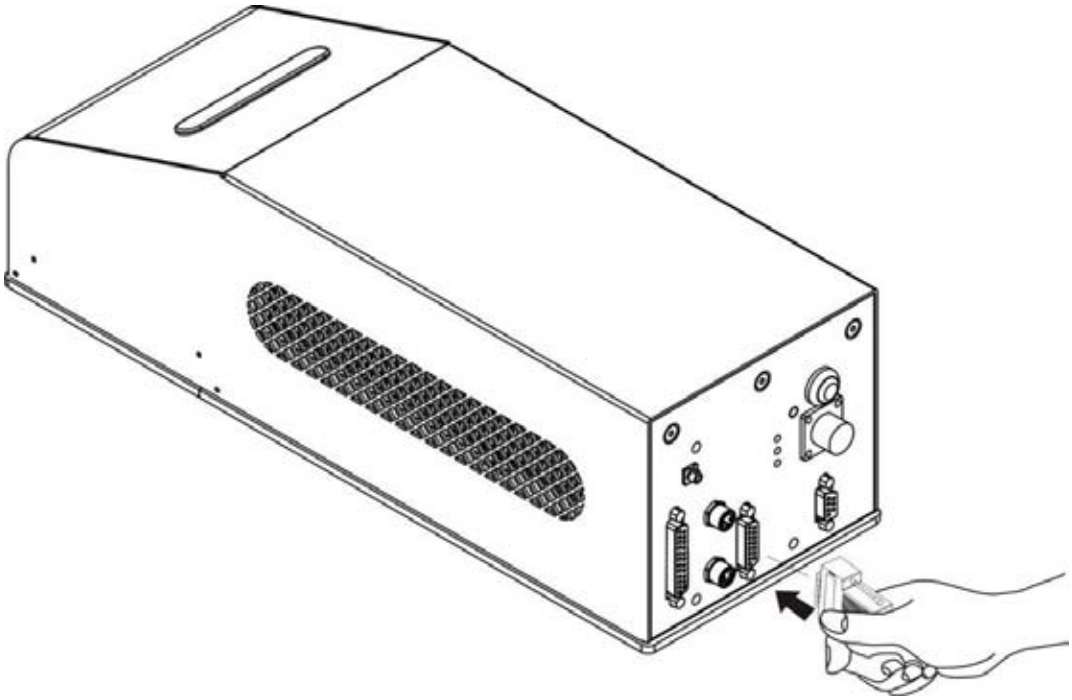


Figure 37: Plug-in signal key connector.

NOTE:

Signal Key equipped **need to be connected** inside as shown in chapter 2.8, figure 48. In option it is possible to use Control Box accessory (chapter 1.4 – Accessories).

2.5.5 CONTROL BOX BASIC CONNECTION (OPTIONAL)

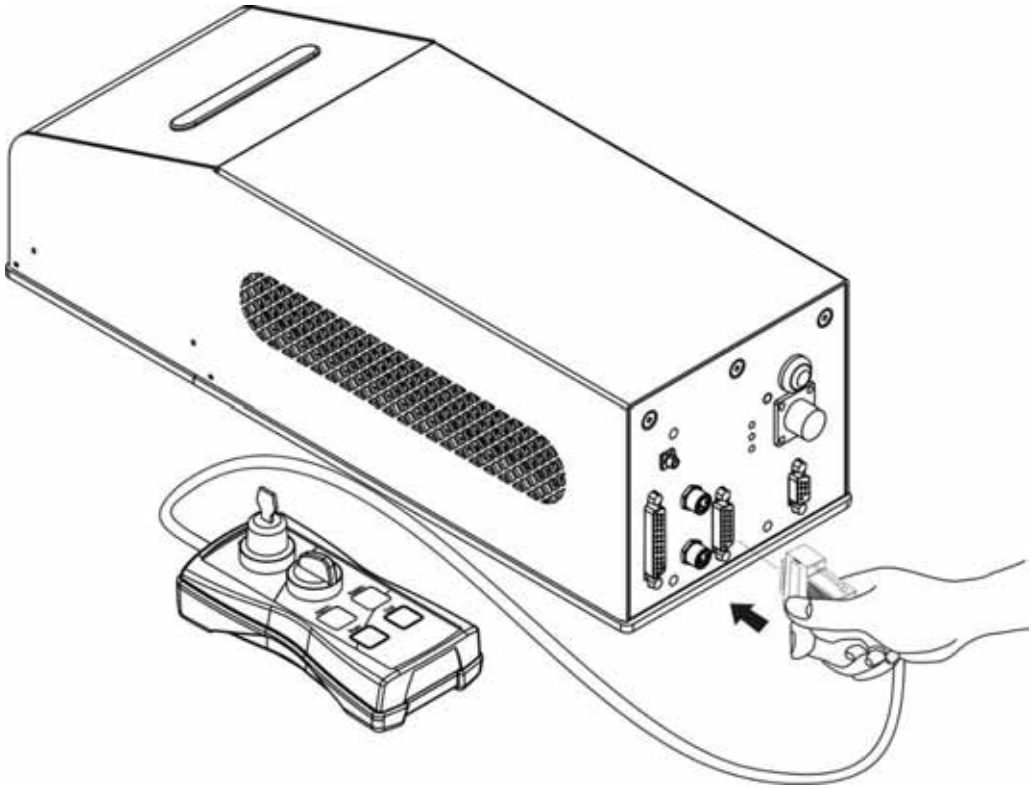


Figure 38: Control Box Basic connection.

2.5.6 CONTROL BOX EVO CONNECTION (OPTIONAL)

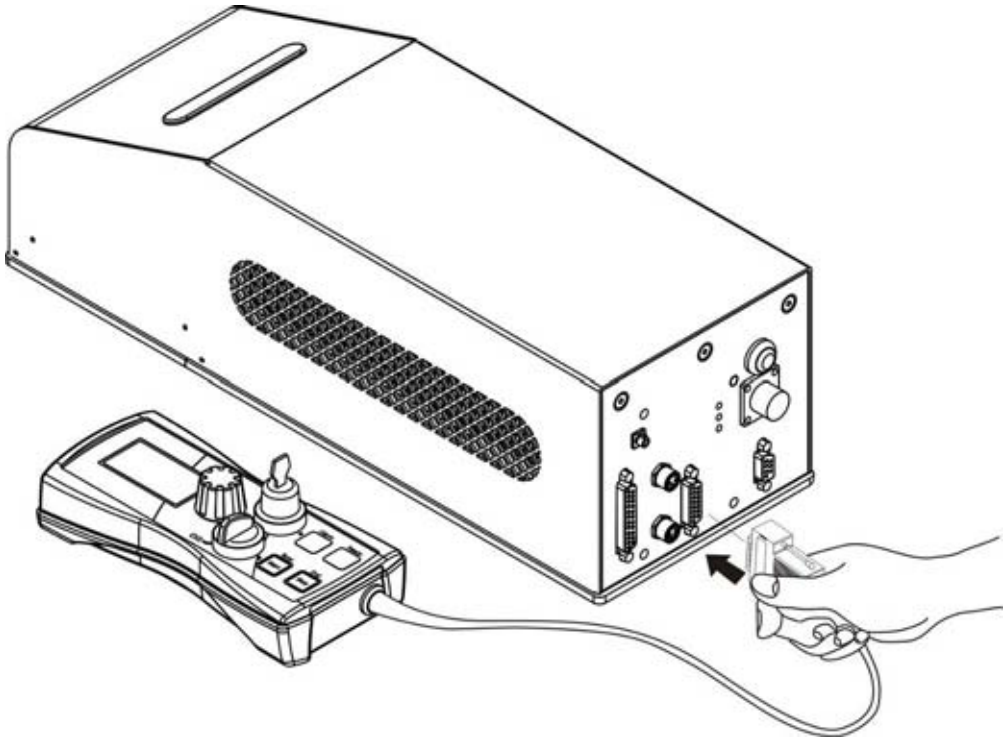


Figure 39: Control Box Evo connection.

2.5.7 REMOTE CAN DISPLAY CONNECTION (OPTIONAL)

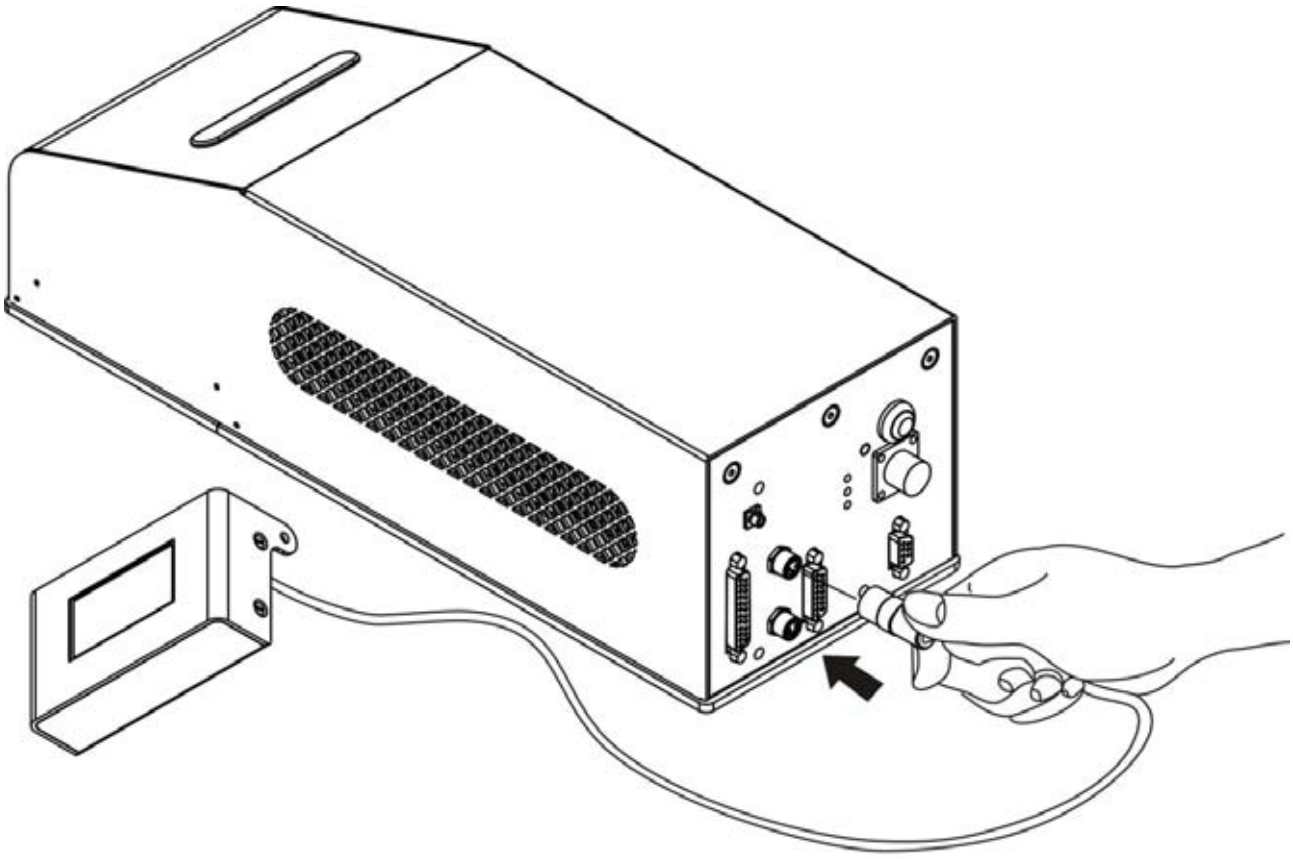


Figure 40: Remote CAN display connection.

2.5.8 iMARK CONNECTION

Connect galvo and PC cables coming from iMark board. See next paragraph to iMark installation and connections.

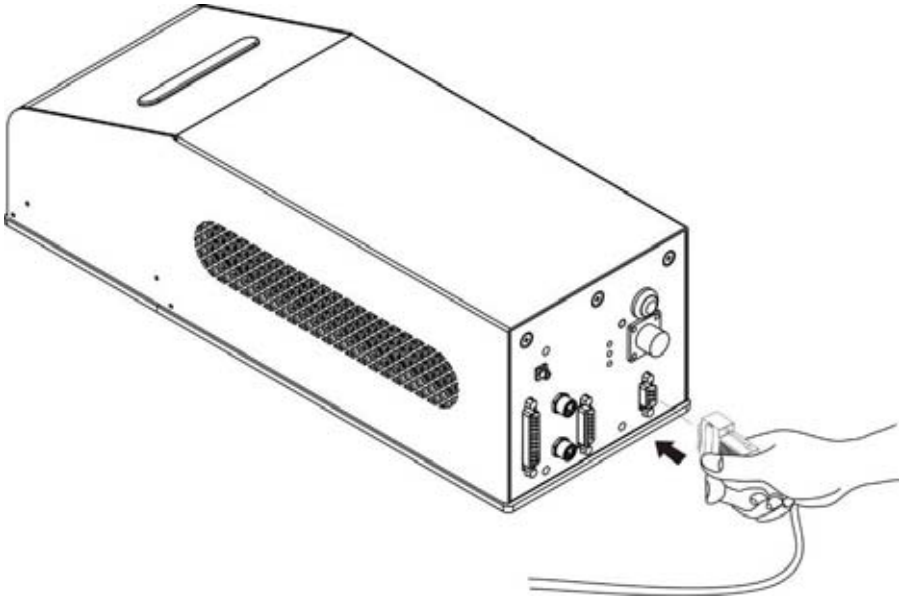


Figure 41: Laser signals cable connection.

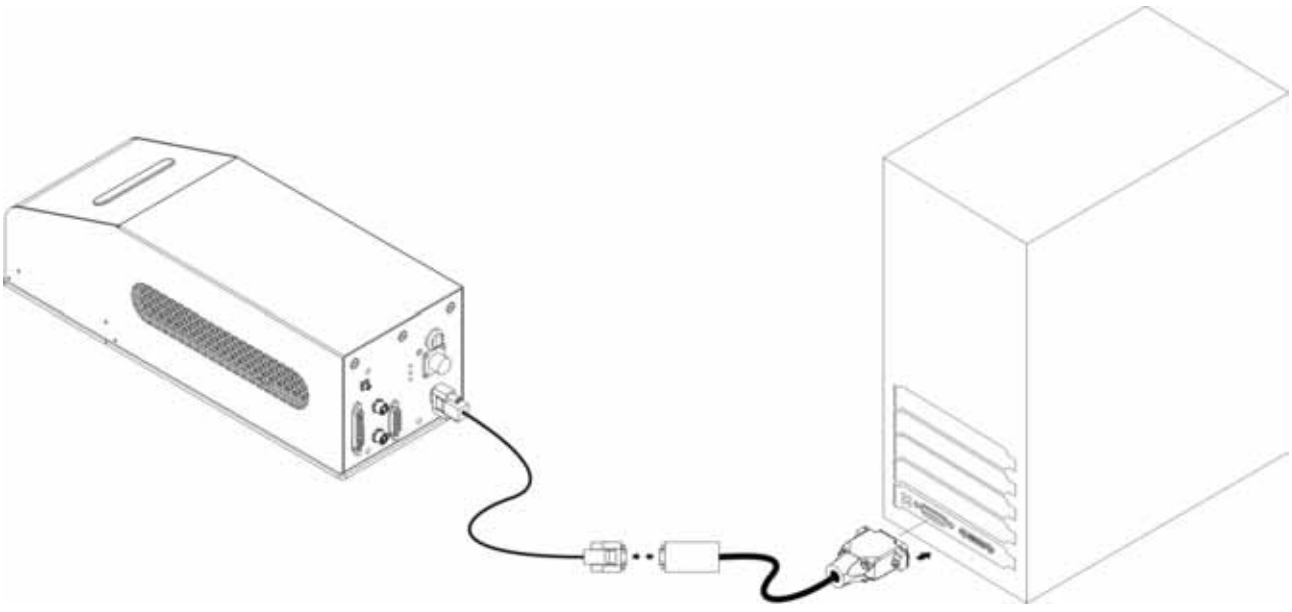


Figure 42: Laser signals adapter connection.

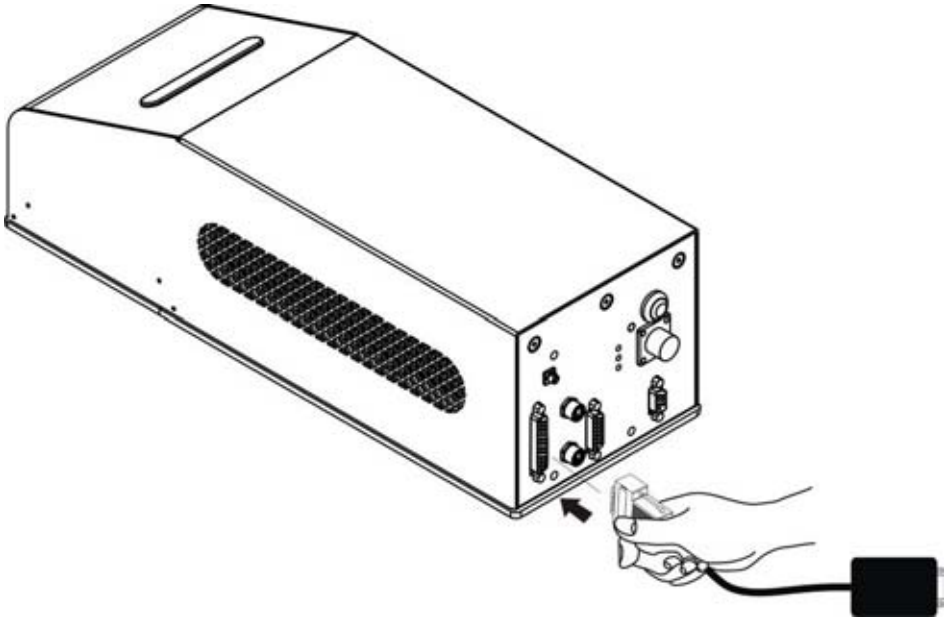


Figure 43: galvo adapter connection.

