VLASE™ IR

USER MANUAL

InfraRed Laser Marker

DATALOGIC

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PREFACE

ABOUT THIS MANUAL

This User Manual (UM) is provided for users seeking advanced technical information, including connection, programming, maintenance and specifications. The Quick Reference Guide (QRG) and other publications associated with this product can be downloaded free of charge from the website listed on the back cover of this manual.

Manual Conventions

The following conventions are used in this document:

The symbols listed below are used in this manual to notify the reader of key issues or procedures that must be observed when using the reader:

NOTE

Notes contain information necessary for properly diagnosing, repairing and operating the reader.

CAUTION

The CAUTION symbol advises you of actions that could damage equipment or property.

WARNING

The WARNING symbol advises you of actions that could result in harm or injury to the person performing the task.

TECHNICAL SUPPORT

Support Through the Website

Datalogic provides several services as well as technical support through its website. Log on to (www.datalogic.com).

For quick access, from the home page click on the search icon, and type in the name of the product you're looking for. This allows you access to download Data Sheets, Manuals, Software & Utilities, and Drawings.

Hover over the Support & Service menu for access to Services and Technical Support.

Reseller Technical Support

An excellent source for technical assistance and information is an authorized Datalogic reseller. A reseller is acquainted with specific types of businesses, application software, and computer systems and can provide individualized assistance.

CHAPTER 1
INTRODUCTION

ABOUT THE LASER MARKER

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

This manual refers to VLASE™ IR laser markers, that is a Class 4 Laser Product.

In addition to being professionally trained in their role, personnel assigned to work with laser marker 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.

CAUTION

Datalogic shall not be held responsible for any non-conforming use of the laser marker of its manufacture.

NOTE

BEFORE INSTALLING AND USING THE LASER MARKER, CAREFULLY READ THIS MANUAL.

MODEL DESCRIPTION

Vlase™ laser markers are described by their model number which indicates the characteristics listed in the diagram below. Not all combinations are available. For a complete list of combinations see the Models tab on the Product page of the website.

VLASE 1XX9-1X42

Nominal Power	F-Theta scan lens
10 = 10W	3 = 160 S
20 = 20W	4 = 160L
	6 = 254 S
	7 = 254 L
	9 = 100 L
	A = 330 L
	B = 420 L

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 through Datalogic commercial reference contacts. Since April 20th, 2016 the main European directives applicable to Datalogic products require inclusion of 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 customer to do a new risk assessment regarding the final installation.

CAUTION

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

FCC COMPLIANCE

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

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

This laser marker has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This laser marker 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 laser marker in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

EAC COMPLIANCE

Customs Union: this laser marker complies with CU Conformity certification; this allows the Product to bear the Eurasian Mark of conformity.

LASER STANDARDS

This laser marker is classified as Class 4 Laser Product according to the following:

EU: EN60825-1

USA: 21 CFR 1040.10

China: GB7247-1

Datalogic, as manufacturer of laser products, provides a laser marker 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 final system manufacturer MUST ensure the safety of the laser processing machine according to its standards including the risk-analysis, implementation of safety measures, certification and testing of safety measures and the production of adequate information for use of the machine.

Datalogic is available for providing to the customers all the information in its possession to help in complying with applicable standards.

WARNING

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

OVERVIEW

The Vlase™ laser marker features a control unit whose size is compatible with the standard 19" 2,5U in varnished steel, and a resonator whose compact dimensions make it easy to integrate into a system that comprises safety devices required by applicable regulations, the management of marking signals and the customer's complementary modules, if any.

All laser marker connections are found on the rear of the rack: power supply, safety, electrical signals, communication ports, patch cord to the scanner head, while the front features key and enable command devices, status LED in addition to a USB connector for the communication with the internal embedded controller.

Vlase™ belongs to the family of DPSS (Diode Pump Solid State) laser sources in the "end pumped" and "Q-Switched" configuration.

The mechanical and electrical characteristics satisfy standardization and connectivity needs of the industrial field, such as the new 19" rack and different solutions for laser marker control.

The new laser marker control platform allows for an easy integration in industrial environments and complies with the standard of the other Datalogic laser markers, with the same philosophy implemented in Arex™.

Based on the optical layout of the Datalogic Violino™ laser source, the Vlase™ family guarantees significant improvements in terms of performance thanks to the new laser diode current and temperature controllers, developed by the Datalogic laboratories, which shorten warm-up time and improve the stability of emitted laser power. The operating temperature range has been extended to 5°- 40°C for its use in industrial environments.

Main features:

- 100 to 240 V AC @ 50-60Hz Power Supply
- Operating Temperature Range extended to 40°C
- Fully integrated marking and system control
- Integrated PC embedded and marking software for stand-alone operation
- Ease of integration in industrial environments and maximum control compatibility with other marking platforms (Arex™/Eox™)
- Integrated photocell and encoder connectors for Marking ON Fly (MOF) applications
- Unattended control of the system by LAN network or serial communication (RS232 protocol)
- Stable Marking process and high a beam quality (M^2<2)
- Compact Design: 19" 2,5U rack
- High peak power (up to 60kW) and short pulse duration (<10ns)
- Beam Expander with various available magnifications
- Improved focus distance repeatability, thanks to new Beam Expander design which guarantees higher beam collimation control
- Available cable lengths: 3m standard, other lengths available on request
- Simplified access to Laser Diode Module for fiber installation and Laser Diode Module maintenance
- Dedicated software tool for laser parameter setting and diagnostics

Operation of a Laser Marker with Galvometric Scanning

During the marking the laser generates an invisible, high-energy infrared beam.

In order to obtain a more accurate focus, the laser beam is first enlarged using an optical expansion system and then deflected by a scanning system consisting of two mirrors mounted on galvanometric motors.

These mirrors deflect the beam in a controlled path along the X and Y axes; processing of the product surface occurs by coordinating the movement of the two mirrors and the turning on/off of the laser beam.

The deflected laser beam is focused by an F-Theta scan lens on the surface of the product.

Generally speaking, the marking is carried out within the focus plane of the F-Theta scan lens.

Marking Software

The Lighter™ marking software is preinstalled on the product.

NOTE

Consult Lighter™ software user's manual for a proper use of the same.

NOTE

If necessary, consult See “How to update the marking software” on page 114., to upgrade the preinstalled software.

IMPORTANT WARNINGS

Access to the internal parts of the laser marker 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 active parts by untrained or unauthorized personnel.

CAUTION

It is forbidden to change the intended use for which the product was designed and developed.

Datalogic declines any and all responsibility for improper use of its laser product.

CAUTION

The integration and use of this laser marker is customer responsibility.

CAUTION

Never expose reflecting surfaces to laser radiation!

The reflected laser beam may cause damage to laser marker.

CAUTION

Laser marking interacts with materials through, for example, a thermal carbonization process which may lead to the emission of fumes, dust and vapors.

Adequate fume/dust extractor and treatment must be provided by customer!

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 laser marker itself. Always use adequate fume extractor during PVC and plastic marking.

CAUTION

It is the responsibility of the customer to install the laser marker in proper safety condition!

CHAPTER 2
INSTALLATION

UNPACKING

Before installing or operating the laser marker, you should:

- Inspect the shipping container for damage
- Inspect the laser marker for signs of damage
- Confirm that the shipping box contains all items on the shipping inventory list including any accessories

When unpacking the laser marker from the shipping box you should:

- Remove the accessories and documentations
- Carefully remove the laser marker from the packaging using both hands.

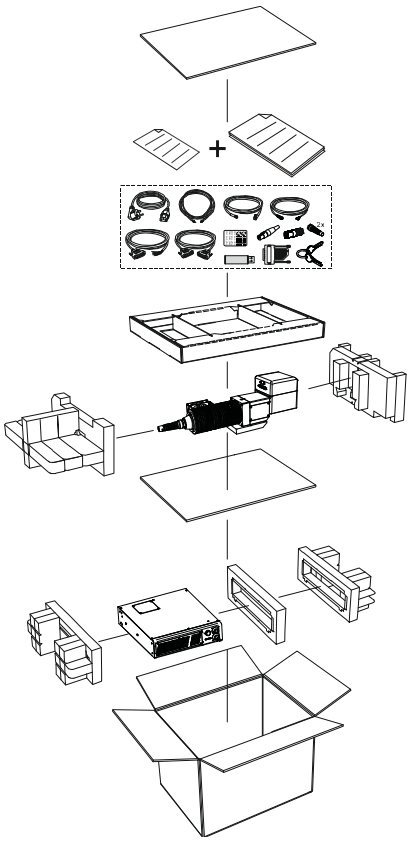
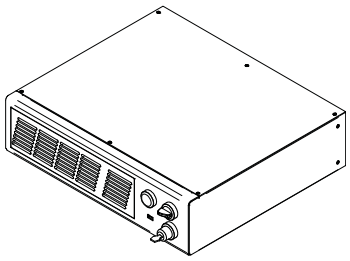
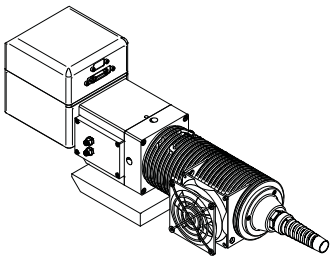
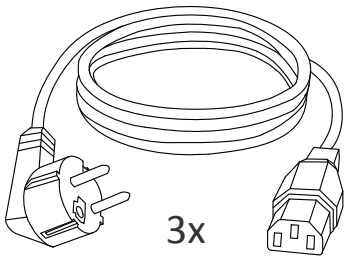
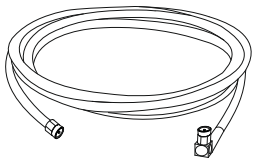
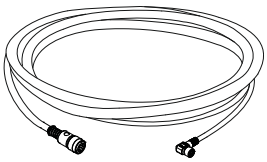
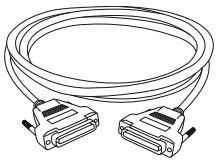
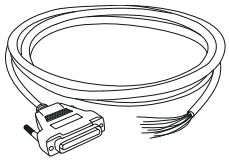
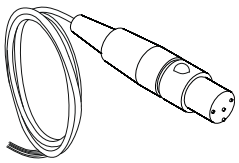
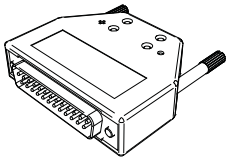
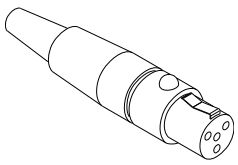
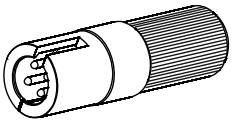
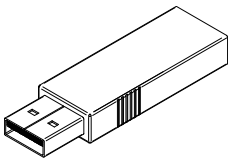
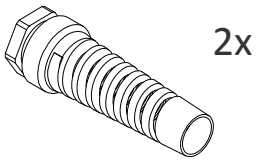
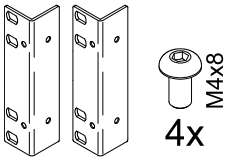
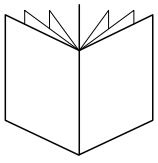


Figure 1: Unpacking

Keep all packing materials until the laser has been inspected for completeness and damage. If something is missing or defective, call Datalogic (see "Technical Support" on page viii for contact details).

CONTENTS OF THE PACKAGING

 Control Rack	 Resonator	 Power Supply cables
 RF Cable	 Resonator Cable	Optical fiber cable
 Scan Head Cable	 Command Box cable	 Interlock cable
 Command Box MUTING DEVICE	 Interlock MUTING DEVICE	 Interlock OUT
Selector keys	 USB Recovery Disk	 Cable glands
 Rack Fixing Brackets	Test report and sample test plate	 Quick Reference Guide

ON MOISTURE CONDENSATION

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

Note on moisture condensation

Moisture may condense when you bring the laser marker from a cold place into a warm place (or vice versa) and when you use the laser marker in a humid place.

If moisture condensation occurs

Turn off the laser marker and wait about 1 hour for the moisture to evaporate.

How to avoid moisture condensation

Before moving the laser marker 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).

FIXING AND POSITIONING

CAUTION

Fix the laser marker according to instructions shown in the figures.

CAUTION

It is mandatory to secure the laser marker before you start marking, since improper securing or positioning may cause serious damage.

Do not secure the laser marker in a way other than the one described in the figure.

CAUTION

Introduction of optical or mechanical surfaces, such as mechanical shutters or additional protective glass, between F-Theta scan lens output and marking surface may case optical feedback into the laser marker.

Optical induced damage caused to laser marker by reflection from external surfaces is not covered by warranty.

NOTE

In order to prevent marking distortions, avoid vibrations and bumps during the marking process!

NOTE

It is recommended to install the resonator on a positioning Z-axis system for accurate mounting at focal distance!

CONTROL RACK INSTALLATION

Horizontal installation

The control rack must be positioned in a safe manner, following the recommendations below.

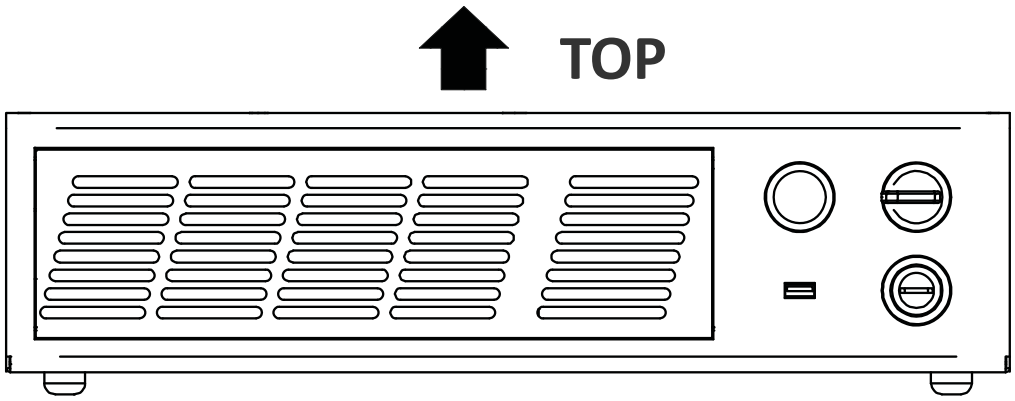


Figure 2: Control rack horizontal positioning

The control rack can be installed on a standard 19" rack cabinet using the fixing brackets supplied as a standard equipment.

The figure below shows the fixing points for installation in a rack cabinet. Rack handles for an easier installation are available as an accessory (see "Fume Extractor" on page 78).

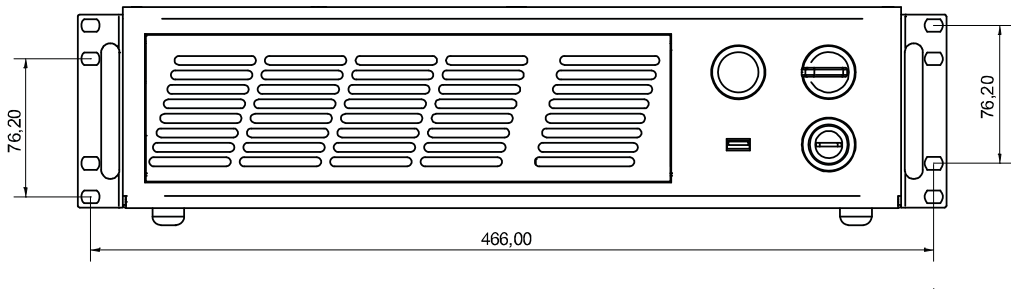


Figure 3: Control rack fixing bracket mounting configuration

NOTE

All dimensions are in millimeters.

Vertical installation

The control rack must be positioned in a safe manner, following the recommendations below.

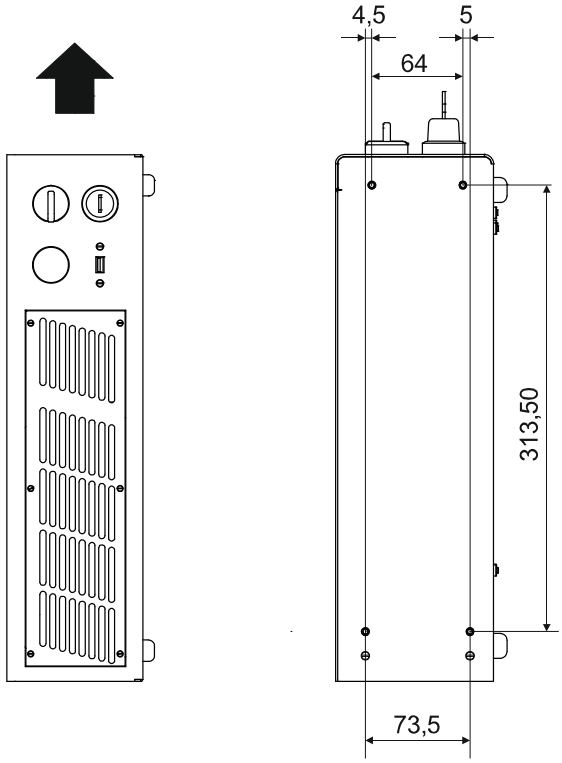


Figure 4: Control rack vertical positioning

NOTE

All dimensions are in millimeters.

CAUTION

The control rack MUST be fixed to a side wall using the appropriate fixing points placed on the side of the control rack.

Control rack mounting screws length

To determine the length of the mounting screws, consider the thickness of the mounting plate and the thickness of the washer.

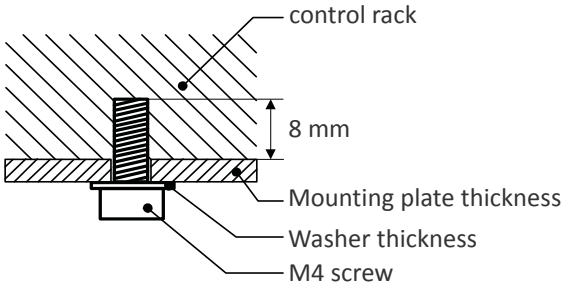


Figure 5: Length of mounting screws.

NOTE

Mounting holes depth is = 8mm. Tightening torque = 2 Nm.

RESONATOR INSTALLATION

The resonator can be installed in any orientation and must be fixed to a suitable base (not supplied by Datalogic) using the dedicated threaded holes.

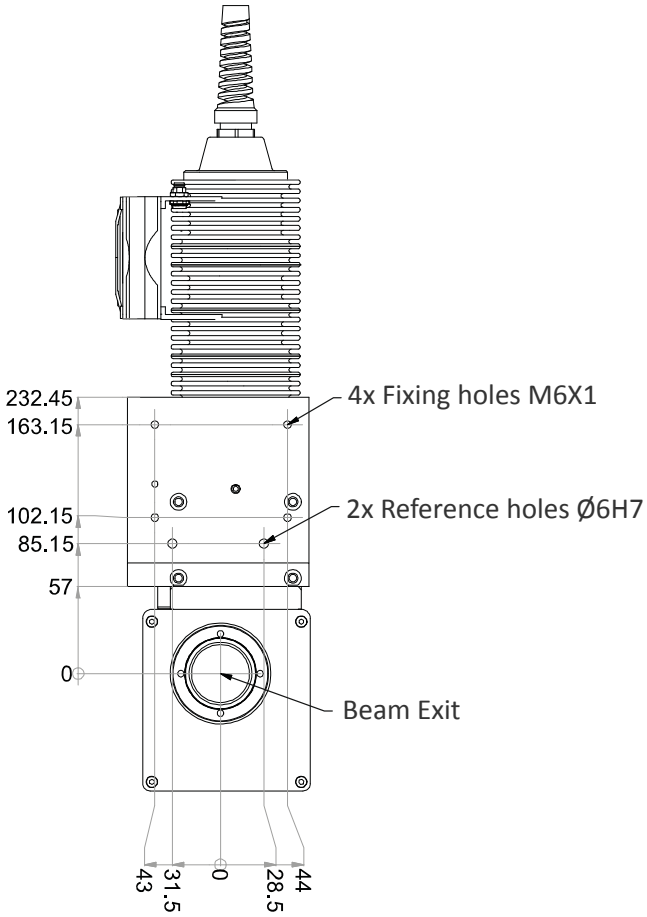


Figure 6: Resonator fixing points

NOTE

All dimensions are in millimeters.

Rsonator mounting screws length

To determine the length of the mounting screws, consider the thickness of the mounting plate and the thickness of the washer.

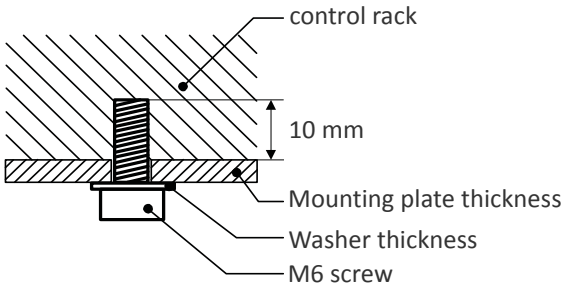


Figure 7: Length of mounting screws.

NOTE

Mounting holes depth is = 10mm. Tightening torque = 2 Nm.

IINSTALLATION ENVIRONMENT

Control Rack

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

The control rack uses a forced air cooling system: an adequate air flow is necessary to guarantee its correct cooling. Install the control rack so that air flow is not obstructed. Moreover, do not install it near a heat source.

CAUTION

If not enough space is provided, the temperature inside the control rack could rise, causing temperature error.

Clean the air filter when it is dirty. If the air filter is dirty, insufficient air-flow might not ensure correct cooling and might stop the marking operation. Clean or replace the air filter periodically.

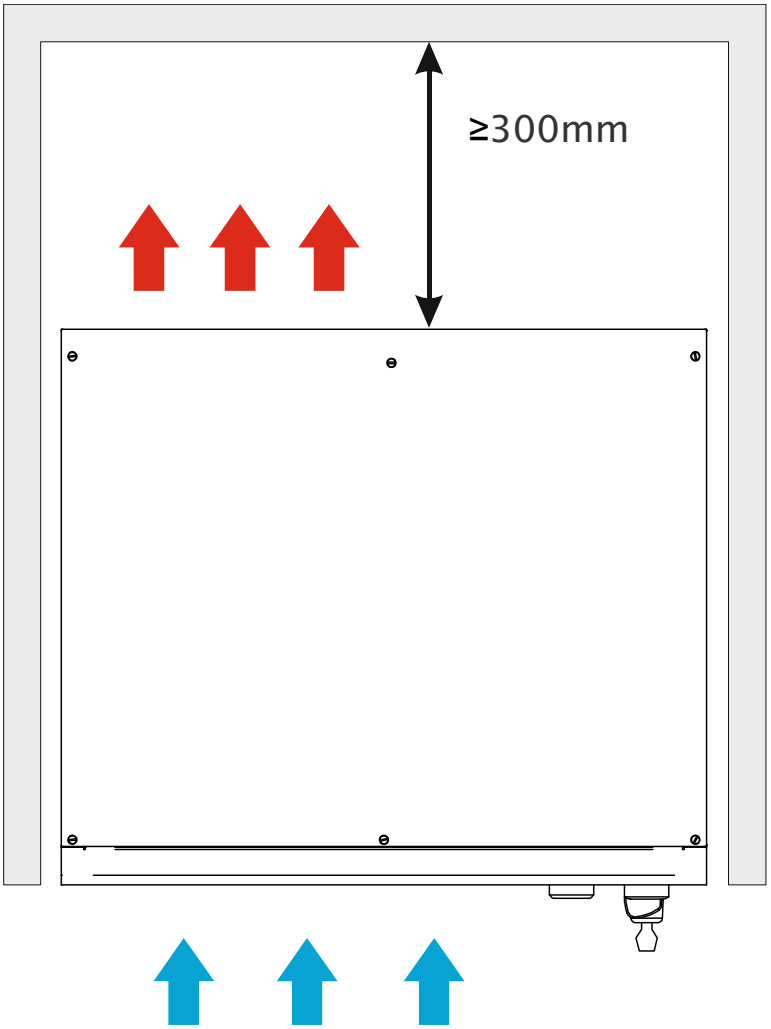


Figure 8: Control rack installation environment

CAUTION

DO NOT place heavy objects on top of the control rack!

Resonator

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

The resonator uses a a forced air cooling system: an adequate air flow is necessary to guarantee its correct cooling. Install the resonator so that air flow is not obstructed. Moreover, do not install it near a heat source.

CAUTION

If not enough space is provided, the temperature inside the control rack could rise, causing temperature error.

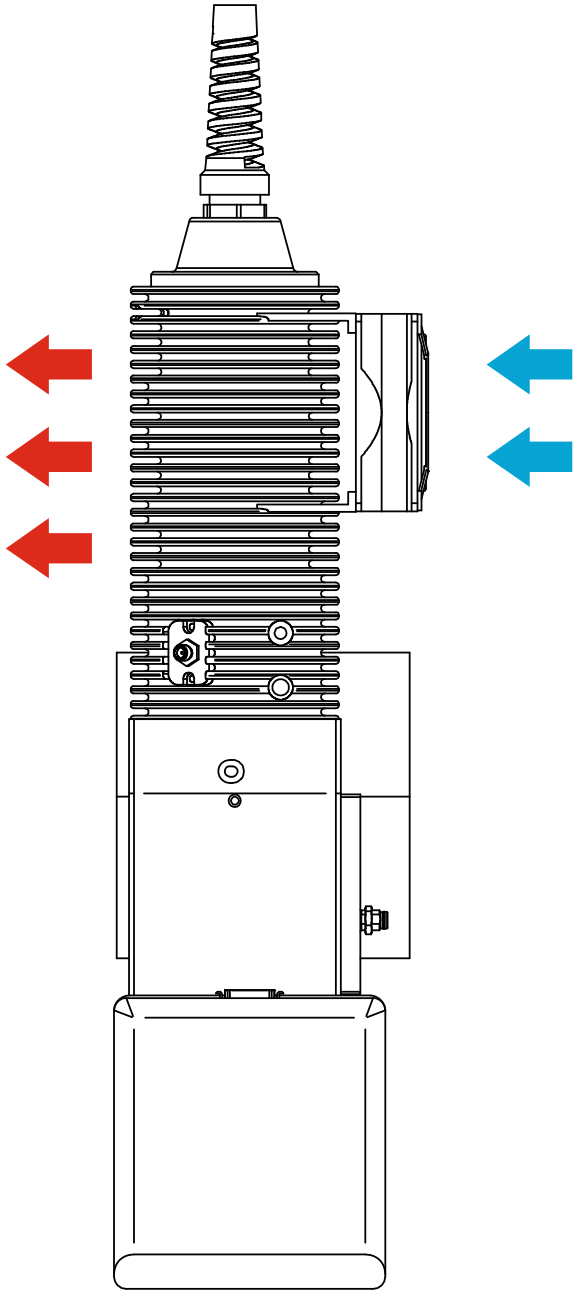


Figure 9: Resonator installation environment

FUME / DUST EXTRACTOR

During the marking process, dust and/or fume may be produced. It is important to use an adequate fume/dust extractor and/or air filtration (see "Fume Extractor" on page 78).

CAUTION

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

CHAPTER 3
TECHNICAL SPECIFICATIONS

TECHNICAL CHARACTERISTICS

VLASE IR MODELS		1109-1x42	1209-1x42
ELECTRICAL SPECIFICATIONS			
Input Voltage (main power supply)	V (AC)	100 to 240 @ 50-60 Hz	
Max. Input Current (main power supply)	A	6	
Max power	W	600	
LASER SOURCE SPECIFICATIONS[A]			
Laser Type		DPSSL (Diode Pumped Solid State Laser)	
Nominal Power	W	10	20
Avarege Power at reference Rep. Rate[b]	W	8.5	17.0
Pulse Energy (max.)	mJ	0.48 (15 ns)	0.55 (8 ns)
Peak Power (max.)	kW	32	65
Central Emission Wavelength	nm	1064	
Repetition Rate[c]	kHz	10 to 200	20 to 200
Laser Aiming Beam		Class 2: 630-670 nm	
ENVIRONMENTAL SPECIFICATIONS			
Operating Temperature	C (F)	5° to 40° (41° to 104°)	
Storage Temperature	C (F)	-10° to 60° (14° to 140°)	
Humidity	%	< 90 without condensation	
Altitude	m	2000	
Shock and Vibration		MIL 810E “CAT 1 Basic Transportation”	
Package Drop Test	cm	60	
Pollution Degree		2	
Overvoltage Category		II	

VLASE IR MODELS		1109-1x42	1209-1x42
PHYSICAL SPECIFICATIONS			
Control Rack dimensions (HxWxD)	mm in	122x430x480 4.8x16.9x18.9	
Control Rack Weight	Kg lbs	15 33.1	
Control Rack Cooling		Forced Air Cooling Rack fans: L10@40°C = 60000 h	
Resonator dimensions (HxWxD)[d]	mm in	166x128x686 6.5x5.0x27.0	
Resonator Weight[e]	Kg lbs	7 15.4	
Resonator Cooling		Forced Air Cooling Resonator fan: L10@40°C = 70000 h	
Noise	dB (A)	<70 at 1 meter	
Optical fiber minimun Bending Radius	mm in	200 (fixed installation) 7.87 (fixed installation)	
Cables length	m	3 standard, other available	
OTHER SPECIFICATIONS			
Marking speed[f]	mm/s	Up to 4800	
Char Marking Speed[g]	char/s	Up to 400	
MOF (marking on fly)		YES (constant speed or encoder)	
Line speed [h] - Productivity	m/min pcs/s	Up to 75 3	
Marking Control and Software		EMC (Embedded Marking Control) and Lighter™ Suite	
Communication		RS232, Ethernet (TCP/IP 10, 100 Mbit), EtherNet/IP, TCP Server Protocol, ProfiNet, Digital I/O	

a. Specification @ 25°C
b. Without F-Theta scan lens @ 100kHz
c. Without power derating
d. Varies by model
e. Without F-Theta scan lens
f. May vary: measured with f =160mm
g. Char in Roman-s font, 1mm height, Level100% f=100Hz, F-Theta scan lens 160S on TESA label
h. Single line string, Roman-s font

PRODUCT DESCRIPTION

Resonator

A description of the main parts of the resonator unit is provided here below:

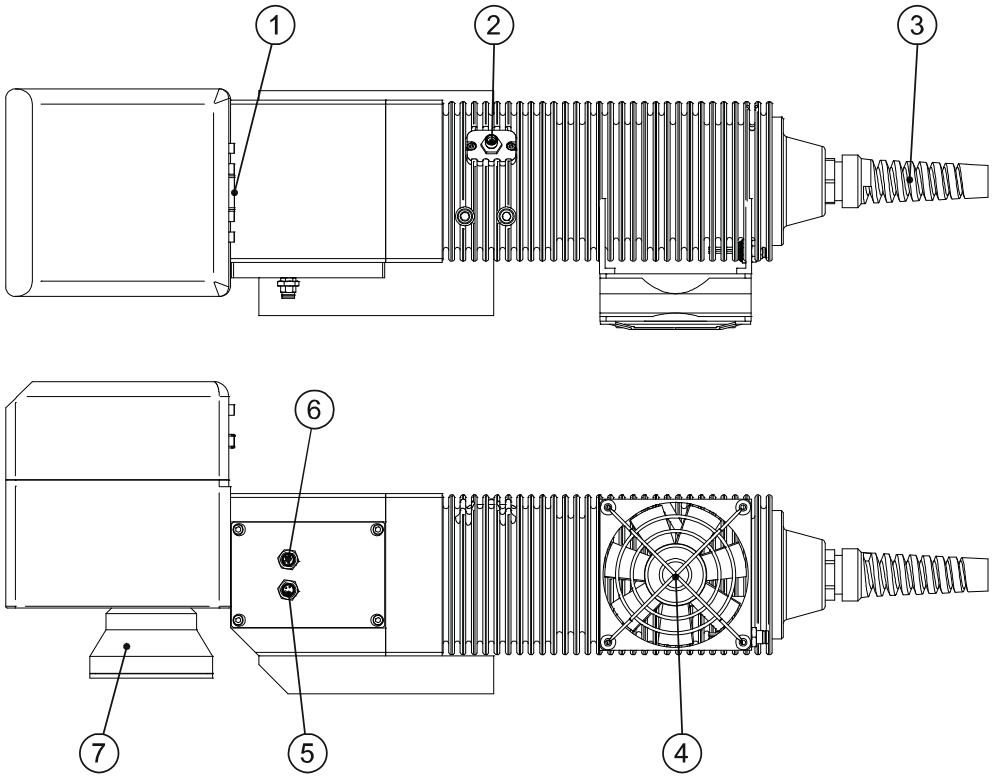


Figure 1: Resonator overview (bottom and side views)

1. MDR signals connector
2. RF connector
3. Optic fiber inlet
4. Cooling fan
5. Fan connector
6. Resonator connector
7. F-Theta Scan Lens

CONTROL RACK

A description of the main parts of the control rack unit is provided here below:

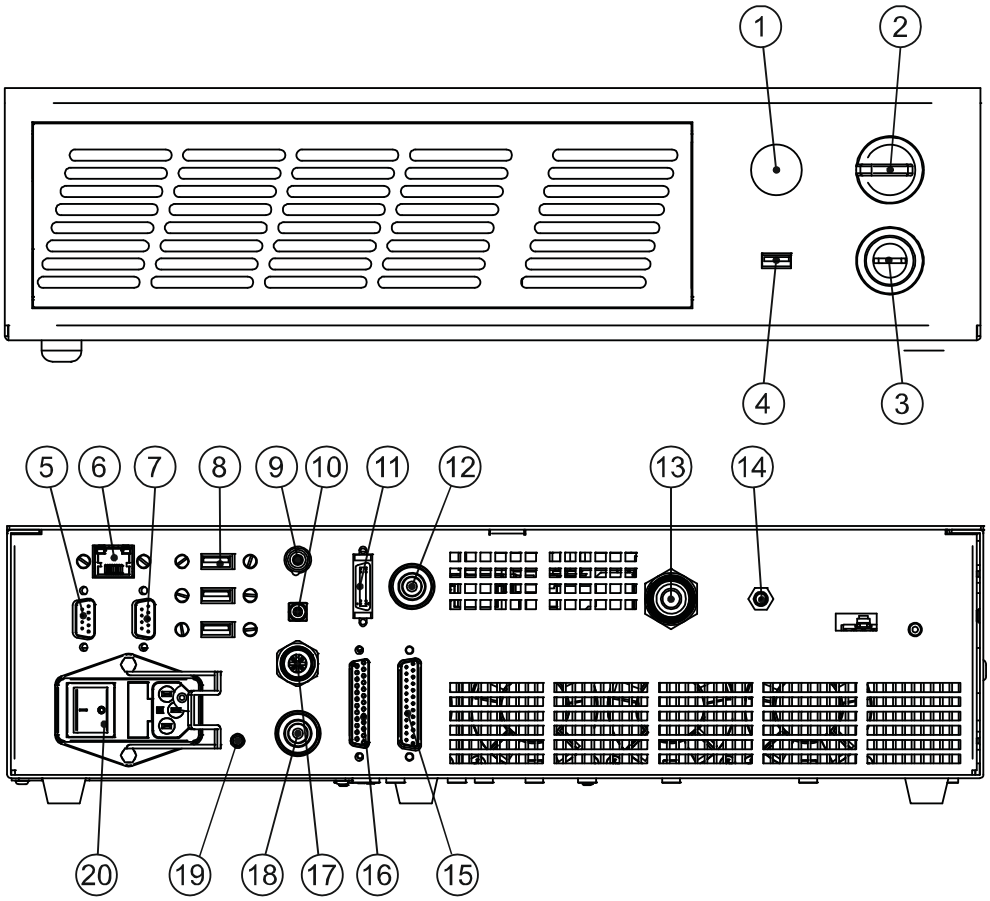


Figure 2: Control Rack overview (front and back views)

1. Status LED
2. Enable selector
3. Key selector
4. USB port
5. VGA port
6. LAN port
7. RS232 port
8. 3x USB ports
9. Interlock connector
10. Interlock OUT connector
11. MDR signal connector
12. Resonator connector
13. Optic fiber outlet
14. RF connector
15. Command Box connector
16. I/O connector (axis control)
17. Photocell connector
18. Encoder connector
19. Earth ground
20. Main power supply connector

MARKING AREA SPECIFICATION

Datalogic provides a wide range of laser marker models with different F-Theta scan lenses configurations.

These configurations are provided to best match customer needs regarding marking field size, working distance and power density.

NOTE

Contact Datalogic if other configurations are necessary.

NOTE

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

CAUTION

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

CAUTION

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

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

F-Theta Scan Lens diameter M39			
F-THETA SCAN LENS		f = 160S	f = 254S
Working Distance (WD)	mm	183 ± 5	280 ± 4
Fixing Distance (FD)	mm	154 ± 6	257 ± 5
Marking Area (MA)	mm^2	100 x 100	140 x 140

F-Theta Scan Lens diameter M85						
F-THETA SCAN LENS		f = 100L	f = 160L	f = 254L	f = 330L	f = 420L
Working Distance (WD)	mm	99 ± 1	176 ± 2	296 ± 5	388 ± 6	494 ± 8
Fixing Distance (FD)	mm	98 ± 2	170 ± 3	329 ± 6	427 ± 7	533 ± 9
Marking Area (MA)	mm^2	50 x 50	110 x 110	180 x 180	220 x 220	285 x 285

NOTE

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

NOTE

Fixing Distance is defined as the distance between the base of the resonator and the marking area. Refer to the following figure.

WD: Working Distance

FD: Fixing Distance

MA: Marking Area

AB: Aiming Beam

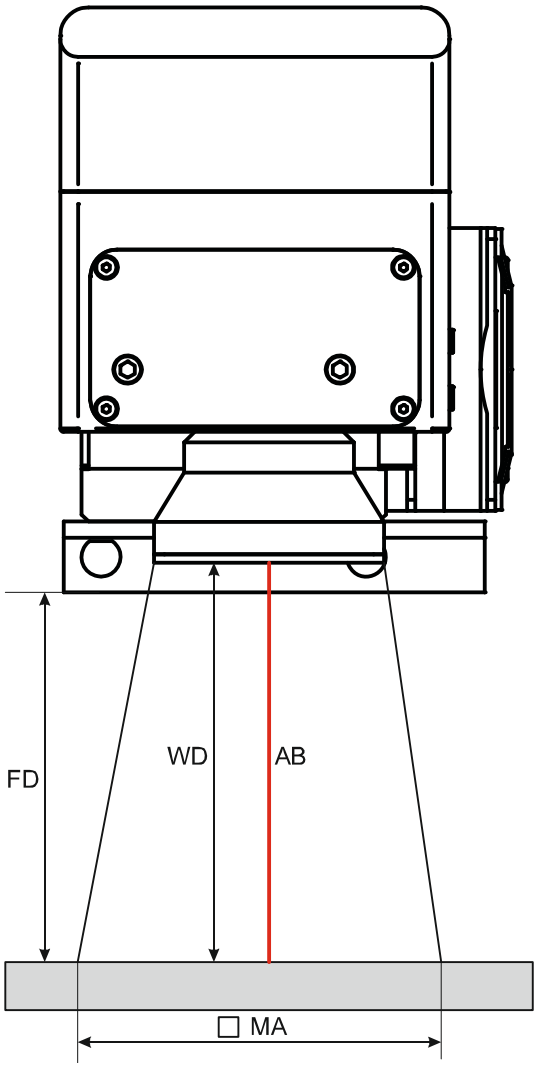


Figure 3: Marking Area

CONNECTORS SPECIFICATIONS

Interlock

Disables the Class4 laser source inside the laser marker. Interlock internal circuit is designed to comply with the single fault condition.

