

# AREX™ 400

## USER MANUAL



InfraRed Fiber Laser Marker

**Datalogic S.r.l.**

Via S. Vitalino, 13  
40012 Calderara di Reno (BO)  
Italy  
Tel. +39 051 3147011  
Fax +39 051 3147205

**© 2018-2019 Datalogic S.p.A. and /or its affiliates**

All rights reserved. Without limiting the rights under copyright, no part of this documentation may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means, or for any purpose, without the express written permission of Datalogic S.p.A. and/or its affiliates.

Owners of Datalogic products are hereby granted a non-exclusive, revocable license to reproduce and transmit this documentation for the purchaser's own internal business purposes. Purchaser shall not remove or alter any proprietary notices, including copyright notices, contained in this documentation and shall ensure that all notices appear on any reproductions of the documentation.

Electronic versions of this document may be downloaded from the Datalogic website ([www.datalogic.com](http://www.datalogic.com)). If you visit our website and would like to make comments or suggestions about this or other Datalogic publications, please let us know via the "Contact" page.

**Disclaimer**

Datalogic has taken reasonable measures to provide information in this manual that is complete and accurate, however, Datalogic shall not be liable for technical or editorial errors or omissions contained herein, nor for incidental or consequential damages resulting from the use of this material. Datalogic reserves the right to change any specification at any time without prior notice.

**Trademarks**

Datalogic and the Datalogic logo are registered trademarks of Datalogic S.p.A. in many countries, including the U.S.A. and the E.U.

Arex™ 400, Arex™, Lighter™ Suite, Marvis™ and Matrix™ are trademarks of Datalogic S.p.A. and/or its affiliates. All other trademarks and bands are property of their respective owners.

# TABLE OF CONTENTS

---

<b>PREFACE</b> .....	<b>V</b>
<b>About this Manual</b> .....	<b>v</b>
Manual Conventions .....	v
<b>Technical Support</b> .....	<b>vi</b>
Support Through the Website .....	vi
Reseller Technical Support .....	vi
<b>INTRODUCTION</b> .....	<b>1</b>
<b>General</b> .....	<b>1</b>
<b>Model Description</b> .....	<b>2</b>
PRO Version .....	2
BASIC Version .....	2
<b>CE Compliance</b> .....	<b>3</b>
<b>FCC Compliance</b> .....	<b>3</b>
<b>EAC Compliance</b> .....	<b>3</b>
<b>UL Compliance</b> .....	<b>4</b>
<b>Laser Standards</b> .....	<b>5</b>
<b>Overview</b> .....	<b>6</b>
Laser Source .....	6
Galvanometric scan head .....	6
Operation of a laser marker with galvanometric scanning .....	6
Marking Software .....	7
Important Warnings .....	7
<b>INSTALLATION</b> .....	<b>8</b>
<b>Unpacking</b> .....	<b>8</b>
<b>Contents of the packaging</b> .....	<b>10</b>
<b>On moisture condensation</b> .....	<b>11</b>
Note on moisture condensation .....	11
If moisture condensation occurs .....	11
How to avoid moisture condensation .....	11
<b>Fixing and positioning</b> .....	<b>12</b>
<b>Control Rack installation</b> .....	<b>13</b>
Horizontal installation .....	13
Vertical installation .....	15
Control rack mounting screws length .....	16
<b>Scan Head installation</b> .....	<b>17</b>
Scan head mounting screws length .....	20
<b>Installation environment</b> .....	<b>21</b>
Control rack .....	21
Scan Head .....	22
<b>Fume / Dust extractor</b> .....	<b>23</b>
<b>TECHNICAL SPECIFICATIONS</b> .....	<b>24</b>
<b>Technical Characteristics</b> .....	<b>24</b>
<b>Product Description</b> .....	<b>26</b>
Control rack .....	26
Scan head .....	27
<b>Marking Area Specification</b> .....	<b>28</b>
F-Theta Scan Lens for Arex™ 110-XXX and 120-XXX .....	29

F-Theta Scan Lens for Arex™ A20-X6X .....	29
F-Theta Scan Lens for Arex™ 130-X6X and 150-X6X .....	30
<b>Green Spot .....</b>	<b>31</b>
<b>Connectors Specifications .....</b>	<b>32</b>
Safety Circuit .....	32
Control rack back panel connector .....	32
Muting Device .....	34
Command Box (Laser Control) .....	35
Control rack back panel connector .....	35
Muting Device .....	36
Axes (I/O Control) .....	37
Control rack back panel connector .....	37
Encoder .....	38
Control rack back panel connector .....	38
Photocell .....	38
Control rack back panel connector .....	38
Device Port 1 .....	39
Control rack back panel connector .....	39
Device Port 2 .....	39
Control rack back panel connector .....	39
RS232 (COM3) .....	40
Control rack back panel connector .....	40
Ext Focus .....	40
Scan head connector .....	40
<b>Input/Output specifications .....</b>	<b>41</b>
Digital Input .....	41
Digital Output .....	41
<b>Laser Marker States .....</b>	<b>42</b>
Normal Operation States .....	42
Error States .....	43
Warning State .....	43
Control the Laser Marker States .....	44
Key Selector mode .....	44
Command Box mode .....	44
<b>Timing Diagrams .....</b>	<b>45</b>
Turning On sequence .....	45
Marking control signals behavior .....	45
SW_Ready output signal (Ready to Mark mode) .....	46
Good\Bad output signal .....	46
System_Alarm output signal .....	46
MARVIS™ I/O signals behavior .....	47
Safety functions behavior .....	47
Interlock behavior .....	47
Laser_Stop behavior .....	47
Green Spot behavior .....	48
System Ready to Mark mode .....	48
Marking Confirmation mode .....	48
MARVIS Verification mode .....	48
Axes I/O signals behavior .....	49
<b>Lighter™ Suite marking software .....</b>	<b>49</b>
<b>SET UP .....</b>	<b>52</b>
<b>Connections .....</b>	<b>52</b>
Connecting Command Box connector .....	52
Connecting Safety Circuit connector .....	53
Connecting Power Supply cable .....	54
Connecting the Earth Ground .....	54
Local Mode Control connections .....	55
Remote Mode Control connection .....	57
<b>F-Theta scan lens protection cap removal .....</b>	<b>58</b>

<b>USE AND OPERATION .....</b>	<b>59</b>
<b>First time boot .....</b>	<b>60</b>
<b>Turning On sequence .....</b>	<b>61</b>
Sequence using Key Selector .....	61
Sequence Using Command Box .....	64
<b>CUSTOMIZE THE LASER MARKER SOFTWARE .....</b>	<b>66</b>
<b>Change O.S. language and keyboard layout .....</b>	<b>66</b>
<b>Change the LAN configuration and IP address .....</b>	<b>70</b>
<b>Change the video setting .....</b>	<b>73</b>
<b>Remote desktop connection .....</b>	<b>75</b>
<b>ACCESSORIES .....</b>	<b>76</b>
<b>Control Box .....</b>	<b>76</b>
<b>Remote Start Foot Switch .....</b>	<b>77</b>
<b>I/O interface .....</b>	<b>77</b>
<b>DB25-to-Free Leads Cable .....</b>	<b>78</b>
<b>MARVIS™ Add-on .....</b>	<b>78</b>
MARVIS™ Mounting Bracket .....	79
MARVIS™ LED Ring Light ID 50mm - White .....	79
<b>Micrometric distance sensor kit .....</b>	<b>79</b>
<b>M39 F-Theta protective cap .....</b>	<b>80</b>
<b>Starter Kit for Marking On the Fly (MOF) .....</b>	<b>81</b>
<b>Rack Handles .....</b>	<b>82</b>
<b>Fume Extractor .....</b>	<b>82</b>
<b>TECHNICAL SUPPORT.....</b>	<b>83</b>
<b>Seals .....</b>	<b>83</b>
<b>Maintenance .....</b>	<b>84</b>
F-Theta scan lens cleaning procedure .....	84
Air filter cleaning procedure .....	85
<b>Troubleshooting .....</b>	<b>86</b>
Service Interface .....	86
List of warning and error states .....	88
List of problems related to laser marker states .....	89
List of most common problems .....	89
<b>Remote Assistance .....</b>	<b>92</b>
<b>LABELS .....</b>	<b>93</b>
<b>Labels .....</b>	<b>93</b>
<b>Positioning of external labels .....</b>	<b>94</b>
Positioning of labels on the control rack: .....	94
Positioning of labels on the scan head: .....	95
<b>Safety labels in local languages .....</b>	<b>95</b>
<b>UNDERSTANDING SLO: SAFE LASER OFF SAFETY CONSIDERATIONS ACCORDING TO EN ISO 13849-1:2008.....</b>	<b>96</b>
<b>Machine Safety .....</b>	<b>96</b>
<b>Risk Assessment .....</b>	<b>96</b>
<b>Performance Level (PL) .....</b>	<b>98</b>
<b>Datalogic Laser Markers .....</b>	<b>98</b>
<b>SLO connection diagram .....</b>	<b>99</b>
<b>Safety Functions Of Arex™ 400 .....</b>	<b>100</b>
Arex™ XXX-X5X .....	100
Arex™ XXX-X6X .....	100
Example 1 .....	101
Example 2 .....	102
Example 3 .....	103
<b>LASER SAFETY .....</b>	<b>104</b>
<b>Laser radiation .....</b>	<b>106</b>
<b>Absorption of laser radiation .....</b>	<b>107</b>
<b>Classification and danger level .....</b>	<b>108</b>
<b>Degree of risk with radiation viewing conditions .....</b>	<b>108</b>

- Direct viewing of the laser beam ..... 108
- Viewing of a laser reflected beam ..... 109
- Viewing of direct laser beam from a fiber output ..... 109
- Viewing of scattered laser beam ..... 109
- N.O.H.D. determination and O.D. of protection goggles ..... 110**
  - Accidental vision of the reflected laser radiation ..... 111
  - Filter scale index of the protection goggles ..... 111
- Eyes and skin risks ..... 111**
- General safety regulations ..... 111**
- Other risks ..... 112**
- USING MARKING SOFTWARE ..... 113**
  - How to create and edit graphics layout ..... 113
  - How to test and mark layout ..... 115
  - How to use Command Box signals to mark layout ..... 117
- MOPA FIBER LASER ..... 119**
  - Laser marker operations ..... 119**
    - Pulse Profile ..... 121
  - Lighter™ Pulse Profile Configuration ..... 123**
    - Creating a document with multiple objects using a single pulse profile ..... 123
    - Creating a document with multiple objects using different pulse profiles ..... 124
- MARKING SOFTWARE UPGRADE ..... 126**
  - How to update the marking software ..... 126
- RECOVER THE LASER MARKER ..... 132**
  - Overview ..... 132**
  - How to recover the laser marker ..... 132**
    - Recover the system: ..... 132
    - Initialize the Hardware ..... 135
    - Customize the marking software ..... 136
- MECHANICAL DRAWINGS ..... 137**
  - Control Rack ..... 138**
  - Scan Head ..... 139**

# 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](http://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

---

### GENERAL

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 Arex™ 400 Fiber 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 laser marker of its manufacture.**

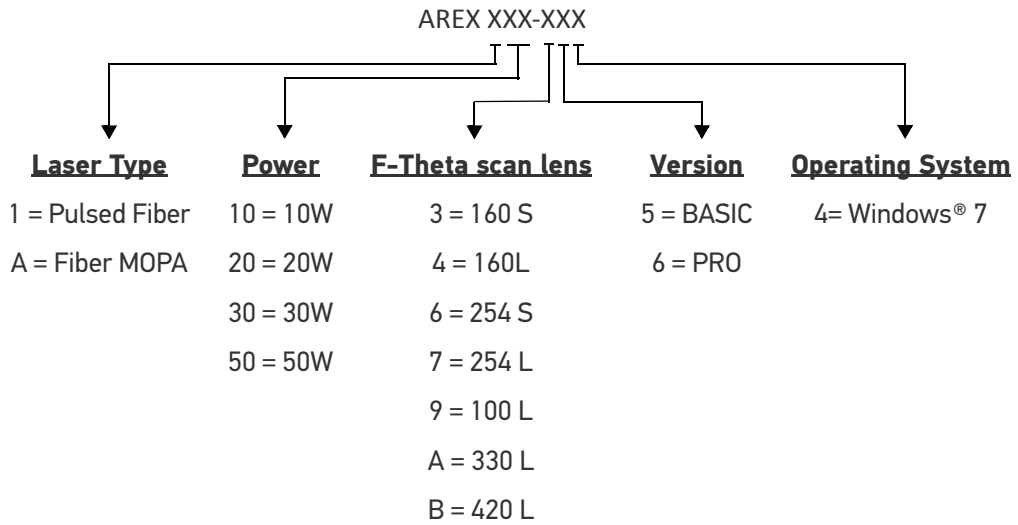


**NOTE**

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

# MODEL DESCRIPTION

Arex™ 400 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.



## PRO Version

- Wider power range selection
- Wider F-Theta scan lens selection
- High performance level for safety features
- High PC performance (powered by Intel® Celeron®)
- 3x Ethernet ports 10/100/1000 Mbps
- High Precision Marking Field Center specifications
- Advanced software features

## BASIC Version

- Models with power level 10W & 20W
- Basic performance level for safety features
- Basic PC performance (powered by Intel® Atom®)
- 1x Ethernet port 10/100/1000 Mbps
- Basic Precision Marking Field Center specifications
- Basic software features

## 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.



**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.

# UL COMPLIANCE

Reading this manual prevents the operator from carrying out operations that could cause damage to himself or others.

**CERTIFICATE OF COMPLIANCE**

Certificate Number	20190513-E499316
Report Reference	E499316-20190502
Issue Date	2019-MAY-13

**Issued to:** DATALOGIC SRL  
VIA S VITALINO 13  
LIPPO DI CALDERARA DI RENO  
40012 BOLOGNA BO ITALY

**This certificate confirms that representative samples of** MARKING AND CODING EQUIPMENT, ELECTRONIC Class 4 Laser marking machine model AREX XBC-DEY (where X can be 1 or A; BC can be 10, 20, 30, or 50; D can be 3, 6, 7, 8, 9, A, or B; and E can be 5 or 6; Y can be any alphanumeric character. A possible suffix of SHxxxx may follow where xxxx can be any alphanumeric character)

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.


**Standard(s) for Safety:** UL 60950-1 and CAN/CSA C22.2 No. 60950-1-07, Information Technology Equipment - Safety - Part 1: General Requirements  
Subject 2178, outline of investigation for marking and coding equipment


**Additional Information:** See the UL Online Certifications Directory at <https://iq.ulprospector.com> for additional information.

This *Certificate of Compliance* does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Certification Mark on the product.

  
Bruce Mahrenholz, Director North American Certification Program  
UL LLC



Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at [2@ul.com/about/location](mailto:2@ul.com/about/location)

Page 1 of 1

Follow-Up Service Procedure issued on 2019-03-26.

## 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 Fiber laser marker developed and manufactured by Datalogic employs the most advanced technologies with regards to the opto-mechanical parts, the electronic control of laser beam power, communication and the overall safety of the entire marker.

The Arex™ 400 laser marker features a control rack and a scan head. The control rack size is standard 19" 2.5U. The scan head compact dimensions make it easy to integrate.

All product connections are on the rear or front of the control rack.

### Laser Source

On Arex™ 400 laser marker it is used a sealed fiber laser source. This source is based on the new fiber solid state technology. It guarantees high stability, lower sensitivity to optical misalignment and a longer product lifetime.

### Galvanometric scan head

The scan head features two deflection mirrors that deflect the beam in X and Y directions, depending on the graphics/pattern to be reproduced.

### Operation of a laser marker with galvanometric 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 “How to update the marking software” on page 126, 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



Control rack and scan head are joined by a connection cable 3 meters long, referred as Head Cable. Control rack and scan head are NOT separable.



Be extremely careful to not damage the connection cable between scan head and control rack.



To avoid damaging or breaking the optical fiber, never subject the Head Cable to a bending radius below the limits specified in the technical specification table (see “Unpacking” on page 8).



The Arex™ 400 laser marker is a delicate optical device, that can be damage by shock and vibrations.

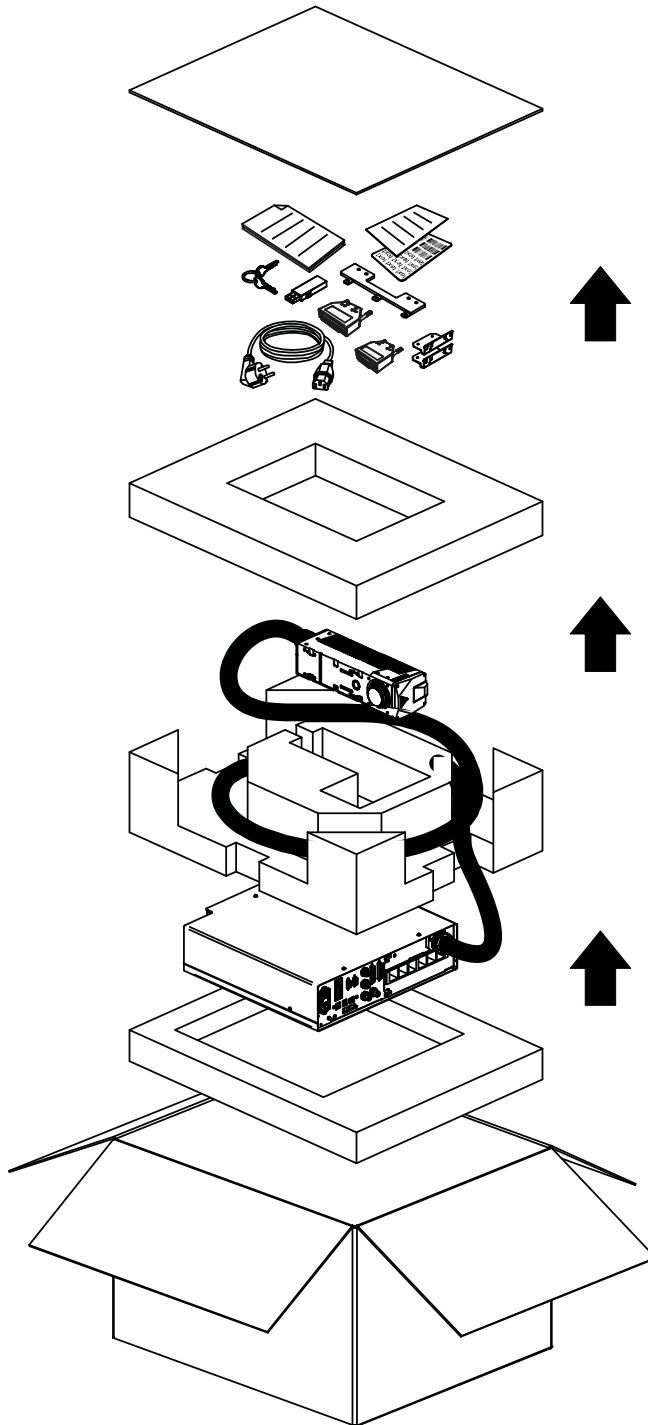


Before installing or operating the laser marker, you should:

- 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:

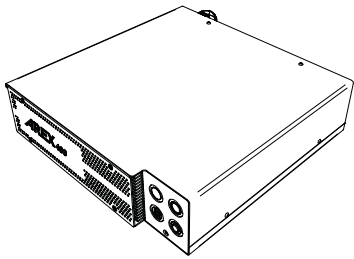
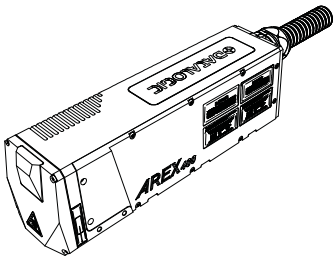
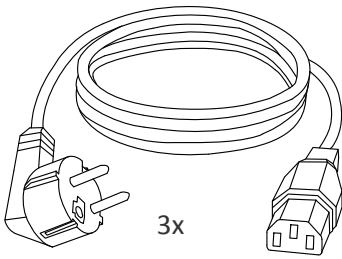
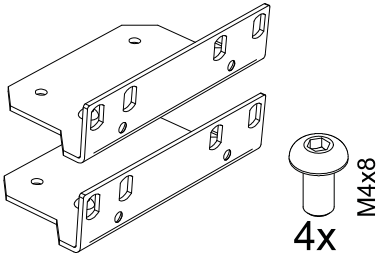
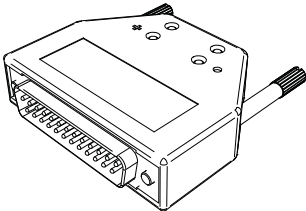
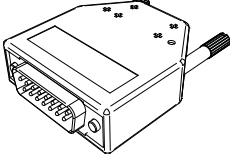
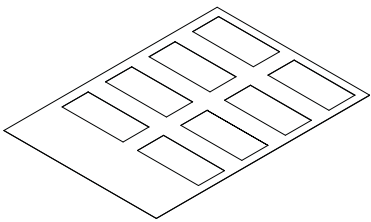
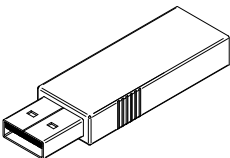
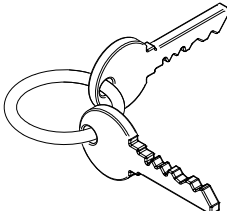
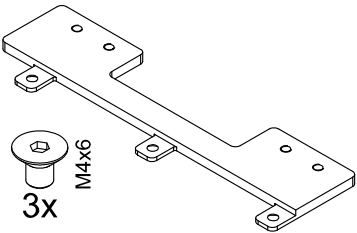
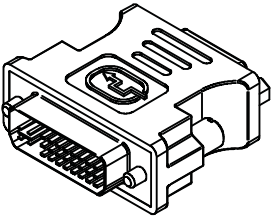
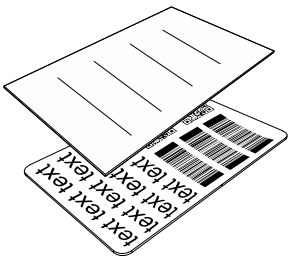
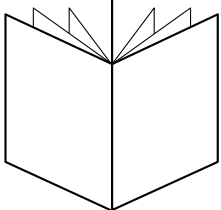
- Remove the accessories and documentations
- Carefully remove the laser marker from the packaging using both hands



**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 vi for contact details).

# CONTENTS OF THE PACKAGING

 <p>Control Rack</p>	 <p>Scan Head</p>	 <p>3x Power Supply cables</p>
 <p>4x M4x8 Rack Fixing Brackets (Only for XXX-X6X models)</p>	 <p>Command Box MUTING DEVICE</p>	 <p>Safety Circuit MUTING DEVICE</p>
 <p>Safety labels</p>	 <p>USB Recovery Disk</p>	 <p>Selector Keys</p>
 <p>3x M4x6 Scan Head Fixing Bracket</p>	 <p>VGA to DVI Adapter (Only for XXX-X6X models)</p>	 <p>Test report and sample test plate</p>
 <p>Quick Reference Guide</p>		

## 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



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



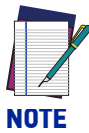
It is mandatory to secure the laser marker before you start marking, since improper securing or positioning may cause serious damage.

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

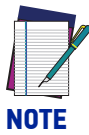


Introduction of optical or mechanical surfaces, such as mechanical shutters or additional protective glass, between F-Theta scan lens output and marking surface may cause optical feedback into the laser marker.

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



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

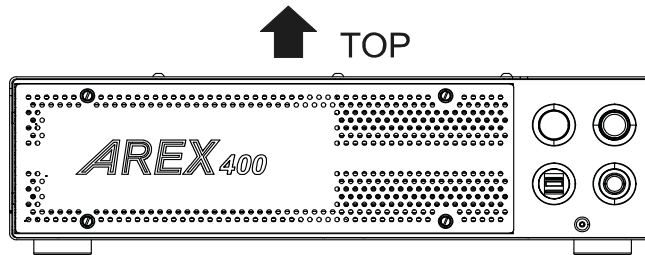


It is recommended to install the scan head on a positioning Z-axis system for accurate mounting at focal distance!

# CONTROL RACK INSTALLATION

## Horizontal installation

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

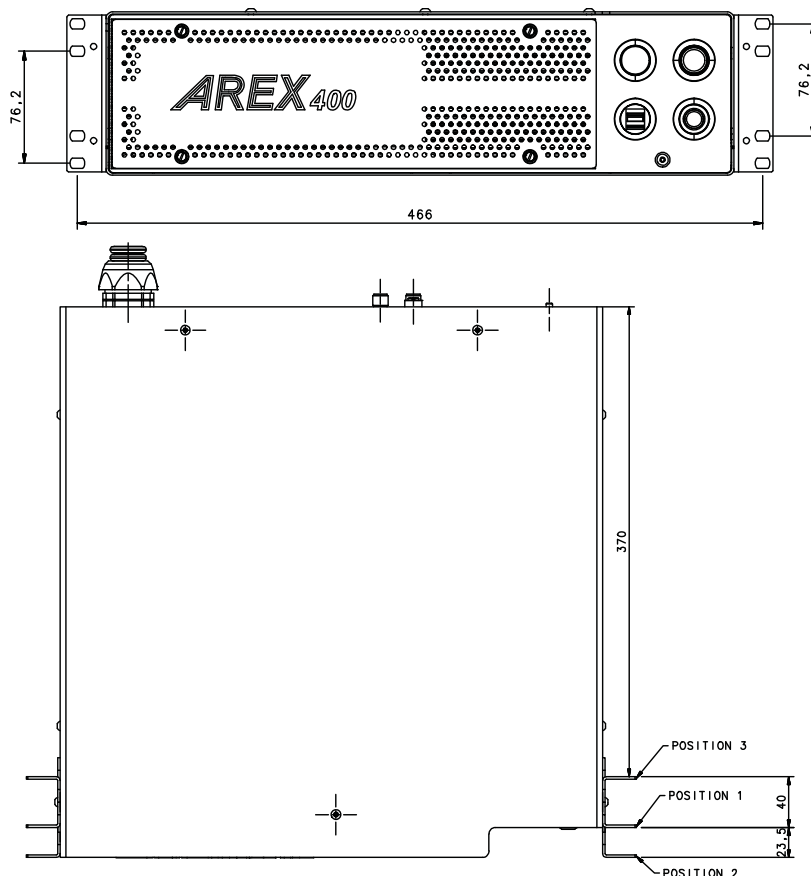


**Figure 2: Control rack horizontal positioning**

The control rack can be installed on a standard 19" rack cabinet using the fixing brackets supplied as a standard equipment with XXX-X6X models and as an accessory for XXX-X5X models (see "Rack Handles" on page 82).

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 "Rack Handles" on page 82).

Using the fixing brackets is possible to install the control rack in three different positions inside the cabinet:



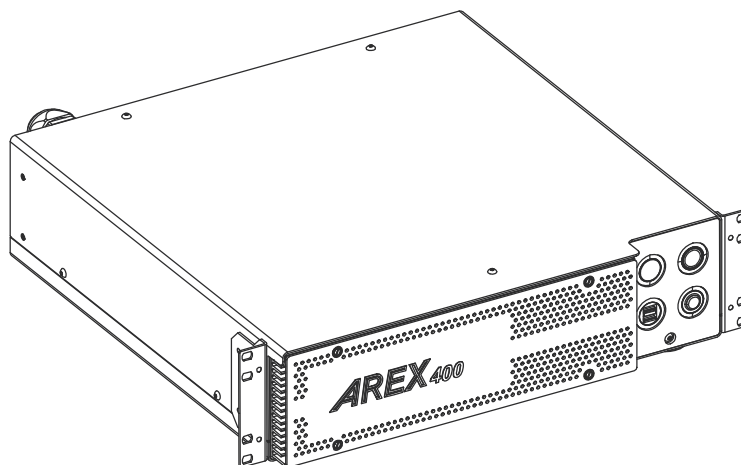
**Figure 3: Control rack fixing bracket mounting configuration**



**NOTE**

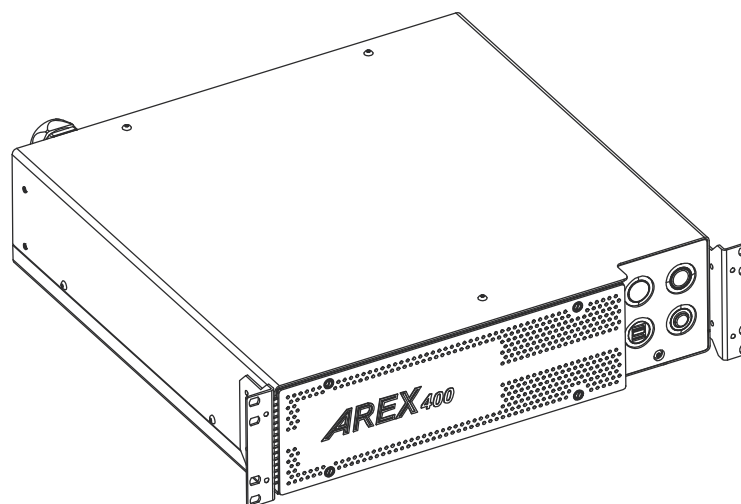
**All dimensions are in millimeters.**

Using this position the fixing brackets are aligned with the console.



