

# USER'S MANUAL



>Ulyxe iMark™

 DATALOGIC



Datalogic S.r.l.  
Via S. Vitalino 13  
40012 – Calderara di Reno  
Italy

Ulyxe iMark™ User's Manual

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821002683 rev. D

# SYMBOLS

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



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**Generic Warning:**

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

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**Electricity Warning:**

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

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**Laser Warning:**

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

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**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 marking system.

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**Notice:**

Notes, usage tips, or additional information.

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**Note:**

Carefully read the user's manual before using the marking system.

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## REVISION INDEX

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Revision	Date	Number of added or edited pages
821002680 rev. A	02-10-2013	Release
821002681 rev. B	10-04-2014	10, 21, 48, 49, Appendix E
821002682 rev. C	13-06-2016	General Review
821002683 rev. D	06-06-2017	ii



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**NOTE:**

We sometimes update the documentation after original publication. Therefore, you should also review the documentation on [www.datalogic.com](http://www.datalogic.com) for any updates.

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# FOREWORD

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Information included in this manual is intended for a ***qualified installer*** able to integrate the marking system into a system, complying with all the protection features required by international rules and local legislations. Refer to the Appendices for further information.

Following manual refers to an Ulyxe™ 1PWX-TL35 marking system in Class 4 configuration.

In addition to being professionally trained in their role, personnel assigned to work on the marking system must be informed and made acquainted with the risks inherent to invisible and visible laser radiation. The operator is required to carefully read the section of the manual concerning safety instructions as well as the sections related to matters falling under her/his responsibility.

The workers assigned to the marking system can be identified as:

- **OPERATOR**

responsible for loading elements to be processed, visually checking the work cycle, removing the finished product and cleaning the marking system.

- **MAINTENANCE PERSONNEL**

responsible for the electrical, mechanical and optical maintenance and adjustment of the marking system.



**WARNING!**

Datalogic shall not be held responsible for any non-conforming use of marking system of its manufacture.

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**NOTE:**

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

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## **PATENTS**

See [www.patents.datalogic.com](http://www.patents.datalogic.com) for patent list.

This product is covered by one or more of the following patents:  
Utility patents: IT1366132, US7480318

# OVERVIEW

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We are satisfied of your choice for a Datalogic 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.

It's 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. The entire unit and its mechanical base are covered with a metal casing that makes it more resistant to external agents.

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).

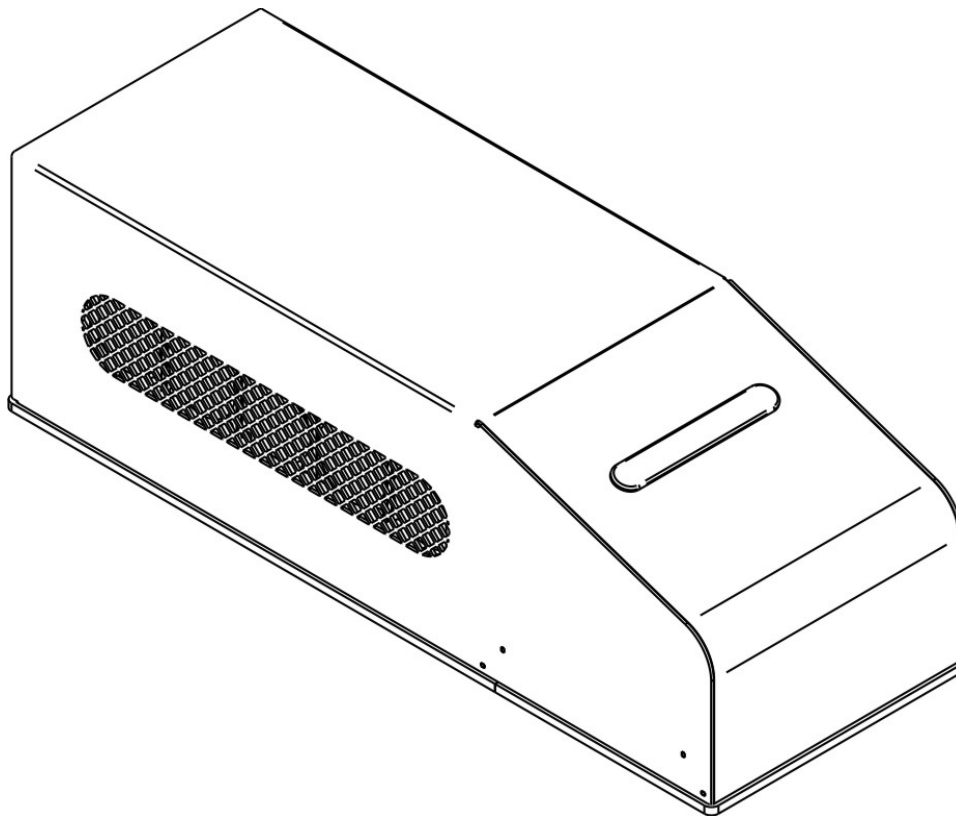


Figure 1: Overview.



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## **WARNING!**

**Marking system installation in secure environment is responsibility of the system integrator!**

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## **IMPORTANT WARNINGS**

Access to the internal parts of the marking system is allowed only to authorized personnel, duly qualified and trained with regards to risks of optical and electrical nature.

Datalogic declines any and all responsibility for work carried out on live parts by untrained or unauthorized personnel.



### **WARNING!**

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

Datalogic declines any responsibility and liability for irregular and improper use of the marking system which it manufactures.

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### **WARNING!**

These marking system actuation is demanded to the system integrator.

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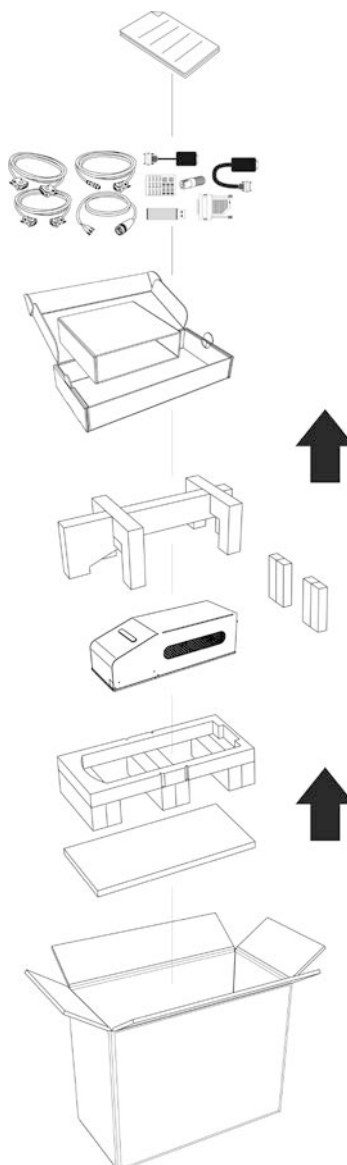
## 1. CONTENTS OF THE PACKAGING

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### 1.1 UNPACKING

When unpacking the marking system from the shipping carton you should:

- Remove the documentation from the top of the marking system
- Remove the box containing the accessories
- Carefully remove the marking system from the packaging using both hands



**Figure 2: Unpacking.**

Before installing or operating the marking system, you should:



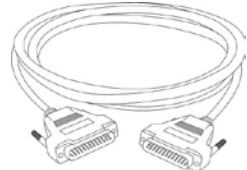

- Inspect the shipping container for damage
- Inspect the marking system for signs of damage
- Confirm that the shipping carton contains all items on the shipping inventory list including any accessories


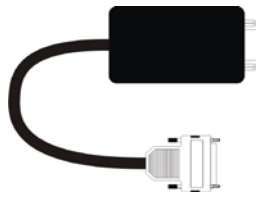
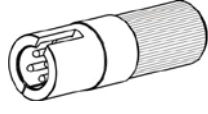

Retain all packaging materials until the marking system has been inspected for completeness and damage, and you have checked the operating performance. If anything is missing or defective, see chapter 6 for contact details.

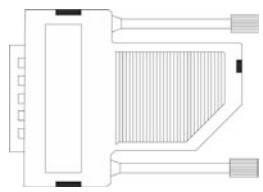

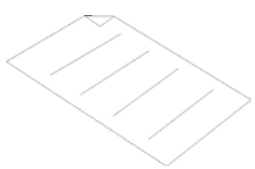
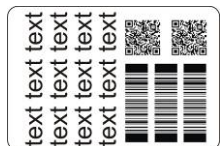
**1.2 MAIN HARDWARE**

 <p><b>Ulyxe iMark™</b></p>	 <p><b>F-Theta</b> (except 1PWX-T0SV)</p>	 <p><b>iMark Boards</b></p>
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**1.3 CABLE AND ACCESSORIES**

 <p><b>Power supply cable</b></p>	 <p><b>RS232 cable</b></p>	 <p><b>Rack cable</b></p>	 <p><b>Head cable</b></p>
---	--	--	---

 <p><b>iMark Galvo adapter</b></p>	 <p><b>iMark PC adapter</b></p>	 <p><b>Aux interlock gold connector (*)</b></p>	 <p><b>USB key</b></p>
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 <p><b>Control Box connector</b></p>	 <p><b>User Manual</b></p>	 <p><b>Test Report</b></p>	 <p><b>Sample Test</b></p>
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\* If this connector is used, the marking system works in **DANGEROUS** condition (MUTING DEVICE).

## 1.4 TRANSPORT

The marking system can be easily lifted up and moved by a single person thanks to its compact size and reduced weight.

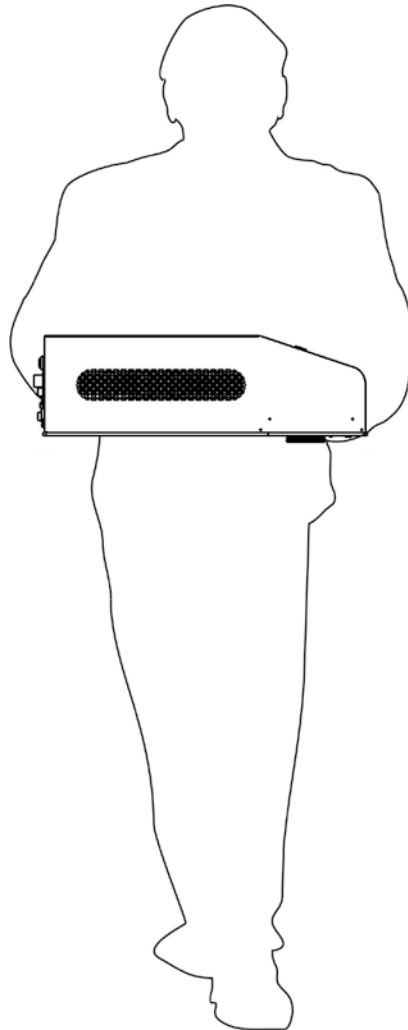


Figure 3: Ulyxe iMark™ transport.



### **WARNING!**

The Ulyxe iMark™ is a delicate optical marking system, avoid damaging it with shock and vibrations.

## 1.5 ON MOISTURE CONDENSATION

If the marking system is brought directly from a cold to a warm location, moisture may condense inside or outside the marking system. This moisture condensation may cause a malfunction of the marking system.

### **If moisture condensation occurs**

Turn off the marking system and wait about 1 hour for the moisture to evaporate.

### **Note on moisture condensation**

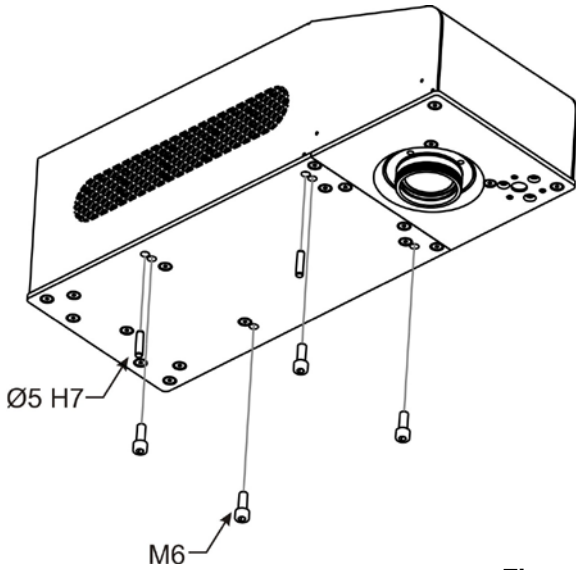
Moisture may condense when you bring the marking system from a cold place into a warm place (or vice versa) or when you use the marking system in a humid place as shown below.

### **How to avoid moisture condensation**

When you bring the marking system from a cold place into a warm place, put it in a plastic bag and seal it tightly. Remove the bag when the air temperature inside the plastic bag has reached the ambient temperature (after about 1 hour).

### 1.6 FIXING AND POSITIONING

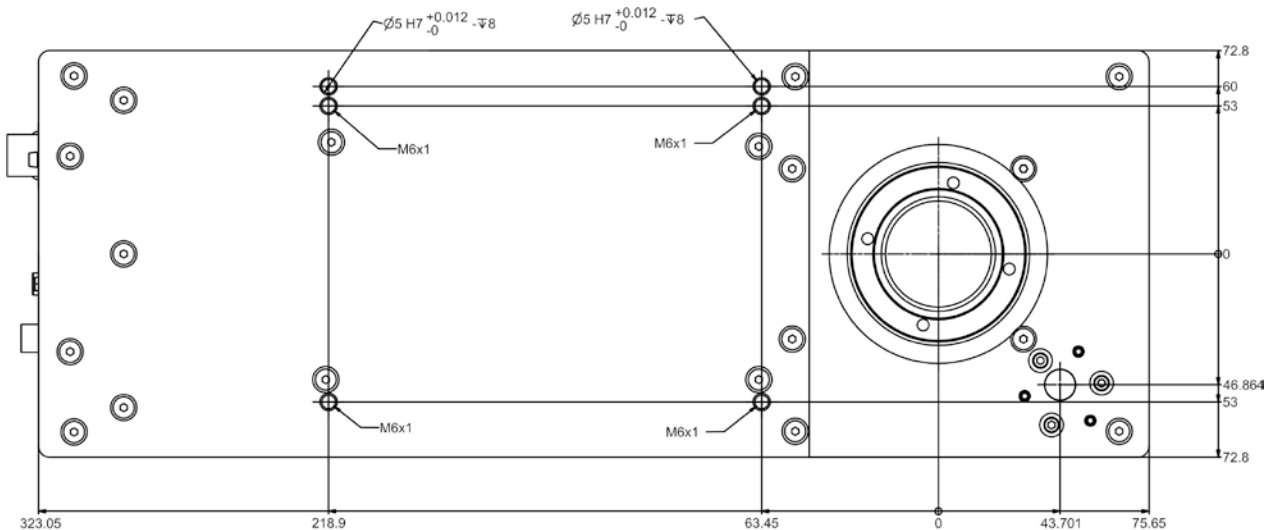
The marking system need to be positioned in safety mode and fixed on an appropriate plan absolutely with no vibrations.



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

Screws	M6
Fixing pins	Ø5 H7

Figure 4: Fixing points.



\* DIMENSIONI IN MM

Figure 5: Measures, distance threaded holes and fixing pins drivers.



**WARNING!**

It is very important to secure the marking system before you start marking the piece since improper securing or positioning may cause serious damage. Do not secure the marking system in a way other than the one described in the figure.



**NOTE:**

In order to prevent marking distortions, check for the absence of vibrations between marking system and piece to be marked.



**NOTE:**

It is recommended to install the marking system on a micrometer positioning Z-axis system!

## 1.7 INSTALLATION ENVIRONMENT

The marking system must be installed in a suitable environment in order to allow proper air flow passage and correct housing of the cables.

Ulyxe iMark™ is an air cooled marking system, an adequate air flow is necessary to guarantee its correct cooling. Installation must not slow or stop the flow of air cooling. Moreover, do not install a heat source near.

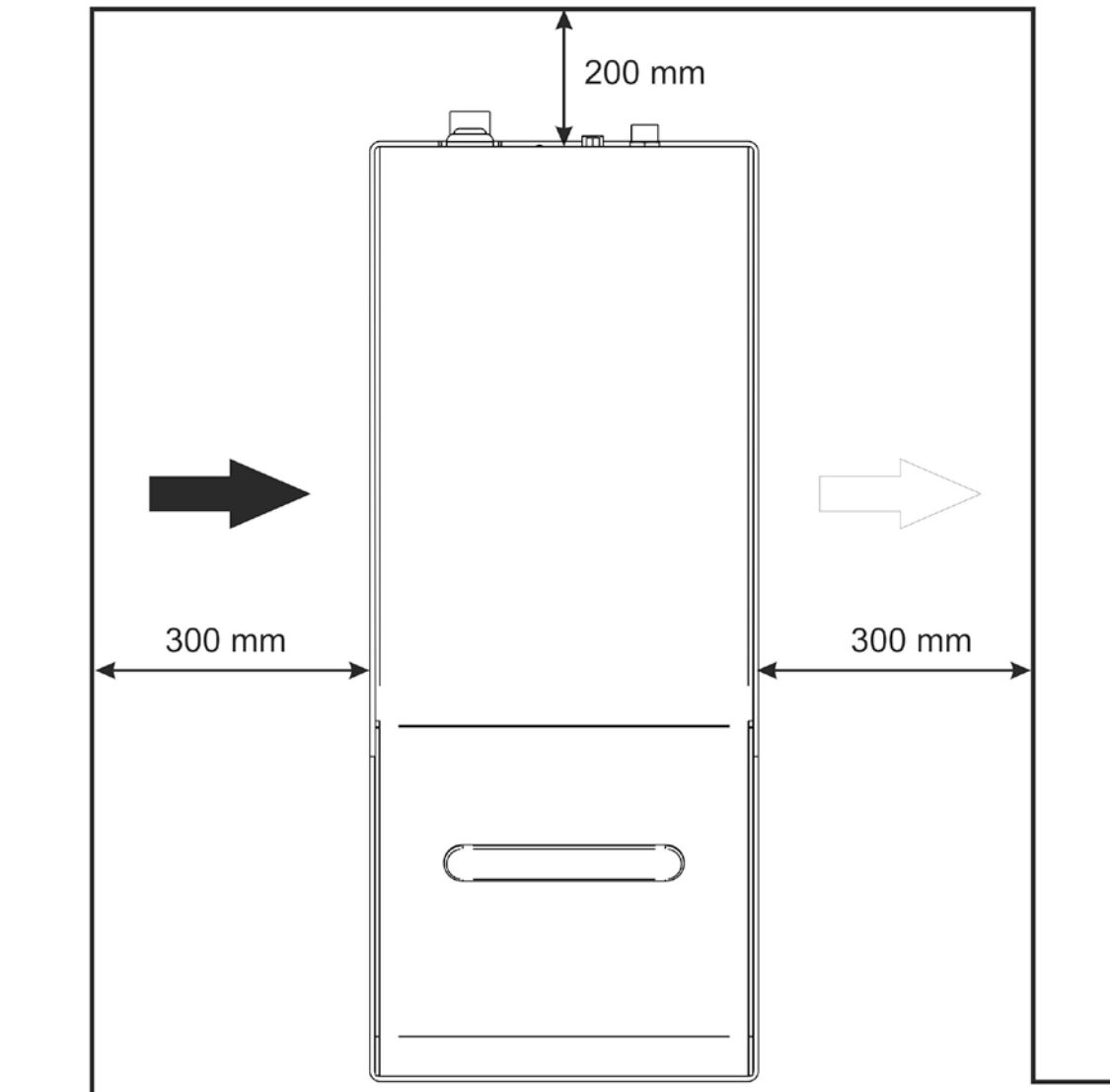


Figure 6: Installation environment.

## 1.8 FUME / DUST EXTRACTOR

During marking process, dust and/or gas may be produced. It is important to use adequate fume extractor and/or air filtration.



### WARNING!

Marking PVC (or other plastic material) can cause the release of chlorine gas which can be harmful to the laser operator and to the marking system itself. Always use adequate fume extractor during PVC and plastic marking.

## 2. TECHNICAL SPECIFICATIONS



**NOTE:**

**BEFORE** INSTALLING AND USING THE MARKING SYSTEM, **READ CAREFULLY** THE APPENDIXES.



**WARNING!**

**Ulyxe iMark™** is a **CLASS 4 LASER PRODUCT** and it is the responsibility of the OEM/system integrator to provide the safety completeness to be ready-to-use.

### 2.1 TECHNICAL SPECIFICATION

**MECHANICAL CHARACTERISTICS**

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

\* without F-Theta scan lens

\*\* in horizontal position only



**NOTE:**

Refer to Datalogic's website for detailed drawings.

**STORAGE AND TRANSPORTATION CONDITIONS**

Storage temperature	-5° to 55°C (23° to 131°F)
Shock and vibrations	The components are not designed to withstand shocks and vibrations

**WARNING!**

This product includes precision optical parts; avoid vibration and shocks: marking quality may deteriorate.

**ENVIRONMENTAL OPERATING CONDITIONS**

Environmental temperature	15°C to 35°C (59° to 95°F)
Humidity	< 90% without condensation
Altitude	< 1000 m
Suspended matter	< 3 mg/m <sup>3</sup>
Pollution Degree	2
Overvoltage Category	II

**ELECTRICAL POWER SUPPLY**

Input Voltage	24V DC
Input Current	13 A max
Max Power	300 W

**PERFORMANCE**

<b>LASER MARKER SOURCE</b> (typical values @ 25°C)		
Laser Type		Class 4 DPSSL (Diode Pumped Solid State Laser)
Average Power @ reference Rep Rate (50kHz) <sup>1</sup>	W	6.5
Pulse energy (max) @ reference Rep Rate (15kHz)	mJ	0.30
Central emission wavelength	nm	1064
Repetition Rate	kHz	15 ÷ 200
Laser aiming beam		Class 2 <1mW @ 630-670nm
Focus aiming beam		Class 2 <1mW @ 630-670nm
Cooling		Forced Air
Noise	dB(A)	< 70 @ 1 meter

<b>OTHER</b>		
Marking Speed	mm/s	Up to 5000 mm/s
Char Marking Speed <sup>2</sup>	char/s	Up to 275 char/s @ 2000 mm/s
Software Control		Lighter Suite
Communication		RS232, digital I/O

<sup>1</sup> Without F-Theta

<sup>2</sup> h char=1mm in Roman-S Level100% f=40kHz F-Theta160S on TESA label



### 2.2 DESCRIPTION OF THE MARKING SYSTEM

A description of the main parts of the Ulyxe iMark™ marking system is provided here below:

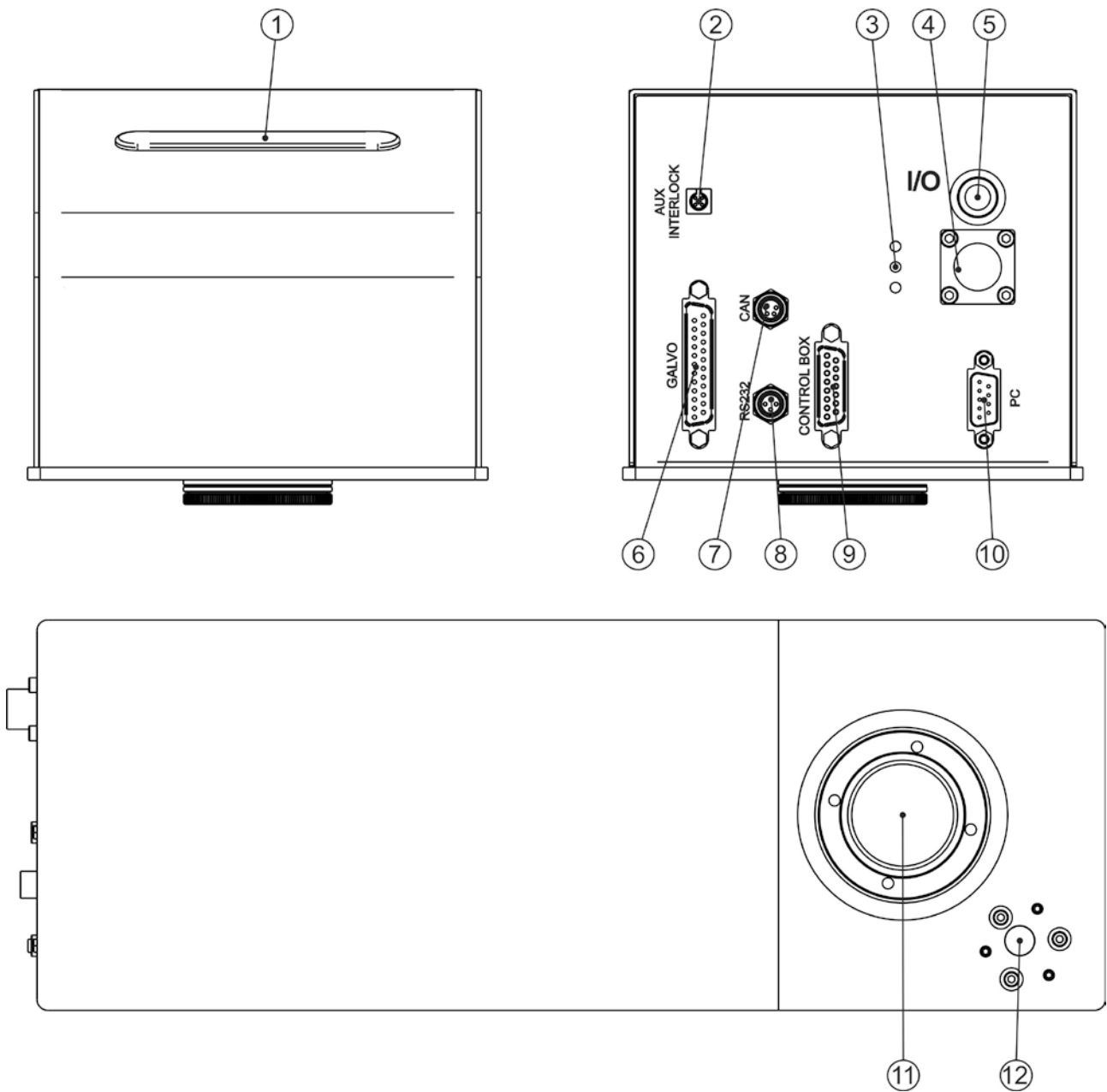


Figure 7: Installation environment.