Control Rack back panel connector

Type SWITCHCRAFT TB Series male Tini Q-G (Mini XLR) panel mount connector, 4 pins.

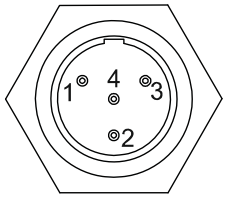


Figure 4: Interlock connector, male panel plug (front view)

PIN	SIGNAL	TYPE	DESCRIPTION
1	VCC_INT_IN_A	OUTPUT	24V DC reference for INTERLOCK_A signal
2	INTERLOCK_A	INPUT	INTERLOCK IN signal A
3	GND_INT_IN_B	GND	Ground reference for INTERLOCK_B signal
4	INTERLOCK_B	INPUT	INTERLOCK IN signal B

Table 1: Interlock connector pinout

Electric Diagram

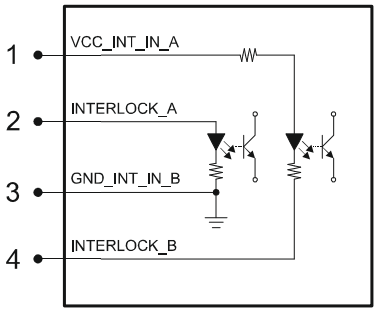


Figure 5: Interlock connector electric diagram

PIN1-PIN2	PIN3-PIN4	MARKING FUNCTIONALITY	CONDITION
CONTACT OPEN	CONTACT OPEN	NOT POSSIBLE	SAFE
CONTACT CLOSED	CONTACT OPEN	NOT POSSIBLE	DANGEROUS
CONTACT OPEN	CONTACT CLOSED	NOT POSSIBLE	DANGEROUS
CONTACT CLOSED	CONTACT CLOSED	NOT POSSIBLE	DANGEROUS

Table 2: Interlock connector conditions

CAUTION

In order to NOT DAMAGE the interlock circuitry, we recommend using "dry circuit" (zero voltage) switches or relay circuitry.

Plug connector

Connector type SWITCHCRAFT TA Series Tini Q-G (Mini XLR) female cable mount connector, 4 pins.

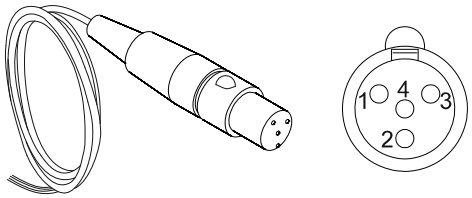


Figure 6: Female cable mount connector cod. TY4F (solder view)

CAUTION

To restore the marking system it is necessary to repeat the "Before turning on the laser marker, be sure that the laser marker is connected as previously described. Check the presence of:" on page 57 **without shutting down the system.**

Muting device

Connector type SWITCHCRAFT TA Series Tini Q-G (Mini XLR) female plug connector, 4 pins.

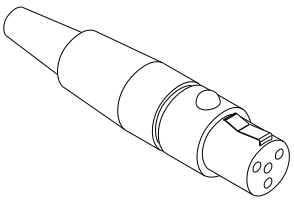


Figure 7: Interlock Muting Device provided

CAUTION

Do not use the Interlock Muting Device for external devices, since this will result in loss of the safety function of the machine to which this product is installed.

Do not use the Interlock Muting Device except for maintenance of this product.

CAUTION

It is the customer's responsibility to provide a correct integration of the safety signals according to applicable regulations.

Internal Electric Diagram

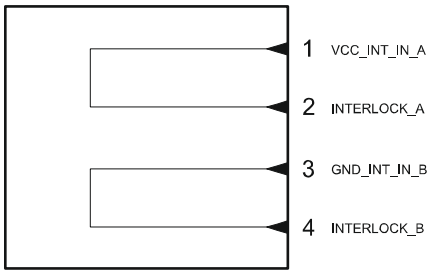


Figure 8: Interlock Muting Device electric diagram

Interlock Out

The Interlock Out allows monitoring of the interlock connector operation.

Control Rack back panel connector

Panel socket BINDER, 4 pins female, 719 series.

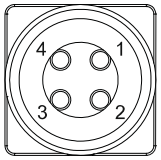


Figure 9: Interlock Out connector, female panel socket (front view)

PIN	SIGNAL	TYPE	DESCRIPTION
1	INT_OUT_A_COLLECTOR	COLLECTOR	Interlock Out signal A (INT_OUT_A)
2	INT_OUT_A_EMITTER	EMITTER	
3	INT_OUT_B_COLLECTOR	COLLECTOR	Interlock Out signal B (INT_OUT_B)
4	INT_OUT_B_EMITTER	EMITTER	

Table 3: Interlock Out connector pinout

Electric Diagram

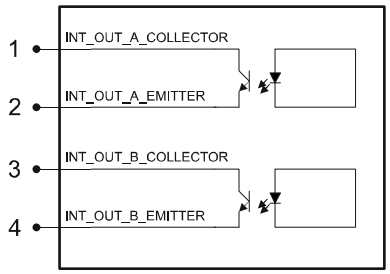


Figure 10: Interlock Out connector electric diagram

INT_OUT_A	INT_OUT_B	CONDITION
CLOSED	CLOSED	SAFE
CLOSED	OPEN	DANGEROUS
OPEN	CLOSED	DANGEROUS
OPEN	OPEN	DANGEROUS

Table 4: Interlock Out connector conditions

TECHNICAL CHARACTERISTICS	
Type	NPN BJT Transistor
Vmax	300 V
Imax	60 mA
Vsaturation	< 1.5 V
Leakage current	< 400 nA

NOTE **The response time is 10 ms from the output's switching.**

Plug Connector

Binder male cable mount connectors, 719 series, 4 pins.

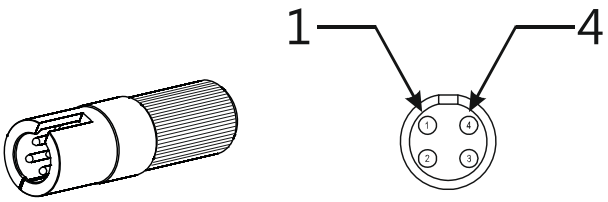


Figure 11: Male cable mount connector cod. 09-9767-00-04 (front view)

Command Box (laser control)

Control rack back panel connector

Panel socket Sub-D, 25 pins, female.

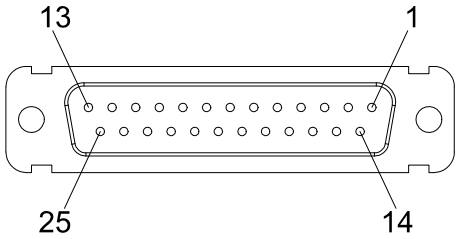


Figure 12: Command Box connector, female panel socket (front view)

PIN	SIGNAL	TYPE***	DESCRIPTION
1	12V_ENABLE_B	Output Power Supply	12V DC power supply available for EXT_ENABLE_B (max 250mA)
2	EXT_ENABLE_B	Digital Input	Secondary external ENABLE signal: - HIGH level: contact closed - LOW level or disconnected: contact opened
3	RESERVED	Digital Output	DO NOT CONNECT
4	EXT_12V	Output Power Supply	Auxiliary 12V DC power supply available for drive input logical HIGH (max 250mA)
5	EXT_12V	Output Power Supply	Auxiliary 12V DC power supply available for drive input logical HIGH (max 250mA)
6	EXT_12V	Output Power Supply	Auxiliary 12V DC power supply available for drive input logical HIGH (max 250mA)
7	12V_ENABLE_A	Output Power Supply	12V DC power supply available for EXT_ENABLE_A (max 250mA)
8	EXT_ENABLE_A	Digital Input	Primary external ENABLE signal: - HIGH level: contact closed; - LOW level or disconnected: contact opened
9	BUSY*	Digital Output	This signal is used to know if the current spooler is executing (marking in progress): - ON during marking process
10	CONNECTOR PRESENCE	Digital Input	This signal is used to check the presence of the Command Box connector: - HIGH level: normal operation; - LOW level or disconnected
11	START_MARKING*	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
12	EXT_KEY	Digital Input	External KEY signal: - HIGH level: contact closed; - LOW level or disconnected: contact opened
13	STOP_MARKING*	Digital Input	This signal is used to stop the marking process: - HIGH level pulsed signal stop the marking process

PIN	SIGNAL	TYPE***	DESCRIPTION
14	RESERVED	Digital Input	DO NOT CONNECT
15	RESERVED	Digital Input	DO NOT CONNECT
16	RESERVED	Digital Input	DO NOT CONNECT
17	END	Digital Output	This signal is used to know if the marking process is finished: - ON at the end of marking process
18	POWER_ON	Digital Output	This signal is used to know if the system is already warmed up: - ON when the laser is in STAND_BY or READY state
19	GND	Ground	Ground reference
20	SYSTEM_ALARM	Digital Output	This signal is used to know if the system is in booting up state or in error state: - ON during BOOTING UP - ON in case of system error
21	GND	Ground	Ground reference
22	ENABLE_OUT	Digital Output	This signal is used to know if the system is ready to emit laser radiation: - ON when the system is in READY state
23	SW_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 READY state (SW_READY COMPATIBILITY** = false) - ON when a script is running n AUTO MODE** and "IoPort.setReady (true)" function is used
24	GND	Ground	Ground reference
25	GND	Ground	Ground reference

Table 5: Command Box connector pinout

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

** refers to Lighter user's manual

*** ** see "Input/Output specifications" on page 34

Muting Device

Sub-D, 25 pins, male, with shell.

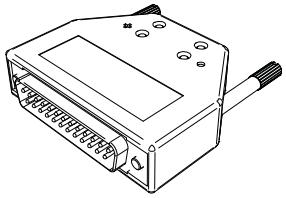


Figure 13: Command Box Muting Device provided

CAUTION

If the Command Box Muting Device provided is connected, the laser marker enable is bypassed.

Internal electric diagram

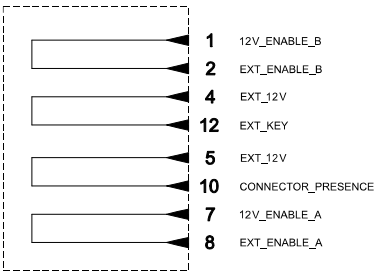


Figure 14: Command Box Muting Device electric diagram

Axes (I/O Control)

Control rack back panel connector

Plug Sub-D, 25 pins, male.

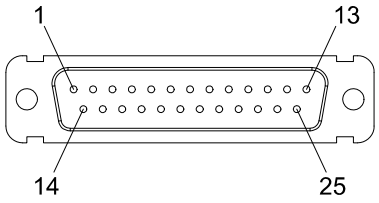


Figure 15: Axes connector, male panel plug (front view)

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

PIN	SIGNAL	TYPE**	DESCRIPTION
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	OUTPUT_11 (*) or DIR R	Digital Output	Generic output or R-Axis drive direction signal
25	GND	Ground	Ground reference

Table 6: Axis connector pinout

* enabling an axis causes the corresponding control signals to no longer be available as generic inputs/outputs. 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 "Input/Output specifications" on page 34

RS232 (COM3)

Control rack back panel connector

Plug Sub-D, 9 pins, male.

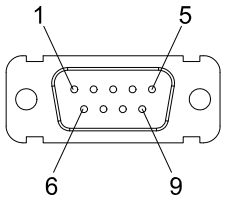


Figure 16: RS232 connector, male panel plug (front view)

PIN	SIGNAL	TYPE	DESCRIPTION
1	DCD	Input	Data Carrier Detect
2	RXD	Input	Receive Data
3	TXD	Output	Transmit Data
4	DTR	Output	Data Terminal Ready
5	GND	Ground	Ground reference
6	DSR	Input	Data Set Ready
7	RTS	Output	Request to Send
8	CTS	Input	Clear to Send
9	RI	Input	Ringing Indicator

Table 7: RS232 connector pinout

Encoder

Control rack back panel connector

Panel socket BINDER, M12, 8 pins female, 763 series. Recommended encoder: Datalogic ENC58-S10-XXXX-M1 (ENC58-S10-5000-M12).

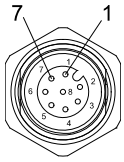


Figure 17: Encoder connector, female panel socket (front view)

PIN	SIGNAL	TYPE*	DESCRIPTION
1	GND	Ground	Ground reference
2	VCC	Power Output	Auxiliary 12V DC power supply
3	ENC_A	Digital Input	Encoder HTL A channel signal
4	GND	Ground	Return signal for ENC_A
5	ENC_B	Digital Input	Encoder HTL B channel signal
6	GND	Ground	Return signal for ENC_B
7	RESERVED	-	DO NOT CONNECT
8	RESERVED	-	DO NOT CONNECT
BODY	SHIELD	Shield	Shield

Table 8: Encoder connector pinout

Photocell

Control rack back panel connector

Panel socket BINDER, M12, 4 pins female, 763 series. Recommended photocell: Datalogic S51-PA-5-B01-PK; Datalogic S15-PA-5-B01-PK or equivalent.

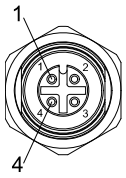


Figure 18: Photocell connector, female panel socket (front view)

PIN	SIGNAL	TYPE*	DESCRIPTION
1	VCC	Power Supply	Auxiliary 12V DC power supply
2	RESERVED	-	DO NOT CONNECT
3	GND	Ground	Ground reference
4	PHOTOCELL	Digital Input	PNP photocell signal

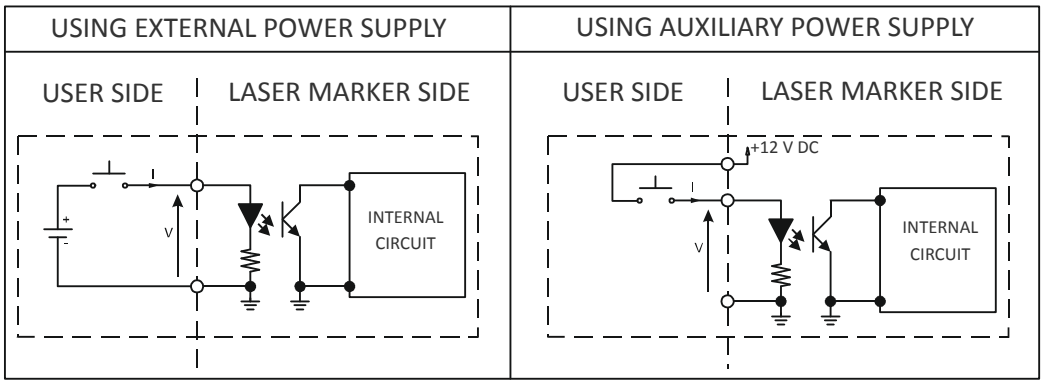
Table 9: Photocell connector pinout

CAUTION

For EMC compliance a RICHCO RRC-16-9-28-M2-K5B ferrite (or equivalent) must be used.

INPUT/OUTPUT SPECIFICATIONS

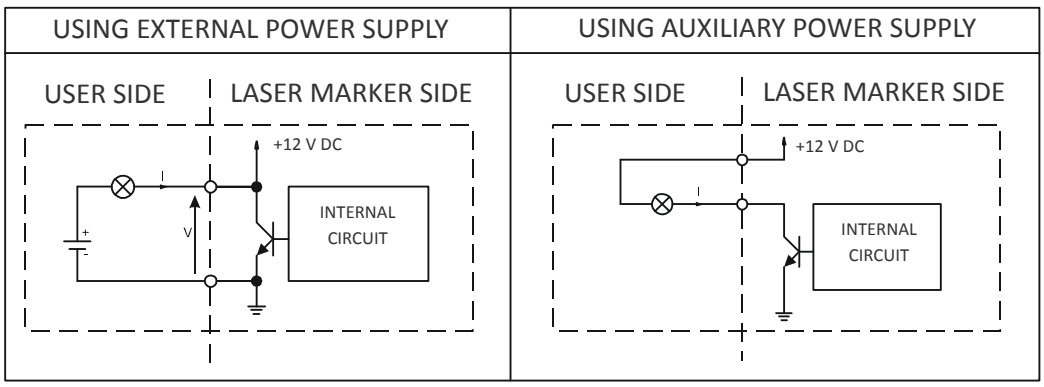
Digital Input



TECHNICAL CHARACTERISTICS			
Type	Optocoupler		
Vmax	24 V DC		
Imax	5 mA @ 24 V DC		
Pulse Width	≥ 1 ms (debounce)		
	MIN	TYP	MAX
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

Table 10: Digital Input specification

Digital Output



TECHNICAL CHARACTERISTICS	
Type	Low side driver
Vmax	24 V DC
Imax	250 mA
Vsaturation	<0.5V DC
Leakage current	< 5µA
OUTPUT Stase ON	V ≤ 0.5 V DC; I ≤ 250mA
OUTPUT Stase OFF	V ≤ 24 V DC; I ≤ 5µA

Table 11: Digital Output specification

LASER MARKER STATE

Normal Operation States

STATE	DESCRIPTION	STATUS LED
SYSTEM BOOTING UP	This state occurs since the laser marker is switched on until Laser Engine has been loaded and no errors occurred	Blinking
WAIT FOR START	In this state the laser marker cannot emit IR lasers radiation and Aiming beam cannot be activated	Steady
WARMING UP	In this state the laser marker is performing the warm up process	Blinking
STANDBY SHUTTER CLOSED	In this state Aiming and Focus beam can be activated while the laser marker cannot emit IR laser radiation	Steady
READY	In this state the laser marker is able to emit IR laser radiation	Steady

Error States

STATE	DESCRIPTION	STATUS LED
ERROR	This state occurs if the laser marker detects an error that prevents normal operation	Blinking

SYSTEM ERROR	DESCRIPTION
INTERLOCK ERROR	This error rise if the INTERLOCK function is ON. To reset the error, set INTERLOCK function to OFF and repeat the turning on sequence
	This error rise if the CONNECTOR_PRESENCE signal (pin 10 Command Box connector) is LOW or not connected. To reset the error, set CONNECTOR_PRESENCE signal to HIGH value and repeat the turning on sequence
TEMPERATURE ERROR	This error rise if the temperature inside the laser source is out of the operating temperature range. To reset the error, a Laser marker restart is required
MASTER OSCILLATOR ERROR	This error rise if the laser source detects an internal failure. To reset the error, a Laser marker restart is required

Warning State

STATE	DESCRIPTION	STATUS LED
WARNING INVALID START SEQUENCE	This state occurs if the turning on sequence has not been followed. To restore normal laser marker operation, repeat the turning on sequence	Blinking

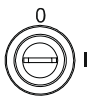
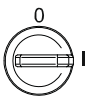
Control the Laser Marker States

The laser marker states can be controlled by:

- Key and Enable Selector
- Command Box connector

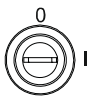
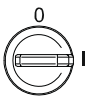
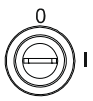
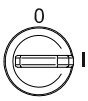
Key and Eneable Selector mode

Controlling the laser marker states using the Key Selector on the control rack front panel requires that the input signals of the command box connector *EXT_KEY*, *EXT_ENABLE_A* and *EXT_ENABLE_B* are set to fixed HIGH level:

STATE	COMMAND BOX INPUT STATE		KEY SELECTOR	ENABLE SELECTOR	STATUS LED
SYSTEM BOOTING UP	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH HIGH HIGH			Blinking
WAIT FOR START	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH HIGH HIGH			Steady
WARMING UP	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH HIGH HIGH			Blinking
STANDBY SHUTTER CLOSED	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH HIGH HIGH			Steady
READY*	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH HIGH HIGH			Steady

Command Box mode

Controlling the laser marker states using the Command Box connector on the control rack back panel requires that the Key Selector and Enable Selector are set to 1:

STATE	COMMAND BOX INPUT STATE		KEY SELECTOR	ENABLE SELECTOR	STATUS LED
SYSTEM BOOTING UP	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	LOW LOW LOW			Blinking
WAIT FOR START	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	LOW LOW LOW			Steady
WARMING UP	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH LOW LOW			Blinking
STANDBY SHUTTER CLOSED	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH LOW LOW			Steady
READY*	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH HIGH HIGH			Steady

TIMING DIAGRAMS

Turning On sequence

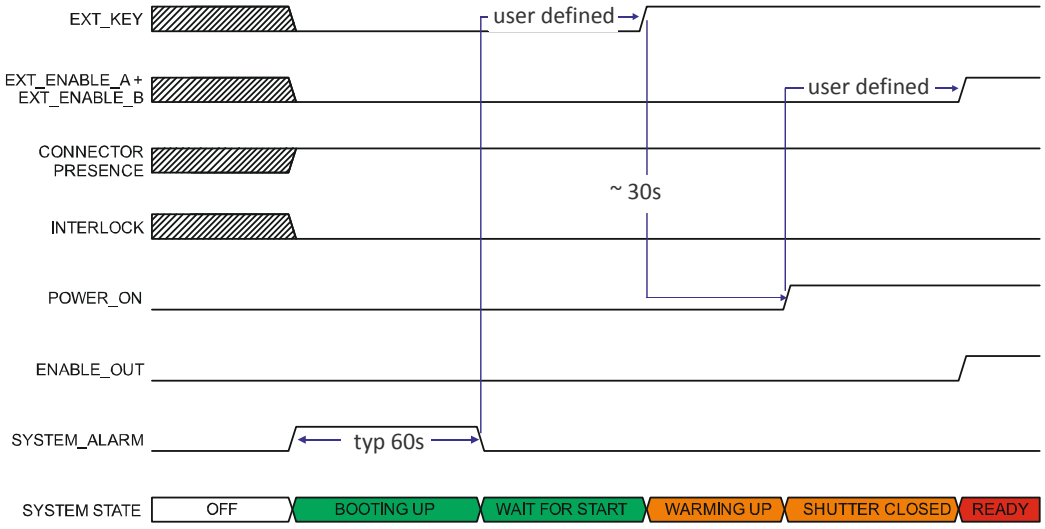


Figure 19: Turning On sequence timing diagram

Marking control signals behavior

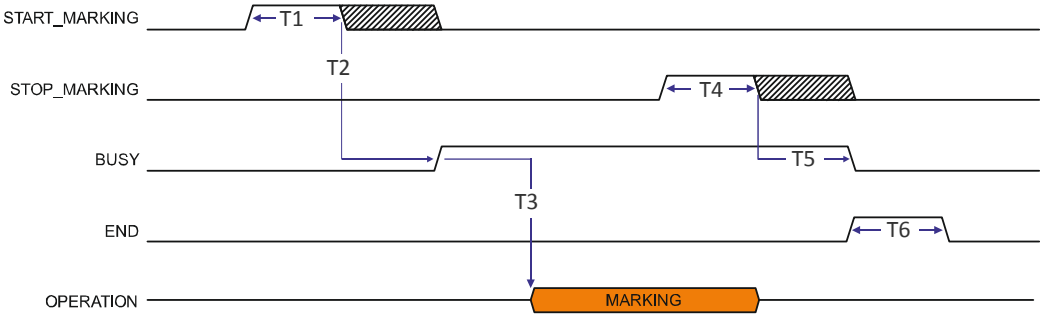


Figure 20: Marking process timing diagram

REF.	NAME	DESCRIPTION
T1	Start Time	Minimum time duration that the START_MARKING signal must have in order to be accepted as a valid START_MARKING event
T2	Start Delay	Delay between the acceptance of the START_MARKING signal and the rising edge of the BUSY signal
T3	Busy Advance	Delay between the rising edge of the BUSY signal and the laser emission
T4	Stop Time	Minimum time duration that the STOP_MARKING signal must have in order to be accepted as a valid STOP_MARKING event
T5	Busy Delay	Delay between the end of the laser emission and the falling edge of the BUSY signal
T6	End Time	ime duration of the END signal

NOTE **Consult Lighter™ software user's manual for a proper use of the same.**

MARVIS™ I/O signals behavior

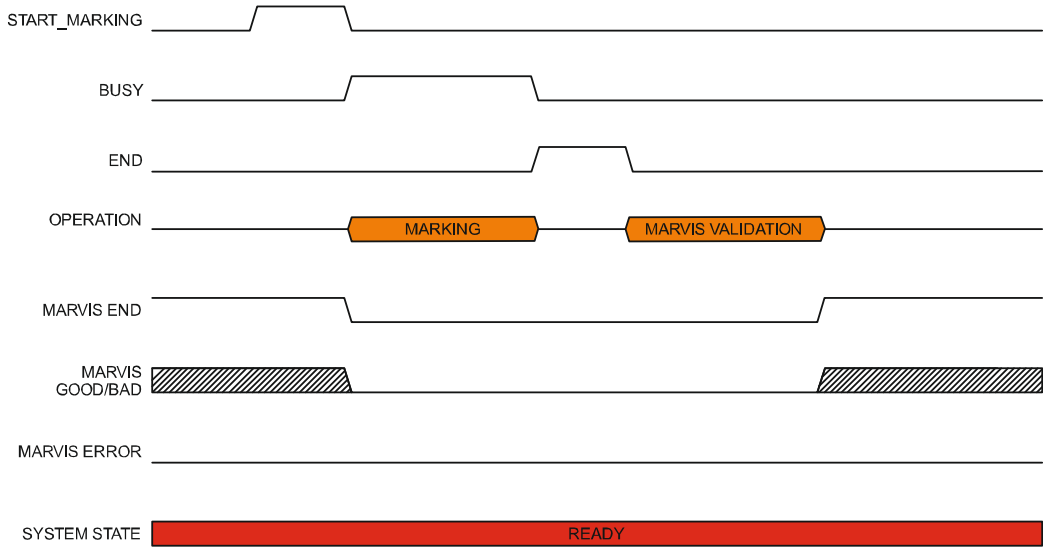


Figure 21: MARVIS™ I/O signals behavior

Axes I/O signals behavior

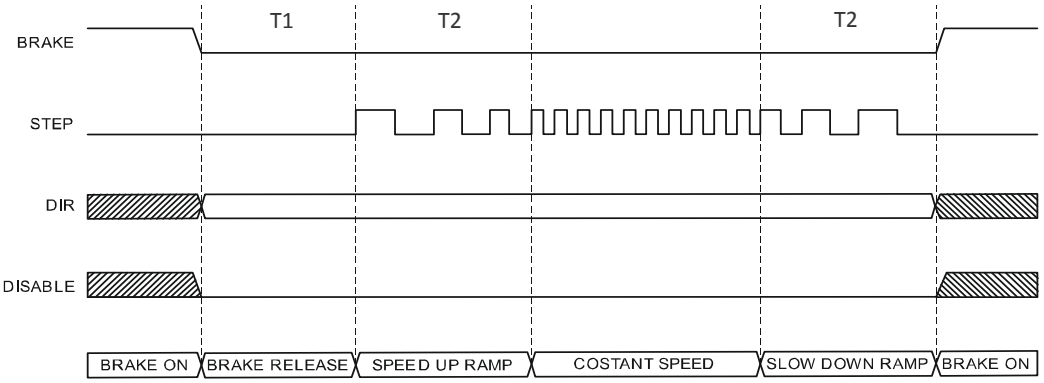


Figure 22: Axes I/O signals behavior

REF.	NAME	DESCRIPTION
T1	Brake release	The time that elapses between the brake release signal activation and the start of mechanical movement
T2	Ramp Time	The time to go from minimum speed (Start speed) to working speed (Speed)

LIGHTER™ SUITE MARKING SOFTWARE

The laser marker is equipped with Lighter™ Suite marking software.

Lighter™ Suite is the all-inclusive editing and laser management software for all Datalogic Laser Marking products.

Lighter™ Suite with its innovative approach focused on the user experience is revolutionizing Laser Marking management; the powerful and simple interface, the flexible and comprehensive customization capabilities and effective production tools represent an important step-ahead in traceability and branding industrial applications.

Lighter™ Suite combines into an unified GUI (Graphical User Interface) a powerful vectorial graphical editor, an advanced laser controller and the innovative MARVIS™ (MArk Read Verify Integrated Solution) feature to seamless interact with AutoID code reader for in-line validation of marked traceability codes.

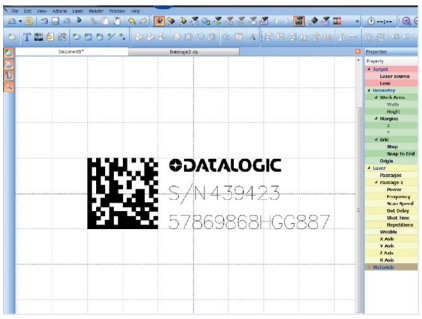
MARVIS™ connects Datalogic MATRIX™ N-series reader with the laser marker, enabling controlling from one single interface and enhancing individual products' performances.

MARVIS™ is also available as update for existing products.

Object-Oriented Configuration

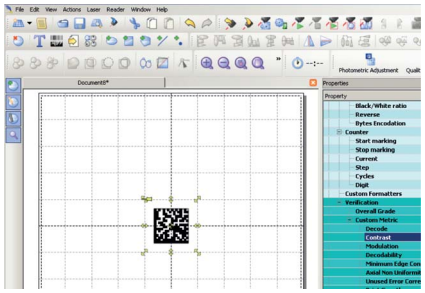
In the Lighter Suite, each object is associated with specific LASER parameters and READER configuration; loading a graphical layout will automatically retrieve and update laser and reader configurations.

Advanced Editing Function



- Easily create, import and edit texts, shapes and logos
- One-click code generator for 1D and 2D symbologies
- Object-related Property Browser for fast adjustment of Marker and Reader parameters
- Imports Bitmap and Vector files (DXF, DWG, PLT, PDF, AI, SVG, BMP, JPG, PNG and TIFF…)
- Advanced filling featured with various laser-optimized patterns

MARVIS™ Integrated Configuration And Setup



- IP address discovery and connection management
- Dedicated Digital output for in-line parts selection
- Dedicated Digital input for deferred reader trigger
- Configurable images storage pool
- New Code Quality Training feature to automatically define code quality threshold from "Golden Sample"
- Patent Pending "Quality Grade Metric Profile" (QGP)

Connectivity

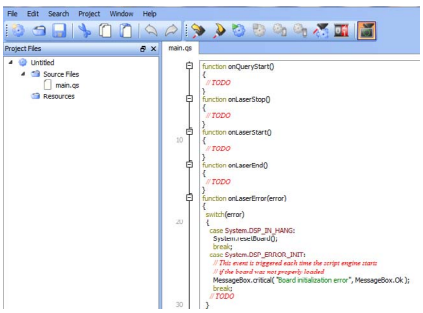
The Lighter™ Suite allows OEMs and Machine builders to develop a complete and cost effective Laser Marking Station, based on embedded hardware and software resources (such as STAND ALONE mode) or to design an advanced Laser Marking Solution able to control machinery over a simple Ethernet connection with a supervisor computer (MASTER-SLAVE mode).

Lighter™ Suite natively embeds Ethernet TCP/IP and EtherNet/IP protocols.

Scripting programmability

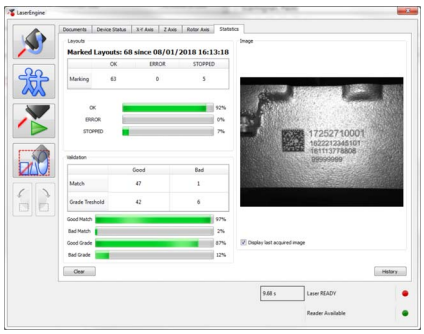
The LIGHTER Suite integrates the IDE (Integrated Development Environment) providing the users with a full set of tools to be used for extremely flexible customization.

The programming language is ECMAScript (also called JavaScript).



- Control the entire marking process
- Create and fully customize marking layout and its content at runtime
- Interact with local or centralized databases
- Create alternative customized interfaces
- Interact with Third Party devices

Runtime Production Statistics and Reports



Built-in validation statistics dashboard.

Configurable log file with Quality Reporting and code images.

CHAPTER 4
SET UP

CONNECTIONS

The laser marker connections are described here below. Follow the operations as described.

Fan installation

The fan supplied with the laser marker must be accurately positioned and fixed on the resonator so that it can work properly.

The fan must be assembled so that the air flow is aimed at the unit containing the crystal (gold-coloured section on the resonator).

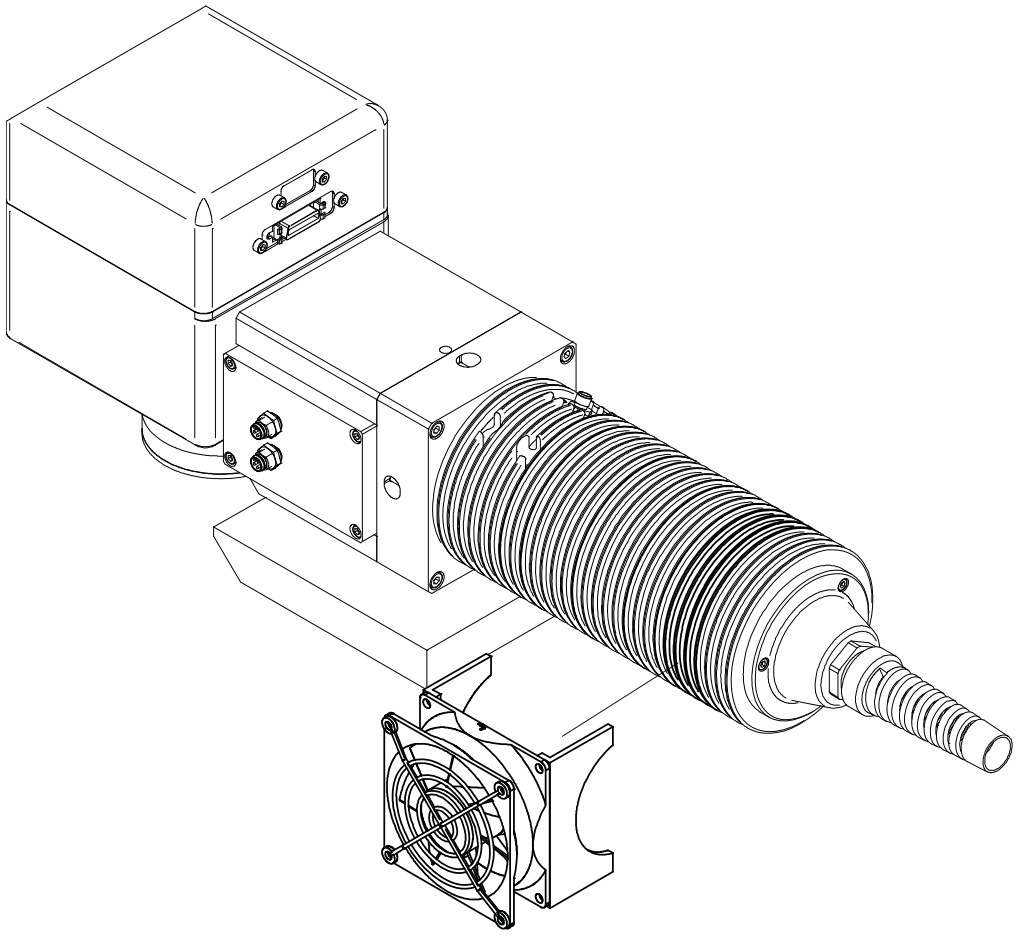


Figure 1: Fan installation

Connecting Command Box cable

The Command Box cable must always be inserted with properly signals provided in order to use the laser marker. The absence of such connector blocks the laser marker operations.

CAUTION

If the Command Box Muting Device provided is connected, the laser marker enable is bypassed.

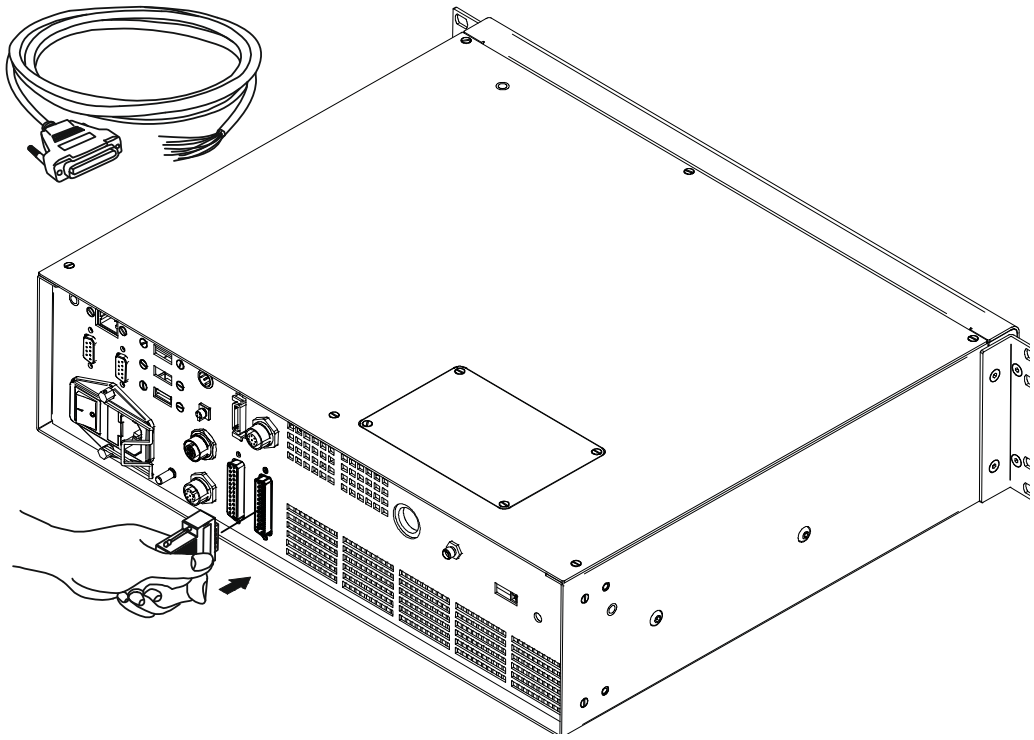


Figure 2: Connecting Command Box cable

Connecting Interlock cable

The Interlock cable must always be inserted with properly signals provided in order to use the laser marker. The absence of such connector blocks the laser emission.

CAUTION

Do not use the Interlock Muting Device for external devices, since this will result in loss of the safety function of the machine to which this product is installed.

Do not use the Interlock Muting Device except for maintenance oh this product.