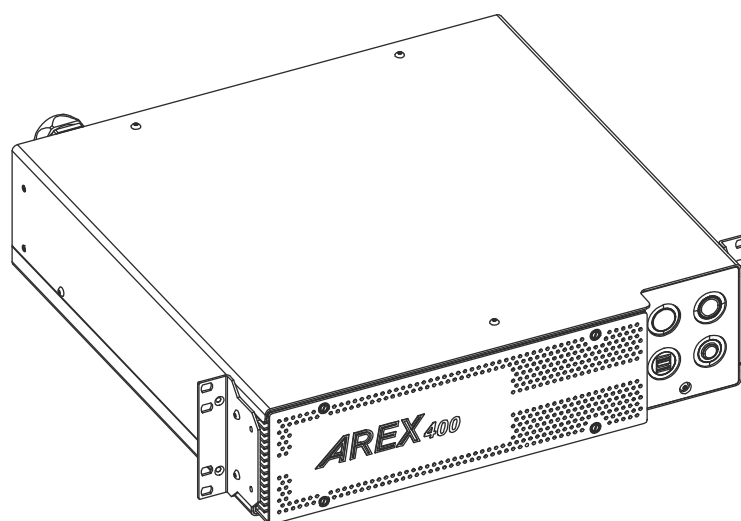
**Figure 4: Control rack fixing brackets mounting position 1**

Using this position the fixing brackets are aligned with the frontal grid panel.



**Figure 5: Control rack fixing brackets mounting position 2**

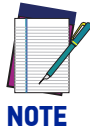
Use this position if you want to use a pre-existing integration for AREX™ 3 and it is required that the back panel of AREX™ 400 is in the same position as the back panel of AREX™ 3 inside the cabinet.



**Figure 6: Control rack fixing brackets mounting position 3**

## Vertical installation

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



The feet must be removed from the bottom of the control rack and installed on the left side of the control rack using the appropriate fixing points. Tightening torque = 0.5 Nm.

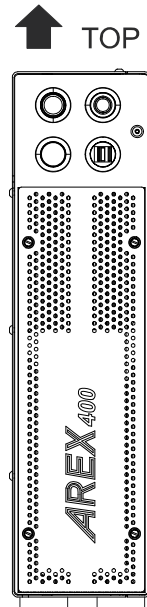


Figure 7: Control rack vertical positioning



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

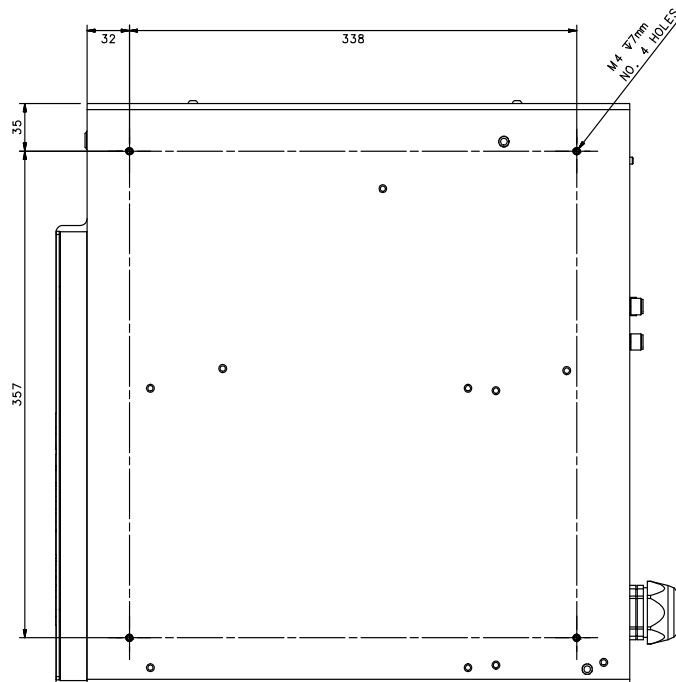


Figure 8: Control rack fixing points for vertical installation

## 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.

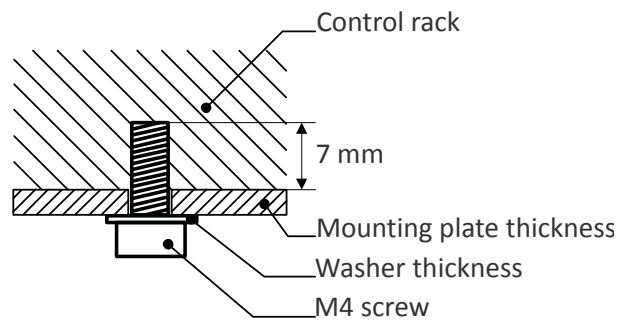
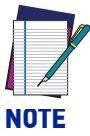


Figure 9: Length of mounting screws



**NOTE**

**Mounting holes depth is = 7mm. Tightening torque = 2 Nm.**



# SCAN HEAD INSTALLATION

The scan head can be installed in any orientation and must be fixed to a suitable base (not supplied by Datalogic) using the dedicated threaded holes and the high precisions slotted seats:

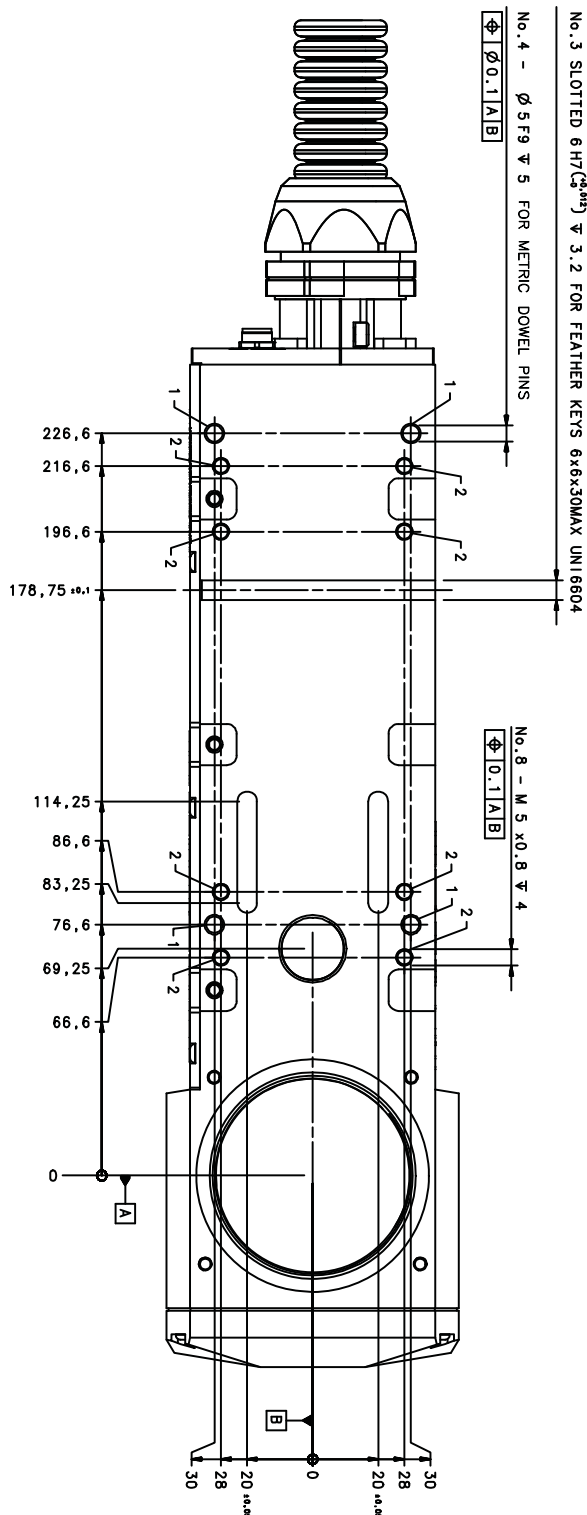


Figure 10: Fixing points on scan head (bottom view)



NOTE

Mounting holes depth is = 7mm. Tightening torque = 2 Nm.

A fixing bracket for scan head is provided to offer dedicated threaded holes designed to be fully compatible with Arex™ 3 products:

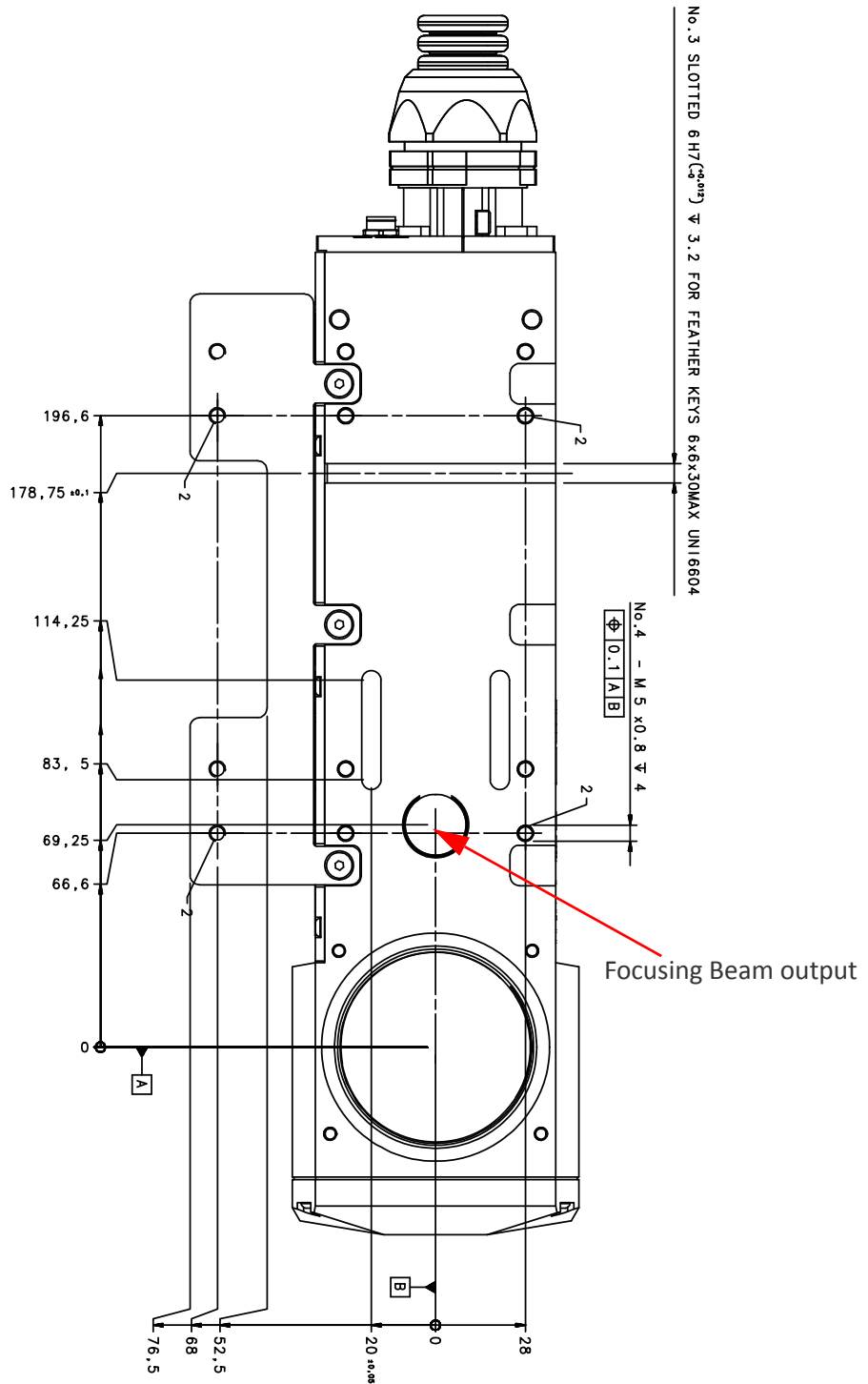


Figure 11: Fixing points on scan head (back compatibility with Arex™ 3)



If the scan head is mounted on an existing support suitable for Arex™ 3, the Arex™ 400 focusing beam diode may be covered.



All dimensions are in millimeters.

It is also possible to mount the scan head sideways using dedicated threaded holes:

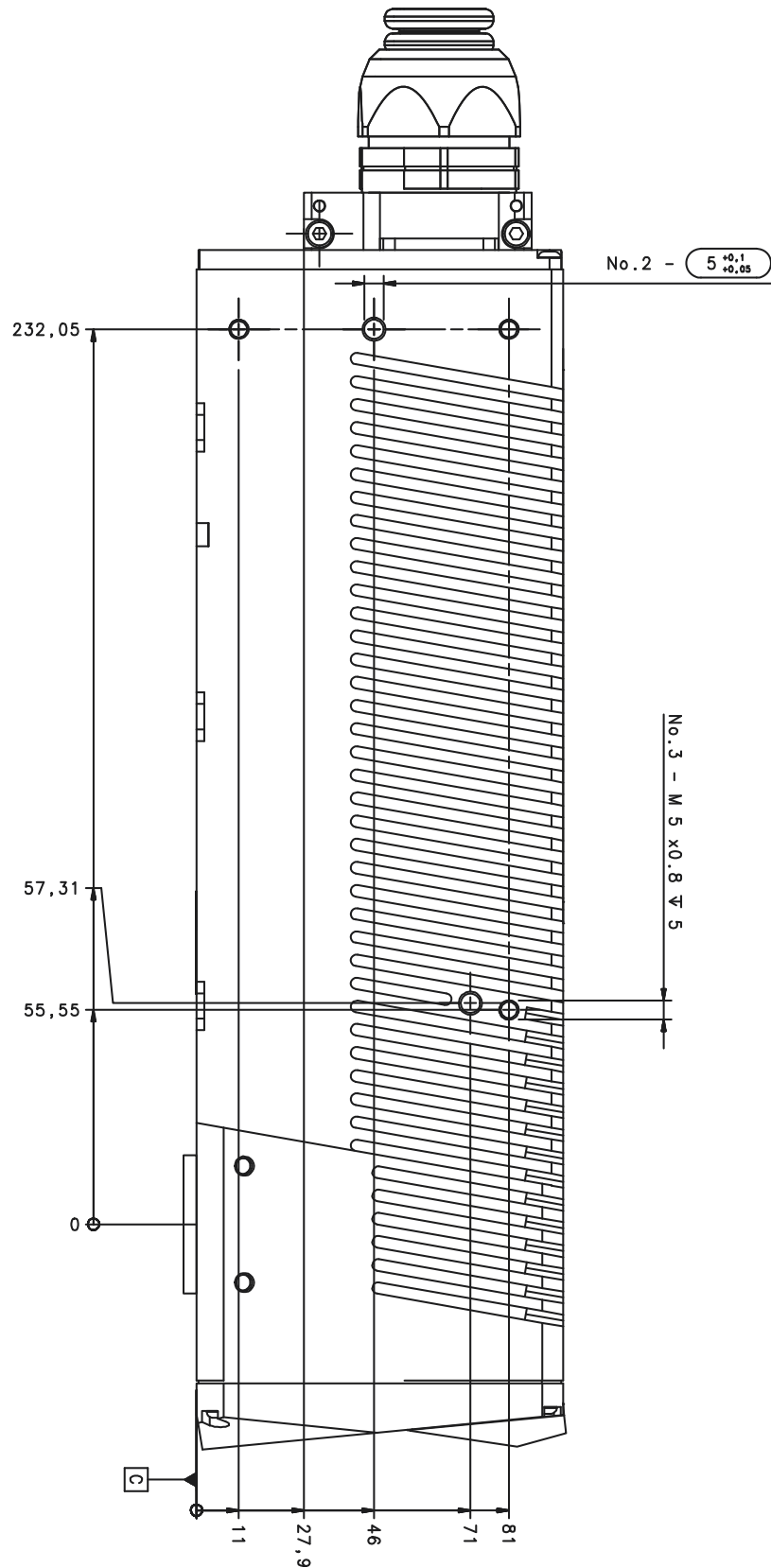


Figure 12: Fixing points on scan head side



NOTE

All dimensions are in millimeters.

## Scan head mounting screws length

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

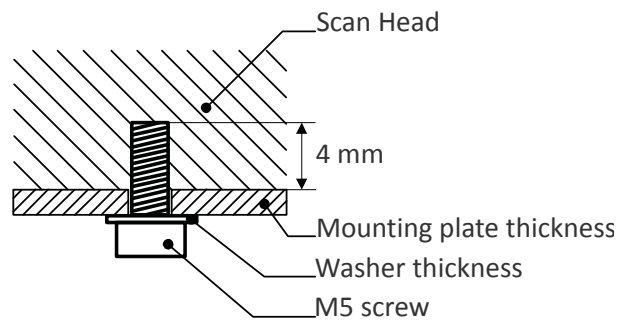


Figure 13: Length of mounting screws



### NOTE

Mounting holes depth is = 4mm. Tightening torque = 2 Nm.

# INSTALLATION 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.

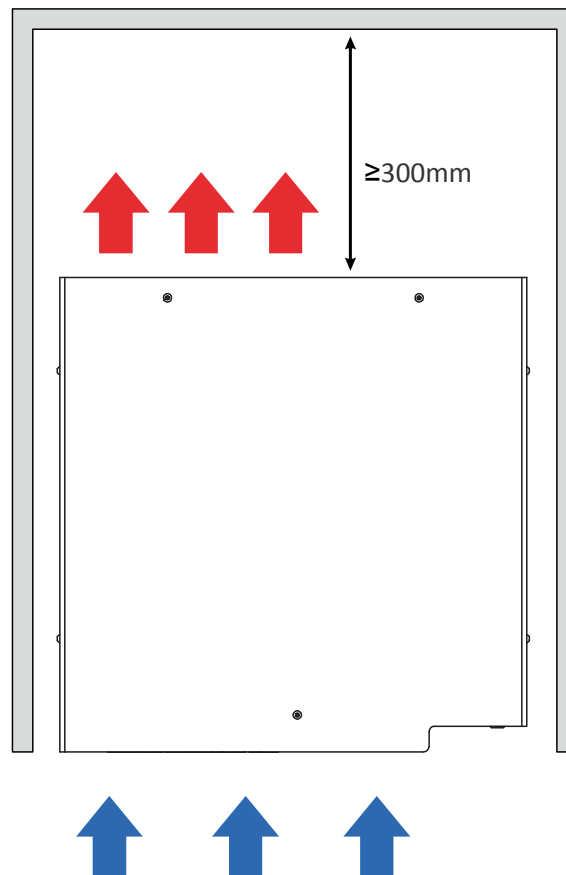


Figure 14: Control rack installation environment



**CAUTION**

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



**NOTE**

**The control rack IP rating is IP31 in horizontal position, otherwise IP30.**

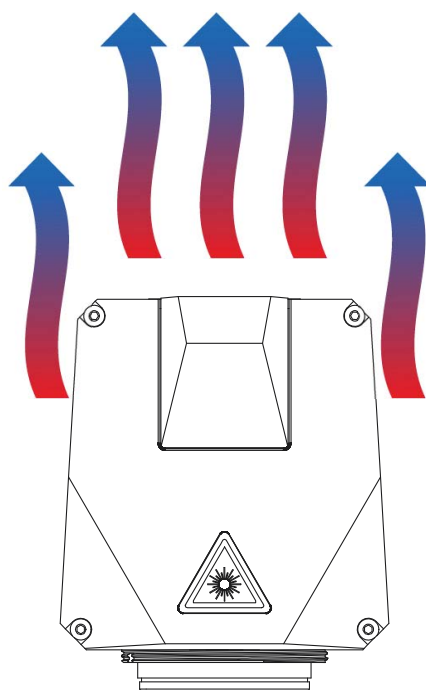
## Scan Head

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

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



**If not enough space is provided, the temperature inside the scan head could rise, causing temperature error.**



**Figure 15: Scan head installation environment**



**NOTE**

**The scan head IP rating is IP64 not considering F-Theta scan lens.**



**NOTE**

**To ensure a complete IP64 protection for 160S and 254S F-Theta scan lenses use the proper accessory (see "M39 F-Theta protective cap" on page 80).**

## 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 82).



**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

AREX 400 MODELS		A20-X6X	110-XXX	120-XXX	130-X6X	150-X6X
<b>ELECTRICAL SPECIFICATIONS</b>						
Input Voltage (main power supply)	V (AC)	100 to 240 @ 50-60 Hz				
Max. Input Current (main power supply)	A	3 - 1.25			4 - 1.7	
Max power	W	300			400	
<b>LASER SOURCE SPECIFICATIONS<sup>1</sup></b>						
Laser Type		Pulsed Fiber Laser				
Nominal Average Power	W	20	10	20	30	50
Pulse Energy (max.)	mJ	≥ 0.75	1			
Peak Power (max.)	kW	≥ 10	10			
Central Emission Wavelength	nm	1050-1080	1064			
Typical Nominal Pulse Width	ns	4 to 250	100			
Repetition Rate	kHz	20 to 500	2 to 200			
Laser Aiming Beam / Focus Beam		Class 2: 655 nm				
<b>ENVIRONMENTAL SPECIFICATIONS</b>						
Operating Temperature	C (F)	5° to 40° (41° to 104°)			5° to 35° 41 to 95	
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				
<b>PHYSICAL SPECIFICATIONS</b>						
Control Rack dimensions (HxWxD)	mm in	113x432x434 4.4x17x17.1				



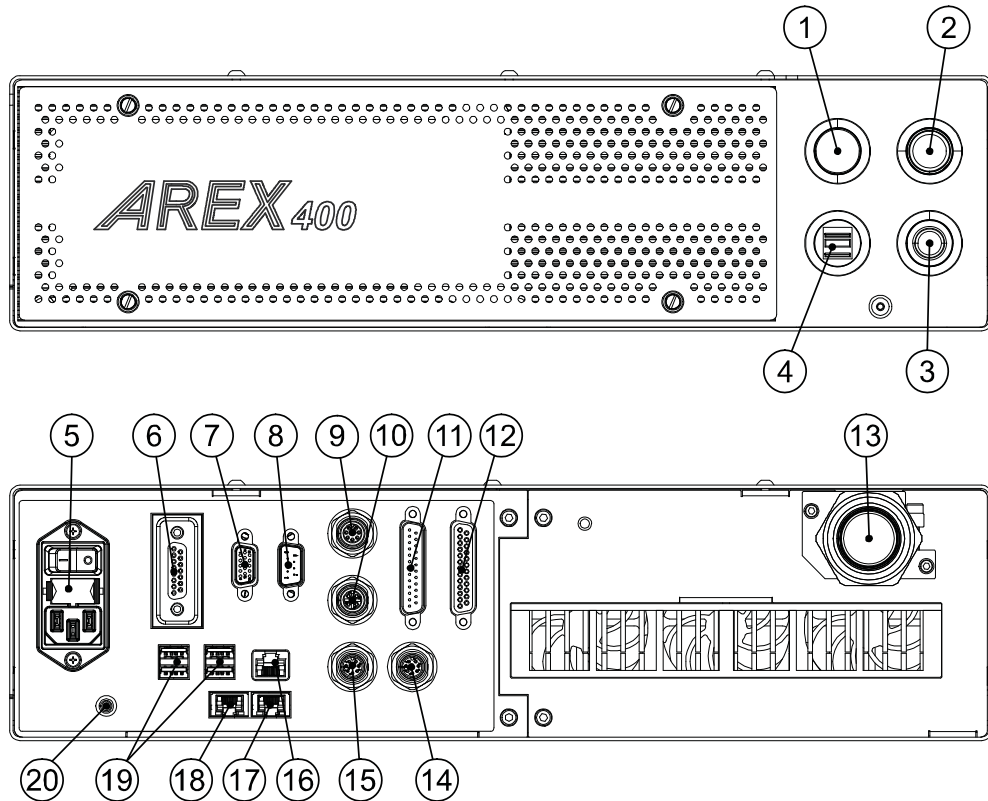
AREX 400 MODELS		A20-X6X	110-XXX	120-XXX	130-X6X	150-X6X
Control Rack Weight	Kg	17.5				
	lbs	38.5				
Control Rack IP Rating		IP31 (in horizontal position, otherwise IP30)				
Control Rack Cooling		Forced Air Cooling Rack fans: L10@40°C = 70000 h Laser source fans: L10@40°C = 65000 h				
Scan Head dimensions (HxWxD) <sup>2</sup>	mm	96x90x326				
	in	3.7x3.5x12.8				
Scan Head Weight <sup>3</sup>	Kg	3.5				
	lbs	7.7				
Scan Head IP Rating <sup>4</sup>		IP64				
Scan Head Cooling		Air Cooling				
Noise	dB (A)	<65 at 1 meter				
Head Cable minimum bending radius	mm	80 (fixed installation); 110 (mobile installation)				
	in	3.15 (fixed installation); 4.33 (mobile installation)				
Head Cable length	mm	2885				
	in	113.5				
Beam deflection		High speed galvanometer scanning system				
<b>OTHER SPECIFICATIONS</b>						
Marking speed <sup>5</sup>	mm/s	Up to 10000				
Char Marking Speed <sup>6</sup>	char/s	Up to 600				
MOF (marking on fly)		YES (constant speed or encoder)				
Line speed - Productivity	m/min	Up to 75				
	pcs/s	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				

1. Specification @ 25°C
2. Without F-Theta scan lens
3. Without F-Theta scan lens
4. Using M39 F-Theta scan lens protective cap
5. May vary: measured with  $f = 160\text{mm}$
6. Single line string, Roman-s font, 1mm height

# PRODUCT DESCRIPTION

## Control rack

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



**Figure 1: Control rack overview (front and back panels view)**

Front panel:

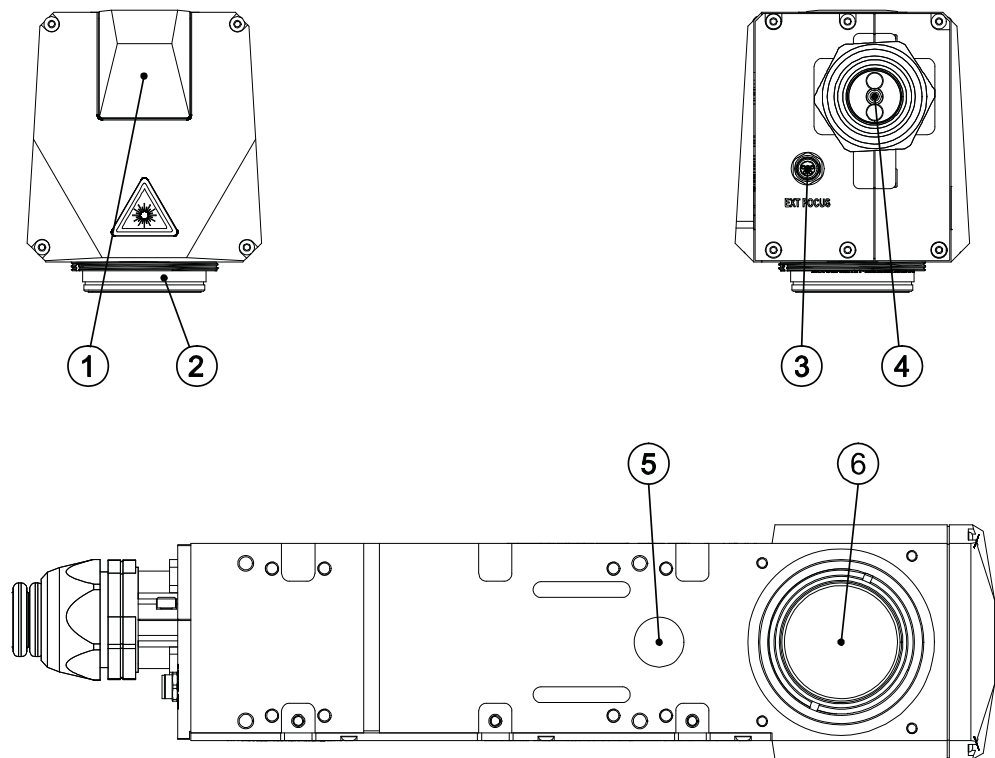
1. Status LED
2. Start Marking button
3. Key Selector
4. 2x USB 2.0 ports

Back panel:

5. Main Power Supply connection
6. Safety Circuit connector
7. VGA port
8. RS232 port
9. Encoder connector
10. Photocell connector
11. I/O connector (Axes Control)
12. Command Box connector (Laser Control)
13. Head Cable
14. Device Port 2
15. Device Port 1
16. LAN 1 port
17. LAN 3 port (*only for XXX-X6X models*)
18. LAN 2 port (*only for XXX-X6X models*)
19. 4x USB 2.0 ports
20. Earth ground connection

## Scan head

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



**Figure 2: Scan head overview (front, rear and bottom view)**

1. Status LED
2. F-Theta Scan Lens
3. External Focus Beam connector
4. Head Cable
5. Focusing Beam output
6. IR laser beam output / Aiming laser beam output / Green Spot beam output

## 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:**

- Arex™ 110-XXX/120-XXX/A20-X6X: square marking field measured on black anodized aluminium plate.
- Arex™ 130-X6X/150-X6X: square marking field within which power is >95% with respect to power in center.