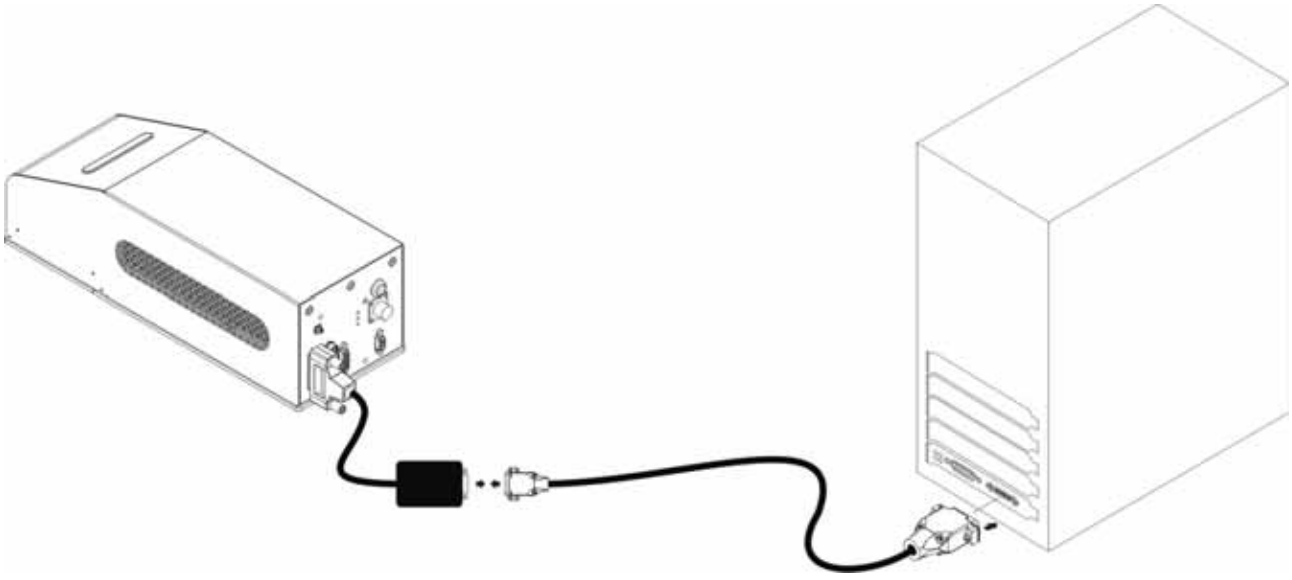


Figure 44: connection galvo signals to iMark board.

2.6 iMARK BOARDS AND LIGHTER SOFTWARE INSTALLATION

The electronics which control the laser system and the related I/O signals is composed of a board with iMark controller (laser controller) which is inserted in a PCI-E slot of a standard PC. One type of expansion board can be connected to this board to control I/O signals.

General procedure (please refer to the relevant manual for the complete procedure):

- Turn OFF the PC
- Install the iMark board inside the PC
- Turn ON the PC
- Insert CD or Pen Drive containing Lighter and install the software
- Upload the file `LASER.INZ` provided by Datalogic Automation Srl contains the settings of the laser.
- Restart the PC

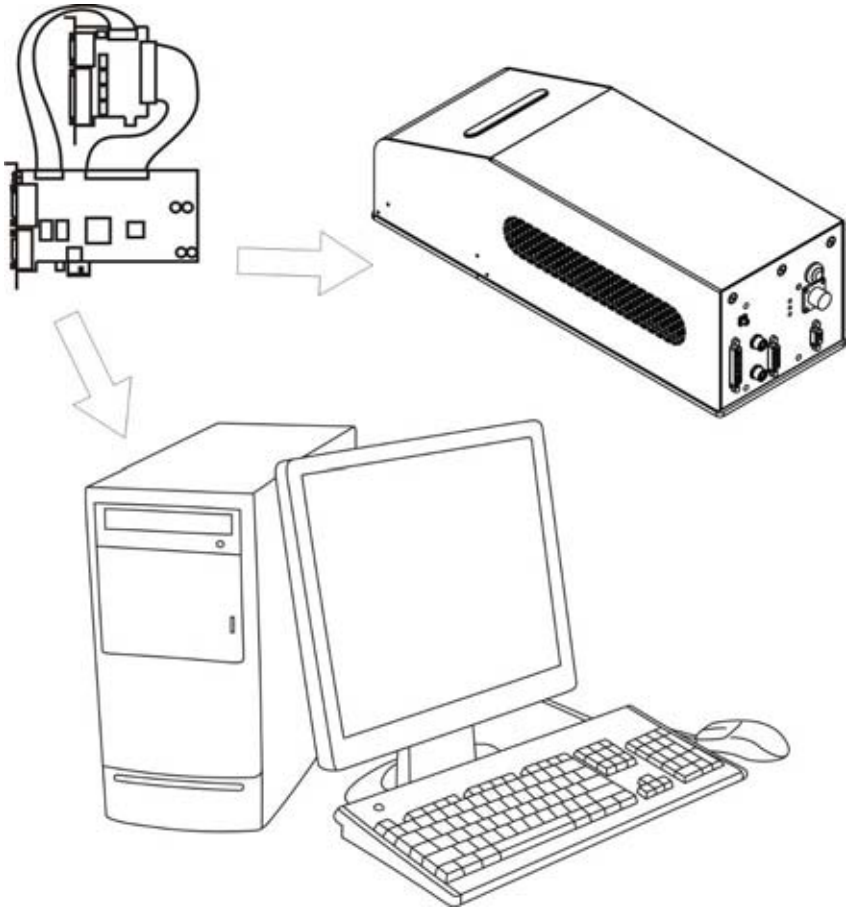


Figure 45: iMark installation.

NOTE:
In order to install the **iMark** hardware, please refer to the **relevant installation manual**.

NOTE:
In order to install the **Lighter** software, please refer to the **relevant installation manual**.

2.7 MARKING AREA

According to focal lenses used from Ulyxe iMark it is possible to have different marking areas as follow:

FOCUS (mm)	MARKING AREA SIDE	WORKING DISTANCE
63	35	72
100	50	114
160	100	178
254	140	282
330	220	376

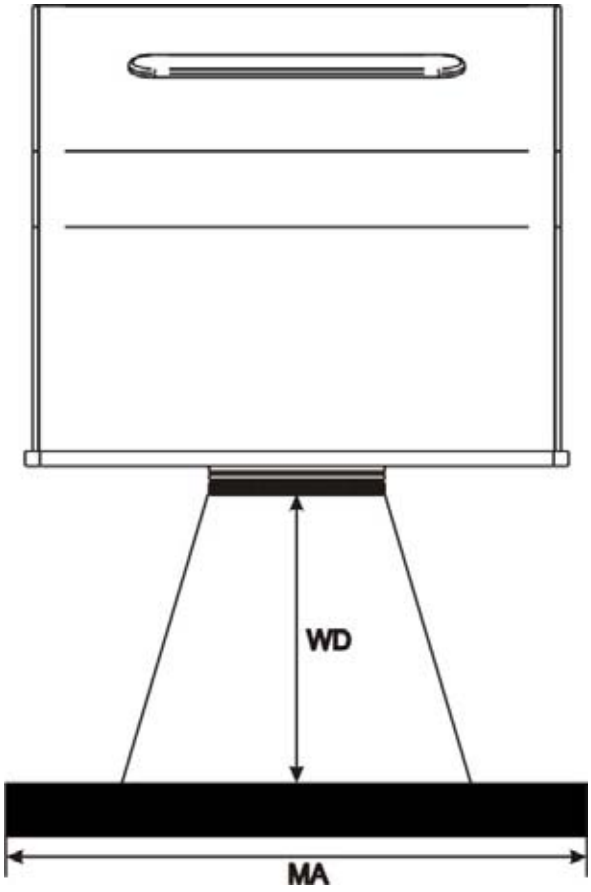


Figure 46: Working Area.

WD: Working Distance

MA: Marking Area

2.8 EXAMPLE OF APPLICATIONS AND EXTERNAL CONNECTIONS

Handy and simple installation of Ulyxe iMark allow to make it easy to use also in line production applications.

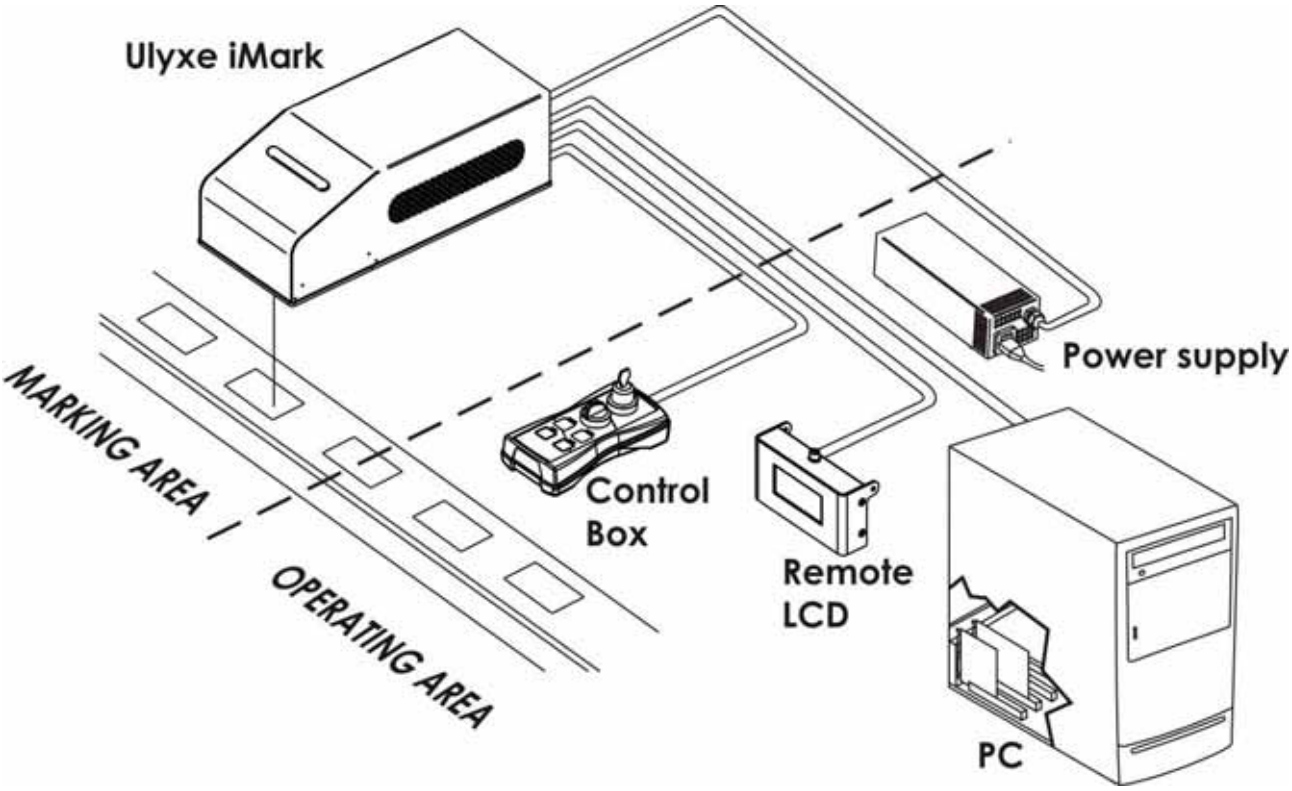


Figure 47: Example of external connections.

NOTE:
The operator **SHOULD NOT** enter in the marking area during the marking process!

NOTE:
It is important to install an **emergency circuit** able to cut 24V DC power supply voltage (or indirectly on 110/220Vac) switching off **Ulyxe iMark** entirely. This safety circuit needs to be installed from qualified personnel only.

NOTE:
To obtain a good marking quality, and not to decrease life time, we recommend a ventilation or suction in a protection box to limit dust due to marking phase.

POSSIBLE EXTERNAL CONNECTIONS.

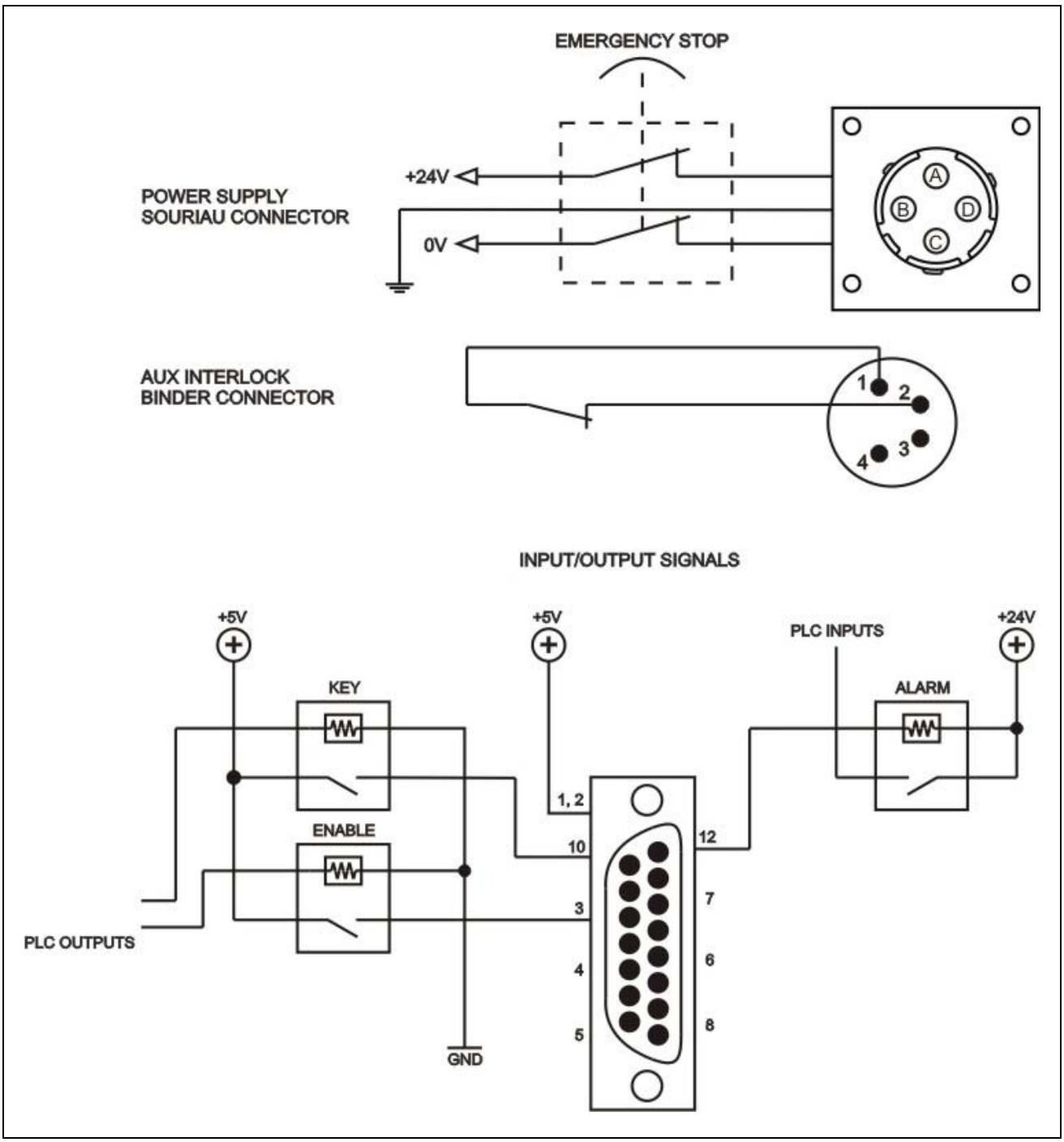


Figure 48: Possible external connections.

* See chapter 4.2 for more information.

2.9 MATERIAL PROCESSING

Here below indicative parameters for different material processing (metal, plastic) are specified.
Use the indicated values only as reference parameters:

MATERIAL	PARAMETERS	ANNEALING	COLOR MARKING	ABLATION
Metal				
	Power (W)	70 – 80%	70 – 80%	100%
	Frequency (KHz)	75	60 – 80	10 – 20
	Speed (mm/s)	100 mm/s	50 – 200 mm/s	> 200 mm/s
	Filling	Single 0,05	Single/Cross 0,02 – 0,05	--

MATERIAL	PARAMETERS	COLOR CHANGE*	FOAMING
Plastic			
	Power (W)	Ca. 80%	70 – 80%
	Frequency (KHz)	30 - 80	> 40
	Speed (mm/s)	> 200 mm/s	--
	Filling	--	--

* Consider the additives that are added to the plastic.

3 : UTILIZATION AND OPERATIONS

3.1 STARTING PROCEDURE

First to proceed with turn on the Ulyxe iMark, insure to a right device connection like descripted previously. Check presence of voltage power supply connector, Aux interlock connector, Signal Key connector (or Control Box) and signals and head cables. Below there are described windows showed from remote display (optional) also. Proceed as follow:

1) power on Ulyxe iMark with 24V DC voltage (turn on power supply if present):

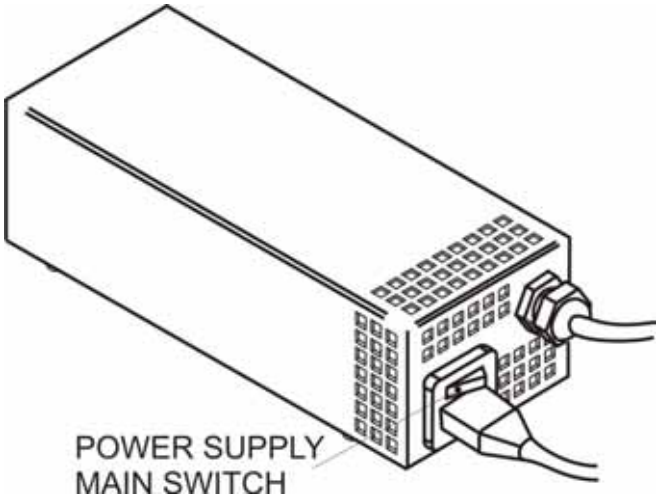


Figure 49: Boxed power supply with main switch.