CAUTION

It is the customer's responsibility to provide a correct integration of the safety signals according to applicable regulations.

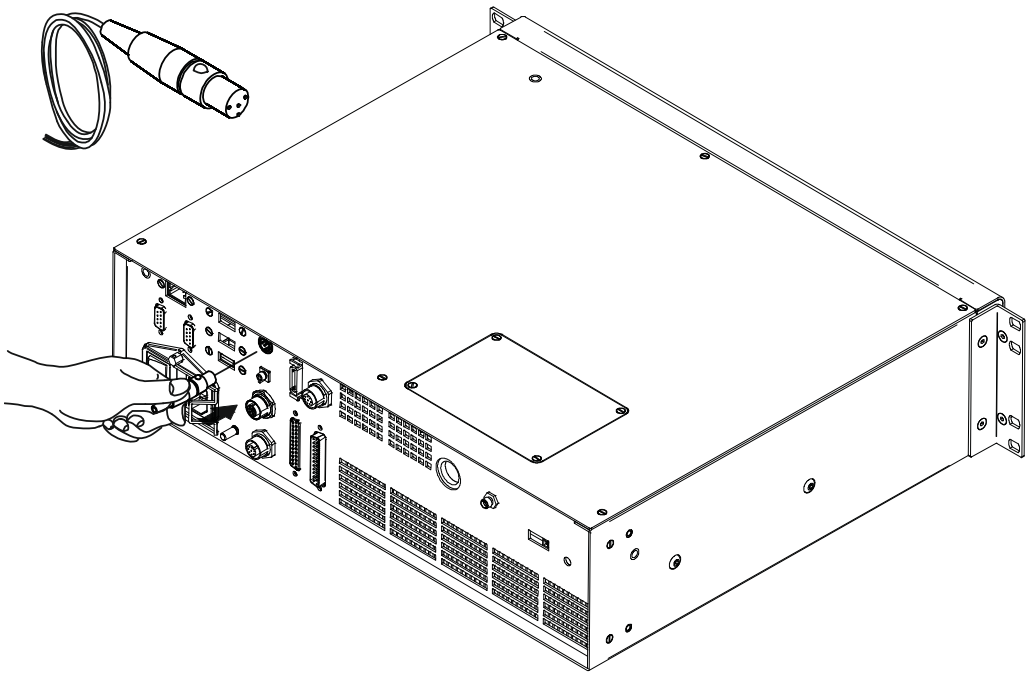


Figure 3: Connecting Interlock cable

Connecting Interlock Out connector

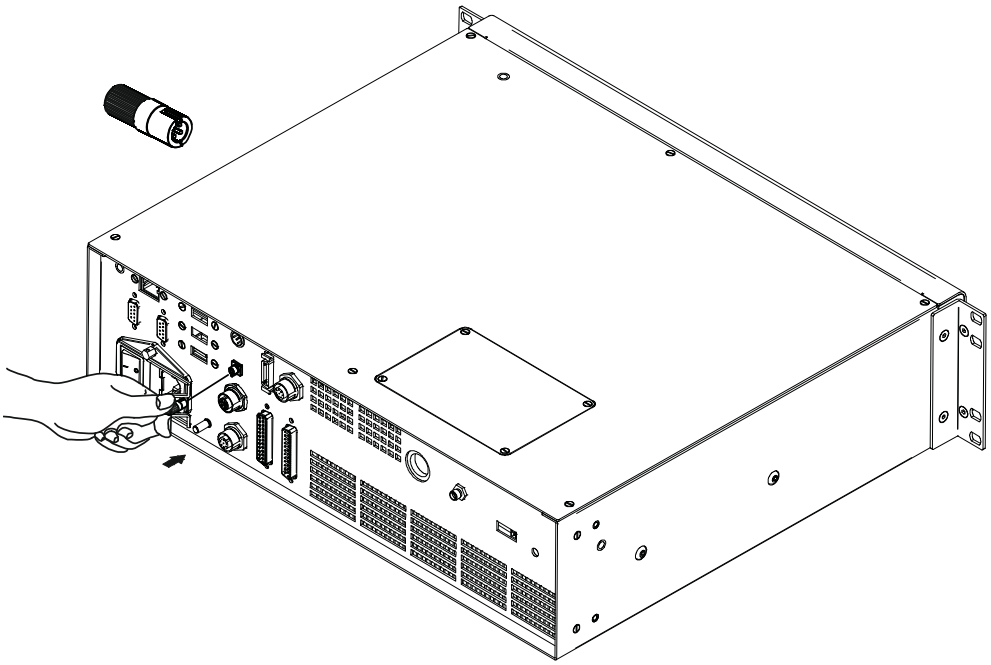


Figure 4: Connecting Interlock Out

Connecting the Optical Fiber to the control rack

Follow the steps listed here below to connect the optical fiber to the control rack:

1. unscrew the four screws holding the cover plate on the control rack.

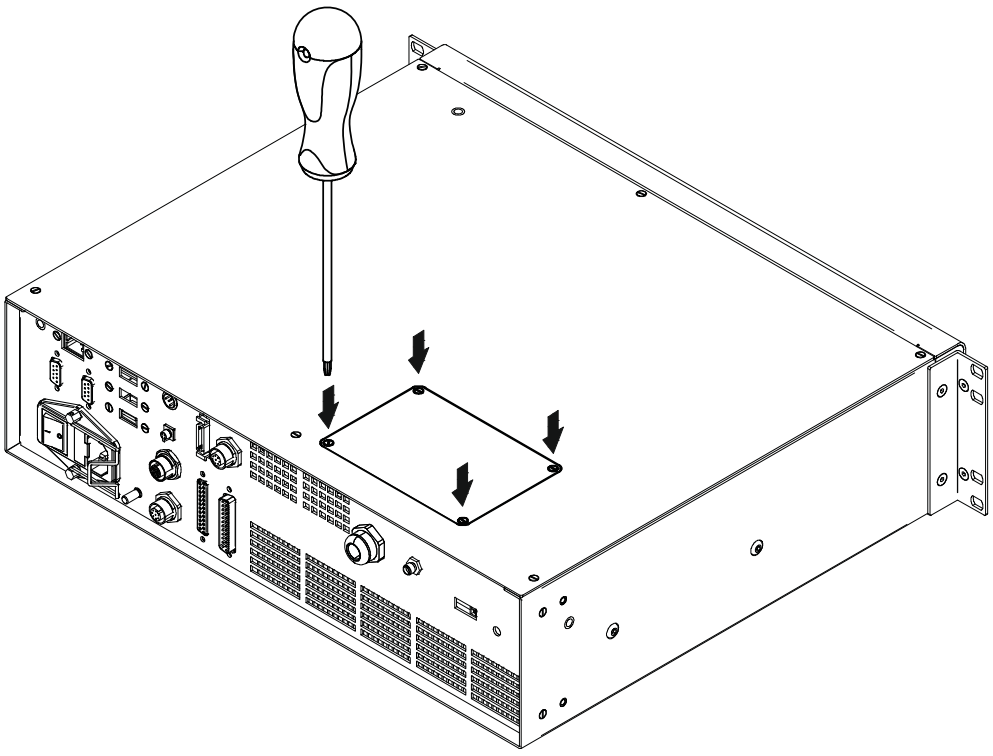


Figure 5: Removing the cover plate from the control rack

2. insert the optical fiber into the cable gland without removing its protection cap.

CAUTION

The insertion of the optical fiber is a delicate operation. You must make sure that the optical fiber is protected by its cap during insertion through the cable gland to avoid damaging or dirtying it.

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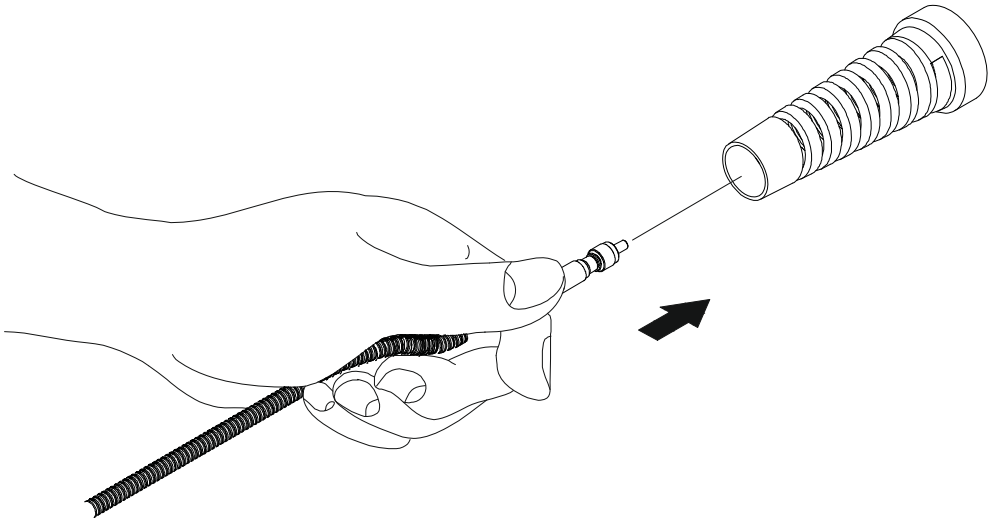


Figure 6: Passing the optical fiber through the cable gland

3. insert the optical fiber into the PG cable gland mounted on the rear panel of the control rack.

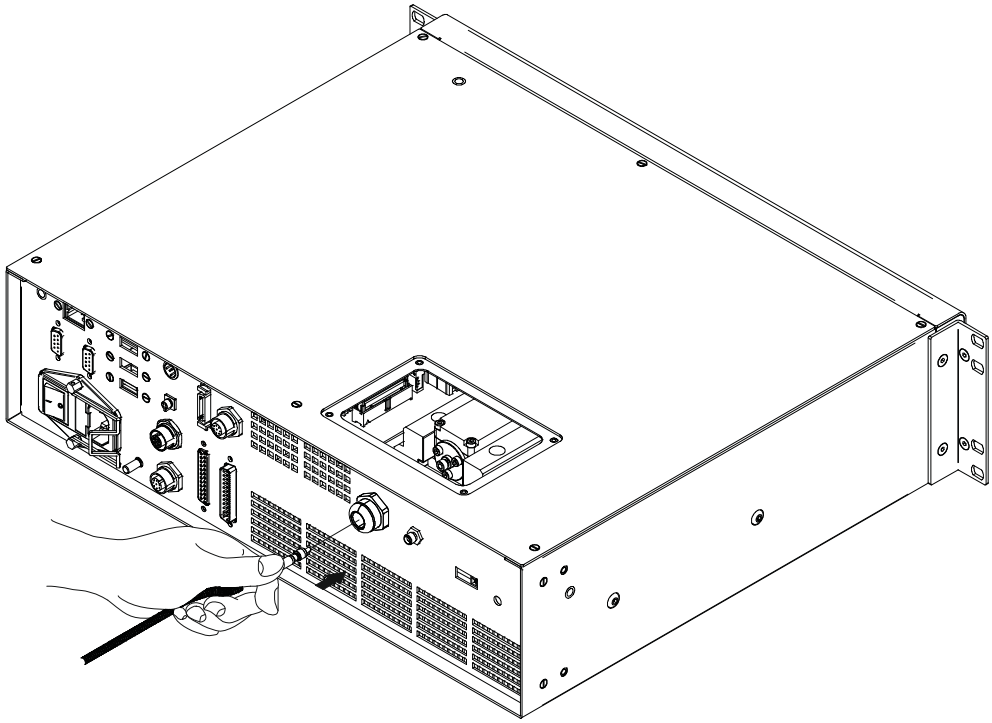


Figure 7: Passing the optical fiber through the PG cable gland

4. remove the optical fiber protection cap and tighten it to the fiber diode module paying attention not to soil or scratch the fiber end. Tighten the hexagonal nut of the fiber by hand, until resistance to rotation is felt.

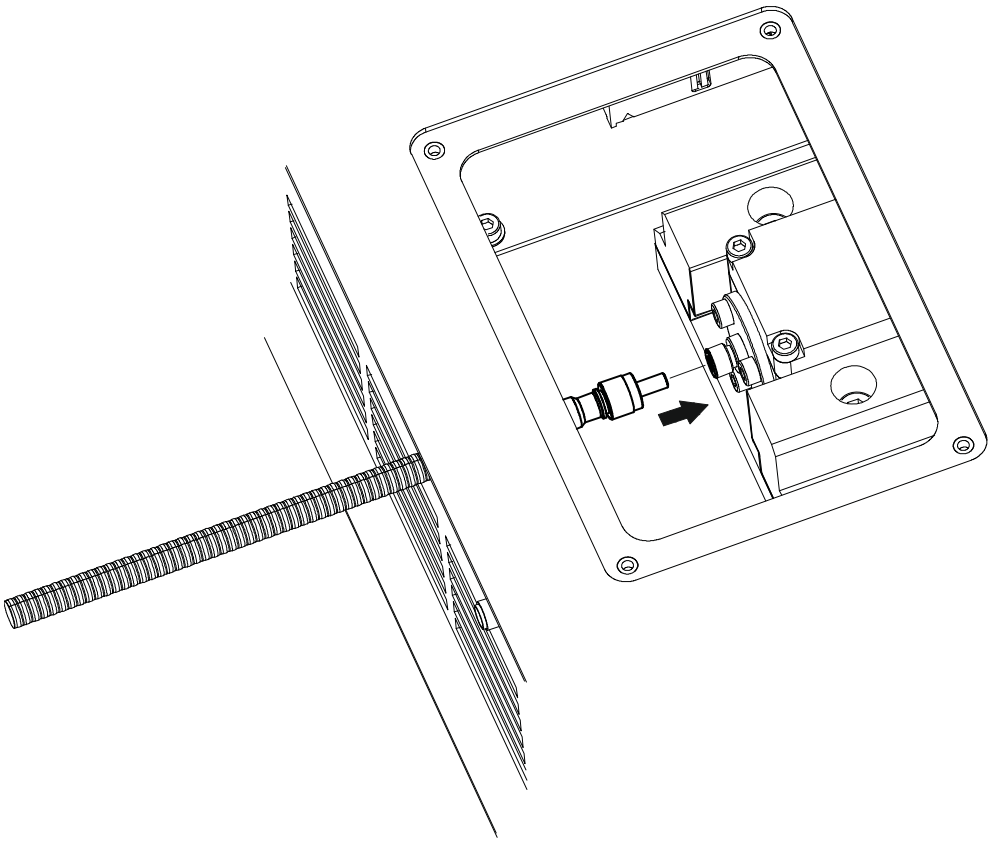


Figure 8 : Connection of the optical fiber

5. fix the cable gland to the PG cable gland on the rack.

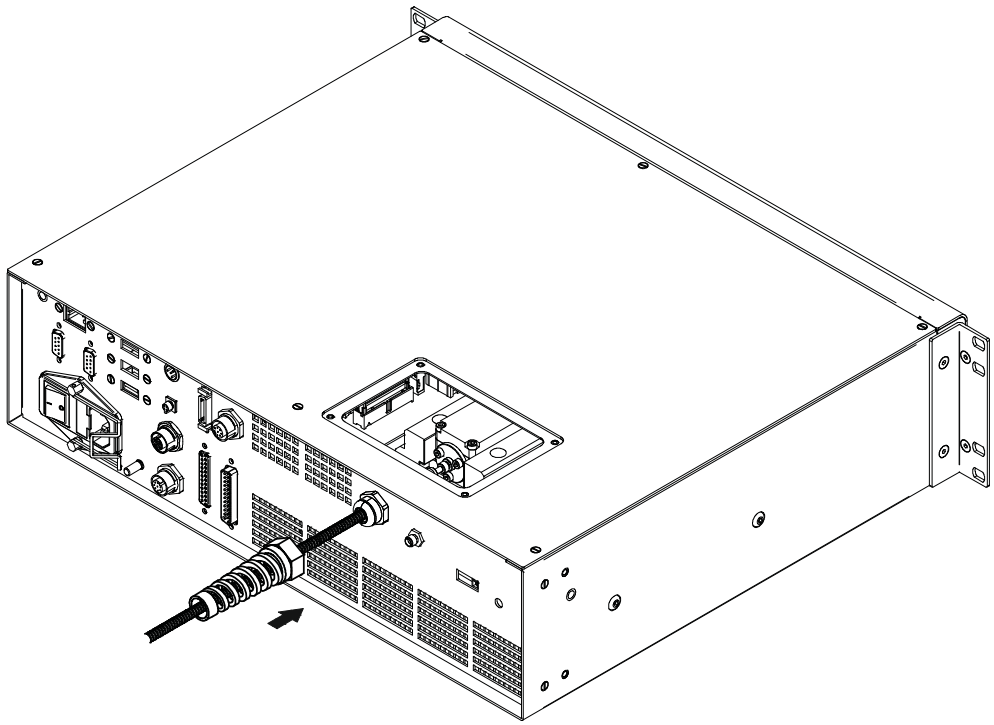


Figure 9 : Fixing the cable gland

6. close the rack cover plate.

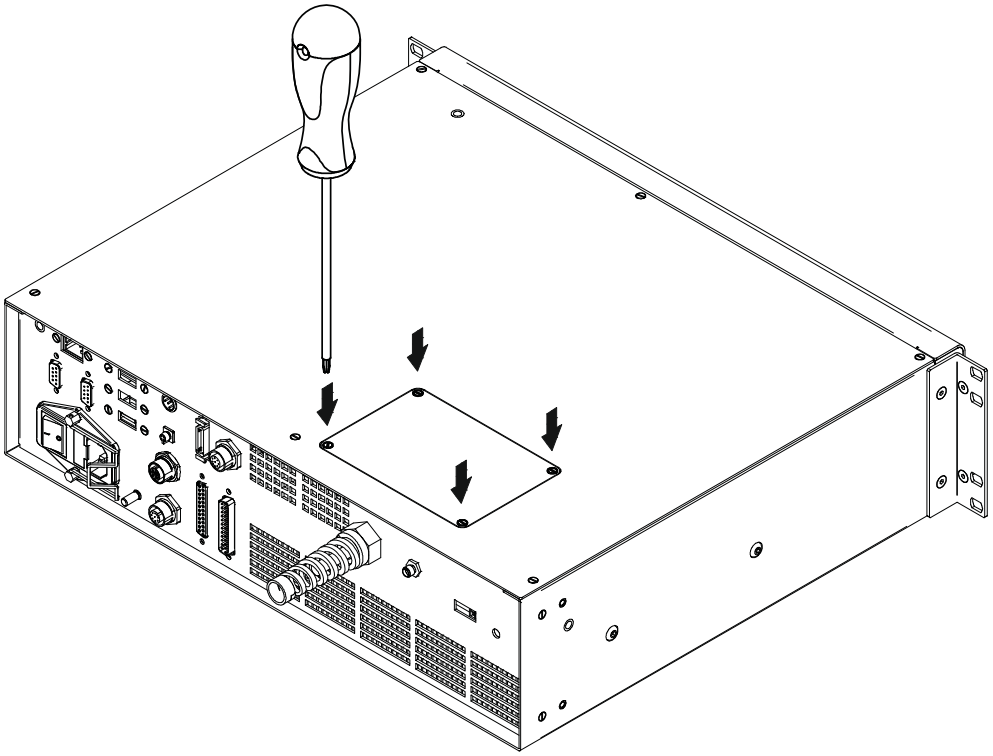


Figure 10 : Closing cover

Connecting the Opical Fiber on the resonator

Follow the steps listed here below to wire the optical fiber to the resonator:

1. unscrew the three screws that secure the metallic cover and cable gland to the resonator.

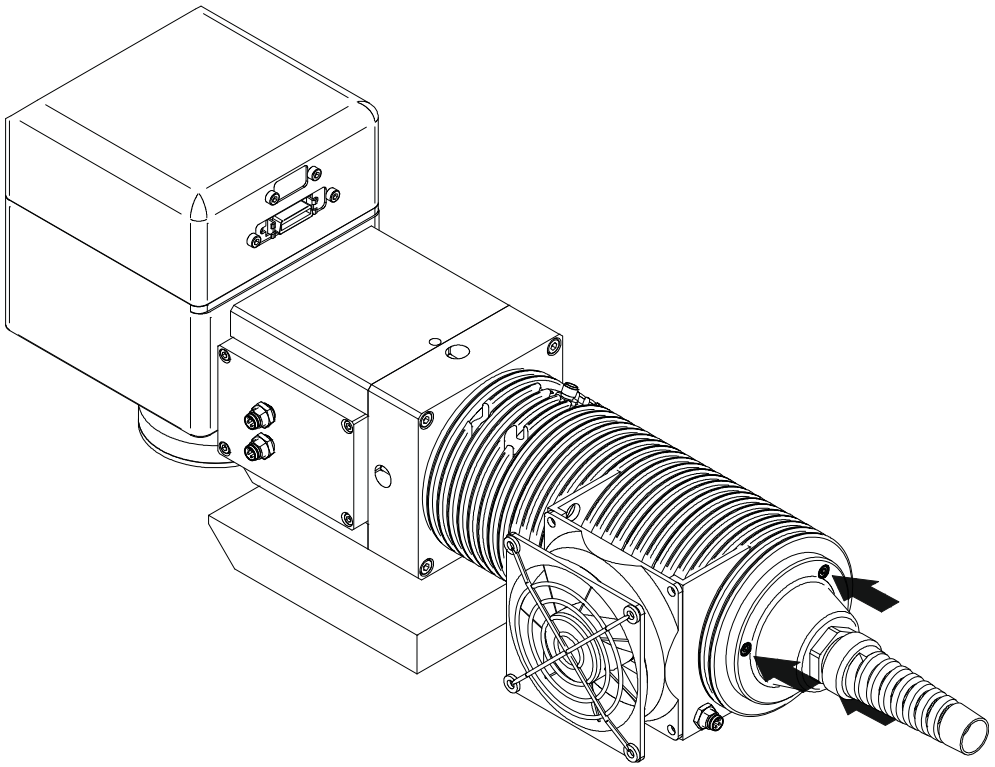


Figure 11 : Disassembling the optical fiber cable gland from the resonator

2. insert the optical fiber through the cable gland without removing the protection cap.

CAUTION

The insertion of the optical fiber is a delicate operation. You must make sure that the optical fiber is protected by its cap during insertion through the cable gland to avoid damaging or dirtying it.

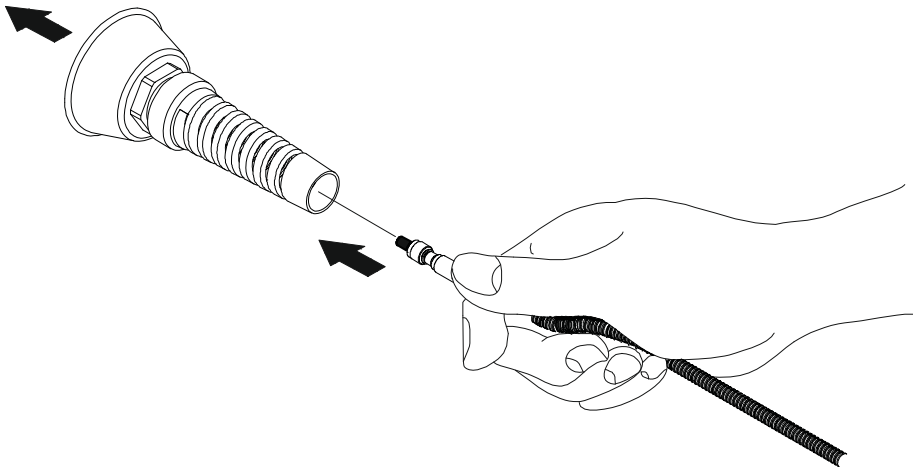


Figure 12: Passing the optical fiber through the cable gland

3. remove the protection cap and insert the optical fiber in the resonator, being careful not to soil or scratch the fiber end. Tighten the hexagonal nut of the fiber by hand, until resistance to rotation is felt.

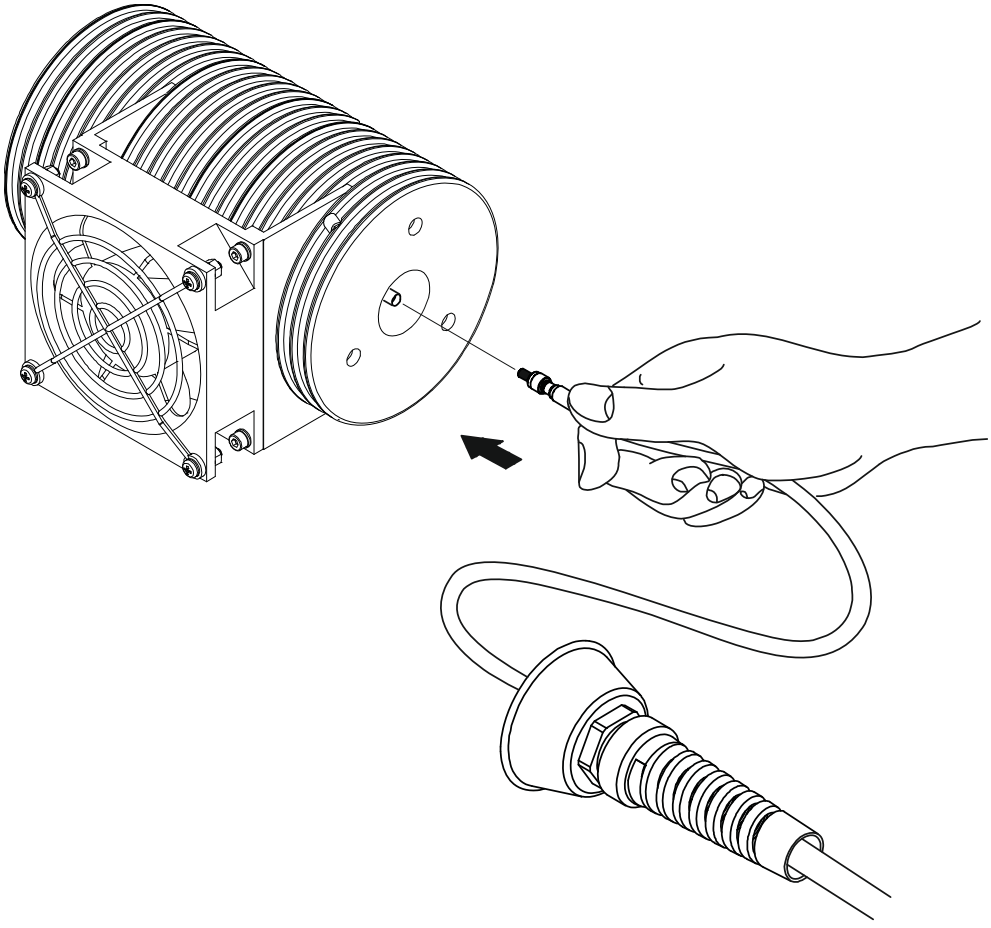


Figure 13: Connecting the optical fiber to resonator.

4. screw the metallic cover and cable gland onto the resonator.

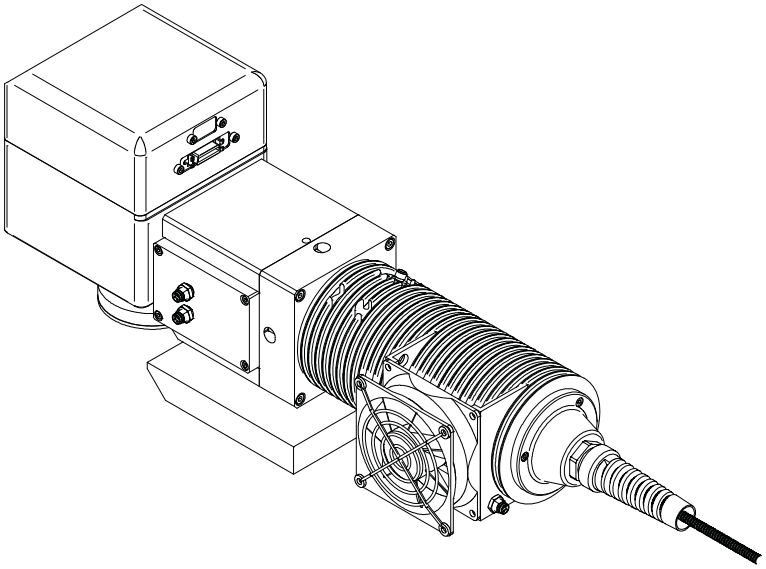


Figure 14: Final closing

CAUTION

To avoid damaging or breaking the optical fiber, never subject it to a bending radius smaller than 20 cm.

Connecting Radiofrequency cable

Screw in the SMA cable connectors, starting at the resonator side (90° end) then at the rack side.

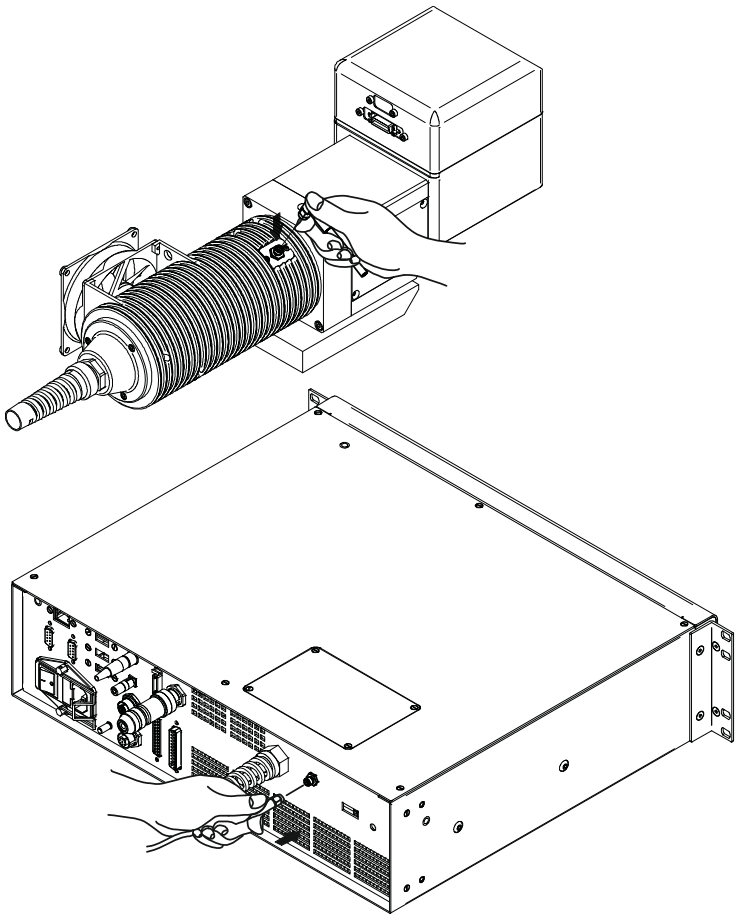


Figure 15: RF cable connection

Connecting MDR cable

Connect the MDR cable to the rack:

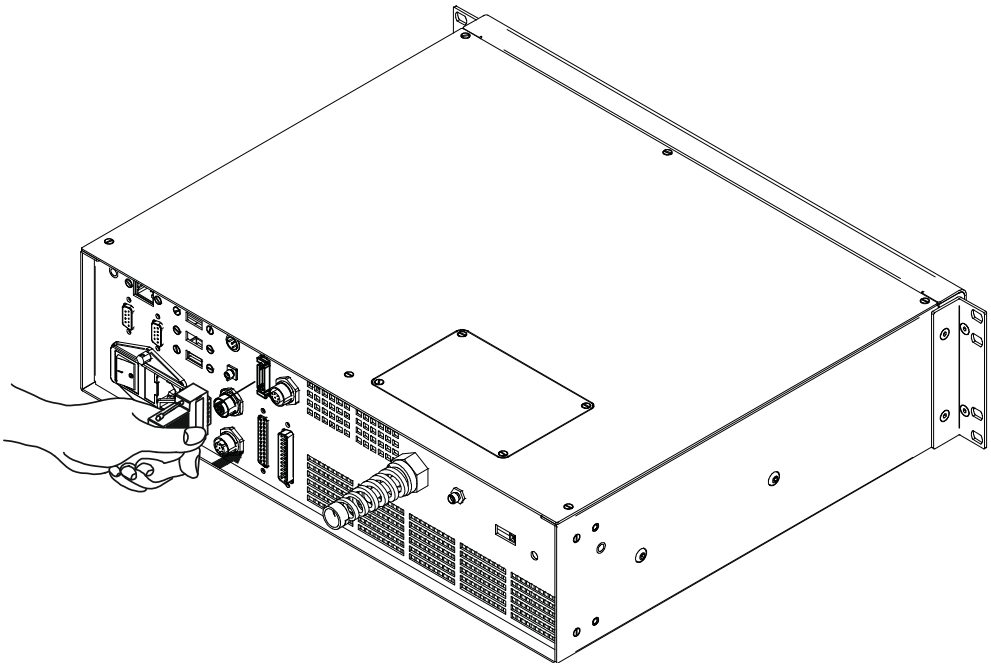


Figure 16: MDR connection control rack side

Connect the other end of the cable to the scanner head.

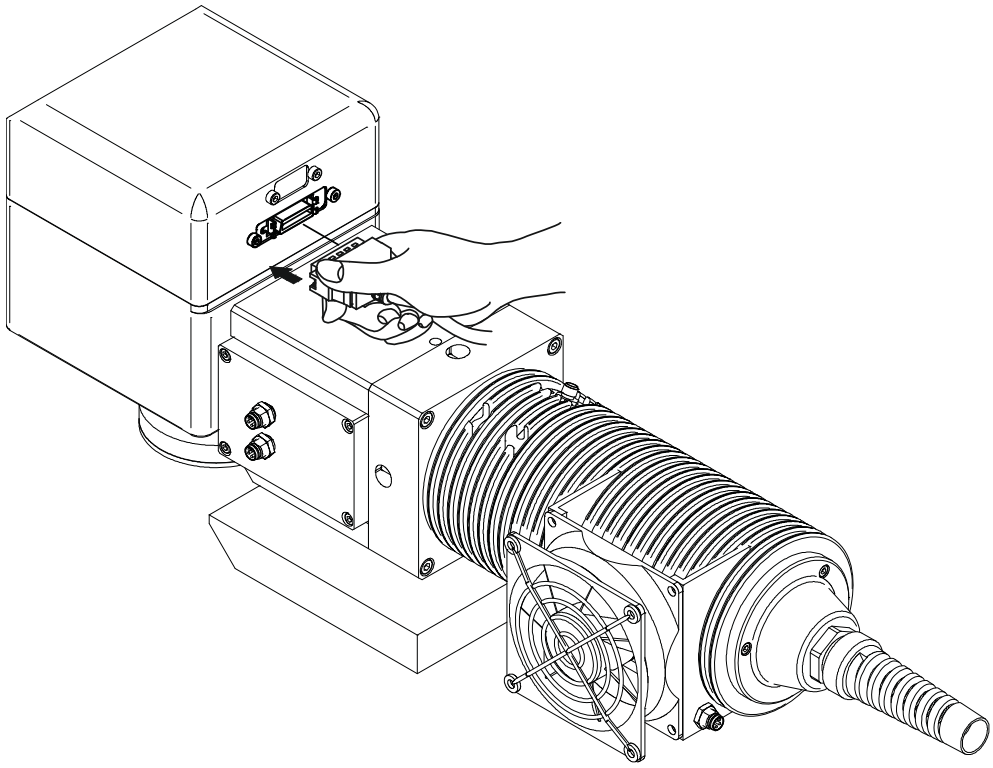


Figure 17: MDR connection resonator side

Connecting Resonator cable

Connect the resonator cable to the rack:

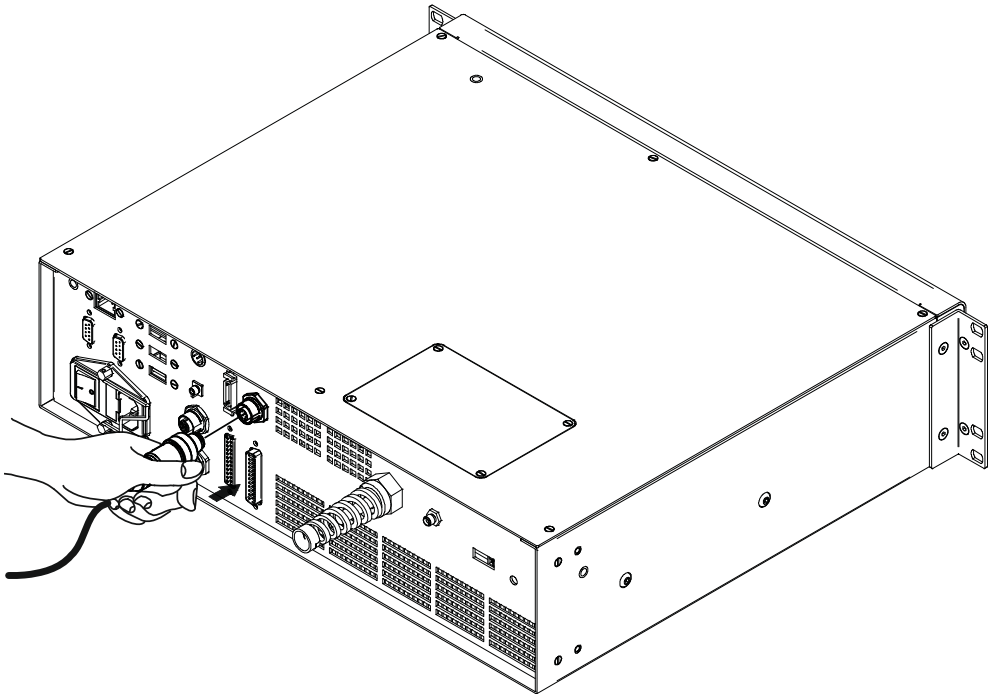


Figure 18: Resonator cable connection rack side

Connect the other end of the cable to the resonator.