### 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, scan head 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, scan head or laser source. Such damage is not covered by warranty!**

## F-Theta Scan Lens for Arex™ 110-XXX and 120-XXX

The table below lists the standard F-Theta scan lenses currently available for Arex™ 110-XXX and 120-XXX:

F-Theta Scan Lens diameter M39				
F-THETA SCAN LENS		$f = 160S$	$f = 254S$	
Working Distance (WD)	mm	185 ± 2	285 ± 4.5	
Fixing Distance (FD)	mm	199 ± 3	305 ± 5.5	
Marking Area (MA)	mm <sup>2</sup>	100 x 100	140 x 140	

F-Theta Scan Lens diameter M85 (available only for XXX-X6X versions)					
F-THETA SCAN LENS		$f = 100L$	$f = 330L^*$	$f = 420L^*$	
Working Distance (WD)	mm	99.5 ± 1	397 ± 6	507 ± 9	
Fixing Distance (FD)	mm	141.5 ± 2	480 ± 7	576 ± 10	
Marking Area (MA)	mm <sup>2</sup>	50 x 50	220 x 220	285 x 285	

(\* ) NOT AVAILABLE for 110-X6X

## F-Theta Scan Lens for Arex™ A20-X6X

The table below lists the standard F-Theta scan lenses currently available for Arex™ A20-X6X:

F-Theta Scan Lens diameter M39				
F-THETA SCAN LENS		$f = 160S$	$f = 254S$	
Working Distance (WD)	mm	185.5 ± 2	285.5 ± 5	
Fixing Distance (FD)	mm	199.5 ± 3	305.5 ± 6	
Marking Area (MA)	mm <sup>2</sup>	100 x 100	140 x 140	

F-Theta Scan Lens diameter M85					
F-THETA SCAN LENS		$f = 100L$	$f = 330L$	$f = 420L$	
Working Distance (WD)	mm	99.5 ± 1	397.5 ± 6.5	508 ± 10	
Fixing Distance (FD)	mm	141.5 ± 2	480.5 ± 7.5	577 ± 11	
Marking Area (MA)	mm <sup>2</sup>	50 x 50	220 x 220	285 x 285	

## F-Theta Scan Lens for Arex™ 130-X6X and 150-X6X

The table below lists the standard F-Theta scan lenses currently available for Arex™ 130-X6X and 150-X6X:

F-Theta Scan Lens diameter M85				
F-THETA SCAN LENS		$f = 160L$	$f = 254L$	$f = 330L$
Working Distance (WD)	mm	178 ± 3.5	301 ± 4	397 ± 6
Fixing Distance (FD)	mm	214 ± 4.5	372 ± 5	480 ± 7
Marking Area (MA)	mm <sup>2</sup>	100 x 100	170 x 170	210 x 210



**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.

The **Working Distance tolerance** is defined as the ± 2-Sigma value of deviation from Working Distance mean value of the estimated Gaussian model.

Refer to the following figure.

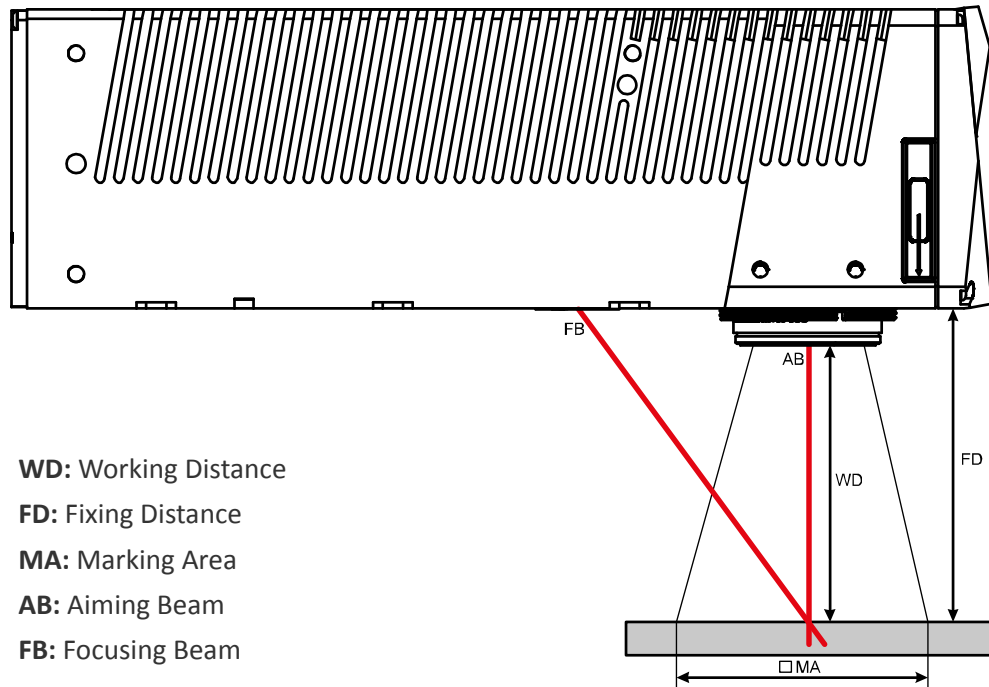


**NOTE**

**Fixing Distance** is defined as the distance between the base of the scan head and the marking area.

The **Fixing Distance tolerance** is defined as the ± 2-Sigma value of deviation from Fixing Distance mean value of the estimated Gaussian model.

Refer to the following figure.



- WD:** Working Distance
- FD:** Fixing Distance
- MA:** Marking Area
- AB:** Aiming Beam
- FB:** Focusing Beam

Figure 3: Marking Area

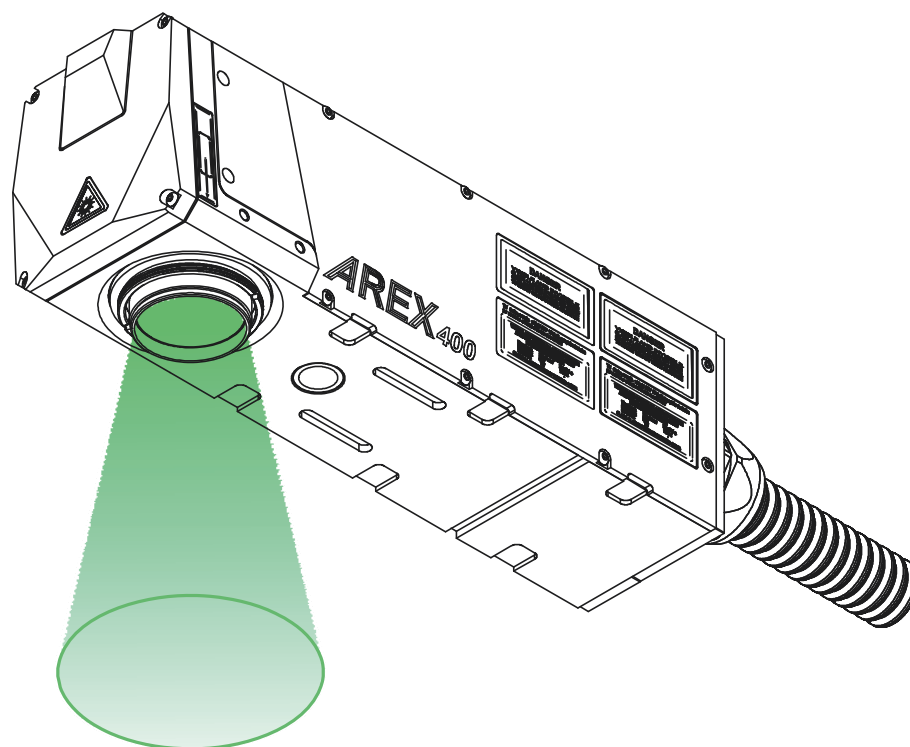


**NOTE**

For products equipped with 160S, 254S, 160L and 100L F-Theta scan lenses the focus position, defined at the point where the focus beam overlaps with the aiming beam, is preset at factory.

## GREEN SPOT

The Green Spot is an indicator integrated in the scan head able to provide a green visual feedback in the center of marking field area.



**Figure 4: Green Spot indicator**

CONFIGURATION <sup>1</sup>	DESCRIPTION
<b>OFF</b>	The Green Spot indicator is not active (always OFF)
<b>SYSTEM READY TO MARK</b>	The Green Spot is steady ON only when all these events are verified: <ul style="list-style-type: none"> <li>the laser marker is in READY state</li> <li>a document is in AUTO MODE or WORK MODE</li> <li>the marking process is not in progress</li> </ul>
<b>MARKING CONFIRMATION</b>	The Green Spot turns ON when all these events are verified: <ul style="list-style-type: none"> <li>the laser marker is in READY state</li> <li>a document is in AUTO MODE or WORK MODE</li> <li>the marking process was correctly executed (no errors, no stop marking, no state changing)</li> </ul> <p>The Green Spot indicator turns ON at the end of the marking process and stay active for a configurable range of time from 0.1s to 5s</p>
<b>MARVIS VERIFICATION</b>	This is available only if MARVIS™ feature is enabled. The Green Spot turns ON when all these events are verified: <ul style="list-style-type: none"> <li>the laser marker is in READY state</li> <li>a document is in AUTO MODE or WORK MODE</li> <li>the marking process was correctly executed (no errors, no stop marking, no state changing)</li> <li>the verification of the marking content made by MARVIS™ device was positive</li> </ul> <p>The Green Spot indicator turns ON at the end of the marking process and stay active for a configurable range of time from 0.1s to 5s</p>

1. refer to Lighter™ user's manual "Setting I/O parameters" paragraph to set the signal properties

# CONNECTORS SPECIFICATIONS

## Safety Circuit

### Control rack back panel connector

Socket Sub-D, 15 pins, female.

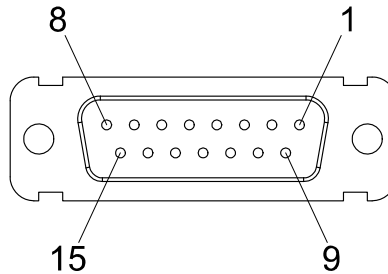


Figure 5: Safety Circuit connector, female panel plug (front view)

PIN	SIGNAL	TYPE	DESCRIPTION
1	VCC	Power Output	Auxiliary 24V DC power supply
2	RESERVED	-	DO NOT CONNECT
3	VCC	Power Output	Auxiliary 24V DC power supply
4	SAFETY_FDBK+	Output	Clean contact pole for monitor K relays state (Common)
5	SAFETY_FDBK-	Output	Return of clean contact pole for monitor K relays state (Normally Closed)
6	GND	Ground	Ground reference
7	RESERVED	-	DO NOT CONNECT
8	GND	Ground	Ground reference
9	INTERLOCK_A	Input	Interlock signal for K1 relay coil
10	RESERVED	-	DO NOT CONNECT
11	INTERLOCK_B	Input	Interlock signal for K2 relay coil ( <i>only for XXX-X6X models</i> )
12	RESERVED	-	DO NOT CONNECT
13	LASER_STOP_A	Input	Return signal for K1 relay coil
14	RESERVED	-	DO NOT CONNECT
15	LASER_STOP_B	Input	Return signal for K2 relay coil ( <i>only for XXX-X6X models</i> )

Table 1: Safety Circuit connector pinout



## Safety Circuit Electric Diagram

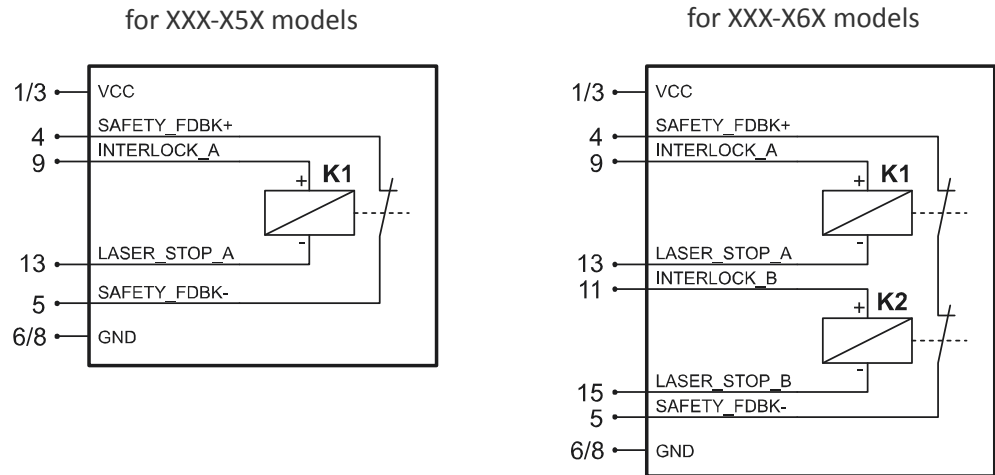


Figure 6: Safety Circuit connector, electric diagram

TECHNICAL CHARACTERISTICS	
<b>Control Contacts</b>	
Inrush current max.	15 A for 20 ms
Switching current range	5 mA to 6 A
Contact resistance (as	$\leq 100 \text{ m}\Omega / 6 \text{ V} / 100 \text{ mA}$
<b>Standard coils for direct current</b>	
Nominal Voltage V DC	24
Min. pick-up voltage at 20°C	$\leq 16.8$
Drop-out voltage at 20°C	$\geq 2.4$
Nominal current in mA	31.5
Resistance in Ohm at 20°C	$760 \pm 10\%$

## Muting Device

Sub-D, 15 pins, male, with shell.

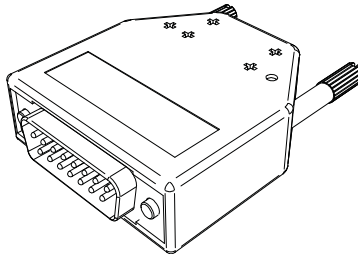


Figure 7: Safety Circuit Muting Device provided



**Do not use the Safety Circuit 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 Safety Circuit Muting Device except for maintenance of this product.**



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

### Internal electric diagram

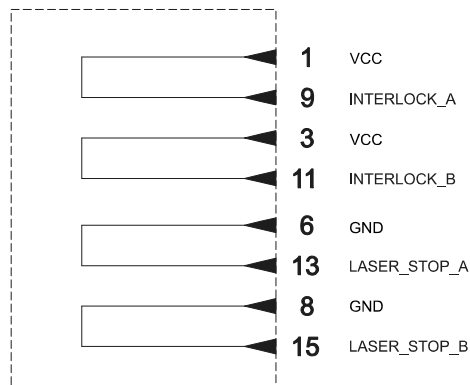


Figure 8: Safety Circuit Muting Device electric diagram

## Command Box (Laser Control)

### Control rack back panel connector

Socket Sub-D, 25 pins, female.

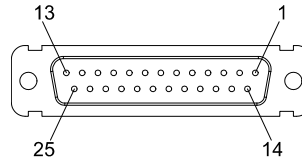


Figure 9: Command Box connector, female panel socket (front view)

PIN	SIGNAL	TYPE***	DESCRIPTION
1	24V_ENABLE_B	Output power supply	Auxiliary 24V DC power supply available for EXT_ENABLE_B (max 125mA)
2	EXT_ENABLE_B	Digital Input	Secondary external ENABLE signal: - HIGH level: contact closed - LOW level or disconnected: contact opened
3	GOOD/BAD	Digital Output	This signal is used to notify a bad marking: - ON in case of bad marking
4	EXT_24V	Output power supply	Auxiliary 24V DC power supply available for drive input logical HIGH (max 125mA)
5	EXT_24V	Output power supply	Auxiliary 24V DC power supply available for drive input logical HIGH (max 125mA)
6	EXT_24V	Output power supply	Auxiliary 24V DC power supply available for drive input logical HIGH (max 125mA)
7	24V_ENABLE_A	Output power supply	Auxiliary 24V DC power supply available for EXT_ENABLE_A (max 125mA)
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: laser marker faulty
11	START_MARKING*	Digital Input	This signal is used to start 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
14	RESERVED	-	DO NOT CONNECT
15	RESERVED	-	DO NOT CONNECT
16	RESERVED	-	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 laser marker 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 laser marker is in booting up state or in error state: - ON during BOOTING UP - ON in case of system error

PIN	SIGNAL	TYPE***	DESCRIPTION
21	GND	Ground	Ground reference
22	ENABLE_OUT	Digital Output	This signal is used to know if the laser marker is ready to emit laser radiation: - ON when the laser marker is in READY state
23	SW_READY*	Digital Output	Depending on the configuration this signal can be used in different ways: - COMPATIBILITY: ON when a document or a sequence is running in AUTO MODE** or WORK MODE** independently from the laser marker state. The signal is ON regardless of whether the laser marker is ready to start a new marking - STANDARD: ON when a document or a sequence is running in AUTO MODE** or WORK MODE** and the laser marker state is READY. The signal is ON regardless of whether the laser marker is ready to start a new marking - READY TO MARK: ON only when a document or a sequence is running in AUTO MODE** or WORK MODE** and the laser marker state is READY. The signal is ON only if the laser marker is ready to accept a new START_MARKING event (loading/spooling already executed) This signal can also be driven using Lighter™ Script engine "IoPort.setReady (true)" function
24	GND	Ground	Ground reference
25	GND	Ground	Ground reference

**Table 2: Command Box connector pinout**

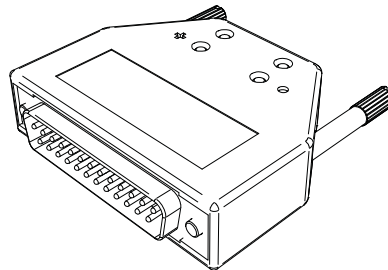
(\*) refers to Lighter™ user's manual "Setting I/O parameters" paragraph to set the signal properties

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

(\*\*\*) see "Input/Output specifications" on page 41

### Muting Device

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



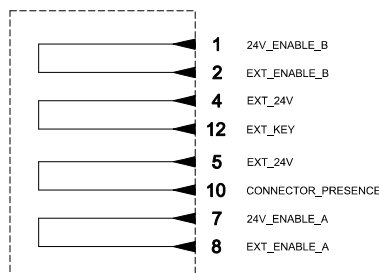
**Figure 10: Command Box Muting Device provided**



**CAUTION**

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

#### Internal electric diagram



**Figure 11: Command Box Muting Device electric diagram**

## Axes (I/O Control)

### Control rack back panel connector

Plug Sub-D, 25 pins, male.

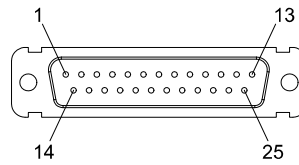


Figure 12: Axes connector, male panel plug (front view)

PIN	SIGNAL **	TYPE***	DESCRIPTION
1	EXT_24V	Output Power supply	Auxiliary 24V DC power supply available for drive input logical HIGH (max 125mA)
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 state 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 state 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 state prior to activation
13	GND	Ground	Ground reference
14	OUTPUT_12 (*) or STEP R	Digital Output	Generic output or R-Axis drive step signal (Clock) for axis control
15	OUTPUT_1 (*) or STEP X	Digital Output	Generic output or X-Axis drive step signal (Clock) for axis control
16	OUTPUT_3 (*) or DIR Z	Digital Output	Generic output or Z-Axis drive direction signal
17	OUTPUT_5 (*) or DIR Y	Digital Output	Generic output or Y-Axis drive direction signal
18	OUTPUT_7 (*) or DIR X	Digital Output	Generic output or X-Axis drive direction signal
19	INPUT 9	Digital Input	Generic Input
20	INPUT 8	Digital Input	Generic Input
21	INPUT_7 (*) or ZERO R	Digital Input	Generic input or R-Axis home sensor input. The home search is stopped when this signal goes HIGH
22	INPUT_6 (*) or DISABLE R	Digital Input	Generic input or R-Axis disable signal. When HIGH, the corresponding step signal remains in the state 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 3: Axes 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

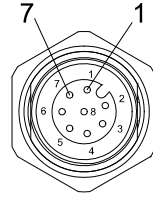
(\*\*) see "Axes I/O signals behavior" on page 49

(\*\*\*) see "Input/Output specifications" on page 41

## Encoder

### Control rack back panel connector

Socket, M12, 8 pins female. Recommended encoder: Datalogic ENC58-S10-XXXX-M12 (ENC58-S10-5000-M12). See “Starter Kit for Marking On the Fly (MOF)” on page 81.



**Figure 13: Encoder connector, female panel socket (front view)**

PIN	SIGNAL	TYPE*	DESCRIPTION
1	GND	Ground	Ground reference
2	VCC	Power Output	Auxiliary 24V DC power supply (750mA max)
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

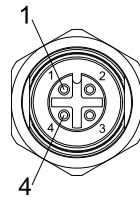
**Table 4: Encoder connector pinout**

(\*) see “Input/Output specifications” on page 41

## Photocell

### Control rack back panel connector

Socket, M12, 4 pins female. Recommended photocell: Datalogic S51-PA-5-B01-PK; Datalogic S15-PA-5-B01-PK or equivalent. See “Starter Kit for Marking On the Fly (MOF)” on page 81.



**Figure 14: Photocell connector, female panel socket (front view)**

PIN	SIGNAL	TYPE*	DESCRIPTION
1	VCC	Power Supply	Auxiliary 24V DC power supply (120mA max)
2	RESERVED	-	DO NOT CONNECT
3	GND	Ground	Ground reference
4	PHOTOCELL	Digital input	PNP photocell signal

**Table 5: Photocell connector pinout**

(\*) see “Input/Output specifications” on page 41

## Device Port 1

### Control rack back panel connector

Plug, M12, 8 positions male.

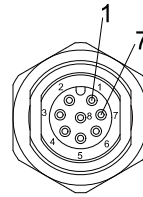


Figure 15: Device Port 1 connector, male panel plug (front view)

PIN	SIGNAL	TYPE*	DESCRIPTION
1	VCC	Power Output	Auxiliary 24V DC power supply (15W max power)
2	GND	Ground	Ground reference
3	EXT_TRIG_#1	Digital Output	Reserved output for MARVIS™
4	EXT_INPUT_#1	Digital Input	Reserved input for MARVIS™
5	RESERVED	-	DO NOT CONNECT
6	INT_RS232_RX	Digital Input	Reserved RS232 for micrometric distance sensor
7	INT_RS232_TX	Digital Output	Reserved RS232 for micrometric distance sensor
8	RESERVED	-	DO NOT CONNECT
<b>BODY</b>	SHIELD	Shield	Connector case provides electrical connection to the body

Table 6: Device Port 1 connector pinout

(\*) see "Input/Output specifications" on page 41

## Device Port 2

### Control rack back panel connector

Plug, M12, 8 positions male.

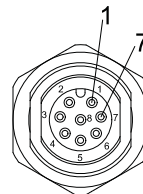


Figure 16: Device Port 2 connector, male panel plug (front view)

PIN	SIGNAL	TYPE*	DESCRIPTION
1	VCC	Power Output	Auxiliary 24V DC power supply (15W max power)
2	GND	Ground	Ground reference
3	EXT_TRIG_#2	Digital Output	Reserved output for MARVIS™
4	EXT_INPUT_#2	Digital Input	Reserved input for MARVIS™
5	RESERVED	-	DO NOT CONNECT
6	RESERVED	-	DO NOT CONNECT
7	RESERVED	-	DO NOT CONNECT
8	RESERVED	-	DO NOT CONNECT
<b>BODY</b>	SHIELD	Shield	Connector case provides electrical connection to the body

Table 7: Device Port 2 connector pinout

(\*) see "Input/Output specifications" on page 41

## RS232 (COM3)

### Control rack back panel connector

Plug Sub-D, 9 pins, male.

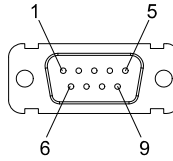


Figure 17: RS232 connector, male panel plug (front view)

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 8: Standard RS232 connector pinout

## Ext Focus

### Scan head connector

Socket, M8, 4 pins female.