1) Status LED bar	7) CAN connector
2) Aux interlock connector	8) RS232 port
3) LED indicators	9) Control Box connector
4) Power supply connector	10) PC connector
5) Main Switch with LED	11) F-Theta Scan Lens
6) Galvo connector	12) Focusing beam

## 2.3 MARKING AREA SPECIFICATION

Datalogic provides a wide range of F-Theta scan lenses to be attached to the scanning head to focus the laser beam in flat Marking Field, in order to achieve high-resolution marking results.

These F-Theta scan lenses are available to best-match the object (i.e.: logo; string; 2D matrix; etc.) to be marked with customer need, over the material processing, and fit the standard Datalogic Scanning Head; further solutions about different models of lenses and scanning heads will be considered upon request.

The table below lists the standard F-Theta scan lenses currently available:

F-Theta Scan Lens diameter: M39				
F-Theta Scan Lens		$f = 100S$	$f = 160S$	$f = 254S$
Working Distance (WD)	mm	114	178	282
Marking Area (MA)	mm <sup>2</sup>	50 x 50	100 x 100	140 x 140



### NOTE:

Definition of Marking Area: *square marking field measured on black anodized aluminium plate.*



### WARNING!

This product was designed to use only certain configurations of F-Theta lens and marking field. If your needs are not satisfied by current available F-Theta lens configurations please contact Datalogic for a solution. The use of other F-Theta lenses or operation outside the specified marking field for a certain F-Theta lens configuration can lead to damage of F-Theta lens, scanning head or laser source. Such damage is not covered by warranty!



### WARNING!

For each F-Theta lens configuration Datalogic recommends the use of certain adapter. This adapter ensures that residual back reflections caused by F-Theta lens do not damage optics of the scanning head. The removal of such adapter or its incorrect use (for example incomplete threading, use of another F-Theta lens adapter, etc.) can lead to damage of the F-Theta lens, scanning head or laser source. Such damage is not covered by warranty!



**NOTE:**

Working Distance is defined as the distance between the center of the marking area (defined in the focal plane) and the last mechanical edge of the F-Theta Scan Lens. Refer to the following figure.

**WD:** Working Distance

**FD:** Fixing Distance

**MA:** Marking Area

**AB:** Aiming beam

**FB:** Focusing beam

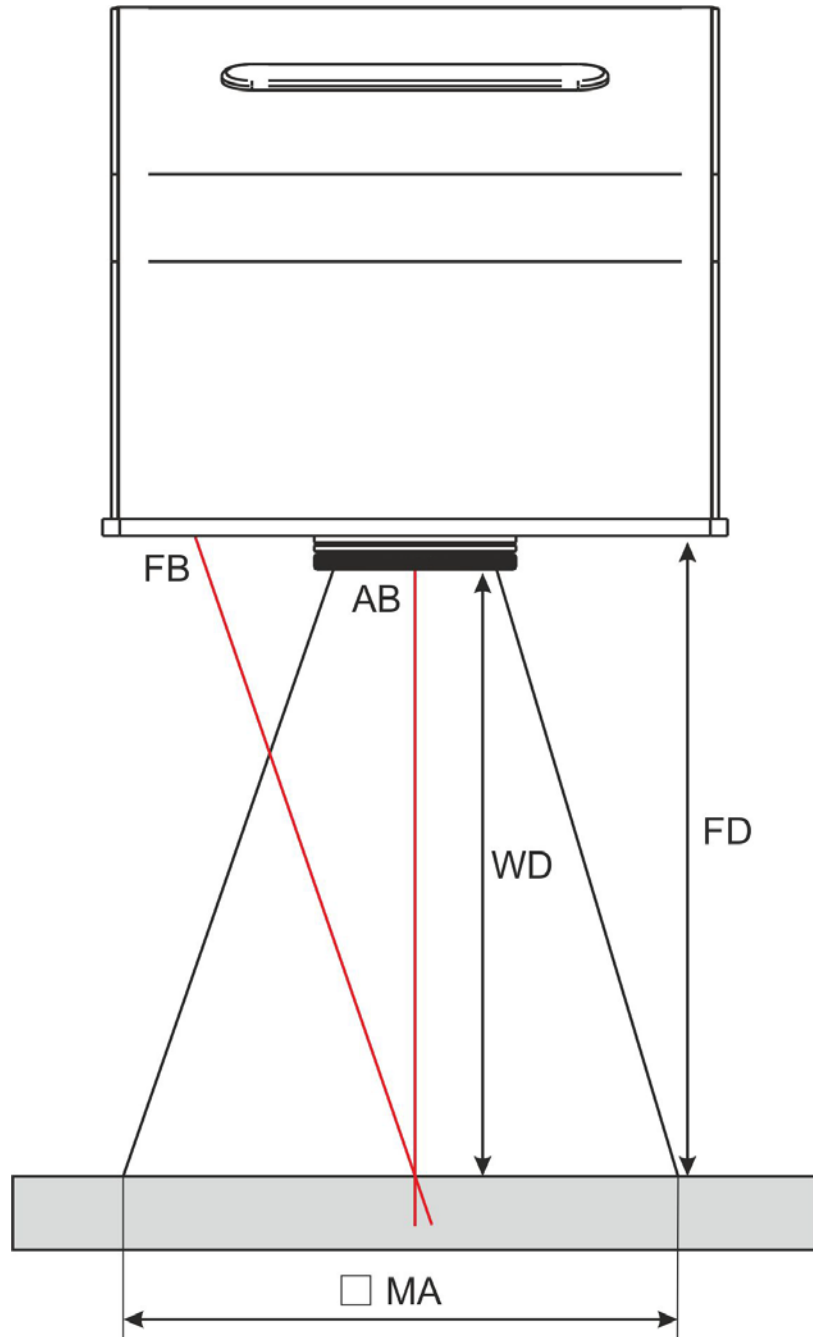


Figure 8: Marking area.

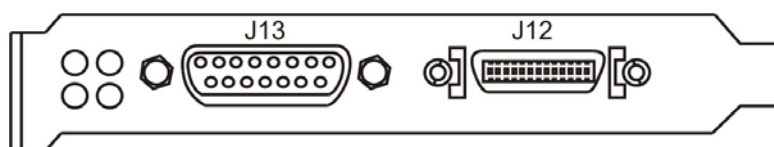


**NOTE:**

For systems equipped with standard F-Theta Scan Lens the focus condition is obtained by matching the Aiming Beam with the Focusing beam.

## 2.4 iMARK CONNECTORS SPECIFICATIONS

### 2.4.1 iMARK BOARD



#### 2.4.1.1 CONNECTOR J13

Sub-D 15 pin female – Laser source controller. The signals related to this connector are all TTL compatible outputs. They are active when the logical level is up.

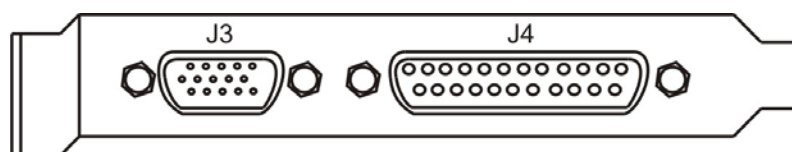
PIN	SIGNAL	TYPE	DESCRIPTION
1	SPI SCK	Digital Output	SPI SCK signal
2	Pen Down	Digital Output	Pen Down signal
3	Q-Switch Modulation	Digital Output	Q-Switch Modulation signal
4	GND	Ground	Ground reference
5	+12V	Output Power Supply	+12V DC power supply
6	+12V	Output Power Supply	+12V DC power supply
7	NOT USED	RESERVED	DO NOT CONNECT
8	CAN+		
9	CAN-		
10	SPI MOSI	Digital Output	SPI MOSI signal
11	NOT USED	RESERVED	DO NOT CONNECT
12	GND	Ground	Ground reference
13	LVDS DO-	Negative differential output	Data output signal
14	LVDS DO+	Positive differential output	Data output signal
15	SPI CS	Digital Output	SPI CS signal

**2.4.1.2 CONNECTOR J12**

MDR26 Digital scanner head connection between iMark board and Galvo adapter converter.

<b>PIN</b>	<b>SIGNAL</b>	<b>TYPE</b>	<b>DESCRIPTION</b>
1	GND	Ground	Ground reference
2	DO+	Positive differential output	Data output signal
3	GND	Ground	Ground reference
4	LOCK	Digital Output	Lock signal
5	GND	Ground	Ground reference
6	GND	Ground	Ground reference
7	+15V	Output Power Supply	+15V DC power supply
8	+15V	Output Power Supply	+15V DC power supply
9	+15V	Output Power Supply	+15V DC power supply
10	-15V	Output Power Supply	-15V DC power supply
11	-15V	Output Power Supply	-15V DC power supply
12	-15V	Output Power Supply	-15V DC power supply
13	GND	Ground	Ground reference
14	GND	Ground	Ground reference
15	DO-	Negative differential output	Data output signal
16	GND	Ground	Ground reference
17	STATUS	Digital Output	Status signal
18	GND	Ground	Ground reference
19	GND	Ground	Ground reference
20	+15V	Output Power Supply	+15V DC power supply
21	+15V	Output Power Supply	+15V DC power supply
22	+15V	Output Power Supply	+15V DC power supply
23	-15V	Output Power Supply	-15V DC power supply
24	-15V	Output Power Supply	-15V DC power supply
25	-15V	Output Power Supply	-15V DC power supply
26	GND	Ground	Ground reference

## 2.4.2 I/O MODULE BOARD



### 2.4.2.1 J3 CONNECTOR (LASER CONTROL)

Sub-D HD male 15 poles– Controls/Laser status and 7 additional signals defined and managed by the software. The output signals of this connectors are open-drain. They are active when conducting (output to GND) and not active when disabled (high impedance). All inputs are opto-isolated and require a voltage in the range from 12 to 24V to be activated.

PIN	SIGNAL	TYPE (***)	DESCRIPTION
1	END (*)	Digital Output	This signal is used to know if the marking process is finished: - ON at the <i>END</i> of marking process
2	BUSY (*)	Digital Output	This signal is used to know if the current spooler is executing (marking in progress) - ON during marking process
3	READY (*)	Digital Output	This signal is used to know if a document, sequence or script is loaded and ready to be executed: - ON when a document or a sequence is running in AUTO MODE (**) or WORK MODE (**) (SW_READY COMPATIBILITY (**) = true) - ON when a document or a sequence is running in AUTO MODE (**) and laser in <i>READY</i> state (SW_READY COMPATIBILITY (**) = false) - ON when a script is running n AUTO MODE (**) and “IoPort.setReady (true)” function is used
4	START (*)	Digital Input	This signal is used to start to the marking process when a document or a sequence is running in AUTO MODE (**) or WORK MODE (**): - HIGH level pulsed signal start the marking process
5	STOP (*)	Digital Input	This signal is used to stop the marking process - HIGH level pulsed signal stop the marking process
6	INPUT_13	Digital Input	Generic Input
7	INPUT_15	Digital Input	Generic Input
8	OUTPUT_15	Digital Output	Generic Output
9	EXT_P12V	Output Power Supply	Auxiliary 12V DC power supply available for drive input logical HIGH (max 250mA)
10	RUN	Digital Output	Generic Output
11	INPUT_10 or OUTPUT_10	User Configurable Digital I/O	Configurable as generic INPUT_10 or generic OUTPUT_10 (see paragraph 2.4.2.3 to configure)
12	GND	Ground	Ground reference
13	INPUT_12	Digital Input	Generic Input
14	INPUT_14	Digital Input	Generic Input
15	OUTPUT 14 or BAD-M	Digital Output	Generic Output or BAD-M signal (only for MOF)

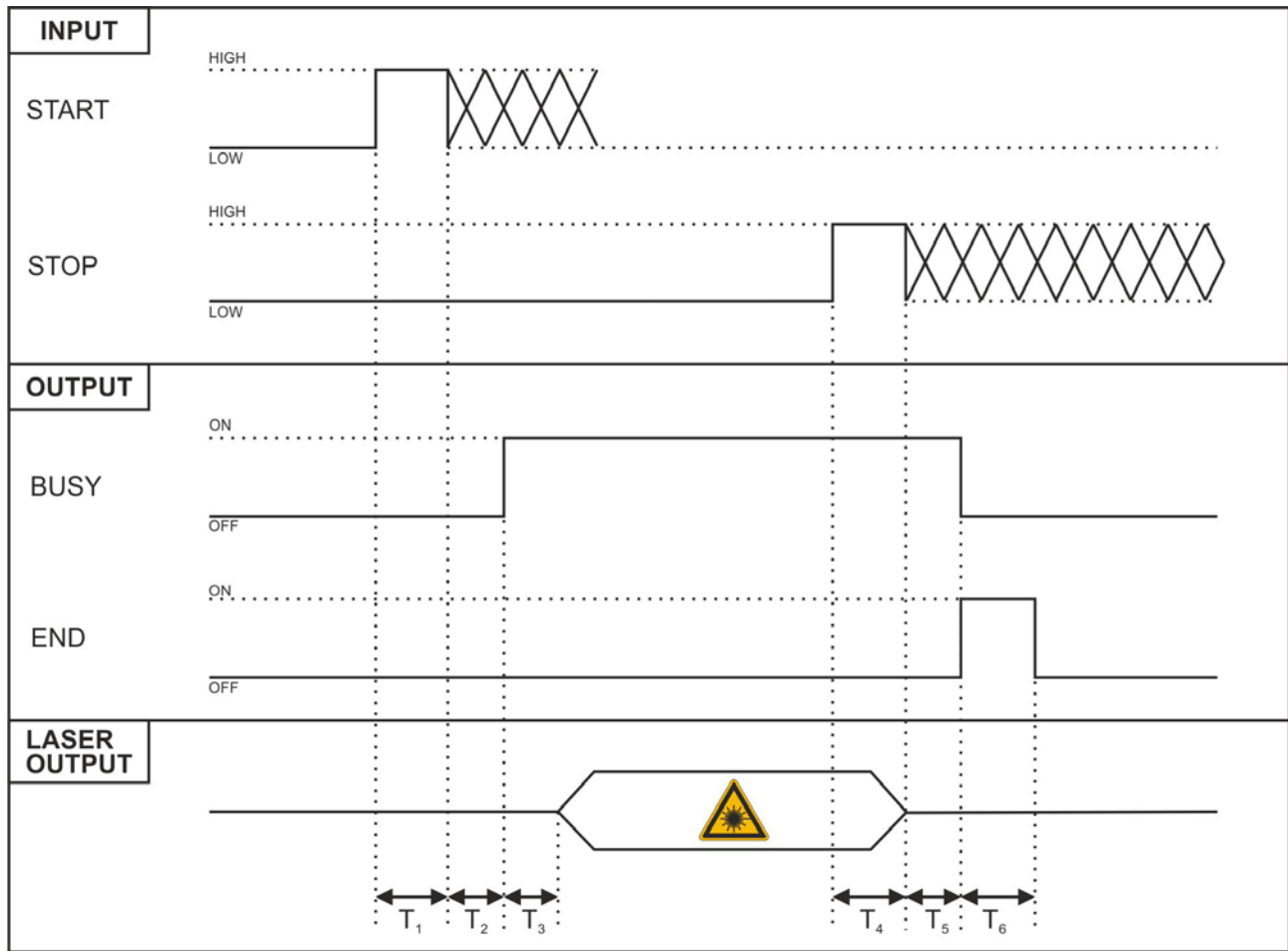
(\*) refers to Lighter user's manual "Setting I/O parameters" paragraph to set the signal properties

(\*\*) refers to Lighter user's manual

(\*\*\*) refer to paragraph 2.4.2.4

**MARKING PROCESS SIGNALS TIMING**

The following diagram illustrates the possible timings and settings of these signals:



**Figure 9: Timing signals.**

The time intervals in the diagram can all be programmed by a resolution of 1 ms.

- $T_1$       Start Time      For setting the minimum acceptable time for the *START* marking signal
- $T_2$       Start Delay      For delaying marking start
- $T_3$       Busy Advance    *BUSY* signal corresponding to mark progress
- $T_4$       Stop Time        The minimum time for stop signal to stop the marking process
- $T_5$       Busy Delay       For delaying the Laser *END* signal with respect to laser emission
- $T_6$       End Time         For setting the Laser *END* activation time

### 2.4.2.2 J4 CONNECTOR (AXES AND I/O CONTROL)

Sub-D male 25 poles. Connectors for additional signals defined and managed by the software.

The output signals of this connectors are open-drain. They are active when conducting (output to GND) and not active when disabled (high impedance).

All inputs are opto-isolated and require a voltage in the range from 12 to 24V to be activated.

As an alternative the iMark board can generate the signals for controlling four independent axis driven by stepper motors.

PIN	SIGNAL	TYPE (**)	DESCRIPTION
1	EXT_12V	Output Power supply	Auxiliary 12V DC power supply available for drive input logical HIGH (max 250mA)
2	OUTPUT_0 (*) or STEP_Y	Digital Output	Generic output or Y-Axis drive step signal (Clock) for axis control (**)
3	OUTPUT_2 (*) or STEP_Z	Digital Output	Generic output or Z-Axis drive step signal (Clock) for axis control (**)
4	OUTPUT_4 (*) or BRAKE X	Digital Output	Generic output or X-Axis electromechanical brake release signal. ON during drive motion
5	OUTPUT_6 (*) or BRAKE Y	Digital Output	Generic output or Y-Axis electromechanical brake release signal. ON during drive motion
6	OUTPUT_8 (*) or BRAKE Z	Digital Output	Generic output or Z-Axis electromechanical brake release signal. ON during drive motion
7	INPUT_0 (*) or ZERO X	Digital Input	Generic input or X-Axis home sensor input. The home search is stopped when this signal goes HIGH
8	INPUT_1 (*) or ZERO Y	Digital Input	Generic input or Y-Axis home sensor input. The home search is stopped when this signal goes HIGH
9	INPUT_2 (*) or ZERO Z	Digital Input	Generic input or Z-Axis home sensor input. The home search is stopped when this signal goes HIGH
10	INPUT_3 (*) or DISABLE X	Digital Input	Generic input or X-Axis disable signal. When HIGH, the corresponding step signal remains in the status prior to activation
11	INPUT_4 (*) or DISABLE Y	Digital Input	Generic input or Y-Axis disable signal. When HIGH, the corresponding step signal remains in the status prior to activation
12	INPUT_5 (*) or DISABLE Z	Digital Input	Generic input or Z-Axis disable signal. When HIGH, the corresponding step signal remains in the status prior to activation
13	GND	Ground	Ground reference
14	OUTPUT_12 (*) or STEP R	Digital Output	Generic output or R-Axis drive step signal (Clock) for axis control
15	OUTPUT_1 (*) or STEP X	Digital Output	Generic output or X-Axis drive step signal (Clock) for axis control
16	OUTPUT_3 (*) or DIR Z	Digital Output	Generic output or Z-Axis drive direction signal
17	OUTPUT_5 (*) or DIR Y	Digital Output	Generic output or Y-Axis drive direction signal
18	OUTPUT_7 (*) or DIR X	Digital Output	Generic output or X-Axis drive direction signal
19	INPUT 9	Digital Input	Generic Input
20	INPUT 8	Digital Input	Generic Input
21	INPUT_7 (*) or ZERO R	Digital Input	Generic Input or R-Axis home sensor input. The home search is stopped when this signal goes HIGH

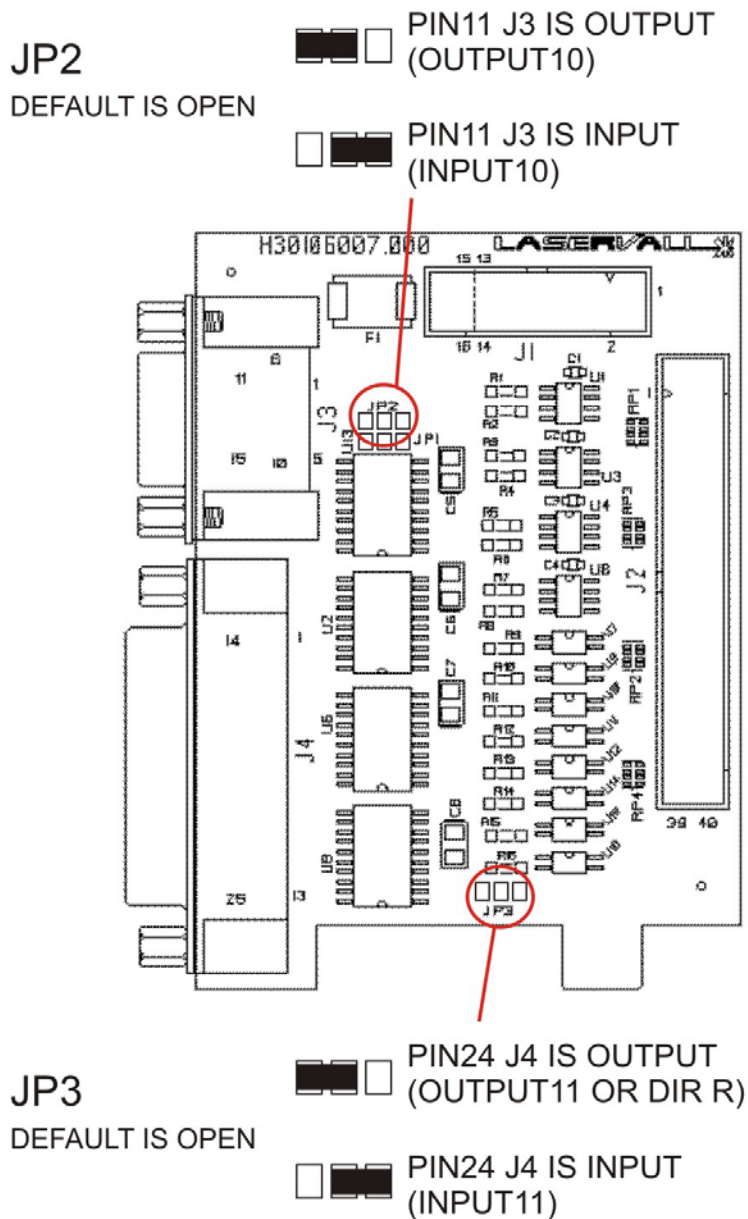


22	INPUT_6 (*) or DISABLE R	Digital Input	Generic input or R-Axis disable signal. When HIGH, the corresponding step signal remains in the status prior to activation
23	OUTPUT_9 (*) or BRAKE R	Digital Output	Generic output or R-Axis electromechanical brake release signal. ON during drive motion
24	INPUT_11 / OUTPUT_11 (*) or DIR R	User Configurable Digital I/O	Configurable as generic INPUT_11 or generic OUTPUT_11 / R-Axis drive direction signal (*see paragraph 2.4.2.3 to configure)
25	GND	Ground	Ground reference

(\*) enable an axis cause that the corresponding signals will no longer be available as generic inputs/output. Refer to Lighter user's manual, "Setting the X, Y, Z, and Rotor Axes parameters" to enable/disable Axes and set the Axes properties