2) press back panel main switch of Ulyxe iMark:

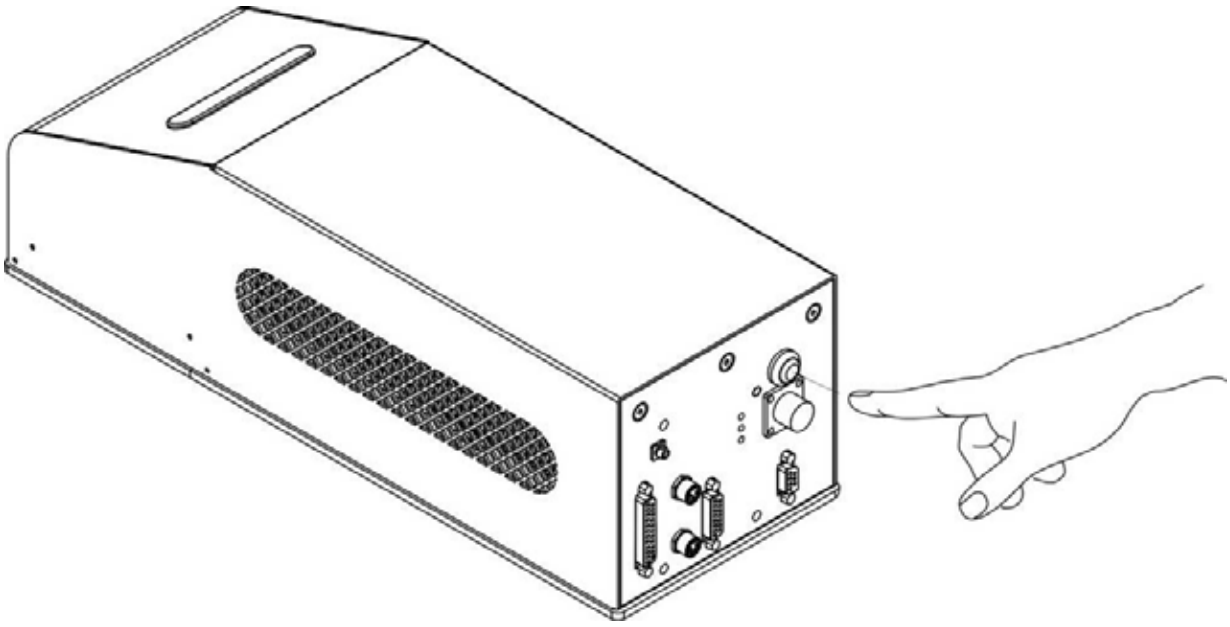


Figure 50: Ulyxe iMark main switch.

If power supply input is correct green led indicator on back panel will light on otherwise if there is a reversed voltage input red led indicator on back panel will light on. Refer to troubleshooting paragraph in case of error:

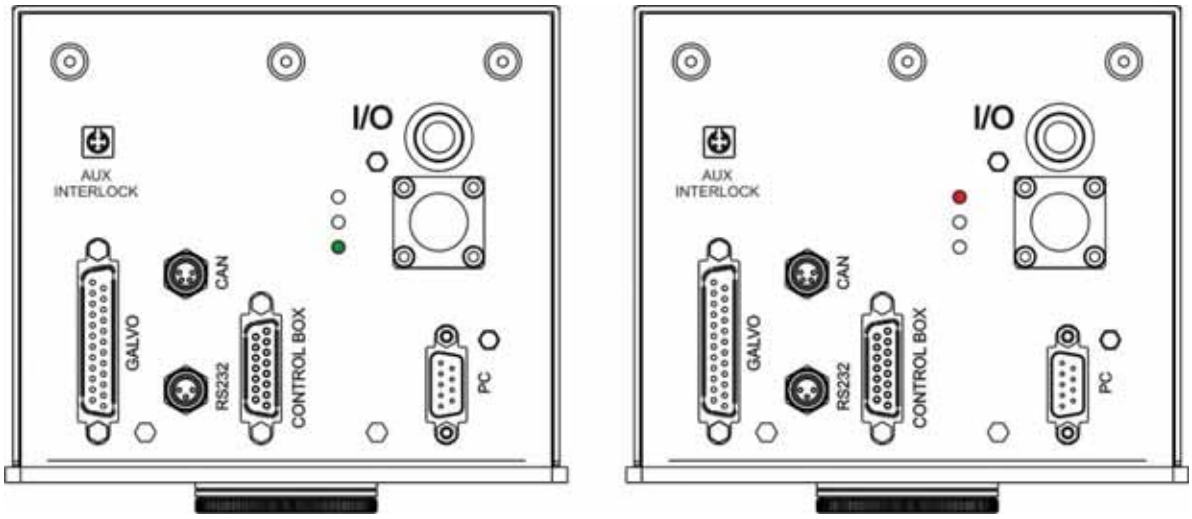


Figure 51: Green and red leds on back panel.

3) turning on Ulyxe iMark the fans cooling system will be powered on and it will be showed LCD firmware version on display temporarily (if present), then led bar will be lighted on in orange colour until system power on time will be not completed:

Figure 52: Starting system.

4 immediately after led bar is lighted on to green color and Ulyxe iMark remains in waiting for key start mode and power module is off:

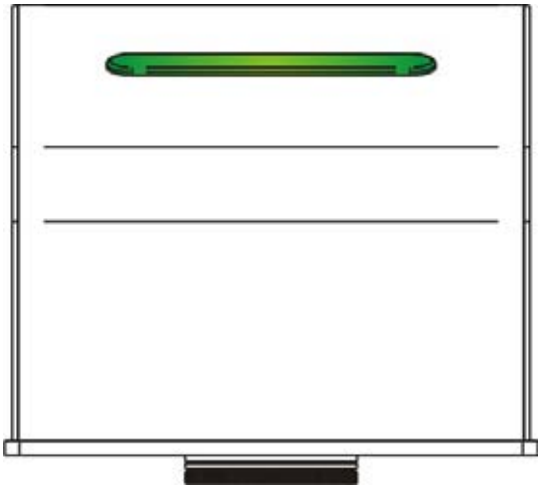


Figure 53: Led Bar green: laser system off.

Figure 54: Waiting for key start.

5) enable *key* signal to start Ulyxe iMark and wait for a moment to permit system warm up. After this operation led bar will come green blinking.

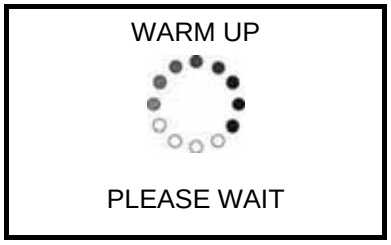


Figure 55: Waiting for warm up.

6) once warm up is completed Ulyxe iMark is ready to use waiting external *enable* command and led bar comes orange:

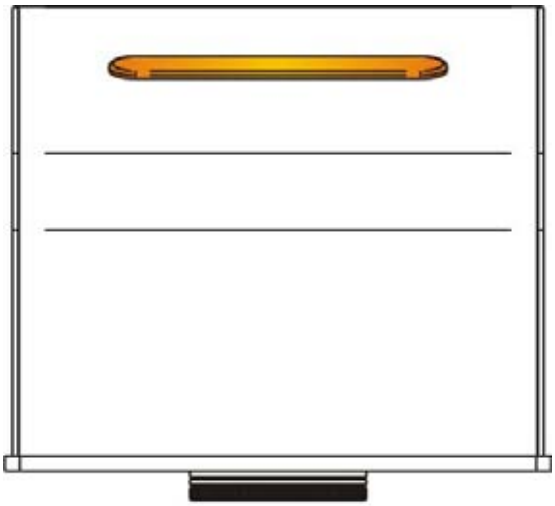


Figure 56: Orange Led Bar: stand-by system.

Figure 57: System waiting enable command.

NOTE:
If aiming and focusing (optional) beam laser diodes setup are in automatic mode they'll be light on.

Ulyxe iMark is ready for operation. See chapter 4.3 for touchscreen display functions.

NOTE:
For information about use of **Lighter** software, see related manual.

7) activate *enable shutter* command to open mechanical shutter. Led bar comes red. ALARM signal will be active.

NOTE:
In this situation Ulyxe iMark can emit LASER.

NOTE:
Due to not availability to understand when Ulyxe iMark is marking or not remote lcd display can not show emission laser warning message. TAKE CARE during operations with shutter opened status.

NOTE:
If aiming and focusing (optional) beam laser diodes setup are in automatic mode they'll be light off.

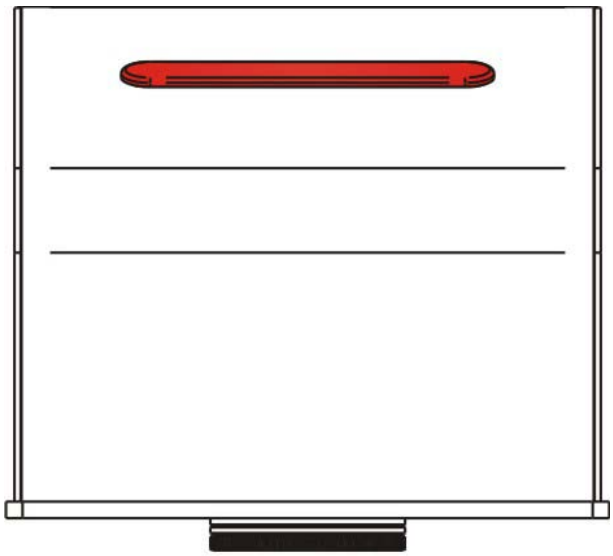


Figure 58: Red led bar: system with shutter opened.

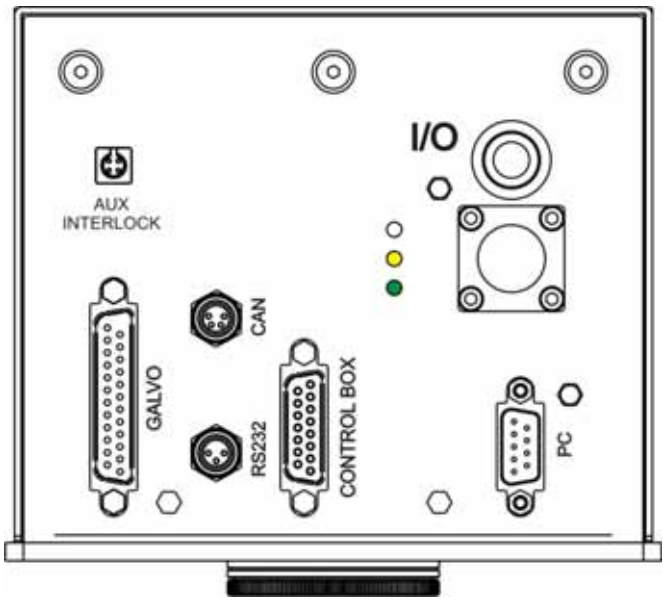


Figure 59: Yellow led indicator on back panel.

3.2 MAINTENANCE

The ordinary maintenance program foresees only. Some operations consist in a mere “check” of the operating condition.

The maintenance activities must be done in respect of law prescriptions regarding the safety rules during the operations.

The following parts/functions have to be controlled.

MAINTENANCE PROGRAM

COMPONENT OR FUNCTION	TYPE OF OPERATION	INTERVALS
Laser Output	Check	Weekly: rub gently with a cloth tampered with acetone or ethyl ether
Fan and heat exchanger unit	Check	Every 6 months (according to the place and frequency of use)

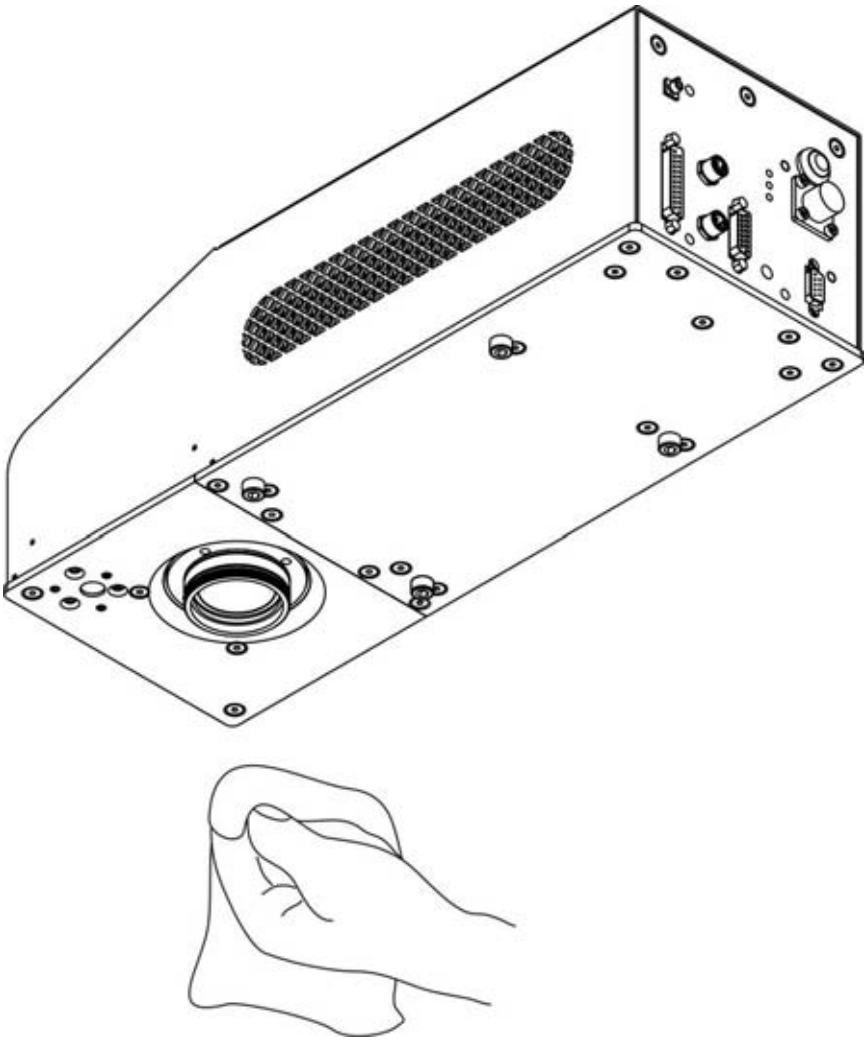


Figure 60: Cleaning laser output.

4 : TECHNICAL SPECIFICATIONS

4.1 ELECTRICAL UNIT

PWM MAIN BOARD

The PWM main board communicates with the various elements of the electrical system, centralizing and sorting operational and management:

- Temperature control; a peltier cells module is mounted on the base of power laser diode to maintain ait to constant temperature.
- Current Driver; manages and controls the current which supplies the laser diode.
- Supply voltages Devices.
- Fan thermally control.
- Aiming Beam.
- Display LCD with CAN bus.
- Shutter control inside resonator.

iMARK

The electronics, that controls laser system and the related signals, consists of a board with iMark P processor which has to be connected to a standard PC through iMark cables.

It manages all the operations concerning the marking process; the remote commando from iMark board to scan head are used for scanning of lines, segments (vectors and polygons) and raster images.

Each element to be marked by scan head has to be divided in small lines and segments.

Spooler command is sent from PC to iMark board where a circular double buffer stores the data. After a Start signal, data are converted from digital to analog signals inside iMark board through an integrated DAC. After that they are sent in real time to scanner head.

Q-SWITCH RF DRIVER

The radio frequency driver, driver the electro-optical Q-Switch QS, modulating an output to 40.68 MHz between 15 KHz and 200 KHz, directly based in the command signals received from iMark card by PWM connections.

COOLING FANS

Five fans grants a constant air flow for the cooling of the power laser diode and current driver electronics.

SCAN MARKING HEAD (ON BOARD)

Two inclinable mirrors are mounted inside the scan marking head. They are moved by galvo-motors and controlled by iMark.

I/O INTERFACE

Interfaces control, managing and external/internal status signals generating an insulation between them.

LASER DIODE AND PELTIER CELL

The laser diode is installed in the couplet unit. It is supplied about 2 Vdc low voltage and current up to 30A. It works at a monitored and regulated temperature between 22°C (71,6°F) and 35°C (95°F) and supplies electro-magnetic energy, the so called “optical pumping”, needed to supply the resonator.

AIMING LASER DIODE

The aiming laser diode, supplied with approximately 3,5-4Vdc low voltage, is installed on the resonator unit.

FOCUSING BEAM (OPTIONAL)

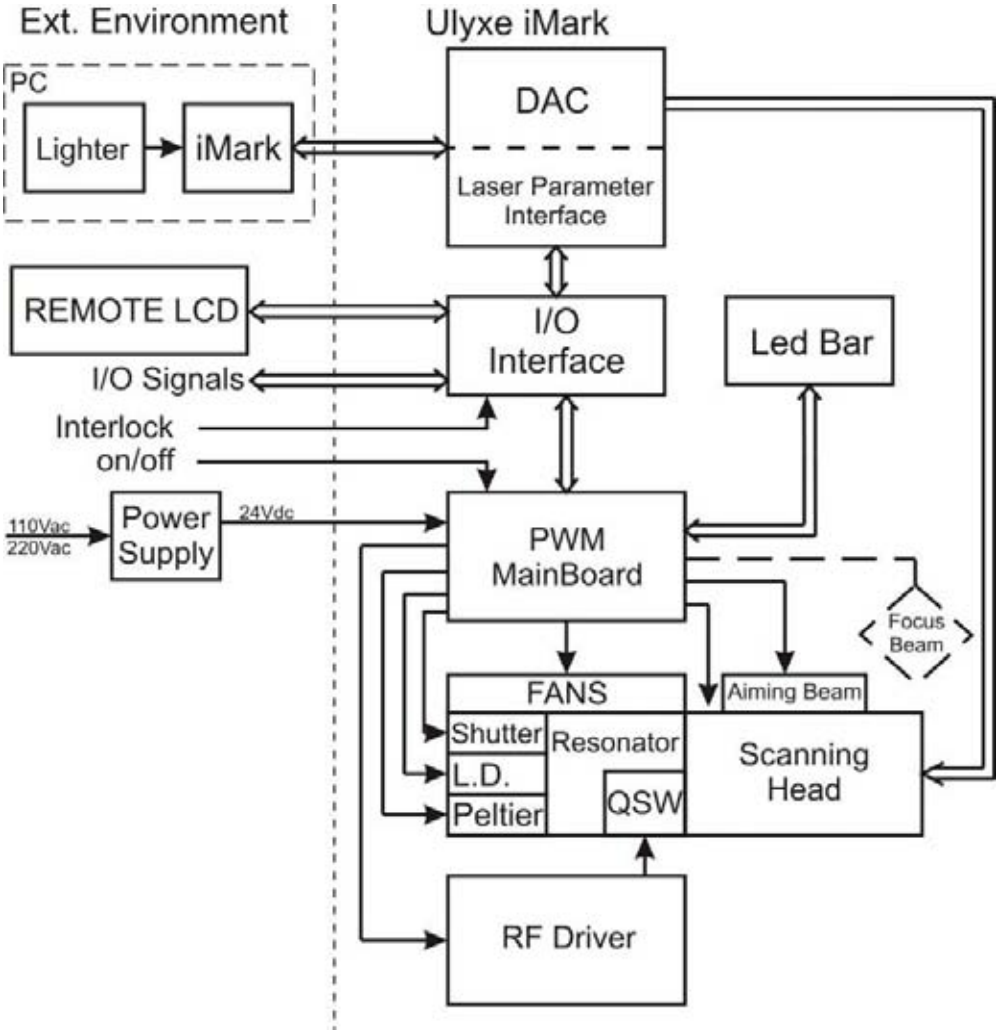
Focusing beam pointer is supplied with approximately 3,5-4Vdc low voltage and it is used to show right focus distance of marking plain. It is located on right side (front view) of scanner head.