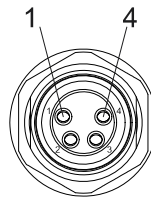


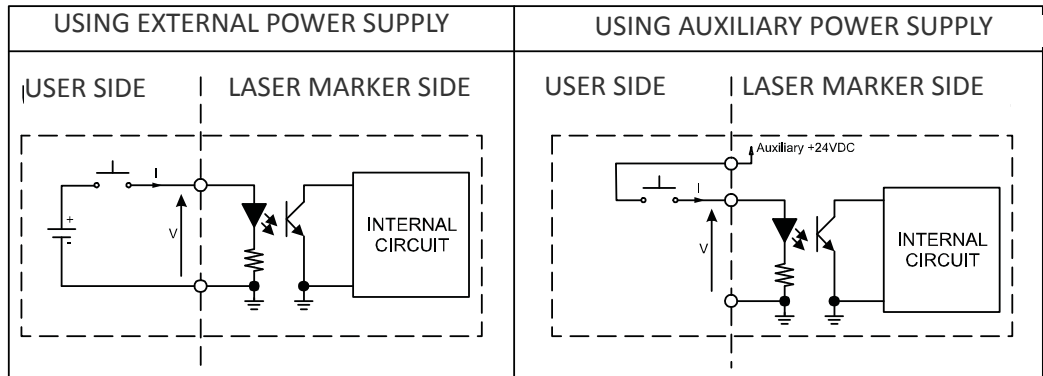
Figure 18: Ext Focus connector, female socket (front view)

PIN	SIGNAL	TYPE	DESCRIPTION
1	EXT_FOCUS+	Power Output	Reserved Auxiliary power supply for focusing beam
2	EXT_FOCUS-	Ground	Reserved ground for focusing beam
3	RESERVED	-	DO NOT CONNECT
4	RESERVED	-	DO NOT CONNECT



# INPUT/OUTPUT SPECIFICATIONS

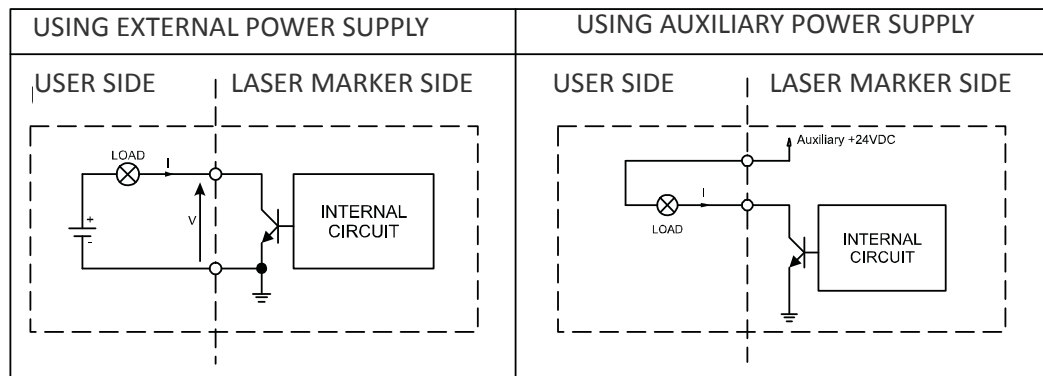
## Digital Input



TECHNICAL CHARACTERISTICS			
Type	Optocoupler		
Vmax	28 V DC		
Imax	10 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	10.0 V DC	24.0 V DC	28.0 V DC

Table 9: Digital Input specification

## Digital Output







TECHNICAL CHARACTERISTICS	
Type	Low side driver
Vmax	24 V DC
Imax	250 mA
LOW Level Output	V ≤ 0.5 V DC; I ≤ 250mA
HIGH Level Output	V ≤ 24 V DC; I ≤ 5μATYP


Table 10: Digital Output specification

# LASER MARKER STATES

## Normal Operation States

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


## Error States

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

SYSTEM ERROR	DESCRIPTION
<b>INTERLOCK ERROR</b>	This error rise if the INTERLOCK function is ON. To reset the error, set INTERLOCK function to OFF and repeat the turning on sequence
<b>CBOX ERROR</b>	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
<b>RACK TEMPERATURE ERROR</b>	This error rise if the temperature inside the control rack is out of the operating temperature range. To reset the error, a Laser marker restart is required
<b>SCANHEAD TEMPERATURE ERROR</b>	This error rise if the temperature inside the scan head is out of the operating temperature range. To reset the error, a Laser marker restart is required
<b>SCANHEAD CONNECTION ERROR</b>	This alarm rise if the cable between control rack and scan head is not connected. To reset the error, a Laser marker restart is required

LASER SOURCE ERRORS	DESCRIPTION
<b>TEMPERATURE ERROR</b>	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
<b>POWER SUPPLY ERROR</b>	This error rise if the power supply of the laser source is out of range. To reset the error, a Laser marker restart is required
<b>BACK REFLECTION ERROR</b>	This error rise if high optical power is reflected back to the laser source. To reset the error, a Laser marker restart is required
<b>GENERIC ERROR</b>	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
<b>WARNING INVALID START SEQUENCE</b>	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 Selector
- Command Box connector

### Key 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	STATUS LED
SYSTEM BOOTING UP	EXT_KEY	HIGH		 Blinking
WAIT FOR START	EXT_KEY	HIGH		 Steady
STANDBY SHUTTER CLOSED	EXT_KEY	HIGH		 Steady
READY*	EXT_KEY	HIGH		 Steady

\* *LASER\_STOP* safety function not active

### Command Box mode

Controlling the laser marker states using the Command Box connector on the control rack back panel requires that the Key Selector is set to fixed position LASER ON:

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

\* *LASER\_STOP* safety function not active

## TIMING DIAGRAMS

### Turning On sequence

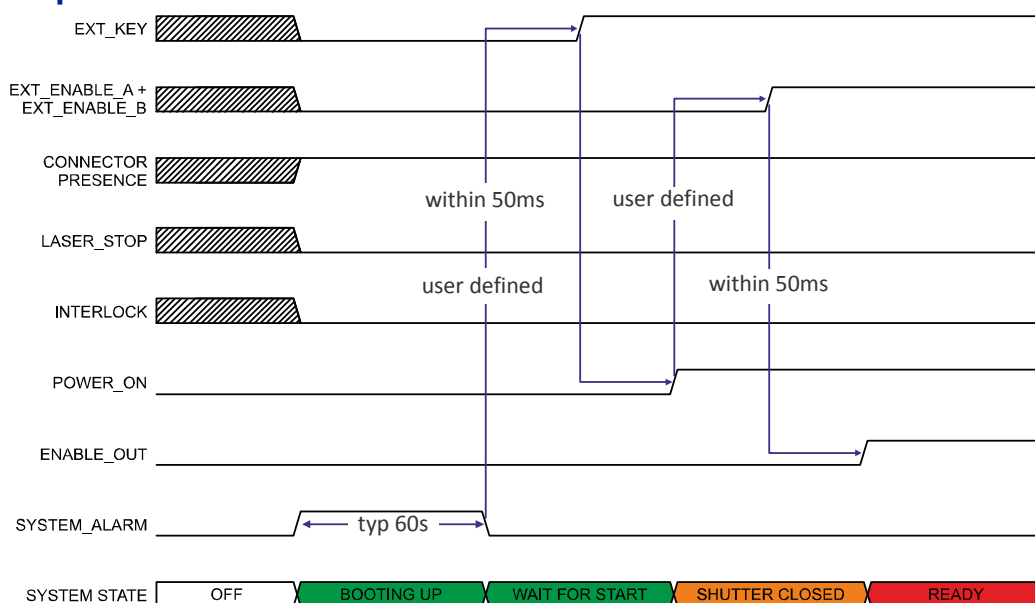


Figure 19: Turning On sequence timing diagram

### Marking control signals behavior

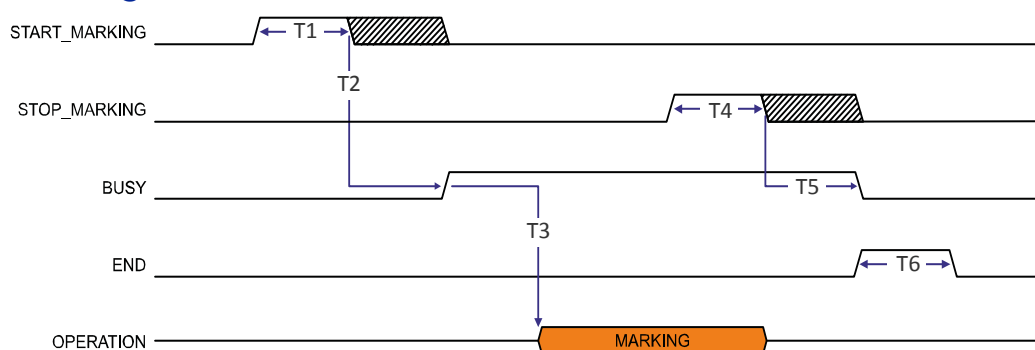


Figure 20: Marking process timing diagram

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	Time duration of the END signal



#### NOTE

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

## SW\_Ready output signal (Ready to Mark mode)

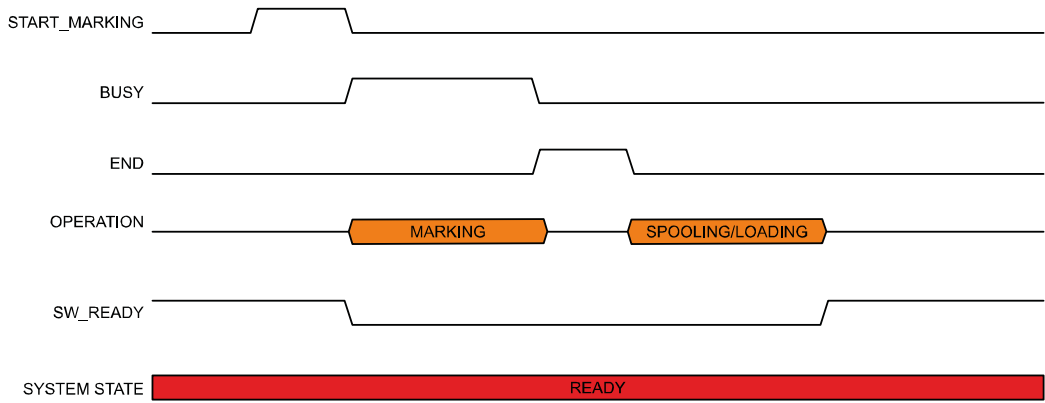


Figure 21: SW\_Ready signal timing diagram

## Good\Bad output signal

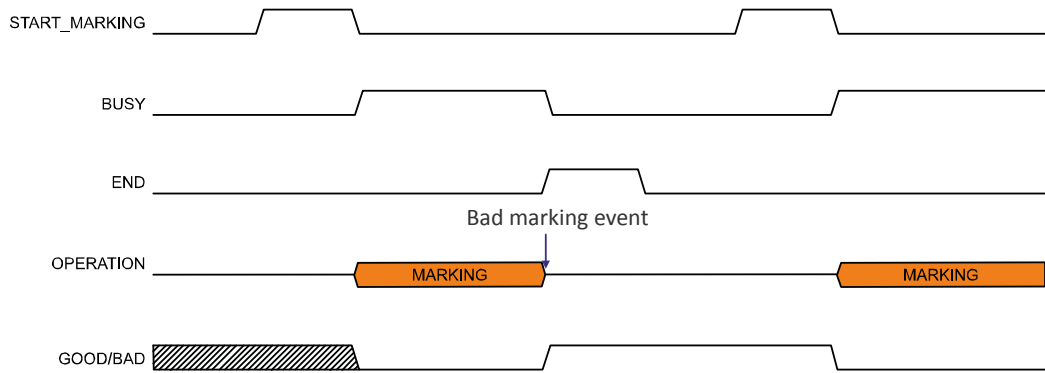


Figure 22: Good\Bad signal timing diagram

## System\_Alarm output signal

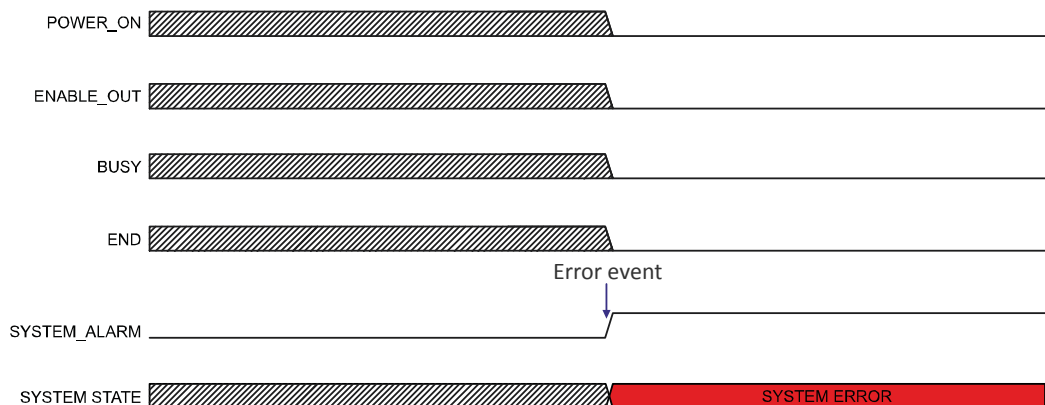


Figure 23: System Alarm timing diagram

## MARVIS™ I/O signals behavior

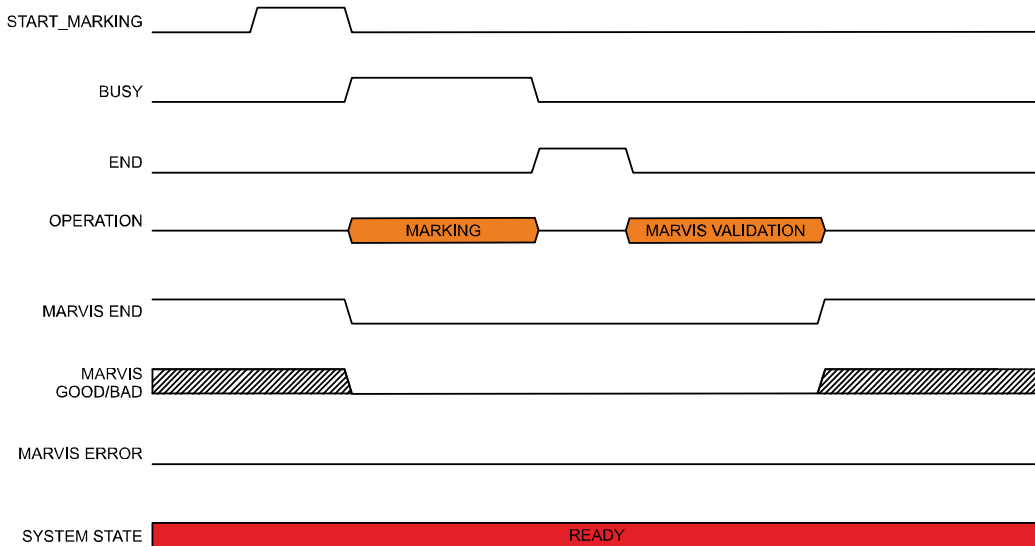


Figure 24: MARVIS™ I/O signals behavior

## Safety functions behavior

### Interlock behavior

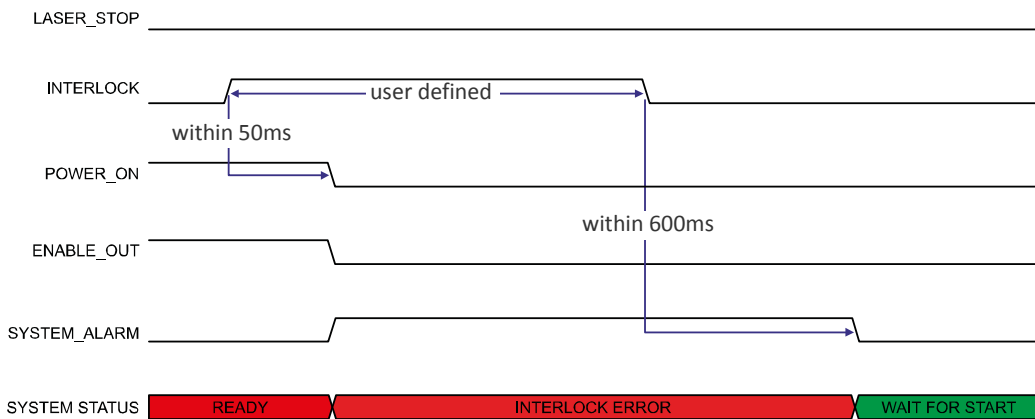


Figure 25: Interlock behavior

### Laser\_Stop behavior

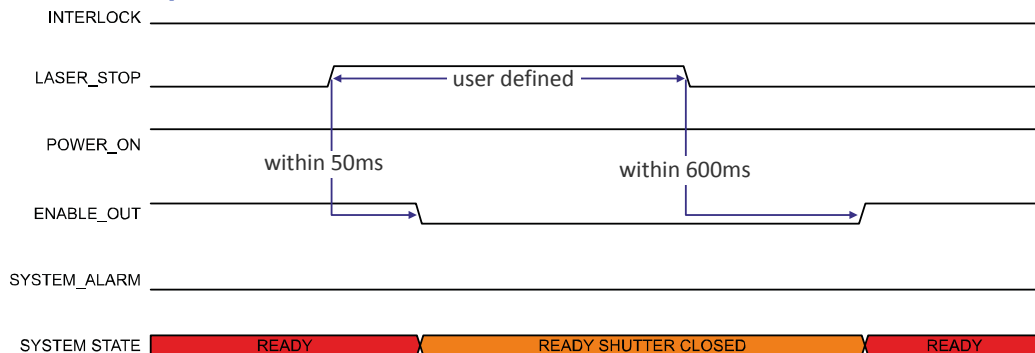


Figure 26: Laser\_Stop behavior

## Green Spot behavior

### System Ready to Mark mode

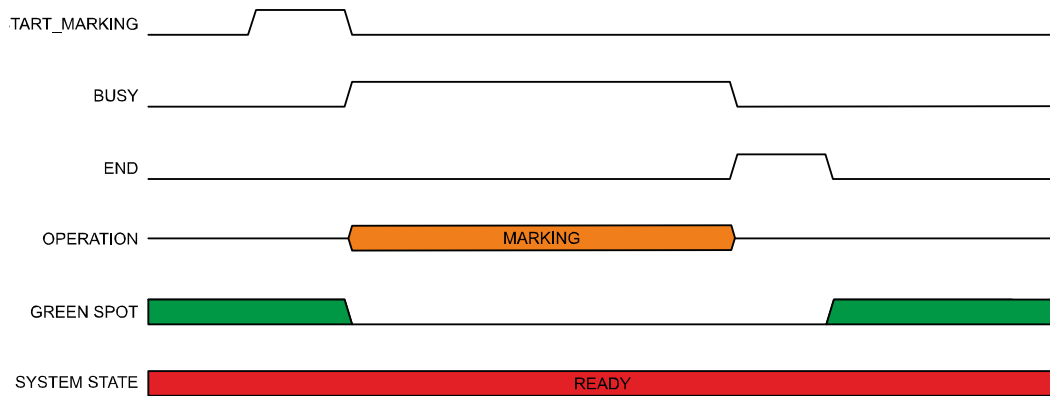


Figure 27: Green Spot: System Ready to mark

### Marking Confirmation mode

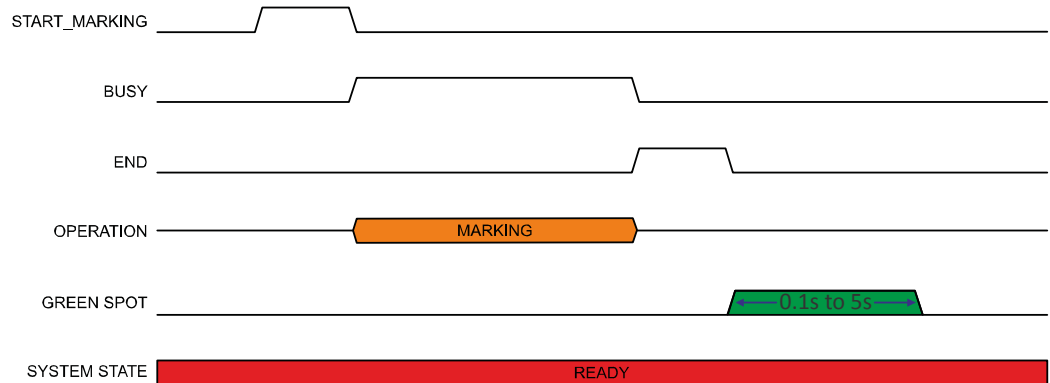


Figure 28: Green Spot: Marking Confirmation

### MARVIS Verification mode

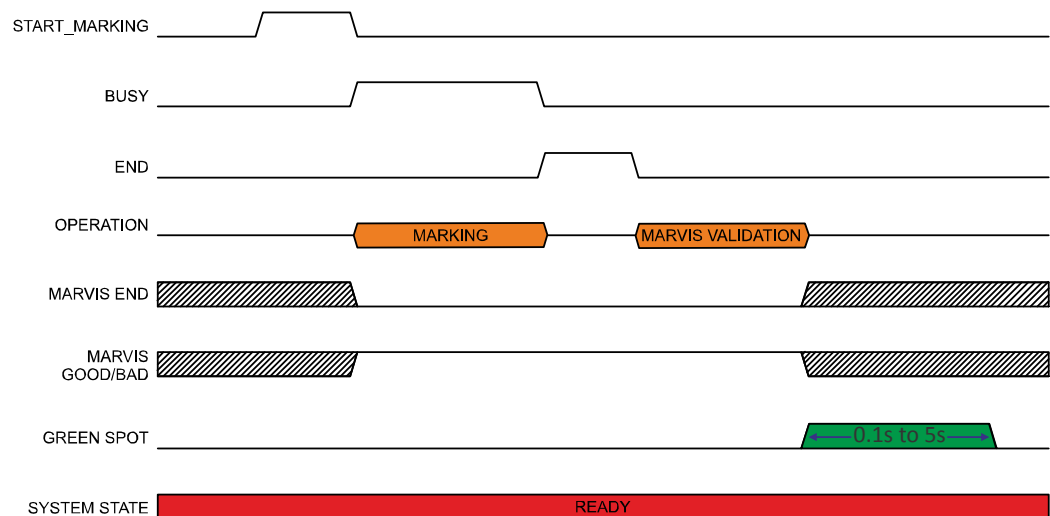


Figure 29: Green Spot: MARVIS™ Verification



## Axes I/O signals behavior

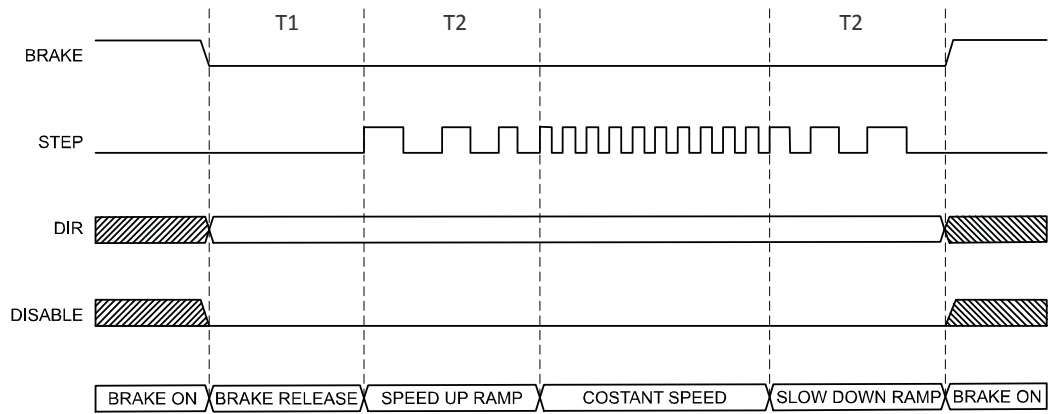


Figure 30: Axes I/O signals behavior

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.

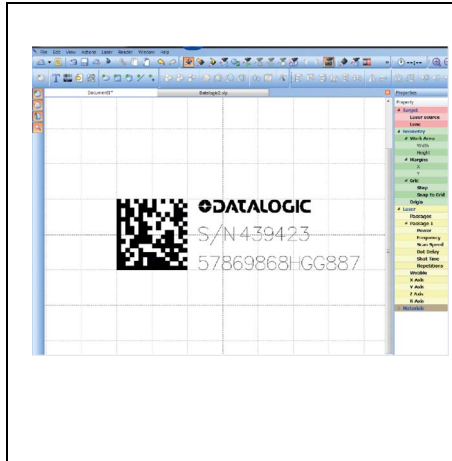
MARVIS™ connects Datalogic MATRIX™ N-series reader with the laser marker, enabling controlling from one single interface and enhancing individual products' performances.

MARVIS™ is also available as update for existing products.

### Object-Oriented Configuration

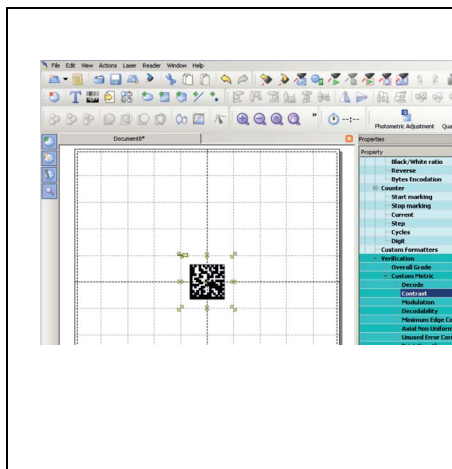
In the Lighter Suite, each object is associated with specific LASER parameters and READER configuration; loading a graphical layout will automatically retrieve and update laser and reader configurations.

## 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

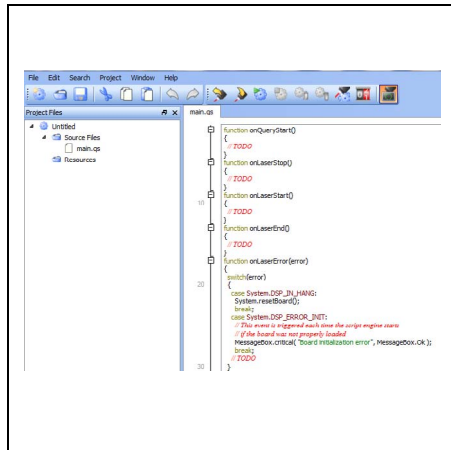
The Lighter™ Suite allows OEMs and Machine builders to develop a complete and cost effective Laser Marking Station, based on embedded hardware and software resources (such as STAND ALONE mode) or to design an advanced Laser Marking Solution able to control machinery over a simple Ethernet connection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

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

## Scripting programmability

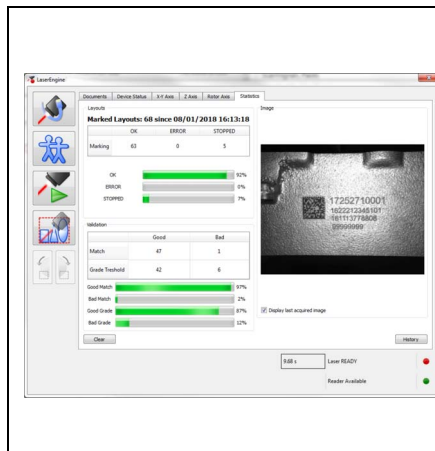
The LIGHTER Suite integrates the IDE (Integrated Development Environment) providing the users with a full set of tools to be used for extremely flexible customization.

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.



**Control rack and scan head are joined by a connection cable 3 meters long. Control rack and scan head are NOT separable.**

### Connecting Command Box connector

The Command Box connector 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.



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

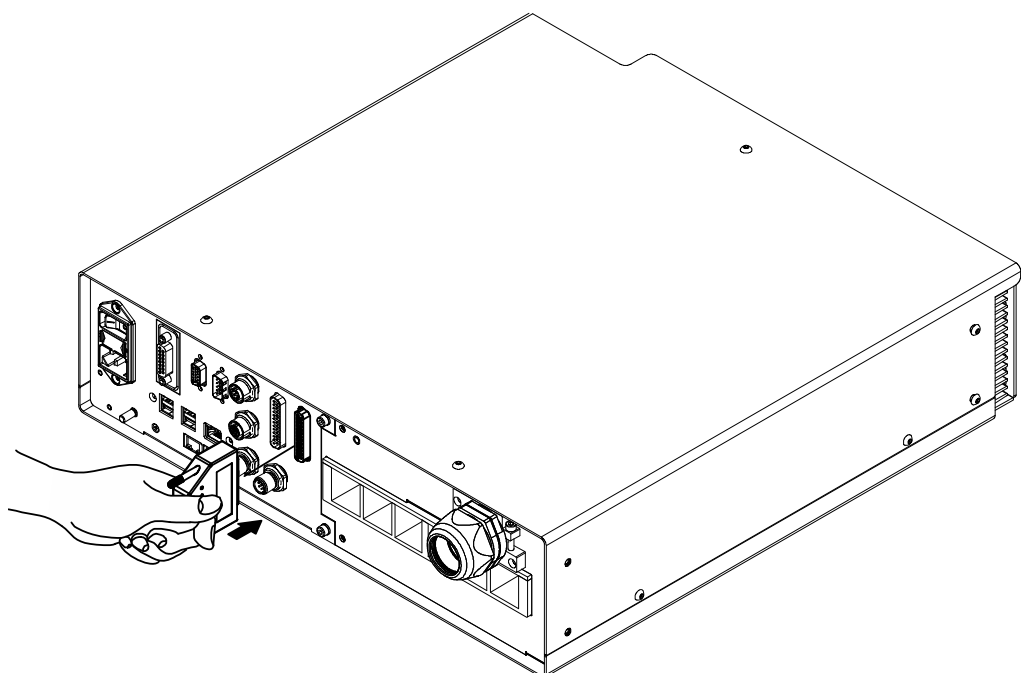


Figure 1: Connecting Command Box connector

## Connecting Safety Circuit connector

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



**WARNING**

**Do not use the Safety Circuit 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 Safety Circuit Muting Device except for maintenance oh this product.**



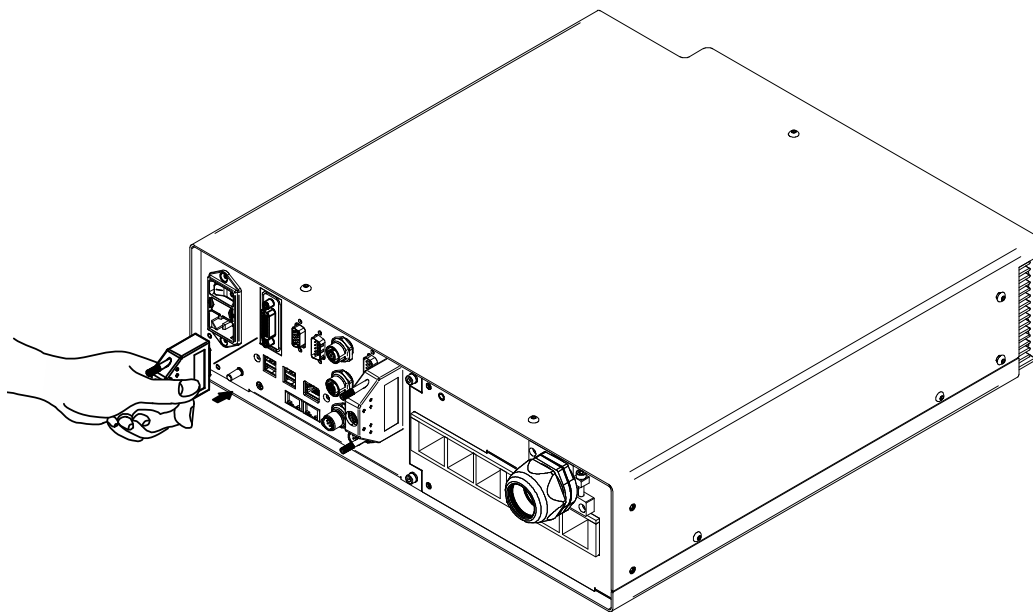
**WARNING**

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



**NOTE**

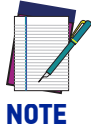
**See "Appendix B " on page 96 about the compliance to safety.**



**Figure 2: Connecting Safety connector**

## Connecting Power Supply cable

Connect the Power Supply cable using the cord retention system.