(\*\*) see paragraph 2.4.2.4

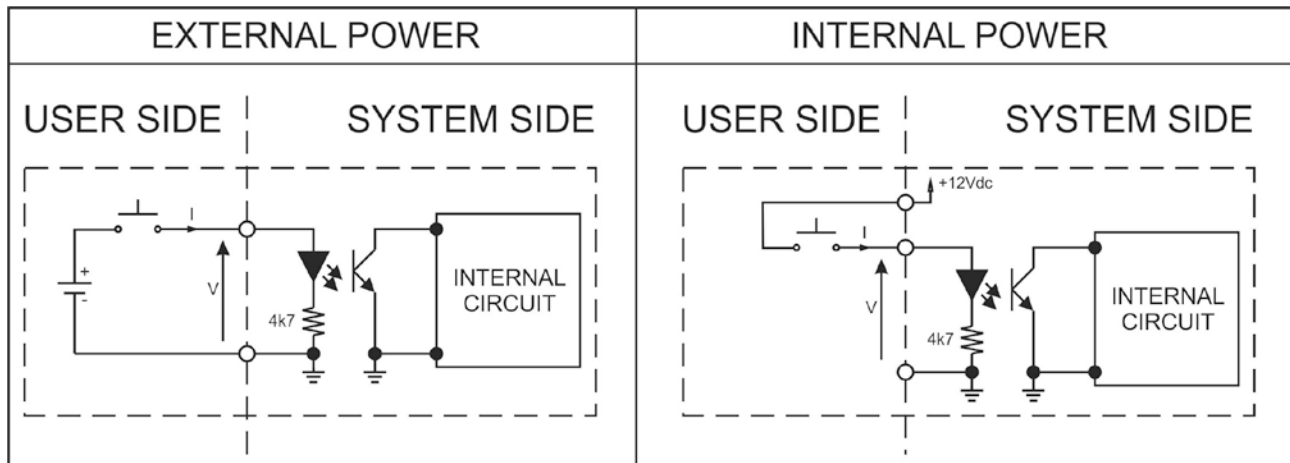
**2.4.2.3 I/O MODULE BOARD CONFIGURATION**



**Figure 10: I/O Module board configuration.**

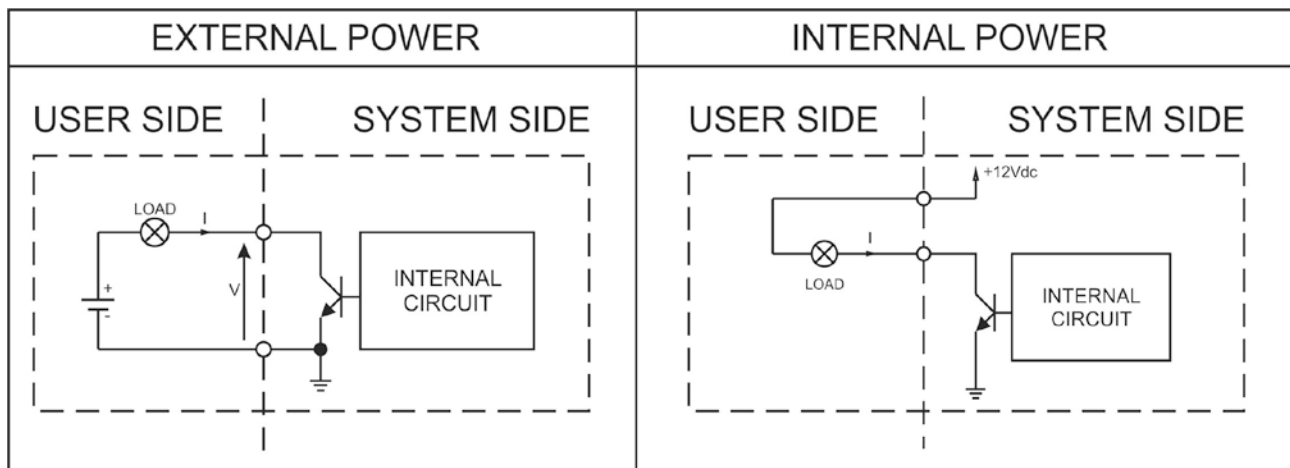
### 2.4.2.4 ELECTRICAL CHARACTERISTIC'S SIGNAL

#### DIGITAL INPUT:



Type	Optocoupler		
$V_{max}$	24V DC		
$I_{max}$	5mA @ 24V DC		
Pulse Width	≥ 1ms (debounce)		
	<b>MIN</b>	<b>TYP</b>	<b>MAX</b>
INPUT Logic LOW	0.0 V DC	0.0 V DC	2.0 V DC
INPUT Logic HIGH	5.0 V DC	12.0 V DC	24.0 V DC

#### DIGITAL OUTPUT:



Type	Low side driver		
$V_{max}$	24V DC		
$I_{max}$	250mA		
$V_{saturation}$	<0.5V DC		
Leakage current	< 5μA		
OUTPUT State ON	$V \leq 0.5 \text{ V DC}; I \leq 250\text{mA}$		
OUTPUT State OFF	$V \leq 24 \text{ V DC}; I \leq 5\mu\text{A}$		

## 2.5 CONNECTORS SPECIFICATIONS

### 2.5.1 AUX INTERLOCK CONNECTOR (SW LEVEL)

Aux interlock **disables** the Class 4 laser source inside the marking system.

#### PANEL CONNECTOR

Type BINDER 719 series panel mount connector, 4 positions.



Figure 11: Female panel socket cod. 09-9766-30-04 (front view).

PIN	SIGNAL	TYPE	DESCRIPTION	FUNCTIONAL DIAGRAM
1	VCC	OUTPUT	5V DC for INTERLOCK signal	
2	INTERLOCK	INPUT	INTERLOCK signal	
3	GND	GROUND	DO NOT CONNECT	
4	N.C.	-	NOT USED	

#### PLUG CONNECTOR

Connector type BINDER 719 series, 4 positions.

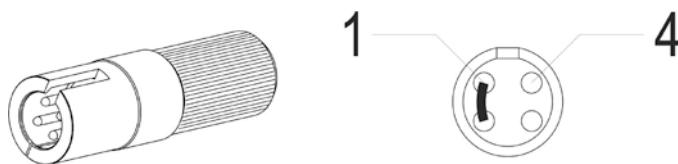


Figure 12: Male plug connector cod. 09-9767-00-04 (front view).



#### WARNING!

If the Aux interlock gold connector is used, the marking system is in **DANGEROUS** condition (MUTING DEVICE).



#### NOTE:

To restore the marking system it is necessary to repeat the "Turning on sequence" without shutting down the system. See chapter 4.1 for more details.

## 2.5.2 CONTROL BOX CONNECTOR (LASER CONTROL)

Panel socket Sub-D, 15 positions, female.

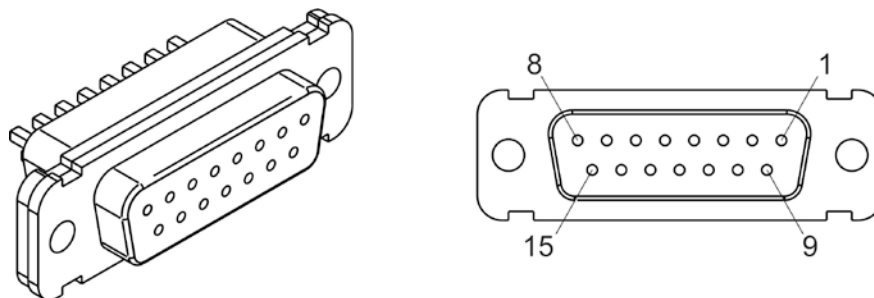


Figure 13: Panel socket (front view) and internal interface.

PIN	SIGNAL	TYPE (*)	DESCRIPTION
1, 2	5VDC	Output power supply	Auxiliary 5V DC power supply available for drive input logical HIGH ( <b>max 200mA</b> )
3	SHUTTER EN	Digital Input	External "Shutter Enable" signal: (see paragraph 2.5.2.1) - HIGH level: Shutter opened - LOW level or disconnected: Shutter closed
4	RESERVED	Digital Input	DO NOT CONNECT
5	RESERVED	Digital Input	DO NOT CONNECT
6	RESERVED	Digital Output	DO NOT CONNECT
7	RESERVED	Digital Output	DO NOT CONNECT
8	RESERVED	Digital Output	DO NOT CONNECT
9	RESERVED	CAN_PWR	DO NOT CONNECT
10	KEY	Digital input	External KEY signal: (see paragraph 2.5.2.1) - HIGH level: system enabled; - LOW level or disconnected: system disabled
11	RESERVED	CAN_H	DO NOT CONNECT
12	SHUTTER OPEN/ ALARM	Digital Output	This signal is used to know if the system is ready to emit laser radiation: (see par. 2.5.2.1) - ON when the system is in <i>READY</i> state
13	RESERVED	CAN_L	DO NOT CONNECT
14	RESERVED	CAN_GND	DO NOT CONNECT
15	GROUND	Ground	Ground

(\*) refers to paragraph 2.6



### NOTE:

Connection example in paragraph 2.7.

2.5.2.1 LASER CONTROL SIGNALS TIMING

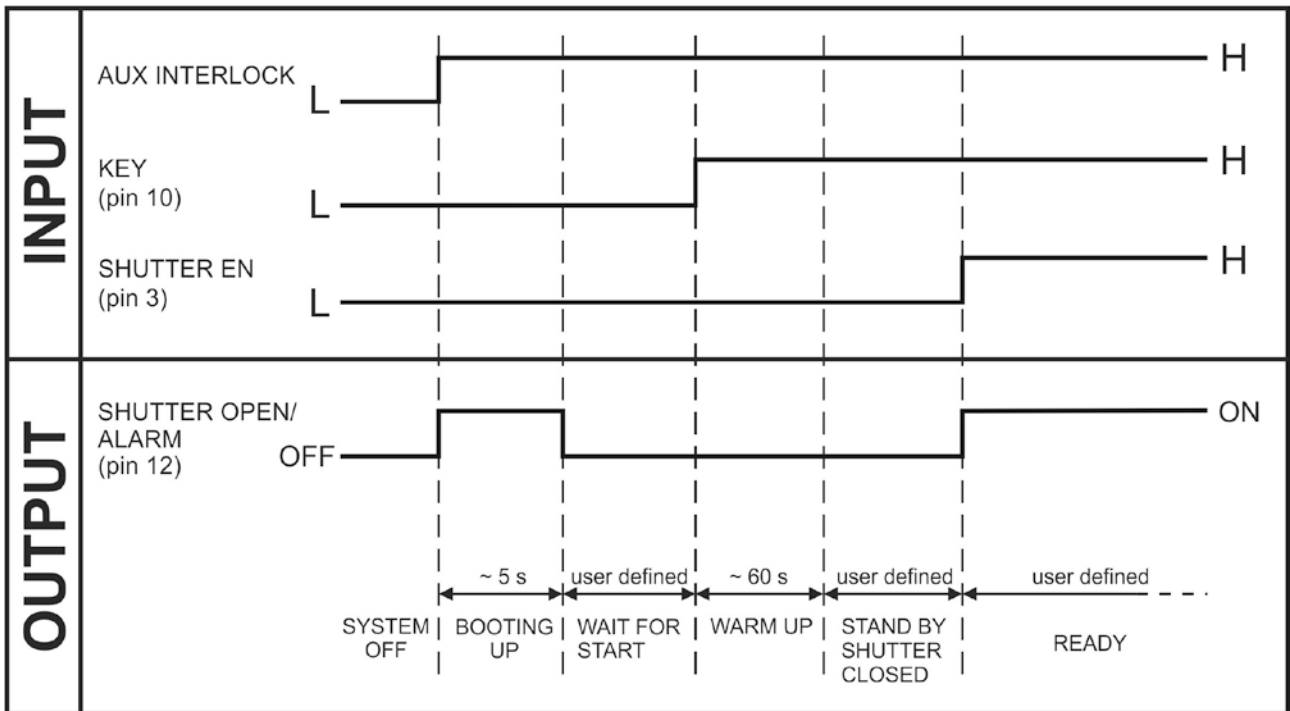


Figure 14: Timing control signals.

### 2.5.3 PC CONNECTOR

Male panel plug Sub-D 9 positions to control laser parameter.

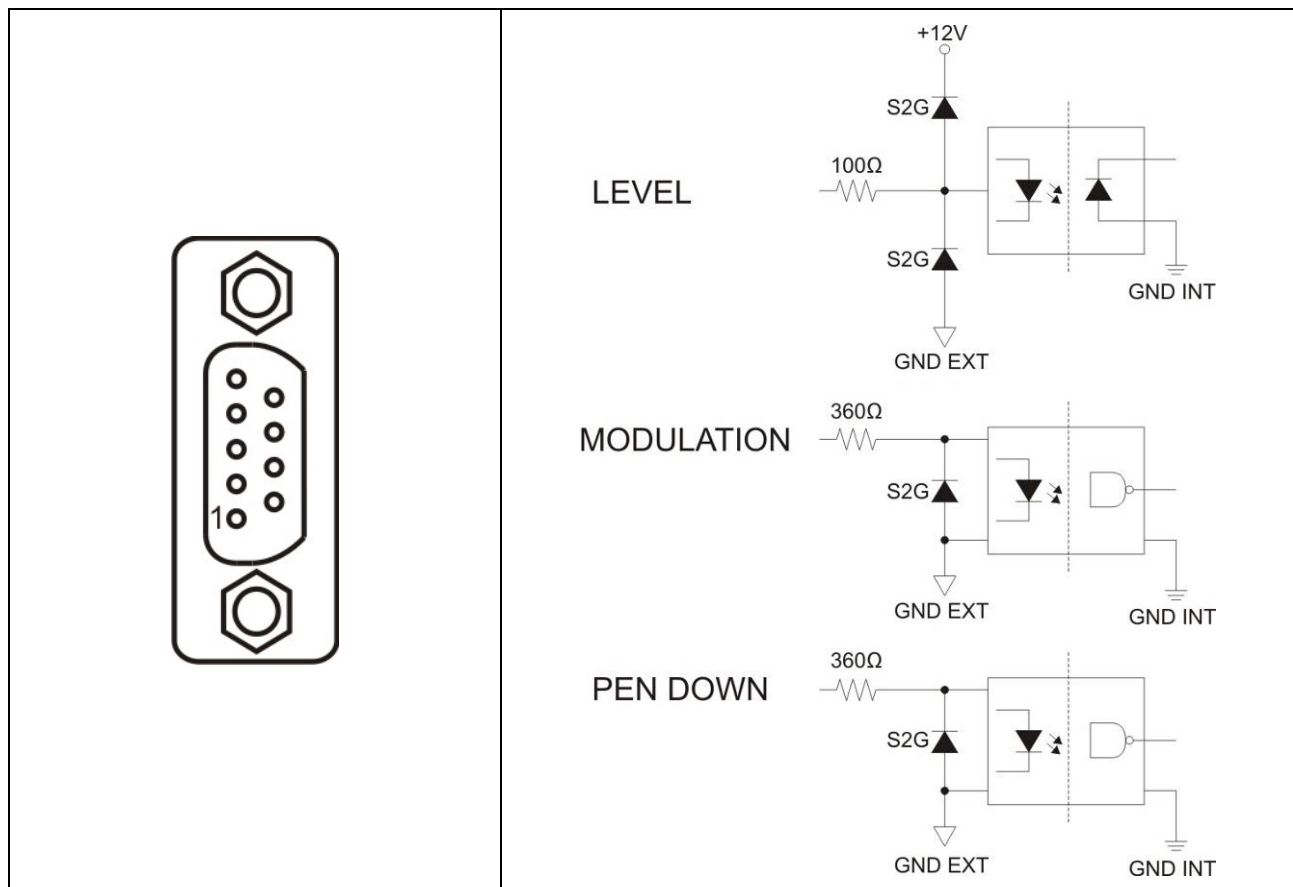


Figure 15: Laser signal connector.

PIN	SIGNAL	TYPE	DESCRIPTION
1	LEVEL	Analog input (0-10V DC)	Analog level for Laser Diode current control (0 - 10V DC) MAX frequency to change value is 1kHz
2	PEN DOWN	Digital input (5V DC)	Laser Enable (5V DC= Laser <i>READY</i> , 0V DC= Laser <i>STAND-BY</i> )
3	GND	Ground	Ground
4	NOT USED	RESERVED	DO NOT CONNECT
5	NOT USED	RESERVED	DO NOT CONNECT
6	MODULATION	Digital input (5V DC)	Q-switch Modulation – 15kHz to 200 kHz range 5V DC = Q-switch closed (ON); 0V DC = Q-switch open (OFF)
7	GND	Ground	Ground
8	+12VDC	Power supply input	Power supply input +12V DC
9	NOT USED	RESERVED	DO NOT CONNECT

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

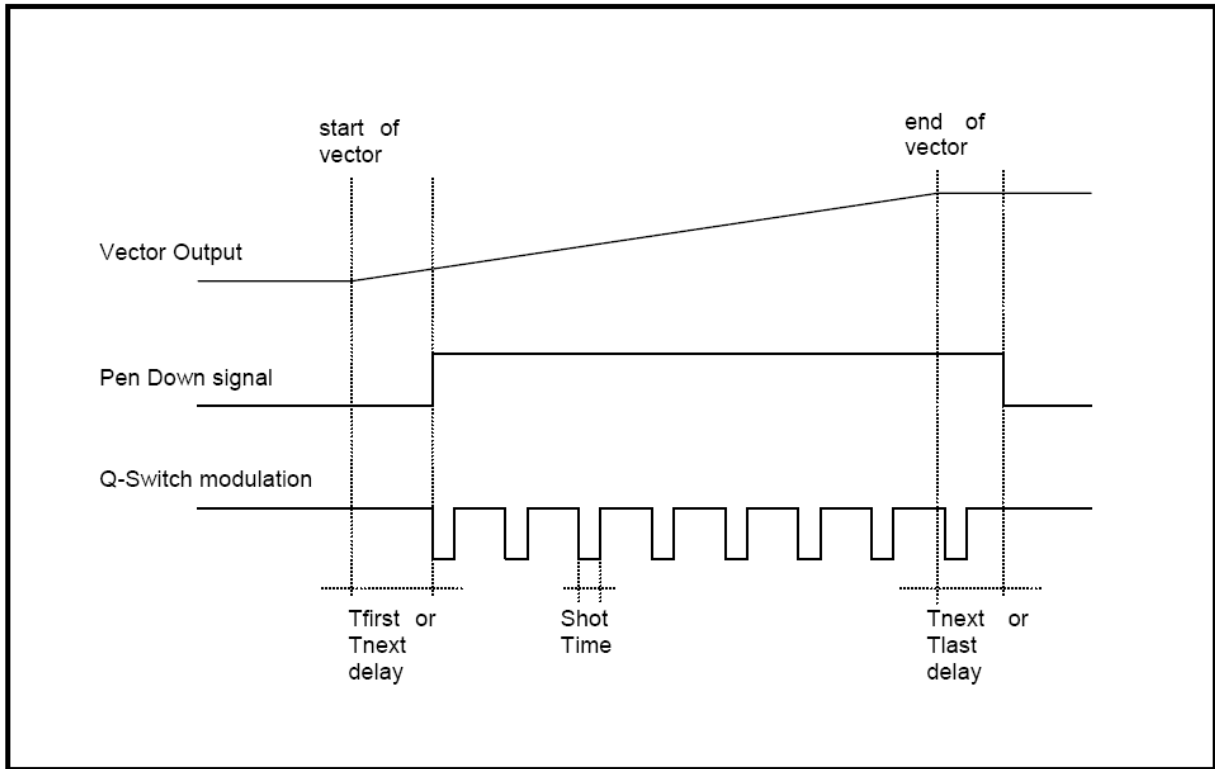


Figure 16: Laser signals diagram.

## 2.5.4 GALVO CONNECTOR (Scanning Head signals)

Female panel socket Sub-D 25 positions dedicated to X-Y axis movement.

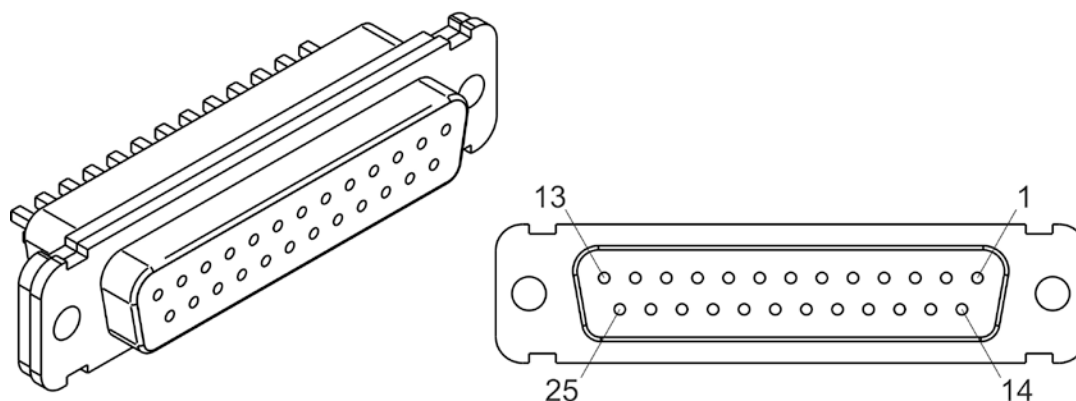


Figure 17: Galvo connector.

PIN	SIGNAL	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 +5V DC
12	SM12V	Power supply input	Power supply input -12V DC
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 +12V DC
25	GND	Ground	Ground reference



### 2.5.5 POWER SUPPLY CONNECTOR

Panel socket SOURIAU TRIM TRIO 4 positions.

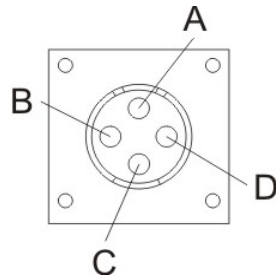


Figure 18: Female panel socket cod. UT0010-4SH (front view).

PIN	SIGNAL	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	FG	Earth	Earth connection
D	N.C.	-	NOT USED

### 2.5.6 POWER SUPPLY CABLE

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

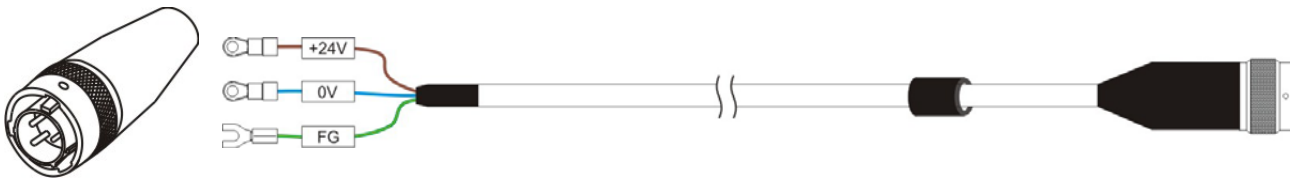


Figure 19: Male plug connector cod. UT0610-4PH (front view) and wiring.

### 2.5.7 RS232 CONNECTOR

Connector type BINDER 768 series, 3 positions.

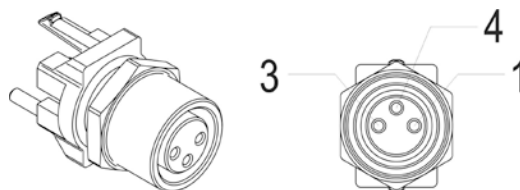
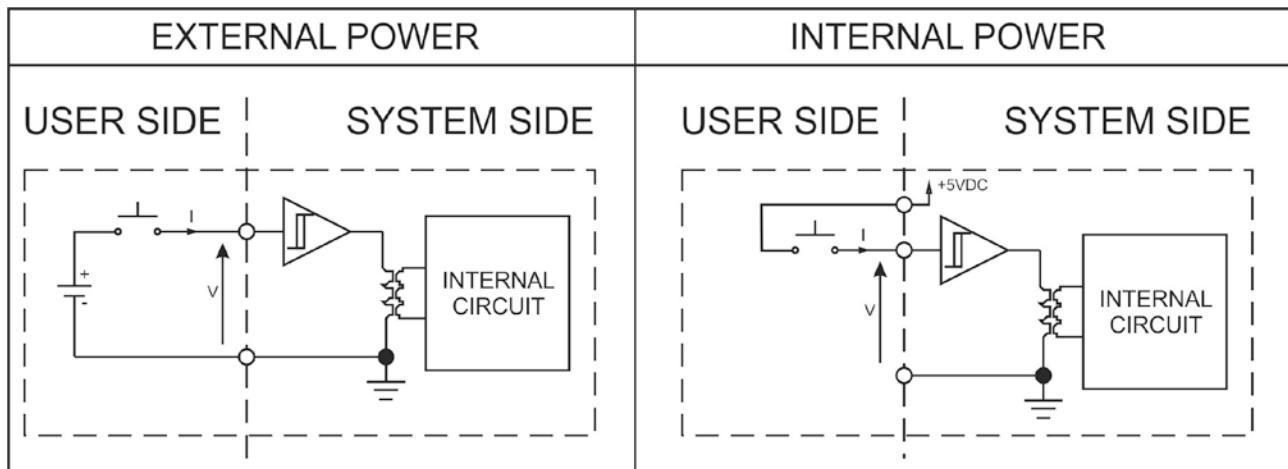


Figure 20: Female panel socket cod. 99-3412-281-03 (front view).