DISPLAY (REMOTE CAN LCD)

Display (CMD board with touchscreen) provides information on the status of the laser and it is the first diagnostic tool in case of a fault.

Q-SWITCH DEVICE

Q-Switch is an acoustic-optical component located inside the resonator unit. It is an active component, it is directly driven by the radio frequency driver with wave values between 15.000 Hz and 200.000 Hz.



OPTICAL UNIT

The principle of physics that the generation of laser light is based on, is the phenomenon of light stimulated emission. Laser is the acronym of Light Amplification by Stimulated Emission of Radiation. This means that laser is a light amplified by a chain reaction light emission, starting from an initial photon (light particle) which by interacting with the energized atomic system, stimulates the emission of two photons and they in turn interact with other atoms giving rise to a landslide effect.

Energizing the atomic system requires an external energy source, in a suitable form able to start the laser effect. “Optical pumping” is obtained when the light emitted from a luminous sources hits the active material (material able to emit laser light) so that the atoms energize by absorbing luminous energy. Amplification of the laser effect is obtained by making the activated material cross the same light it emits various times.
This is done by placing the material between two opposite mirrors, so crystal and mirrors are centered on an aligned optical axis. The faces of the crystal, the front mirror and the flat face of the rear mirror are parallel. In this optical configuration the extraction of laser energy from the resonator is at the maximum, the beam is circular and the intensity is approximately uniform.

The Q–Switch is a supplementary optical/acoustic–optical device placed between the crystal and front mirror, it oscillates at a fixed frequency or is driven in radio frequency on.

It acts as an “optical switch” preventing the regular and constant flow of photons: when “closed” it is used to increase the energetic level of crystal atomic energizing; when “reopened” the useful energy available output by the resonator is higher than the average value. Once produced, laser radiation can be transferred to any point by optical fiber to a refocalization telescope, using it for a specific application.

In this specific case of laser system, the following information is also of interest.

The optical part is composed of two modules with different functions. The first is the resonator (described above) where the laser light is generated. The second is the scanner head, a module able to deviate the light beam to any point in the work field (previously determined by the selected Lens), which is then used to engrave any two dimensional geometric figure. The special feature of the solid state, Ulyxe iMark laser source lies in the optical pumping method of the resonator. Unlike the traditional method, in this case “optical pumping” is effected by a laser diode instead of a flashbulb.

This method is used to obtain an extremely efficient modal and it produces very little heat to be dissipated. These two features make it very easy to significantly reduce the dimensions of the resonator and electrical unit which in this case includes the “pumping” laser diode coupler and its cooling system.

4.2 EXTERNAL CONNECTORS SPECIFICATIONS

4.2.1 POWER SUPPLY PLUG

Panel socket SOURIAU TRIM TRIO 4 ways, cod. UT0010-4SH.

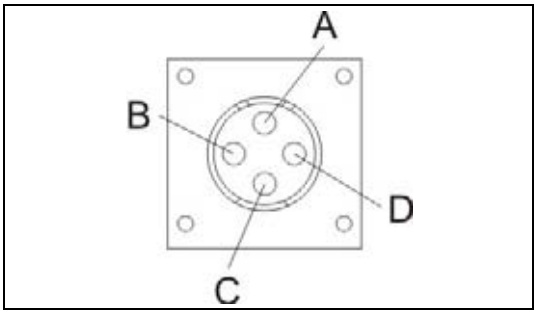


Figure 61: Female panel socket cod. UT0010-4SH (front view).

PIN	SYMBOL	TYPE	DESCRIPTION
A	+24V	Power supply input	Power supply input +24V DC (13A MAX)
B	0V	Power supply input reference	Power supply input reference
C	⏚	Ground - Earth	Earth connection
D	-	-	Not Used

Table: Pin out power supply inlet.

4.2.2 POWER SUPPLY CONNECTOR

Male plug connector SOURIAU TRIM TRIO 4 ways, cod. UT0610-4PH, 3 meter length.

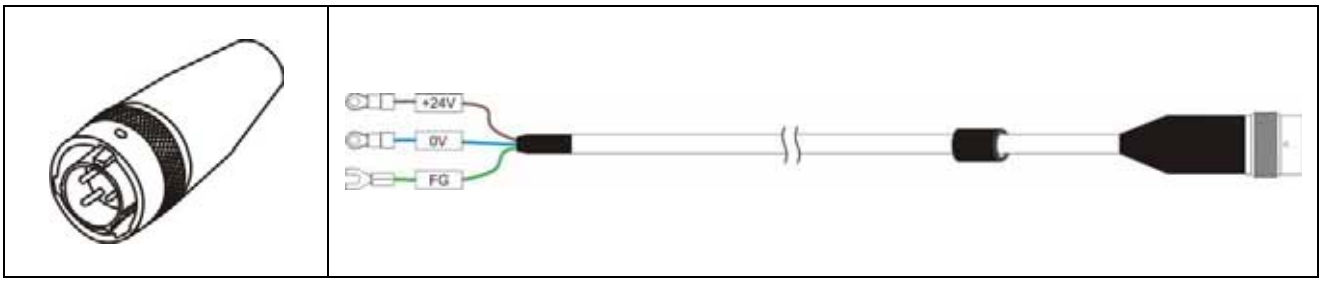


Figure 62: Male plug connector cod. UT0610-4PH (front view) and wiring.

4.2.3 AUXILIARY INTERLOCK SOCKET

Panel socket BINDER series 719, 4 ways. Aux Interlock disable Class4 laser source. To restore the machine is necessary restart. For more information see the paragraph "*4.4.2 - Error Messages*".

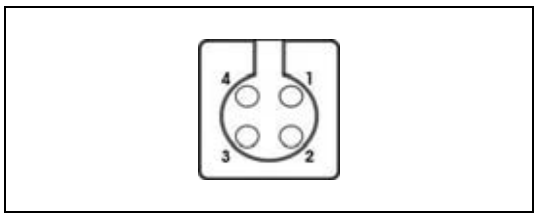


Figure 63: Female panel socket cod. 09-9766-30-04 (front view).

NOTE:
External safety interlock MUST **BE MANAGED** by system integrator.

PIN	SYMBOL	TYPE	DESCRIPTION
1	Vcc	Output power supply	5Vdc output supply
2	INTERLOCK	Digital input	Environmental Interlock 5Vdc = Connected; 0Vdc = Disconnected
3	GND	Ground	Ground
4	N.C.	-	Not Used

Table: Pin out interlock socket.

4.2.4 AUXILIARY INTERLOCK CONNECTOR

Plug connector BINDER series 719, 4 ways.

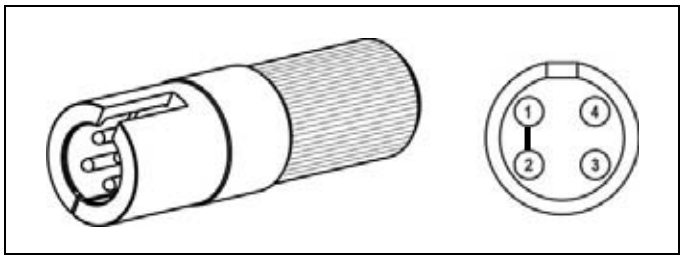


Figure 64: Male plug connector cod. 09-9767-00-04 (front view).

NOTE:
For more information of safety connection, see the next paragraph "*4.2.5 - Signal Key Panel Socket*".

4.2.5 SIGNAL KEY PANEL SOCKET (EXTERNAL SAFETIES AND STATUS SIGNALS)

Female panel socket SUB-D 15 ways.

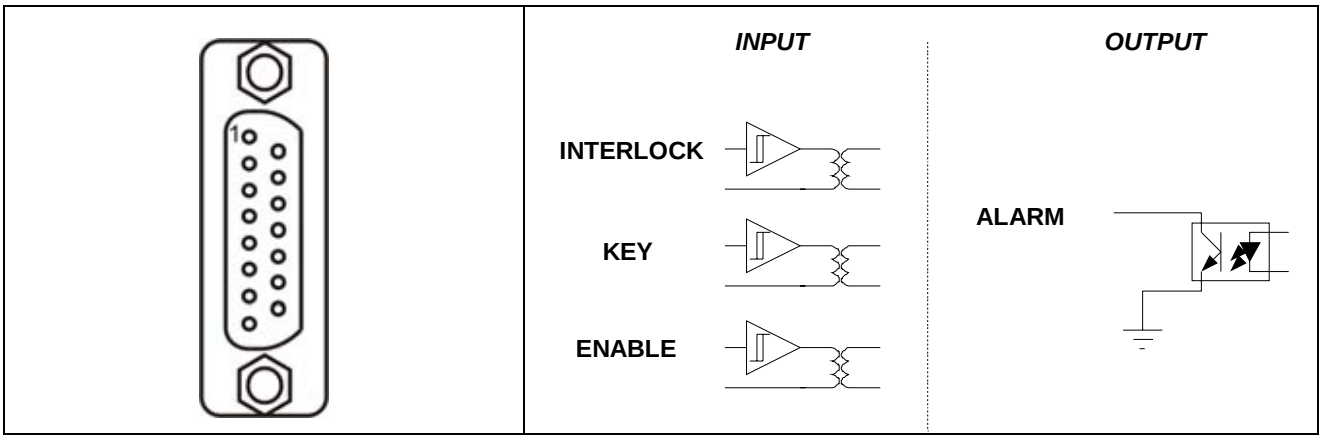


Figure 65: Panel socket (front view) and internal interface.

PIN	SYMBOL	TYPE	DESCRIPTION
1, 2	5VDC	Output power supply	5Vdc output supply (**max 200mA**)
3	SHUTTER EN	Digital input (5Vdc)	Shutter enable signal (5Vdc = Enabled; 0Vdc = Disabled)
4	START	*Not available on Ulyxe iMark*	*Not available on Ulyxe iMark*
5	STOP	*Not available on Ulyxe iMark*	*Not available on Ulyxe iMark*
6	READY	*Not available on Ulyxe iMark*	*Not available on Ulyxe iMark*
7	BUSY	*Not available on Ulyxe iMark*	*Not available on Ulyxe iMark*
8	END	*Not available on Ulyxe iMark*	*Not available on Ulyxe iMark*
9	CANPOWER	Output power supply **CONTROL BOX EVO DEDICATED**	CAN BUS signal dedicated to Control Box EVO
10	KEY	Digital input (5Vdc)	System enable signal (KEY) (5Vdc = System ON; 0Vdc = OFF)
11	CAN_H	Input/Output **CONTROL BOX EVO DEDICATED**	CAN BUS signal dedicated to Control Box EVO
12	ALARM	Open-collector digital output (**max 120mA**)	Main alarm signal (active in “ready to mark” status) Closed = System ready; Open = System not ready (Shutter enable OFF or Fault)
13	CAN_L	Input/Output **CONTROL BOX EVO DEDICATED**	CAN BUS signal dedicated to Control Box EVO
14	CANGND	CAN BUS Ground **CONTROL BOX EVO DEDICATED**	CAN BUS signal dedicated to Control Box EVO
15	GROUND	Ground	Ground

4.2.6 SIGNAL KEY CONNECTOR (EXTERNAL SAFETIES AND STATUS SIGNALS)

Male connector SUB-D15 ways.

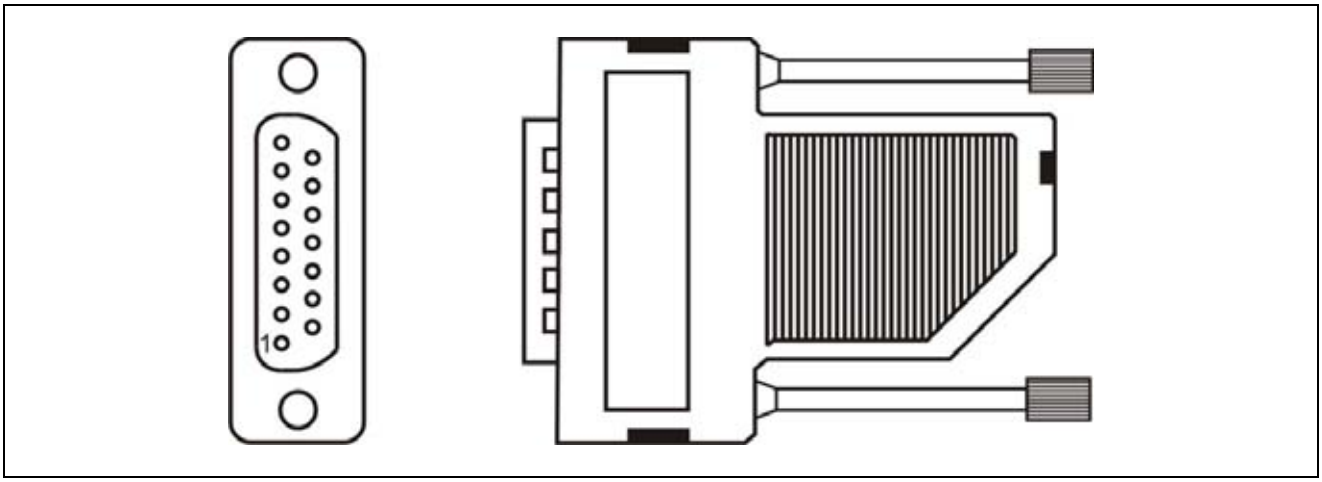


Figure 66: Signal Key male connector.

4.2.7 RS232 CONNECTOR

This connector is used only for service applications (firmware upgrade and debug tool).

4.2.8 CAN CONNECTOR

Not Used.

4.2.9 GALVO PANEL SOCKET (Scanning Head signals)

Female panel socket SUB-D 25 ways dedicated to X-Y axis movement.

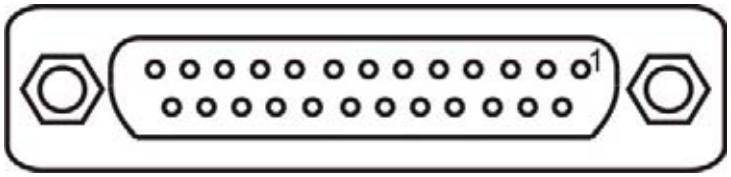


Figure 67: Signal Key panel connector.

PIN	SYMBOL	TYPE	DESCRIPTION
1	NOT USED	RESERVED	DO NOT CONNECT
2	NOT USED	RESERVED	DO NOT CONNECT
3	NOT USED	RESERVED	DO NOT CONNECT
4	NOT USED	RESERVED	DO NOT CONNECT
5	NOT USED	RESERVED	DO NOT CONNECT
6	NOT USED	RESERVED	DO NOT CONNECT
7	NOT USED	RESERVED	DO NOT CONNECT
8	NOT USED	RESERVED	DO NOT CONNECT
9	NOT USED	RESERVED	DO NOT CONNECT
10	NOT USED	RESERVED	DO NOT CONNECT
11	SP5V	Power supply input	Power supply input +5VDC
12	SM12V	Power supply input	Power supply input -12VDC
13	GND	Ground	Ground Reference
14	NOT USED	RESERVED	DO NOT CONNECT
15	NOT USED	RESERVED	DO NOT CONNECT
16	NOT USED	RESERVED	DO NOT CONNECT

17	NOT USED	RESERVED	DO NOT CONNECT
18	NOT USED	RESERVED	DO NOT CONNECT
19	NOT USED	RESERVED	DO NOT CONNECT
20	GALVO X-	Ground	Ground reference for Galvo X
21	GALVO X+	Analog Input	±5V Galvo X analog input
22	GALVO Y-	Ground	Ground reference for Galvo Y
23	GALVO Y+	Analog Input	±5V Galvo Y analog input
24	SP12V	Power supply input	Power supply input +12VDC
25	GND	Ground	Ground reference

4.2.10 PC PANEL PLUG (Laser signals)

Male panel plug SUB-D 9 ways to control laser parameter.

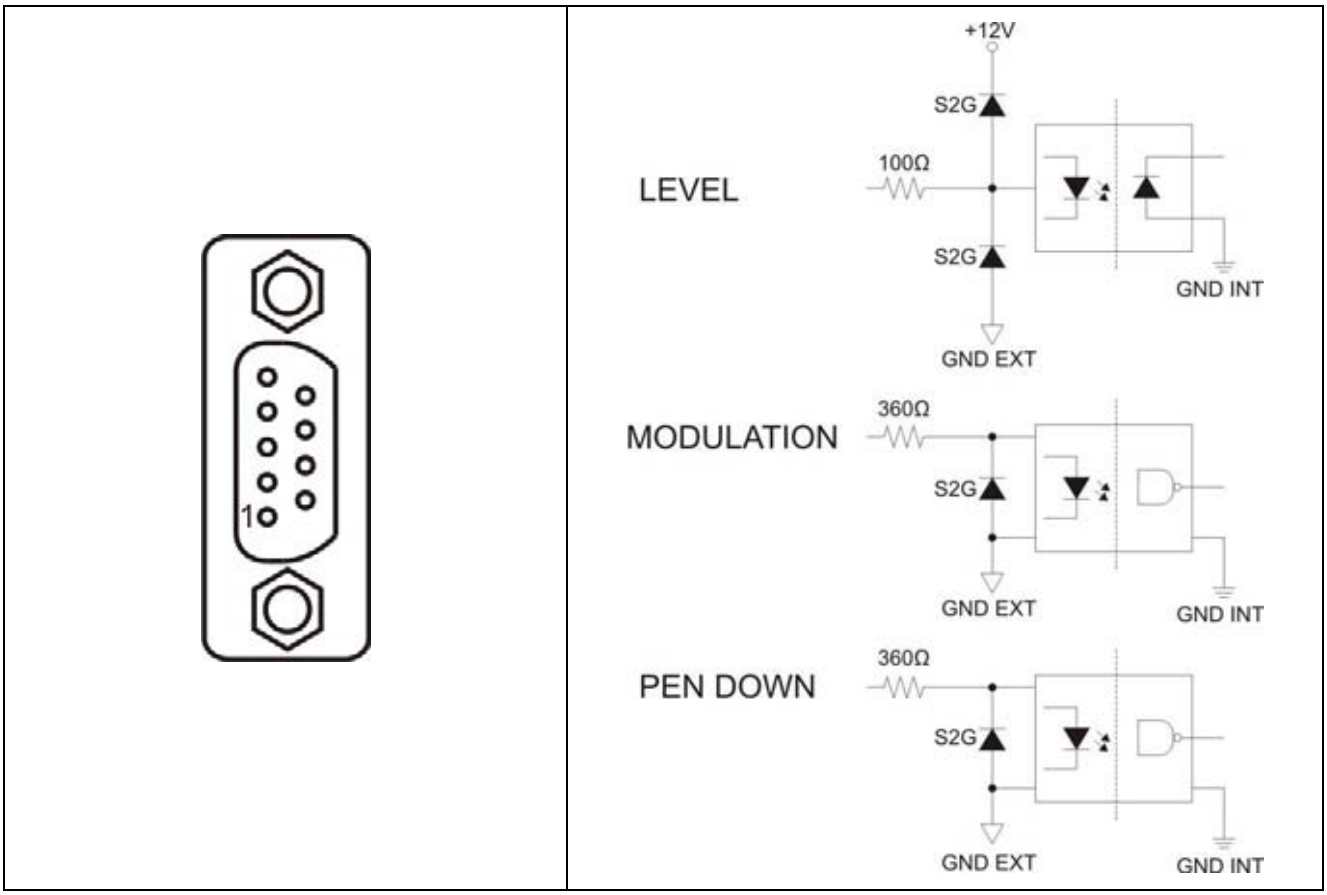


Figure 68: Laser signal male connector.