The locking mechanism is released again by pressing the release lever. Thanks to its luminous bright yellow color, it is easily recognizable and distinguishes this system from conventional mains connections.

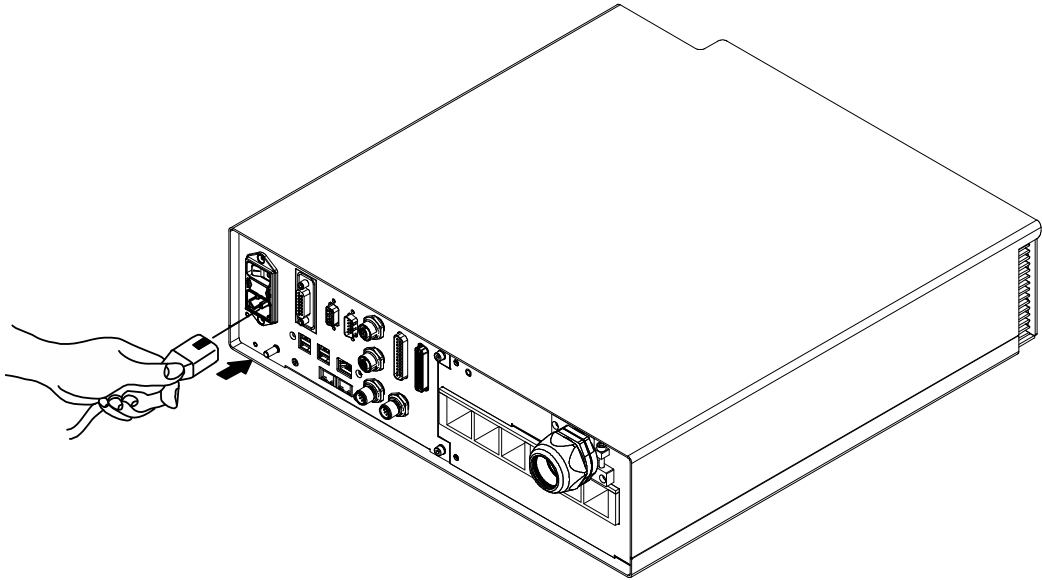


Figure 3: Connecting Power Supply cable

## Connecting the Earth Ground

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

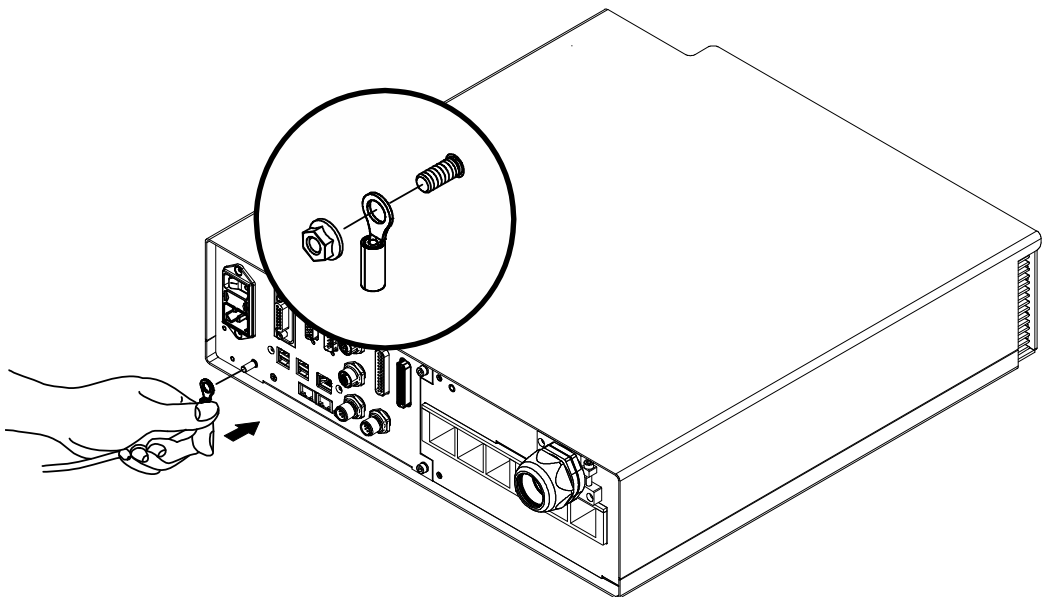


Figure 4: Connecting the Earth Ground

## 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:

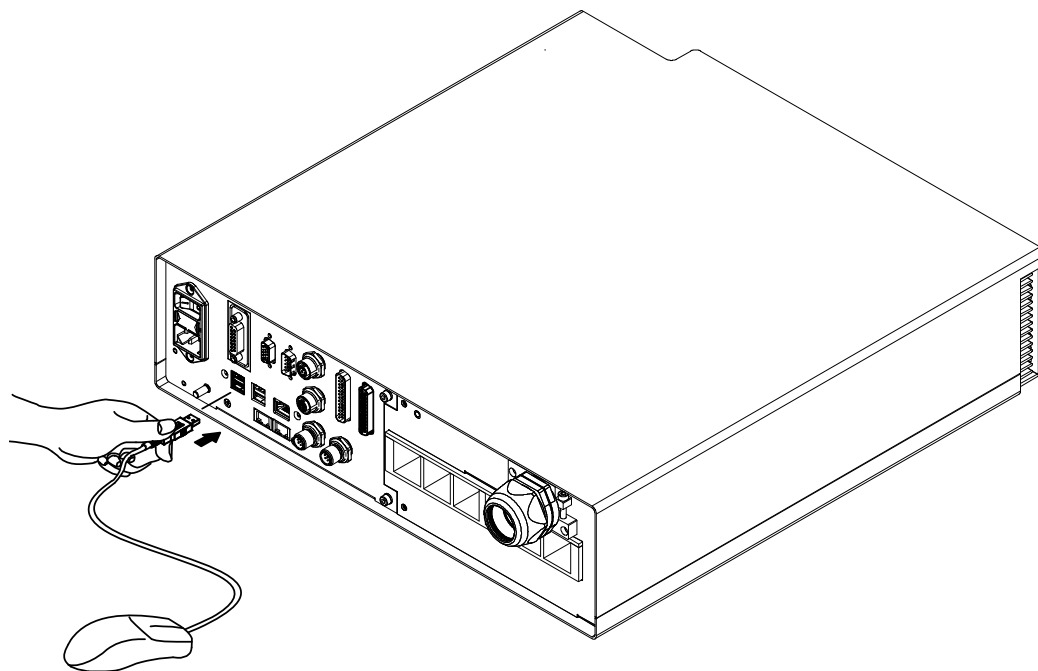


Figure 5: Connecting the mouse

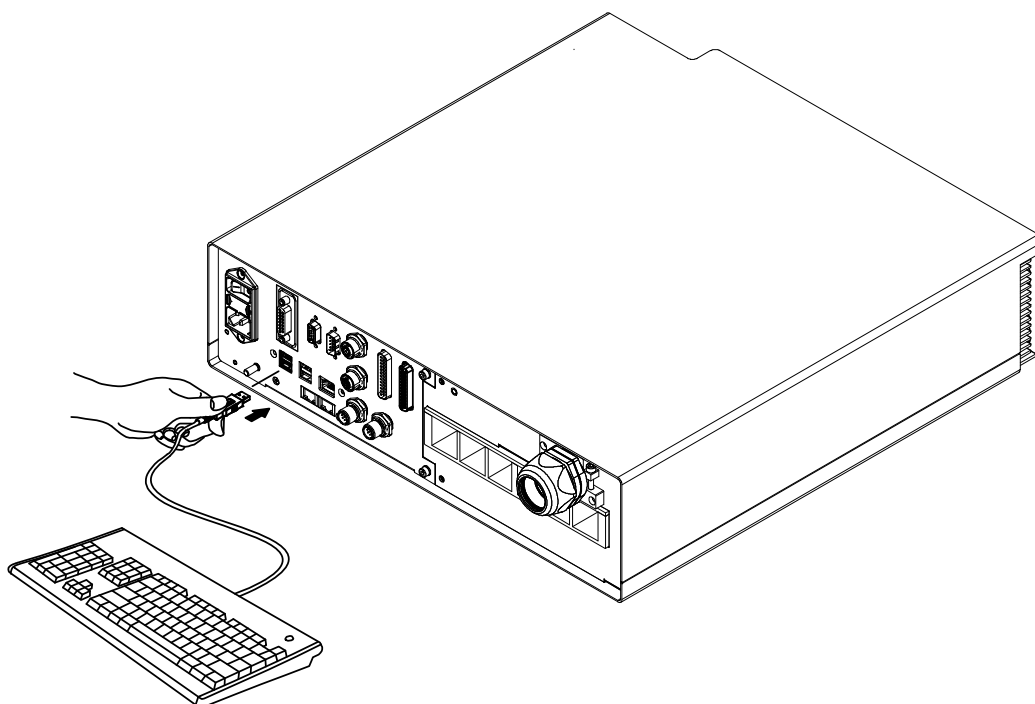


Figure 6: Connecting the keyboard

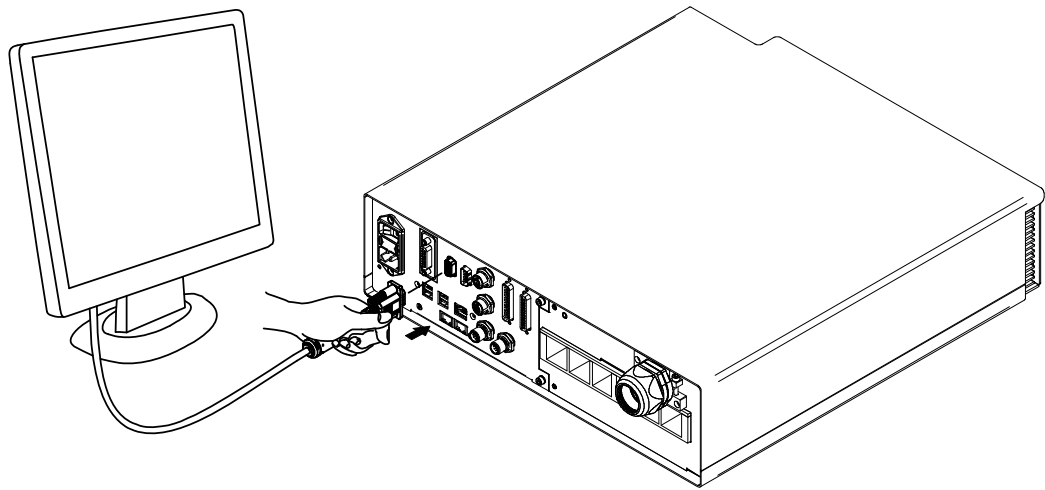


Figure 7: Connecting the monitor



**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:

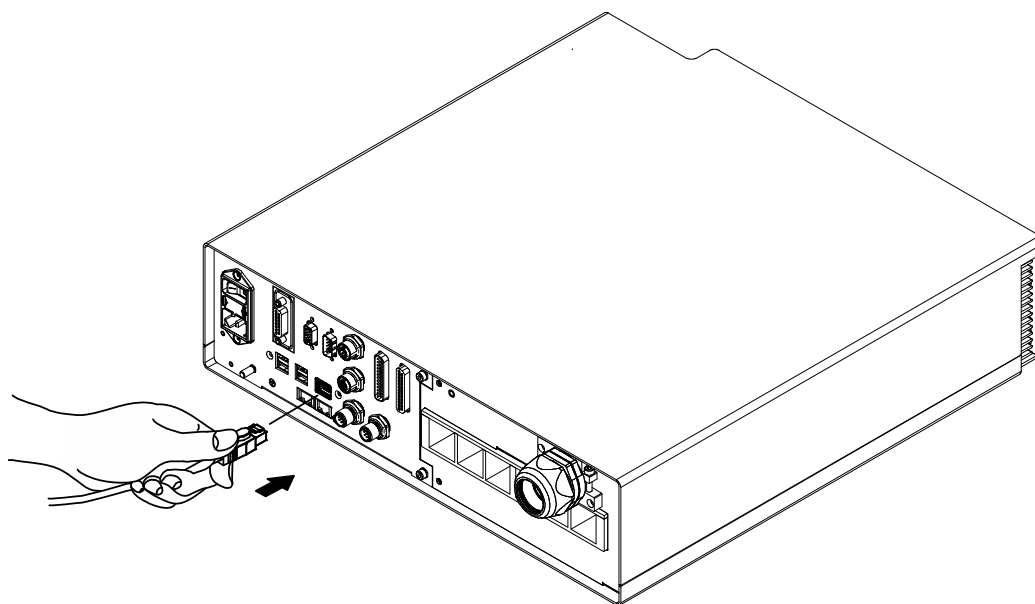


Figure 8: Connecting LAN port



**NOTE**

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

- LAN 1 Default IP address: **192.168.1.10**
- LAN 2 Default IP address: **192.168.3.10** (*available only for XXX-X6X models*)
- LAN 3 Default IP address: **192.168.0.10** (*available only for XXX-X6X models*)
- Default Subnet Mask: **255.255.255.0**

See "Change the LAN configuration and IP address" on page 70 **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:

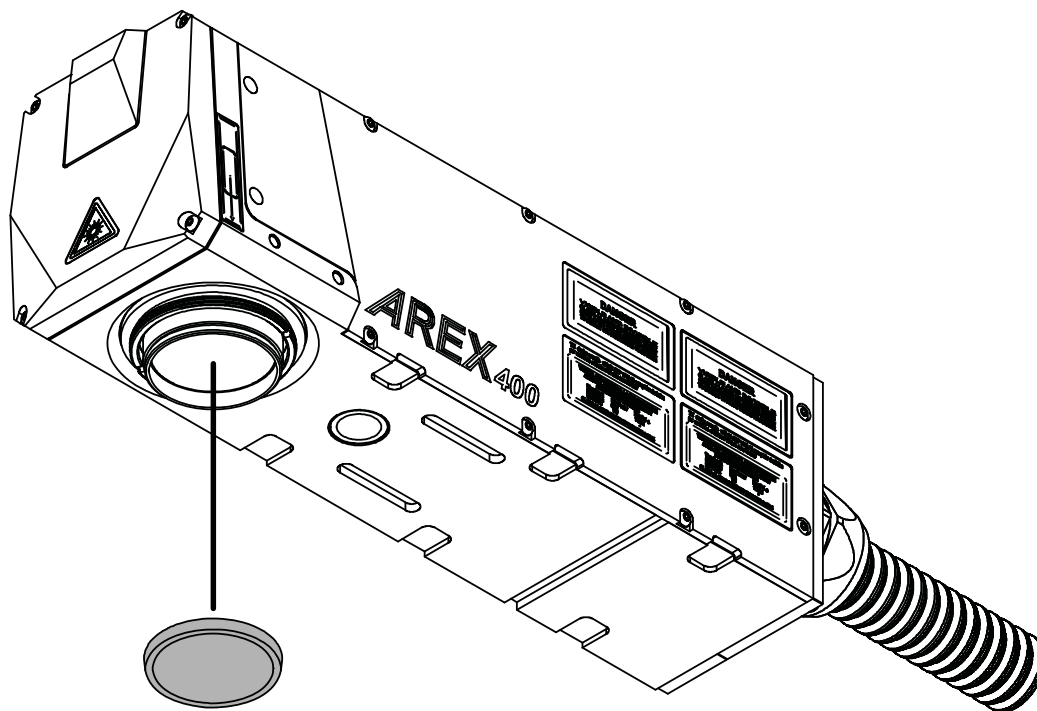


Figure 9: F-Theta scan lens protection cap removal



**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
- Safety Circuit connection
- Command Box connection



**WARNING**

**Do not use the Safety Circuit 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 Safety Circuit Muting Device except for maintenance on this product.**



**WARNING**

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



**WARNING**

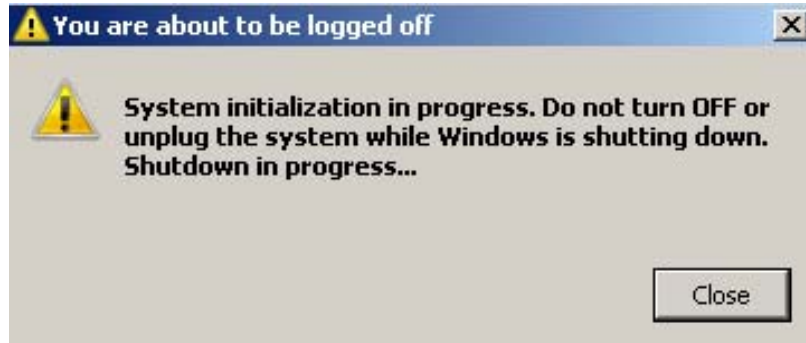
**If the Command Box Muting Device provided is connected, the laser marker enable is bypassed.**

# 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 Selector
- Command Box connector

### Sequence using Key Selector



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.

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:

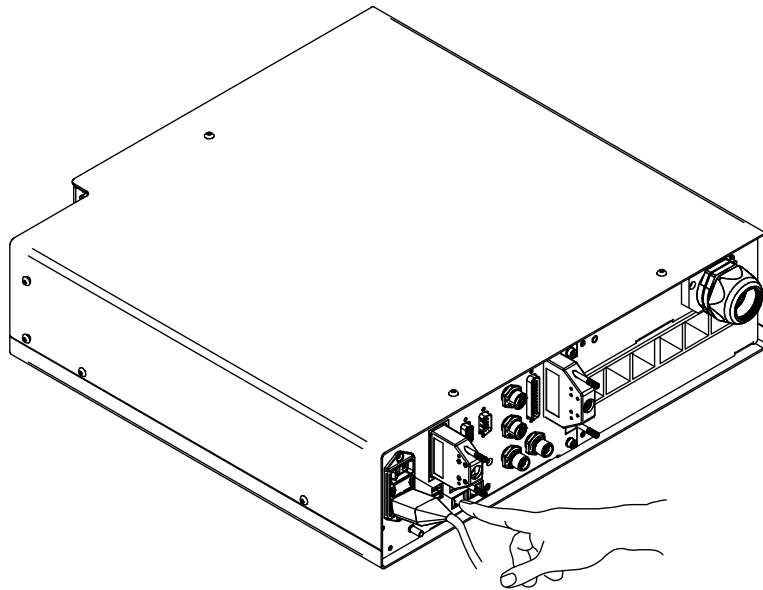


Figure 1: Power on the laser marker

During booting up state, the status LED on the control rack and the status LED on the scan head blink green.

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

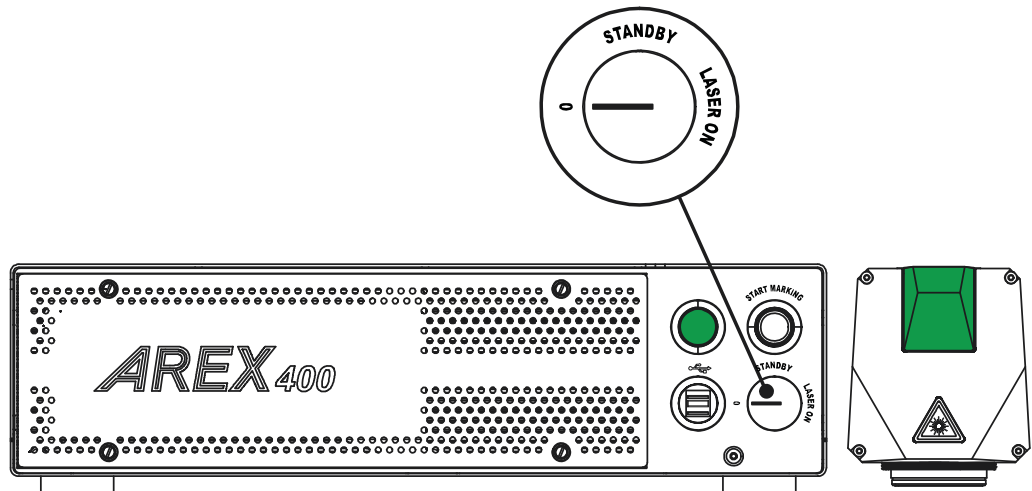


Figure 2: Wait for start state

Rotate the key selector one-step to STANDBY position:

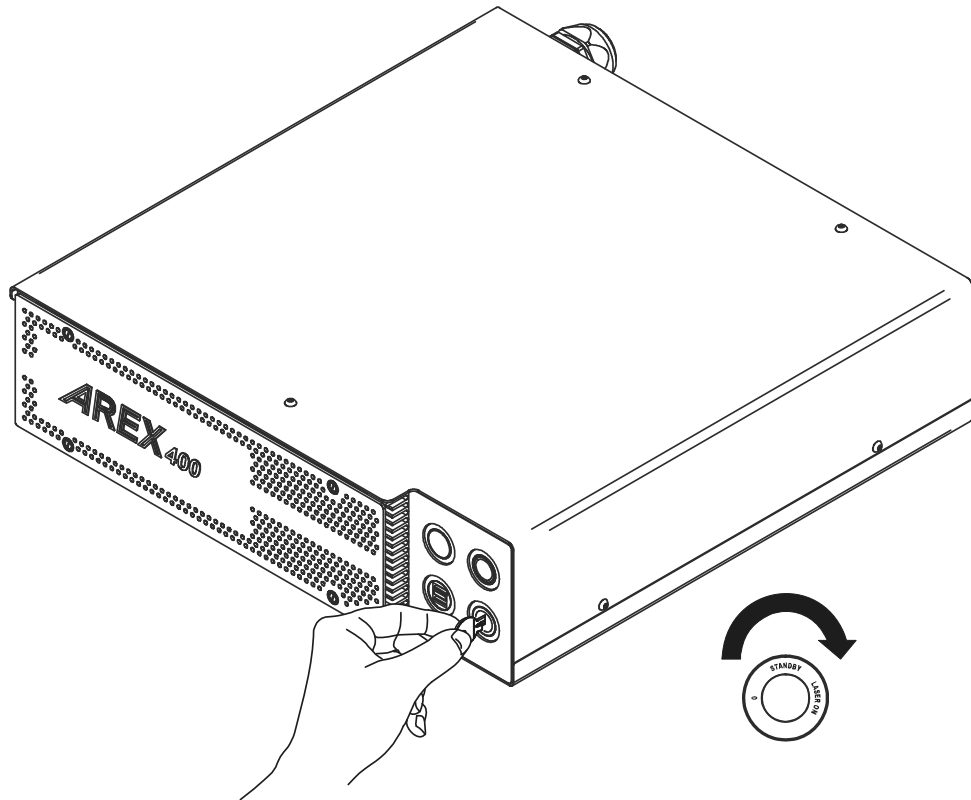


Figure 3: Key selector in STANDBY position

The status LED on the control rack and the status LED on the scan head are steady orange. The laser marker is in STANDBY SHUTTER CLOSED state.

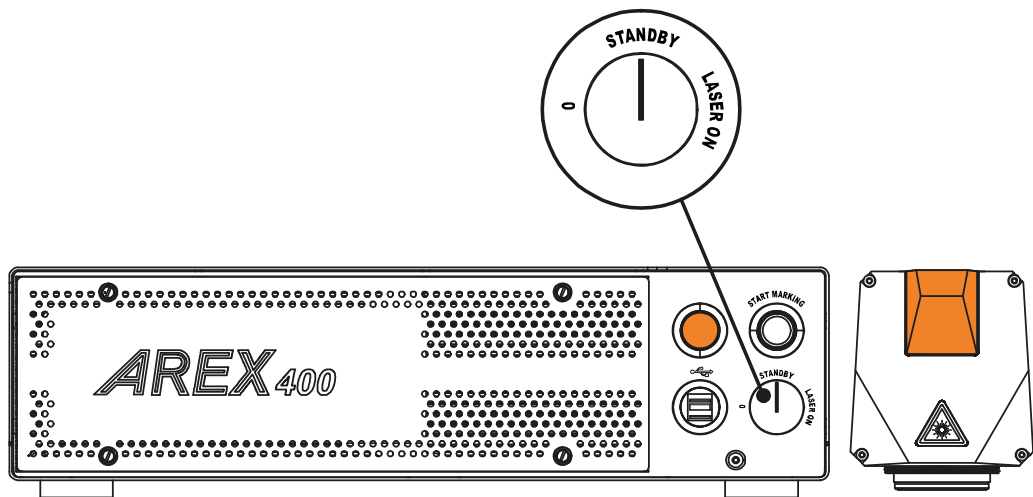
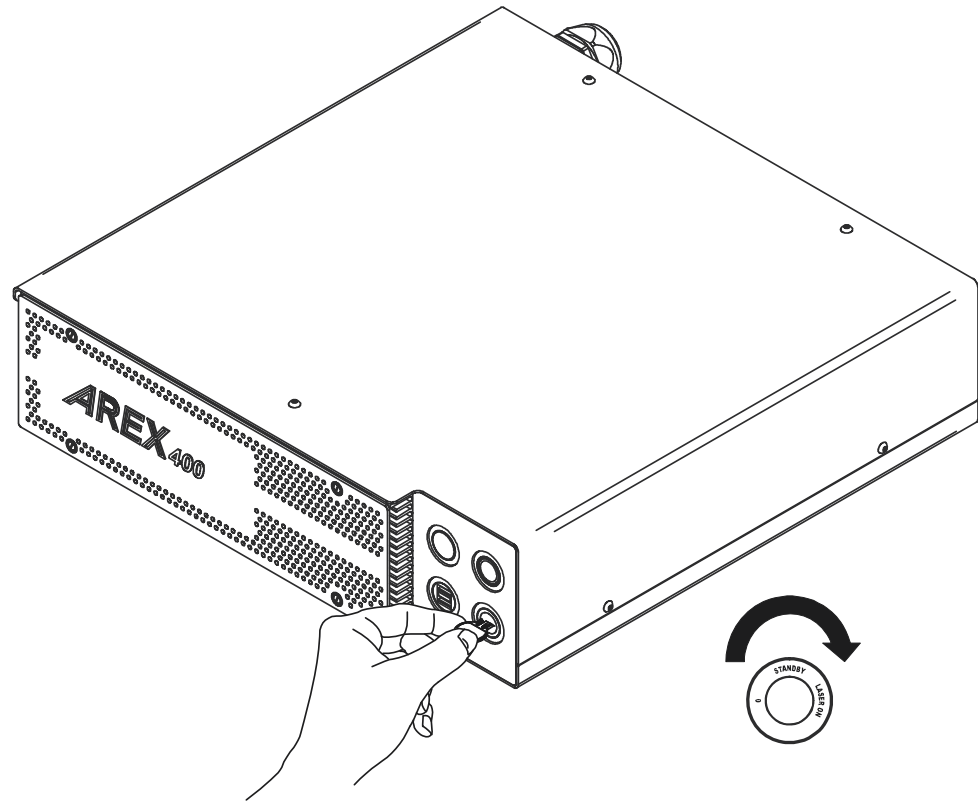


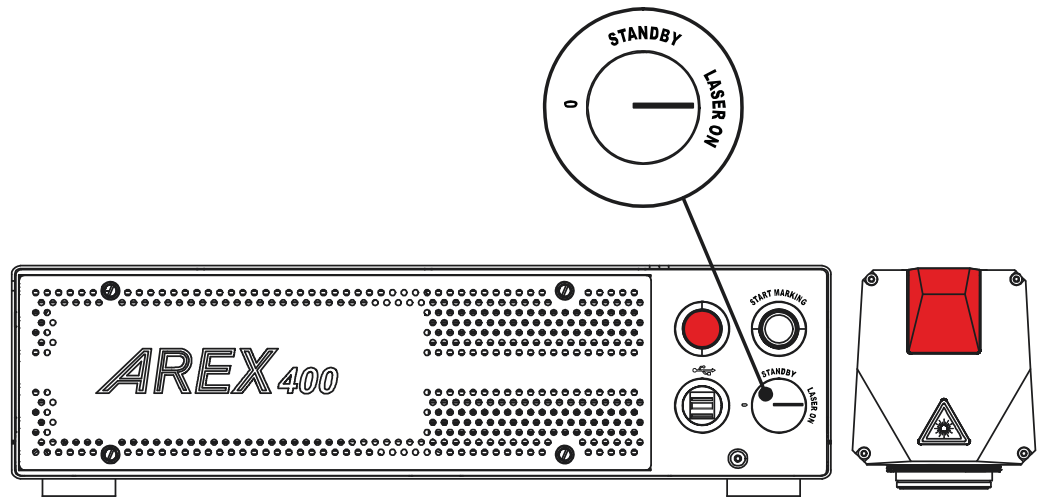
Figure 4: Standby Shutter closed state

Rotate the key selector one-step to LASER ON position:



**Figure 5: Key selector in LASER ON position**

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



**Figure 6: Ready state**

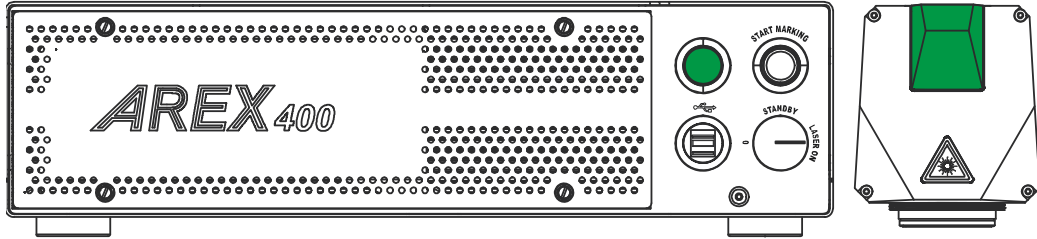
## Sequence Using Command Box



**Controlling the laser marker states using the Command Box connector on the control rack back panel requires that the Key Selector is set to fixed position *LASER\_ON*.**

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 and the status LED on the scan head blink green.