PIN	SIGNAL	TYPE	DESCRIPTION
1	TXD	Output	Transmit Data
4	RXD	Input	Receive Data
3	GND	Ground	Ground reference

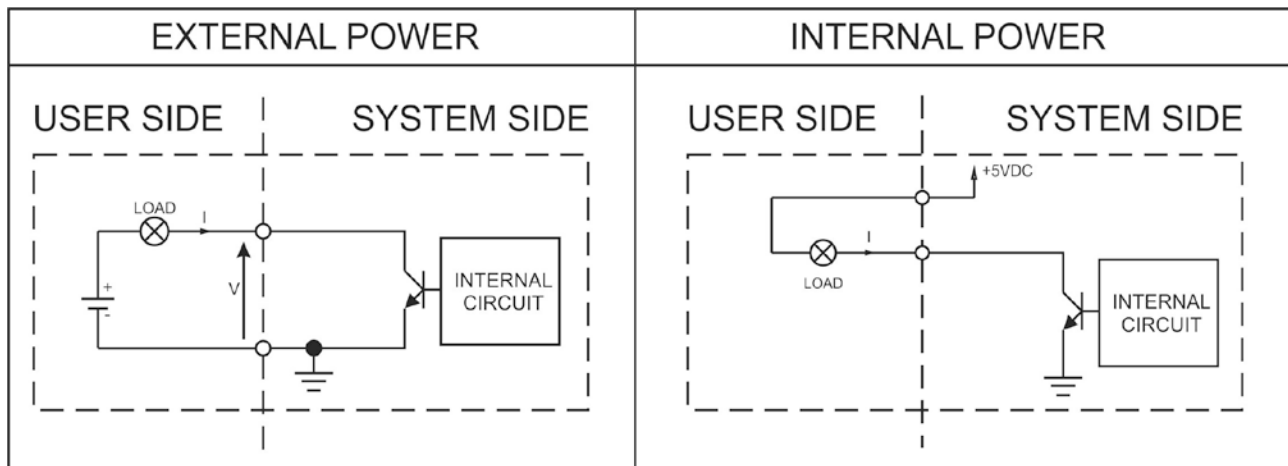
## 2.6 INPUT/OUTPUT SIGNAL SPECIFICATIONS

### DIGITAL INPUT:



Type	Digital Isolator		
$V_{\max}$	7.0 V DC		
$I_{\max}$	1 mA @ 5 V DC		
Pulse Width	$\geq 1$ ms (debounce)		
	<b>MIN</b>	<b>TYP</b>	<b>MAX</b>
INPUT Logic LOW	0.0 V DC	0.0 V DC	1.0 V DC
INPUT Logic HIGH	3.5 V DC	5.0 V DC	7.0 V DC

### DIGITAL OUTPUT:



Type	Darlington open collector low-side
$V_{\max}$	50 V DC
$I_{\max}$	150 mA
$V_{\text{saturation}}$	$< 0.5$ V DC
Leakage current	$< 5$ $\mu$ A
OUTPUT State ON	$V \leq 0.3$ V DC; $I \leq 150$ mA
OUTPUT State OFF	$V \leq 5.0$ V DC; $I \leq 5$ $\mu$ A

2.7 CONNECTION EXAMPLE

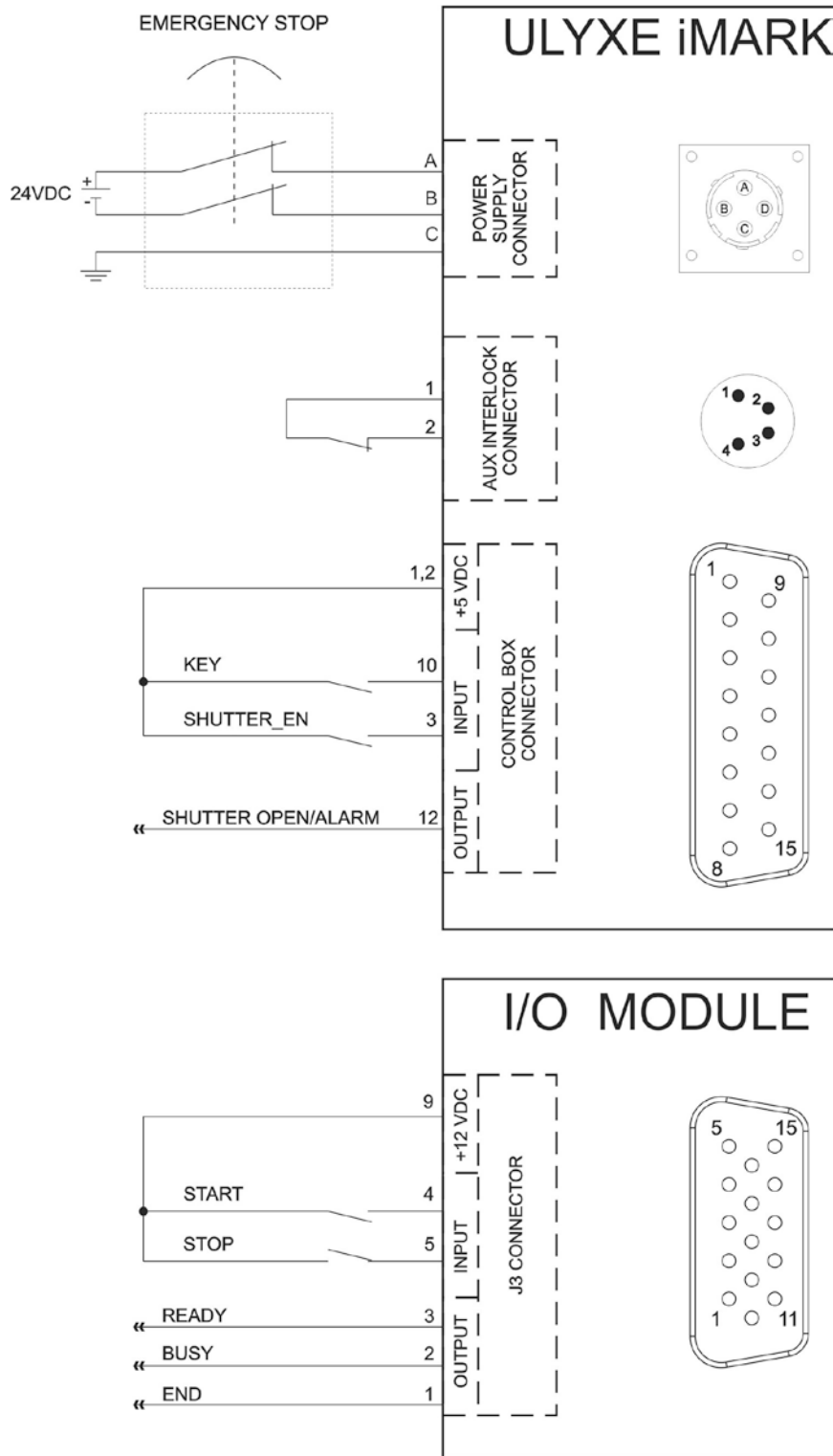


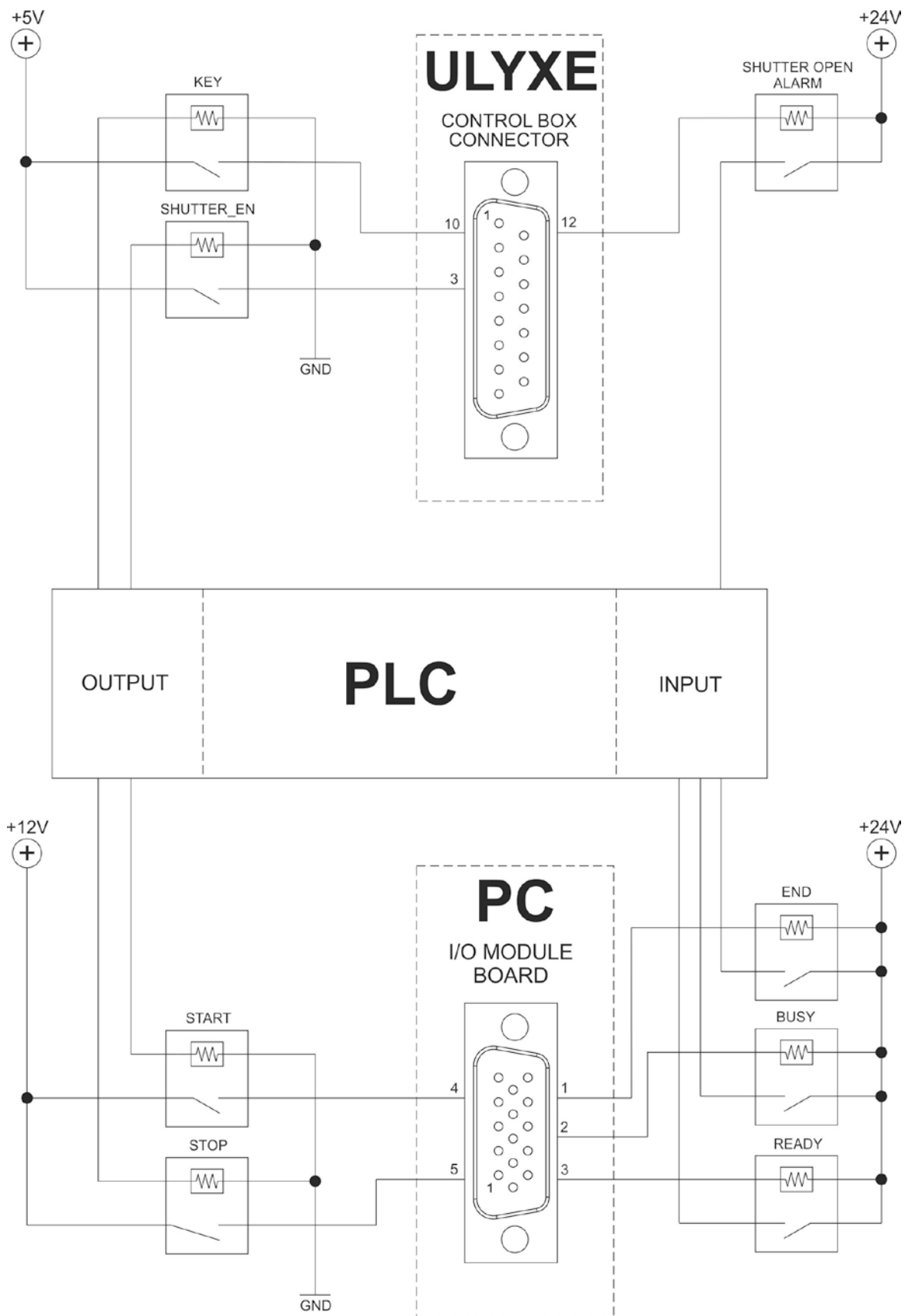
Figure 21: Connection example.



**WARNING!**

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

**EXAMPLE OF CONNECTION TO PLC**



**Figure 22: Example of connection to PLC.**

### 3. INSTALLATION AND SET UP

#### 3.1 LIGHTER SUITE INSTALLATION

Lighter Suite software need to be installed on a PC that will be used with the marking system. To be able to install and operate with Lighter Suite on PC following minimal requirements are needed:

<b>Processor</b>	32 bit (x86) processor or 64 bit (x64) at 1GHz or highest
<b>Operative System</b>	Windows® XP SP3 Professional; Windows® Vista Business, Enterprise or Ultimate; Windows® 7 Professional or Enterprise, Windows® 8 Pro or Enterprise, Windows® 10 Pro or Enterprise
<b>RAM Memory</b>	1 Gb (32 bit) or 2 Gb (64 bit)
<b>Hard Disk</b>	1 Gb of free space on hard disk (32 bit) or 2 GB (64 bit)
<b>Graphic card</b>	Minimal resolution 800 x 600 (1280 x 1024 recommended)
<b>USB</b>	USB 2.0
<b>Furthers</b>	RS232 serial port, 2x free slot PCI-E

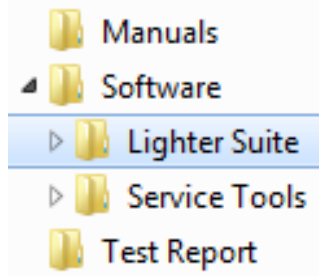


**NOTE:**

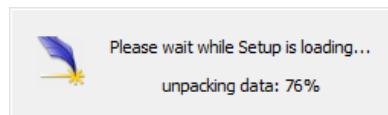
Administrator rights are required for Microsoft® Windows® 7/8/10.

Lighter Suite installer executable file is located on USB key supplied with the marking system. Proceed following below instructions:

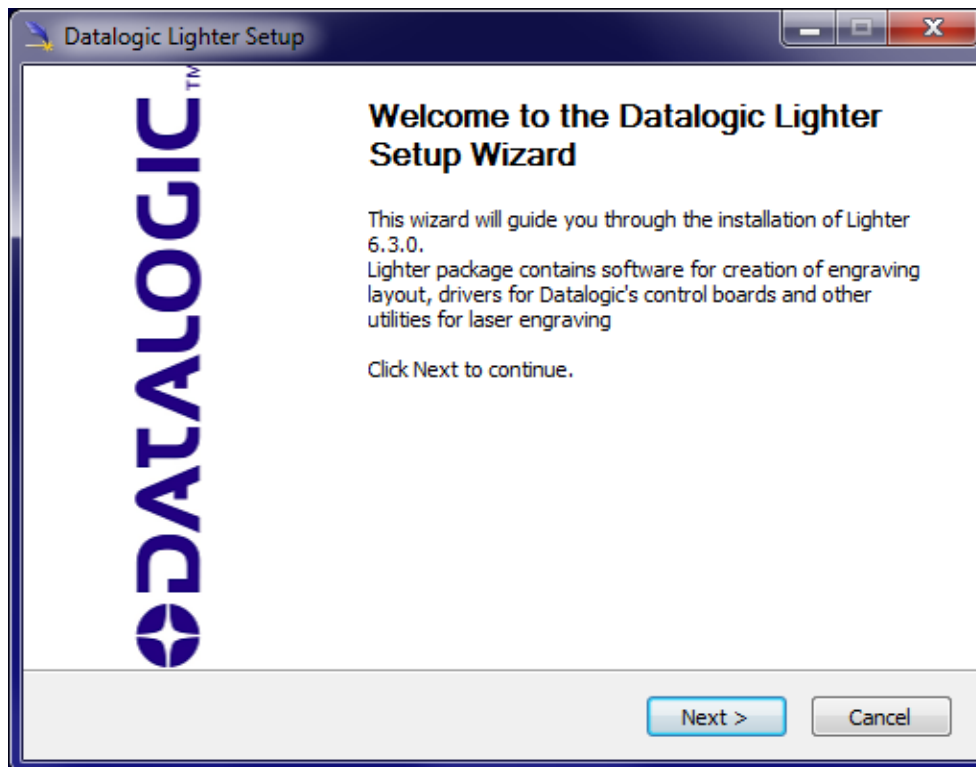
- 1) Insert USB key on the PC that will be used to drive the Ulyxe iMark™;
- 2) Run **Lighter Suite** executable installer located on the USB pen drive:



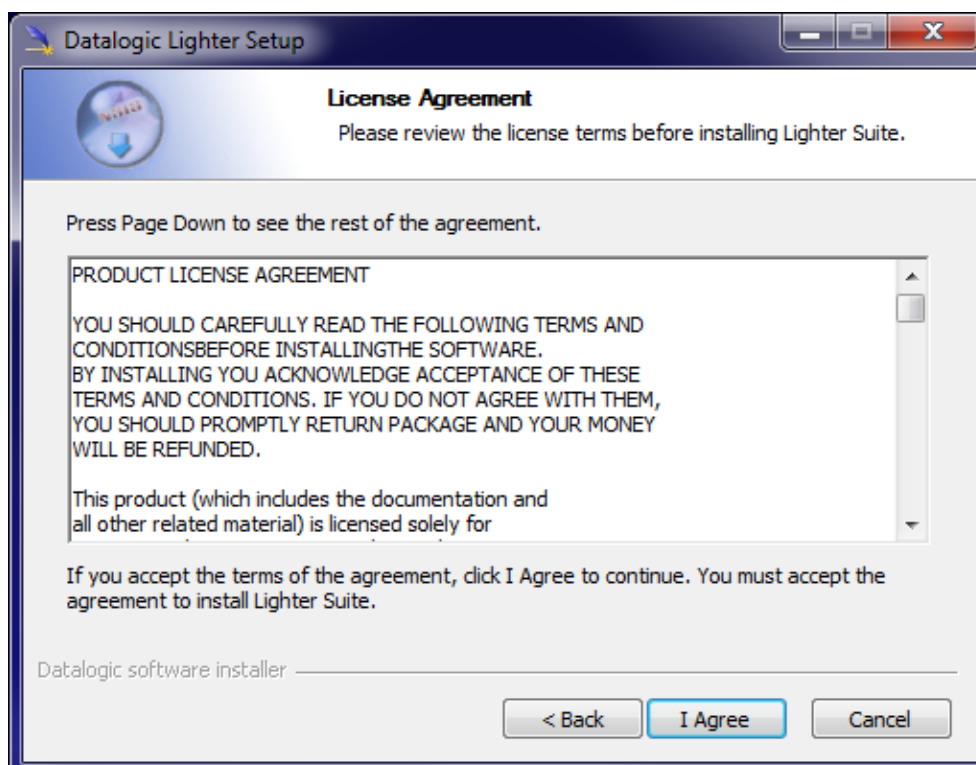
- 3) Wait while Setup is loading:



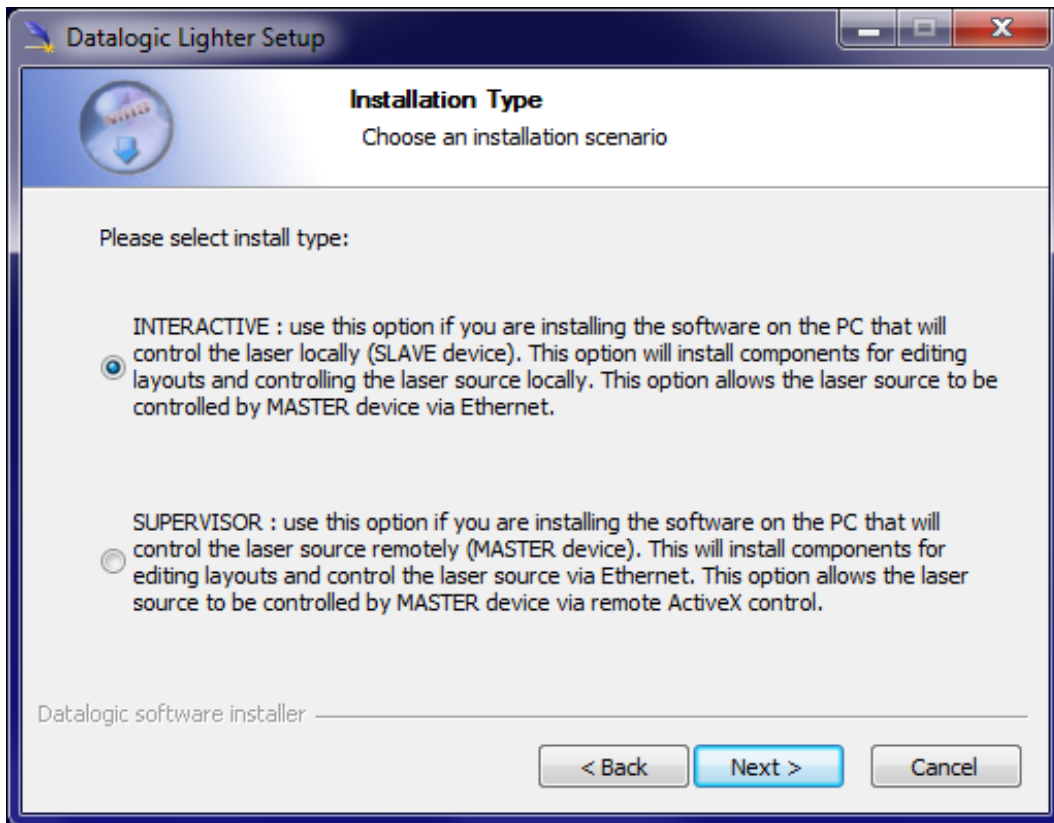
- 4) Press **Next** to continue:



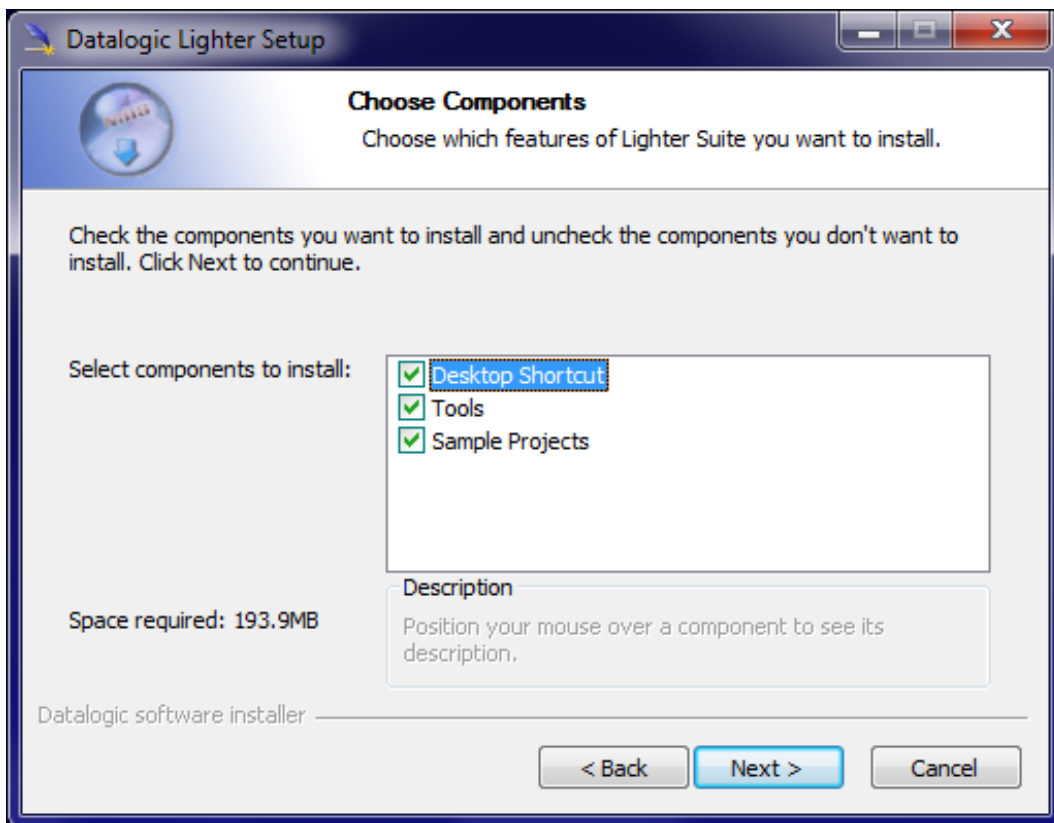
- 5) Press **I Agree** to accept licence agreement:



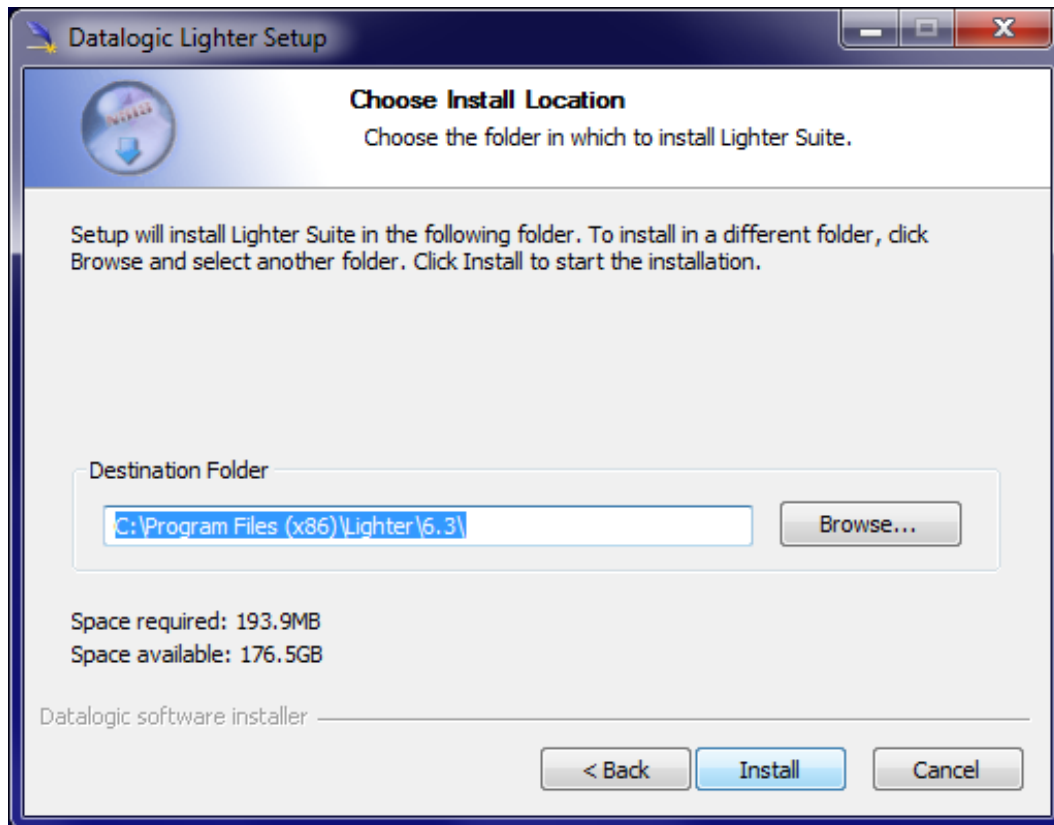
6) Select “**INTERACTIVE**” installation type press **Next** to continue:



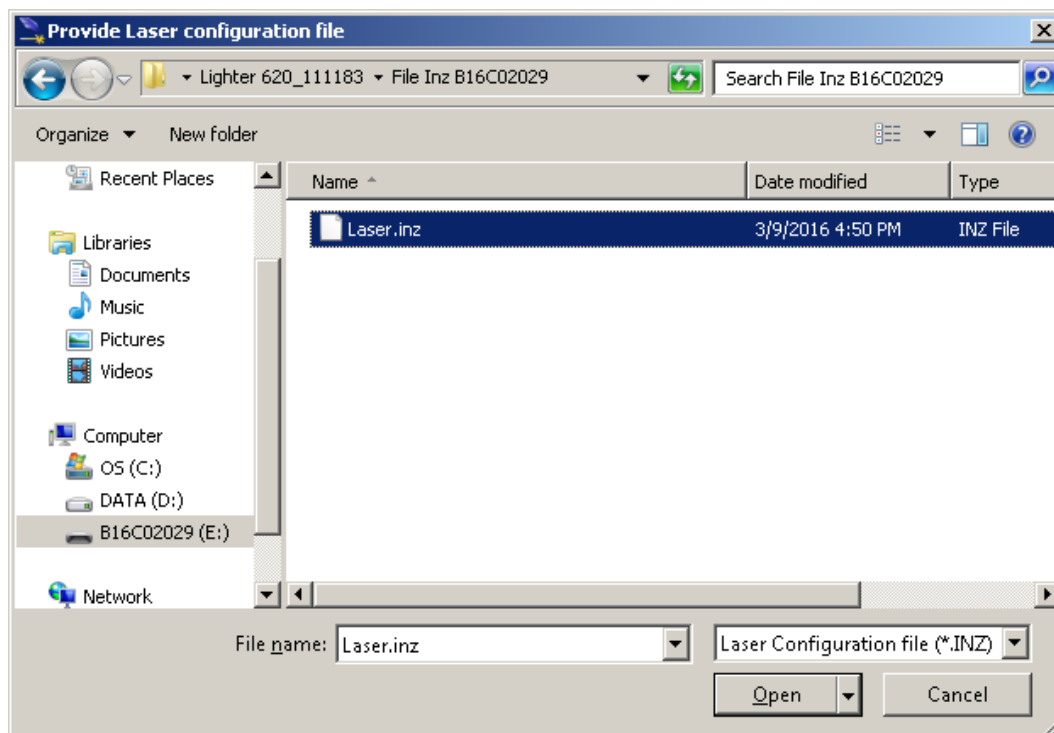
7) Select the components to install and press **Next** to continue:



- 8) Choose the destination folder and press **Install** to continue:

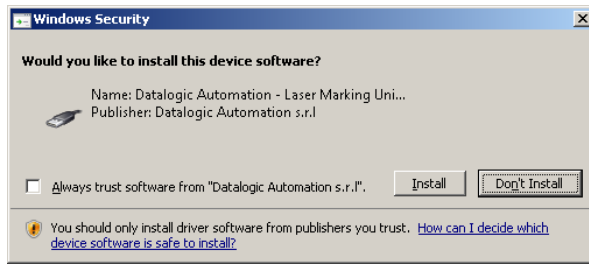


- 9) Provide laser configuration file located on USB pen drive supplied with equipment and press **Open** to continue:

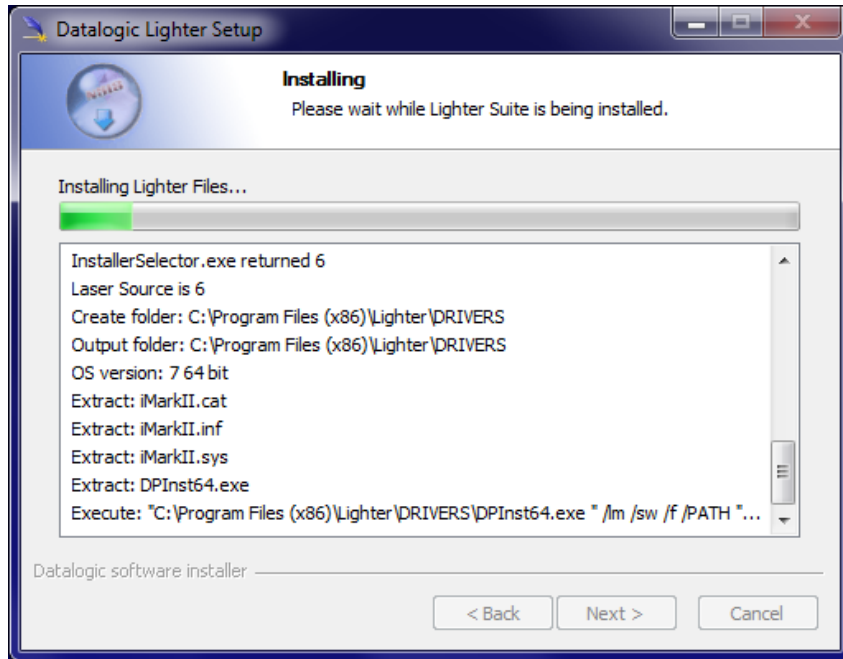




10) Microsoft® Windows® will ask you to install the device driver; press **Install** to continue:



11) Wait while Lighter Suite is installing:



12) Press **Finish** to complete the installation:



## 3.2 BOARD HARDWARE INSTALLATION



### WARNING:

iMark PCI-E board absorbs 150W max. **450W** power supplier is needed.



### NOTE:

iMark PCI-E board cannot be installed on system equipped with Windows® 9X/ME/NT/2000 operative systems.

### 3.2.1 iMARK BOARD

iMark board is the electronic which control the marking system and the related I/O signals. It must be inserted in a PCI-E slot of a standard PC.

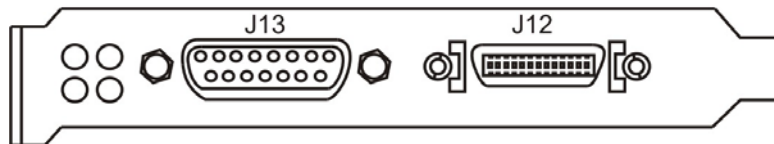


Figure 23: iMark board.

### BOARD ASSEMBLING

- Ensure the PC main switch is in OFF position.
- Disconnect PC power supply plug.
- Remove screws or holders holding the PC cover.
- Remove carefully the PC cover to access the motherboard.
- Locate the two housing on PCI-E bus to place the boards.



### WARNING!

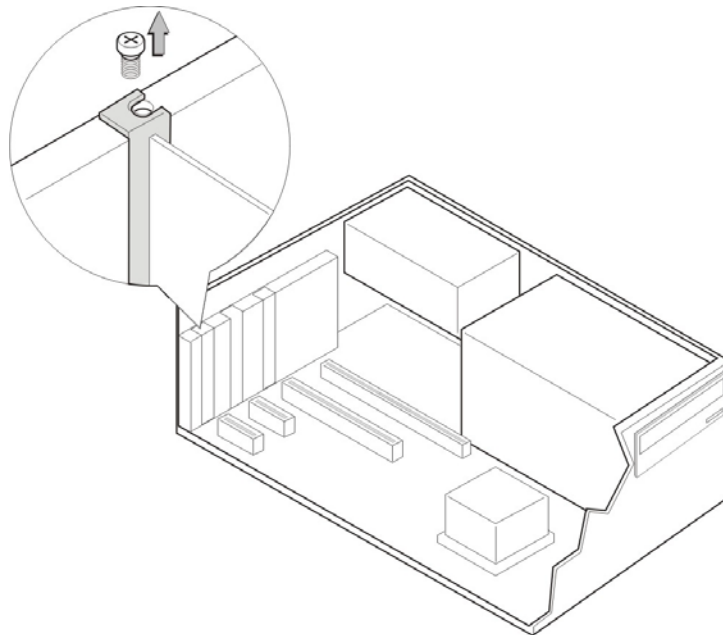
The PCI-E bus empty slots must be two at least, one is for the iMark boards and the other is for I/O.



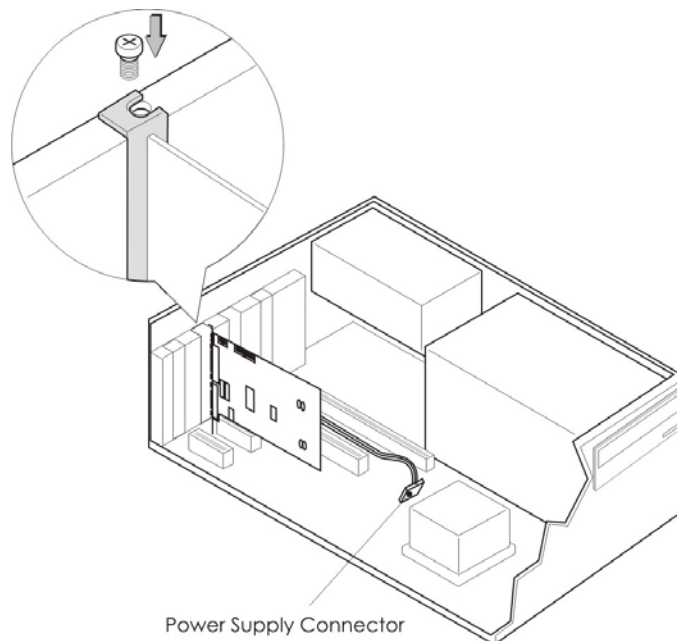
### WARNING!

iMark Board **must be installed** on PCI-E bus only (not on PCI).

- Remove the metal cover from the chosen PCI-E slot as shown in the figure below. Often the metal plate cap is replaced by a plate stripe. If this is the case, remove it smoothly doing some rotations forwards and backwards until it will be removed.



- Holding the iMark board with two hand, align the board PCI-E connector with the PCI-E slot on the motherboard.
- Press the board gently into the PCI-E slot.
- Fix the board with the screw as shows in the figure below.



**WARNING!**

Power Supply Connector (IDE or SATA) must be connected to power supply.



**WARNING!**

Wrong board connection can hinder the PC or damage the inner hardware.

### PCI-E iMark Board Dimensions

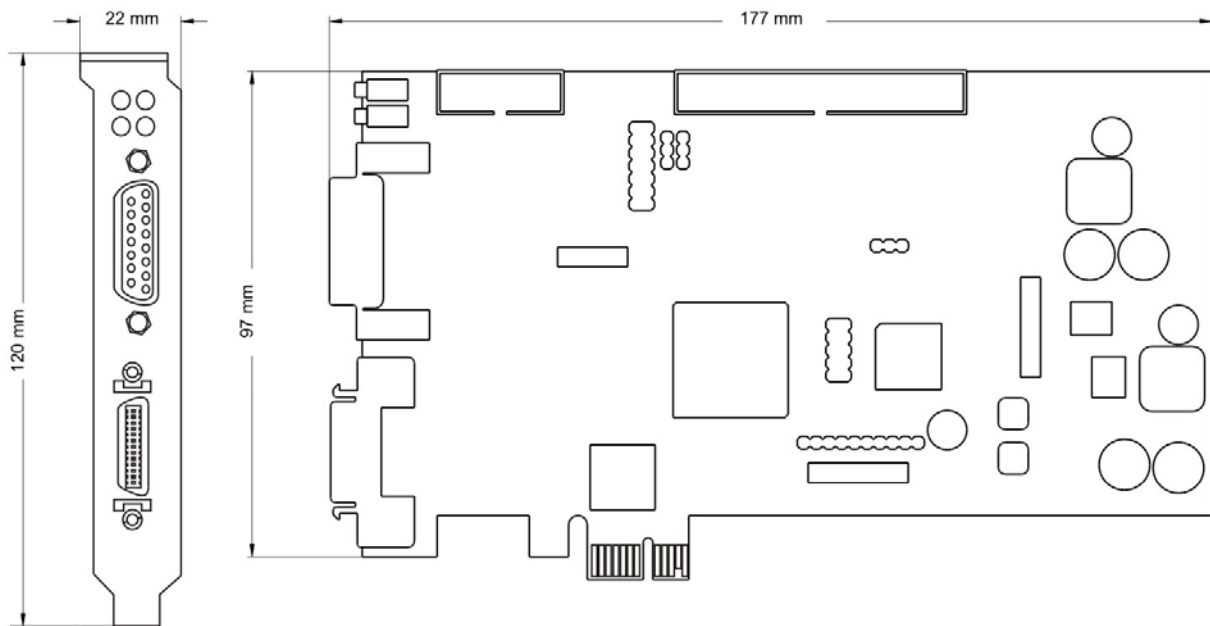


Figure 24: iMark board dimensions.

### STATUS LED

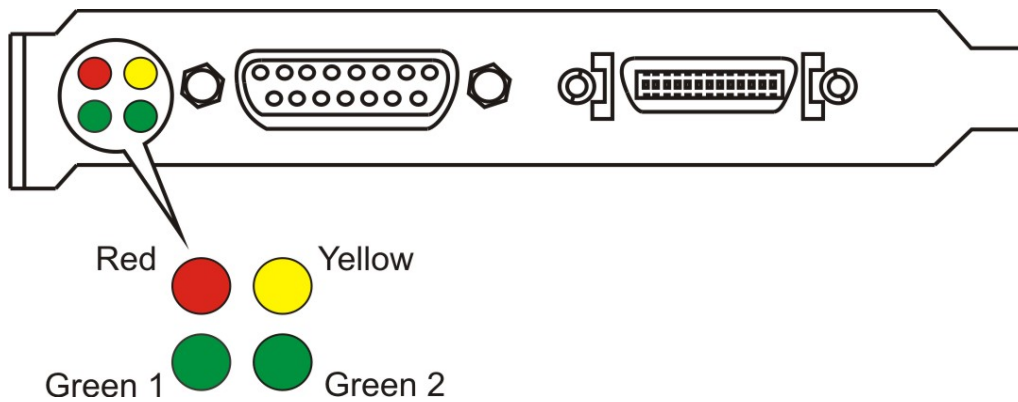


Figure 25: Status LED.

Status LED have these meaning:

Status	Green LED 1	Red LED	Yellow LED	Green LED 2
Run	OFF	OFF	OFF	Blinking
iMark Ready	ON	OFF	OFF	Blinking
iMark Busy	OFF	ON	OFF	Blinking
iMark Error	OFF	ON	Blinking	Blinking
Fatal Error	Blinking	Blinking	Blinking	OFF

### 3.2.2 I/O MODULE BOARD

This module has additional I/O signals that can be software controlled and is capable of moving up to four mechanical axes. It must be connected to iMark board.

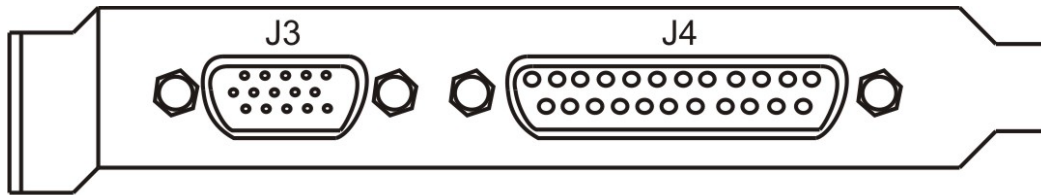
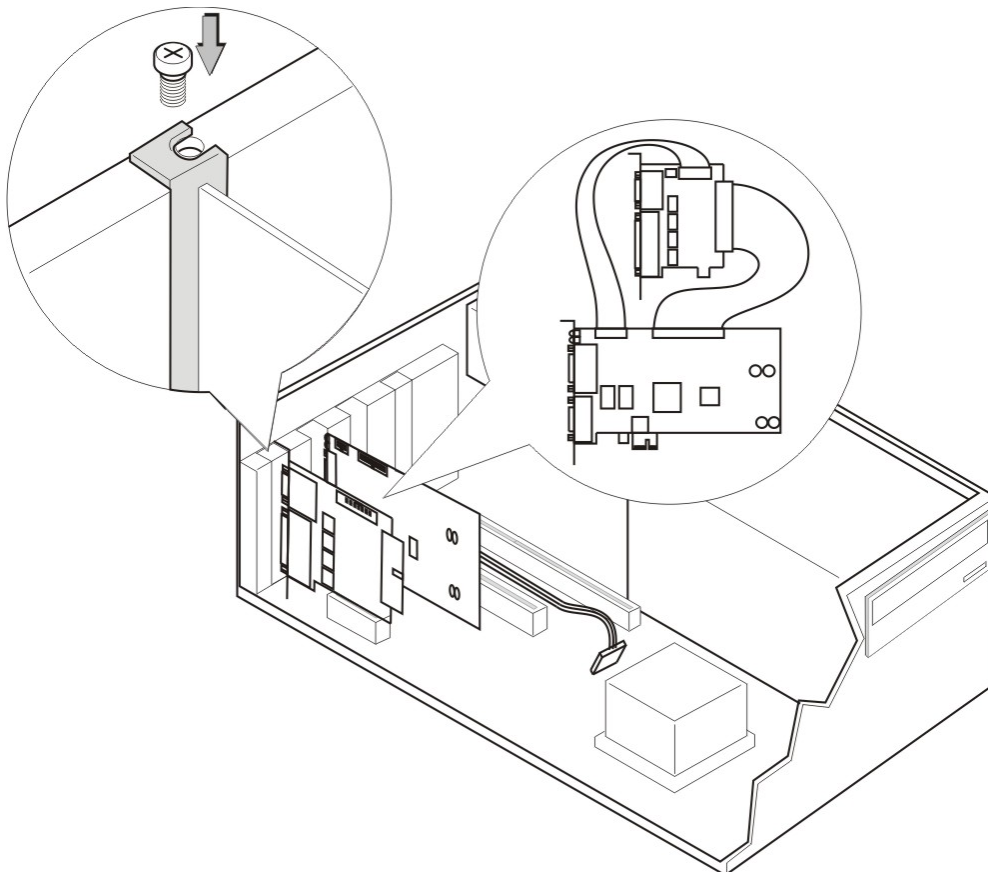


Figure 26: I/O module board.

- Connect the flat cables on J14 and J15 iMark board.
- Remove the metal cover from the chosen PCI-E slot. Often the metal plate cap is replaced by a plate stripe. If this is the case, remove it smoothly doing some rotations forwards and backwards until it will be removed.
- Align the connector of the board to the one of the mother board and press smoothly, avoiding lateral movements, until the board will be fixed in its lodging.
- Fix the metal plate of the board with the screw that you have removed before.
- Connect the flat cable on J3 and J4 of I/O module board.



- Close the PC putting on its cover.

### 3.3 CONNECTIONS

This section of the manual describes the marking system connections. Carry out the connecting operations as described below.



#### WARNING!

Connect the marking system to other parts **WITHOUT** voltage in order to avoid risks for the operator and for the marking system.

#### 3.3.1 CONTROL BOX CONNECTOR CONNECTION

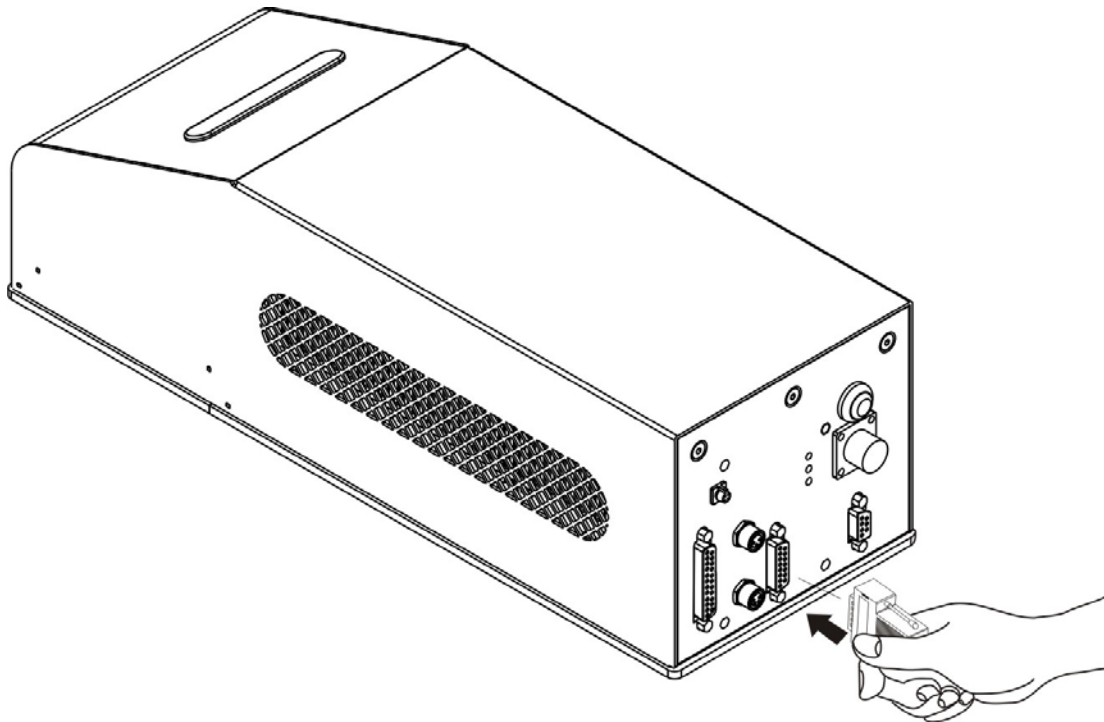


Figure 27: Connecting Control Box connector.

#### NOTE:



The Control Box connector must always be properly wired and inserted in order to use the marking system. If this connection is not present the marking system goes in error status.  
In option it is possible to use Control Box accessory (see chapter 5 – Accessories)

#### NOTE:



Refer to paragraph 2.6 for a connection example of the Control Box Connector.

### 3.3.2 AUX INTERLOCK CONNECTION

Plug Aux interlock connector to marking system.

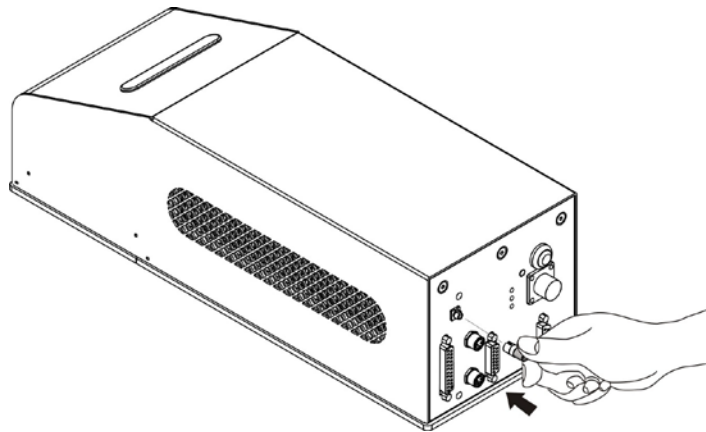


Figure 28: Connecting Aux interlock connector.