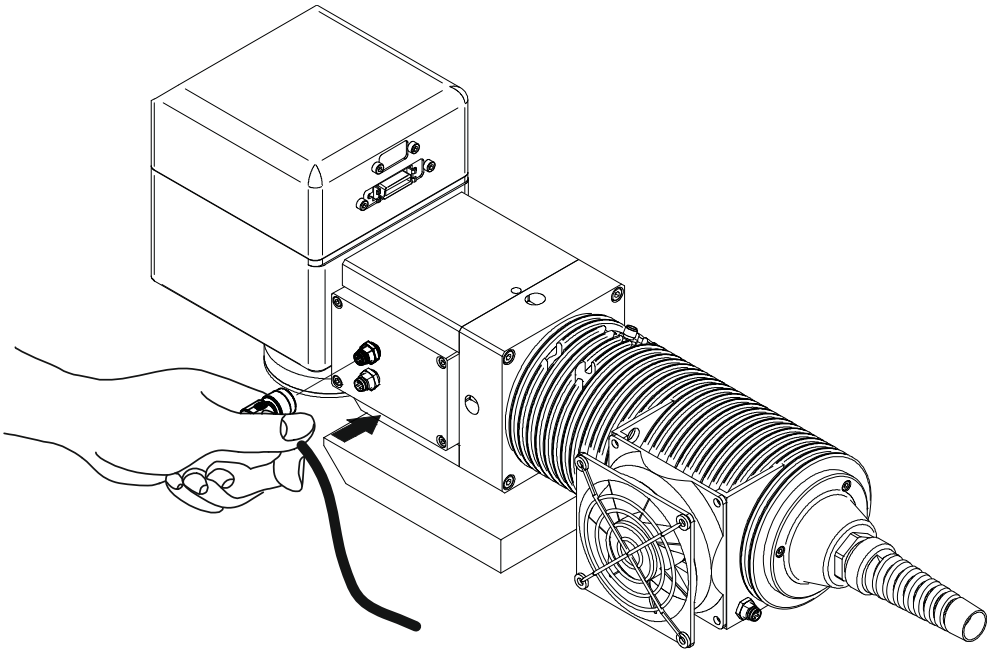


Figure 19: Resonator cable connection resonator side

Connecting Fan cable

Connect the fan cable to the resonator.

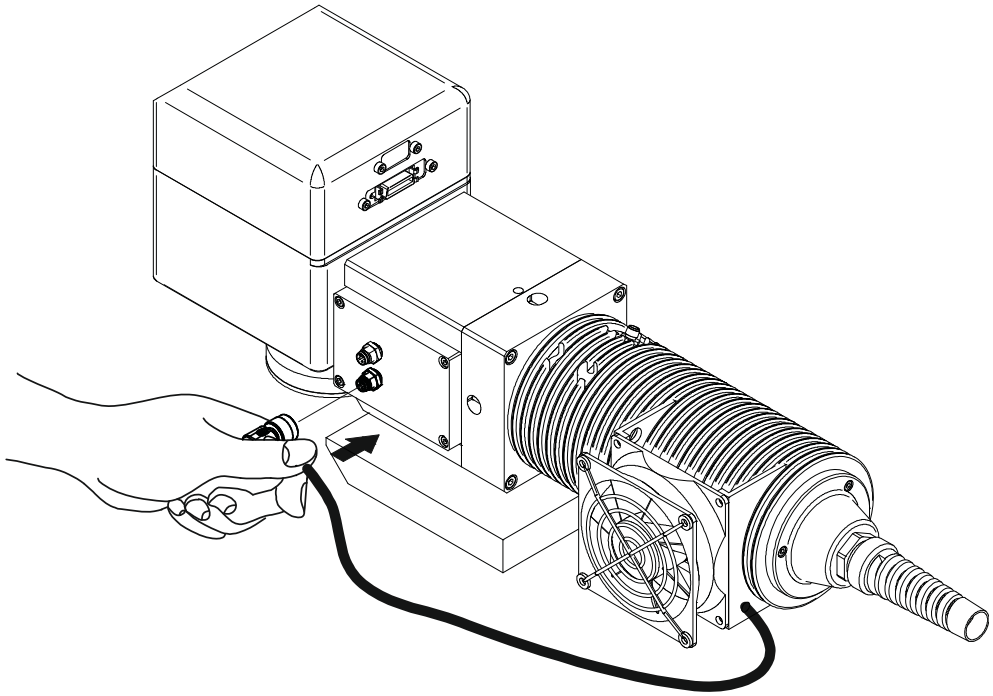


Figure 20: Resonator fan cable connection

Connecting Power Supply cable

Connect the Power Supply cable using the cord retention system.

CAUTION

Lock the plug with the retaining clamp to avoid accidental disconnection.

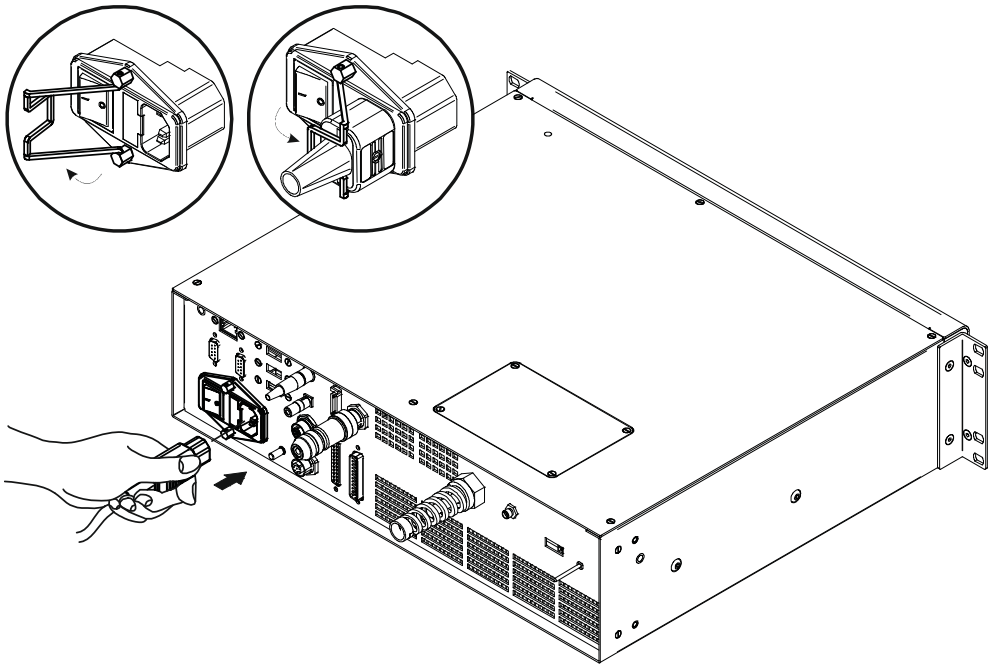


Figure 21: Power Supply cable connection

Connecting the Earth Ground

To ensure high electrical noise immunity it is strongly recommended to connect the chassis to suitable earth ground.

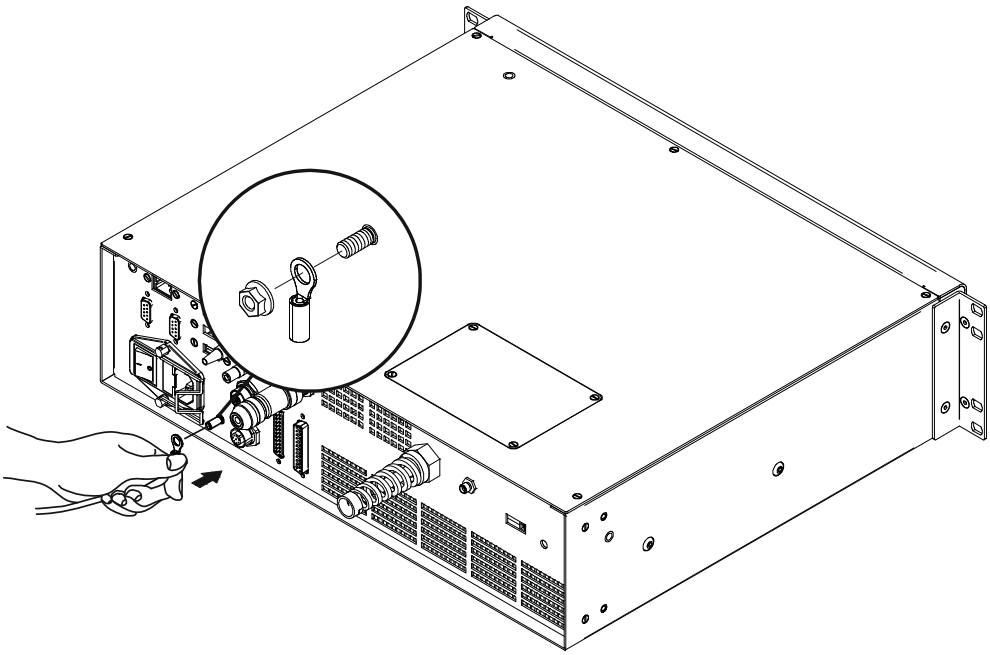


Figure 22: Connecting the Earth Ground

Local Mode Control connections

To use the laser marker in “Local Mode Control” it is necessary to install a mouse, keyboard and monitor. Connect the monitor and input devices to laser marker as shown below:

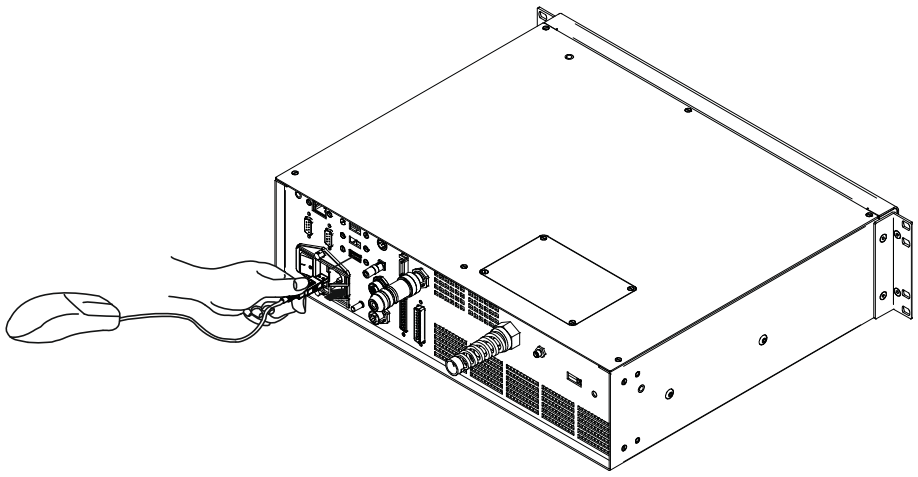


Figure 23: Connecting the mouse

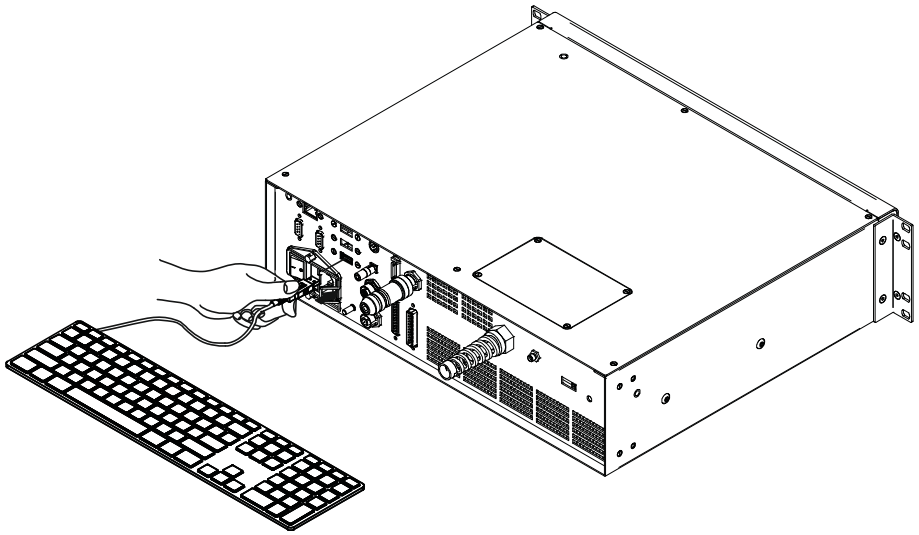


Figure 24: Connecting the keyboard

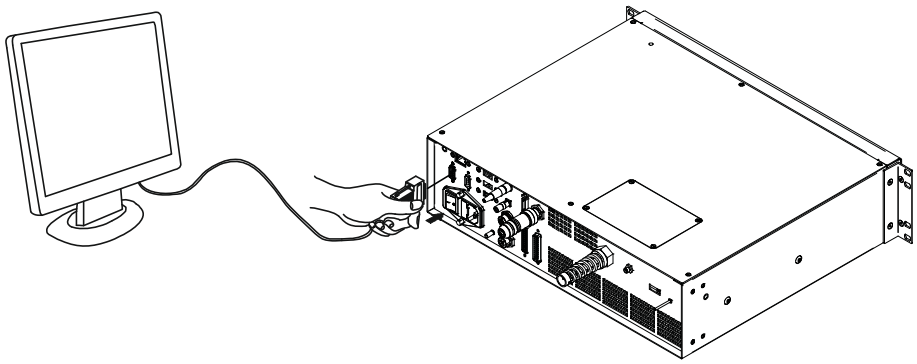


Figure 25: Connecting the monitor

NOTE

Minimum monitor resolution 800 x 600 (VGA standard).

Remote Mode Control connection

To use the laser marker in “Remote Mode Control” it is necessary to connect a network cable:

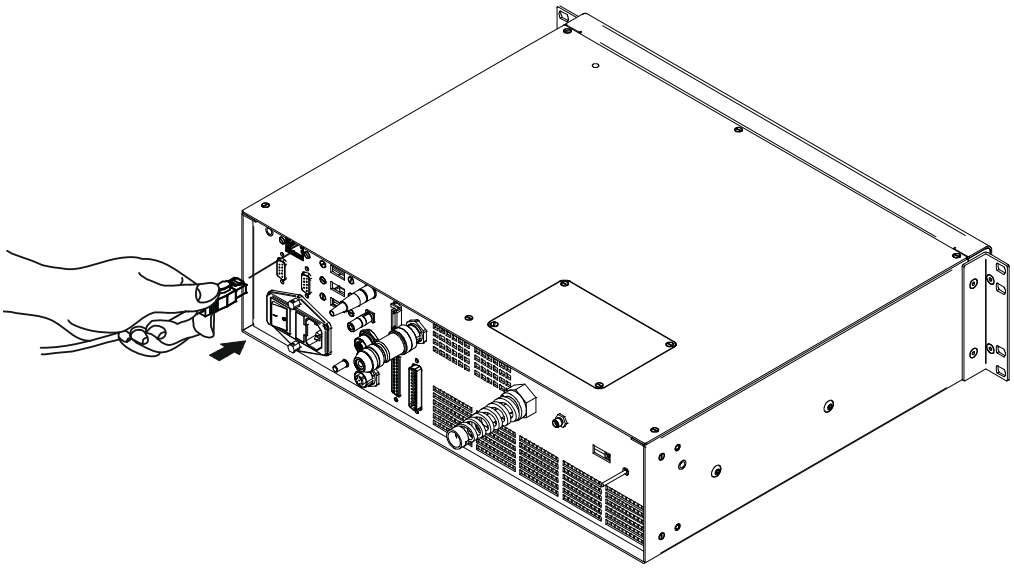


Figure 26: Connecting LAN port

NOTE

The LAN ports are configured by default with a fixed IP Address and Subnet Mask:

- Default IP address: 192.168.0.10

- Default Subnet Mask: 255.255.255.0

See "Change the LAN configuration and IP address" on page 68 **in order to change LAN configuration.**

NOTE

Ethernet TCP/IP 10, 100 Mbit.

F-Theta scan lens protection cap removal

Remove the F-Theta scan lens protection cap before marking operation:

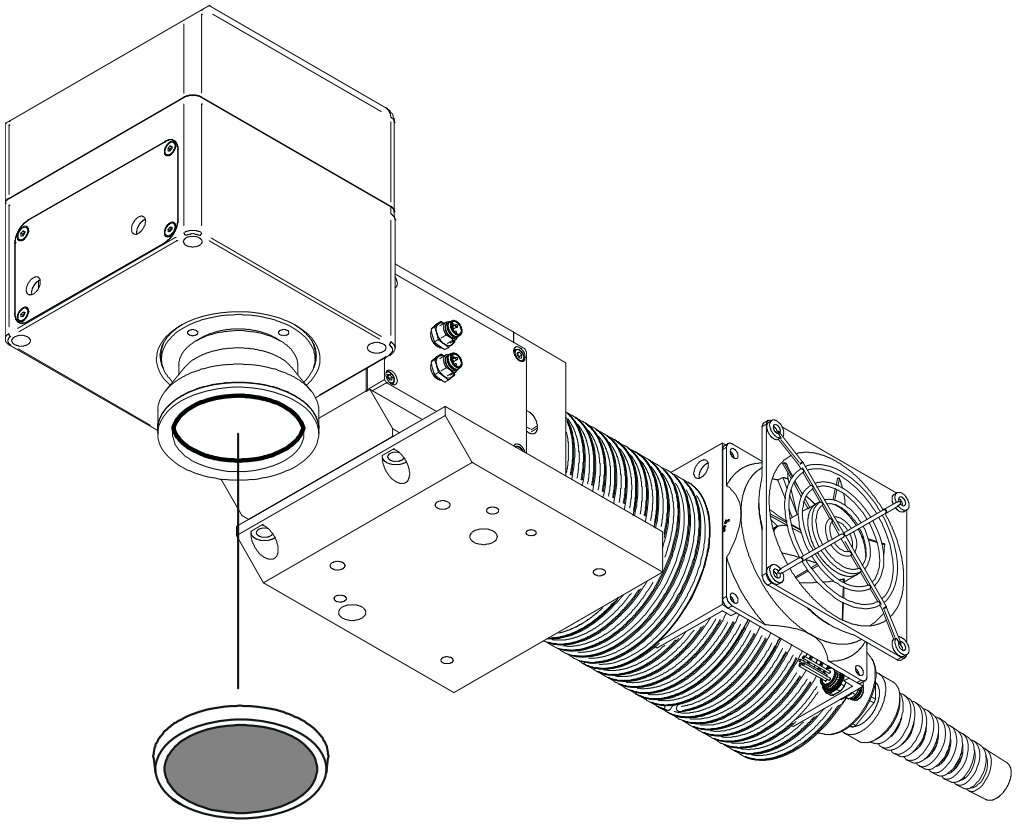


Figure 27: F-Theta scan lens protection cap removal

CAUTION

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

CHAPTER 5
USE AND OPERATION

Before turning on the laser marker, be sure that the laser marker is connected as previously described. Check the presence of:

- Voltage power supply connection
- Interlock connection
- Command Box connection

WARNING

Do not use the Interlock Muting Device for external devices, since this will result in loss of the safety function of the machine to which this product is installed.

Do not use the Interlock Muting Device except for maintenance oh this product.

WARNING

It is the customer's responsibility to provide a correct integration of the safety signals according to applicable regulations.

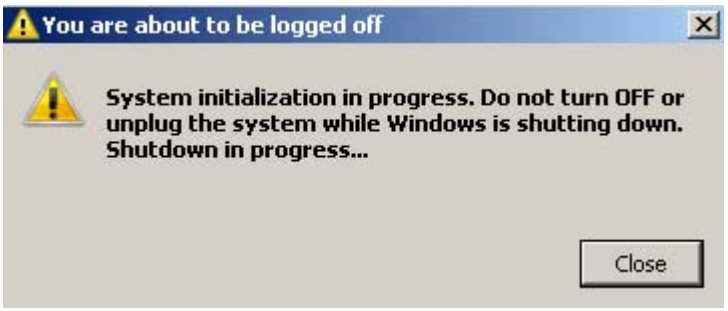
WARNING

If the Command Box Muting Device provided is connected, the laser marker enable is bypassed.

FIRST TIME BOOT

NOTE

The first time the laser marker is turned on after it has been unpacked, it warns that the operating system will be restarted within a few seconds.



CAUTION

The CAUTION symbol advises you of actions that could damage equipment or property.

CAUTION

Wait for the shutdown of the operating system.

CAUTION

DO NOT turn OFF or UNPLUG the laser marker while Windows® is shutting down.

TURNING ON SEQUENCE

The laser marker states can be controlled by:

- Key and Enable Selectors
- Command Box connector

Sequence using Key and Enable Selectors

CAUTION

Controlling the laser marker states using the Key and Enable Selectors on the control rack front panel requires that the input signals of the command box connector *EXT_KEY*, *EXT_ENABLE_A* and *EXT_ENABLE_B* are set to fixed HIGH level.

1. Turn ON the main power supply switch in the back panel of the control rack. The laser marker turn on and goes in booting-up state:

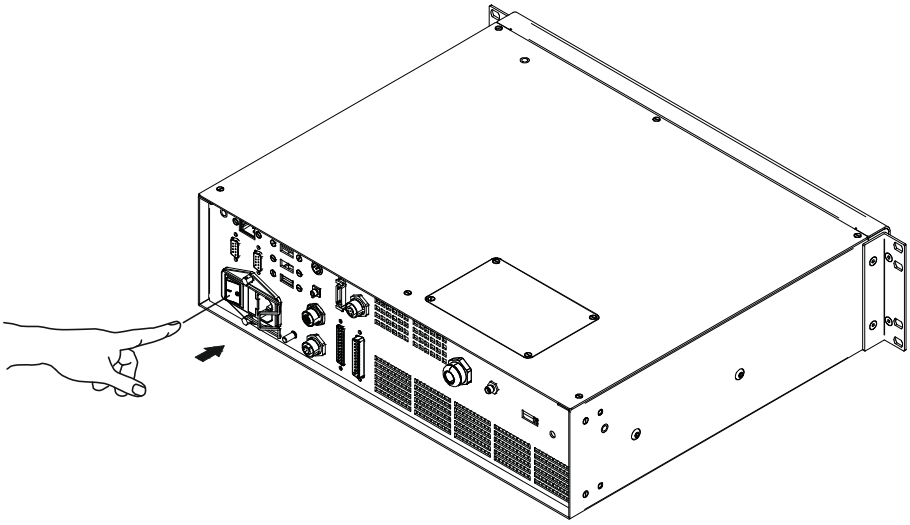


Figure 1: Power on

During booting-up state, the status LED on the control rack blink green.

Wait until booting-up finish: the status LED on the control rack is steady green. The laser marker is in WAIT FOR START state.

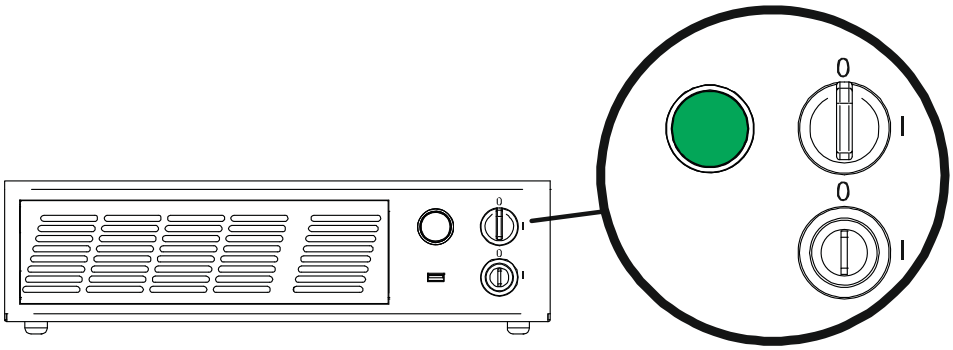


Figure 2: Wait for start state

2. activate the command KEY, by rotating it clockwise:

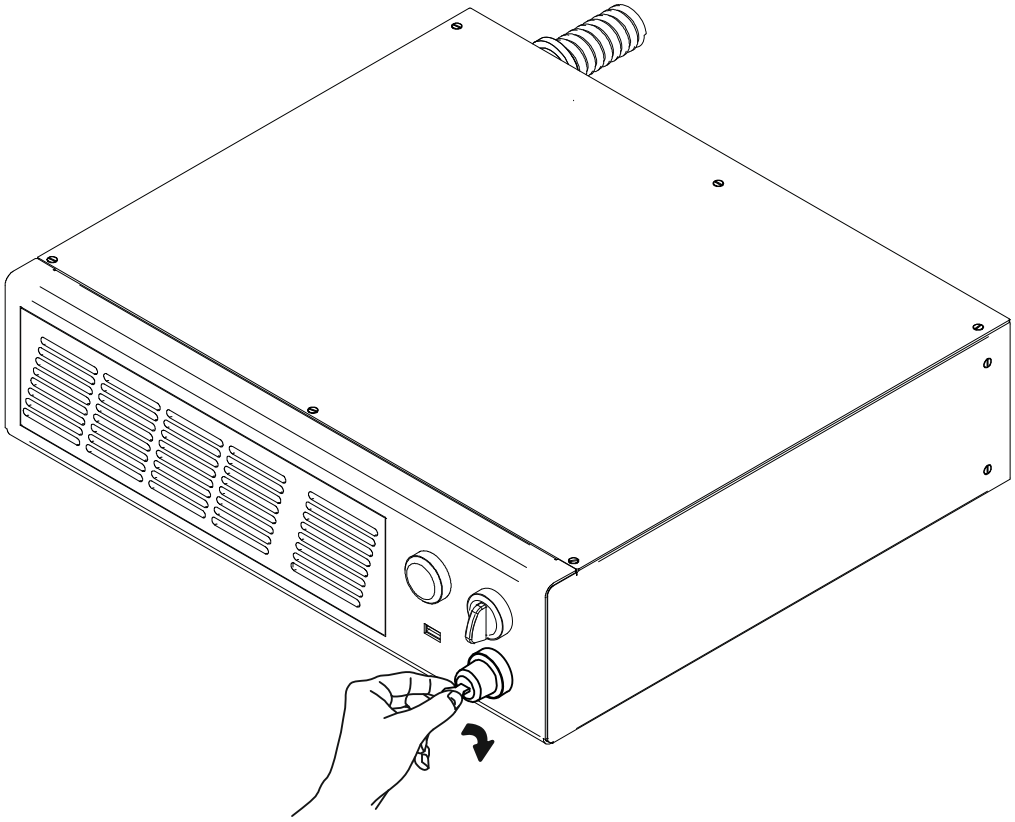


Figure 3: Enable command KEY

When the KEY command is enabled, the status LED on the rack will be blinking orange for about 30 seconds (laser source warm-up).

Wait until laser source warm-up finishes. The status LED on the rack will be steady orange.

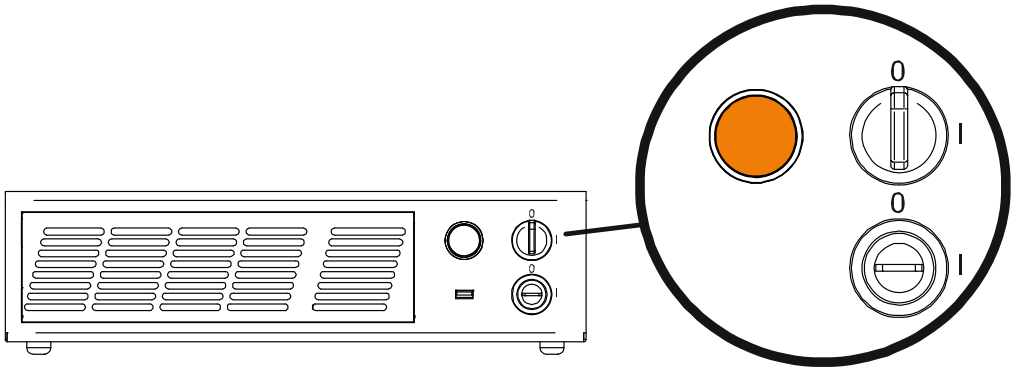


Figure 4: Standby Shutter closed state

3. activate the ENABLE command by rotating it clockwise:

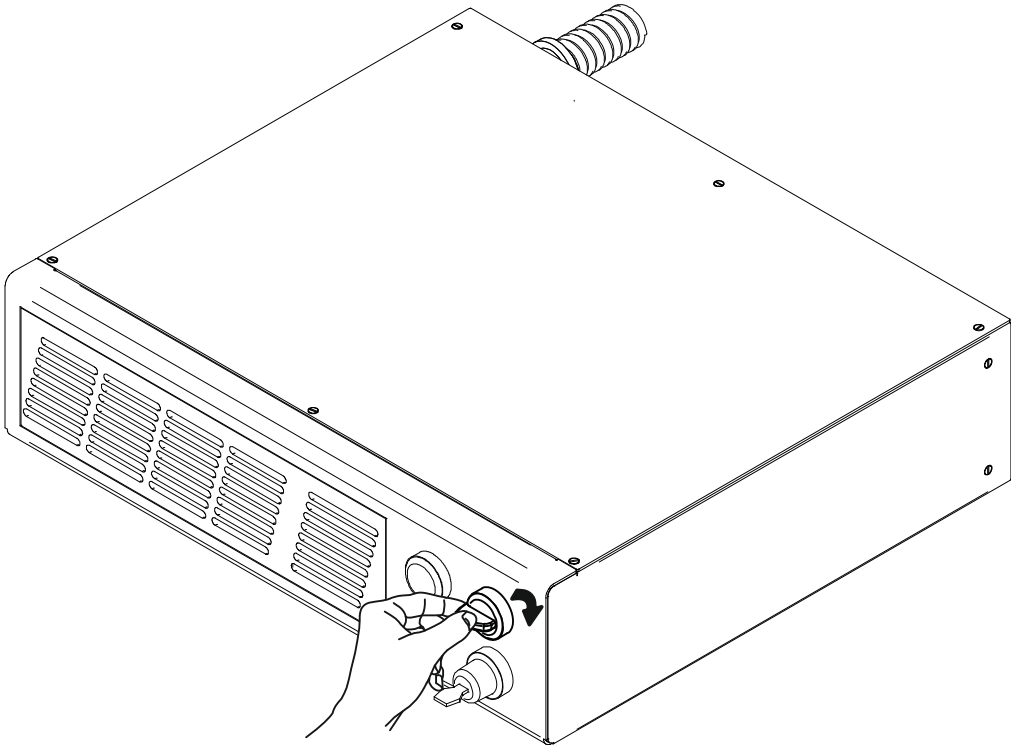


Figure 5: Enable command ENABLE

The laser system is ready to mark. The status LED on the rack will turn red.

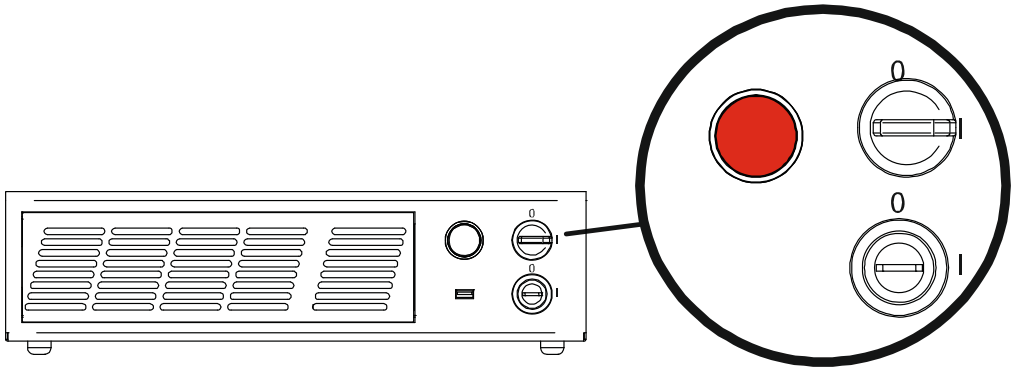


Figure 6: Ready state

Sequence Using Command Box

CAUTION

Controlling the laser marker states using the Command Box connector on the control rack back panel requires that the Key and Enable Selectors are set to fixed position 1.

Turn ON the main power supply switch in the back panel of the control rack. The laser marker turns on and goes in booting-up state. During booting up state, the status LED on the control rack blink green.

Wait until booting-up has ended: the status LED on the control rack is steady green. The laser marker is in WAIT FOR START state.

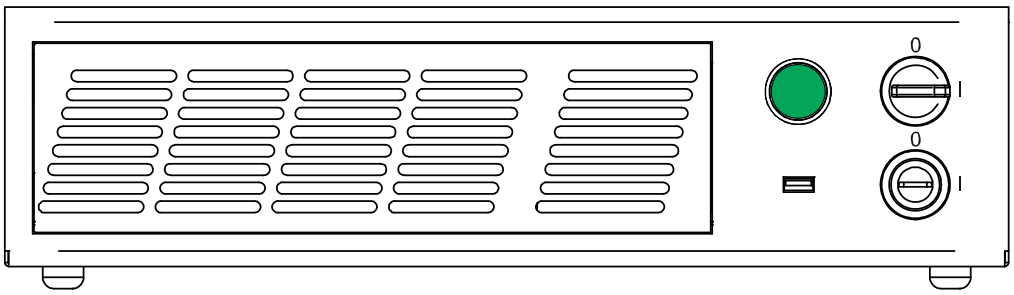


Figure 7: Wait for start state

Set the Command box input signals as in the table below:

STATE	COMMAND BOX INPUT STATE		KEY-ENABLE SELECTOR	STATUS LED
STANDBY SHUTTER CLOSED	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH LOW LOW	0 I 0 I	Steady

The status LED on the rack will be blinking orange for about 30 seconds (laser source warm-up).

Wait until laser source warm-up finishes. The status LED on the rack will be steady orange. The laser marker is in STANDBY SHUTTER CLOSED state.

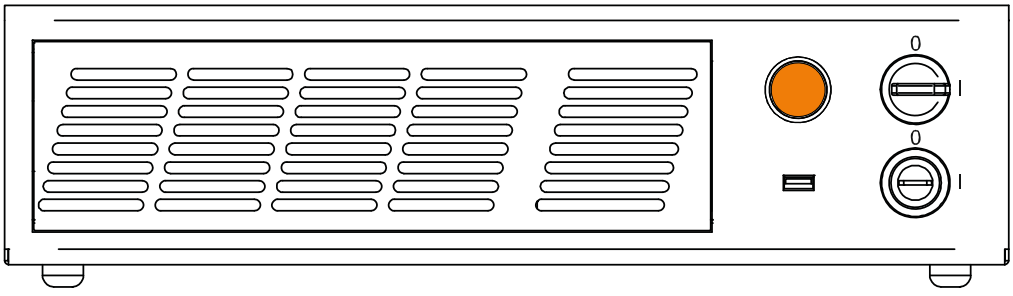
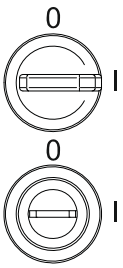


Figure 8: Standby Shutter closed state

Set the Command box input signals as in the table below:

STATE	COMMAND BOX INPUT STATE		KEY-ENABLE SELECTOR	STATUS LED
READY	EXT_KEY EXT_ENABLE_A EXT_ENABLE_B	HIGH HIGH HIGH		 Steady

The status LED on the control rack will turn red. The laser marker is in READY state.

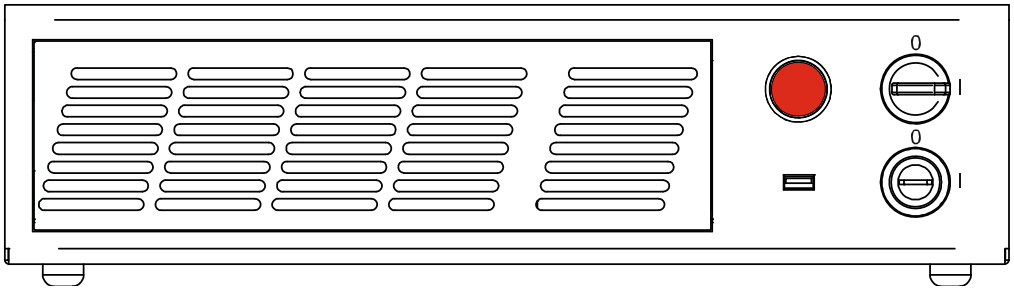


Figure 9: Ready state

CHAPTER 6

CUSTOMIZE THE LASER MARKER SOFTWARE

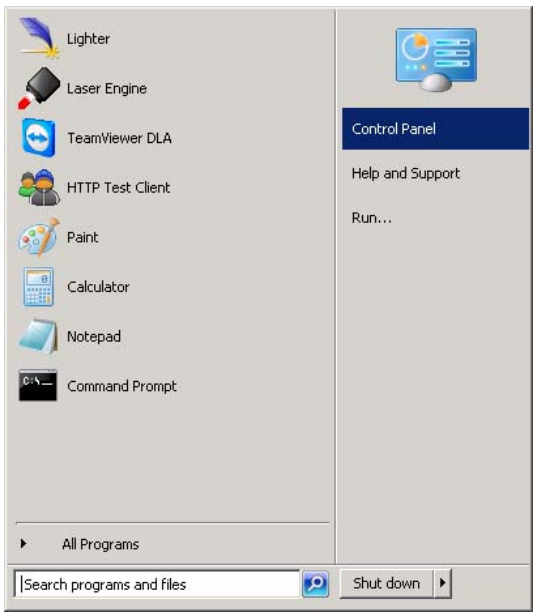
CHANGE O.S. LANGUAGE AND KEYBOARD LAYOUT

The marking system allows you to personalize the operating system changing the language used in menus and dialogs, languages you can use to enter text and keyboard layout.