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

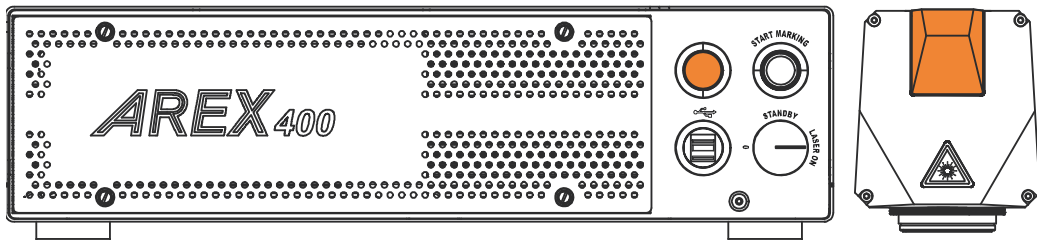


**Figure 7: Wait for start state**

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

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

The status LED on the control rack and the status LED on the scan head are 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 SELECTOR	STATUS LED
READY*	EXT_KEY	HIGH		 Steady
	EXT_ENABLE_A	HIGH		
	EXT_ENABLE_B	HIGH		



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

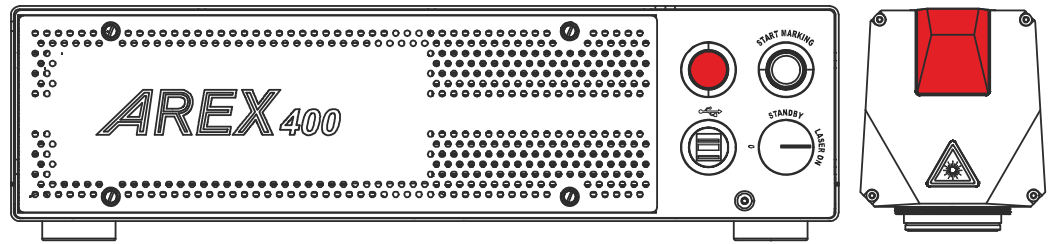


Figure 9: Ready state

# CHAPTER 6

## CUSTOMIZE THE LASER MARKER SOFTWARE

### CHANGE O.S. LANGUAGE AND KEYBOARD LAYOUT

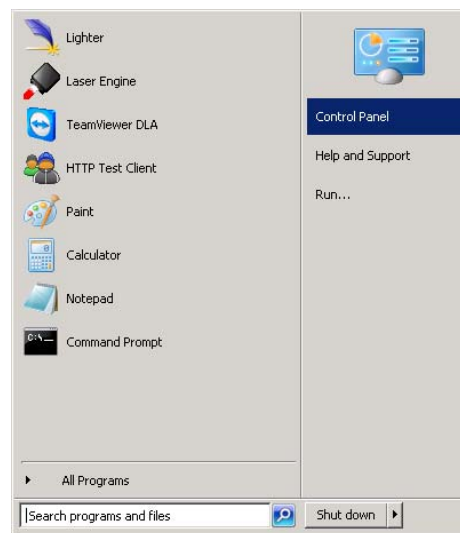
The laser marker allows you to customize the operating system changing the language used in menus, dialogs and languages you can use to enter text and keyboard layout.



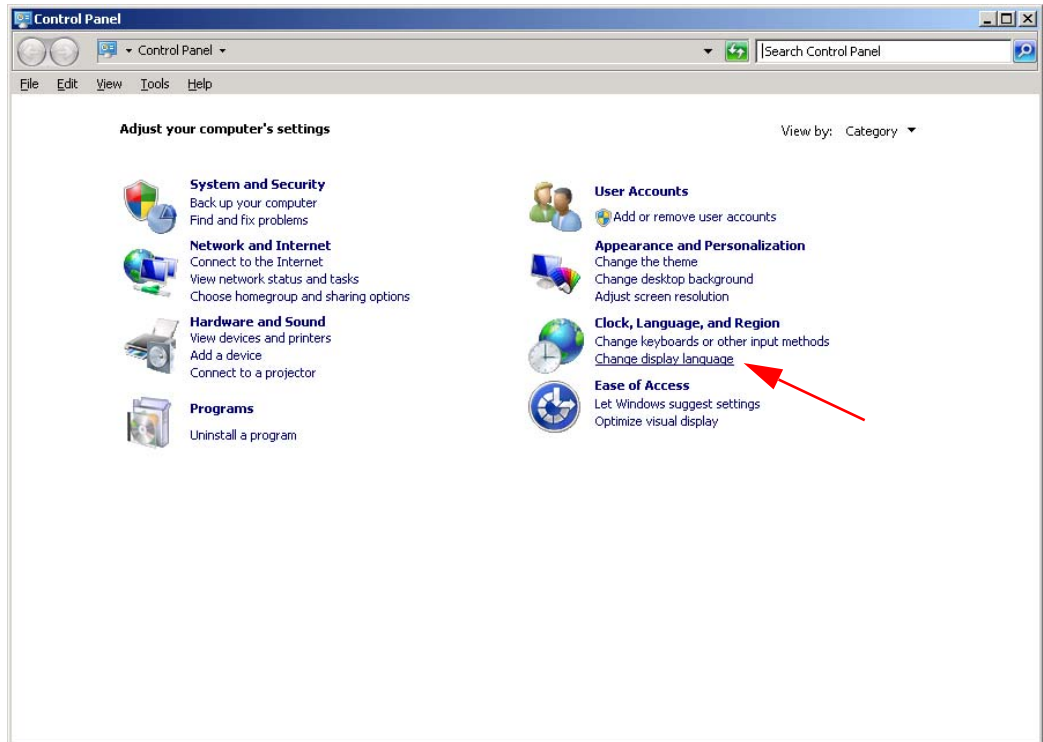
#### NOTE

**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 55).**

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



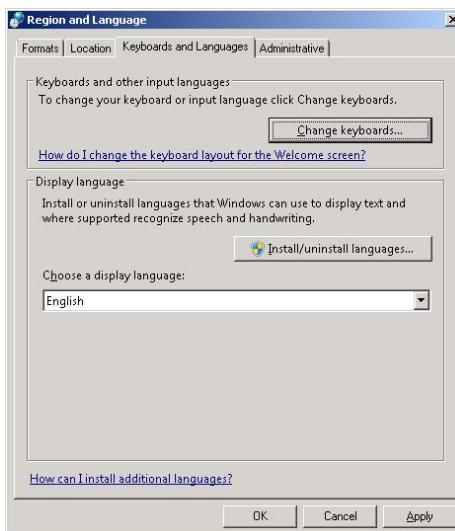
### 3. Select **Change display language**:



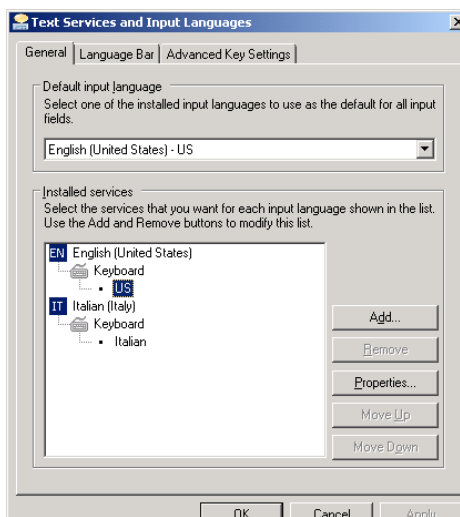
### 4. In **Keyboards and Languages** select and choose the desired language.



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



6. Now select the default input languages and press **OK**:



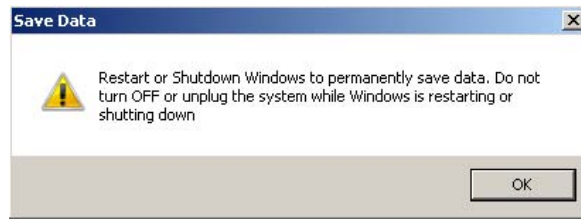
**NOTE**

**Default keyboard layouts are “US” and “IT”. Add a custom keyboard if necessary.**

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

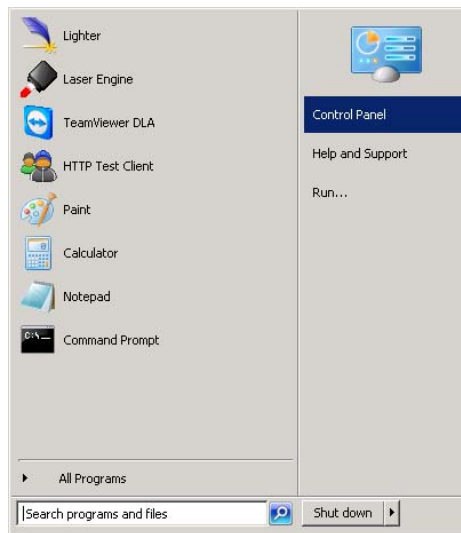
The operating system allows you to change the LAN configuration and IP address.



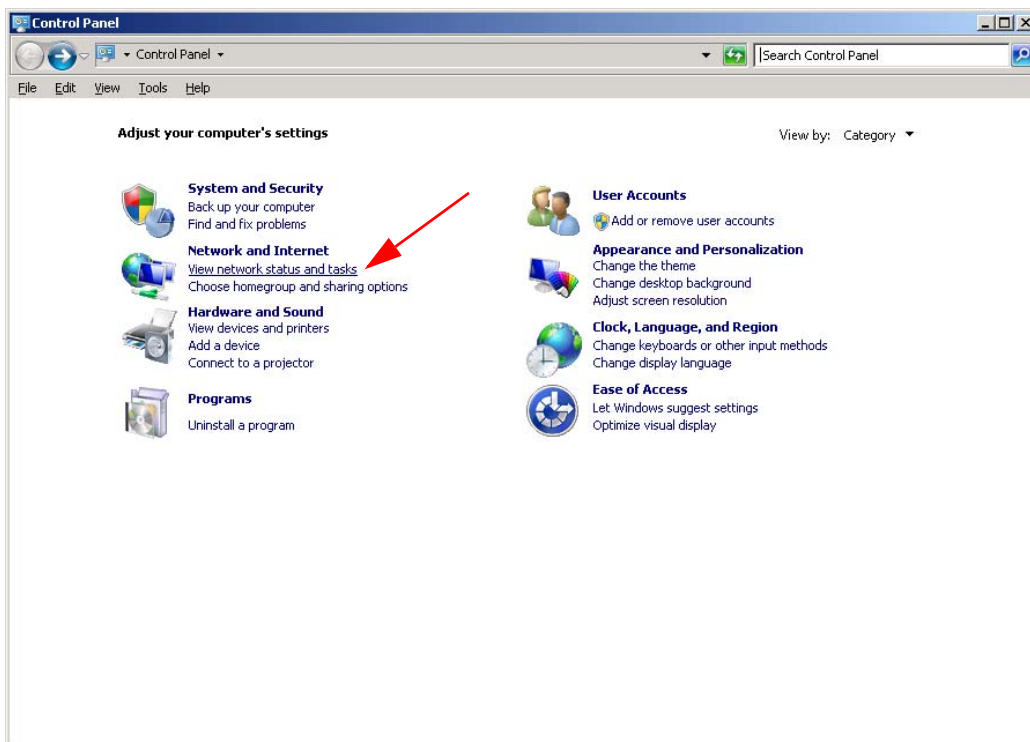
**In order to perform this setting it is necessary to connect mouse, keyboard and monitor to the laser marker (see "Local Mode Control connections" on page 55).**

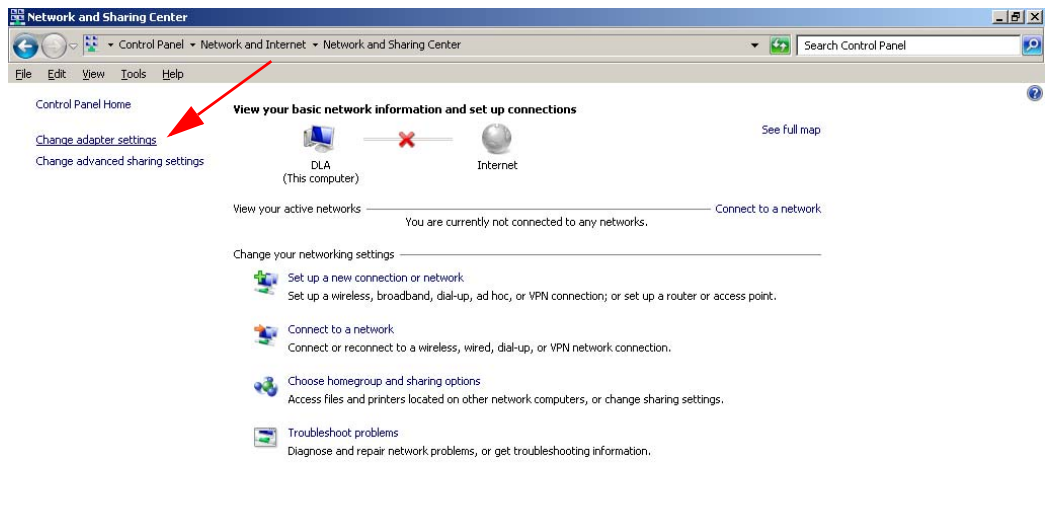
**NOTE**

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

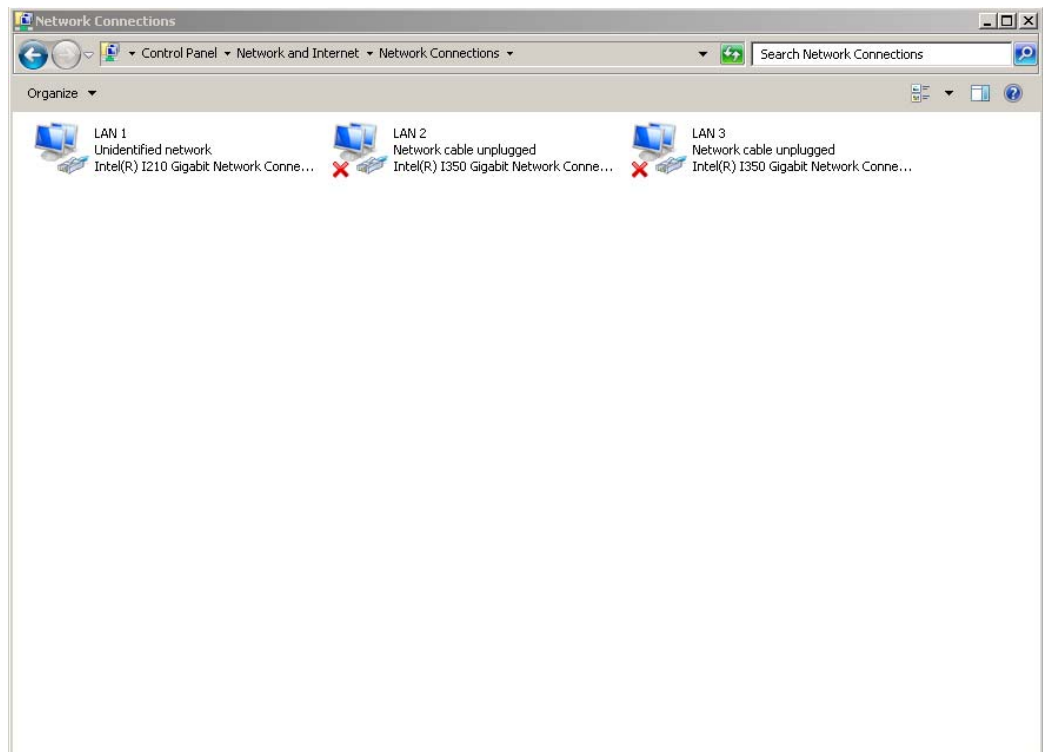


3. Select **View network status and task**:

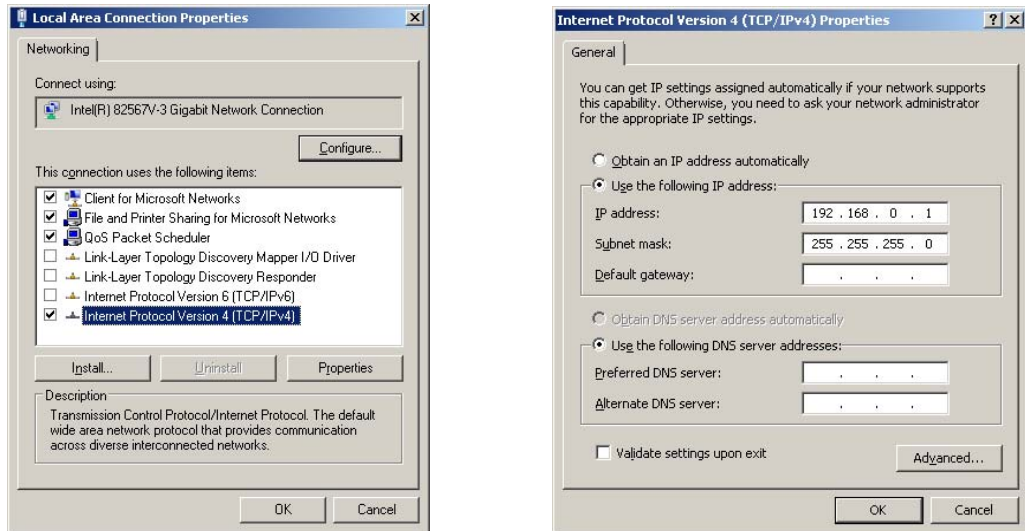


4. In the **Network and Sharing Center** window select **Change adapter settings**:**See also**

HomeGroup  
 Internet Options  
 Windows Firewall

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)**

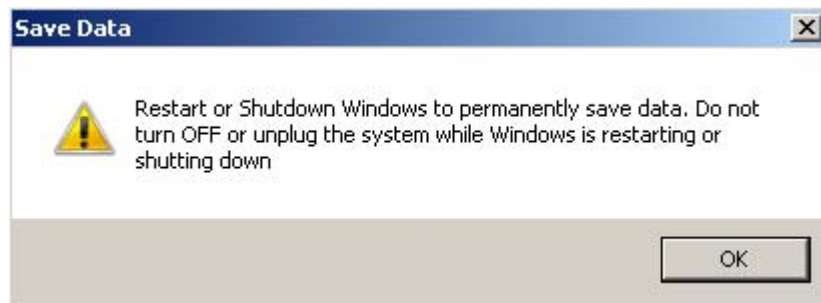
- In the **Internet Protocol Version 4 (TCP/IPv4) Properties** you can change the IP address and configuration:



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



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



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



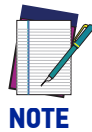
**DO NOT turn OFF or UNPLUG the laser marker while Windows® is shutting down.**

- WAIT** until operating system shuts down automatically (black screen)
- Power off the laser marker to complete installation



# CHANGE THE VIDEO SETTING

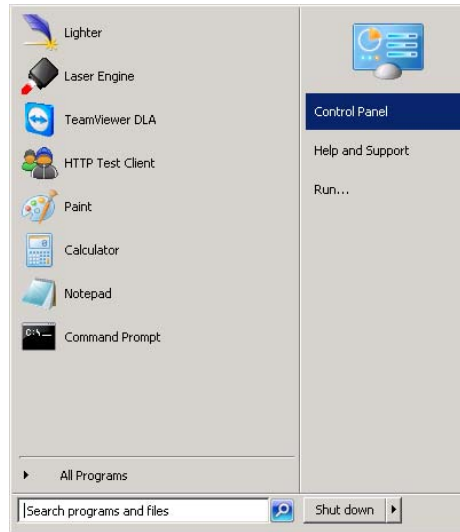
The operating system allows you to change the Video setting.



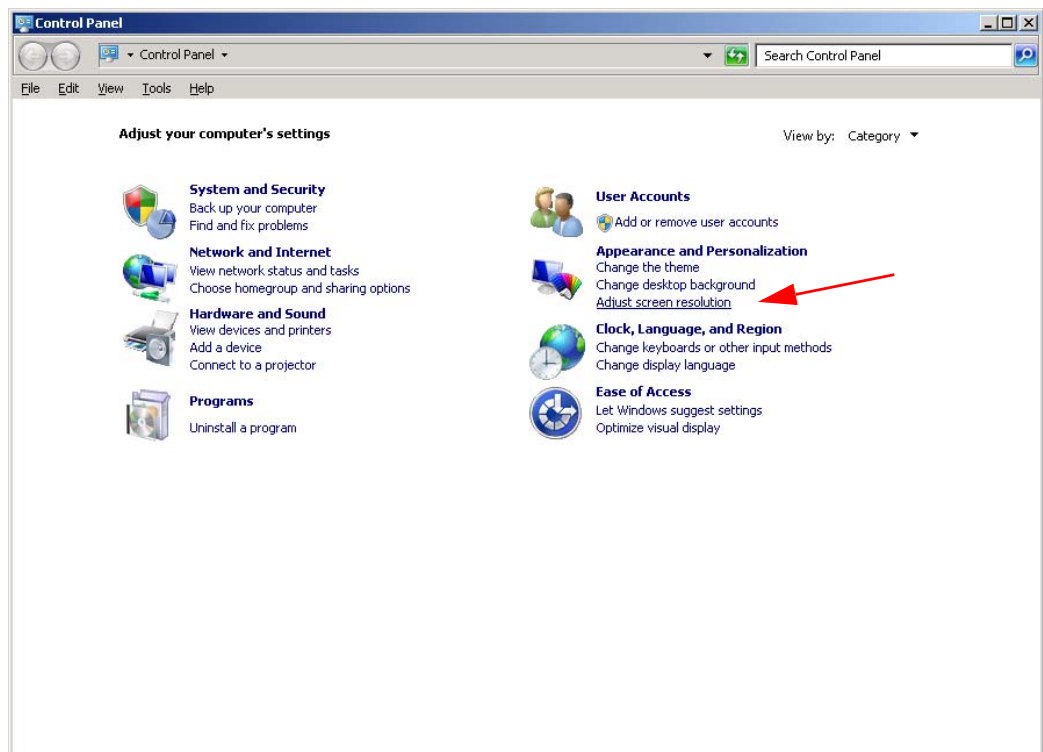
## NOTE

**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 55).**

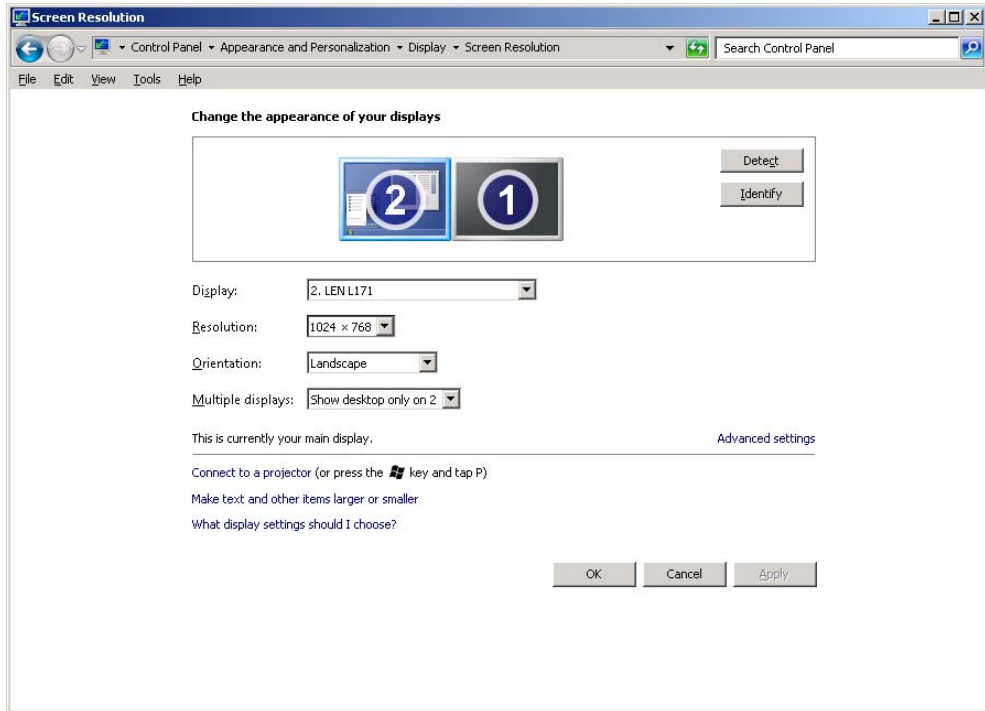
1. Turn OFF and ON the laser marker and wait until booting-up finishes (the status LED on the rack and on the scan head must be steady green)
2. From the main window click on **Start > Control Panel**



3. Select **Adjust screen resolution**:



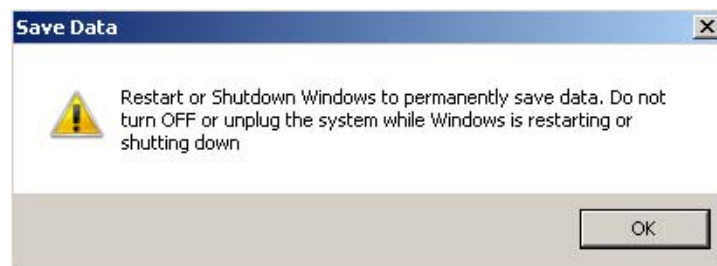
- In the **Screen Resolution** window select the desired Screen resolution and Color quality:



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



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



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



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

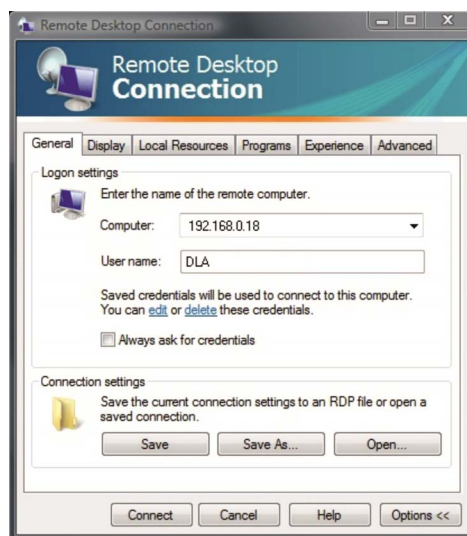
**CAUTION**

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

### 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

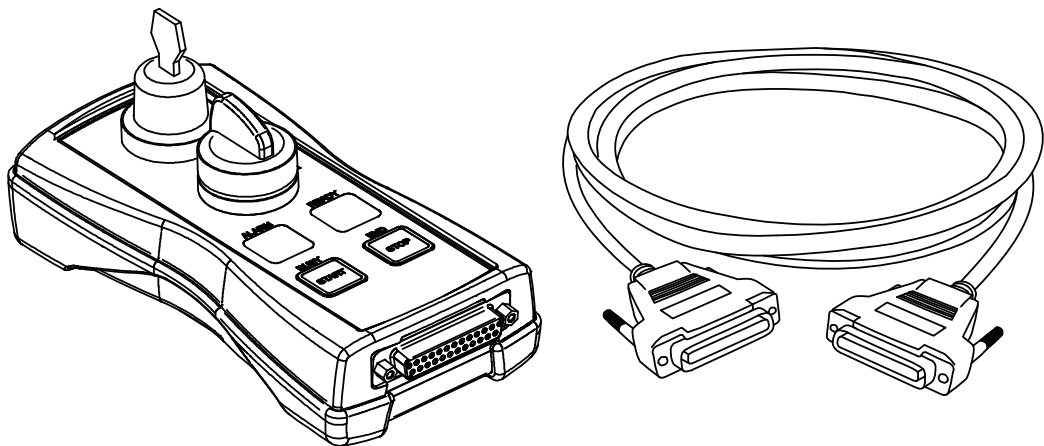


Figure 1: Control Box (ordering no: 985330031).