**WARNING!**

If the Aux interlock gold connector is used, the marking system is in **DANGEROUS** condition (MUTING DEVICE).



**NOTE:**

The Aux interlock connector must always be properly wired and inserted in order to use the marking system. The absence of such connector locks the marking system.

### 3.3.3 POWER SUPPLY CABLE 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.

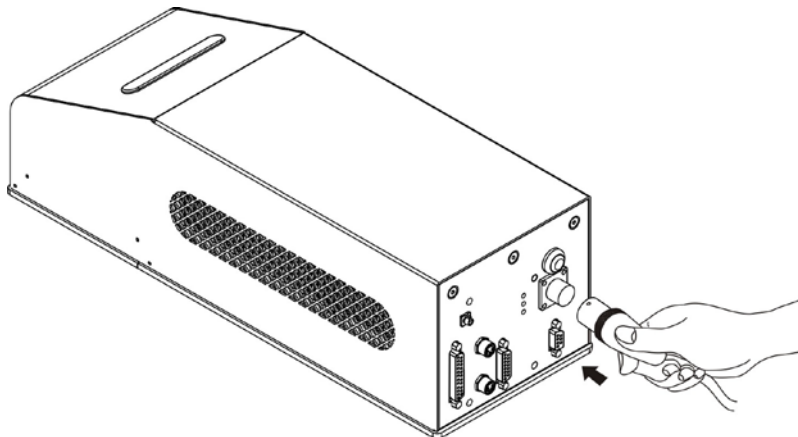


Figure 29: Power Supply cable plug in.



**WARNING!**

Ulyxe iMark™ needs a **safety circuit** for emergency. Consult chapter 2.6 for more details.



**WARNING!**

Ulyxe iMark™ needs a 24V DC stabilized supply voltage 13A max current absorption. It is suggested to use **BOXED POWER SUPPLY KIT** option. See chapter 5.2 for further information.

### 3.3.4 PC CONNECTION

Connect iMark PC adapter to iMark board J13 connector.

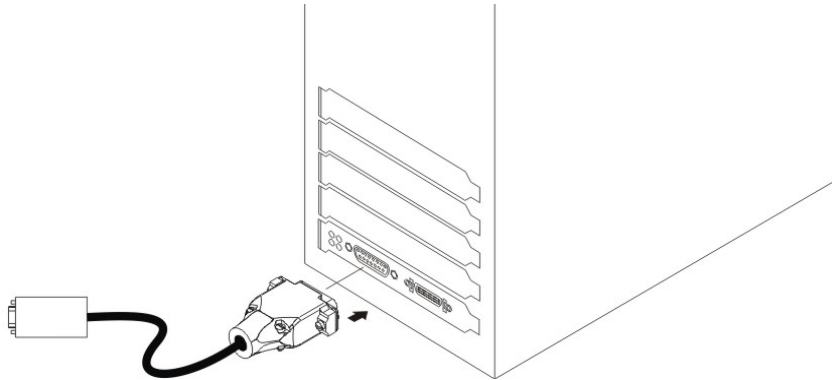


Figure 30: PC adapter connection.

Connect PC cable to Ulyxe iMark™ PC connector.

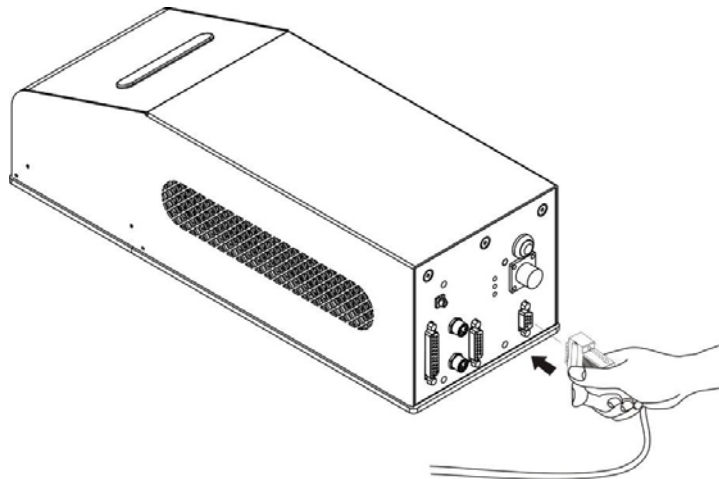


Figure 31: PC cable connection.

Connect PC cable to iMark PC adapter.

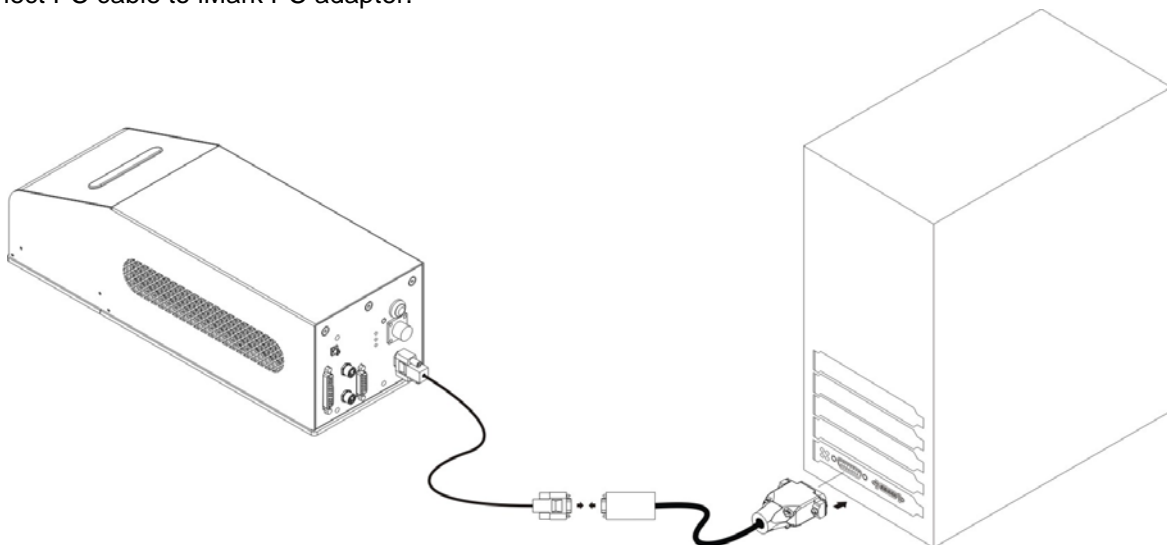


Figure 32: connect PC cable to iMark PC adapter.



### 3.3.5 GALVO CONNECTION

Connect iMark Galvo adapter to iMark board J12 connector.

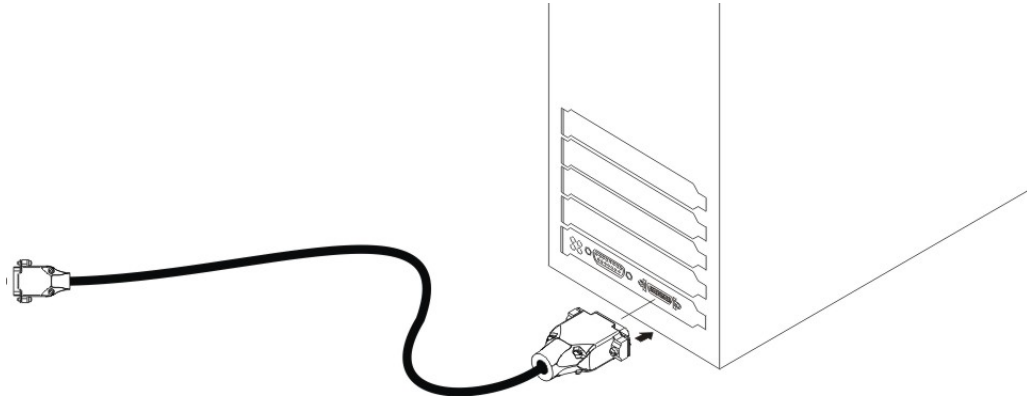


Figure 33: Galvo adapter connection.

Connect Galvo cable to Ulyxe iMark™ Galvo connector.

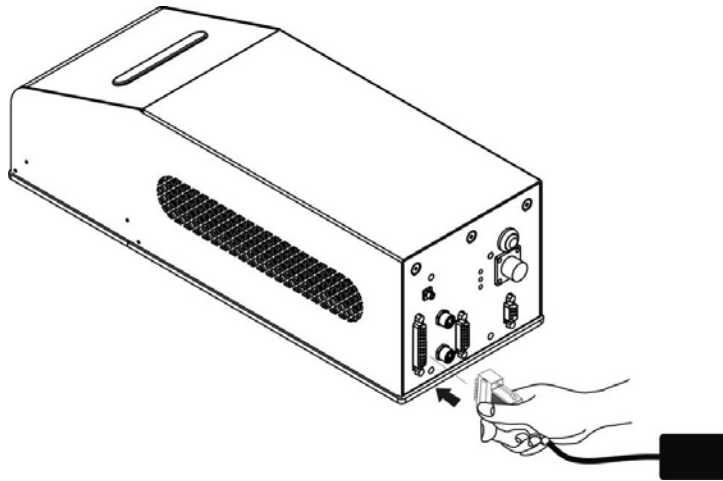


Figure 34: Galvo cable connection.

Connect Galvo cable to iMark Galvo adapter.

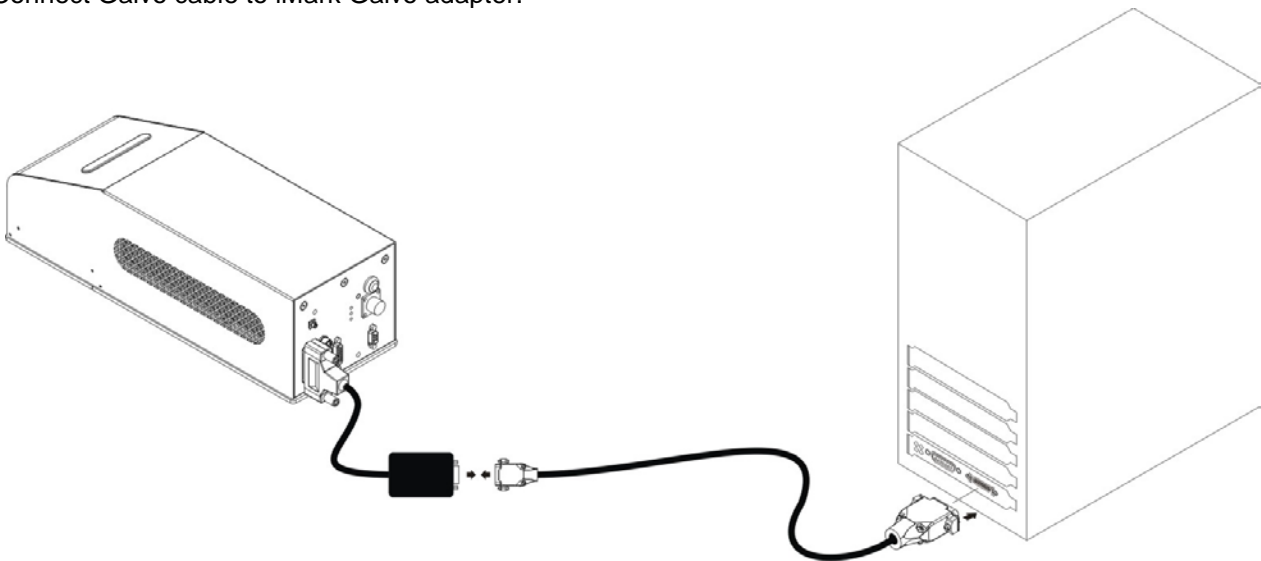


Figure 35: connect Galvo cable to iMark Galvo adapter.

### 3.3.6 F-THETA LENS PROTECTION CAP REMOVAL

Remove the F-Theta Lens protection cap before marking operation.

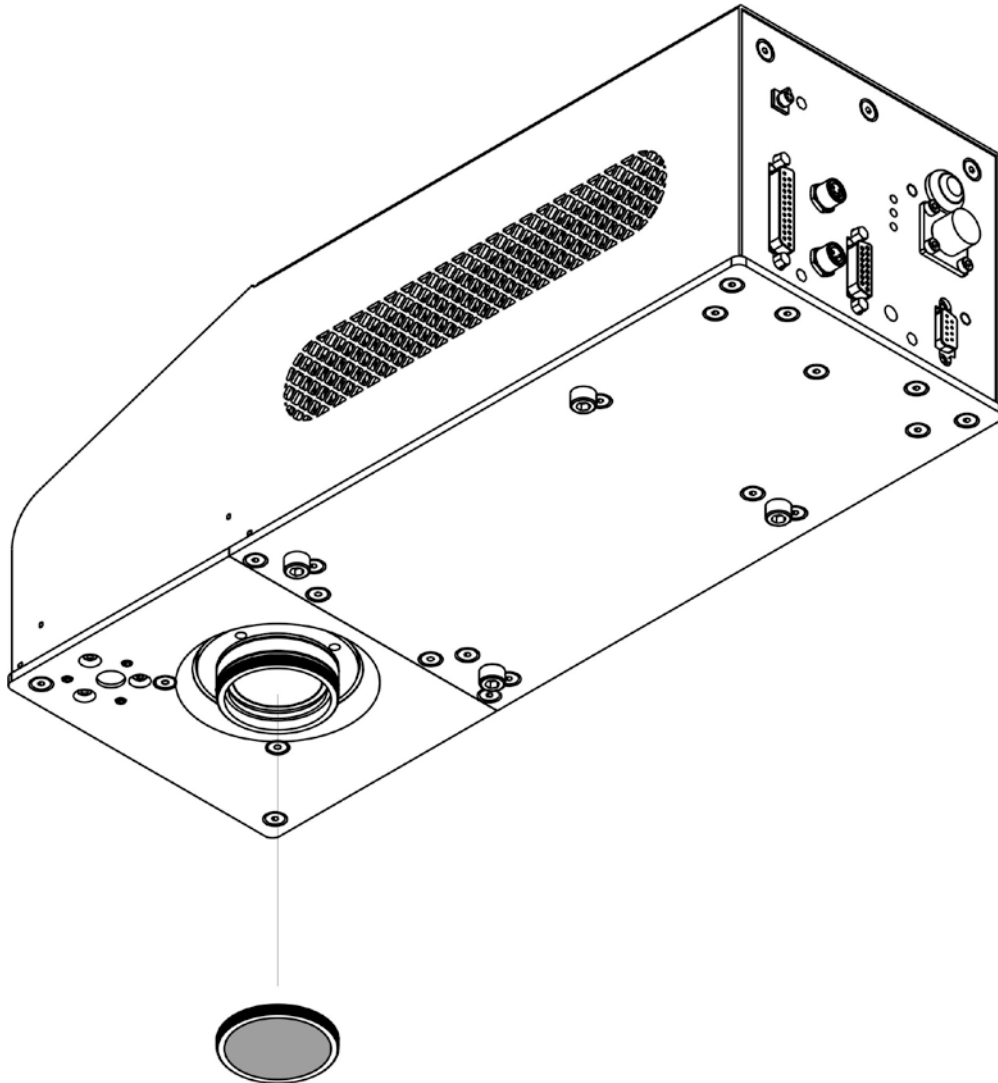


Figure 36: F-Theta Lens protection cap removal.



---

**WARNING!**

Marking with the lens protection cap could result in damage to the lens.

---

## 4. USE AND OPERATIONS

### 4.1 TURNING ON SEQUENCE

Before turning on the Ulyxe iMark™, be sure that the marking system is connected as previously described. Check presence of voltage power supply connector, Aux interlock connector, Control Box connector and signals and head cables. Below there are described windows showed from remote display (optional) also. Proceed as follow:

SIGNAL	STATUS
KEY	OFF
SHUTTER EN	OFF

1<sup>ST</sup>: turn on the main switch in the back of the marking system:

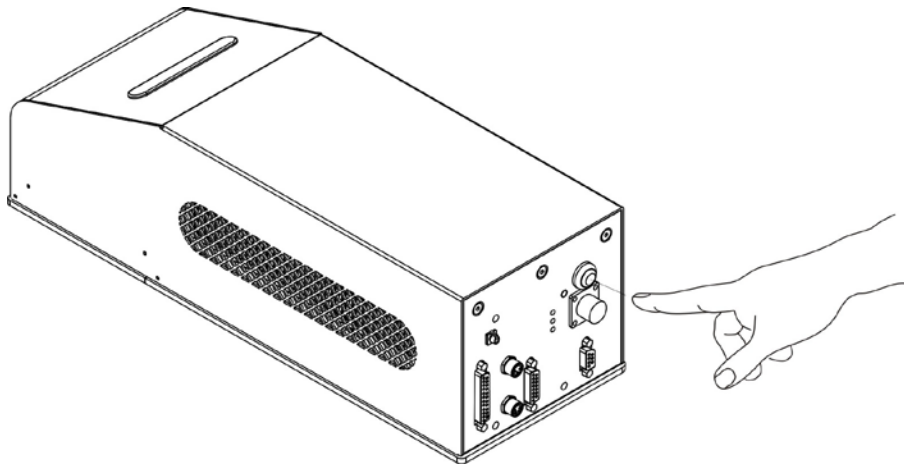


Figure 37: Power on.

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:

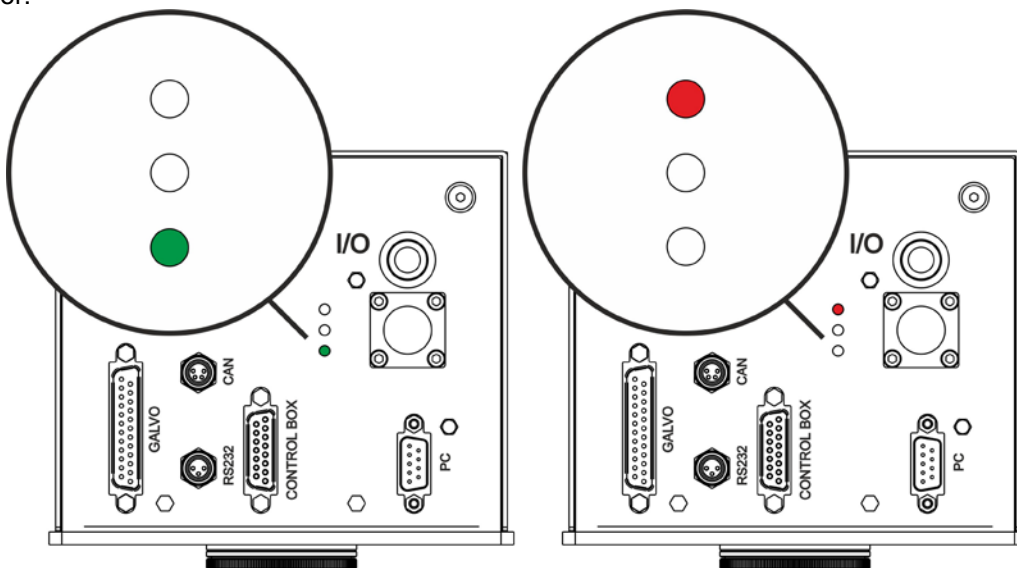


Figure 38: Green and red LED on back panel.

The fans cooling system will be powered on and it will be showed LCD firmware version on remote display temporarily (if present), then LED bar will be lighted on in orange colour until system power on time will be not completed:

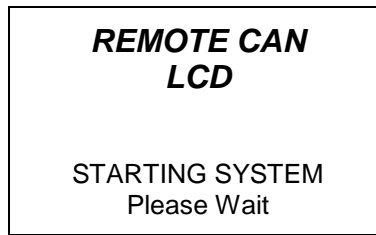


Figure 39: Starting system.

Immediately after LED bar is lighted on to green colour and Ulyxe iMark™ remains in waiting for key start mode and power module is off:

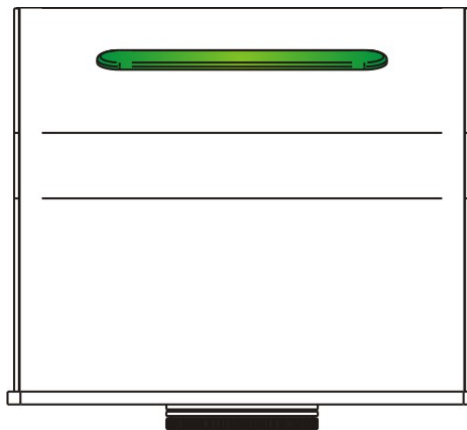


Figure 40: LED Bar green: Marking system off



Figure 41: Waiting for key start.

**2<sup>ND</sup> step:** activate "KEY" signal to start Ulyxe iMark™ and wait for system warm up. During this operation LED bar will come green blinking.

SIGNAL	STATUS
KEY	ON
SHUTTER EN	OFF

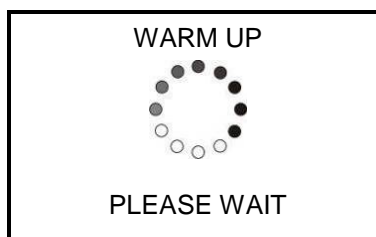


Figure 42: Waiting for warm up.

Once warm up is completed the LED bar comes steady orange and the marking system is ready to use:

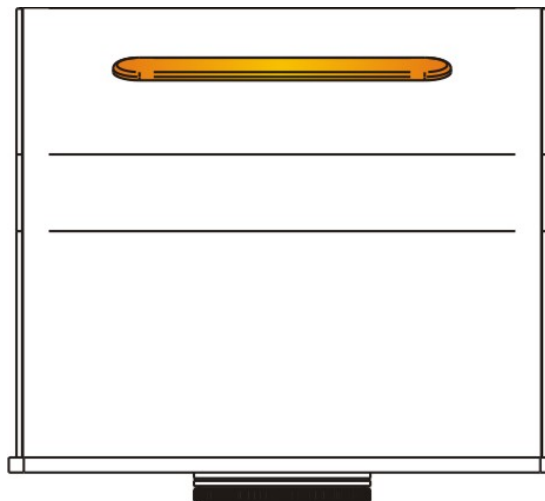


Figure 43: Orange LED Bar: stand-by system.

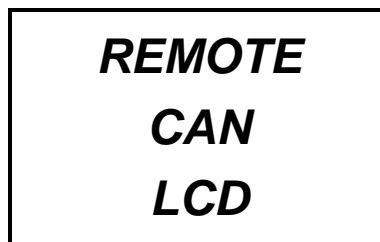


Figure 44: Ulyxe iMark™ waiting *SHUTTER EN* command.



**NOTE:**

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



**NOTE:**

Ulyxe iMark™ is ready for operation. See chapter 5.3 for Touch Screen display functions.



**NOTE:**

For information about use of **Lighte Suite**, see related manual.

**3<sup>RD</sup> step:** activate “*SHUTTER EN*” signal to open mechanical Shutter. LED bar comes steady red. “*ALARM*” signal will be active and yellow LED indicator on back panel will light on.

SIGNAL	STATUS
KEY	ON
SHUTTER EN	ON



**WARNING!**

The marking system is **READY** to mark!

**WARNING!**

Due to not availability to understand when Ulyxe iMark™ is marking or not remote LCD display can't 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.

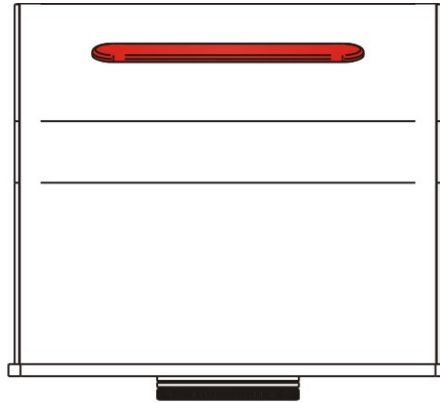


Figure 45: Red LED bar: system with Shutter opened.

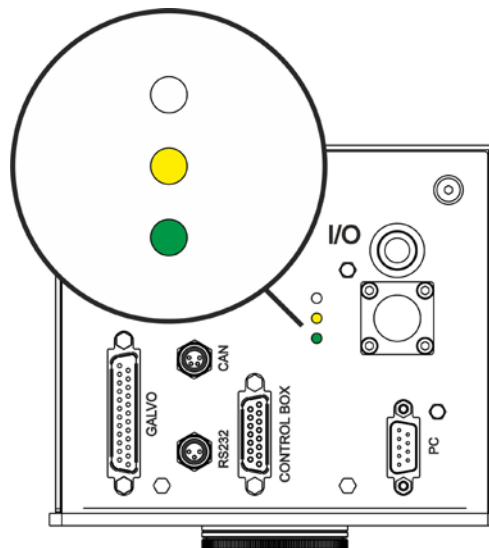


Figure 46: Yellow LED indicator on back panel.