PIN	SYMBOL	TYPE	DESCRIPTION
1	LEVEL	Analog input (0-10Vdc)	Analog level for Laser Diode current control (0 - 10Vdc) MAX frequency to change value is 1kHz
2	PEN DOWN	Digital input (5Vdc)	Laser Enable (5Vdc= Laser Ready, 0Vdc = Laser Stand-by)
3	GND	Ground	Ground
4	Not Used	Not Used	Not Used
5	Not Used	Not Used	Not Used
6	MODULATION	Digital input (5Vdc)	Q-switch Modulation – 15kHz to 200 kHz range 5Vdc = Q-switch closed (ON); 0Vdc = Q-switch open (OFF)
7	GND	Ground	Ground
8	+12VDC	Power supply input	Power supply input +12VDC
9	Not Used	Not Used	Not Used

The iMark board is able to drive one Q-switched laser source. For this control three signals are used:

- a “Pen Down” signal, active high
- a Q-switch Modulation signal, active low
- a “Power Level” analogue signal (0 – 10 V) generated from a 12 bit value

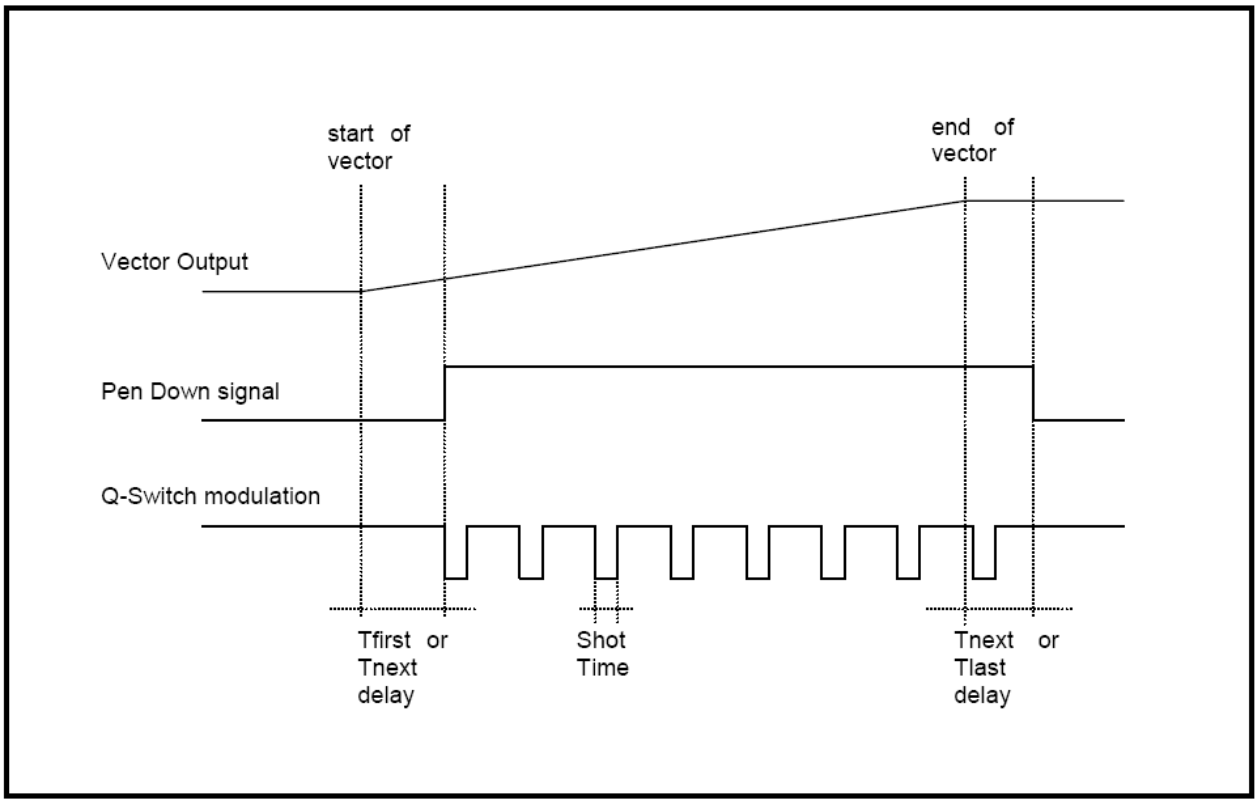


Figure 69: Laser signals diagram.

4.3 REMOTE CAN DISPLAY (OPTIONAL)

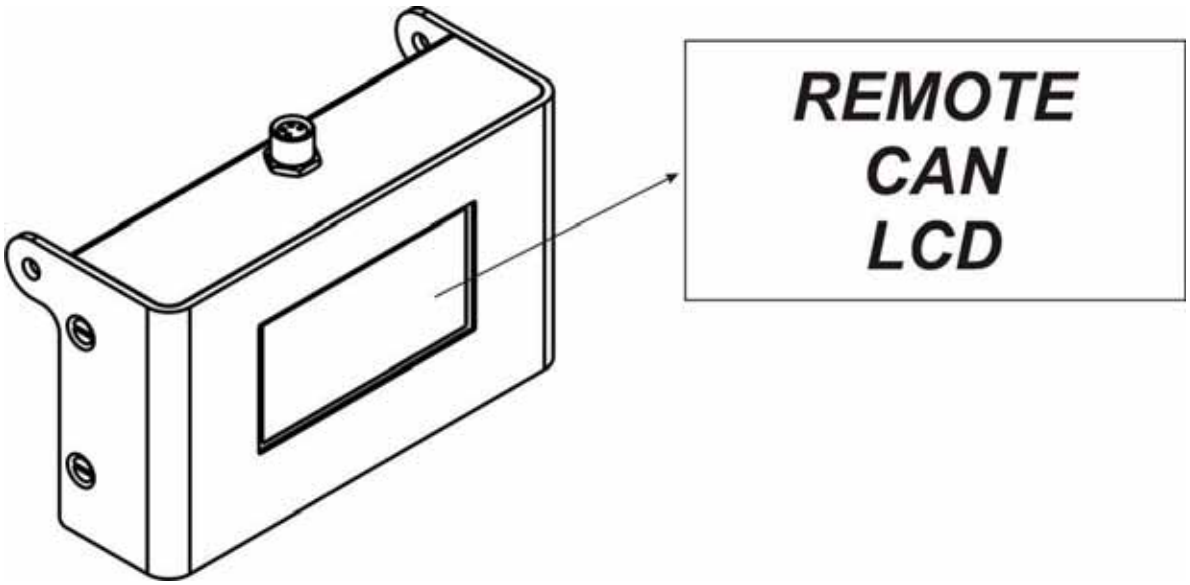


Figure 70: Display Ulyxe iMark.

Selection areas Touch Screen.

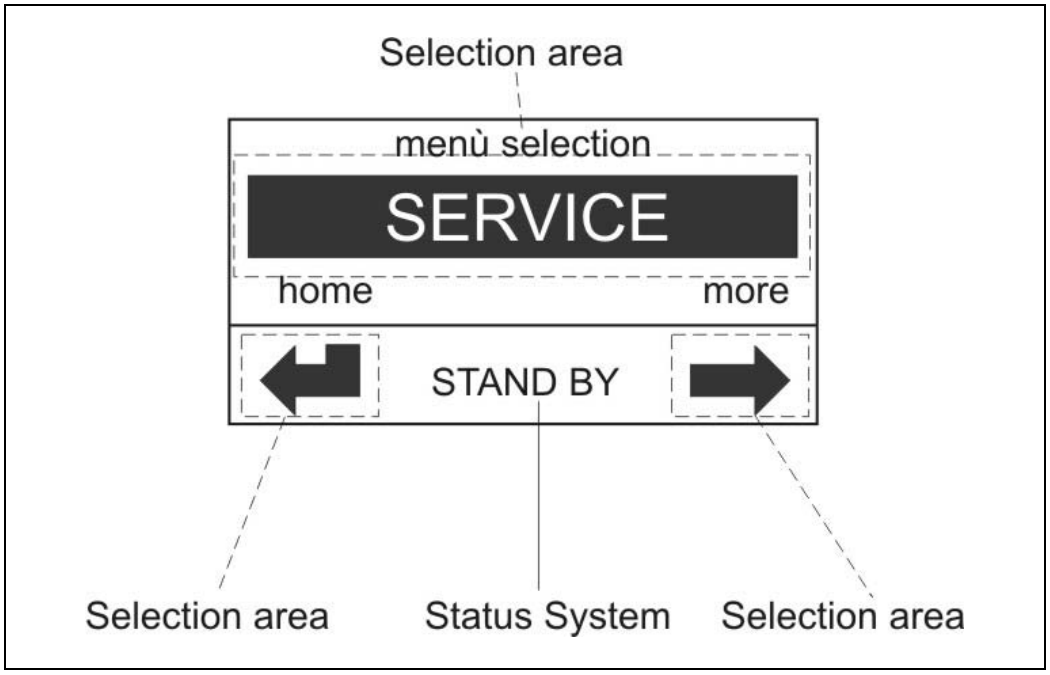


Figure 71: Selection areas Touch Screen.

From display main window where it shows “system ready” it is possible to access to a menu list with more options to select and view as showed in figure.

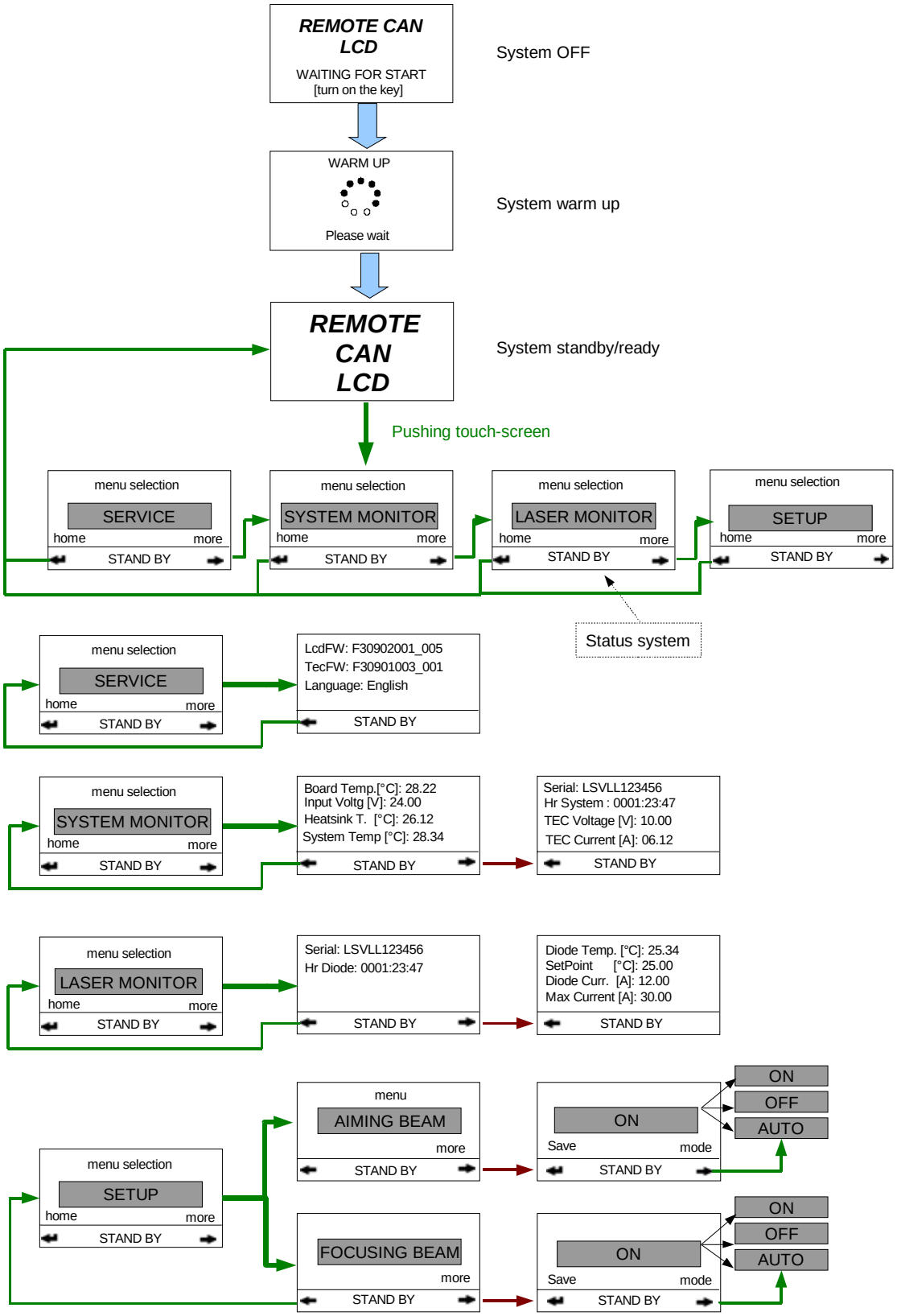
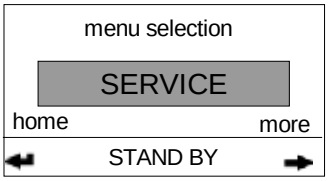
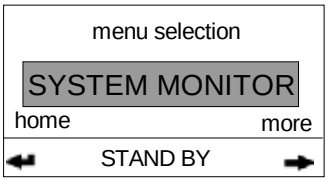
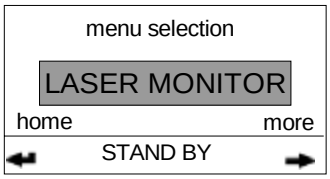
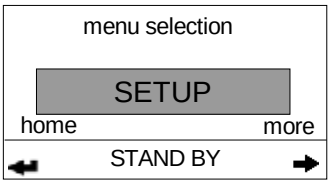
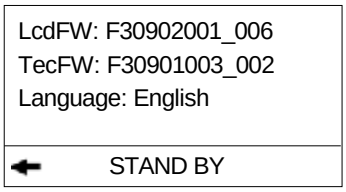
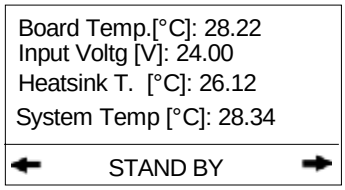
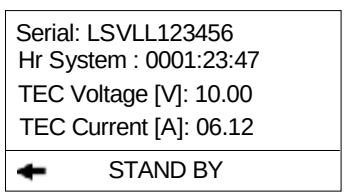
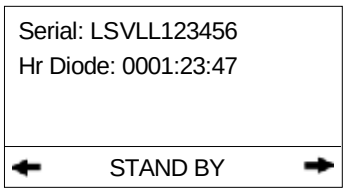
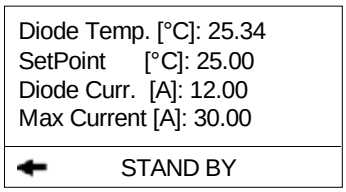
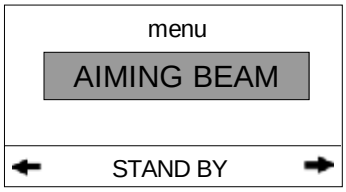
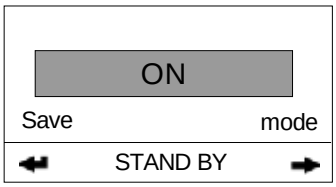
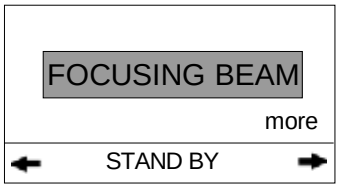


Figure 72: Display Touch screen menu.

	Selection menu to display general SERVICE. • Press the middle area to select it and display the information. • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to access the next selection menu.
	Selection menu to display SYSTEM MONITOR. • Press the middle area to select it and display the data. • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to access the next selection menu.
	Selection menu to display LASER MONITOR. • Press the middle area to select it and display the data. • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to access the next selection menu.
	Selection menu to display the SETUP. • Press the middle area to select it and display the settings. • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to access the next selection menu.
	Data contained in the SERVICE menu. • LcdFW: FW version of the LCD card. • TecFW: FW version of the power mainboard. • Language: language is set on English. • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.
	Information contained in the SYSTEM MONITOR menu (1 of 2). • Board Temp. [°C]: Temperature of the mainoard for the power section. • Input Voltage [V]: Input power voltage measured on the mainboard. • Heatsink T. [°C]: Central heatsink temperature. • System Temp. [°C]: Environment temperature measured inside the system (at the cooling fans inlet). • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to access the following information.
	Information contained in the SYSTEM MONITOR menu (2 of 2). • Serial: System serial number, visible on the outside label too. • Hr System: Total time elapsed with system in operation [hhhh:mm:ss] • TEC voltage [V]: Voltage on the Peltier module • TEC Current [A: Current on the Peltier module • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.