**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.

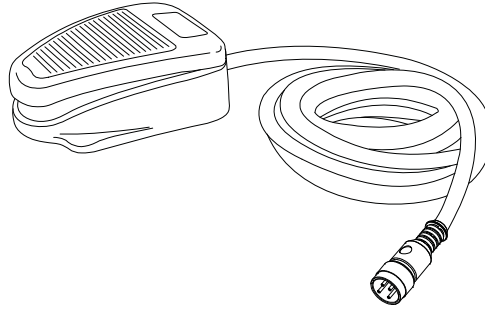


Figure 2: Remote Start Foot Switch (ordering no: 985350035)



**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

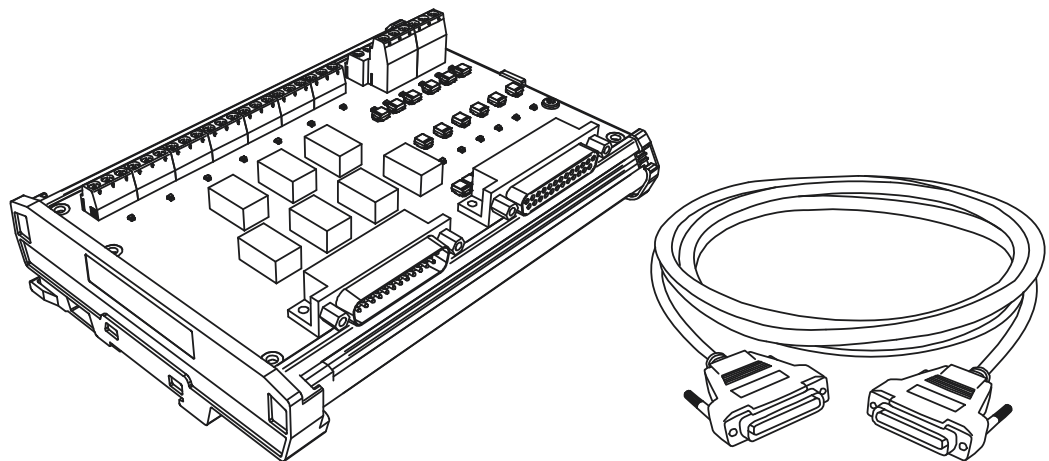


Figure 3: I/O interface (ordering no: 985330032)



**NOTE**

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

## DB25-TO-FREE LEADS CABLE

This accessory allows an easier integration of the laser marker: the Command Box connector signals are all available on the free leads side of the cable, labeled with cable tags.

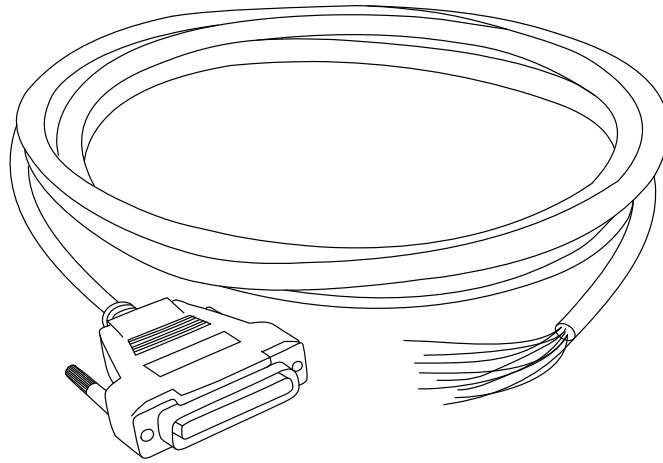


Figure 4: DB25-to-free leads cable (ordering no. 985350032)

## 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 AREX 400 includes:

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

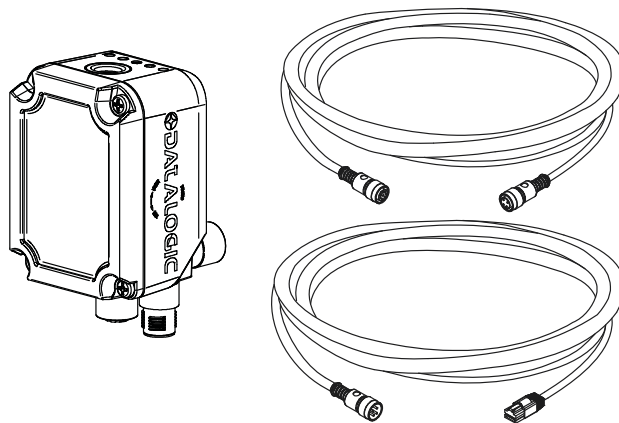


Figure 5: MARVIS™ Add-on for Arex™ 400 (ordering no: 937600124)



**NOTE**

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

## MARVIS™ Mounting Bracket

This accessory is used to properly fix the MATRIX™-N and the MARVIS™ LED Ring Light ID 50mm - White to the scan head in a MARVIS™ application (suitable for F160S and F254S F-Theta scan lens).

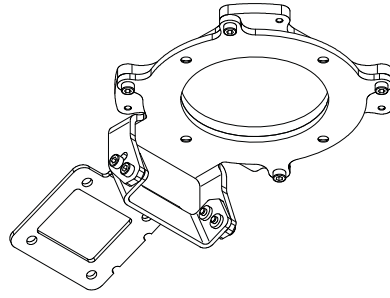


Figure 6: MARVIS™ Mounting Bracket (ordering no: 93ACC1916)

## 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).

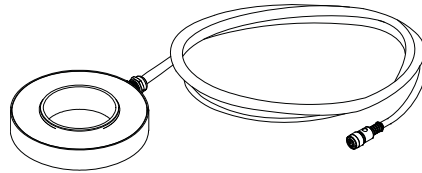


Figure 7: LED Ring Light ID (ordering no: 93A051394)

## MICROMETRIC DISTANCE SENSOR KIT

Automatically measure target position displacement from pre-setted focus position, and automatically drive the external (optional) Z-axis stage to the correct laser head position

- Simplified connectivity with dedicated Device Port 1
- KIT includes sensor, mounting brackets, wires and protective YAG filter

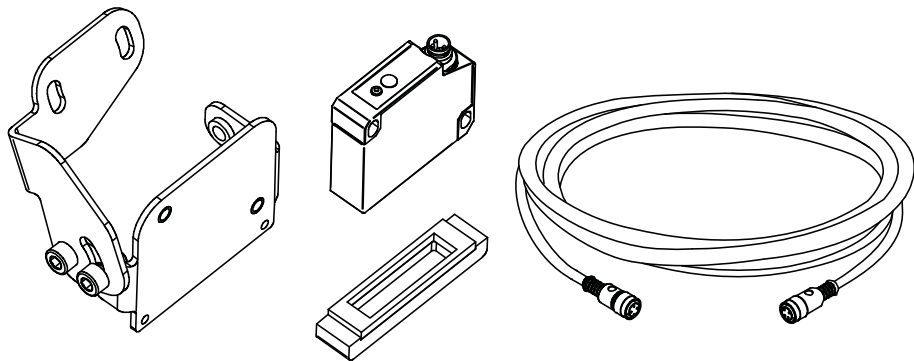


Figure 8: Distance sensor (ordering no: 985350037)



**NOTE**

Refer to Micrometric distance sensor kit instruction manual for more information.

## M39 F-THETA PROTECTIVE CAP

Easy to install, easy to replace; simplifies preventive/periodic maintenance cleaning operation on F-Theta scan lens and allow no-stop operations.

- Ensure complete IP64 protection
- Protect expensive lens from dust and scratches
- Suitable for 160S and 254S F-Theta scan lenses

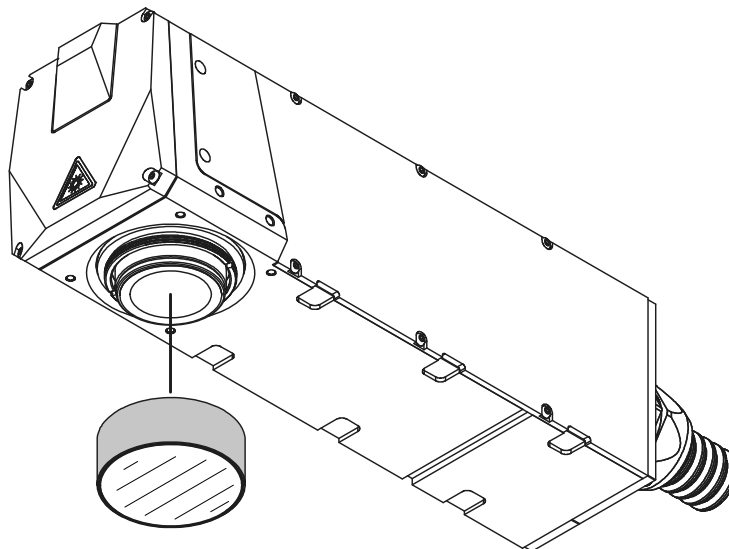


Figure 9: M39 F-Theta protective cap (ordering no. 985350038)



### NOTE

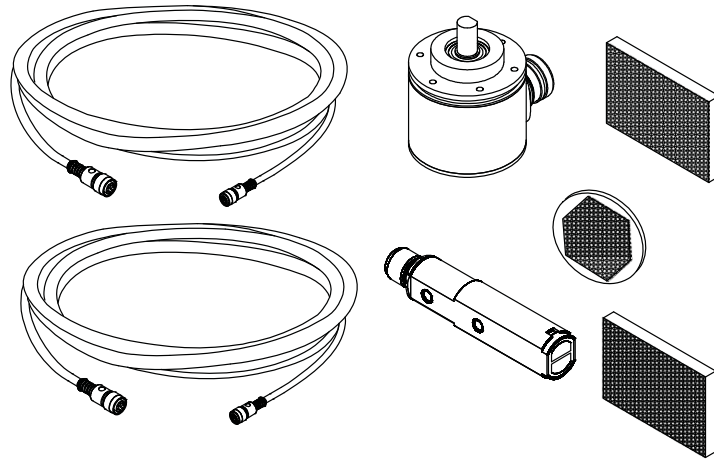
**The Protective Cap guarantees IP64 protection grade.**



## STARTER KIT FOR MARKING ON THE FLY (MOF)

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

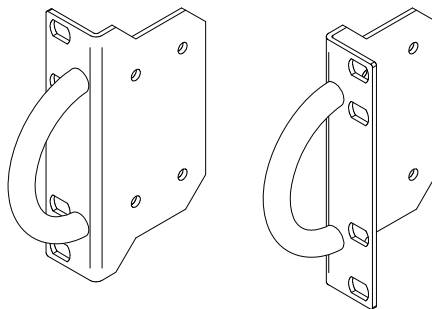
The Kit includes: encoder, photocell, cables and plastic reflectors.



**Figure 10: Kit MOF (ordering no: 985330027)**

## RACK HANDLES

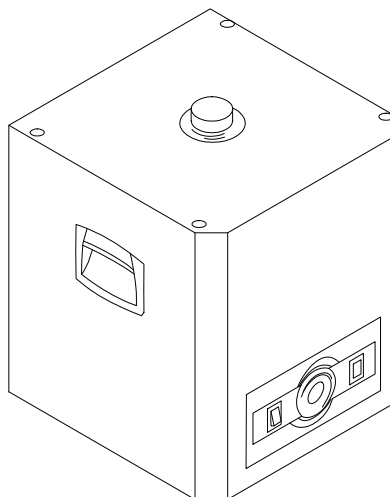
This accessory is used to easily fasten the control rack to the cabinet. The fixing brackets are equipped with handles for easier handling.



**Figure 11: Rack Handles (ordering no: 985350039)**

## 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 12: 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.



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



**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.**



**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.**



**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 scan head.**

**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.

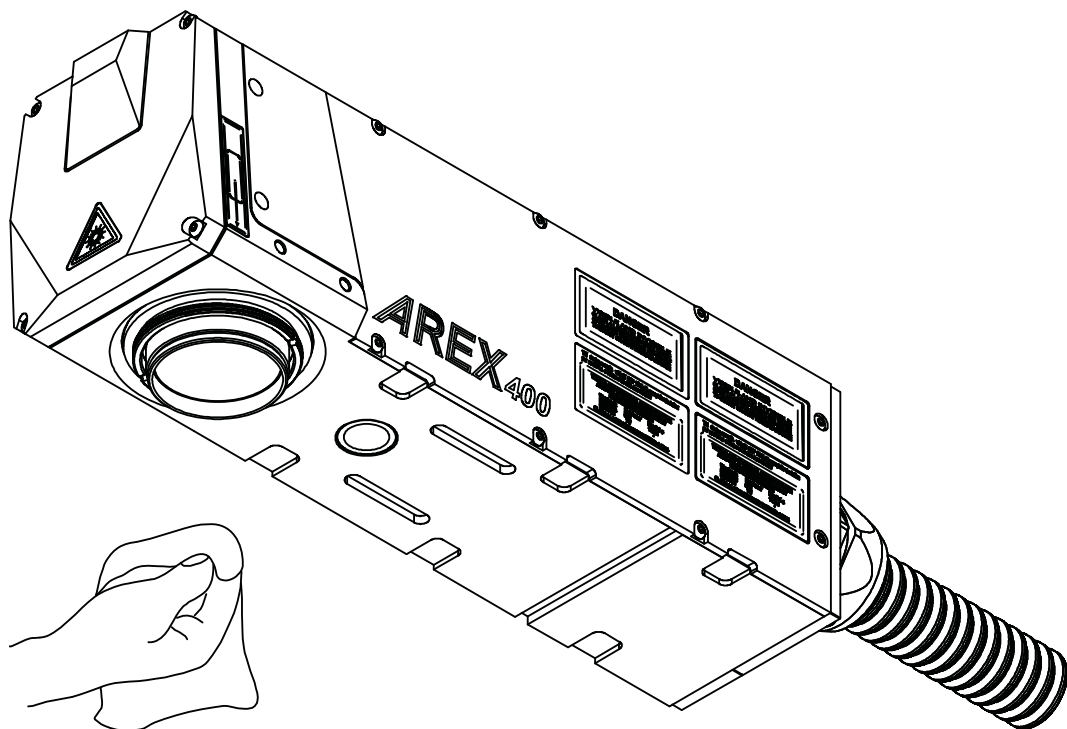
The following parts/functions have to be controlled periodically:

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)



**Disconnect AC power cable before starting any maintenance operations.**

## F-Theta scan lens cleaning procedure



**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

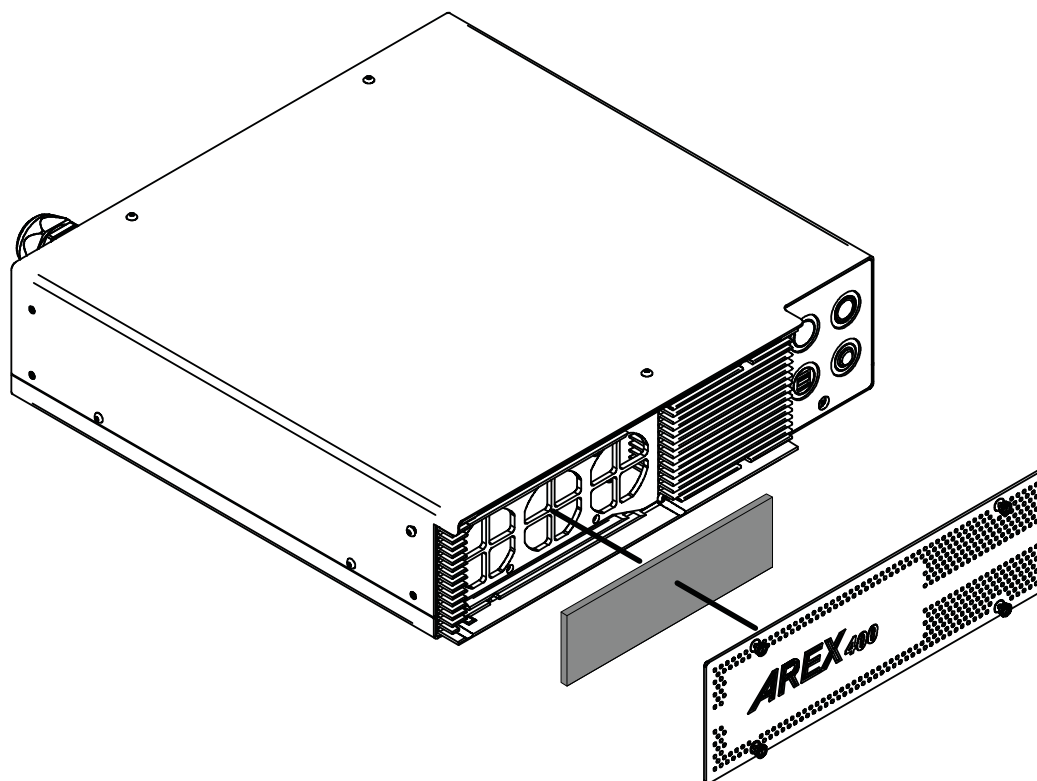


Figure 2: Removal of air filter

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



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



**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 vi).

### Service Interface

The laser marker is equipped with a Service Interface integrated in *Lighter™ Laser Configuration - Service* useful for service purpose.

The Service Interface provide the following information:

SYSTEM INFO	
INFO TYPE	DESCRIPTION
Serial Number	Laser marker serial number
FW revision	Shows the FW and HW revision (separated by dot) installed in the Laser Control Board
System Working Hours	Counter of the laser marker working hours expressed in hours and minutes
CPU Temperature	Shows the CPU temperature of the Laser Control Board
BOARD#1 Temperature	Shows the temperature measured by BOARD#1 sensor of the control rack
BOARD#2 Temperature	Shows the temperature measured by BOARD#2 sensor of the control rack
Scan Head Temperature	Shows the internal temperature of the Scan Head
ERROR TYPE	
System Temperature error	This counter is incremented every time the system temperature is out of the operating temperature range
Scan Head Temperature error	This counter is incremented every time the scan head temperature is out of the operating temperature range
Service Interface erro	This counter is incremented every time the service interface detect a MMC error

SAFETY INFO	
INFO TYPE	DESCRIPTION
Safety relay switching	Counter of the safety functions events. The safety functions events counter is incremented every time the INTERLOCK or LASER_STOP safety function are activated

LASER SOURCE INFO	
INFO TYPE	DESCRIPTION
Serial Number	Source serial number
Source Working Hour	Counter of the laser source working hours expressed in hours and minutes
Diode Working Hours	Counter of the source diode working hours expressed in hours and minutes. The counter starts to count every time the laser marker is in READY state

LASER SOURCE INFO	
<b>Temperature Error</b>	This counter is incremented every time the Laser source temperature is out of the operating temperature range
<b>Power Supply Error</b>	This counter is incremented every time the External supply voltage of the laser source is out of the specified range
<b>Back Reflection Error</b>	This counter is incremented every time the laser source detect an high optical power reflected back to the laser
<b>Generic Error</b>	This counter is incremented every time the laser source detects an internal failure

BACKUP AND RESTORE SERVICE DATA	
INFO TYPE	DESCRIPTION
<b>Backup button</b>	The BACKUP button shall be used to save the actual service data in a XML file

## List of warning and error states

STATUS LED	DESCRIPTION		ACTION	OUTPUT STATE COMMAND BOX CONNECTOR	
<b>Blinking ORANGE</b>	Warning invalid start sequence	Incorrect turning-on sequence	Set Key Switch to “0” and repeat the turning-on sequence. See “Turning On sequence” on page 61	SYSTEM_ALARM POWER_ON ENABLE_OUT	OFF OFF OFF
<b>Blinking RED</b>	System Error	Interlock error	- Check Safety Circuit connector signals (see “Safety Circuit” on page 32) - Check Safety Circuit connector presence	SYSTEM_ALARM POWER_ON ENABLE_OUT	ON OFF OFF
		Connector Presence error	- Check if Command Box connector is present - Check CONNECTOR_PRESENCE input signal of the Command Box connector (see “Command Box (Laser Control)” on page 35)		
		Rack Temperature error	Check the temperature of the environment where the control rack is placed. The temperature must not exceed the operative limit		
		Scan Head Temperature error	Check the temperature of the environment where the scan head is placed. The temperature must not exceed the operative limit		
		Scan Head Connection error	Contact Datalogic Technical Support		
		Source Temperature error	Check the temperature of the environment where the control rack is placed. The temperature must not exceed the operative limit		
		Source generic error	Contact Datalogic Technical Support		
		Source Power Supply error	Contact Datalogic Technical Support		
		Incorrect Firmware version error	Contact Datalogic Technical Support		
		Back reflection error	Check the reflectance of the material to be marked. Marking on high reflective material could damage the laser source.		



## 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 “Recover the laser marker” on page 132)
Laser marker never goes to READY state	Steady ORANGE	Key Switch selector in wrong position	Check the Key Switch is set to LASER ON (see “Turning On sequence” on page 61)
		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)
		LASER_STOP signals is active	Check LASER_STOP_A and LASER_STOP_B input signals on the Safety Circuit connector are both closed to GND
Laser marker never goes to STANDBY SHUTTER CLOSED state	Steady GREEN	Key Switch selector in wrong position	Check the Key Switch is set to STANDBY (see “Turning On sequence” on page 61)
		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 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
	SWITCH of power supply 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 84
	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	<ul style="list-style-type: none"> <li>- 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)</li> <li>- Use Lighter™ System Test to check external START_MARKING and STOP_MARKING signals</li> </ul>
	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 the START MARKING button on the frontal rack Console	STOP_MARKING signal is active	Check that the STOP_MARKING signal on the Command Box connector is not set to HIGH level (see "Command Box (Laser Control)" on page 35)
	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	<ul style="list-style-type: none"> <li>- Use the Laser Engine MOF wizard to setup the laser marker (refers to Lighter™ User's Manual)</li> <li>- Check that the MOF MODE is enabled (refers to Lighter™ User's Manual)</li> </ul>
	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	<ul style="list-style-type: none"> <li>- Check that the encoder is compatible with the laser marker (see "Encoder" on page 38)</li> <li>- Check that the encoder is working using Laser Engine MOF wizard (refers to Lighter™ User's Manual)</li> </ul>
	Incorrect photocell type or connection	<ul style="list-style-type: none"> <li>- Check that the photocell is compatible with the laser marker</li> <li>- Check that the photocell is working using Laser Engine MOF wizard (refers to Lighter™ User's Manual)</li> </ul>
	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
	Aiming Beam Standby time expired	The laser marker is provided with a system that prevent diode wear turning of the diode when the Aiming Beam Standby time expired. Change laser marker state to reset the Standby time
	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) <ul style="list-style-type: none"> <li>• OFF: always OFF</li> <li>• AUTOMATIC: active only in STANDBY SHUTTER CLOSED state</li> <li>• SMART: active only on request</li> </ul>		
Red Focusing Beam not visible	The focusing beam output window is obstructed	Check that the focusing beam output window is not obstructed
	Laser marker is not in the correct state	Check that the laser marker state is coherent with the FOCUSING BEAM TYPE property in Laser Engine Configuration "LASER" (refers to Lighter™ User's Manual)
	Incorrect Focusing Beam setting	Check FOCUSING BEAM TYPE property in Laser Engine Configuration "LASER" (refers to Lighter™ User's Manual) <ul style="list-style-type: none"> <li>• OFF: always OFF</li> <li>• AUTOMATIC: active only during STANDBY SHUTTER CLOSED state</li> </ul>
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 56
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 (scan head) for Arex™ A20-X6X models (*)
	Laser Label (scan head) for Arex™ 110-XXX/120-XXX/130-X6X and 150-X6X models (*)
	Aperture Label
	Label for non-interlock protective housing
	Caution, possibility of electric shock
	USB port
	MAC Address for XXX-X5X models
	MAC Address for XXX-X6X models

LABEL	DESCRIPTION
0 - STAND BY - POWER ON	STAND BY / POWER ON positions
COMMAND BOX	Command Box connector
AXES (I/O)	Control Axes connector
SAFETY CIRCUIT	Safety Circuit connector
LAN	LAN port (LAN2 - LAN3 only for XXX-X6X models)
RS232	RS232 port
VGA	VGA port
PHOTOCELL	Photocell connector
ENCODER	Encoder connector
DEVICE PORT 1	Device port 1
DEVICE PORT 2	Device port 2
EXT FOCUS	External focusing beam connector
 2xT5A	Fuses T5A (110-120-A20 models)
 2xT6.3A	Fuses T6.3A (130-150 models)

(\*) 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:

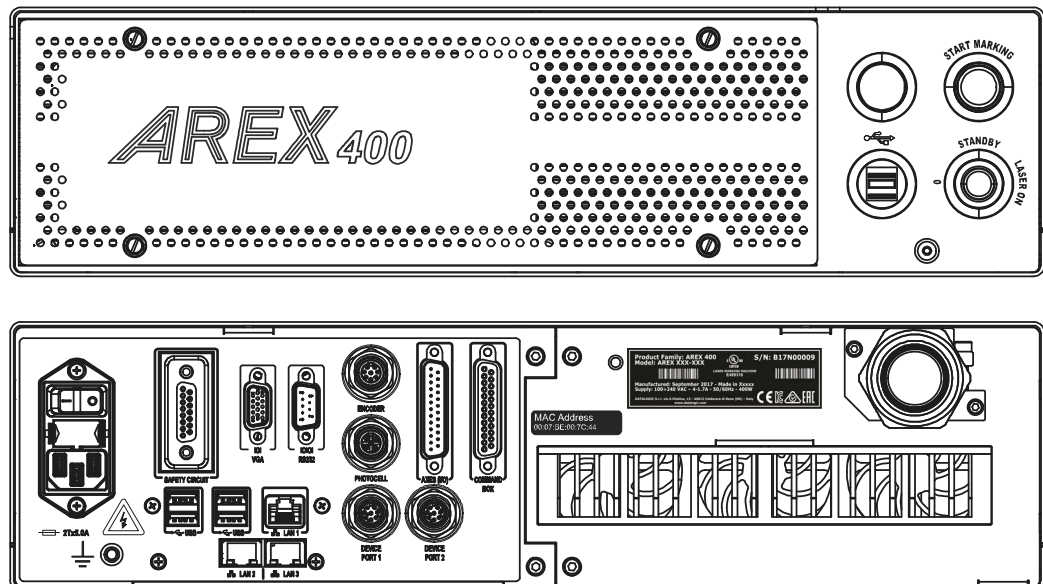


Figure 1: External labels rack location

## Positioning of labels on the scan head:

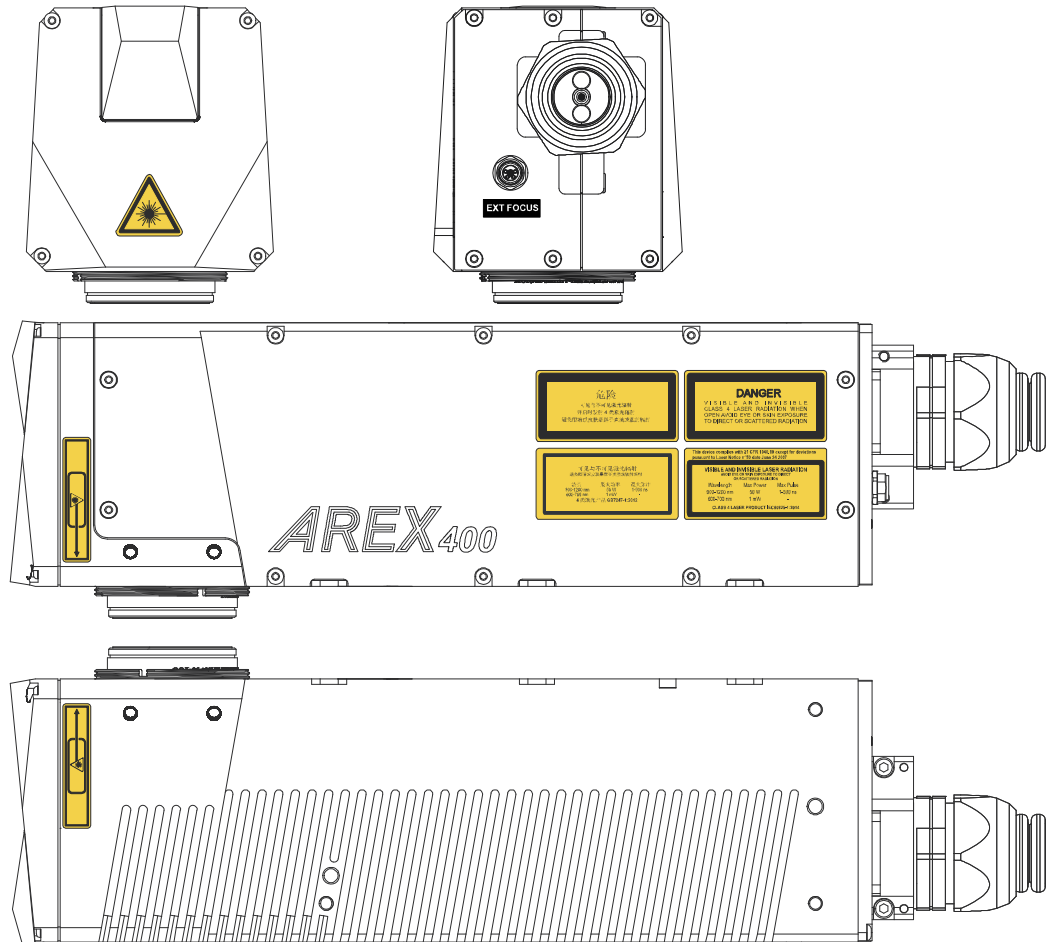


Figure 2: External labels Scan Head location

## SAFETY LABELS IN LOCAL LANGUAGES

The laser marker is provided by default with laser labels and labels for non-interlock protective housing in Chinese and English language already attached to the product.