If marking operation starts LED bar stay steady red and on remote display will be showed laser emission status:

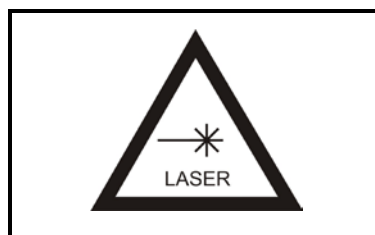


Figure 47: Laser emission.

## 5. ACCESSORIES

The accessories listed here below are described for information purposes only, and are not necessarily included in the packaging. The minimum contents of the packaging include the main hardware, cables and keys. For additional information, please refer to paragraph 1.2.

### 5.1 CONTROL BOX

Ulyxe iMark™ control and command device to manage laser power on and to open Shutter.

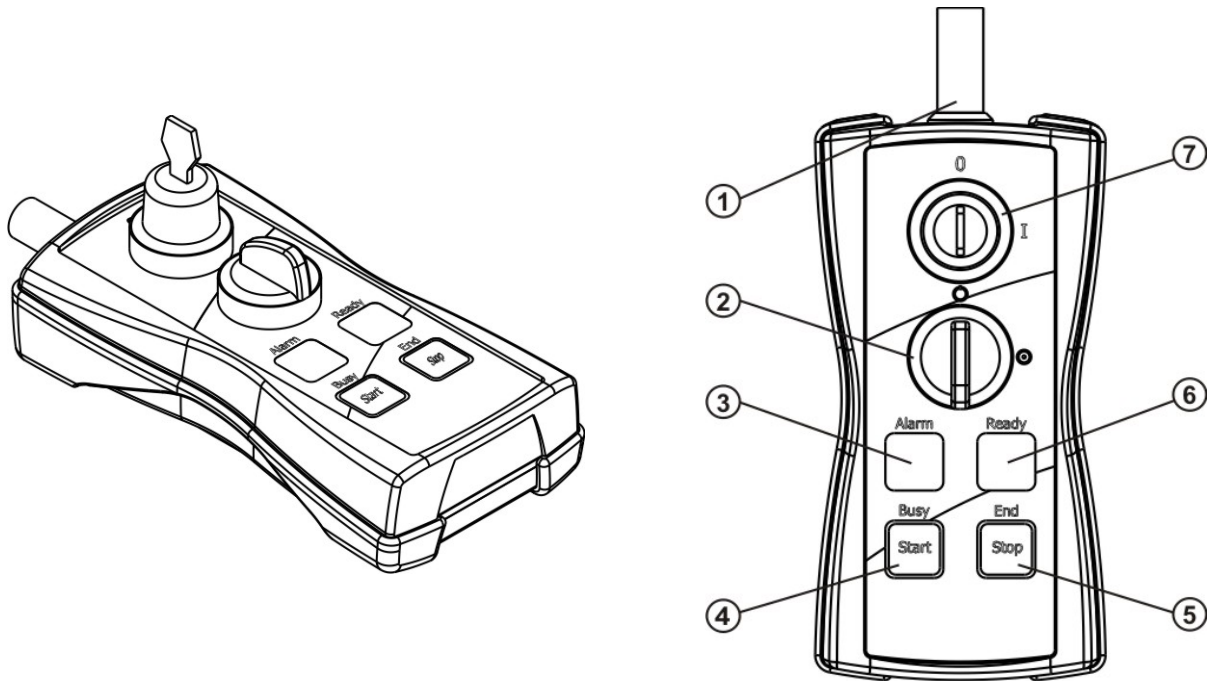


Figure 48: Control Box (Ordering no: 985330001).

1	<b>I/O connection</b> Connection to Ulyxe™ Control Box connector
2	<b>SHUTTER ENABLE</b> Selector switch with LED indicator to open Shutter
3	<b>ALARM LED indicator</b> LED indicator for system in “READY” state
4	<b>START marking / BUSY LED indicator</b> NOT AVAILABLE
5	<b>STOP marking / END LED indicator</b> NOT AVAILABLE
6	<b>Ready LED indicator READY</b> NOT AVAILABLE
7	<b>KEY</b> Selector “KEY” to enable the system



**WARNING!**

If the Control Box is used, the marking system works in **DANGEROUS** condition.

## 5.2 BOXED POWER SUPPLY KIT

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

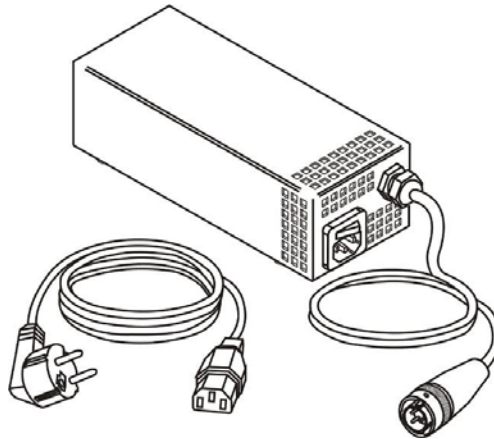


Figure 49: Power supply Ulyxe™ family (Ordering no: 985340000).

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

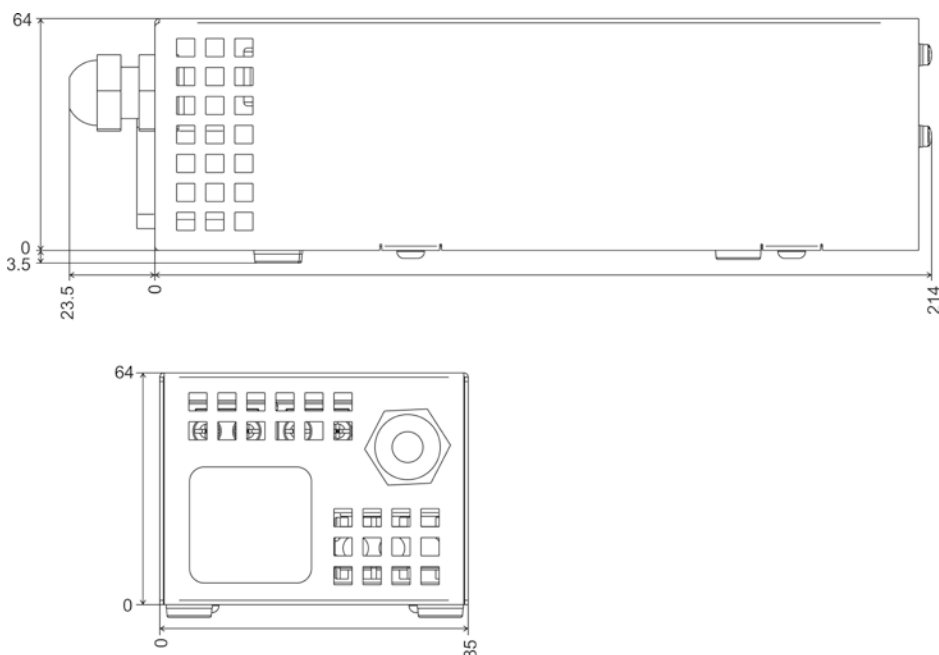


Figure 50: Power supply overall dimensions.



### 5.3 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.

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

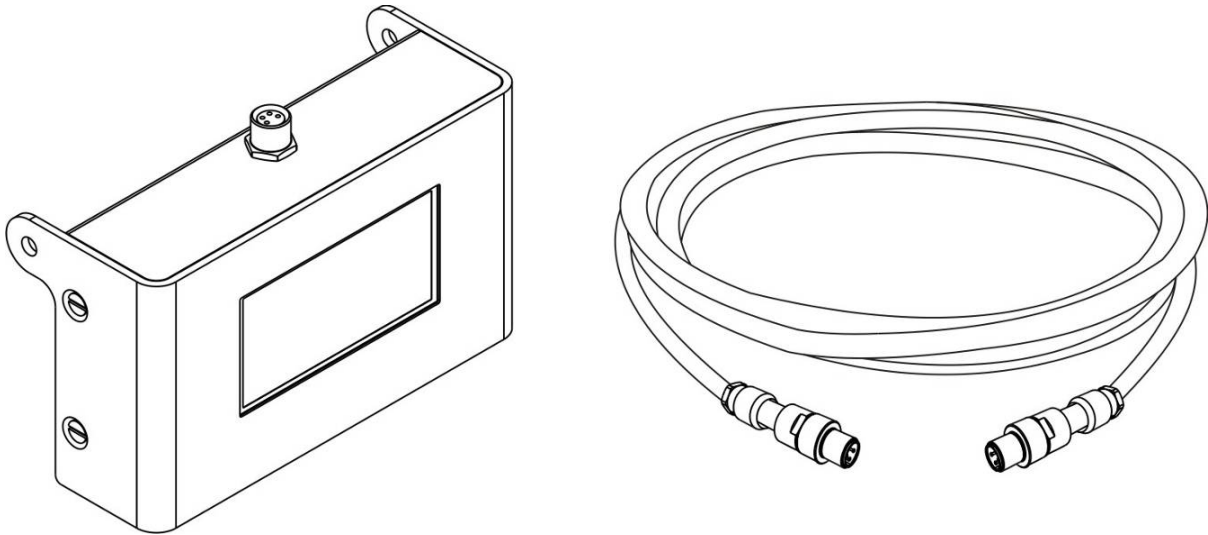


Figure 51: Remote CAN display and cable.

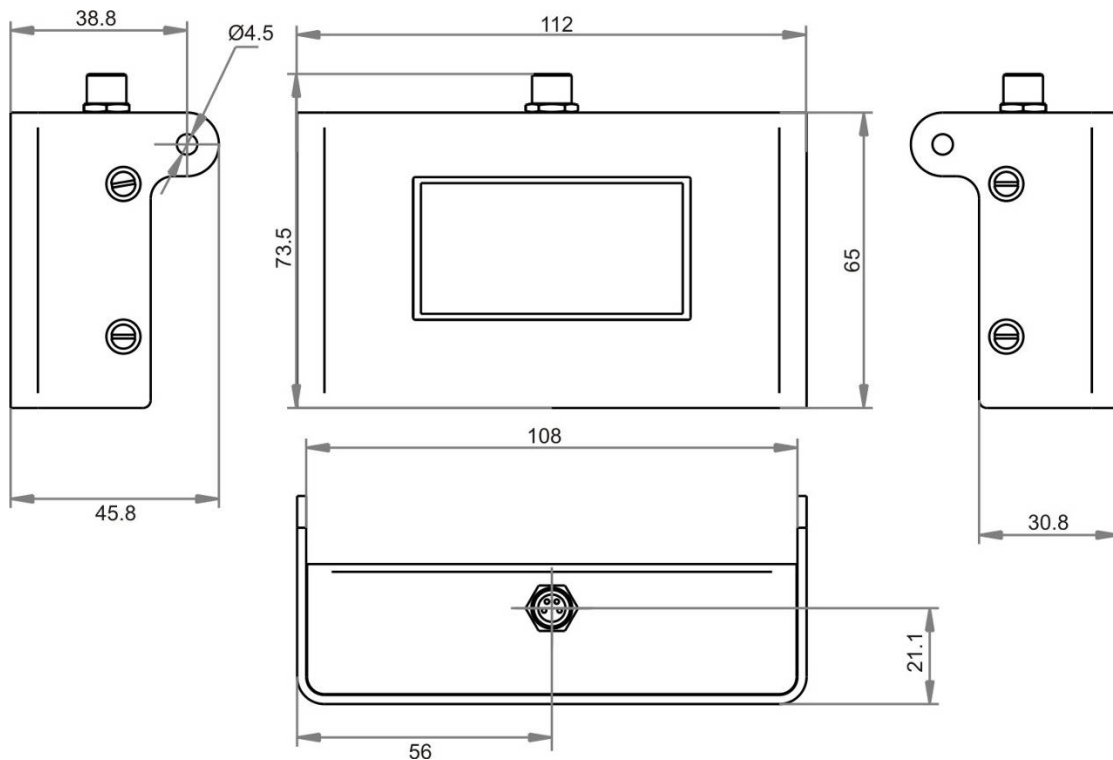


Figure 52: Remote CAN display overall dimensions.

Selection areas Touch Screen.

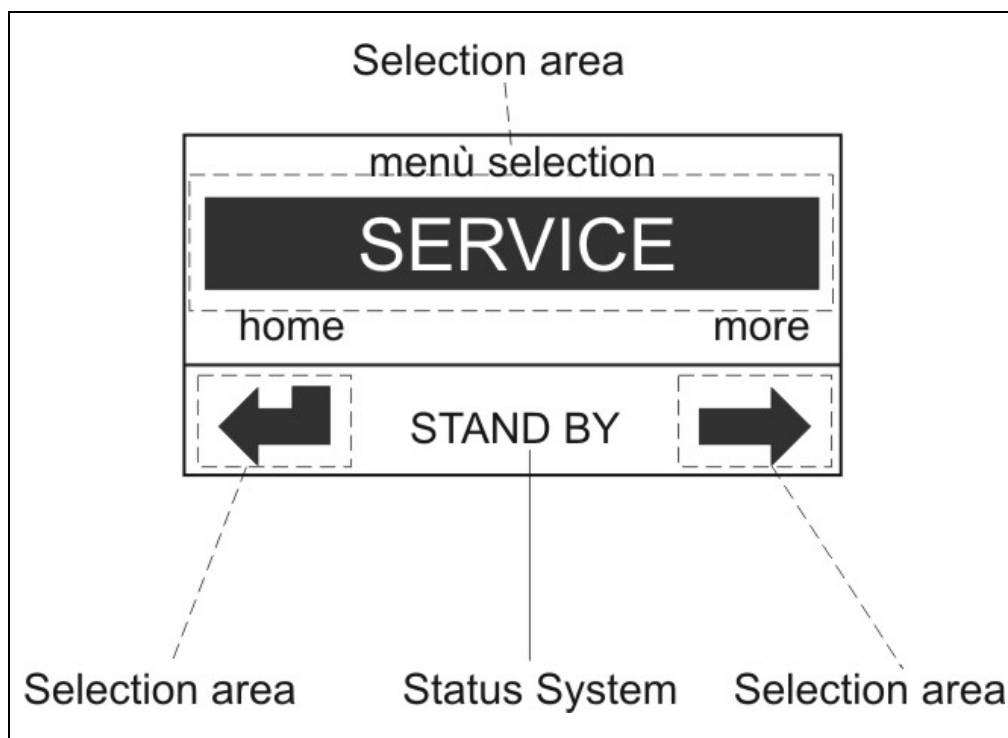


Figure 53: Selection areas Touch Screen.

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.

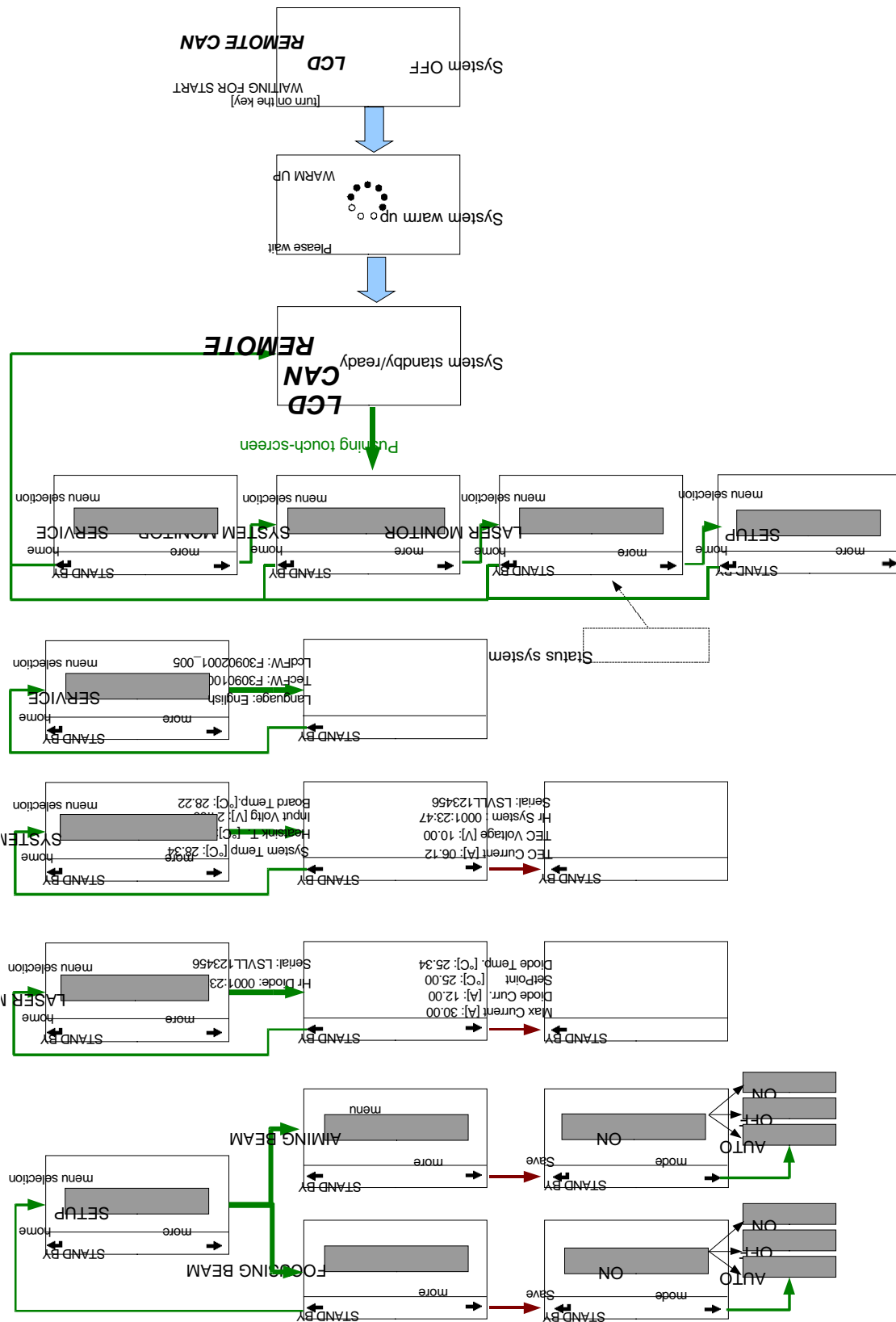
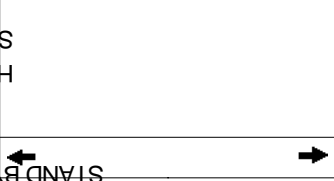
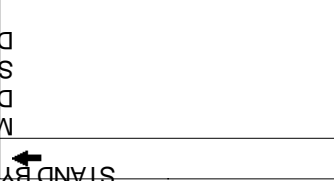
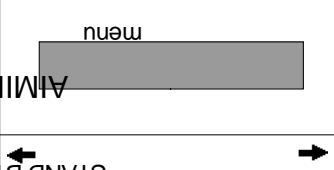
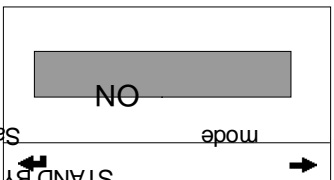
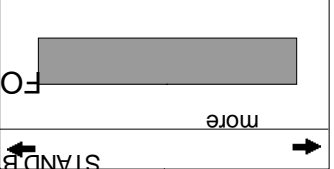


Figure 54: Display Touch Screen menu.

	<p>Selection menu to display general SERVICE.</p> <ul style="list-style-type: none"> <li>• Press the middle area to select it and display the information.</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to access the next selection menu.</li> </ul>
	<p>Selection menu to display SYSTEM MONITOR.</p> <ul style="list-style-type: none"> <li>• Press the middle area to select it and display the data.</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to access the next selection menu.</li> </ul>
	<p>Selection menu to display LASER MONITOR.</p> <ul style="list-style-type: none"> <li>• Press the middle area to select it and display the data.</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to access the next selection menu.</li> </ul>
	<p>Selection menu to display the SETUP.</p> <ul style="list-style-type: none"> <li>• Press the middle area to select it and display the settings.</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to access the next selection menu.</li> </ul>
	<p>Data contained in the SERVICE menu.</p> <ul style="list-style-type: none"> <li>• LcdFW: FW version of the LCD card.</li> <li>• TecFW: FW version of the power mainboard.</li> <li>• Language: language is set on English.</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> </ul>
	<p>Information contained in the SYSTEM MONITOR menu (1 of 2).</p> <ul style="list-style-type: none"> <li>• Board Temp. [°C]: Temperature of the mainboard for the power section.</li> <li>• Input Voltage [V]: Input power voltage measured on the mainboard.</li> <li>• Heatsink T. [°C]: Central heatsink temperature.</li> <li>• System Temp. [°C]: Environment temperature measured inside the system (at the cooling fans inlet).</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to access the following information.</li> </ul>
	<p>Information contained in the SYSTEM MONITOR menu (2 of 2).</p> <ul style="list-style-type: none"> <li>• Serial: System serial number, visible on the outside label too.</li> <li>• Hr System: Total time elapsed with system in operation [hhhh:mm:ss]</li> <li>• TEC voltage [V]: Voltage on the Peltier module</li> <li>• TEC Current [A]: Current on the Peltier module</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> </ul>

	<p>Information contained in the LASER MONITOR menu (1 of 2).</p> <ul style="list-style-type: none"> <li>• Serial: Laser Diode serial number.</li> <li>• Hr Diode: Total time elapsed with laser diode in emission [hhh:mm:ss]</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to access the following information.</li> </ul>
	<p>Information contained in the LASER MONITOR menu (2 of 2).</p> <ul style="list-style-type: none"> <li>• Diode Temp. [°C]: Temperature measured on the laser diode</li> <li>• SetPoint [°C]: Set-point temperature of the laser diode</li> <li>• Diode Current [A]: Current measured on the laser diode</li> <li>• Max current [A]: Max. admissible current on the laser diode</li> </ul> <p>Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</p>
	<p>Selection menu to set the aiming laser diode.</p> <ul style="list-style-type: none"> <li>• Press the middle area to select it and display the settings.</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to switch to the focusing diode.</li> </ul>
	<p>Selection menu to set the red diode.</p> <ul style="list-style-type: none"> <li>• Press the bottom left arrow to confirm the setting and return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to change the operating mode (ON/OFF/AUTO).</li> </ul> <p>ON: always on; OFF: always off; AUTO: on when marking system is in stand-by status.</p>
	<p>Selection menu to set the focusing diode.</p> <ul style="list-style-type: none"> <li>• Press the middle area to select it and display the settings.</li> <li>• Press the bottom left arrow to return to the main screen with the REMOTE CAN LCD logo.</li> <li>• Press the bottom right arrow to switch to the pointer diode.</li> </ul>

## 6. TECHNICAL SUPPORT

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### 6.1 SEALS

The marking 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. Breakage of these seals by a customer shall result in immediate cancellation of the warranty on the entire marking system.



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**WARNING!**

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

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**WARNING!**

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

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

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**WARNING!**

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

Datalogic shall not be held liable for work on electrically charged parts by inadequately trained personnel!

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**WARNING!**

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

Datalogic shall not be held liable for work on parts by inadequately trained personnel!