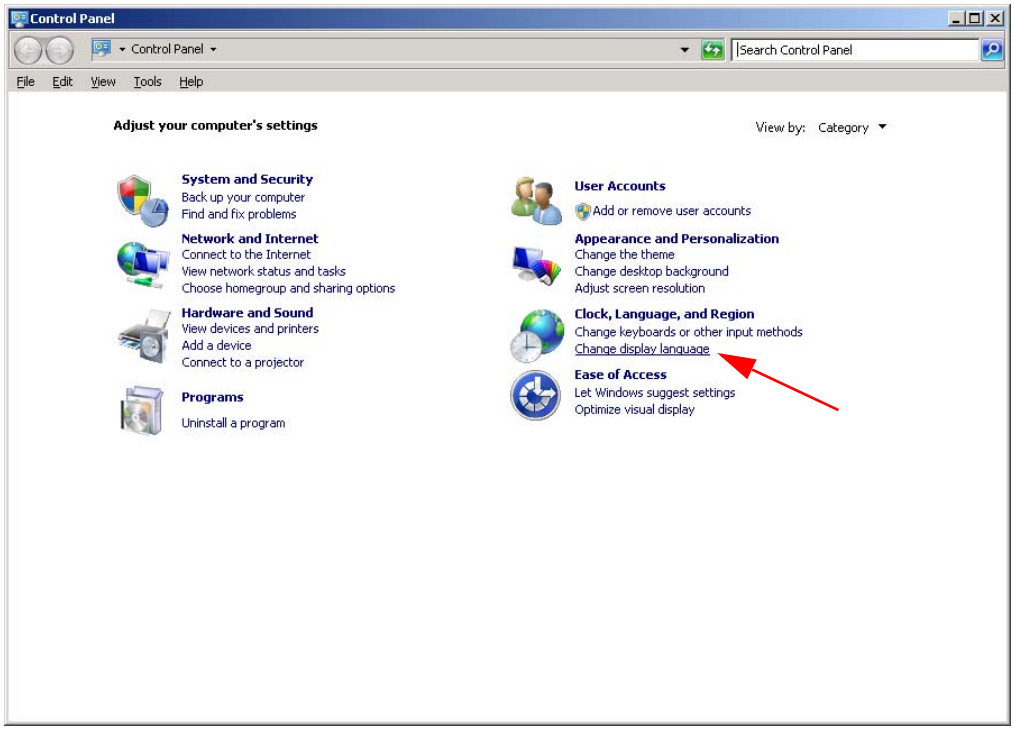
NOTE

In order to perform this setting it is necessary to connect mouse, keyboard and monitor to the laser marker (see "Local Mode Control connections" on page 54**).**

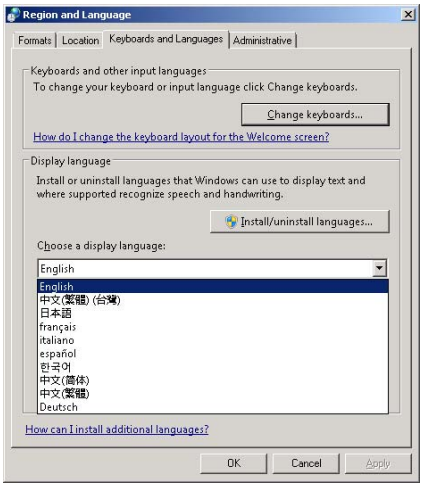
1. Turn OFF and ON the laser marker and wait until booting-up finishes (the status LED on the control rack must be steady green)
2. From the main screen click on **Start > Control Panel**



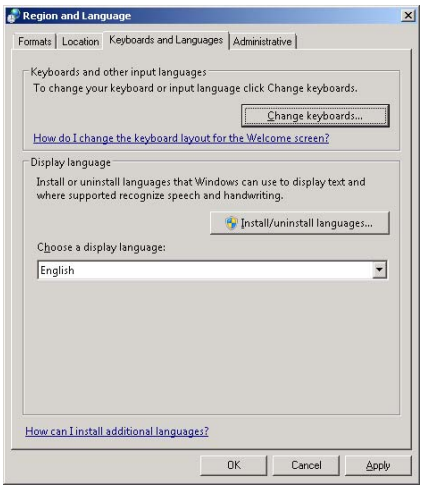
3. Select Change display language



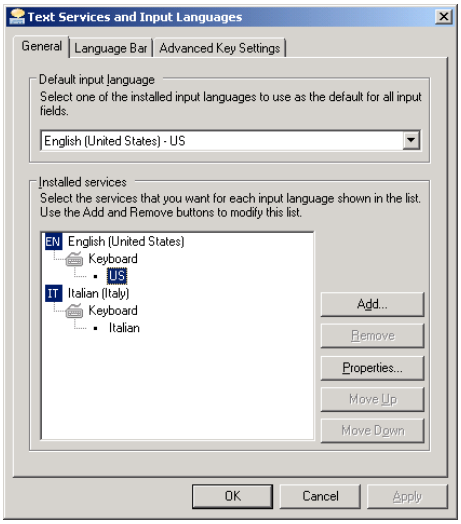
4. In Keyboards and Languages select and choose the desired language



5. Select Change keyboards to change your keyboard or input language

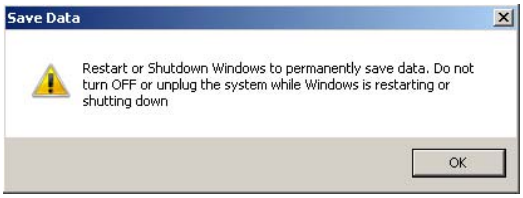


6. Now select the default input languages and press OK



7. Close all the open windows and double click on shortcut to `save-data.bat` icon in the desktop screen

8. A message advises you to restart or shutdown the operating system in order to permanently save data. Press **OK**:



9. Shut down the operating system in order to save the new settings:

CAUTION

DO NOT turn OFF or UNPLUG the laser marker while Windows® is shutting down.

10. **WAIT** until operating system shuts down automatically (black screen)

11. Power off the laser marker to complete installation

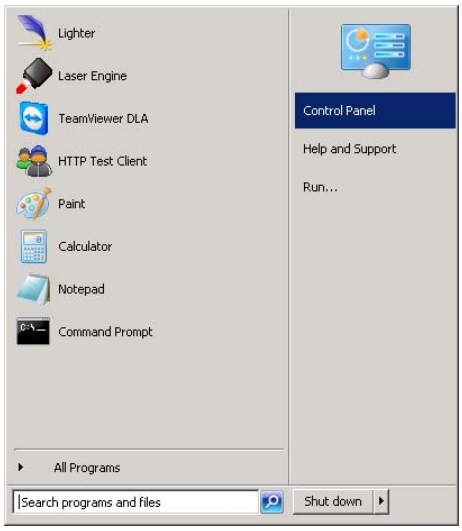
CHANGE THE LAN CONFIGURATION AND IP ADDRESS

The operating system allows you to change the LAN configuration and IP address

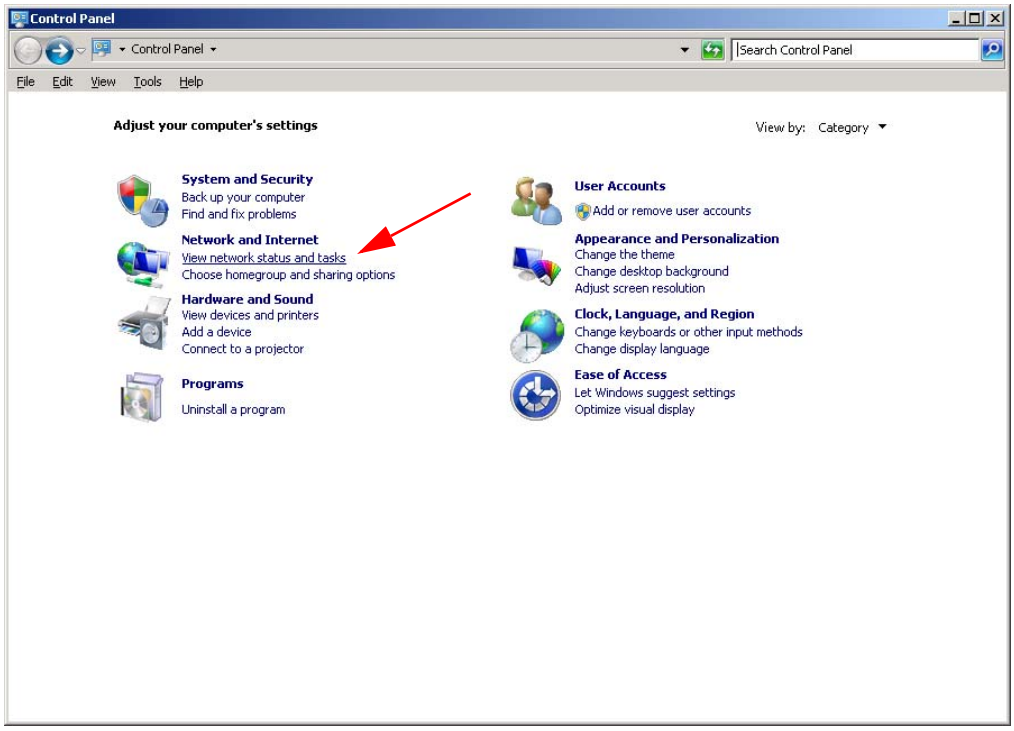
NOTE

In order to perform this setting it is necessary to connect mouse, keyboard and monitor to the laser marker (see "Local Mode Control connections" on page 54**).**

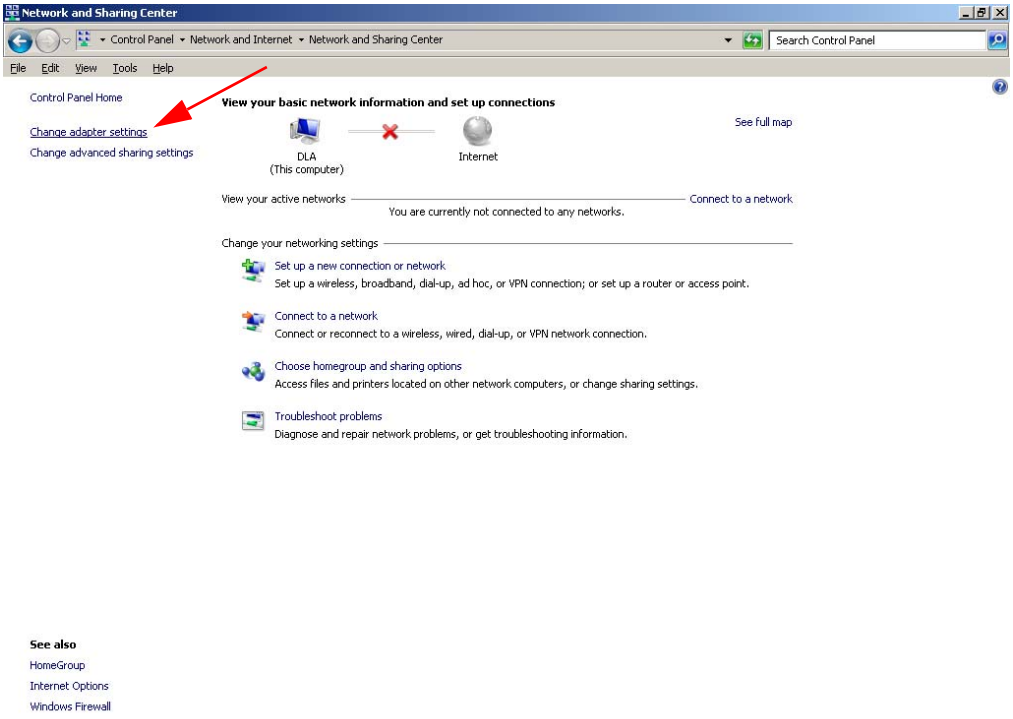
1. Turn OFF and ON the laser marker wait until booting-up finishes (the status LED on the control rack must be steady green)
2. From the main window click on **Start > Control Panel**



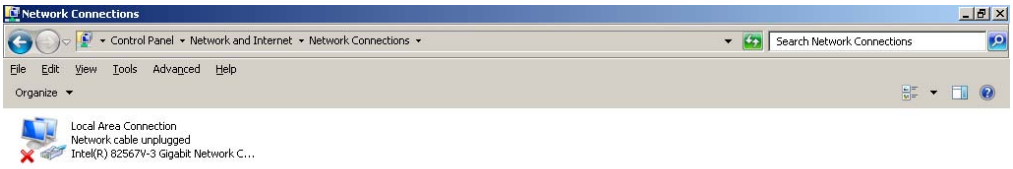
3. Select **View network status and task**:



4. In the **Network and Sharing Center** window select **Change adapter settings**:

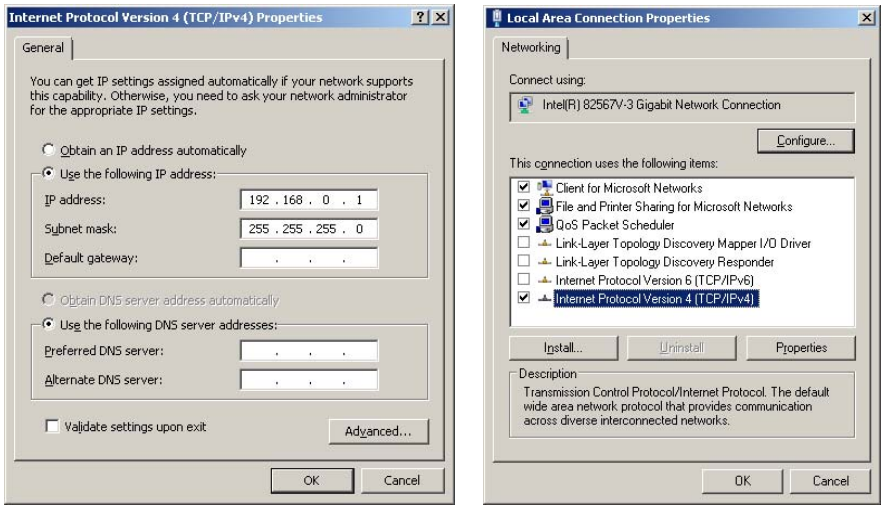


5. In the **Network Connections** window double click on **Local Area Connection** icon:



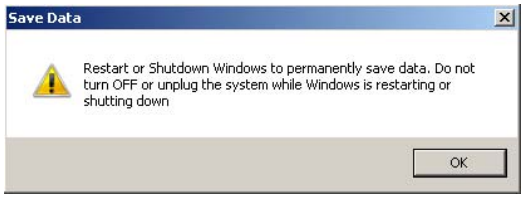
6. In the **Local Area Connection Properties** window double click on **Internet Protocol Version 4 (TCP/IPv4)**

7. In the **Internet Protocol Version 4 (TCP/IPv4) Properties** you can change the IP address and configuration:



8. Close all the open windows and double click on shortcut to `save-data.bat` icon in the Desktop window

9. A message advises you to restart or shutdown the operating system in order to permanently save data. Press **OK**:



10. Shut down the operating system in order to save the new settings:

CAUTION

DO NOT turn OFF or UNPLUG the laser marker while Windows® is shutting down.

11. **WAIT** until operating system shuts down automatically (black screen)

12. Power off the laser marker to complete installation

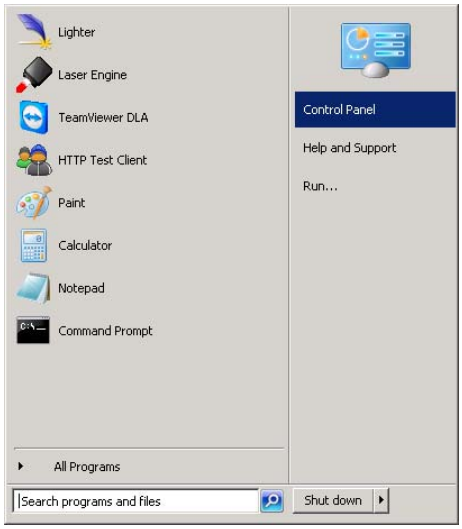
CHANGE THE VIDEO SETTING

The operating system allows you to change the Video setting.

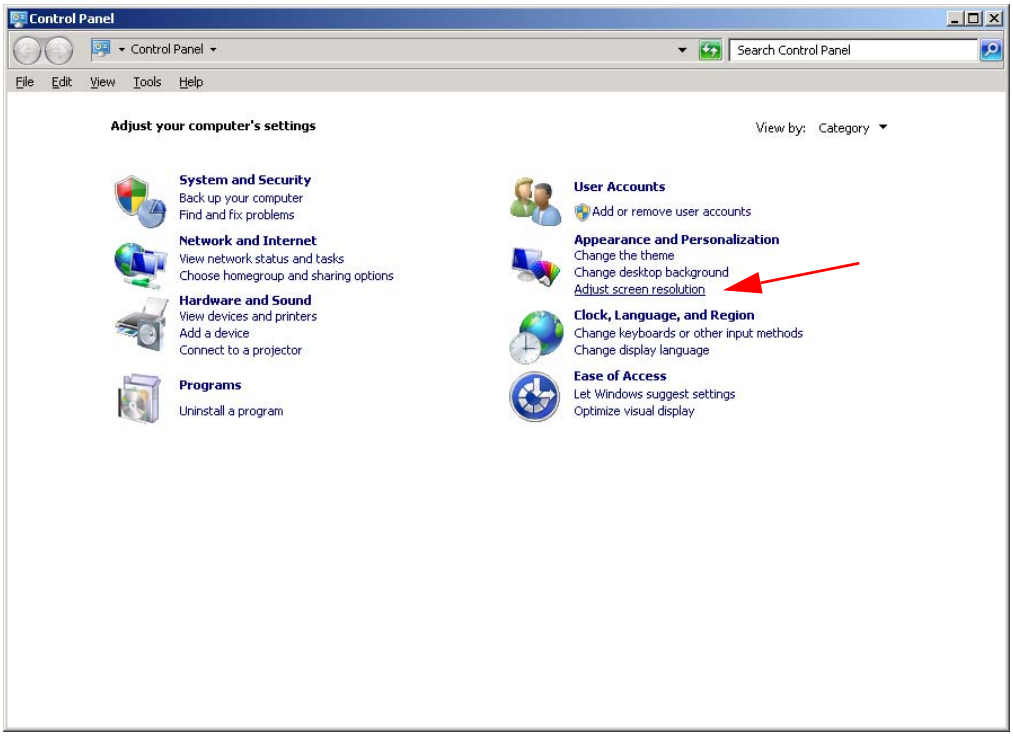
NOTE

In order to perform this setting it is necessary to connect mouse, keyboard and monitor to the laser marker (see "Local Mode Control connections" on page 54**).**

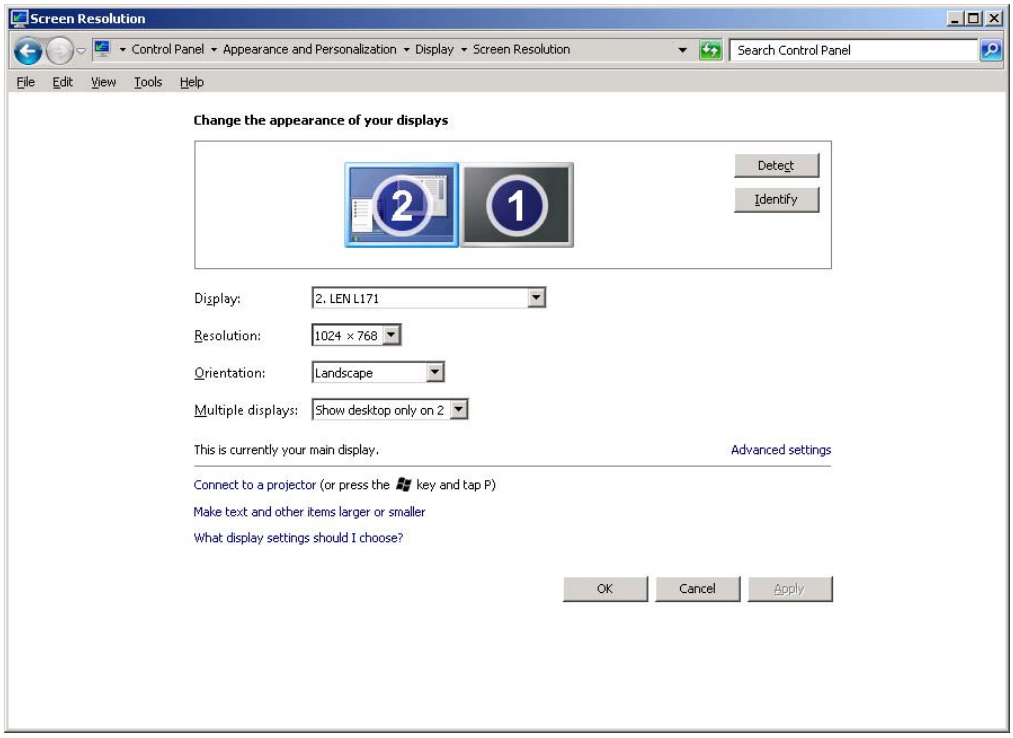
1. Turn OFF and ON the laser marker and wait until booting-up finishes (the status LED on the rack must be steady green)
2. From the main window click on **Start > Control Panel**



3. Select **Adjust screen resolution**:

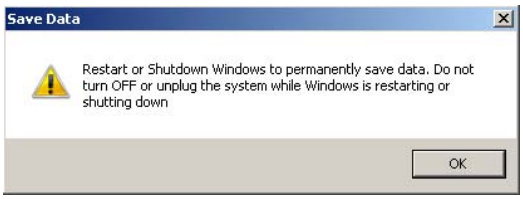


4. In the **Screen Resolution** window select the desired Screen resolution and Color quality:



5. Close all the open windows and double click on shortcut to `save-data.bat` icon in the Desktop window.

6. A message advises you to restart or shutdown the operating system in order to permanently save data. Press **OK**:



7. **Shut down** the operating system in order to save the new settings:

CAUTION

DO NOT turn OFF or UNPLUG the laser marker while Windows® is shutting down.

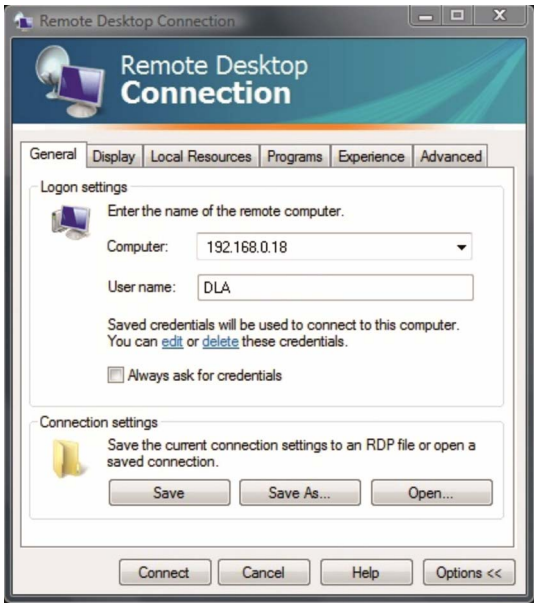
8. **WAIT** until operating system shuts down automatically (black screen)

9. Power off the laser marker to complete installation

REMOTE DESKTOP CONNECTION

To connect the laser marker to a remote Windows® based computer, follow these steps:

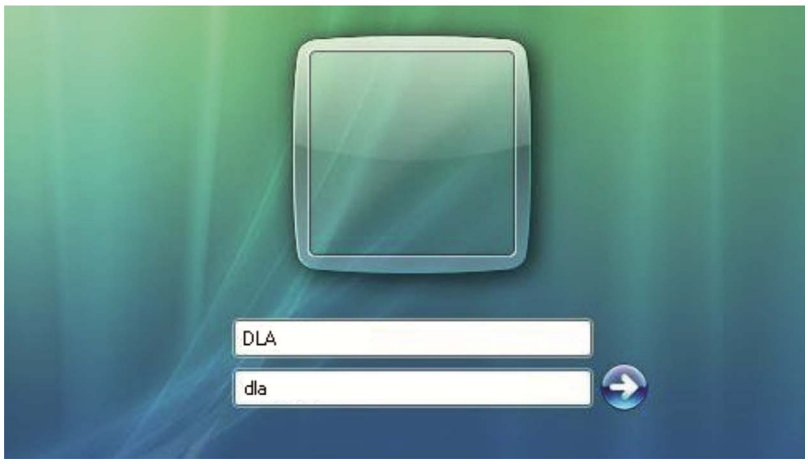
1. Turn on the laser marker
2. Make sure that both laser marker and remote computer are connected to the LAN
3. Click **Start > All Programs > Accessories**, and then click **Remote Desktop Connection**
4. Click **Options**
5. In the Computer list, type the host name or the IP address of the computer to which you want to connect
6. Type the user name, password, and domain (if applicable) of an account to which you have allowed remote access into the corresponding boxes, and then click **Connect**



7. In the **Log On to Windows®** dialog box that appears, type the password of the account with remote access privileges into the Password box:

User name: **DLA**

Password: **dla**



8. In the **Log on to** list, if applicable, select the domain or remote computer that you want, and then click **OK**.
   The remote desktop is displayed in a window on the desktop. The remote computer is locked during this session

9. To disconnect the session, click the **Close** button in the session window, and then click **OK** when you are prompted to disconnect the Windows® session.

CHAPTER 7
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 see "Contents of the packaging" on page 8.

CONTROL BOX

This accessory is used to control the laser marker through the Control Box interface.

The Control Box allows to perform the following functions:

- Changing laser marker state
- Starting and Stopping the marking process
- Showing the marking process state
- Showing the system error state

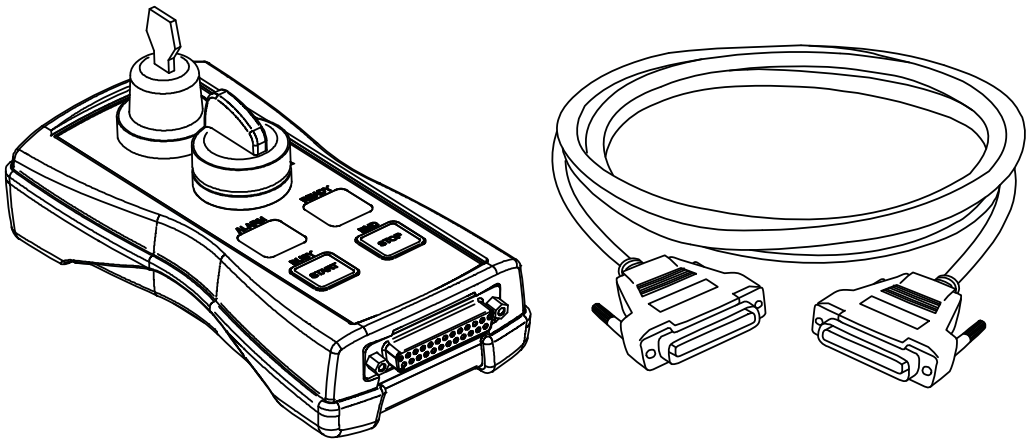


Figure 1: Control Box (ordering no: 985330031).

NOTE

See "Command Box (Laser Control)" on page 35 **for detailed control signal description.**

REMOTE START FOOT SWITCH

This accessory is used to provide the *START_MARKING* signal to the laser marker when the pedal is pressed by the operator.

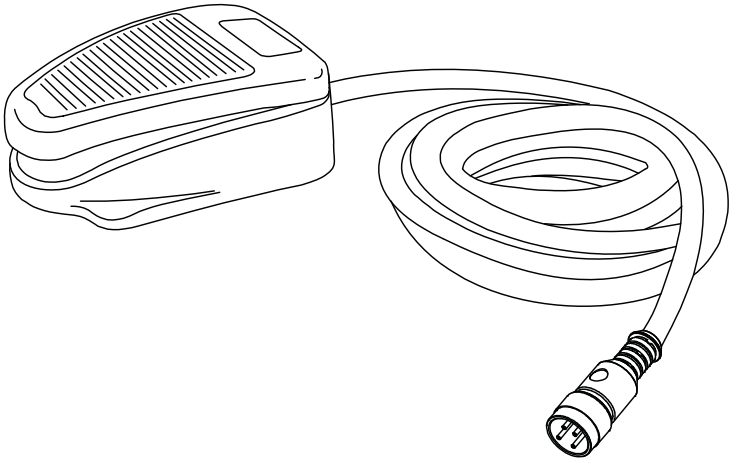


Figure 2: Remote Start Foot Switch (ordering no: 985350035)

NOTE

Refer to Remote Start Foot Switch instruction manual for more information.

I/O INTERFACE

Dedicated to on-site quick and easy termination, PLC interfacing, System Test, I/O troubleshooting, etc. The DB25 Pass-through Command Box connector allows the integrator to use the interface as a I/O test tool on previously installed products.

- I/O Monitoring LED
- Easy assembly thanks to screw down termination
- Dry contact outputs
- Dry contact inputs
- DIN rail mounting enclosure

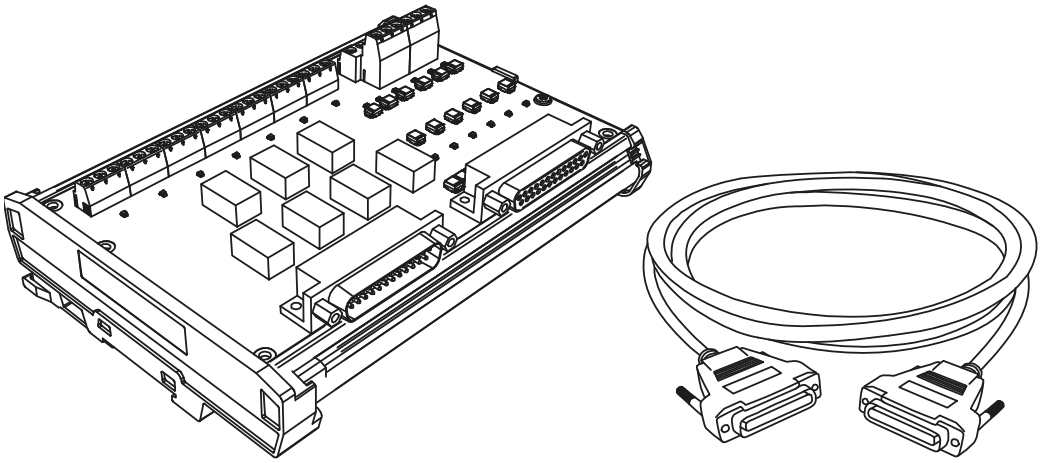


Figure 3: I/O interface (ordering no: 985330032)

NOTE

Refer to I/O Interface instruction manual for more information.

MARVIS™ ADD-ON

MARVIS™ is the most advanced MARK and VALIDATE solution for traceability. The innovative Code Quality Training dramatically simplifies setup in a real production environment. The MARVIS™ Add-on for Vlase includes:

- MATRIX™ 300N reader
- Power & signals cable
- EtherNet cable
- Power Supply
- MARVIS™ license

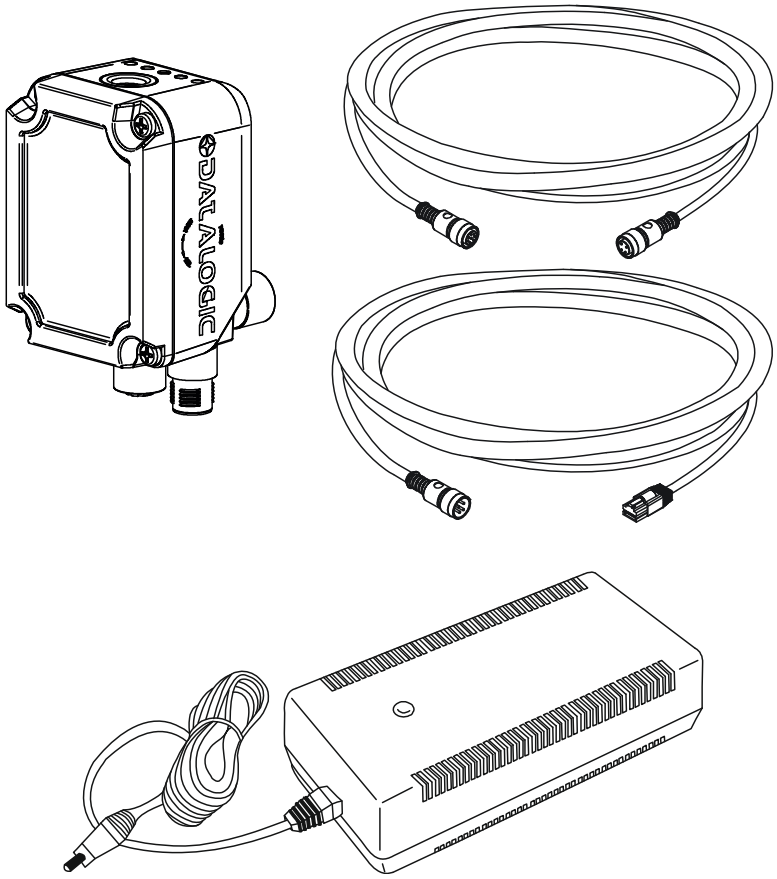


Figure 4: MARVIS™ Add-on for Vlase™ (ordering no: 937600122)

NOTE **Refer to MARVIS™ Application Note for more information**

MARVIS™ LED Ring Light ID 50mm - White

This accessory is used as external illuminator in MARVIS™ application (suitable for F160S and F254S F-Theta scan lens).

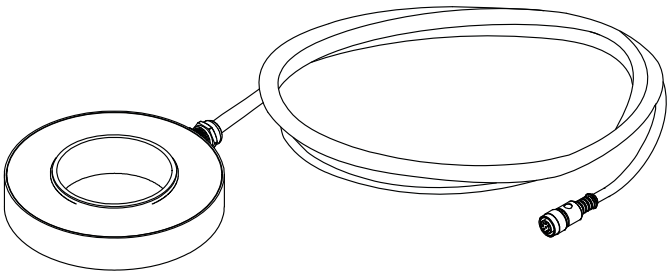


Figure 5: LED Ring Light ID (ordering no: 93A051394)

STARTER KIT FOR MARKING ON THE FLY (MOF)

This accessory is used for the implementation of Marking on the Fly applications.

The Kit includes: encoder, photocell, cables and plastic reflectors.

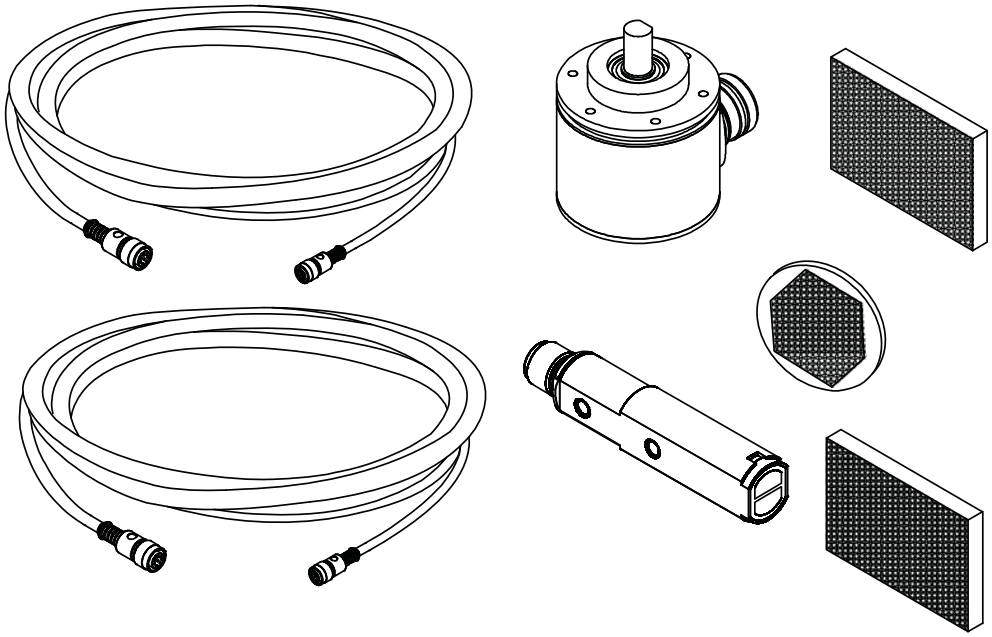


Figure 6: Kit MOF (ordering no: 985330027)

FUME EXTRACTOR

This accessory is suitable for collecting and filtering dry and non combustible types of dust contained in non explosive air mixtures produced during laser marking.

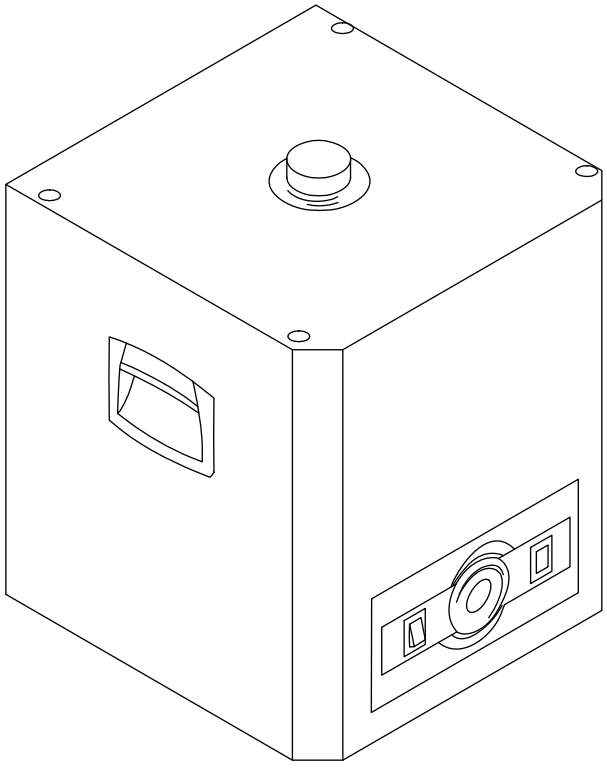


Figure 7: Fume extractor (ordering no: 985340035)

CHAPTER 8
TECHNICAL SUPPORT

SEALS

The laser marker 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. Breaking these seals voids the warranty on the entire laser marker.

CAUTION

If customer breaks or removes the seals placed by Datalogic on the laser marker the warranty will immediately become “null and void”.

CAUTION

Datalogic shall not be held liable for any non-conforming use of the laser marker.

It is forbidden to operate the laser marker before the machine where it is integrated has been declared in conformance with applicable statutory Directives.

CAUTION

Only Datalogic authorized personnel, who have been trained and instructed on the electrical and optical risks, is allowed to access the internal parts of the control rack.

Datalogic shall not be held liable for any damage caused by inadequate work from non-authorized personnel.

CAUTION

Only Datalogic authorized personnel, who have been trained and instructed on the electrical and optical risks, is allowed to access the internal parts of the resonator.

Datalogic shall not be held liable for any damage caused by inadequate work from non-authorized personnel.

MAINTENANCE

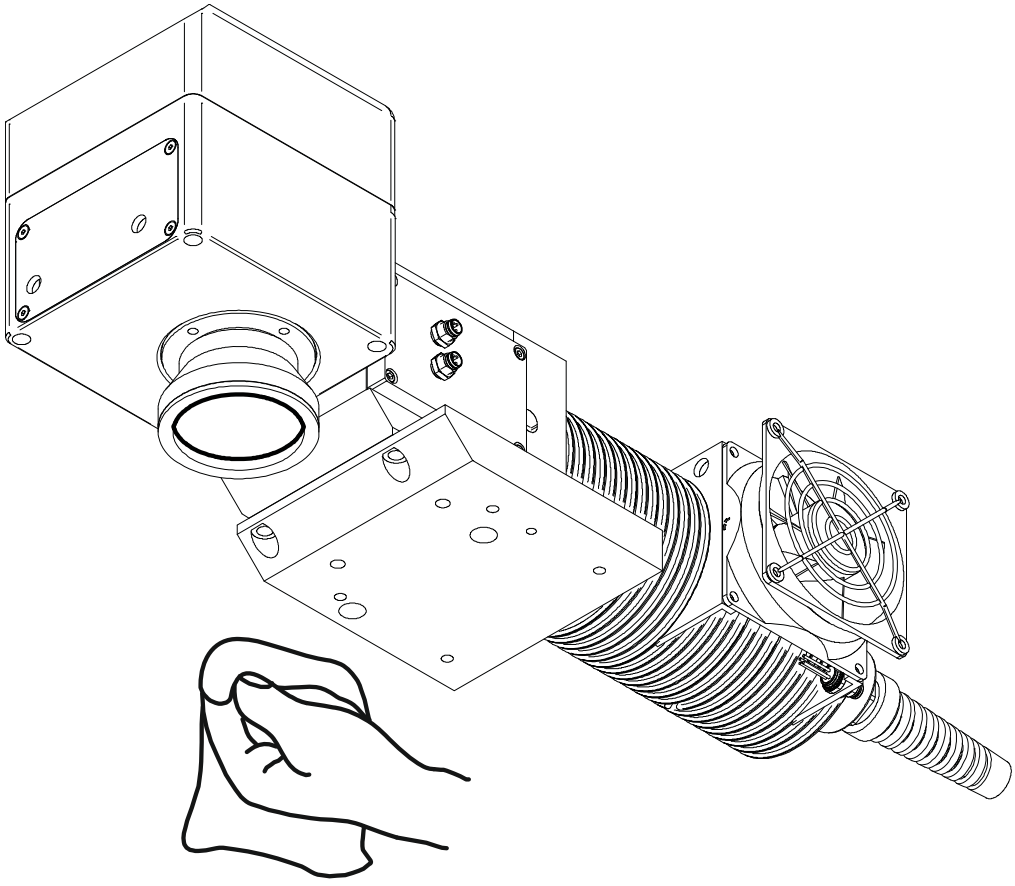
The ordinary maintenance program of the laser marker includes only simple operations. Some operations consist in a mere “check” of the operating condition.