	Information contained in the LASER MONITOR menu (1 of 2). • Serial: Laser Diode serial number. • Hr Diode: Total time elapsed with laser diode in emission [hhhh:mm:ss] • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to access the following information.
	Information contained in the LASER MONITOR menu (2 of 2). • Diode Temp. [°C]: Temperature measured on the laser diode • SetPoint [°C]: Set-point temperature of the laser diode • Diode Current [A]: Current measured on the laser diode • Max current [A]: Max. admissible current on the laser diode Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.
	Selection menu to set the aiming laser diode. • Press the middle area to select it and display the settings. • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to switch to the focusing diode.
	Selection menu to set the red diode. • Press the bottom left arrow to confirm the setting and return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to change the operating mode (ON/OFF/AUTO). ON: always on; OFF: always off; AUTO: on when system is in stand-by status.
	Selection menu to set the focusing diode. • Press the middle area to select it and display the settings. • Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo. • Press the bottom right arrow to switch to the pointer diode.

4.4 TROUBLESHOOTING

Problems may occur while the machine is in operation due to malfunctions or simple oversights. In both cases, the display will show messages referred to the type of problem detected. In case of Hardware error, Ulyxe iMark shuts off automatically without signaling the error. Power off the device upstream before you perform any recovery operation.

The operating limits of Ulyxe iMark are subdivided into hardware values and software values. If a software limit is reached, the machine stays on, the power section is turned off and an error message is displayed. If a hardware limit is reached, the machine goes into a protection status and shuts off automatically. In this case, the type of error can be identified only if the malfunction is listed in the following table.

	SW LIMIT	HW LIMIT
Laser diode MAX temperature	35°C	40°C
Laser diode MIN temperature	10°C	--
Heat sink MAX temperature	60°C	--
Converter MAX temperature	65°C	72°C
MAX environment temperature	40°C	45°C
MIN environment temperature	10°C	0°C
Laser diode MAX current	25A - 31A	38.5V
Laser diode MAX voltage	2.5V	3.5V
Peltier module MAX current	12A	15A
MIN input voltage	22,5V	--

4.4.1 LIST OF POSSIBLE MALFUNCTIONS

STATUS	CAUSE	ACTION
Red LED bar blinking	An internal error has occurred and the system is in software protection mode	Check the error message shown on the display and refer to paragraph 4.4.2 for the recovery procedures
Orange LED bar blinking	Warning status. The display shows “DISABLE SHUTTER” because start sequence is wrong	If the machine was powered on with the signal *enable shutter* active disable it Ulyxe iMark will automatically go into stand-by mode if the *key* signal is activated, otherwise into system-off status
		If *enable shutter* is already disabled: Ulyxe iMark does not supply external power onto I/O connector (control box). Make sure that there is 5Vdc voltage between pin 1 and pin 15 of connector DB15. If there is, make sure the command signals are connected and in compliance. If there is no voltage, call technical assistance
Green LED bar blinking	The machine is in *warm-up* mode because the *key* command has been enabled	Wait for the pre-heating phase to finish before carrying out any other operation
ALARM output signal in OFF mode	The machine is not in Ready mode	Put the machine in Ready mode. Contact technical assistance if the problem persists

The machine turns off when powered on	The machine goes into hardware protection mode because a parameter does not comply with specifications	Check compliance with the stated specifications (input voltage, environment temperature, etc.) Cut off power supply to the Ulyxe iMark and wait 30/60 minutes before restarting. Contact technical assistance if the problem persists
The machine turns off after turning the key	The machine goes into hardware protection mode due to a protection in the power system	Check compliance with the stated specifications (laser diode temperature and current, etc.) Cut off power supply to the Ulyxe iMark and wait 30/60 minutes before turning it back on. Contact technical assistance if the problem persists
The machine turns off during regular operation	The machine goes into hardware protection mode due to a system malfunction	Make sure the interlock connector is present. Cut off power supply to the Ulyxe iMark and turn it back on
		Check compliance with the stated specifications (input voltage, environment temperature, etc.) Cut off power supply to the Ulyxe iMark externally and wait 30/60 minutes before restarting. Contact technical assistance if the problem persists
The LCD does not work	No power on the display	Make sure the machine is turned on. Make sure remote lcd connection is right. Contact technical assistance if the problem persists
The machine does not turn on	The input power is not right or the internal board is broken	Make sure the *Reverse Voltage* back panel LED is active and exchange the power supply cable pins because they are reversed. Contact technical assistance if the problem persists
Laser beam emitted with shutter open with no emission commands	The internal RF Q-switch may be damaged or misaligned, or its RF driver is not working properly	Check to see if you can solve the problem decreasing thermalization value on Smartist laser settings. Contact technical assistance if the problem persists
The laser beam and the pointer one do not move correctly during emission	The laser beam galvo mirrors are not driven correctly due to internal damage	Check cable connections between iMark and Ulyxe iMark. Contact technical assistance if the problem persists

4.4.2 ERROR MESSAGES

ERROR MESSAGE	CAUSE	ACTIONS
DIODE MAX CURRENT FAULT SHUT DOWN AND RESTART	The laser diode max current software level was exceeded. The value is displayed in the Max. Current field in the LASER DATA section.	Turn off, wait 30/60 minutes and restart. Read the value displayed in the *Diode Current* field in the LASER MONITOR section and check to see if it exceeds the Max. Current value. In case the problem occurs, carry out the data log with the service tool and contact technical assistance.
DIODE HIGH TEMP FAULT SHUT DOWN AND RESTART	The laser diode max temperature software level was exceeded. The value is set at 35°C. The system cuts off the current on the diode and tries to bring the laser diode to the proper temperature.	Turn off, wait 30/60 minutes and restart. Make sure that the cooling fans unit is working properly and that the fans are not obstructed in any way. Read the value displayed in the *Diode Temp.* field in the LASER MONITOR section and check to see if it deviates from the Set-point value. In case the problem occurs, carry out the data log with the service tool and contact technical assistance.
DIODE LOW TEMP FAULT SHUT DOWN AND RESTART	The laser diode temperature has fallen below the minimum temperature software level. The value is set at 10°C. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the laser diode temperature controller is out of control.	Turn off, wait 30/60 minutes and restart. Make sure the room temperature complies with the specifications. Read the value displayed in the *Diode Temp.* field in the LASER MONITOR section and checks to see if it deviates from the Set-point value. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
DIODE OUTPUT PROTECTION SHUT DOWN AND RESTART	The laser diode voltage software level was exceeded. The value is set at 2.5V. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the laser diode may be broken, its contacts not connected properly or the internal card malfunctioning.	Turn off, wait 30/60 minutes and restart. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
TEC CURRENT FAULT SHUT DOWN AND RESTART	The Peltier module current software level was exceeded. The value is set at 12A. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the Peltier module may be broken, its contacts not connected properly or the internal card malfunctioning.	Turn off, wait 30/60 minutes and restart. Read the value displayed in the *TEC Current* field in the SYSTEM MONITOR section. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.

TEC OUTPUT VOLTAGE FAULT SHUT DOWN AND RESTART	The Peltier module voltage software level was exceeded. The value is set at 10V and it is displayed in the *TEC Voltage* field in the SYSTEM DATA section. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the internal card is malfunctioning.	Turn off, wait 30/60 minutes and restart. Read the value displayed in the *TEC Voltage* field in the SYSTEM MONITOR section. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
PWM CARD TEMPERATURE FAULT SHUT DOWN AND RESTART	The temperature software level on the power section of the internal card was exceeded. The value is set at 65°C. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the internal heat cannot be dissipated. The problem may be caused by critical environmental conditions (high outside temperature, insufficient air flowing into the fans, etc.) or the internal dissipation is not efficient (poor thermal contact between the internal devices).	Turn off, wait 30/60 minutes and restart. Make sure the environmental conditions comply with specifications. Read the value displayed in the *Card Temp.* field in the SYSTEM MONITOR section, checking to see if it quickly reaches 65°C. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
HEAT SINK HIGH TEMP FAULT SHUT DOWN AND RESTART	The temperature software level on the central heat sink was exceeded. The value is set at 60°C. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the internal heat cannot be dissipated. The problem may be caused by critical environmental conditions (high outside temperature, insufficient air flowing into the fans, etc.) or by a malfunction of the cooling fans.	Turn off, wait 30/60 minutes and restart. Make sure the environmental conditions comply with specifications. Read the value displayed in the Heat sink T. field in the SYSTEM MONITOR section, checking to see if it quickly reaches 60°C. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
SYSTEM HIGH TEMP FAULT SHUT DOWN AND RESTART	The environment temperature software level was exceeded. The value is set at 40°C. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the internal heat cannot be dissipated.	Turn off Ulyxe iMark and make sure the environment temperature complies with the specifications before you turn it back on. Read the value displayed in the *System Temp.* field in the SYSTEM MONITOR section, checking to see if it is near the 40°C limit. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
SYSTEM LOW TEMP FAULT	The environment temperature has fallen below the minimum temperature software level. The value is set at 10°C. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since there is a risk of damaging the optical parts. Fans are maintained ON to try to back to right temperature the system device.	Turn off and make sure the environment temperature complies with the specifications before you turn it back on. If it is first installation wait 30/60 minutes until turn on again. Read the value displayed in the *System Temp.* field in the SYSTEM MONITOR section, checking to see if it is near the 10°C limit. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.

INTERLOCK DISCONNECTED SHUT DOWN AND RESTART	The interlock connector or its closed contact is not present upon turning on the system. The entire internal electronics is disabled.	Turn off and restore the interlock connector before you restart the device. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
SHUTTER FAULT SHUT DOWN AND RESTART	The internal shutter does not work properly. Its position is wrong. The system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the system may emit an unwanted laser beam. The problem may be caused by a malfunction of the shutter or of its position sensor, or the internal card may be malfunctioning.	Turn off, wait 30/60 minutes and restart. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
DISABLE SHUTTER	A wrong power on sequence was carried out. The system was started with the *enable shutter* active.	Disable the enable shutter signal and the system will return to its proper operating status. In case the shutter is not disabled, contact technical assistance.
CAN CONNECTION ERROR	The CAN communication between the internal cards is not working properly. The problem may be caused by an internal connection or a damaged internal device otherwise external CAN connection is not right.	Make sure of right connection of remote lcd. Turn off and restart. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.
LOW VOLTAGE INPUT SHUT DOWN AND RESTART	The inlet power voltage has fallen below the minimum voltage software level. The value is set at 20Vdc. The entire internal electronics is disabled.	Turn off and restore the power voltage to 24Vdc before you restart. Read the value displayed in the *Input Voltage* filed in the SYSTEM MONITOR section, making sure that the value displayed is around 24Vdc. In case the problem re-occurs, carry out the data log with the service tool and contact technical assistance.

APPENDIX A: LABELS IDENTIFICATION

LABEL	DESCRIPTION
	**Identification label**
	**Warning Logotype**
	**Laser labels ***
	**Label for panels**
	**Aperture label**
PC	**PC connector**
GALVO	**GALVO Connector**
I/O	**Power ON switch**
RS232	**Serial communication**
CAN	**CAN communication**
CONTROL BOX	**Control and manage signals**
AUX INTERLOCK	**Auxiliary interlock connector**

* Maximum output of laser radiation as per definition 3.55 of IEC60825-1 considering single fault conditions.

EXTERNAL LABELS LOCATION

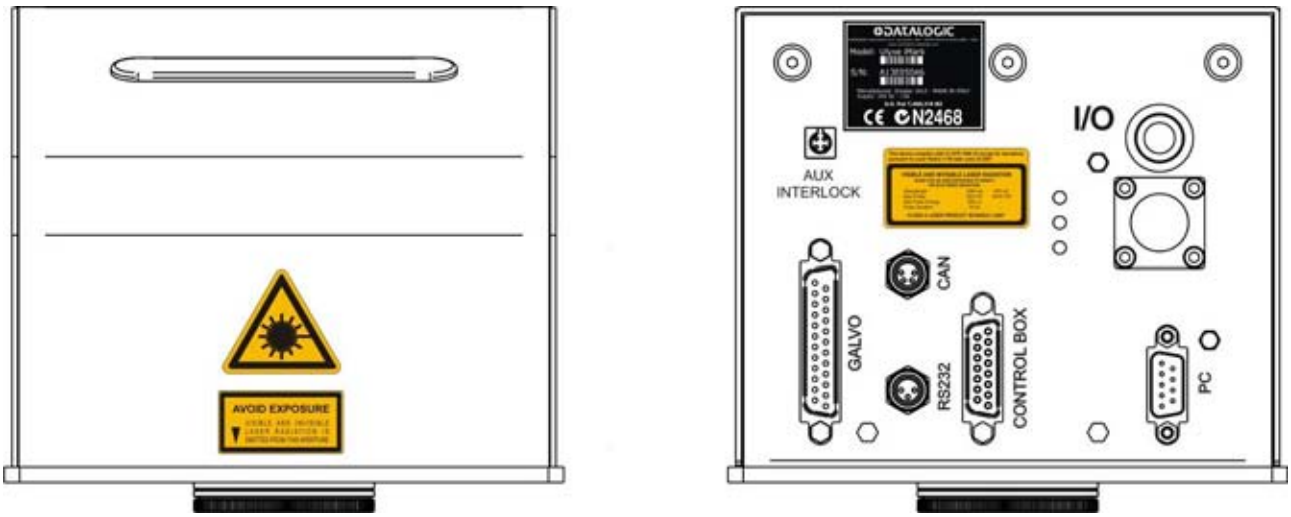


Figure 73: External labels location.

POSIZIONE ETICHETTE INTERNE

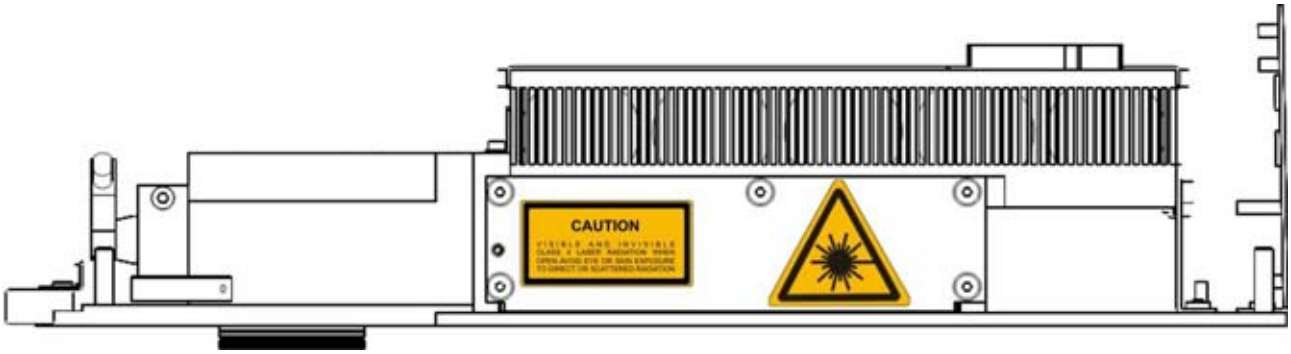


Figure 74: Internal labels location.

APPENDIX B: STANDARDS

LASER STANDARDS

Ulyxe iMark is designed to complies with the applicable sections of these laser standards:

EU : EN60825-1
USA : 21 CFR 1040.10

Ulyxe iMark is classified as Class 4 Laser Product.

Datalogic Automation S.r.l., as manufacturer of "Ulyxe iMark" laser sources, provides a laser device which is NOT intended for immediate use, but it must be connected, by others, to other devices which have the final aim of creating a laser processing system.

The system manufacturer MUST ensure the safety of the laser processing machine according to its standards including the risk-analysis, implementation of safety measures, certification and testing of safety measures and the production of adequate information for use of the machine.

Datalogic Automation S.r.l. is available for providing to the system integrator/OEM all the information in its possession to help in complying with applicable standards

CE COMPLIANCE

See Declaration of Conformity. Note about compliance to EN61010-1. The Risk Assessment regarding the DATALOGIC MARKING SYSTEM has been made in relation to the applicable point of that standard. It is under the responsibility of the system integrator to do a new Risk Assessment regarding the final installation of the DATALOGIC MARKING SYSTEM.

WARNING!

This is a Class A product. In a Class B environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC COMPLIANCE

Modifications or changes to this equipment without the expressed written approval of Datalogic could void the authority to use the equipment.

This device complies with PART 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference which may cause undesired operation.

This equipment has been tested and found to Comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

APPENDIX C: GUIDE FOR SYSTEM INTEGRATOR

Ulyxe iMark is classified as Class 4 Laser product. It is intended to be installed in a system by system integrator/OEMs that they have the final responsability of Classification of their end product.

Final system MUST complies with all requirements in order that the system will be classified as

- CLASS 1 LASER PRODUCT if end user could be exposed to a radiation not exceed the AEL for Class 1 during marking operation (1064nm)
- CLASS 2 LASER PRODUCT if end user is not exposed to a radiation during marking but could be exposed to the radiation not exceeding the AEL for Class 2 during focusing and aiming (635nm)

Ulyxe iMark is designed to easily fulfil all the requirement as per EU/USA standards.

Below a YES/NO table for features of Class 4 Laser. A "NO" in the Ulyxe iMark column means that the feature is available through dedicated connector and MUST be completely implemented by the system integrator/OEM.

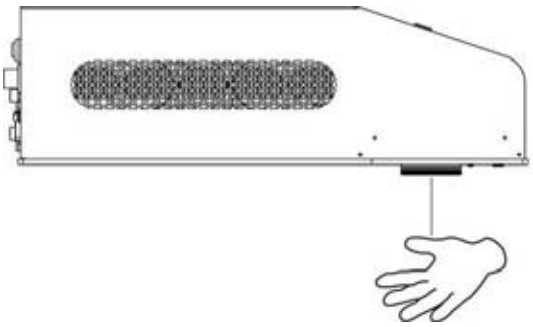
FEATURE	LOCATION/DESCRIPTION	required by USA STANDARDS	required by EU STANDARS	Provided on Ulyxe iMark
KEYSWITCH	Control Panel On/Off key switch controls power to laser electronics. Key can not be removed from switch in "On" position	YES	YES	NO
SHUTTER FUNCTION	Laser Control Functions as beam attenuator to disable current driver/laser output when closed	YES	YES	YES
READY INDICATOR	Panel Indicator (YELLOW) Indicates that the laser has power applied and is capable of lasing	YES	YES	YES
LASER ON INDICATOR	Panel Indicator (RED) Indicates that laser is actively lasing	YES	YES	YES
FIVE SECOND DELAY	Laser Circuit Element Disable current driver/laser output for 5s after key switch is turned to "ON" or remote reset/restart is applied when key switch is in "On" position	YES	NO	YES
Power Fail Lockout	Laser circuit element Disable current driver/laser output if input power is removed then later reapplied (AC or DC power supply failure or remote aux interlock actuation) while key switch is in "ON" position	YES	NO	YES
Remote Interlock	Panel connection Disables current driver/laser output when a remote interlock switch on an equipment door or panel is opened	YES	YES	NO
Warning Label	External / Internal	YES	YES	YES*

* Ulyxe iMark labels comply with Class 4 Laser Product Requirement. The labels to be used in the machine where Ulyxe iMark is installed MUST comply with the requirements for the Laser Class of the machine itself.