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## 6.2 MAINTENANCE

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

The maintenance activities must be done in compliance with the 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
F-Theta Scan Lens	Check / Clean	Weekly: wipe gently with a dry cloth (or soaked in high purity isopropyl alcohol) or clean it with air blowing
Fan and heat exchanger unit	Check	Every 3 months (according to the environment and frequency of use)

### 6.2.1 F-THETA SCAN LENS CLEANING PROCEDURE

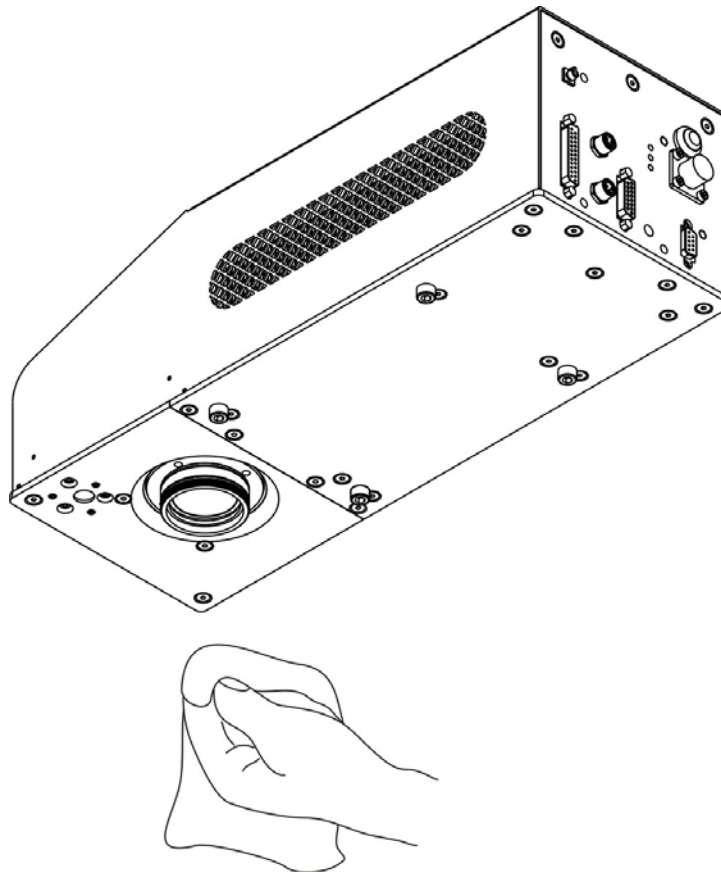


Figure 55: Cleaning F-Theta lens.



**WARNING!**

Before cleaning the F-Theta scan lens, the marking system **MUST** be in set **SAFE** mode:

- 1- Disable Aux interlock.

## 6.3 TROUBLESHOOTING

Problems may occur while the marking system 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 signalling the error. Power off the marking system 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 marking system stays on, the power section is turned off and an error message is displayed. If a hardware limit is reached, the marking system 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	--

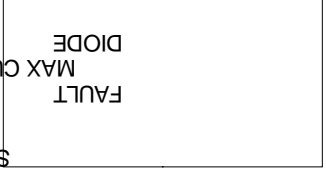
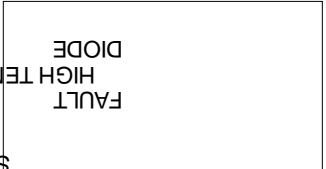



### 6.3.1 LIST OF POSSIBLE MALFUNCTIONS

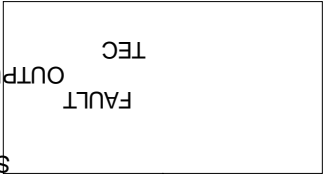
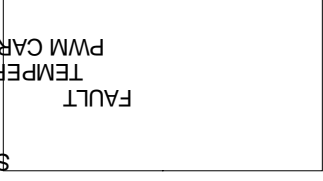
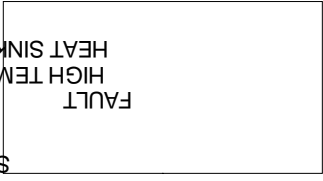
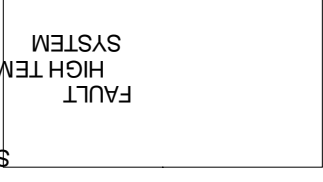
STATUS	CAUSE	ACTION
Red LED bar blinking	An internal error has occurred and the marking system is in software protection mode	Check the error message shown on the display and refer to paragraph 6.3.2 for the recovery procedures
Orange LED bar blinking	Warning status. The display shows "DISABLE SHUTTER" because start sequence is wrong	If the marking system was powered on with the signal <i>Shutter En</i> active disable it Ulyxe iMark™ will automatically go into stand-by mode if the <i>KEY</i> signal is activated, otherwise into system-off status
		If <i>Shutter En</i> is already disabled: Ulyxe iMark™ does not supply external power onto Control Box connector. Make sure that there is 5V DC voltage between pin 1 and pin 15 of Control Box connector. 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 marking system is in <i>warm-up</i> 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 marking system is not in <i>READY</i> mode	Put the marking system in <i>READY</i> mode. Contact technical support if the problem persists

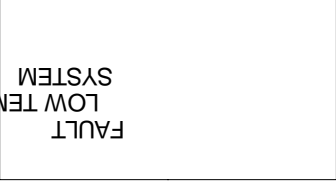

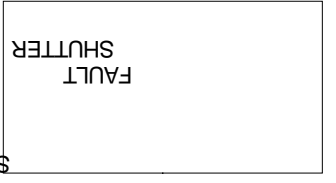


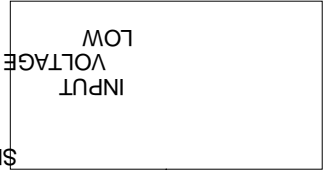


<p>The marking system turns off when powered on</p>	<p>The marking system goes into hardware protection mode because a parameter does not comply with specifications</p>	<p>Check compliance with the stated specifications (input voltage, environment temperature, etc.) Cut off power supply to the Ulyxe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

## 6.3.2 ERROR MESSAGES

ERROR MESSAGE	CAUSE	ACTIONS
	<p>The laser diode max current software level was exceeded. The value is displayed in the Max. Current field in the LASER DATA section.</p>	<p>Turn off, wait 30/60 minutes and restart. Read the value displayed in the <i>Diode Current</i> 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.</p>
	<p>The laser diode max temperature software level was exceeded. The value is set at 35°C. The marking system cuts off the current on the diode and tries to bring the laser diode to the proper temperature.</p>	<p>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 <i>Diode Temp.</i> 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.</p>
	<p>The laser diode temperature has fallen below the minimum temperature software level. The value is set at 10°C. The marking system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the laser diode temperature controller is out of control.</p>	<p>Turn off, wait 30/60 minutes and restart. Make sure the room temperature complies with the specifications. Read the value displayed in the <i>Diode Temp.</i> 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.</p>
	<p>The laser diode voltage software level was exceeded. The value is set at 2.5V. The marking 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.</p>	<p>Turn off, wait 30/60 minutes and restart. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>
	<p>The Peltier module current software level was exceeded. The value is set at 12A. The marking 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.</p>	<p>Turn off, wait 30/60 minutes and restart. Read the value displayed in the <i>TEC Current</i> field in the SYSTEM MONITOR section. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>

	<p>The Peltier module voltage software level was exceeded. The value is set at 10V and it is displayed in the <i>TEC Voltage</i> field in the SYSTEM DATA section. The marking system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the internal card is malfunctioning.</p>	<p>Turn off, wait 30/60 minutes and restart. Read the value displayed in the <i>TEC Voltage</i> field in the SYSTEM MONITOR section. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>
	<p>The temperature software level on the power section of the internal card was exceeded. The value is set at 65°C. The marking 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 marking system).</p>	<p>Turn off, wait 30/60 minutes and restart. Make sure the environmental conditions comply with specifications. Read the value displayed in the <i>Card Temp.</i> field in the SYSTEM MONITOR section, checking to see if it quickly reaches 65°C. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>
	<p>The temperature software level on the central heat sink was exceeded. The value is set at 60°C. The marking 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.</p>	<p>Turn off, wait 30/60 minutes and restart. Make sure the environmental conditions comply with specifications. Read the value displayed in the <i>Heat sink T</i> field in the SYSTEM MONITOR section, checking to see if it quickly reaches 60°C. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>
	<p>The environment temperature software level was exceeded. The value is set at 40°C. The marking system turns off the entire power section (laser diode, Peltier module, RF driver, etc.) since the internal heat cannot be dissipated.</p>	<p>Turn off the marking system and make sure the environment temperature complies with the specifications before you turn it back on. Read the value displayed in the <i>System Temp.</i> field in the SYSTEM MONITOR section, checking to see if it is near the 40°C limit. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>

	<p>The environment temperature has fallen below the minimum temperature software level. The value is set at 10°C. The marking 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 marking system.</p>	<p>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 reoccurs, carry out the data log with the service tool and contact technical assistance.</p>
	<p>The Aux interlock connector or its closed contact is not present upon turning on the system. The entire internal electronics is disabled.</p>	<p>Turn off and restore the Aux interlock connector before you restart the marking system. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>
	<p>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 marking 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.</p>	<p>Turn off, wait 30/60 minutes and restart. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>
	<p>A wrong power on sequence was carried out. The marking system was started with the <i>Shutter En</i> active.</p>	<p>Disable the <i>Shutter En</i> signal and the system will return to its proper operating status. In case the Shutter is not disabled, contact technical assistance.</p>
	<p>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.</p>	<p>Make sure of right connection of remote LCD. Turn off and restart. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>
	<p>The inlet power voltage has fallen below the minimum voltage software level. The value is set at 20V DC. The entire internal electronics is disabled.</p>	<p>Turn off and restore the power voltage to 24V DC before you restart. Read the value displayed in the <i>Input Voltage</i> field in the SYSTEM MONITOR section, making sure that the value displayed is around 24V DC. In case the problem reoccurs, carry out the data log with the service tool and contact technical assistance.</p>

## 6.4 PRODUCT SUPPORT AND CUSTOMER SERVICE

### Warranty Information

Datalogic reserves the right to change the information and specification contained in this manual without prior notice.

### Product Support

In the unlikely event that the marking system does not function normally and that it requires attention, contact Datalogic for advice on further on-site fault diagnosis and/or module return.

If the marking system is to be returned to Datalogic, ensure that all relevant return documentation is in place before shipment. Details of documentation requirements and copies can be obtained where required from Datalogic.

Pack the marking system in the original packing and include all original accessories and documentation as detailed in the original inventory. It is advised that the correct and original packaging is used to prevent transit damage to the marking system. If part or all of the original packaging is unavailable, please contact Datalogic for replacement items. Please take time to complete all return documentation. This can be obtained from Datalogic and accurate details, diagnosis and comments in the documentation can help reduce turnaround time for module repair at Datalogic.

### Customer Service Contacts

#### Product Support

[support-dla-lasermarking@datalogic.com](mailto:support-dla-lasermarking@datalogic.com)

Tel: +39 051-3147011

#### Customer Services

[service-dla-lasermarking@datalogic.com](mailto:service-dla-lasermarking@datalogic.com)






Tel: +39 0331-918001

#### Company Web Site

[www.datalogic.com](http://www.datalogic.com)

For further contact information see the Contact Us link at [www.datalogic.com](http://www.datalogic.com) or contact your local distributor.

## APPENDIX A: LABELS IDENTIFICATION

LABEL	DESCRIPTION
	Identification label
	Warning Logotype
	Laser labels <sup>3</sup>
	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 Box connector
AUX INTERLOCK	Aux interlock connector

<sup>3</sup> Maximum output of laser radiation as per definition 3.55 of IEC60825-1 considering single fault conditions.

## LABELS LOCATION

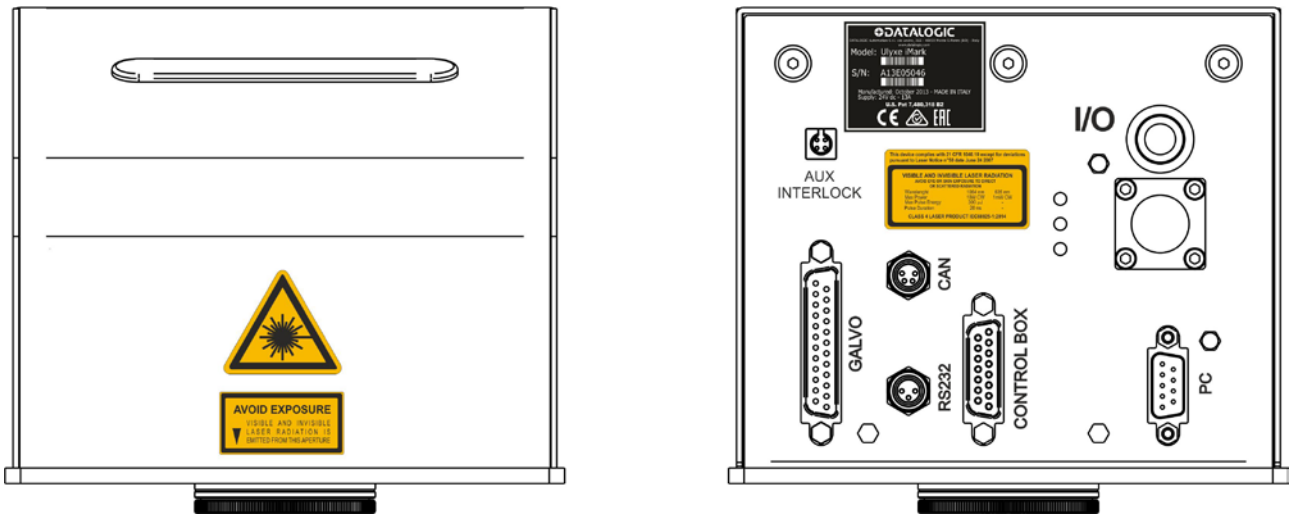


Figure 56: Labels location.

# APPENDIX B: STANDARDS

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## **LASER STANDARDS**

The marking system is designed to comply 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, as manufacturer of "Ulyxe™" laser sources, provides a marking system 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 marking system.

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

## **CE COMPLIANCE**

CE marking states the compliance of the product with essential requirements listed in the applicable European directive.

Since the directives and applicable standards are subject to continuous updates, and since Datalogic promptly adopts these updates, therefore the EU declaration of conformity is a living document.

The EU declaration of conformity is available for competent authorities and customers by Datalogic commercial reference contacts.

Since 20<sup>th</sup> April 2016 the main European directives applicable to Datalogic products require to include an adequate analysis and assessment of the risk(s). This evaluation was carried out in relation to the applicable points of the standards listed in the Declaration of Conformity.

Datalogic products are mainly designed for integration purposes, into more complex systems. For this reason it is under the responsibility of the system integrator to do a new risk assessment regarding the final installation.



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### **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.

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## **FCC COMPLIANCE**

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

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

This marking system 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 system is operated in a commercial environment. This system 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 system 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.

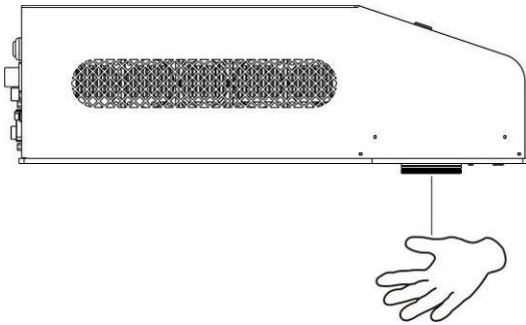


# APPENDIX C: NOTE ABOUT LASER

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## LASER SAFETY

The following information is provided in compliance with regulations set by International Authorities, and it refers to proper use of the marking system.

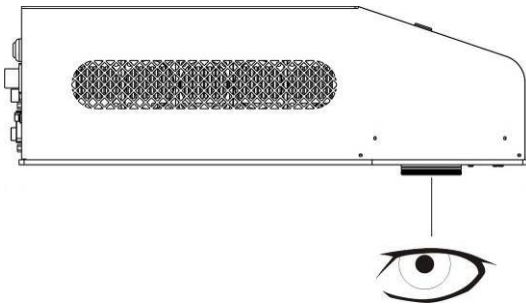


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**WARNING!**

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

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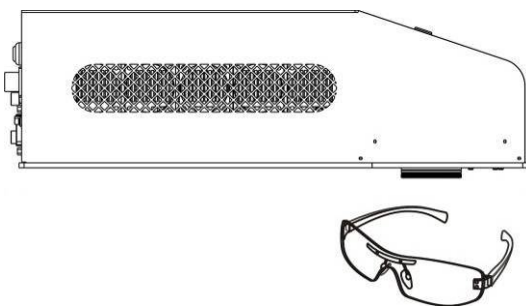


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**WARNING!**

Staring directly at a laser beam may cause irreversible damage to your eyes.

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**WARNING!**

Wear safety goggles while using the marking system!

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**WARNING!**

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

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## LASER RADIATION

Laser radiation is an electromagnetic emission with a micrometric wave length which ranges from the long infrared (CO<sub>2</sub> Laser), close infrared (Laser Nd:Yag, Nd:YVO<sub>4</sub>), visible (Laser He:Ne or Argon) and ultraviolet (excimer laser).

It should be considered non-ionizing Radiation. In Ulyxe iMark™ marking system, 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™ marking system, 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.



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### WARNING!

Directly viewing a laser beam **can cause irreversible damage** to vision.

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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 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.



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### WARNING!

**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.

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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.



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### WARNING!

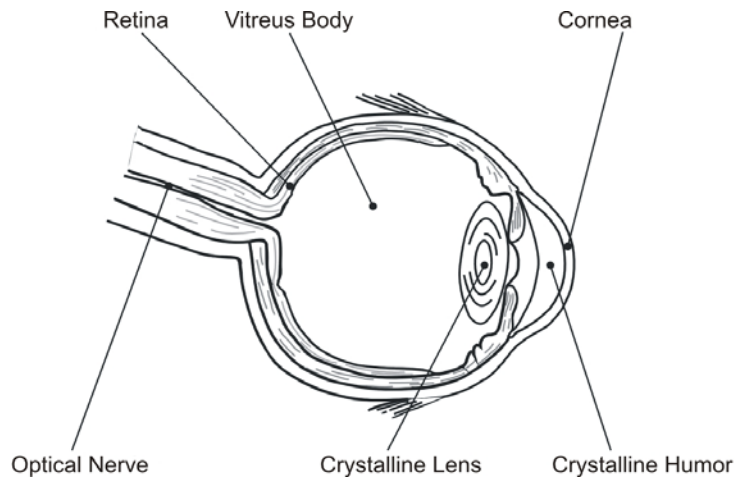
This marking system is classified as **Class 4**. Class 4 includes lasers which can produce risks, not only from **direct** or **reflected** radiation, but also from **scattered** radiation! The laser sources may be a significant risk for the skin and risk of burning flammable materials.

---

## 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<sub>4</sub> 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 57: 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<sup>E6</sup> 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.



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### **WARNING!**

The marking system contains a **Class 4** invisible source.

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## RADIATION VIEWING CONDITIONS

The Laser output of the marking system 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 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 Nominal Ocular Hazard Distance (N.O.H.D.) for Ulyxe iMark™ is showed in the next paragraph.



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### WARNING!

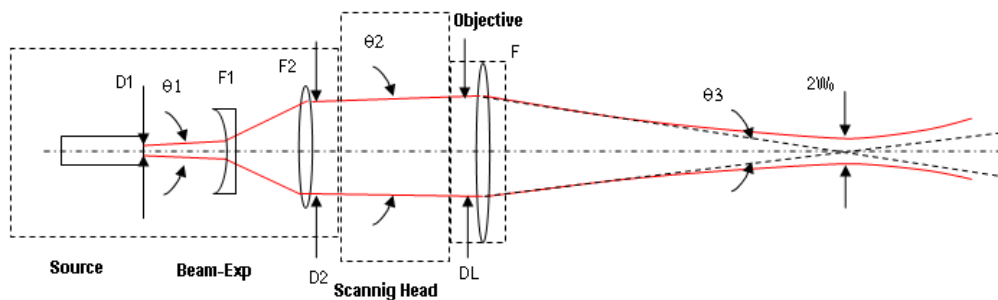
Always use goggles with conformity certificate.

Remember that **no goggles can provide prolonged protection from direct or mirror-reflected radiation!**

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## REAL N.O.H.D. 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 its optical path, the dimensions of the beam and its divergence.



It is very important to know the real divergence of the beam in output from the focalization scan lens (F-Theta).

With all these optical data it is possible to calculate the Nominal Ocular Hazard Distance (N.O.H.D.) and the optical density (O.D.) requested to the protection filters of the laser radiation.

**Calculations have been done following the CEI EN 60825-1 (2014) Normative regarding nominal distance and optical risk in the worst condition and in case of accident exposition of 10 seconds per direct radiation and 100 seconds for diffused radiation.**

Laser type	Nd:YVO <sub>4</sub> : 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 10 seconds and supposing that there is a total reflection without attenuation.

**O.R.N.D. = 28,5 m**

## OPTICAL DENSITY OF THE PROTECTION GOGGLES

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

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

**O.D.= 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 10 seconds maximum.

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

**O.D.= 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 10 seconds 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<sup>2</sup>**

**Case b) Htl = 6760 J/m<sup>2</sup>**

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 **O.D.>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 the marking system 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 marking system. 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 marking system 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.



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### WARNING!

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

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



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### WARNING!

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

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### WARNING!

Do not subject **materials other** than those the marking system was designed for to radiation.

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The most serious collateral risk associated with laser marking system, 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.



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**WARNING!**

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

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For example, during the intended use of the marking system, 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 system was designed for.



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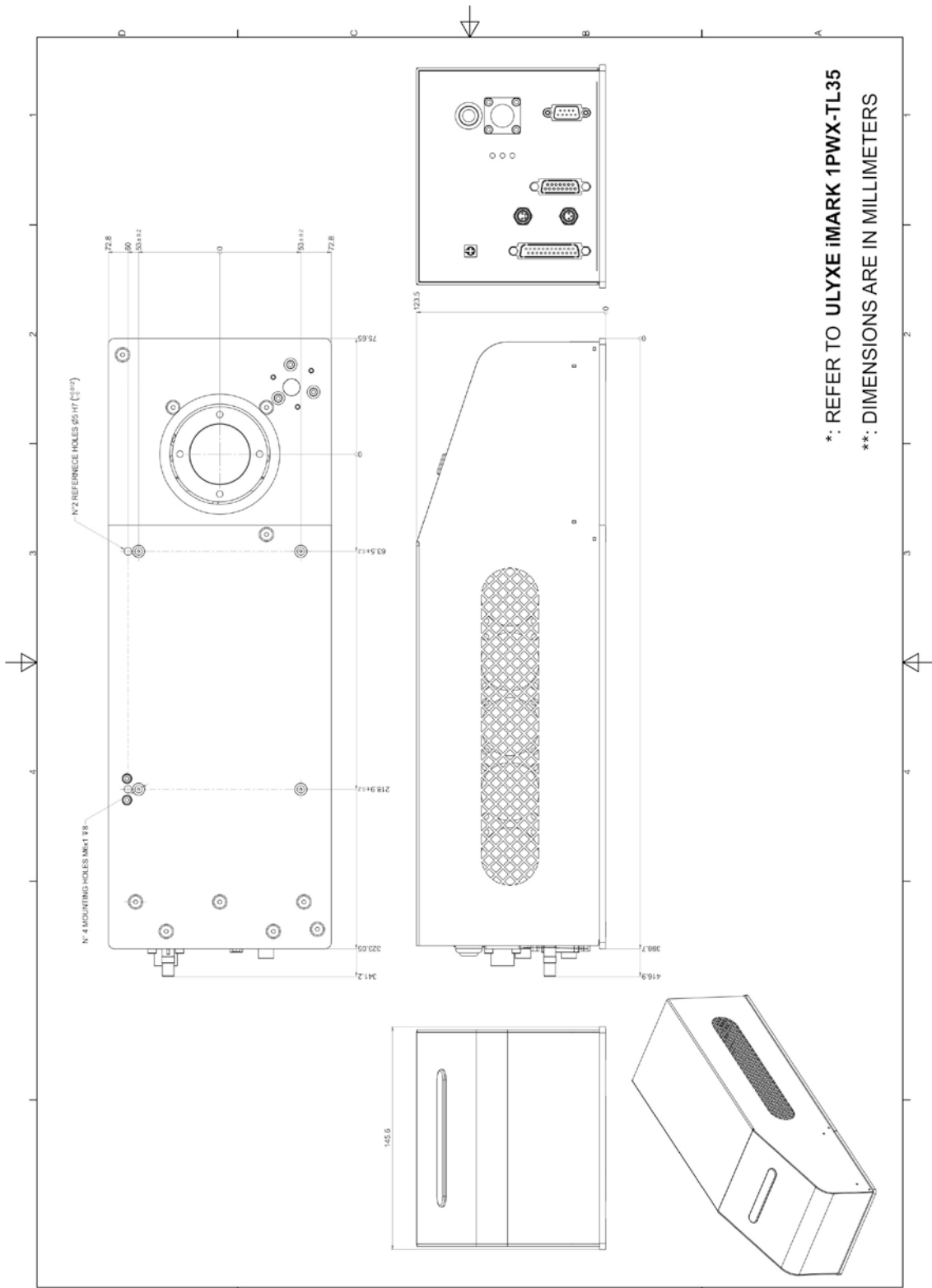
**WARNING!**

Do not subject **materials other** than those the marking system was designed for to radiation.

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# APPENDIX D: MECHANICAL DRAWINGS



\*: REFER TO ULYXE iMARK 1PWX-TL35  
 \*\*: DIMENSIONS ARE IN MILLIMETERS



**NOTE:**

Please refer to Datalogic website for detailed drawings.

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