The maintenance activities must be done in compliance with the legal directives regarding the safety rules during these operations.

The following parts/functions have to be controlled periodically:

COMPONENT	TYPE 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 dry air blowing
Rack Air filter	Clean / Replace	Every 3 months (according to the environment and frequency of use)

F-Theta scan lens cleaning procedure



CAUTION

Disconnect AC power cable before starting any maintenance operations.

Figure 1: Cleaning F-Theta scan lens

Air filter cleaning procedure

Procedure:

- Turn off key switch on controller unit
- Disconnect AC power cable
- Untight grid panel screws and remove it
- Remove filter

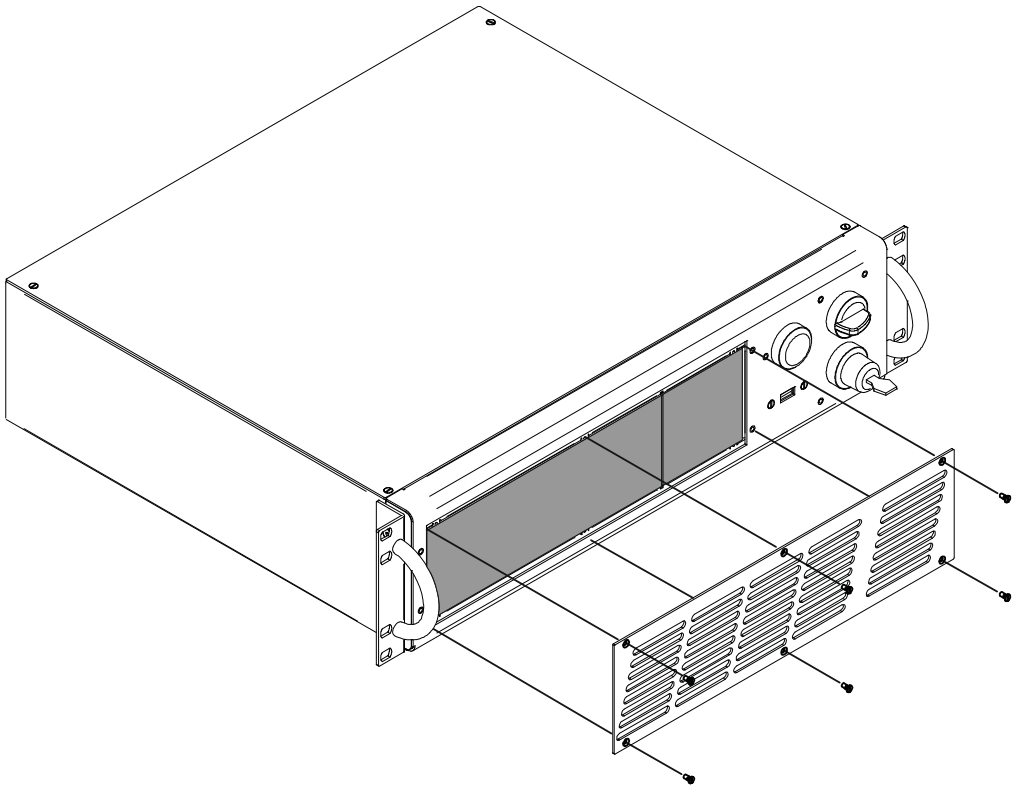


Figure 2: Removal of air filter

- Clean filter with compressed air or with neutral detergent and air-dry it
- Reinstall filter and grid panel

CAUTION

Insert the filter making sure that the surface with the wider meshes is oriented towards the outside.

CAUTION

DO NOT install wet filter!

- If filter cannot be cleaned, replace the filter
- Suitable filters are available as spare parts

TROUBLESHOOTING

If a problem occurs during operation, first check the following troubleshooting. If you cannot fix the problem, contact Datalogic customer service (see “Technical Support” on page viii).

List of warning and error states

STATUS LED	DESCRIPTION		ACTION	OUTPUT STATE COMMAND BOX CONNECTOR	
Blinking ORANGE	Warning invalid start sequence	Incorrect turning-on sequence	Set Key and Enable Switchs to “0” and repeat the turning-on sequence. See “Turning on sequence” on page 59	SYSTEM_ALARM POWER_ON ENABLE_OUT	OFF OFF OFF
Blinking RED	System Error	Interlock error	- Check Interlock connector signals (see “Interlock” on page 23) - Check Interlock connector presence	SYSTEM_ALARM POWER_ON ENABLE_OUT	ON OFF OFF
			- Check if Command Box connector is present - Check CONNECTOR_PRESENCE input signal of the Command Box connector (see “Command Box (laser control)” on page 27)		
		Temperature error	Check the temperature of the environment where the control rack is placed. The temperature must not exceed the operative limit		
		Master Oscillator error	Contact Datalogic Technical Support	SYSTEM_ALARM POWER_ON ENABLE_OUT	ON OFF OFF

List of problems related to laser marker states

PROBLEM DESCRIPTION	STATUS LED		ACTION
Laser marker never goes to WAIT FOR START state	Blinking GREEN	- Lighter™ Suite marking SW corrupted - C:\ or D:\ drive corrupted	Restore the laser marker using USB recovery disk (see "How to recover the laser marker" on page 120)
Laser marker never goes to STANDBY SHUTTER CLOSED state	Steady GREEN	Key Switch selector in wrong position	Check the Key Switch is set to 1 (see "Turning on sequence" on page 59)
		EXT_KEY contact is LOW level or disconnected	Check EXT_KEY input signal on the Command Box connector is set to HIGH level (see "Command Box (laser control)" on page 27)
Laser marker never goes to READY state	Steady ORANGE	Enable Switch selector in wrong position	Check the Enble Switch is set to 1 (see "Turning on sequence" on page 59)
		EXT_ENABLE_A and/or EXT_ENABLE_B contact are LOW level or disconnected	Check EXT_ENABLE_A and EXT_ENABLE_B input signals on the Command Box connector are set to HIGH level (see "Command Box (Laser Control)" on page 35)

List of most common problems

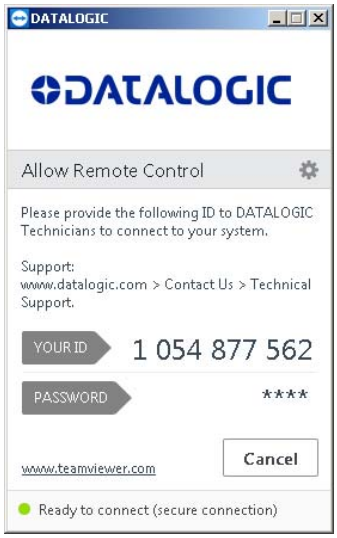
PROBLEM DESCRIPTION	POSSIBLE CAUSE	ACTION
Laser marker doesn't turn ON	Power supply cable disconnected	Check the POWER SUPPLY CABLE connection to the power grid
	Power Suppply SWITCH set to OFF	Check that the POWER SUPPLY switch is set to ON
	FUSES damaged	Check that FUSES of power supply are not damaged
Impossible to control the marking process using the Command Box control signals	Incorrect integration	Check that the Command Box control signals are compatible with the external devices used for integration
Bad marking result	F-Theta scan lens is dirty	Clean the F-Theta scan lens. See "F-Theta scan lens cleaning procedure" on page 80
	Incorrect focus distance	Check that the material to be marked is placed at the right working distance. See "Marking Area Specification" on page 28
	Incorrect laser parameters	Check that the laser parameters set in the layout are appropriate for the material to be marked. Contact Datalogic Technical Support
Laser marker doesn't engrave	Incorrect laser marker state	Check the laser marker state is set to READY
	F-Theta lens protection not removed	Check that the F-Theta scan lens protection has been removed
	The optical path is obstructed	Check that the optical path is free

PROBLEM DESCRIPTION	POSSIBLE CAUSE	ACTION
Laser marker doesn't start to engrave using external START_MARKING signal on the Command Box connector	STOP_MARKING signal is active	Check that the STOP_MARKING signal on the Command Box connector is not set to HIGH level
	START_MARKING signal incorrect timing	- Check the START_MARKING signal on the Command Box connector (see "Command Box (Laser Control)" on page 35). HIGH level pulsed signal start the marking process (refers to Lighter™ user's manual "Setting I/O parameters" paragraph to set the signal properties) - Use Lighter™ System Test to check external START_MARKING and STOP_MARKING signals
	Lighter™ is not set in AUTO MODE / WORK MODE	Check that Laser Engine is set in AUTO MODE or that Laser Editor is set in WORK MODE
Laser marker doesn't start to engrave using an external photocell	STOP_MARKING signal is active	Check that the STOP_MARKING signal on the Command Box connector is not set to HIGH level
	Incorrect photocell type or incorrect connection	Check that the photocell is compatible with the laser marker (see "Photocell" on page 38). HIGH level pulsed signal start the marking process (refers to Lighter™ user's manual "Setting I/O parameters" paragraph to set the signal properties)
	Lighter™ is not set in AUTO MODE / WORK MODE	Check that Laser Engine is set in AUTO MODE or that Laser Editor is set in WORK MODE
Laser marker doesn't work in Marking On Fly mode	MOF is not enabled or not configured	- Use the Laser Engine MOF wizard to setup the laser marker (refers to Lighter™ User's Manual) - Check that the MOF MODE is enabled (refers to Lighter™ User's Manual)
	Laser Engine is not set in AUTO MODE	Check that Laser Engine is set in AUTO MODE (refers to Lighter™ User's Manual)
	Incorrect encoder's type or connection	- Check that the encoder is compatible with the laser marker (see "Encoder" on page 38) - Check that the encoder is working using Laser Engine MOF wizard (refers to Lighter™ User's Manual)
	Incorrect photocell type or connection	- Check that the photocell is compatible with the laser marker - Check that the photocell is working using Laser Engine MOF wizard (refers to Lighter™ User's Manual)
	Inappropriate layout	Check that the layout to engrave is compatible, in terms of marking time, with the MOF application

PROBLEM DESCRIPTION	POSSIBLE CAUSE	ACTION
Red Aiming Beam not visible	F-Theta Lens protection not removed	Check that the F-Theta scan lens protection has been removed
	Laser marker is not in the correct state	Check that the laser marker state is coherent with the AIMING BEAM TYPE property set in Laser Engine Configuration “LASER” (refers to Lighter™ User's Manual)
	Incorrect Aiming beam setting in Laser Engine	Check STANBY POSITION property in Laser Engine Configuration “SCANNER”. Depending on the setting, the aiming beam could be not visible because pointed outside the marking field (refers to Lighter™ User's Manual)
		Check AIMING BEAM TYPE property in Laser Engine Configuration “LASER” (refers to Lighter™ User's Manual) • OFF: always OFF • AUTOMATIC: active only in STANDBY SHUTTER CLOSED state
X, Y, Z, R Axis doesn't work	Incorrect integration	Check that the Axes control signals are compatible with the external devices used for integration
	Axis is not enabled	Check that the selected Axis is enabled in Laser Engine Configuration (refers to Lighter™ User's Manual)
	Axis is not correctly configured	Check that the selected Axis is correctly configured in Laser Engine Configuration (refers to Lighter™ User's Manual)
Windows settings are not saved at system restart	C:\ drive is write protected by EWF filter	Follow the procedure present in “Customize the laser marker software” on page 65
Generic I/O signals doesn't work	Incorrect integration	Check that the I/O control signals are compatible with the external devices used for integration
	I/O already used by Axis	Generic I/O and Axes share the same I/O signals. Check that the selected I/O are not used by an Axis that is enabled

REMOTE ASSISTANCE

The laser marker is equipped with a remote connection tool that can be used for diagnostic purposes by Datalogic technical support.

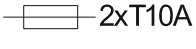


NOTE

The laser marker must be connected to the Internet.

APPENDIX A
LABELS

LABELS

LABEL	DESCRIPTION
	Identification label
	Warning laser logotype
	Laser Label (resonator) (*)
	Laser Label (control rack) (*)
	Aperture Label
	Label for non-interlock protective housing
	Caution, possibility of electric shock
	General Warning
	USB port
	MAC Address
	Control Rack fuses

LABEL	DESCRIPTION
0 - I	KEY/ENABLE positions
COMMAND BOX	Command Box conenctor
AXES (I/O)	Control Axes connector
INTERLOCK	Interlock connector
INTERLOCK OUT	Interlock OUT connector
LAN	LAN connector
RS232	RS232 connector
VGA	VGA connector
PHOT	Photocell connector
ENC	Encoder connector
RES	Resonator connector
MDR	Scan Head connector
RF	Radio frequency connector
FAN	Fan connector

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

POSITIONING OF EXTERNAL LABELS

Positioning of labels on the control rack:

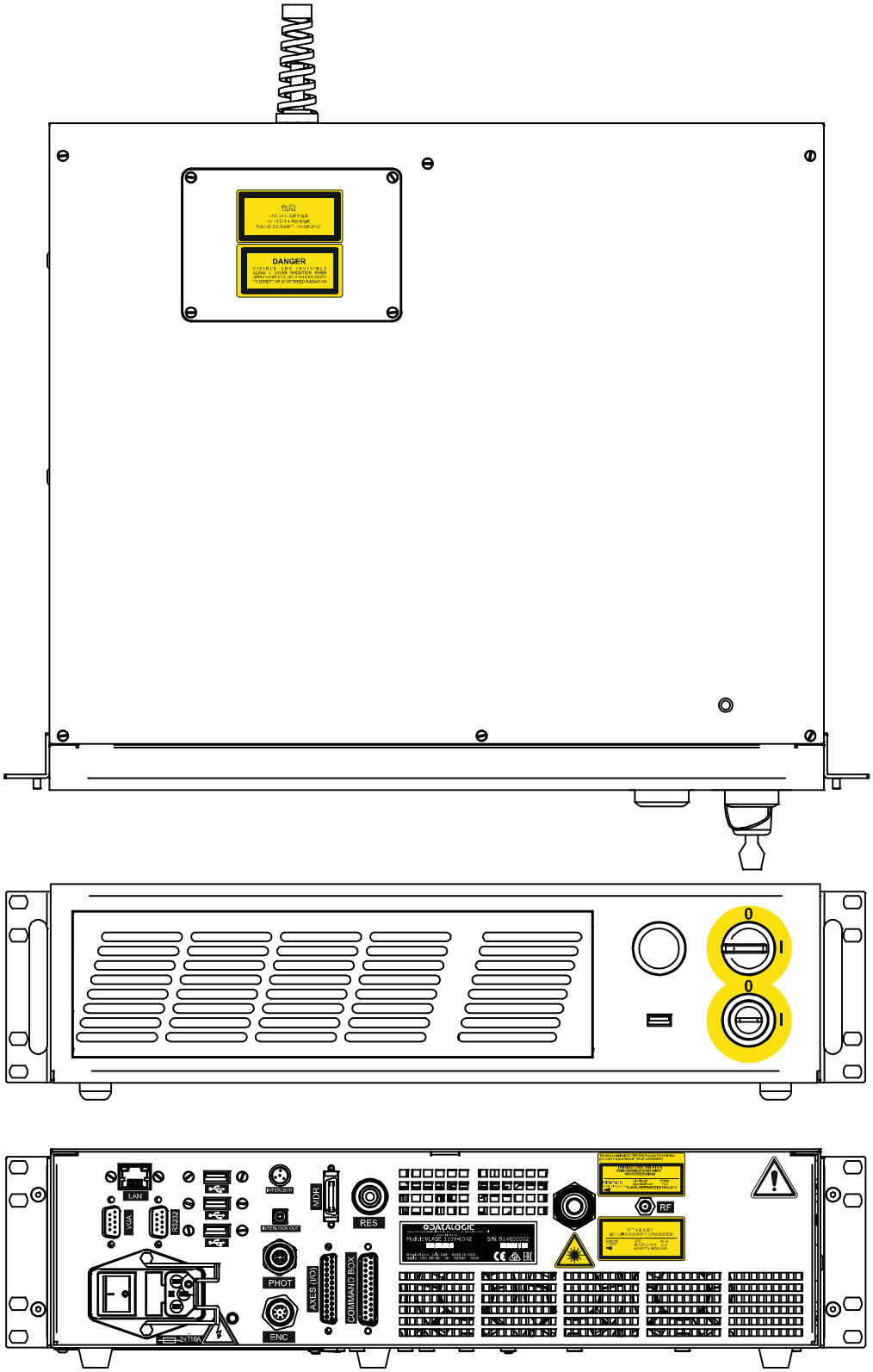


Figure 1: External labels rack location

Positioning of labels on the resonator:

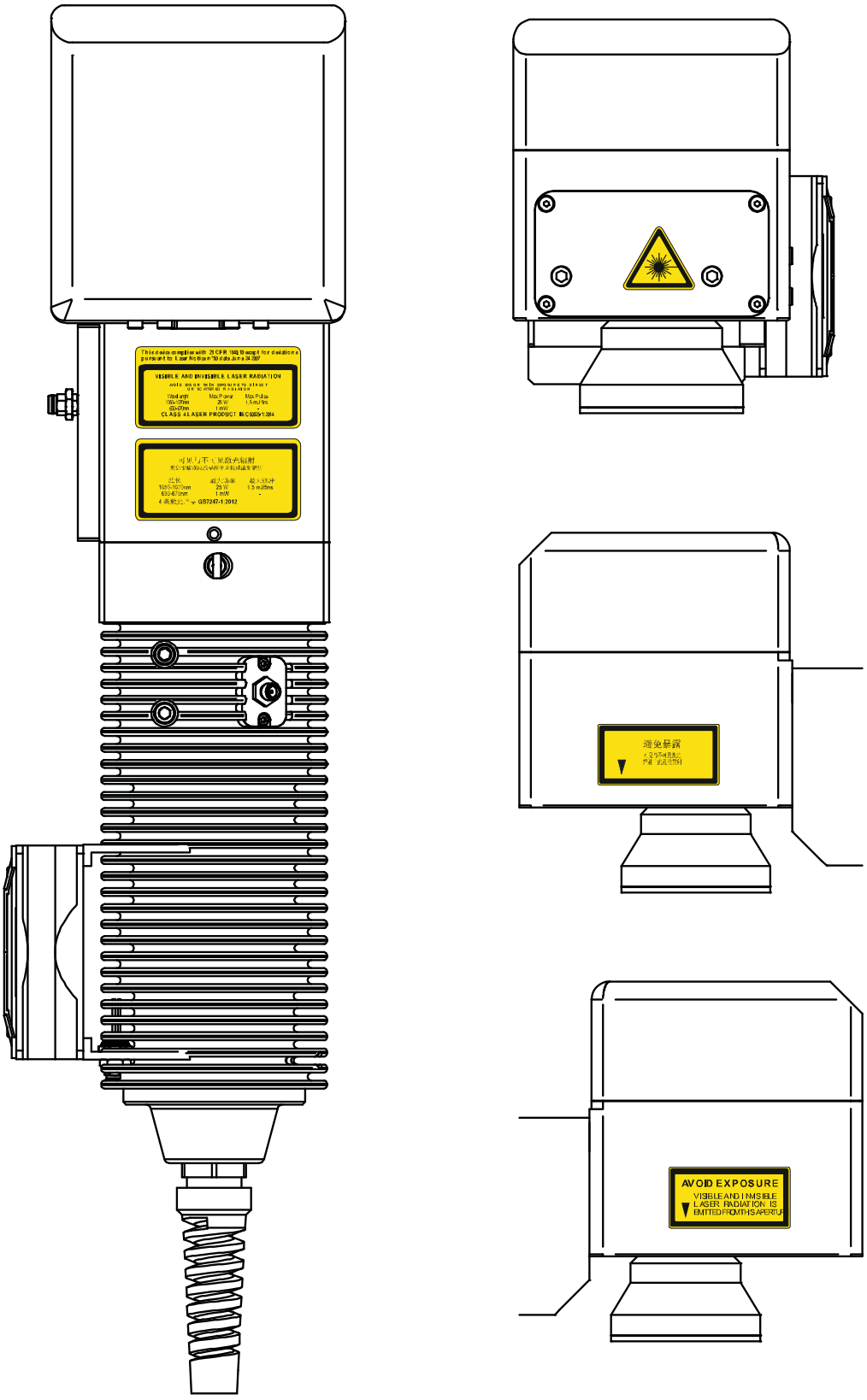


Figure 2: External labels rsonator location

APPENDIX B
SAFETY CONSIDERATION ACCORDING TO EN ISO 13489-1:2008

PERFORMANCE LEVEL (PL)

The PL is specified in EN-ISO13849-1. The risk analysis will lead to a PLr (Performance Level required) for a safety function based on the following graph:

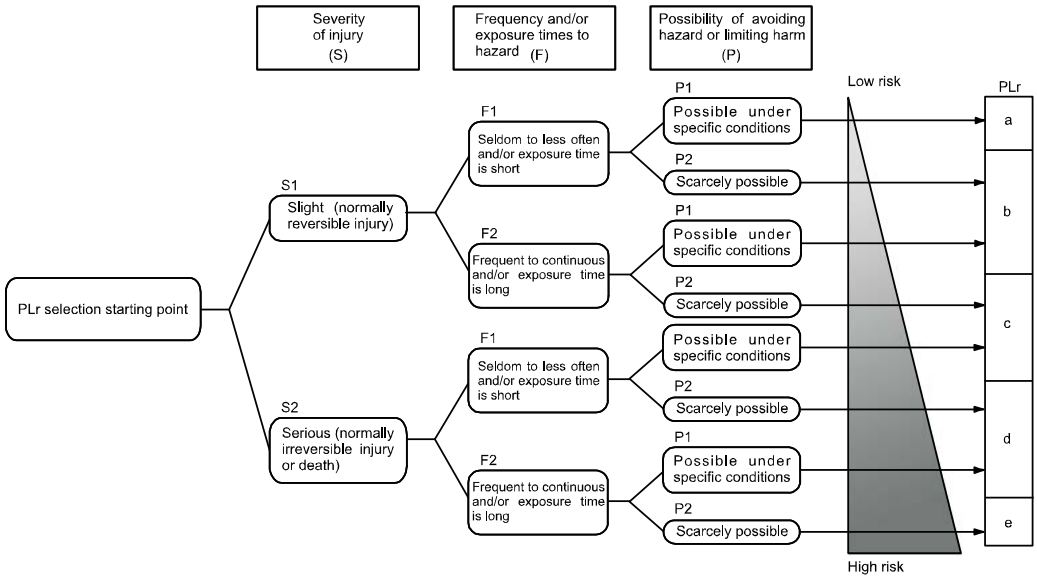


Figure 1: Determining the required Performance Level (PLr)

Application example

CAUTION

This example relates only to the features introduced in Vlase™ to assist in the risk reduction from the laser radiation. Any other risks (mechanical, electrical, etc.) must always be evaluated and appropriate risk reduction measures must be taken where necessary.

The Machinery Directive and EN 13849-1 are NOT applicable to the product Vlase™.

The target safety integrity or performance level (e.g. PLd according to ISO13849-1) shall be determined by the machine integrator, taking into account the machinery directive, the harmonized standards and any sector-specific standard that may apply.

CAUTION

This example is based on the parameters indicated in paragraph "Safety functions of Vlase™" on page 95**.**

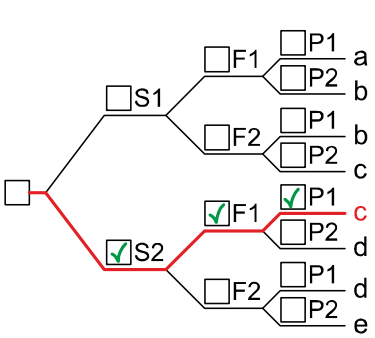
Example automatic production line

In this case the Protective Housing may have a guard capable of being opened or removed, typically only for service operation (frequency: seldom or occasional):

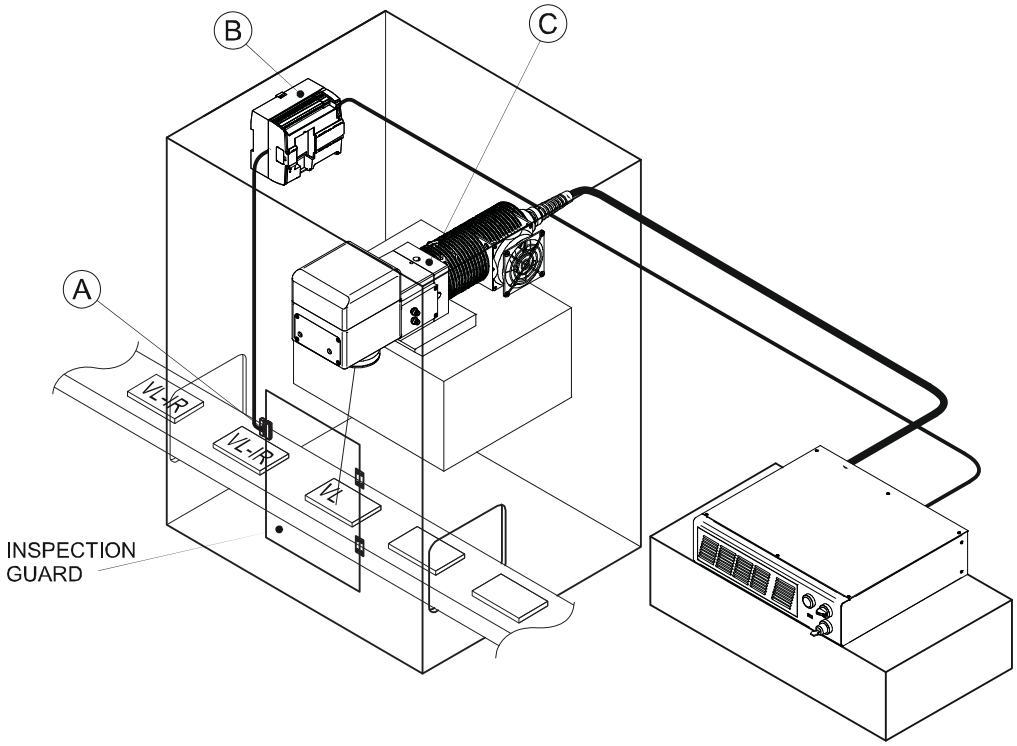
- Guard opening should only be possible with the aid of a tool.
- Guard safety switch is connected as input of a safety logic and Vlase™ interlock system as output/input of that safety logic.
- Warning label for access panel according EN60825-1 must be applied.

Since the frequency is LOW (F1) and the removal of the guard is intentional, the MINIMUM REQUIREMENT as per IEC13849-1 is PLc.

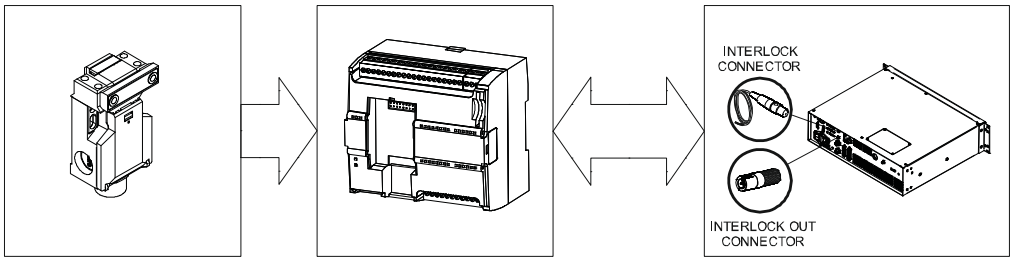
Target: PLr = c



Severity of injury (S)
S1 Slight (normally reversible injury)
✓ **S2** Serious (normally irreversible injury or death)
Frequency and/or exposure time to hazard (F)
✓ **F1** Seldom to less often and/or exposure time is short
F2 Frequent to continuous and/or exposure time is long
Possibility of avoiding hazard or limiting harm (P)
✓ **P1** Possible under specific conditions
P2 Scarcely possible



BLOCK DIAGRAM

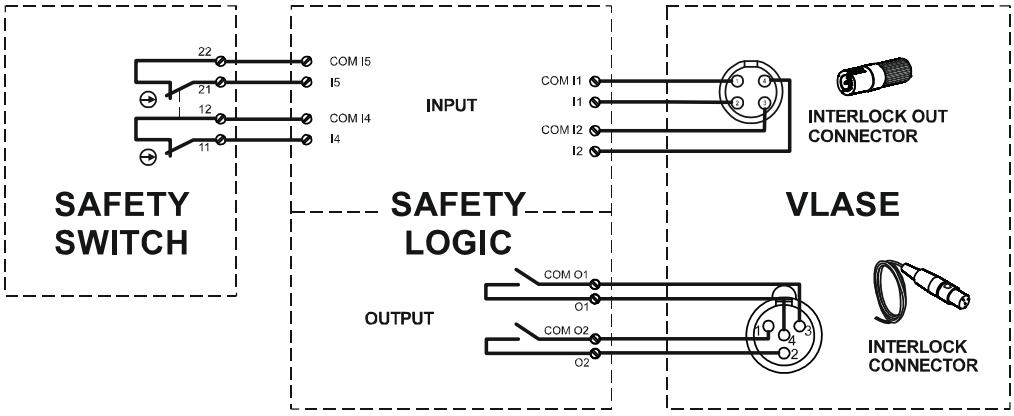


A: SAFETY SWITCH

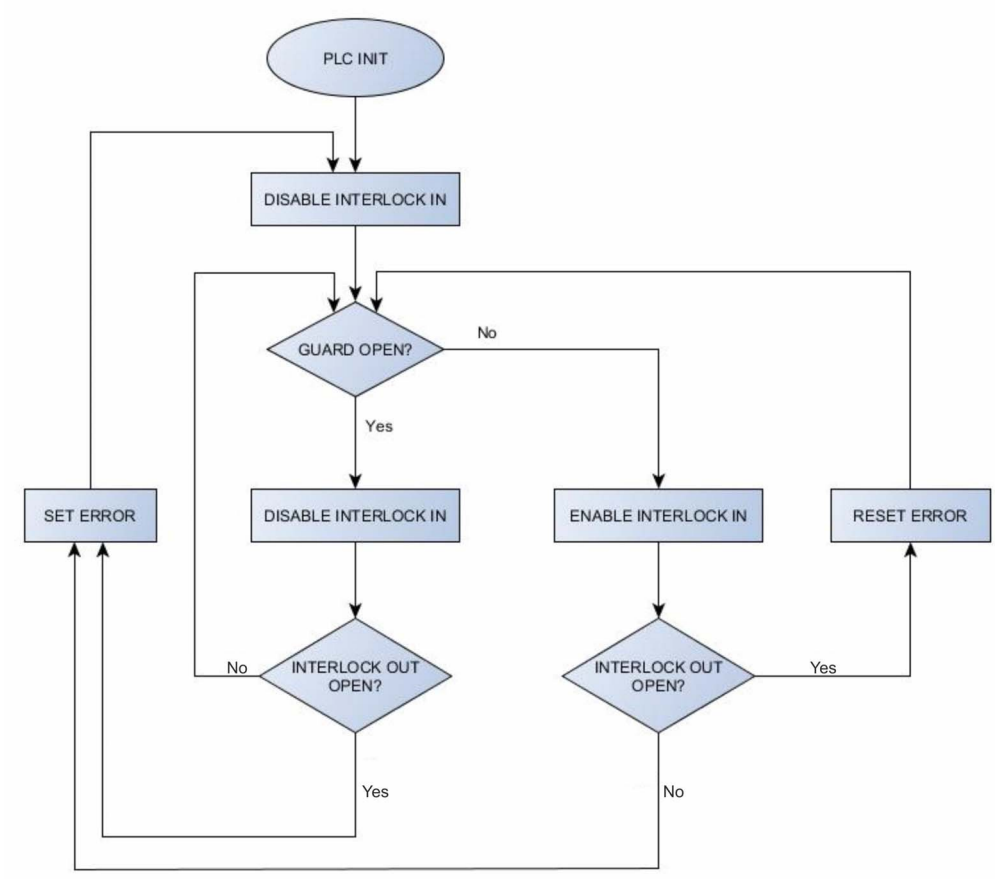
B: SAFETY LOGIC

C: VLASE

Vlase™ safety logic details for automatic production line



PLC Safety Diagram



INTERLOCK_A	INTERLOCK_B	IN_OUT_A	IN_OUT_B	CONDITION
OPEN	OPEN	CLOSED	CLOSED	SAFE
CLOSED	OPEN	CLOSED	OPEN	DANGEROUS
OPEN	CLOSED	OPEN	CLOSED	DANGEROUS
CLOSED	CLOSED	OPEN	OPEN	DANGEROUS

Table 1: Truth table under normal conditions.

COMPONENT CHARACTERISTICS

DOOR SWITCH: SAFETY SWITCH, designed in compliance with the standard currently in effect IEC60947, EN292, EN60204, EN1088. Two redundant contacts. IP67. B10d=2000000.

SAFETY LOGIC: main component SAFETY PLC min. PLd according EN13849-1. Output type relays, min 10mA. To be installed in an IP54 enclosure.

CONCLUSIONS

Because MTTFd is greater than 100 years, Category is 3, max achievable DC is 99%, so this example satisfies the PLr=c.

SAFETY FUNCTIONS OF VLASE™

Vlase™ provides inputs,outputs and actuators to implement the following safety functions:

- SF.1 ENABLE (e.g. no IR laser output if "EXT_ENABLE_A" or "EXT_ENABLE_B" are disabled, where "disabled" means contacts open)
- SF.2 INTERLOCK (e.g. no IR laser output if "INTERLOCK_A" or "INTERLOCK_B" are disabled, where "disabled" means contacts open)

These functions have been evaluated according to UNI EN ISO 13849-1. The results are:

- **SF.1:**

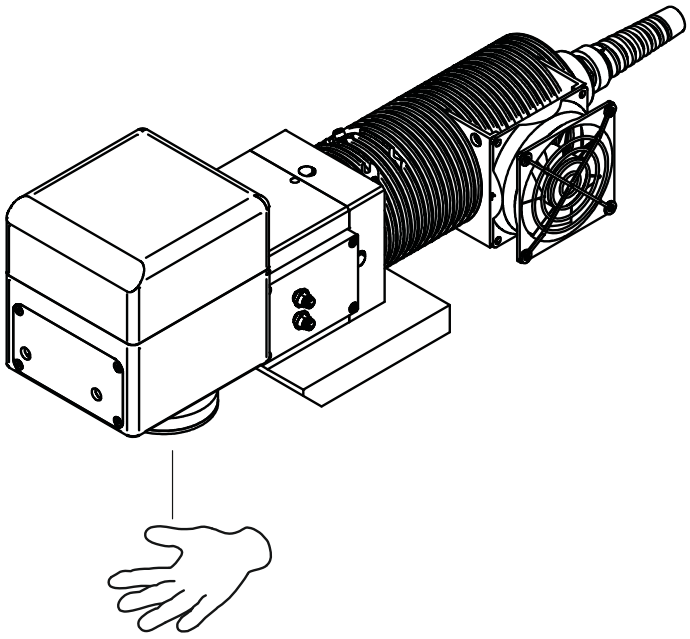
1. - Category: B
2. - MTTFd <10 years
3. - DC: none

- **SF.2:**

1. - Category: 3
2. - MTTFd = 4496 years
3. - DC: feedback is provided. The determination of the diagnostic coverage (DC%) is assigned to the system integrator depending on the supervision system in place.
4. - Response time: 10ms

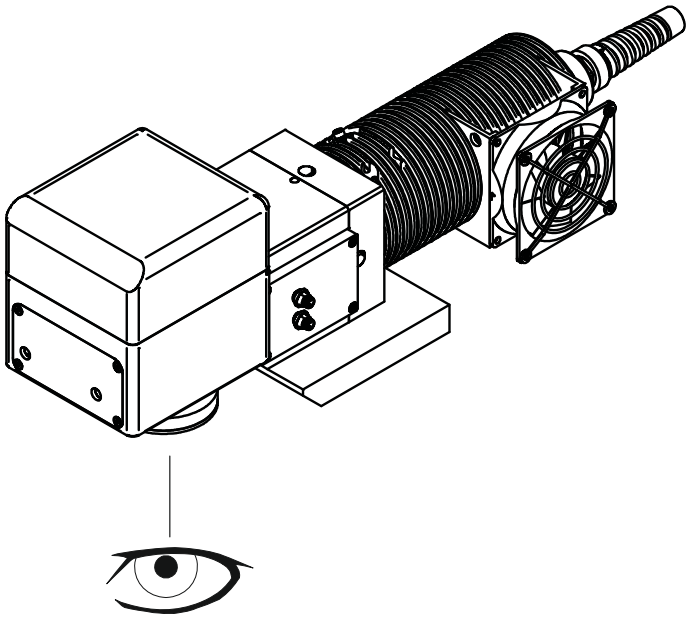
APPENDIX C
LASER SAFETY

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



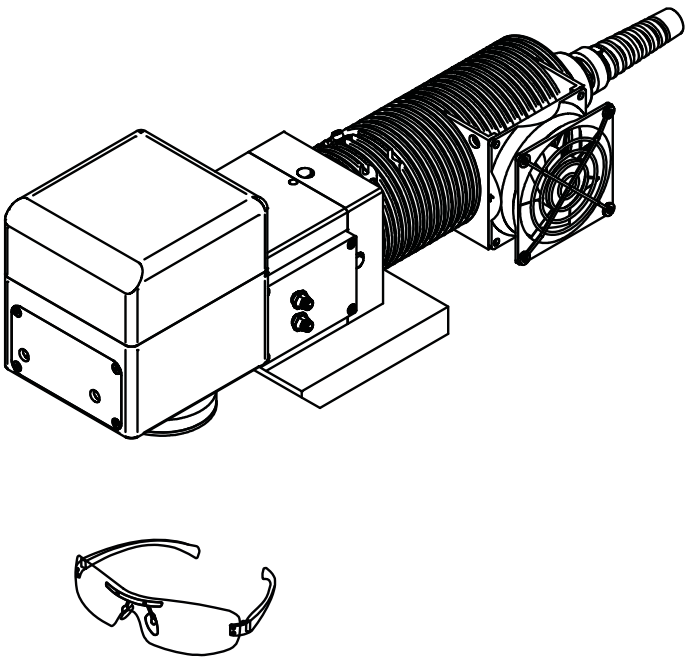
WARNING

It is crucial that you protect yourself against beams of reflected or direct light as they cause permanent damage to your skin.