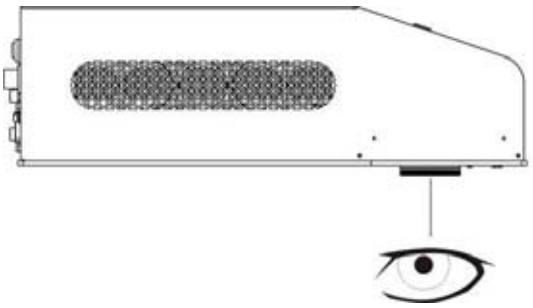
APPENDIX D: NOTE ABOUT LASER

LASER SAFETY

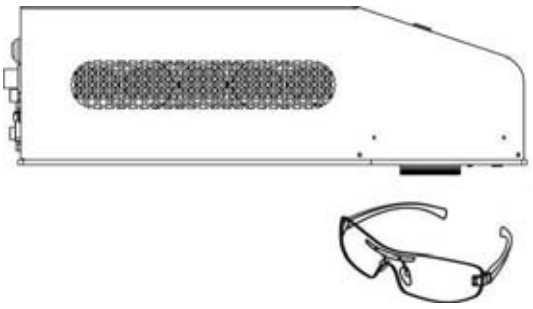
The following information is provided to comply with the rules imposed by International Authorities and refers to the correct use of Ulyxe iMark.



NOTE:
The device is a Class 4 laser product. Visible and invisible laser radiation can be diffused. Avoid skin exposure to direct or reflected radiation.



NOTE:
Direct vision of a laser beam may cause irreversible damage to eyes.



NOTE:
Direct vision of a laser beam may cause irreversible damage to eyes!

NOTE:
BEFORE INSTALLING AND USING THE LASER, **READ CAREFULLY** THE APPENDIX CONCERNING **LASER SAFETY**.

LASER RADIATION

Laser radiation is an electromagnetic emission with a micrometric wave length which ranges from the long infrared (CO_2 Laser), close infrared (Laser Nd:Yag, Nd:YVO_4), visible (Laser He:Ne or Argon) and ultraviolet (excimer laser).
It should be considered non-Ionizing Radiation. In Ulyxe iMark Lasers, the emission of a crystal bar is stimulated by “optical pumping” generated by a Diode Laser. The continuous reflection of Photons, between a front mirror and rear mirror, creates a positive reaction so that their number continues to increase, until reaching the concentration necessary to produce a beam which projects from the semi-reflecting front mirror. The radiation (which we can imagine as a “Beam of invisible light”) is then Collimated and Focalized with Lenses at a point where the intensity becomes high enough to be able to react with various materials producing an alteration in them due to thermal effect.
The radiation of Ulyxe iMark Lasers is invisible, but since it is near the threshold of visibility, the Eye receives it almost in its entirety without using the natural defense provided by pupil reflex! Added to this is the fact that it is generally very intense, with the result that it can be very harmful to the eye and present vision problems.

NOTE:
Directly viewing a Laser beam **can cause irreversible damage** to vision.

To prevent permanent damage to vision, a few precautions must be taken.
All individuals who may be exposed to dangerous levels of laser radiation, must know that the laser is active and wear protective goggles if necessary.

Due to its high power, the laser integrated in the Datalogic Automation system provokes reflected laser light from flat surfaces. Reflected light is potentially dangerous for the eyes and skin. Electromagnetic emission with a micrometric wave length is placed in long infrared, and is therefore invisible, thus it is not clear where reflected beams are aimed.

NOTE:
It is indispensable to protect yourself from reflected light beams, because they can be sufficiently intense to create permanent injury to the eyes or skin.

In addition to possible injury to the eyes or skin, direct laser emission can cause flammable materials to burn like organic solvents (alcohol, acetone) or gasoline and cause fabric and clothing to burn.

NOTE:
This laser is classified as **class 4**. Class 4 includes lasers which can produce risks, not only from **direct** or **reflected** radiation, but also from **scattered** radiation! The laser sources may be a significant risk for the skin and risk of burning flammable materials.

ABSORPTION OF LASER RADIATION

Human skin absorbs electromagnetic radiation in different ways depending on the wave length of the radiation. Both the eye and skin have a “predisposition” for accepting certain wave lengths, and are more unresponsive to absorbing others. In the specific case of the Eye, the Cornea and Crystalline lens let all the wave lengths from 400 to 1400 nm pass and reach the Retina, even with various attenuations. They include the range from visible light to IRA infrared. Thus Nd: YVO_4 laser radiation (1064 nm wavelength) is included in this range and **leads to direct Retina exposure!**

In terms of the Skin, the “biological window” has different absorption percentages but is not dissimilar in terms of wave length. The maximum exposure values for Skin are much different compared to those tolerated by the Eye.

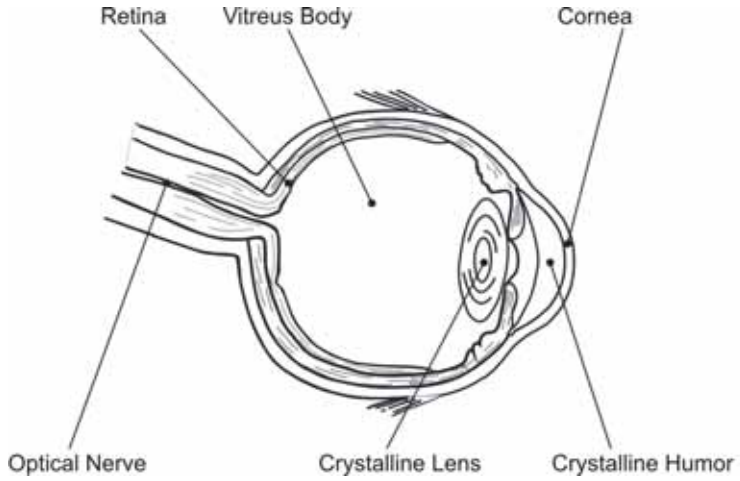


Figure 75: Eyeball section.

In terms of the damage mechanism that absorbed radiation can cause, it also depends on the wave length. Short lengths (ultraviolet: UV-C 180-280nm; UV-B 280-315 nm, UV-A 315-400 nm) generally cause photo-chemical effects:

- cataract, or opacification of the crystalline lens**.**
- melanic coloring, or reddening of the skin.

Greater wavelengths (infrared: IR-A 780-1400 nm; IR-B 1400 3000 nm; IR-C 3000-10^{E6} nm) generally cause thermal effects:

- detachment or photocoagulation of the retina
- burning of the skin

The degree of injury obviously depends on the **amount of absorbed radiation** and the **instantaneous power** of the radiation source.

CLASSIFICATION AND DANGER LEVEL

Regulations have established different classes of Laser danger based on the ability to injure people, from Laser class 1 (basically safe in all conditions) to Laser class 4 dangerous in various conditions.

Lasers which can produce risks, not only for direct or reflected radiation, but also for scattered radiation belong to class 4. These Laser sources can also have a significant risk for the Skin and fire risk for flammable material. For these reasons, the User must put into effect all measures aimed at containing the radiation to make sure that it is terminated at the end of its useful path. The operator must also be informed of the risks from exposure to Laser radiation and must wear specific I.P.D. (individual protection devices) including goggles that protect against radiation and are certified as suitable for this use.

NOTE:
The Ulyxe iMark marker laser device contains a **class 4** invisible source**.**

RADIATION VIEWING CONDITIONS

The Laser output by the resonator is to be considered as a highly collimated and intense monochromatic light source. Due to these characteristics it can be seen as a “punctiform source” of high luminosity. This means that its image is then focalized on the Retina in a very small spot with a dangerously high power density! If the beam becomes divergent and scatters to a non-reflecting screen, then there is an “extended vision” of the image, with a decisively less dangerous power density. So there are different types of radiation viewing based on the access to the radiation and consequently different degrees of dangerousness.

DIRECT VIEWING OF THE LASER BEAM

This type of viewing is the most dangerous and can occur at the outlet of the laser aperture after having removed the lens. It is to be avoided at all costs! No protective goggles represent a valid means against direct viewing of the beam.

DIRECT VIEWING OF THE BEAM AFTER MIRROR REFLECTION

This may occur by directing the beam on a reflecting surface.
Viewing of a mirror reflected beam from a flat surface is very dangerous and equal to direct viewing.

DIRECT VIEWING OF THE BEAM OUTPUT BY AN OPTICAL FIBER

This happens if an Optical Fiber disconnects from the resonator. Viewing of the beam is dangerous up to a significant distance. Filters and Goggles do not ensure safety.

DIRECT VIEWING OF THE BEAM AFTER FOCUSING

This occurs if the Laser beam is not extinguished with an opportune absorber at the end of its useful path. Looking at the beam is dangerous up to a considerable distance. Filters and goggles can ensure safety for brief exposure, as long as they are the right size and certified.

SCATTERED VIEWING OF THE BEAM AFTER FOCUSING

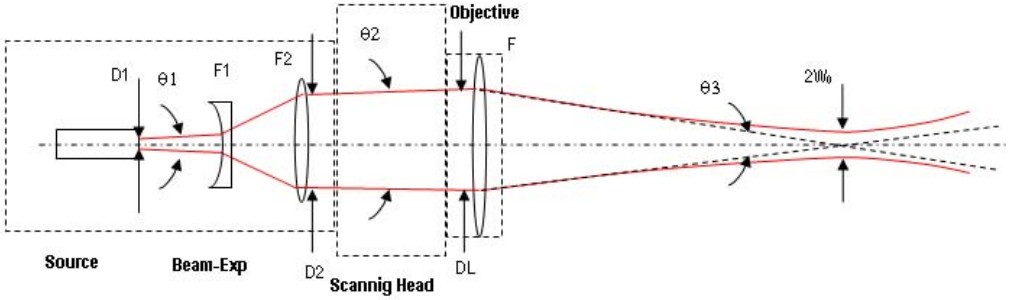
This is the most frequent viewing, but opportune Filters and Goggles can ensure safety, even for prolonged exposure.

The Optical Risk Nominal Distance O.R.N.D. for Ulyxe iMark laser is over 28,5 m, for direct or mirror reflected radiation and over 0,5 m for scattered radiation!
Only goggles with an Optical Density (O.D.) over 5 can momentarily protect the eyes against accidental viewing of damaging laser radiation!

NOTE:
Always use goggles with conformity certificate.
Remember that **no goggles can provide prolonged protection from direct radiation!**

REAL DNRO DETERMINATION AND O.D. OF PROTECTION GOGGLES

In order to determinate the characteristics of the protection goggles, it is essential to determine the characteristics of the radiation, knowing it optical path, the dimensions of the beam and its divergence.



In particular, it is very important to know the diameter of the focal spot (which can be identified with beam waist 2Wo) and the real divergence of the beam in output from the focalization lens.
With all these optical data it is possible to do the calculations of the nominal distance of optical risk and of the optical density requested to the protection filters of the laser radiation.

Calculations have been done following the CEI EN 60825-1 (2007) Normative regarding nominal distance and optical risk in the worst condition and in case of accident exposition of 10s per direct radiation and 100s for diffused radiation.

Ulyxe iMark

Laser type	Nd:YVO_4: 1064 nm
Application type	Marking
Emission type	Pulsed (Q-Switched)
Observation type	Direct Radiation
Subtended angle of the source	Alpha < alphamin
Pulse energy	350 μJ
Pulse duration	20 ns
Repetition frequency	10 KHz
Beam diameter on the lens	2,5 mm
Beam divergence on the lens	1,5 mrad
Focal of the lens	160 mm
Real divergence after the lens	14 mrad
Exposition time	10 s
Diameter of the focal spot	165 μm

ACCIDENTAL CONDITION OF VISION OF THE DIRECT REFLECTED RADIATION

Distance > 0,5 m and for a maximum exposition period of 10s and supposing that there is a total reflection without attenuation.

DNRO = 28,5 m

OPTICAL DENSITY OF THE PROTECTION GOGGLES

Case a) Assuming to remove the fix protections and penetrate in the working area to ad just the process maintaining an observation distance Z of at least 0,5 m from the focal point and presupposing an accidental exposition of maximum 10s.

The protection goggles must have such an optical density to bear down the radiation under the maximum permitted value, precedently calculated, according to the here below reported calculation:

D.O.= 4,04 @ 1064 nm D.I.R.

Case b) Supposing to remove focusing head to do measurements on beam alignment, maintaining a Z observing distance at least to 0,66m from laser aperture, and supposing to use a reduction power of 50% and a total accidental reflection for a 10s maximum.

The protection goggles must have such an optical density to bear down the radiation under the maximum permitted value, precedently calculated, according to the here below reported calculation:

D.O.= 5,3 @ 1064 nm D.I.R.

SCALE INDEX OF THE PROTECTION GOGGLES FILTER

The scale index L of the filters indicates the stability to the radiation, that means the ability of the filter to maintain its characteristics unchanged. This stability is certified by the producer according to the EN 207 with tests conducted for 10s or 100 pulses.
It is then necessary to verify that the scale index of the adopted filter is stable for this period and foreseen an adequate over dimensioned in order to make sure that it could last longer than the accidental exposition period.

Case a) Htl = 62,6 J/m^2

Case b) Htl = 6760 J/m^2

To which it respectively corresponds a scale index (tab2 UNI EN 207) **L5** and **L7**.

To satisfy completely all prescriptions need to use a filter with optical density **OD>6** and scale index **L=7**.

EYES AND SKIN RISKS

If exposed to intense Laser radiation, even of a short duration, or a less intense but longer lasting duration, both the Cornea and the Retina can burn and be damaged irreparably forever. This consequence is completely realistic in the event of direct viewing of a class 4 Laser beam.

If subject to direct focalized radiation, even the skin can burn.

In addition, it is necessary to bear in mind that a collateral ultraviolet radiation may exist with the main radiation: long exposure may cause skin cancer.

GENERAL SAFETY REGULATIONS

The User must comply with the regulations and work in the best possible safety conditions to prevent decreasing the degree of machine safety. Therefore it is necessary to develop a Standard Operating Procedure (S.O.P.) related to maneuvers to effect for turning on and off the equipment. This procedure, which shall be prepared around the time of installation, shall serve as a reference for the Operator and shall be written in his/her language.

Training is essential and must include:

- Familiarization with system operating procedures.
- Knowledge of the biological effects of radiation on the Eyes and Skin.
- Understanding of the necessity for Individual Protection Devices (I.P.D.)

COLLATERAL RISKS

If the intended use of the source is changed, for example for material processing applications, collateral risks may arise represented by the production of fumes and vapors which may be irritating or toxic, if not removed and adequately filtered before being released into the air again.

NOTE:
It is advisable **not to change the intended use** without previously contacting the Manufacturer.

An additional risk may be represented by fire caused by processing materials other than those the equipment is designed for.

NOTE:
When processing **flammable material**, since there is a **fire danger**, it is indispensable to follow the instructions provided by the manufacturer when the machine is commissioned.

NOTE:
Do not subject **materials other** than those the equipment was designed for to radiation.

The most serious collateral risk associated with laser equipment, which may be fatal, is electricity.
This may occur when the manufacturer's warning and procedures are not followed. Unauthorized and untrained personnel must never do any work on the electrical part. The safety devices must never be removed and their operation must be periodically checked.

NOTE:
Do not work on the electrical part if you are not trained to do so. **Do not remove protection devices**.

NOTE:
When processing **flammable material**, since there is a **fire danger**, it is indispensable to follow the instructions provided by the manufacturer when the machine is commissioned.

For example, during the intended use of the Laser source, if a material being processed undergoes alterations and produces irritating and/or toxic fumes, it may be necessary to remove the fumes from processing before releasing them into the air.

An additional risk may be represented by fire caused by processing materials other than those the equipment was designed for.

NOTE:
Do not subject **materials other** than those the equipment was designed for to radiation.

NOTE:
When processing **flammable material**, such as plastic, since there is a **fire danger**, it is indispensable to follow the instructions provided by the manufacturer when the machine is commissioned and follow the instructions in the **SAFETY** Chapter, in the **Collateral Risks** section.