WARNING

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



WARNING

Wear safety goggles while using the laser marker.

NOTE

BEFORE INSTALLING AND USING THE LASER MARKER, CAREFULLY READ THIS MANUAL.

LASER RADIATION

Laser radiation is an electromagnetic emission with a micrometric wavelength which ranges from the long infrared (CO2 Laser), close infrared (Nd Laser: Yag, Nd: YVO4), visible (He Laser: Ne or Argon) and ultraviolet (excimer laser).

It should be considered non-Ionizing Radiation. In the Vlase™ laser marker, 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 radiations of the Vlase™ laser marker are visible and invisible and 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.

WARNING

Directly viewing a laser beam can cause irreversible damage to human eye.

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.

WARNING

Viewing of a reflected laser beam can cause irreversible damage to human eye. The use of accessory external optics may increase the risk of damage.

In addition to possible injuries to human eye and skin, these lasers can ignite flammable materials and cause fires even at long distances.

WARNING

This laser marker is classified as Class 4. Class 4 Lasers can cause damage, not only from direct or reflected laser radiation, but also from scattered radiation. These lasers cause significant risk of irreversible damage to human eye and skin as well as risk of ignition and fire of flammable materials, even at long distances form laser radiation output aperture.

WARNING

Make sure that no flammable objects/materials are within the laser beam path. Use only non-flammable materials for enclosures or any other machine surfaces that may be exposed to direct or indirect laser beam radiation.

ABSORPTION OF LASER RADIATION

Human tissues absorbs electromagnetic radiation in different ways depending on tissue characteristics and the wavelength of the radiation. Certain wavelengths may be transmitted or absorbed, in different levels, by the human tissue. In the specific case of the eye, the Cornea and Crystalline lens allows most of the radiation within the wavelength range of 400nm to 1400nm to pass a reach the retina (where are the vision sensors). This range includes the visible light as wells a s near-infrared. The Vlase™ laser markers emit in the 1064nm range and thus can be focalized by the eye lens at retina with serious risk of causing irreversible damage do vision sensors.

Regarding human skin, the tissue abortion level is higher for the same wavelength range but the maximum exposure tolerance level, before there is a damage, is different compared to eye.

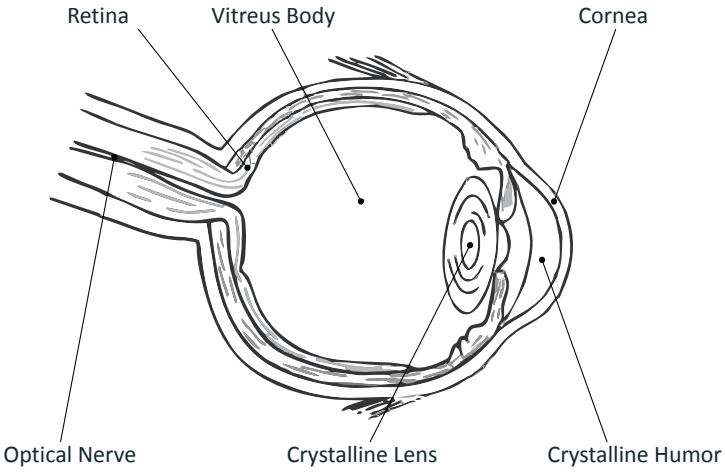


Figure 1: Eyeball section.

The damage mechanism, that absorbed laser radiation can cause, depends on the radiation wavelength. Radiation on the short wavelength range (UV 180-400nm) generally cause photochemical effects such as:

- cataract, or opacification of the crystalline lens
- melanin coloring, or reddening of the skin

Radiation at longer wavelength range (IR 780nm to 10µm), generally cause thermal effects such as:

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

The degree of injury depends on the amount of absorbed radiation; the power, energy and peak power of the radiation source, as well as the time exposed to such radiation.

CLASSIFICATION AND DANGER LEVEL

Regulations have established different classes of Lasers, based on their ability to cause human injury. These classes ranges from Class 1 (basically safe in all conditions) to Class 4 (dangerous in several conditions).

Lasers that can produce risk to human being, not only from direct or reflected radiation but also from scattered radiation, belong to Class 4. These lasers sources can also present risk of causing fires through ignition of flammable materials. For these reasons the Customer must, when integrating the laser marker into their machine, implement all necessary measures to contain laser radiation and ensure compliance with applicable safety regulations. All operators using lasers systems should also use appropriated individual protection devices such as goggles, etc.

WARNING

The Vlase™ laser marker contain Class 4 invisible laser sources. Refer to applicable regulations (including Laser Safety and Machine safety) for recommendations for compliance of your machine with integration and use of such Class lasers type.

DEGREE OF RISK WITH RADIATION VIEWING CONDITIONS

If F-Theta scan lens is removed from resonator the output radiation is a collimated intense coherent laser beam. The image of such a beam, created by any lens is then a very small spot with extremely high power and energy density. Such a beam is also focalized by the human eye and thus result in irreversible damage to the retina. The output radiation of the laser marker, with the F-Theta scan lens, is not a collimated beam but a convergent (before focus plane) and divergent (after focus plane) laser beam. The degree of convergence and divergence depends on the F-theta scan lens specifications and thus varies with the different laser marker models. While marking the laser radiation is typically scattered at the object being marked. Special attention must my taken with objects with high reflectivity to the laser wavelength range since such objects may not only reflect the laser radiation but also change its characteristics according to the shape of such surface (that can work as a lens element). Thus the risk related with laser radiation depends on the characteristics of the beam at which the human is exposed.

In the following sections the risk degree to human eye, related with different viewing conditions, is qualitatively described. Please note that this is intended only as awareness on such risks.

WARNING

It is responsibility of Customer to makes an independent risk evaluation and to implement the necessary safety measures, according to applicable regulations, pertinent to Class 4 Lasers.

Direct viewing of the laser beam

This type of viewing is the most danger for human eye and can occur if looking directly into laser output aperture. Risk is higher in case F-Theta scan lens is removed since output laser beam is, in such conditions, collimated.

WARNING

Do not look directly to laser beam. Individual Protection Devices such goggles do not warrant protection for direct exposure to laser radiation.

Viewing of a laser reflected beam

This may occur when beam is reflected on a mirror surface. This type of viewing is as danger for human eye as direct viewing of the laser beam.

WARNING

Do not look to reflected laser beam. Individual Protection Devices such goggles may only provide protection for a short period of time and thus do not warrant protection for exposure to reflected laser radiation.

WARNING

Many materials, including metals and plastics, have surfaces that strongly reflect laser radiation. Make sure to use non-reflective materials for enclosures or any other machine surfaces that may be exposed to direct or indirect laser beam radiation. Pay special attention when marking objects with high reflectivity properties.

Viewing of direct laser beam from a fiber output

Although unlikely to happen since fiber is protected by an armored stainless steel cable, this may occur when the optical fiber cable, that connect control rack with resonator is damaged and fiber is broke. The laser radiation is highly divergent but power and energy is high and risk is similar to direct viewing of a laser beam.

WARNING

Do not look to fiber output laser beam. Individual Protection Devices such goggles may only provide protection for a short period of time and thus do not warrant protection for exposure to direct laser radiation.

Viewing of scattered laser beam

This is the most typical exposure condition when laser is scattered by at a non-reflective surface (such as blocking element or when marking of some materials). In this case, special filter widows and Individual Protective Devices (such as goggles) may allow full protection even for prolonged exposures if is such protective means respect applicable norms for the type of laser radiation.

WARNING

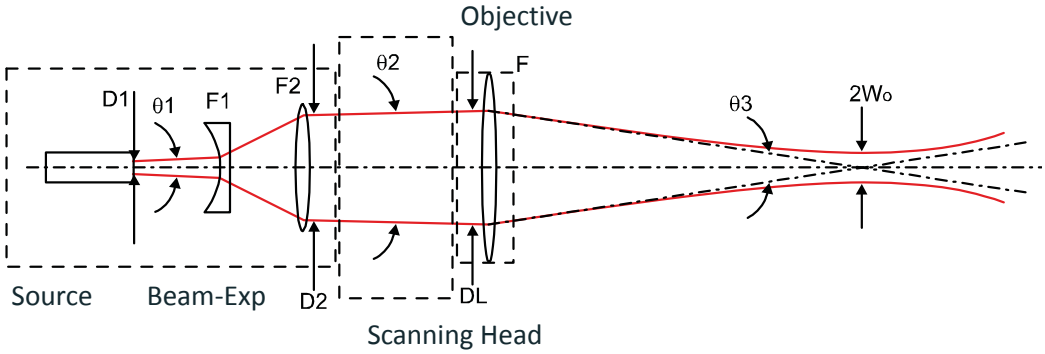
Always use certified protecting goggles appropriated for the laser radiation characteristics to which you can be exposed.

WARNING

Remember that none goggles can provide sufficient protection for prolonged direct or reflected laser beams.

N.O.H.D. DETERMINATION AND O.D. OF PROTECTION GOGGLES

In order to determine 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 laser beam at output of F-Theta scan lens.

With all this optical data available, it is possible to calculate the Nominal Ocular Hazard Distance (N.O.H.D.) and the optical density (O.D.) required by the laser radiation protection filters (goggles).

Below 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 accidental exposure of 10 seconds for direct radiation and 100 seconds for diffused radiation.

Wavelength	RIF	1064 nm
Laser Type		Q-Switched
Observation type		Direct radiation
Pulse energy		Vlase™ IR 1109-TFS2: 480 µJ @ 10 kHz Vlase™ IR 1209-TFS2: 550 µJ @ 20 kHz
Pulse duration		Vlase™ IR 1109-TFS2: 15 ns Vlase™ IR 1209-TFS2: 8 ns
Beam Diameter at 9X Beam Expander Output (1/e2)	DL	Vlase™ IR 1109-TFS2: 6.0 mm Vlase™ IR 1209-TFS2: 5.0 mm
Beam divergence on the lens	θ_2	Vlase™ IR 1109-TFS2: 0.6 mrad Vlase™ IR 1209-TFS2: 0.8 mrad
Focal of the F-Theta lens	F	160 mm
Real divergence after the lens	θ_3	Vlase™ IR 1109-TFS2: 37,5 mrad Vlase™ IR 1209-TFS2: 31,2 mrad
Exposure time		10 s

Accidental vision of the reflected laser radiation

Assuming a direct exposure of 10 seconds at a nominal distance of 0.5 m (worst case considered), with the Vlase™ model using F-Theta scan lens 160 mm, it is possible to calculate the suitable optical density (O.D.) for safety goggles.

The O.D. (Optical Density) in last column assures the reduction of laser radiation below max acceptable exposure.

O.D.= log (H/EMP) where EMP is the Maximum Permissible Exposure and H is the radiant exposure.

SOURCE	N.O.H.D. (NOMINAL OCULAR HAZARD DISTANCE)	O.D. (OPTICAL DENSITY)
Vlase™ IR 10 W Marker with F-Theta 160 mm	25.2 m	> 3.70
Vlase™ IR 20 W Marker with F-Theta 160 mm	28.8 m	> 3.82

Filter scale index of the protection goggles

The scale index L of the filters indicates the stability against radiation, which means the ability of the filter to maintain its characteristics unchanged.

This stability is certified by goggles producer according to the UNI EN 207.

It is then necessary to verify that the scale index of the adopted filter is stable for this period and to consider an adequate overrating in order to make sure that it could last longer than the accidental exposure period.

In case of exposure at 0.5 m for 10 seconds, the suggested optical density for safety goggles is CLASS **L4**.

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. This is particularly critical for Class 4 laser beam.

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

GENERAL SAFETY REGULATIONS

The user of the laser marker must comply with all regulations and work best practices regarding safety. Therefore it is necessary to develop a Standard Operating Procedure (S.O.P.) related to operations of the machine incorporating this laser marker. This procedure, shall be available at 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.)

OTHER RISKS

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

WARNING

Do not use this laser marker for other purpose than the one it was designed for.

Another additional risk associated with the laser marker is electricity. This may occur when accessing internal parts of the laser marker.

CAUTION

Only Datalogic authorized personnel, who have been trained and instructed on the electrical and optical risks, is allowed to access the internal parts of the control rack.

Datalogic shall not be held liable for any damage caused by inadequate work from non-authorized personnel.

CAUTION

Only Datalogic authorized personnel, who have been trained and instructed on the electrical and optical risks, is allowed to access the internal parts of the resonator.

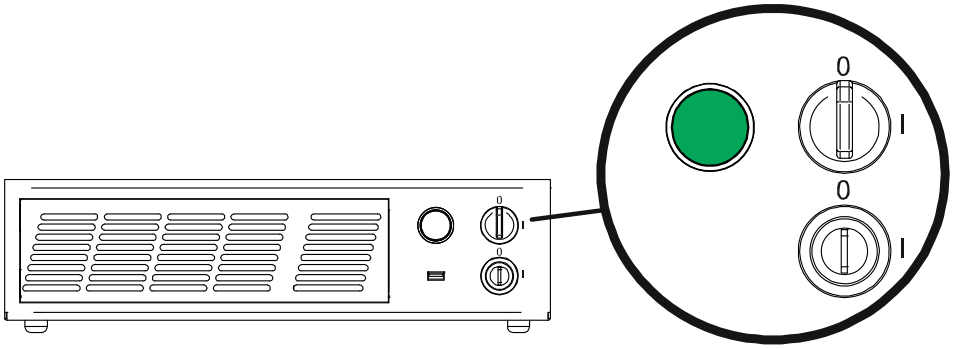
Datalogic shall not be held liable for any damage caused by inadequate work from non-authorized personnel.

APPENDIX D
USING MARKING SOFTWARE

HOW TO CREATE AND EDIT GRAPHICS LAYOUT

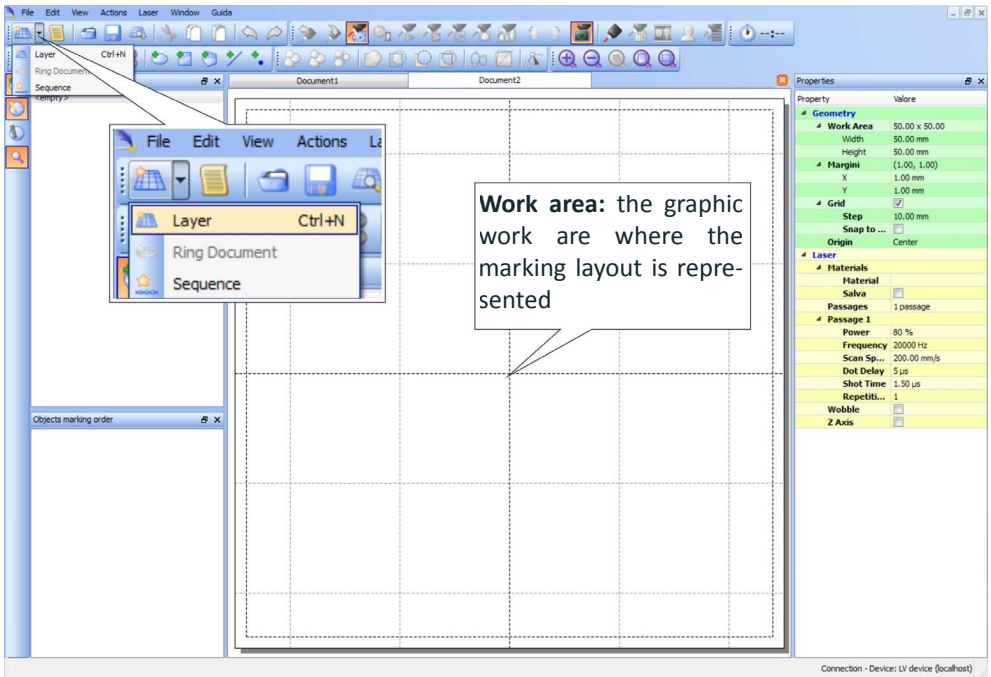
NOTE

This example considers that the laser marker is controlled in Key Selector mode (see “Key and Eneable Selector mode” on page 36).

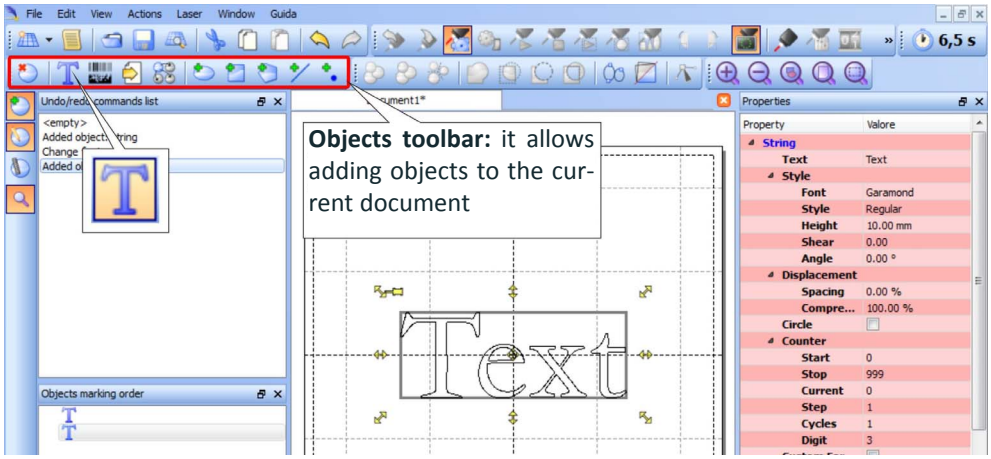


In “WAIT FOR START” state, double click the **Laser Editor** icon to start the layout editor application.

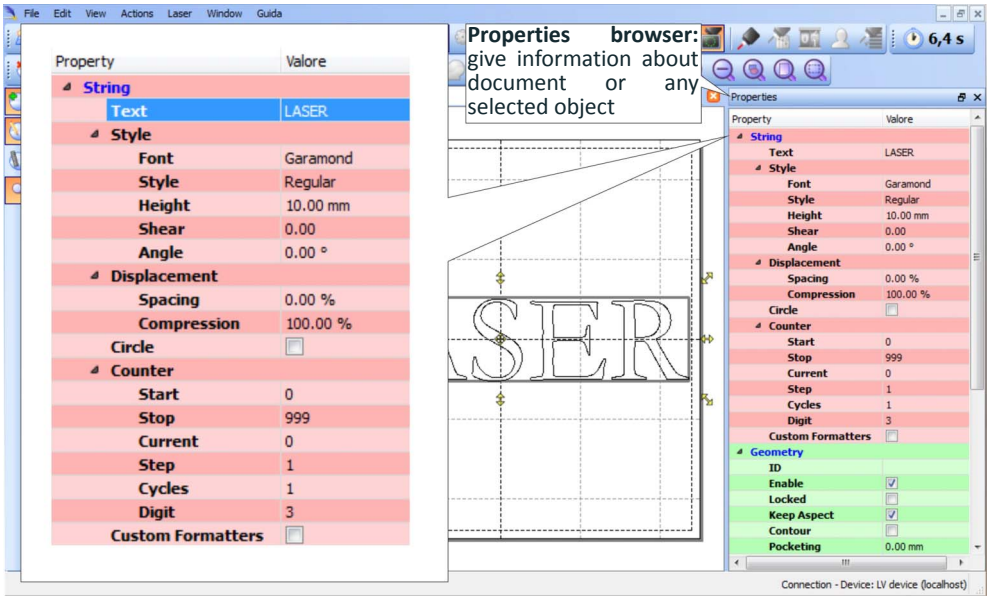
Click on the document type selector and choose **Layer**:



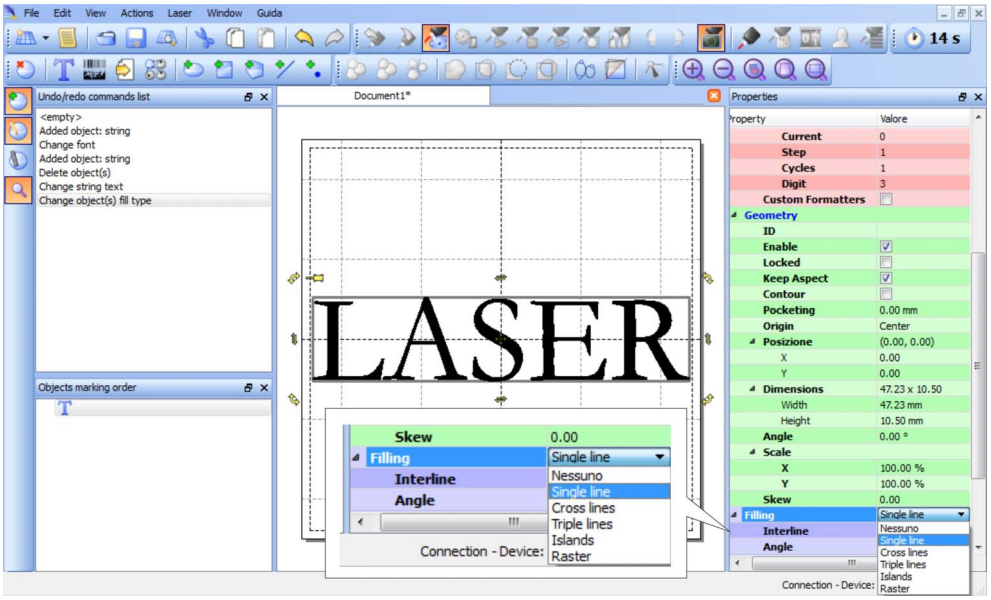
Click on the **Text String** icon in the **Object toolbar** to add a string object to the layer:



Edit String properties such as value, font, style, etc. using the **Properties browser**:



Edit Filling properties such as filling type, interline, etc. using the **Properties browser**:

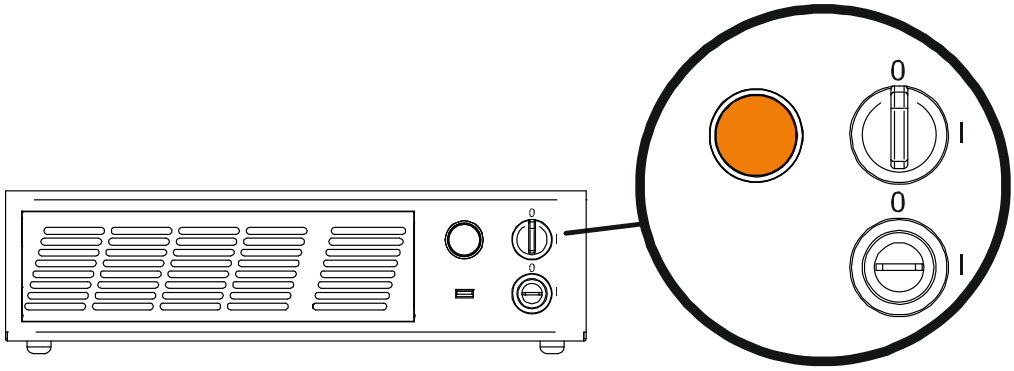


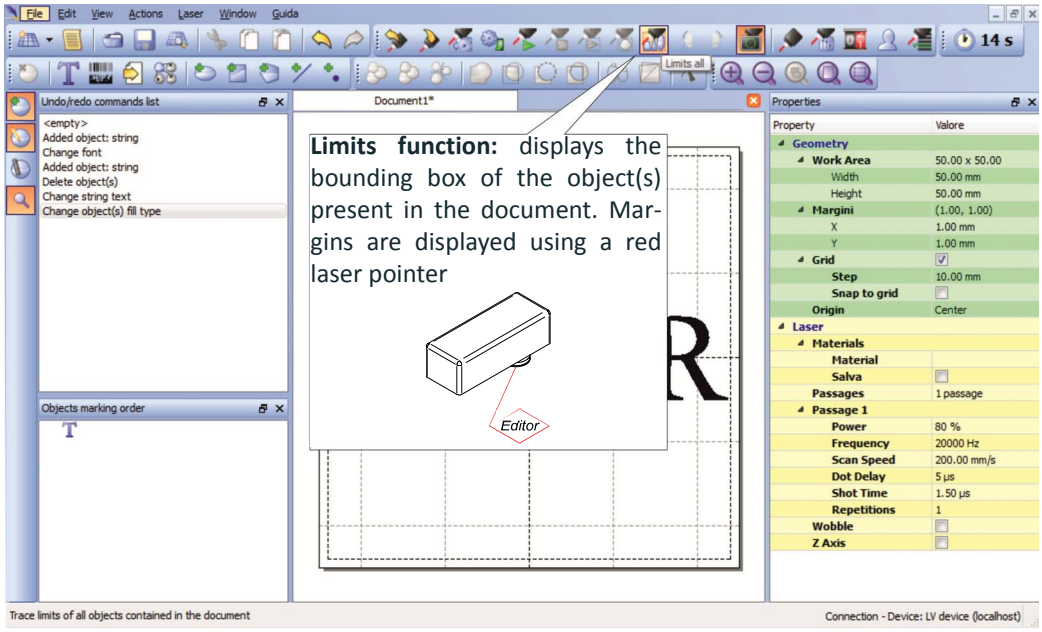
NOTE

Consult Lighter™ software user's manual for a proper use of the same.

HOW TO TEST AND MARK LAYOUT

In “STANDBY SHUTTER CLOSED” state, press **Limits All** button in the **Laser Toolbar** to adjust the object position in the marking field:





CAUTION

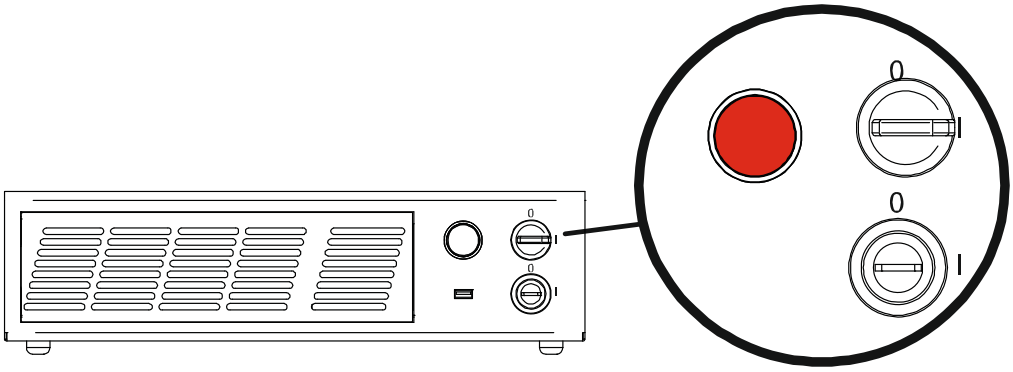
Marking highly reflective materials might cause optical feedback into laser marker. This may result into irreversible damage of the optical components of laser marker.

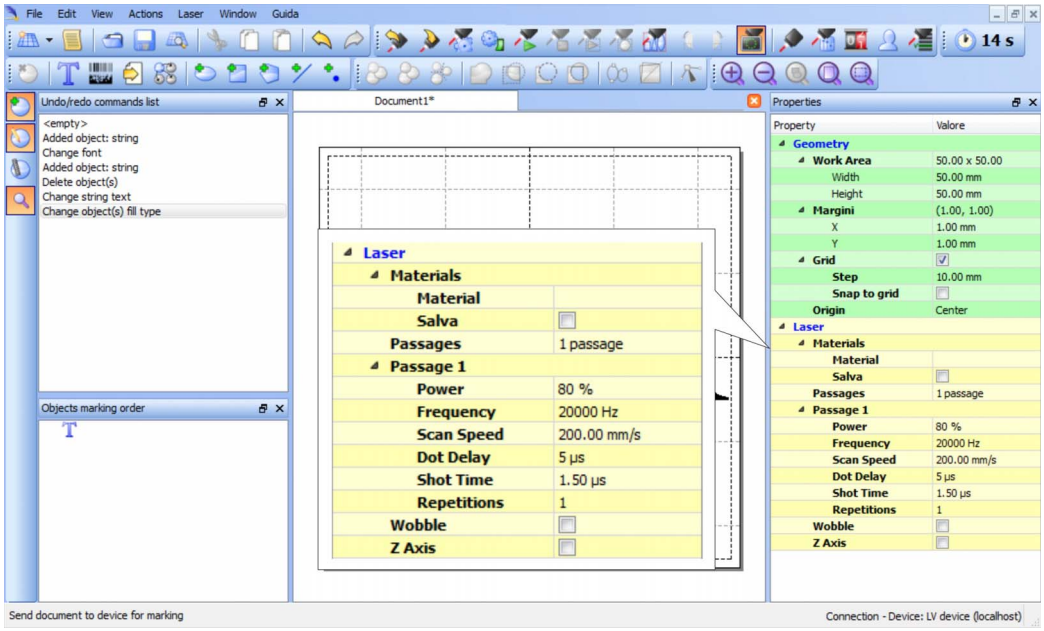
Verify that the position and geometry of the object to mark does not cause any reflection into the optical aperture of the laser marker F-Theta scan lens.

Please contact our Customer Support Service for support on your particular application.

Optical induced damage caused to laser marker by back reflection from high reflective materials is not covered by warranty.

In “READY” state, adjust the Laser parameters using the **Properties browser**:



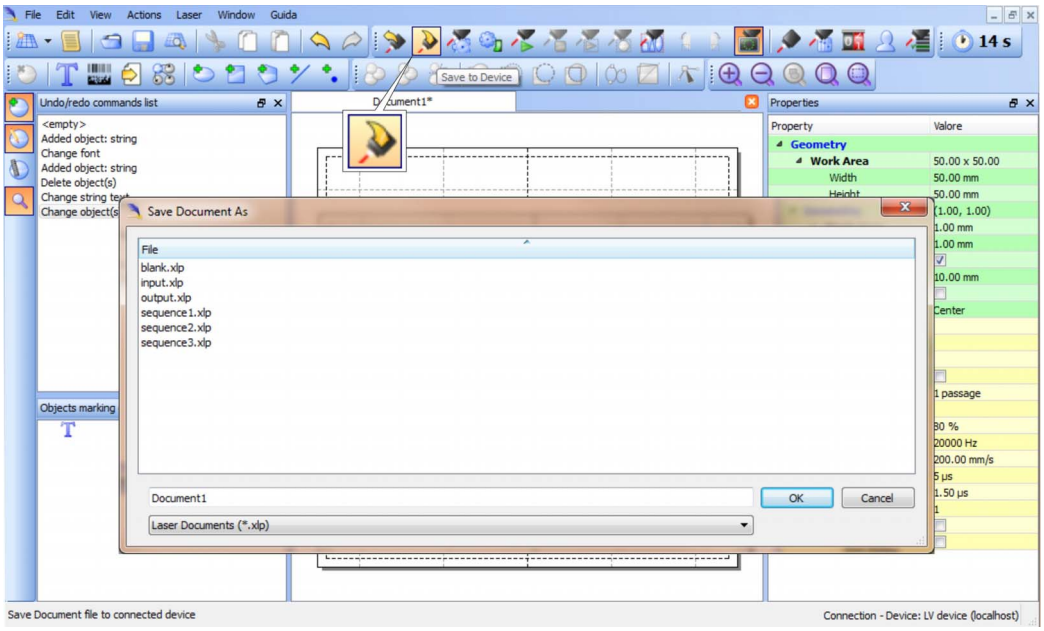


Press the **Send Marking** button in the **Laser Toolbar** .

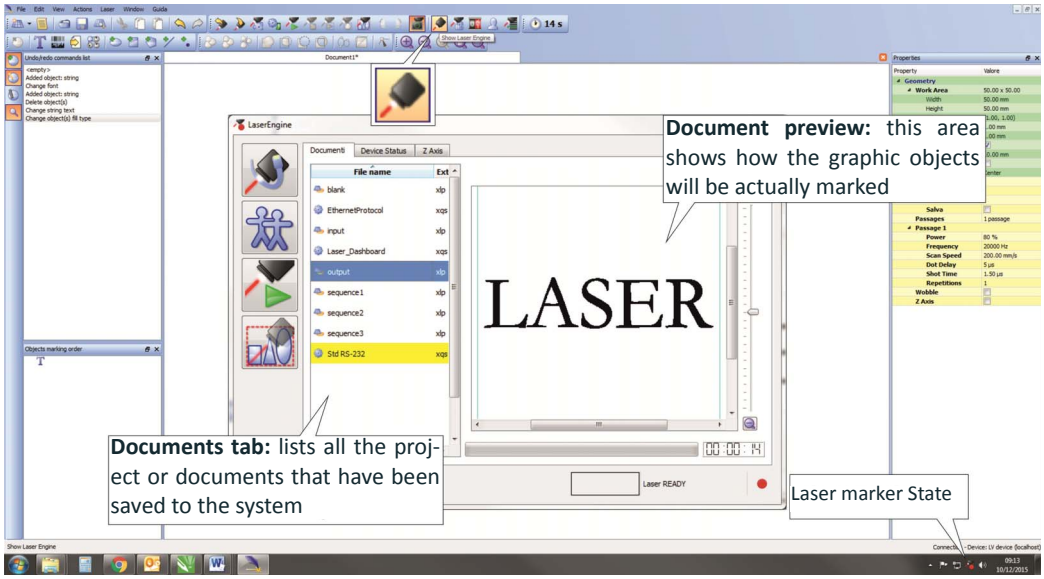
HOW TO USE COMMAND BOX SIGNALS TO MARK LAYOUT

Automate the marking process allowing documents to be marked using external *START_MARKING* and *STOP_MARKING* signals, which can be generated by PLC or other external devices.

Click on the **Save to Device** button to save the layout in the device memory:



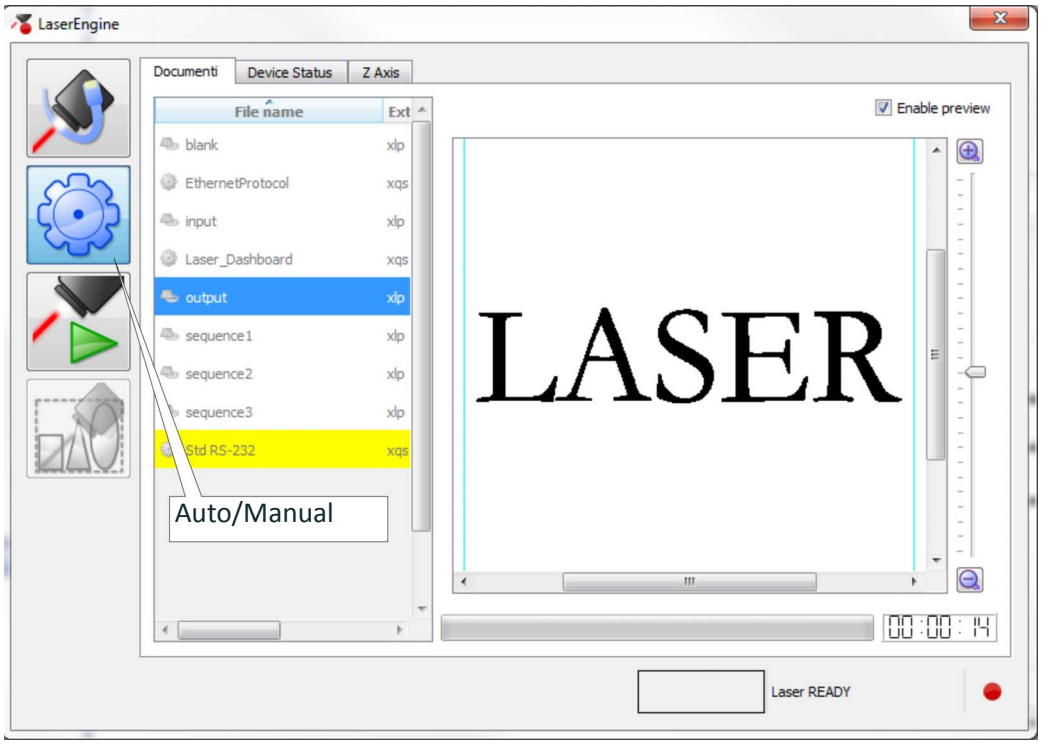
Click on the **Show Laser Engine** button to display Laser Engine window:



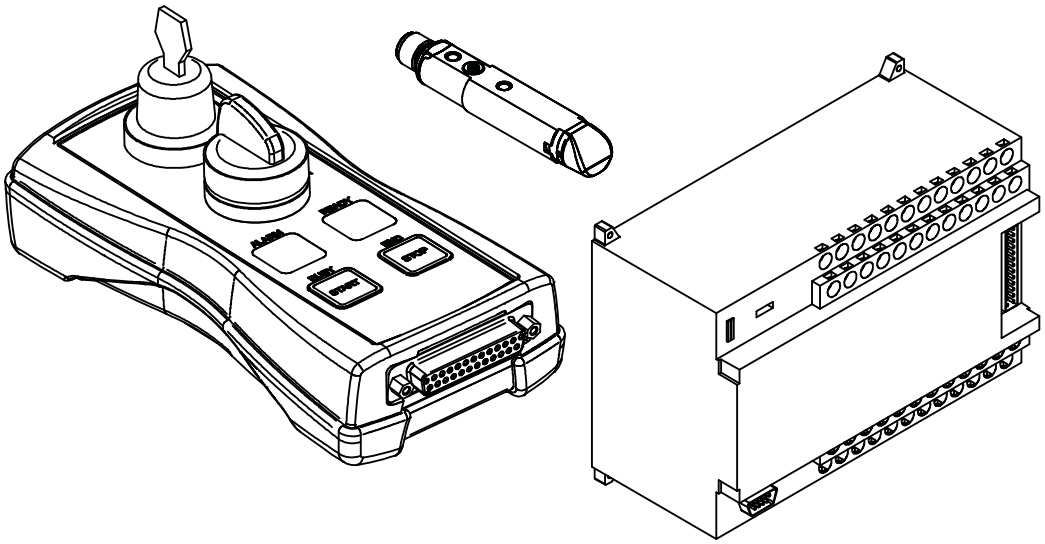
AUTO/MANUAL Mode button allows switching between the two available working modes:

- Auto mode: the engraving operations are executed automatically using external signals.
- Manual mode: used for displaying the margins of the graphic objects to be marked and to test layouts.

Select the document from the list and click on the **To Auto Mode** button:



The laser marker is ready to mark the document using external *START_MARKING* and *STOP_MARKING* signals:



NOTE **Consult Lighter™ software user's manual for a proper use of the same.**

THERMALIZATION AND SUPPRESSION OF GIANT PULSES

Thermalization is useful in order to obtain a good marking quality.

To obtain uniform markings and work processes it is important to keep the Nd:YVO4 crystal constantly pumped. This operation is called thermalization and it is implemented by supplying the laser diode with a suitable level of current. In this way a certain amount of pumping radiation at 808 nm excites the crystal, but with the Q-switch closed, no laser radiation is emitted by the system.

With the Vlase™ source, this procedure can be implemented using Software Thermalization.

Software thermalization

Software thermalization is implemented automatically by the Lighter marking software and consists in defining, within the marking project, a certain thermalization level at which the crystal is maintained during the non-emission intervals. It is generally recommended to keep the level of thermalization similar to the power level used for the marking or slightly lower.

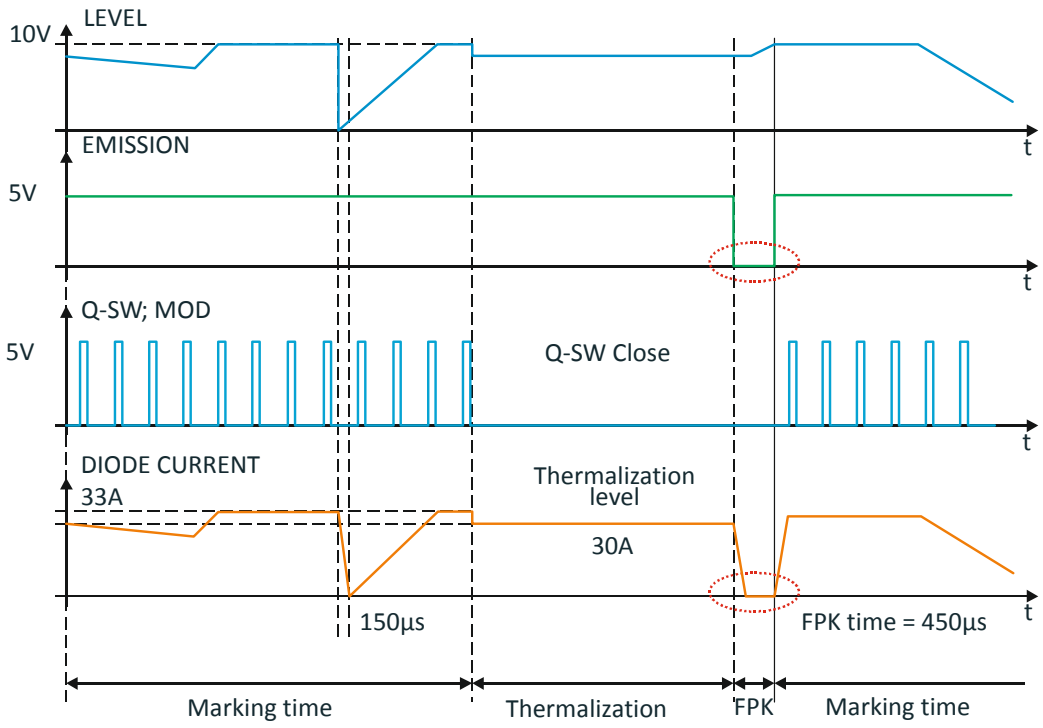


Figure 1: Temporal diagram of Software Thermalization

As you can see in the graph shown in the Figure, during the marking phase the Q-Switch Modulation signal determines the frequency with which the laser pulses are generated, the effect of the LEVEL signal is a corresponding change in the laser diode current.

Please note that, in order for this to occur, the EMISSION signal has to be active.

NOTE

Please also note that the current supplied to the laser diode is intentionally forced to have rising and falling times in the range of 150µs. This protection from rapid commutations (generated by faster changes of LEVEL or EMISSION signal fronts) is intended to reduce the risk of damage risk and extend lifetime of the diode itself.

During the thermalization phase, the EMISSION signal stays active, while the LEVEL signal goes into a pre-set thermalization level (i.e. 90%) and the Q SW MOD signal stays fixed at 0 V.

At the end of the thermalization phase, before starting another marking phase, the FPK (First Pulse Killing) procedure needs to be implemented in order to discharge the crystal, thus avoiding the generation of "giant" pulses which may cause marking defects as well as damages to the internal optics of the resonator.

To discharge the crystal, the Q-Switch is kept closed (Q SW MOD signal at 0 V) and the EMISSION signal is brought to a 0V level for at least 450 µs, so as to cut off the current in the laser diode and consequently the pumping of the crystal (FPK delay).

LASER SOURCE	FREQUENCY INTERVAL	OPERATION IN CONTINUOUS WAVE (CW)	Q-SWITCH OPENING TIME (SHOT TIME)	OPTIMAL FPK DELAY
Vlase™ IR 10 W	10 kHz to 200 kHz	YES	1,5 µs	450 µs
Vlase™ IR 20 W	20 kHz to 200 kHz	YES	1,5 µs	450 µs

CAUTION

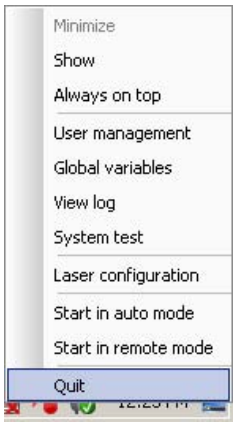
It is strongly recommended NOT to change the set FPK Shot time and delay, because they have been optimized to ensure the safety of the marking system and the performance marking linked to the high stability of the laser pulses.

APPENDIX E
MARKING SOFTWARE UPGRADE

HOW TO UPDATE THE MARKING SOFTWARE

This document describes how to update the software version:

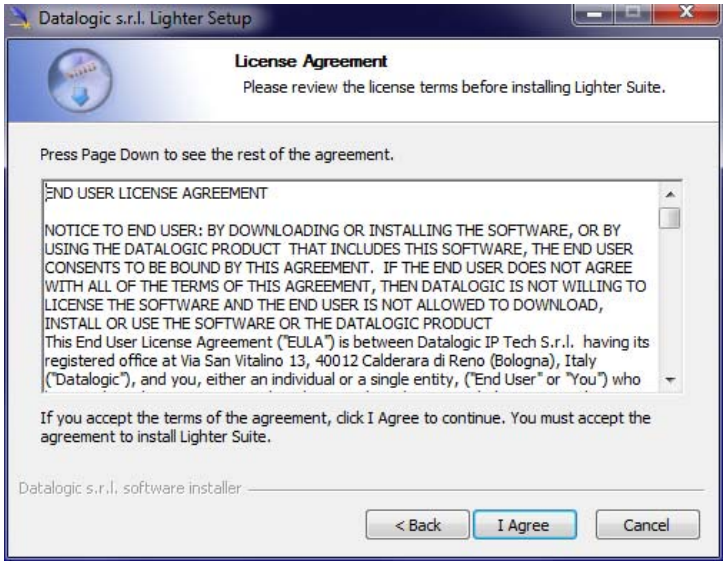
1. Close Lighter™ Laser Editor and Laser Engine (right-click on the icon in the tray bar and select QUIT QUIT)



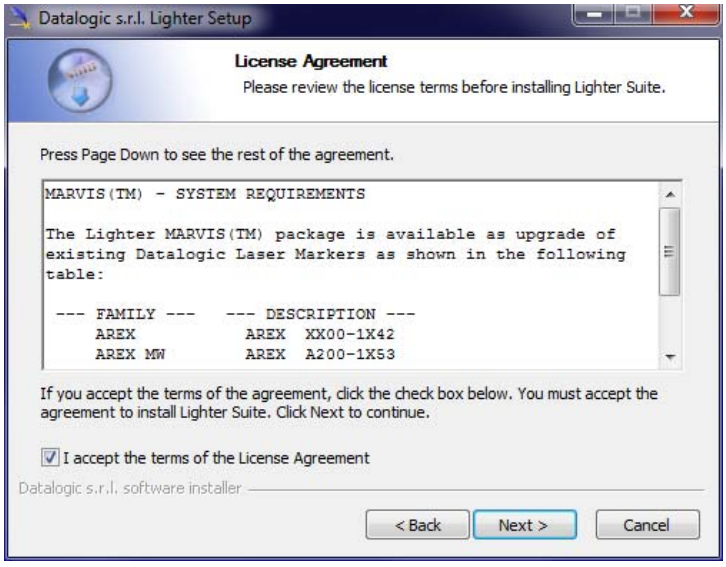
2. Run the new Lighter™ Suite installer from an external USB device.

3. Press **Next** to continue:

4. Press **I Agree** to continue:

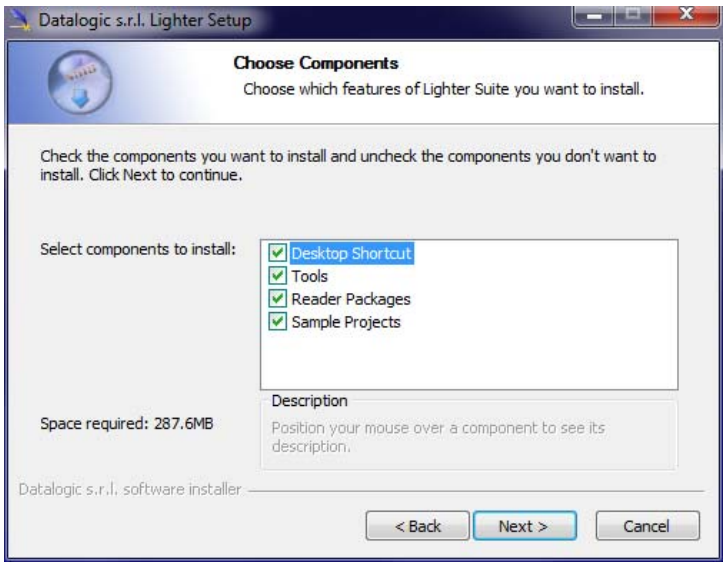


5. Check *"I accept the terms of the License Agreement"* and press **Next** to continue:

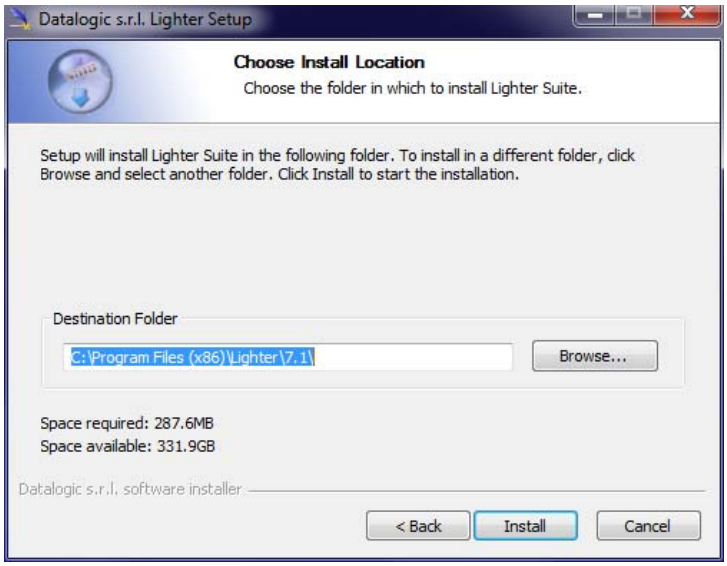


6. Choose the *INTERCATIVE* installation type and press **Next** to continue:

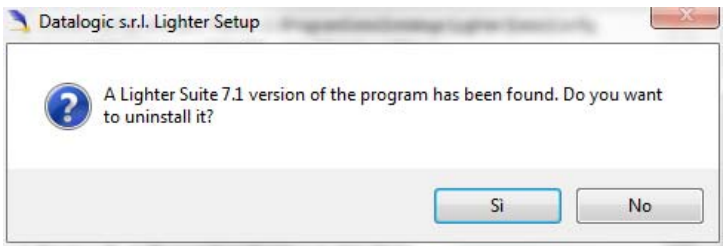
7. Choose the components to install and press **Next** to continue:



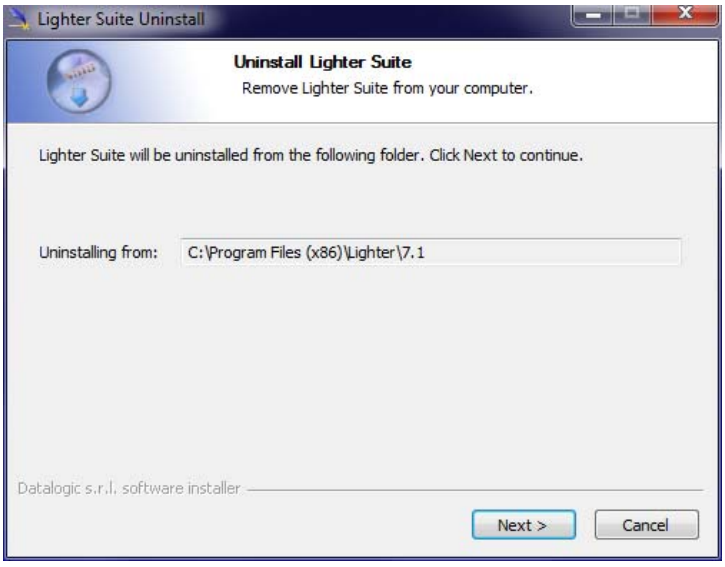
8. Do not change the destination folder and press **Install** to continue:



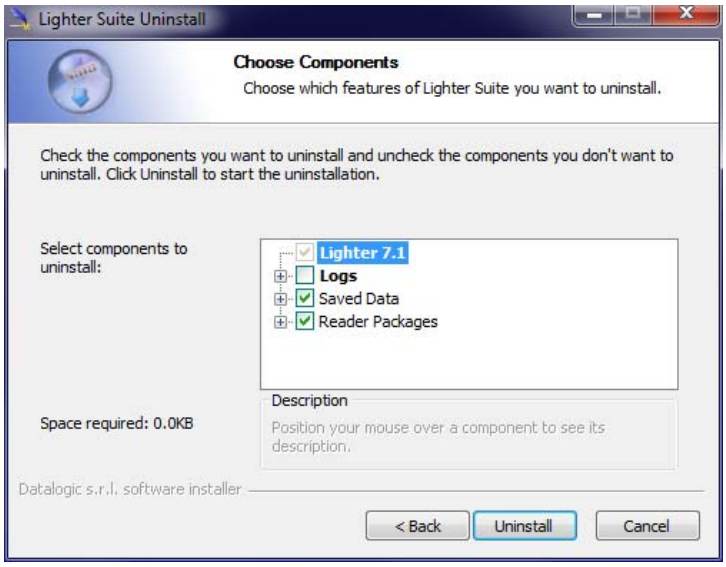
9. Press **OK** to uninstall the old Lighter™ Suite version



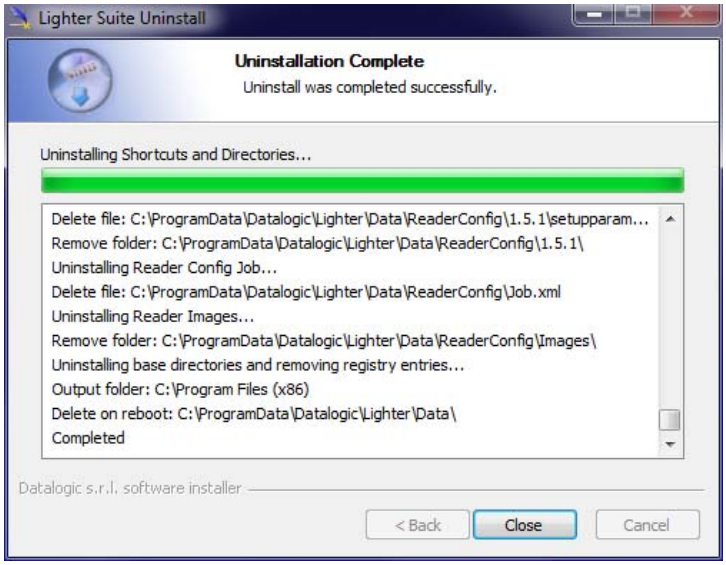
10. Press **Next** to continue:



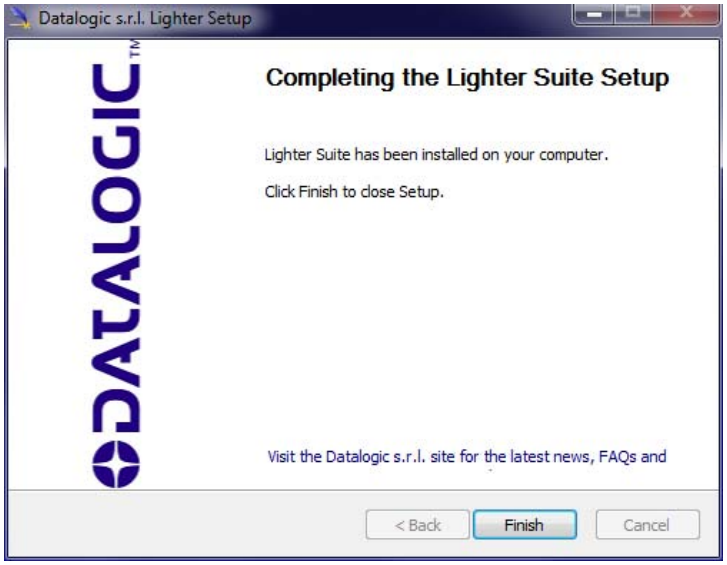
11. Select the components of the old Lighter™ Suite version to remove and press **Uninstall**:



12. Wait until the unistallation is complete and press **Close** to continue:

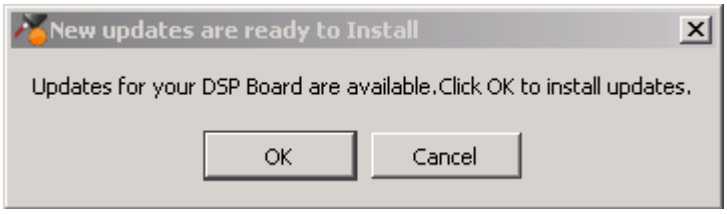


13. Lighter Suite will be installed. Press **Finish** to complete the procedure:

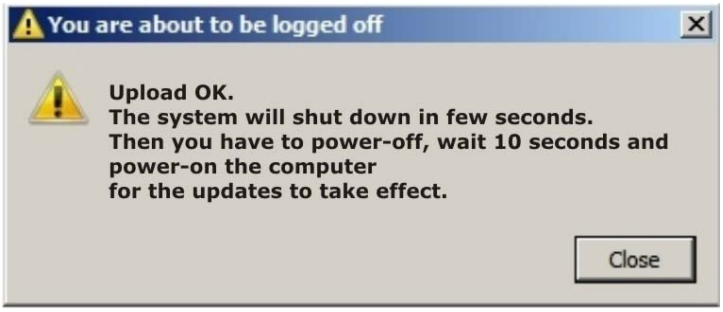


14. Depending on whether the Lighter™ Suite update includes any control board updates different procedure should be followed:

- Procedure with laser control board upgrade:



- press **OK** to execute control board update
- upon completion, a window informs the user that data is automatically saved in the operating system



- operating system will be shut down automatically within the next 10 seconds

DO NOT turn OFF or UNPLUG the laser marker while Windows® is shutting down!

- wait until the operating system shuts down automatically (black screen)
- **POWER OFF** the laser marker to complete installation
- **POWER ON** the laser marker and wait until the operating system is restarted automatically

- Procedure without laser control board upgrade:

- A window informs the user that data is automatically saved in the operating system

- operating system will be restarted automatically within the next 10 seconds

CAUTION

DO NOT turn OFF or UNPLUG the laser marker while Windows® is restarting!

- wait until the operating system is restarted automatically

APPENDIX F
RECOVER THE LASER MARKER

OVERVIEW

The laser marker is provided with an **USB recovery disk** (see “Contents of the packaging” on page 8) able to restore it to the factory settings.

The USB recovery disk should be used if the ***Operating System is corrupted*** or ***disks are corrupted***.

HOW TO RECOVER THE LASER MARKER

The recovery procedure requires the USB recovery disk which is included in the standard equipment.

CAUTION

All existing data in the laser marker will be overwritten. All existing data will be lost If possible, make a backup copy of all the customer's data before recovering the system.

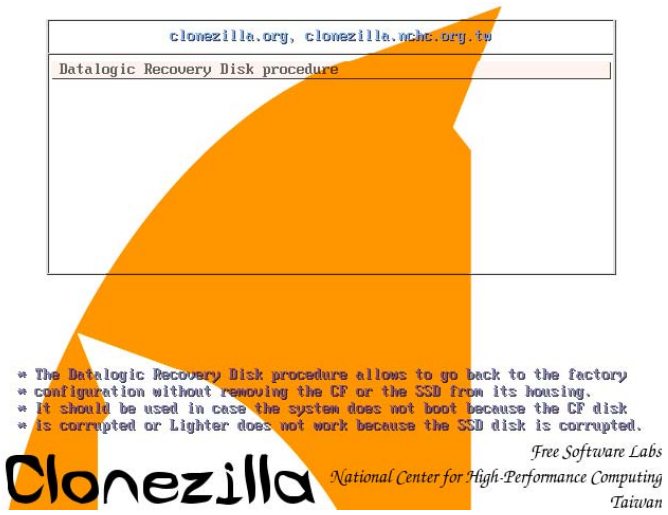
NOTE

Images shown below are indicative only.

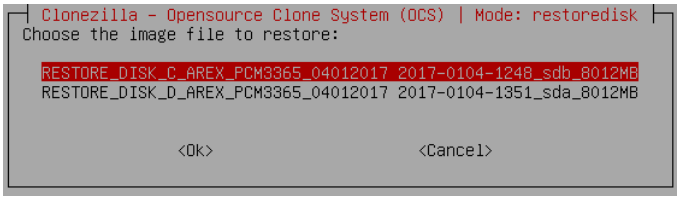
Recover the system:

- Turn OFF the laser marker
- Insert the USB recovery disk provided with the laser marker in the USB port
- Turn ON the laser marker and press the **ESC** key to enter the BIOS menu
- Go to BOOT menu, select **Hard Drive BBS Priorities** and press the **ENTER** key
- Select **Boot Option #1** and press the **ENTER** key
- Select the **USB disk** from the list and press the **ENTER** key
- Press the **F4** key
- Select **YES** and press **ENTER**
- The laser marker will restart and Clonezilla live will boot from the USB disk

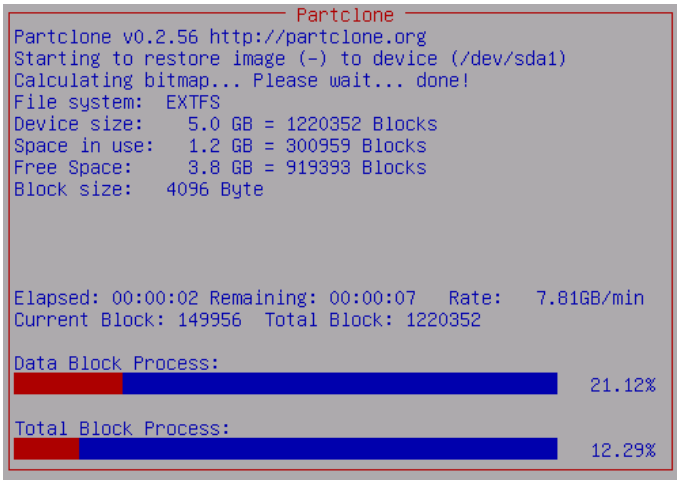
- Datalogic Recovery Disk procedure screen will appear:



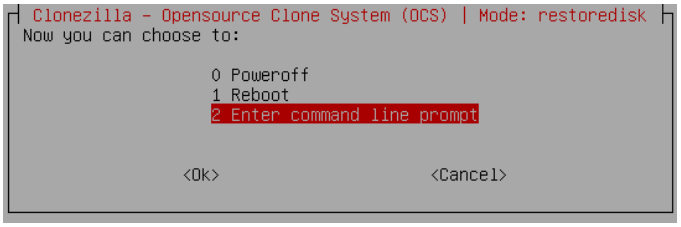
- Press **ENTER** key to continue
- Choose **RESTORE_DISK_C_PCM3365** to restore *disk C:* and press **ENTER** key



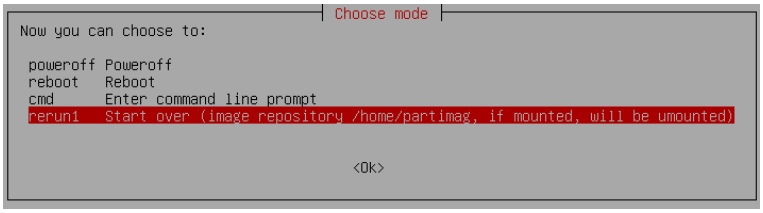
- In the next screen, choose **NANDrive** or **SATA_Flash** as target disk and press **ENTER** key
- In some cases you may be asked to confirm the operation. Press **ENTER** key to continue
- Wait for the end of the procedure (about 20 minutes):



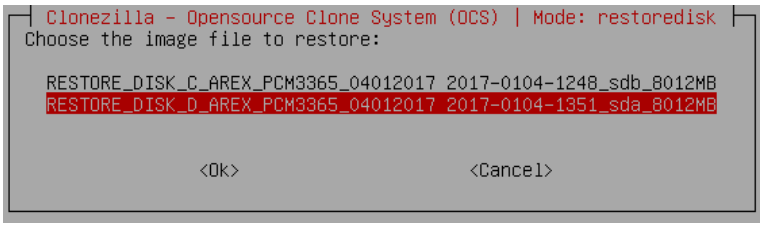
- Select **Enter command line prompt** and press **ENTER** key



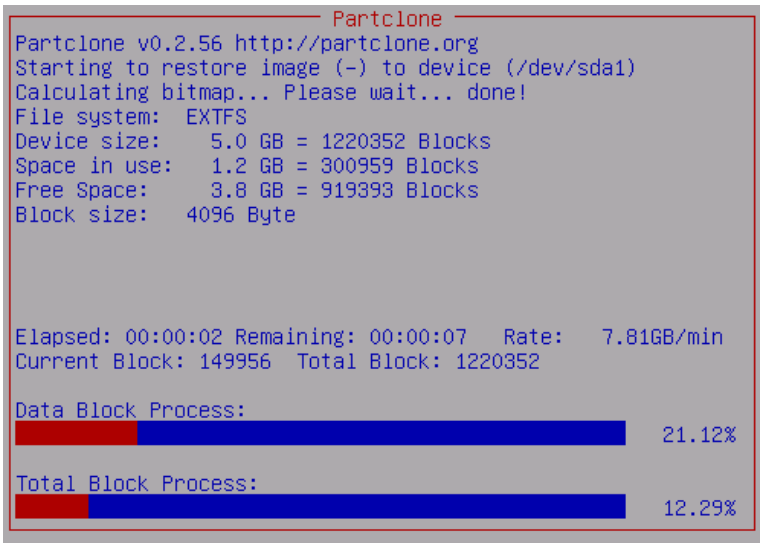
- Select **Start over** and press **ENTER** key



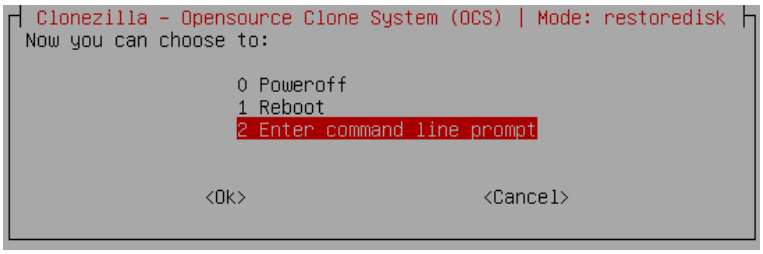
- Choose **RESTORE_DISK_D_PCM3365** to restore *disk D:* and press **ENTER** key



- o In the next screen, choose **SATA_SSD** or **SQF-xxxxx** as target disk and press **ENTER** key
- In some cases you may be asked to confirm the operation. Press **ENTER** key to continue
- Wait for the end of the procedure (about 2 minutes):



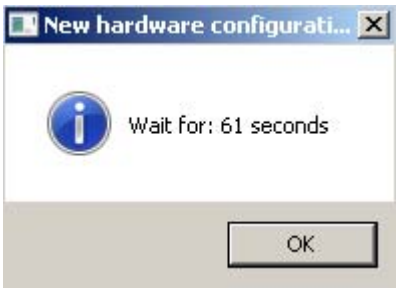
- Select **Power off** and press **ENTER** key



- Wait some seconds until the shutdown process is done
- Turn OFF the laser marker using the main switch
- Remove the USB recovery disk from the USB port

Initialize the Hardware

- Turn **ON** the laser marker
- A message will advise you that the operating system is initializing the new hardware
- **WAIT** until the process is completed:



- A message advise you that **Windows will be automatically rebooted**:

CAUTION

DO NOT turn OFF or UNPLUG the laser marker while Windows® is restarting!

- **WAIT** for operating system restart

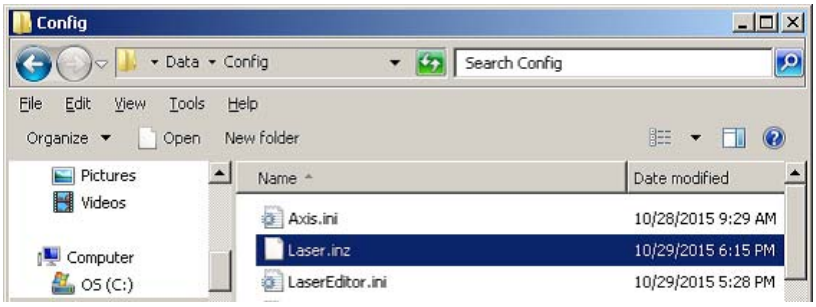
Customize the marking software

NOTE

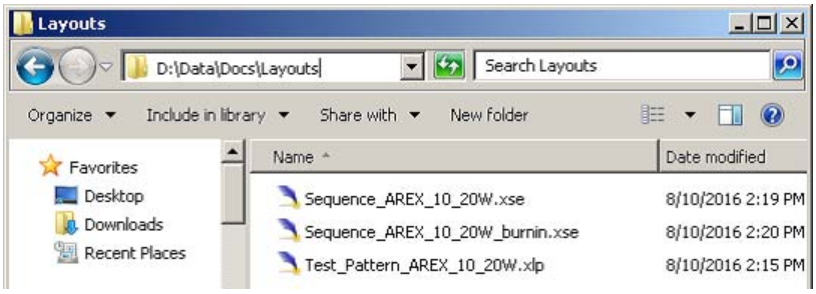
In order to work, the marking software must be customized with the correct configuration file. If the `Laser.inz` file is not available or the original USB recovery disk was lost, contact Datalogic. See "Technical Support" on page viii.

- An error message will advise you that Lighter™ configuration file is not present:

- Press **OK** to continue
- Insert the **USB recovery disk** provided with the laser marker in the USB port
- Navigate to **Fileinz and report** folder on the USB recovery disk
- Copy customized `Laser.inz` file in **D:\DATA\CONFIG** folder



- Select **Test Layouts** folder on the USB recovery disk
- Select the right **test layouts files** based on the laser marker model
- Copy the selected **test layouts files** file in **D:\DATA\DOCS\LAYOUTS** folder



- **Shut down** the operating system:

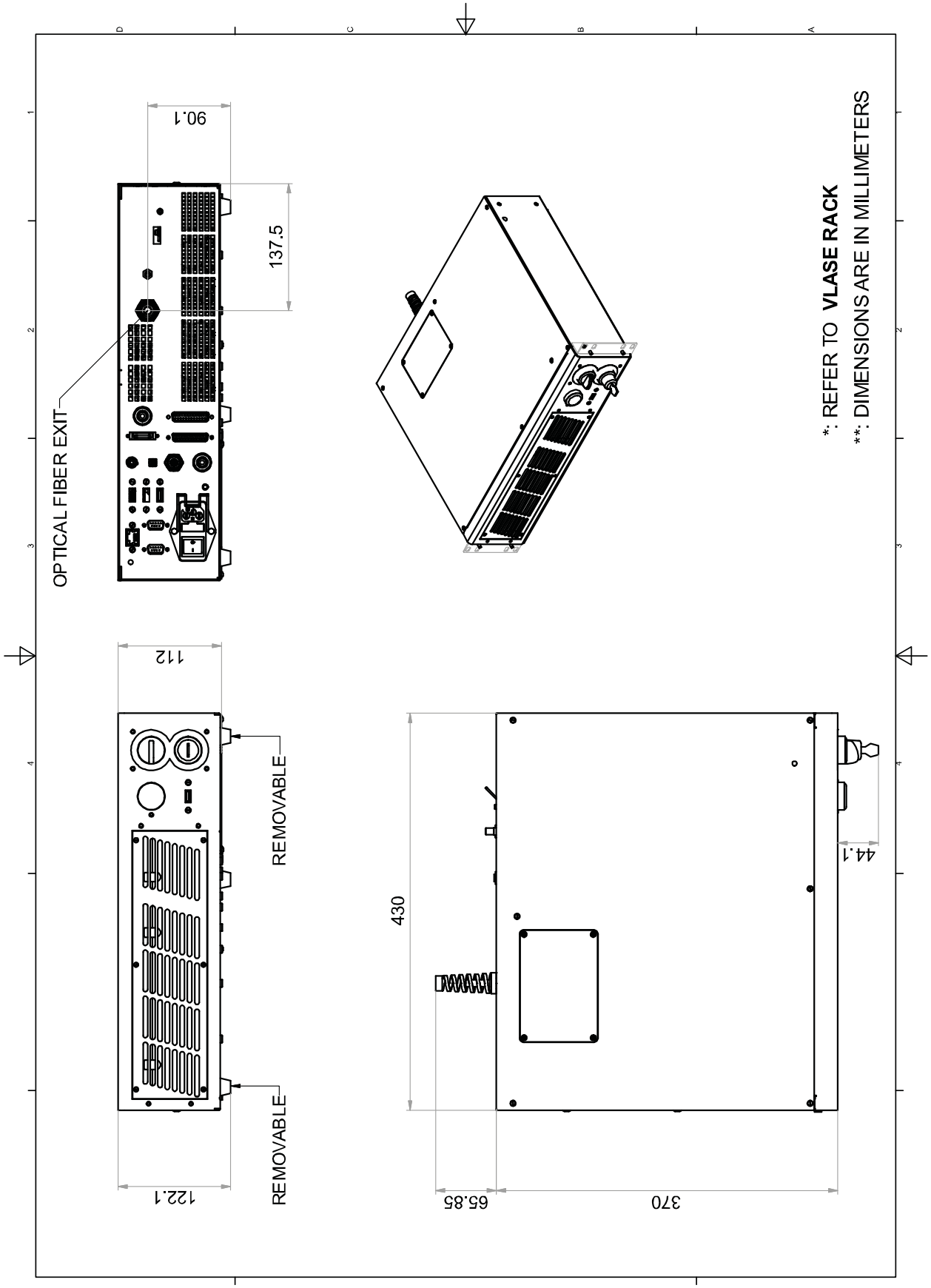
CAUTION

DO NOT turn OFF or UNPLUG the laser marker while Windows® is shutting down!

- **WAIT** until operating system shuts down
- Remove the USB recovery disk from the USB port
- **Power off** the laser marker

APPENDIX G
MECHANICAL DRAWINGS

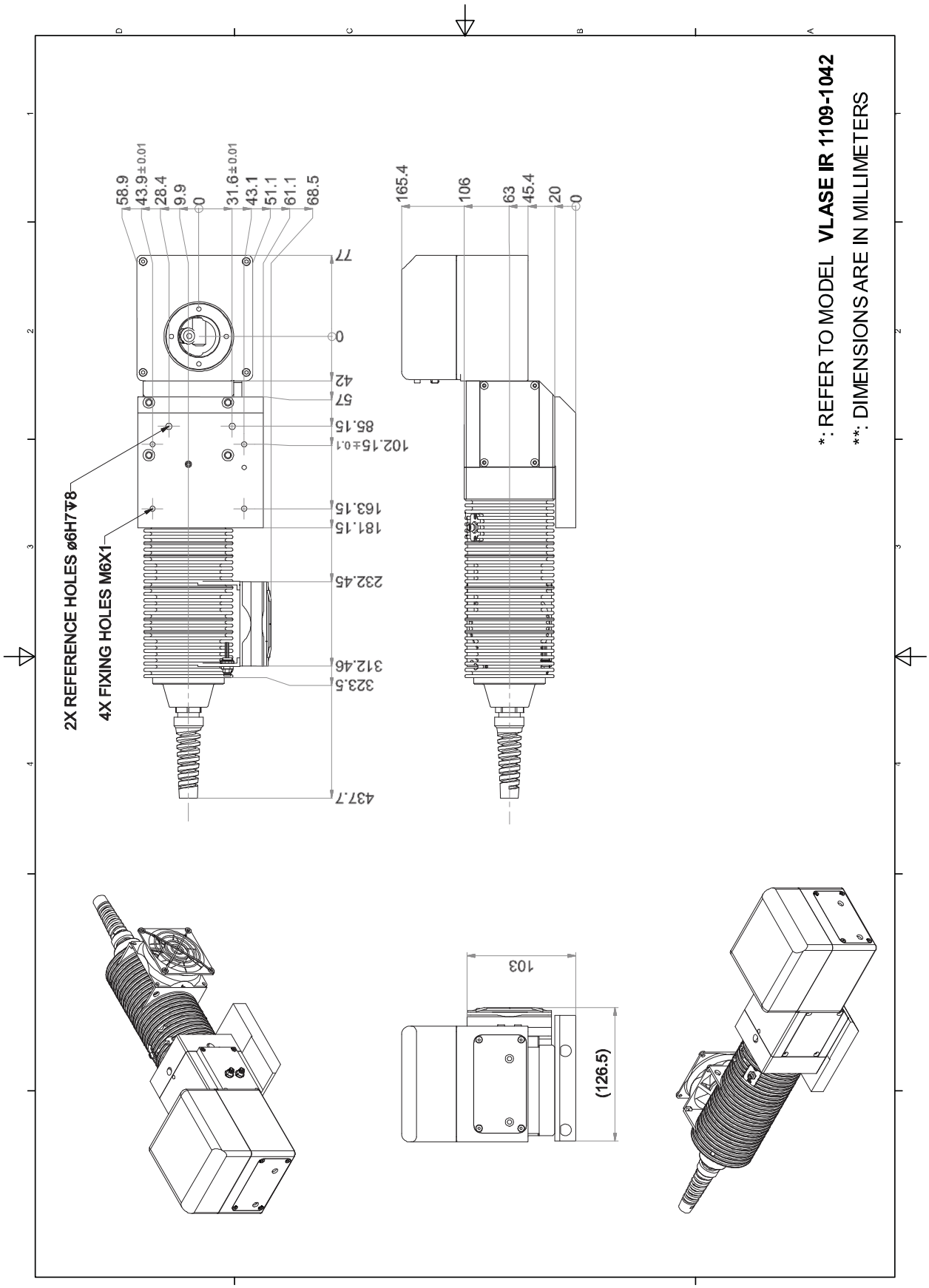
CONTROL RACK



NOTE

Please refer to Datalogic website for detailed drawings.

RESONATOR



NOTE **Please refer to Datalogic website for detailed drawings.**

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