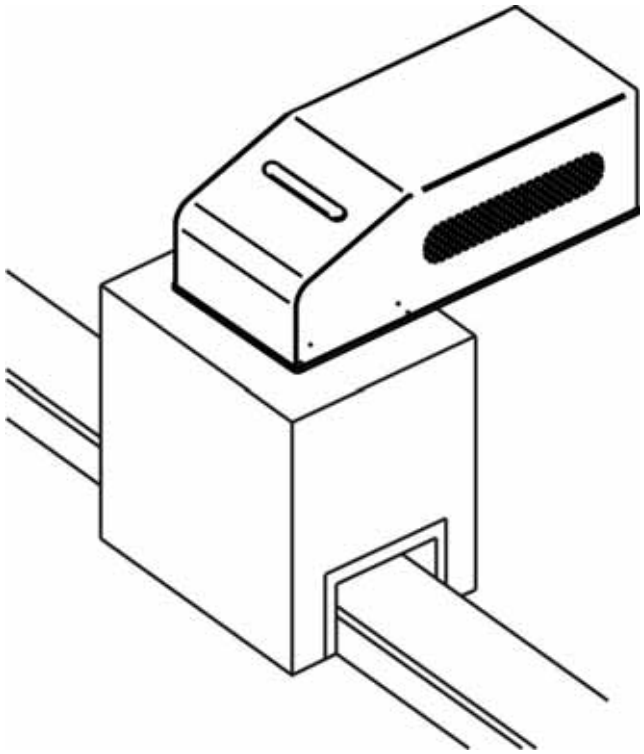


Figure 76: Safety mode example

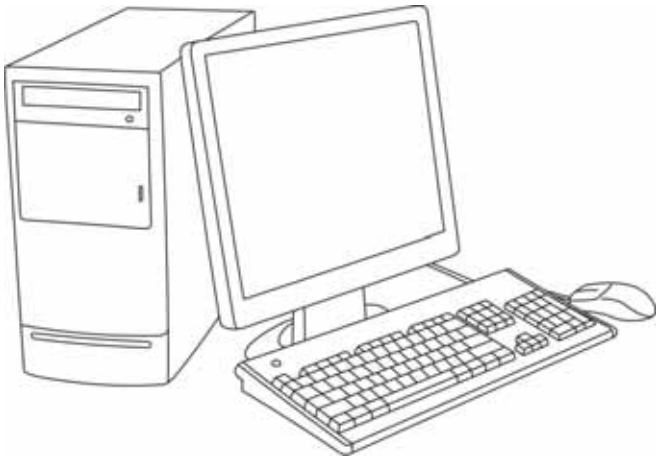
APPENDIX E: FIRMWARE UPGRADE

This document describes the ***procedure to update firmware*** on ***Ulyxe family products***, through the use of ***UlyxeUpdater*** application. This procedure allows to update firmware on:

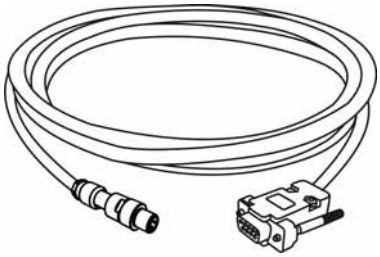
- ***SYSTEM control board*** – PWM_CTR
- ***LCD display board*** – CMD_ULX1

REQUIRED MATERIALS

- ***PC*** with Windows XP or later OS equipped with one ***COM*** port



- Ulyxe ***RS232 cable***

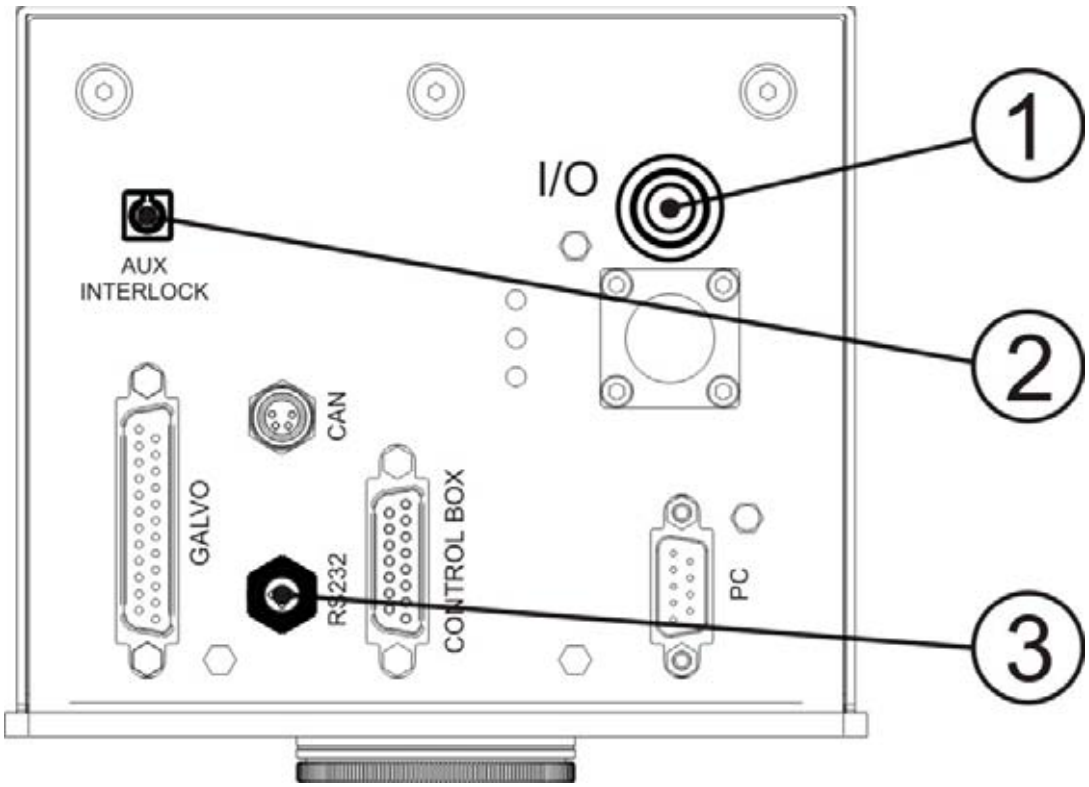


- ***UlyxeUpdater.exe*** application

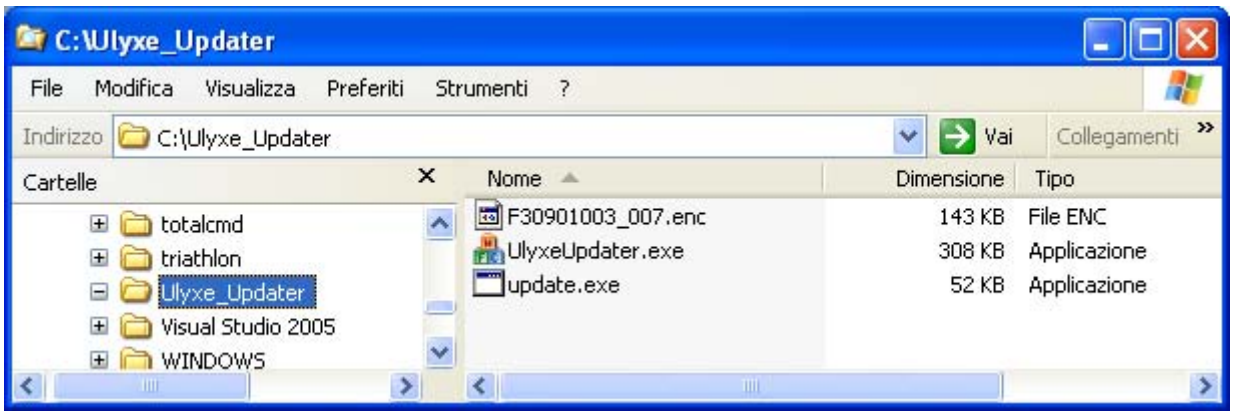
PREPARE TO FIRMWARE UPDATE

Turn OFF Ulyxe using the ***main switch*** (1)

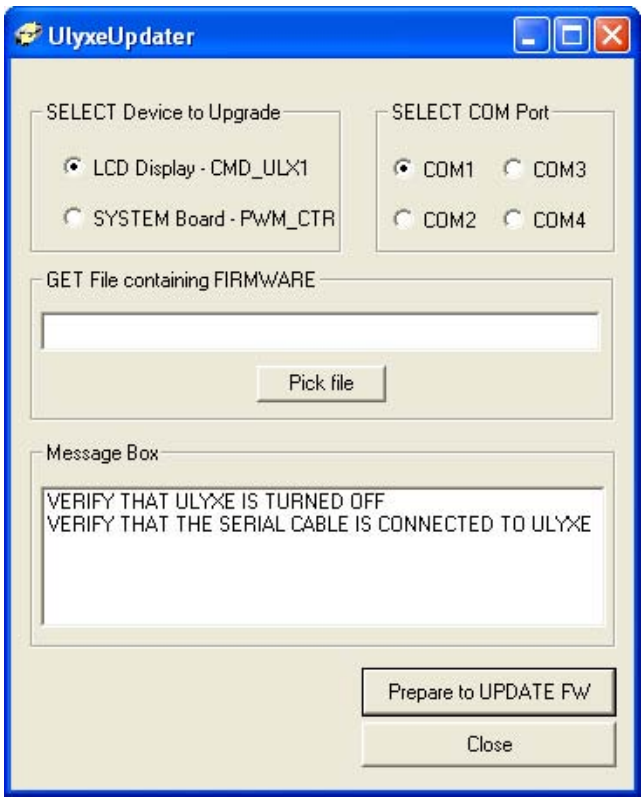
- Disconnect all the plugs except ***Aux Interlock plug*** (2)
- Connect one side of the Ulyxe RS232 cable to the ***COM port*** of the PC and the other to the ***RS232 plug*** on Ulyxe back panel (3)



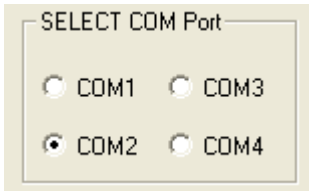
- Create a folder in the PC containing:
  - **`UlyxeUpdater.exe`** file
  - **`update.exe`** file
  - ***firmware file (`.enc`)***



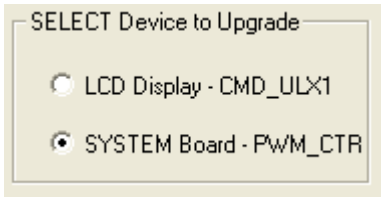
- Run ***UlyxeUpdater.exe*** application



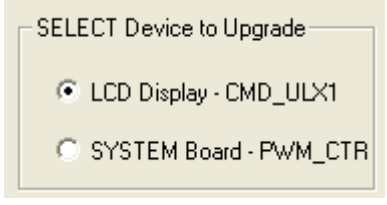
- Select the correct ***COM port*** acting on ***SELECT COM Port***:



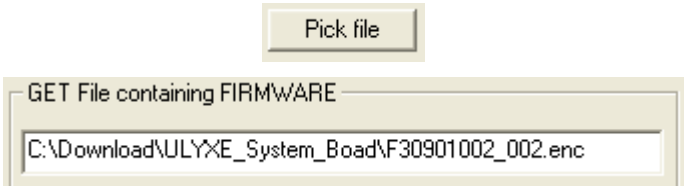
- Select the board to update acting on ***SELECT Device to Update***:
  - ***SYSTEM Board – PWM_CTR*** if you want to update System Control Board firmware



  - ***LCD Display – CMD_ULX1*** if you want to update Display Board firmware

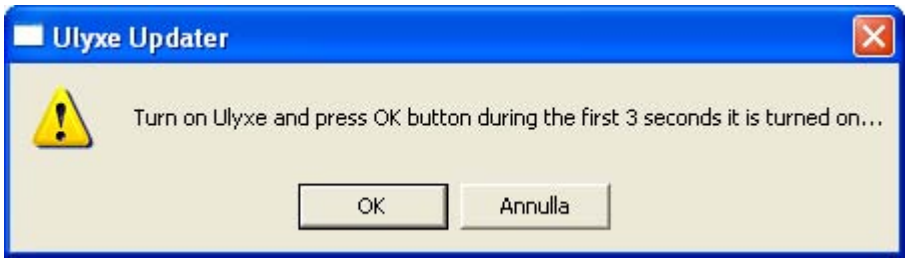


- Press ***Pick file*** button to choose the firmware file (`.enc`)

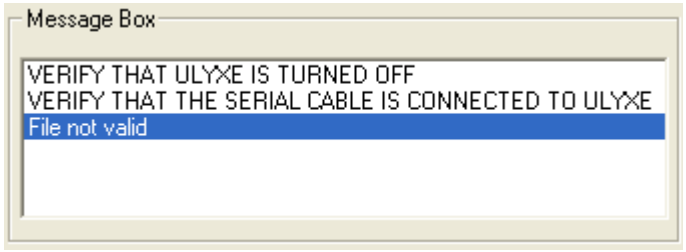


- Press ***Prepare to UPDATE FW*** button

- The following pop-up window will be shown:



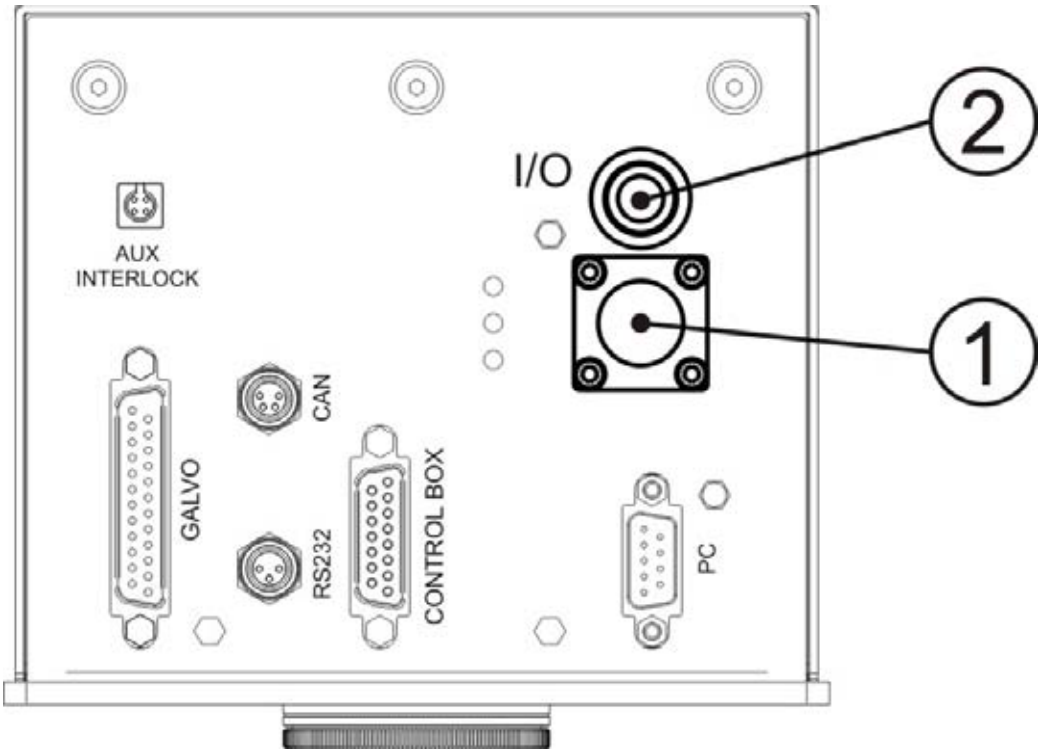
- If the selected firmware file (`.enc`) does not contain the proper firmware for the board, the ***File not valid*** message will be shown in the Message Box:



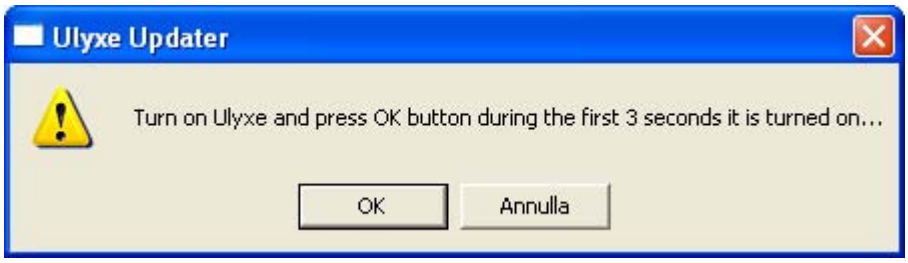
- In this case press Pick file button to choose the correct firmware file (`.enc`)

FIRMWARE UPDATE

- Connect the ***Power supply plug*** (1)
- ***Turn ON*** the Ulyxe using the ***main switch*** (2)

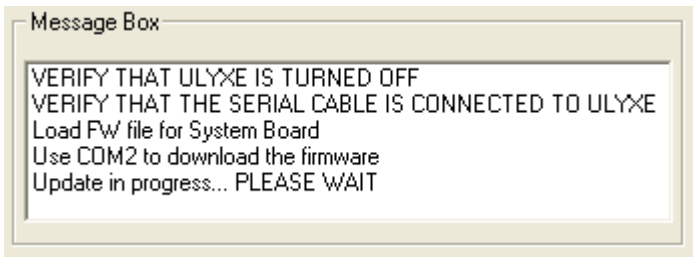


- ***Press ENTER*** or click OK button ***within 3 seconds***

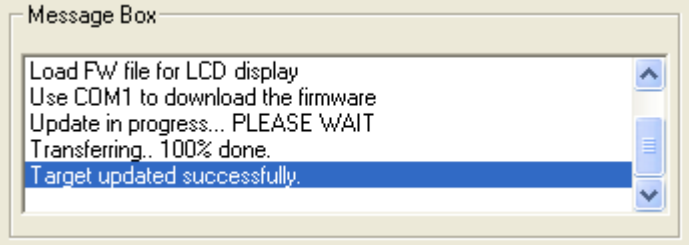


- The firmware upgrade starts (the procedure takes about 30 seconds)

- The update status is shown in the message box



- When the update is finished "***Target updated successfully***" is shown in the message box



- If the firmware is successfully downloaded, ***ULYXE will automatically restarts***
- Close ***UlyxeUpdater*** application
- ***Turn OFF*** Ulyxe using the main switch
- Disconnect the ***RS232 plug***
- Reconnect all the other plugs

APPENDIX E: DECLARATION OF CONFORMITY

CE

Datalogic Automation S.r.l.
Via Lavino 265
40050 Monte San Pietro
Bologna – Italy
www.automation.datalogic.com

Laser Marking Business Unit
Via Le Gorrey 10 – 11020 Donnas (AO)
Via dell'Industria 20 – 21018 Sesto Calende (VA)

declares that the

ULYXE IMARK LASER MARKER

and all its models

are in conformity with the requirements of the European Council Directives listed below:

2004/108/EC EMC Directive
2006/95/EC Low Voltage Directive

This Declaration is based upon compliance of the products to the following standards:

EN 61000-6-2, SEPTEMBER 2005:	*ELECTROMAGNETIC COMPATIBILITY (EMC) PART 6-2: GENERIC STANDARDS – IMMUNITY FOR INDUSTRIAL ENVIRONMENTS*
EN 61000-6-4, JANUARY 2007:	*ELECTROMAGNETIC COMPATIBILITY (EMC) PART 6-4: GENERIC STANDARDS – EMISSION STANDARD FOR INDUSTRIAL ENVIRONMENTS*
EN 61010-1, OCTOBER 2010:	*SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE – PART 1: GENERAL REQUIREMENTS*
EN 60825-1, OCTOBER 2007:	*SAFETY OF LASER PRODUCTS – PART 1: EQUIPMENT CLASSIFICATION, REQUIREMENTS ABD USER'S GUIDE*

Monte San Pietro, June 27th, 2012

Paolo Morselli
Quality Manager
Morselli Paolo

UNI EN ISO 9001 UNI EN ISO 14001

FIGURES

DATALOGIC

DATALOGIC

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