Additional labels in French, Swedish, German, Italian, Spanish and Korean languages are provided with the laser marker.

**WARNING:** Be sure to attach the labels in a language understandable to operators in the locations shown in the figure:

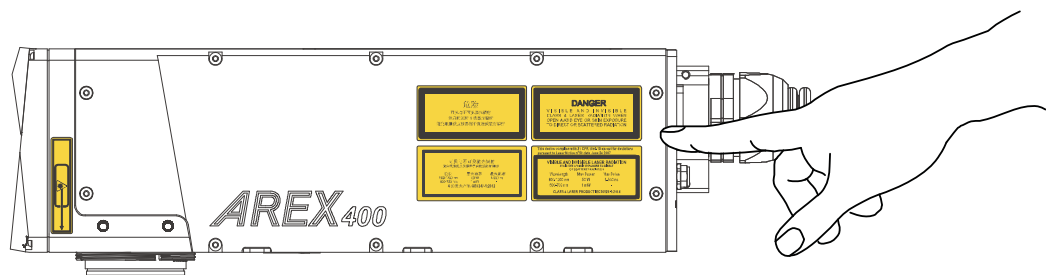


Figure 3: Safety labels replacement


# APPENDIX B

## UNDERSTANDING SLO: SAFE LASER OFF SAFETY CONSIDERATIONS ACCORDING TO EN ISO 13849-1:2008

---

### MACHINE SAFETY

The European Community Directives establish that industrial machinery should not present a risk for workers and operators. The manufacturers should retain full responsibility for certifying the conformity of their machinery to the provisions of **Machine Directive**.

The **CE mark** (  ) is the only marking which guarantees that machinery conforms to the requirements of the Machine Directive.

The Machinery Directive 2006/42/EC compels machine manufacturers to meet a **minimum set of requirements** before a machine may be placed on the market, Annex I, of such directive, provides a **list of Safety Requirements** to which machinery must comply where relevant.

It is the responsibility of the final machine manufacturer to ensure that all the Safety Requirements are satisfied.

Several harmonized Standards have been published to support Manufacturers in Safety Requirements fulfillment.

For Laser Processing machine:

EN 60825-1

EN ISO 11553-1

The process that brings evidence that all potential machine hazard are addressed is the **risk assessment**.

### RISK ASSESSMENT

Core of the Machine Directive are “Risk Assessment” and “Risk Reduction” process.

EN ISO 12100:2010 is aimed to support manufacturers during Risk Assessment.

Machinery must be designed to be **operated, adjusted** and **maintained** without putting persons at risk when these operations are carried out.

Risk Assessment must also taking into account any **reasonably foreseeable misuse** of the system.



**RISK ASSESSMENT** is based on a clear understanding of the machine limits and functions and the tasks that may be required to be performed at the machine throughout its life.

During Risk Assessment all the **Hazards** must be **identified** and analyzed for all the possible tasks of the machine (such as maintenance or cleaning).

As an example, for a “Laser Processing Machine” the hazards list will include laser-related hazards like:

- Direct, scattered, diffused and indirect laser radiation
- Fumes, particles and vapors from target material
- Fire/explosion from target material

Refer to EN ISO 11553-1 for a complete list.

Each Hazard represent a risk of harm, and each **Risk** must be **estimated** and quantified in terms of:

- THE SEVERITY OF POTENTIAL INJURY
- THE PROBABILITY OF ITS OCCURRENCE

Once the Risk Estimation is completed, next step is the Risk Reduction.

The 2006/42/EC Directive provides a hierarchy of measures for eliminating the risk:

1. Inherently Safe Design: Eliminate/reduce risks as far as possible by machine design
2. **Additional Protection Devices:** Install safeguarding and protective measures in relation to risks that cannot be eliminated by design
3. Personal Protective Equipment and/or Training

In case of Protective Devices It will be necessary to ensure that access can only be gained while the machine is safe. Protective measures such as interlocked guard doors and/or trip systems will be required.

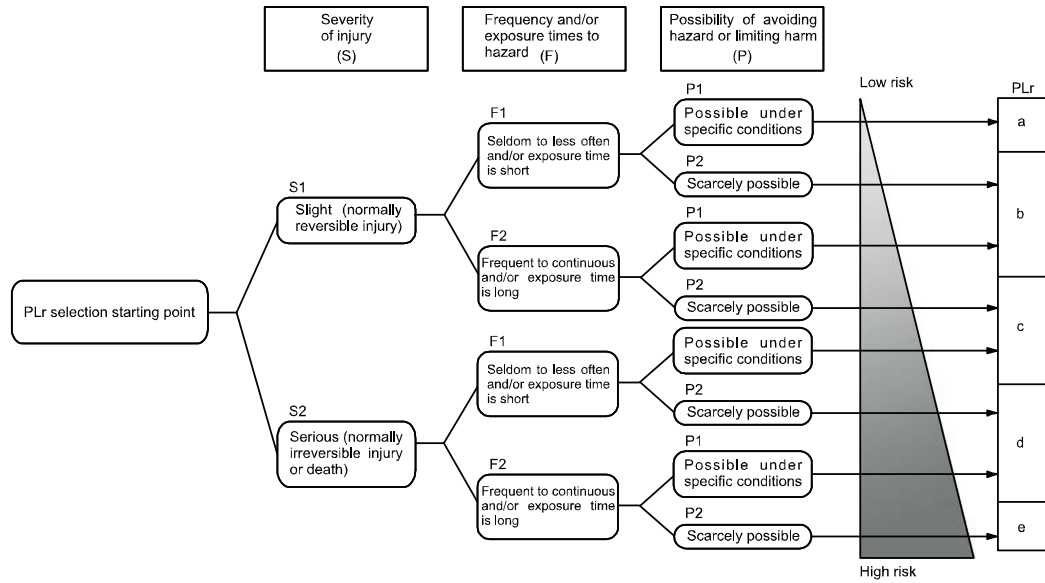
THERE is no ONE SINGLE SOLUTION TO SAFETY but a SYSTEMATIC PROCESS.

**RISK ASSESSMENT** based on a clear understanding of the machine limits and functions and the tasks that may be required to be performed at the machine throughout its life.

**RISK REDUCTION** is then performed if necessary and safety measures are selected based on the information derived from the risk assessment stage. The manner in which this is done is the basis of the SAFETY STRATEGY for the machine

## 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:



## DATALOGIC LASER MARKERS

The Machinery Directive 2006/42/UE, EN 13849-1 and EN ISO 11553-1 are NOT applicable to Datalogic Laser Markers.

Datalogic, in order to help customers in their approval process, as a voluntary act, has applied in its laser marker, where possible, some points of above mentioned regulations.

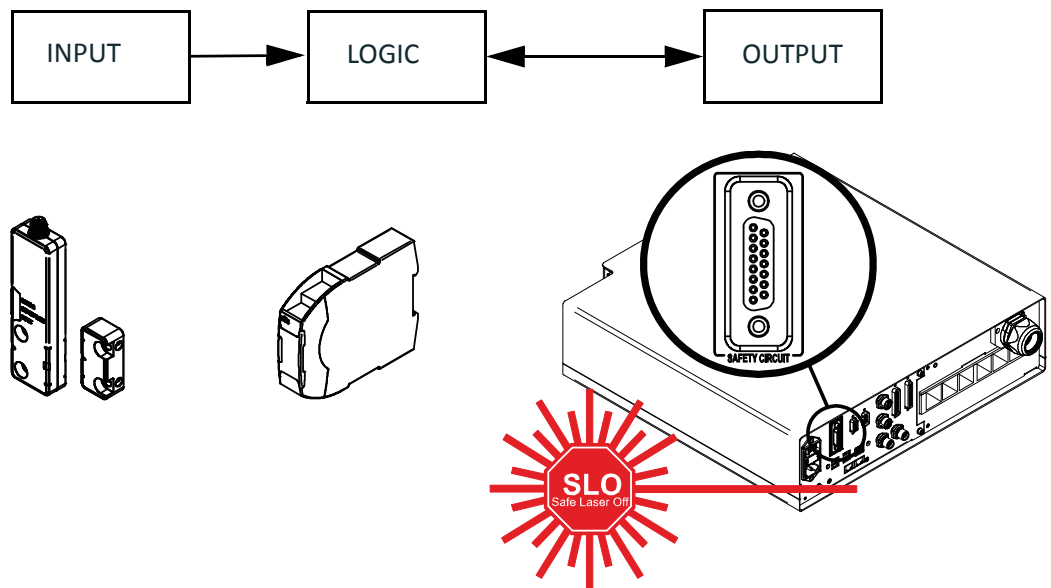
The examples of this appendix relate only to the features introduced in Arex™ XXX-X6X models to assist in the laser radiation risk reduction.



**Any other risks (mechanical, electrical, etc.) must always be evaluated and appropriate risk reduction measures taken where necessary.**

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

## SLO CONNECTION DIAGRAM



SLO is one of the components of the Protective System and Equipment.  
SLO is intended to be used in combination with safety PLC or safety relays.

# SAFETY FUNCTIONS OF AREX™ 400

## Arex™ XXX-X5X

SAFETY FUNCTION	PHYSICAL INTERFACE	
<b>SF.1: Enable</b> no laser emission if "EXT_ENABLE_A or "EXT_ENABLE_B" signals are disabled, where "disabled" means contacts open	Command Box connector (Sub-D 25 F type)	Number of Channels: 1 Category: B MTTFd: 3 to 10 years Continuous operation: yes Reaction Time: 50 ms IP degree: IP31
<b>SF.2: Interlock</b> No laser output if "INTERLOCK_A" is disabled, where "disabled" means contacts open. This SF complies with IEC 60825-1_2014	Safety Circuit connector (Sub-D 15 F type)	Number of Channels: 1 Category: 1 MTTFd: 32876 years DC Coverage: up to 99% Continuous operation: yes Reaction Time (Class IV to Class I): 420 ms Reaction Time (Class I to Class IV): 520 ms IP degree: IP31
<b>SF.3: Laser Stop</b> no laser output if "LASER_STOP_A" is disabled, where "disabled" means contacts open	Safety Circuit connector (Sub-D 15 F type)	Number of Channels: 1 Category: 1 MTTFd: 161 years DC Coverage: up to 99% Continuous operation: yes Reaction Time (Class IV to Class I): 420 ms Reaction Time (Class I to Class IV): 520 ms IP degree: IP31 Supplementary condition: the marking is not in progress

## Arex™ XXX-X6X

SAFETY FUNCTION	PHYSICAL INTERFACE	
<b>SF.1: Enable</b> no laser emission if "EXT_ENABLE_A or "EXT_ENABLE_B" signals are disabled, where "disabled" means contacts open	Command Box connector (Sub-D 25 F type)	Number of Channels: 1 Category: B MTTFd: 3 to 10 years Continuous operation: yes Reaction Time: 50 ms IP degree: IP31
<b>SF.2: Interlock</b> No laser output if "INTERLOCK_A" or "INTERLOCK_B" signals are disabled, where "disabled" means contacts open. This SF complies with IEC 60825-1_2014	Safety Circuit connector (Sub-D 15 F type)	Number of Channels: 2 Category: 3 MTTFd: 32876 years (each channel) DC Coverage: up to 99% Continuous operation: yes Reaction Time (Class IV to Class I): 420 ms Reaction Time (Class I to Class IV): 520 ms IP degree: IP54
<b>SF.3: Laser Stop</b> no laser output if "LASER_STOP_A" or "LASER_STOP_B" signals are disabled, where "disabled" means contacts open	Safety Circuit connector (Sub-D 15 F type)	Number of Channels: 2 Category: 3 MTTFd: 161 years (each channel) DC Coverage: up to 99% Continuous operation: yes Reaction Time (Class IV to Class I): 420 ms Reaction Time (Class I to Class IV): 520 ms IP degree: IP54 Supplementary condition: the marking is not in progress

## Example 1

Risk Analysis of a fully automatic laser processing machine that operates only when protection system is disengaged.

- Operative cycle: 500 pcs/hour, 3 shifts (8h/shift) 350 days/year
- Dedicated enclosures prevent laser emission also during parts loading/unloading
- An interlocked door is dedicated to **maintenance and cleaning**
- Maintenance technicians are **SKILLED** on laser risks and have specific **DPI**
- In case of access line is stopped and restarted

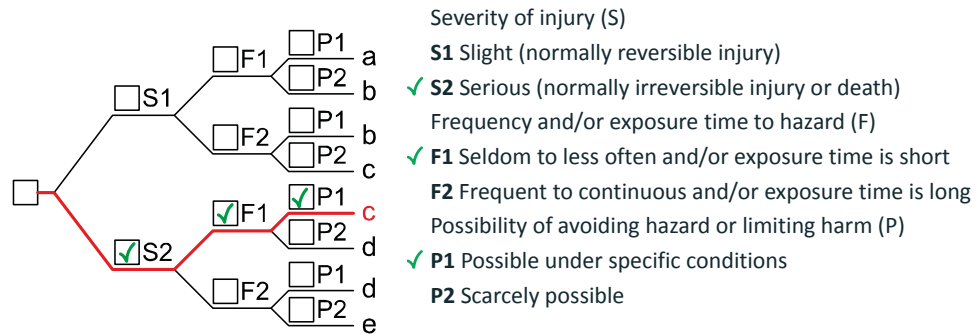
**LASER RISK ASSESSMENT:** HAZARD, direct and scattered laser radiation:

- RISK SEVERITY: SEVERE (irreversible eye damage)
- RISK FREQUENCY: **RARE** (1/month for maintenance)
- AVOIDANCE PROBABILITY: **POSSIBLE** (with DPI)

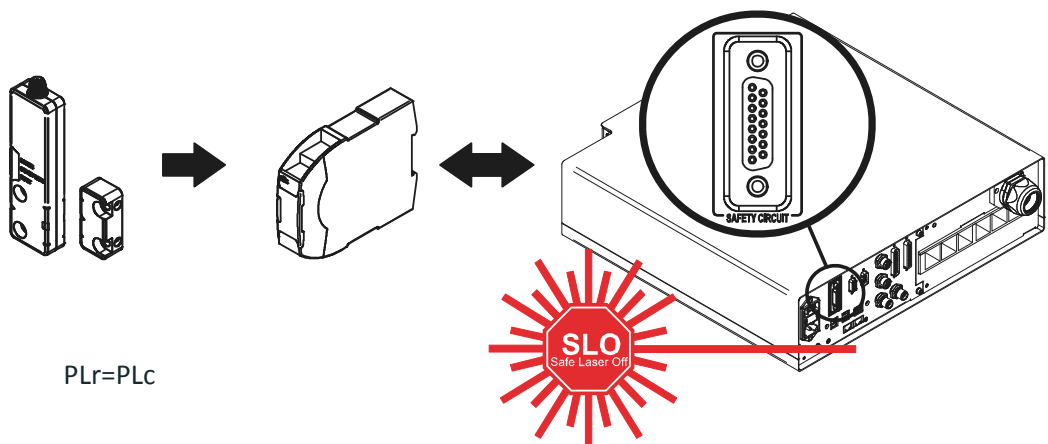
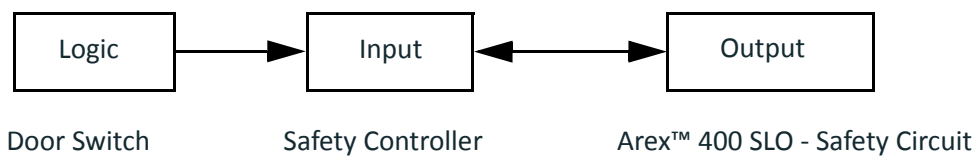
**RISK REDUCTION:** INTERLOCKED DOOR

Estimation of PLr for door interlock safety function

- SEVERITY: SEVERE **S2**
- FREQUENCY: SELDOM **F1**
- POSSIBILITY OF AVOIDING HAZARD: POSSIBLE **P1**



PLr = PLc



Restart: manual reset

## Example 2

Risk Analysis of a fully automatic laser processing machine that operates only when protection system is disengaged.

- Operative cycle: 500 pcs/hour, 3 shifts (8h/shift) 350 days /year
- Dedicated enclosures prevent laser emission also during parts loading / unloading
- An interlocked door is dedicated to **maintenance and blockage recovery**
- Operator are **NOT SKILLED** on laser risks and do **NOT** have **DPI**
- In case of access line is stopped and restarted

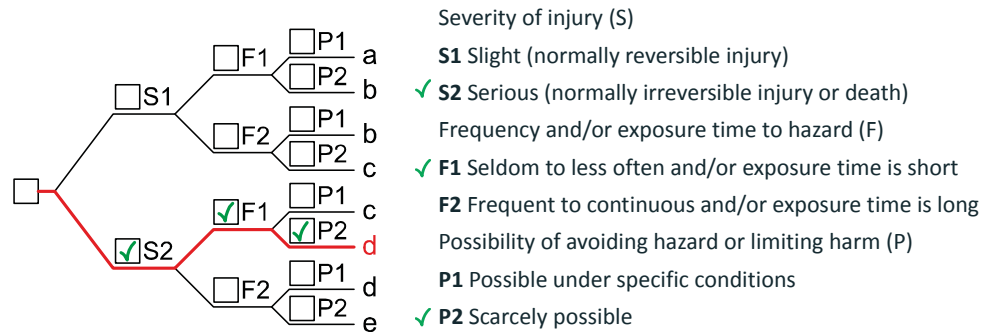
**LASER RISK ASSESSMENT:** HAZARD, direct scattered laser radiation:

- RISK SEVERITY: SEVERE (irreversible eye damage)
- RISK FREQUENCY: **SELDOM** (1/week)
- AVOIDANCE PROBABILITY: **NOT POSSIBLE**

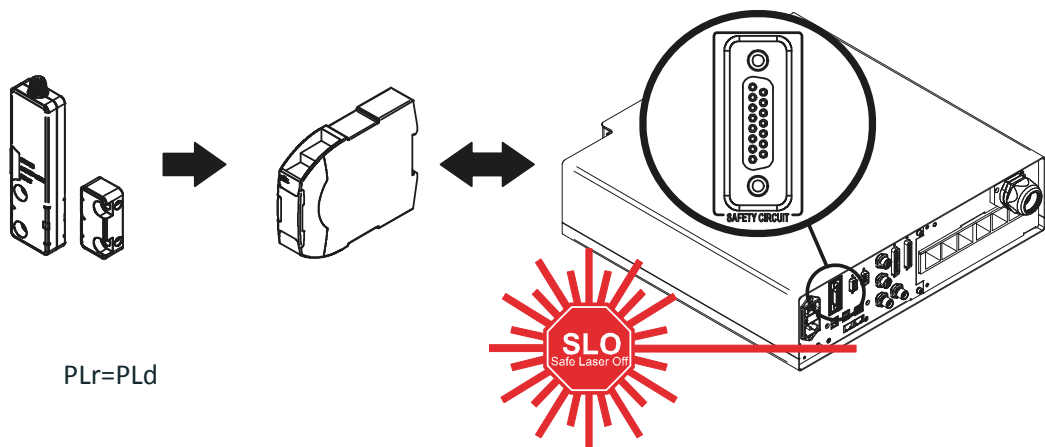
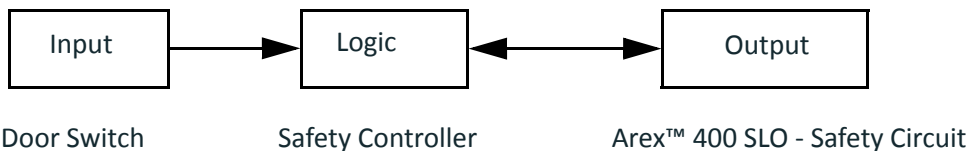
**RISK REDUCTION:** INTELOCKED DOOR

Estimation of PLr for door interlock safety function

- SEVERITY: SEVERE **S2**
- FREQUENCY: SELDOM **F1**
- POSSIBILITY OF AVOIDING HAZARD: NOT POSSIBLE **P2**



PLr = PLd



PLr=PLd

Restart: manual reset

## Example 3

Risk Analysis of a manual loading laser processing machine.

- Operative cycle: 500 pcs/hour, 1 shift (8h/shift) 250 days /year
- Dedicated enclosures prevent laser emission during laser processing
- An interlocked door is dedicated to **part loading**
- Operator are **NOT SKILLED** on laser risks and do **NOT** have **DPI**
- In case of access to marking area, laser is disabled, system is not stopped

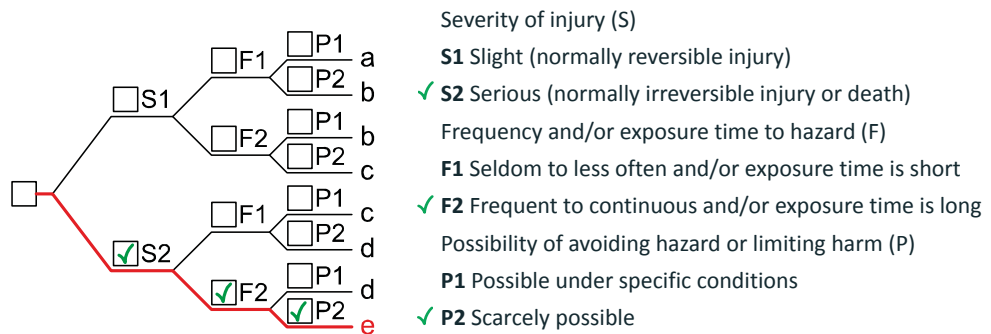
**LASER RISK ASSESSMENT:** HAZARD, direct scattered laser radiation

- RISK SEVERITY: SEVERE (irreversible eye damage)
- RISK FREQUENCY: **FREQUENT** (1/minute)
- AVOIDANCE PROBABILITY: **NOT POSSIBLE**

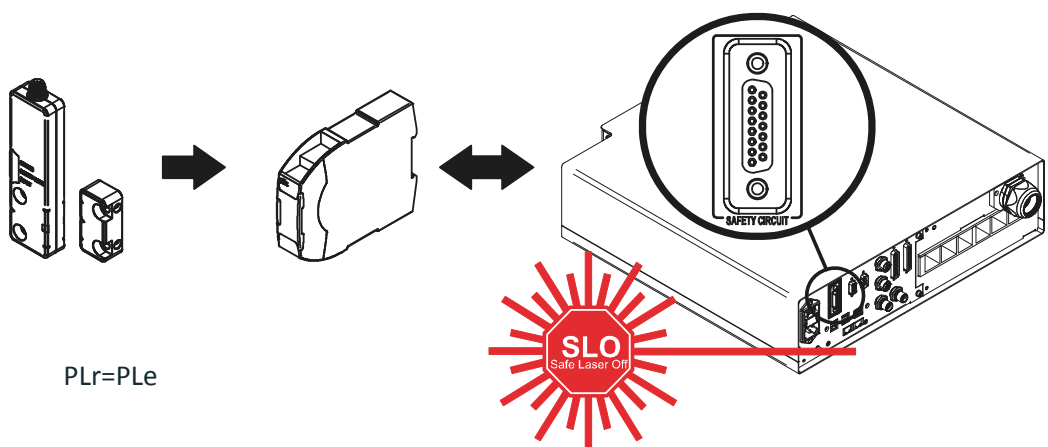
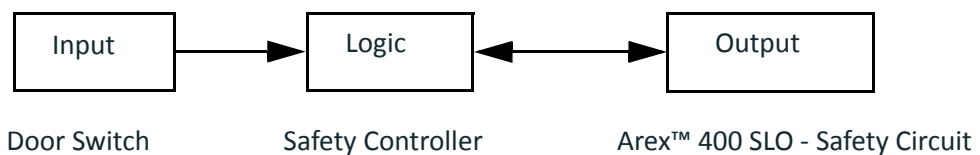
**RISK REDUCTION:** INTELOCKED DOOR

Estimation of PLr for door interlock safety function

- SEVERITY: SEVERE **S2**
- FREQUENCY: FREQUENT **F2**
- POSSIBILITY OF AVOIDING HAZARD: NOT POSSIBLE **P2**



$PLr = PLe$



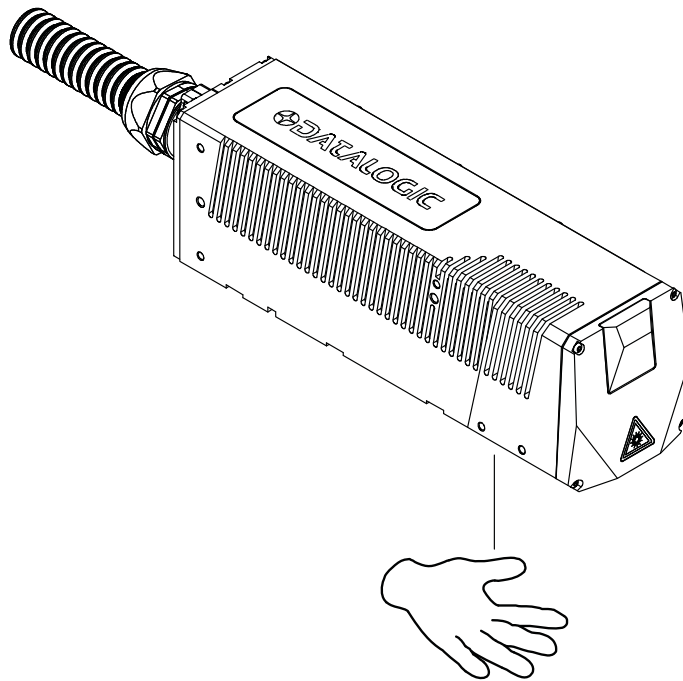
Restart: automatic

# APPENDIX C

## LASER SAFETY

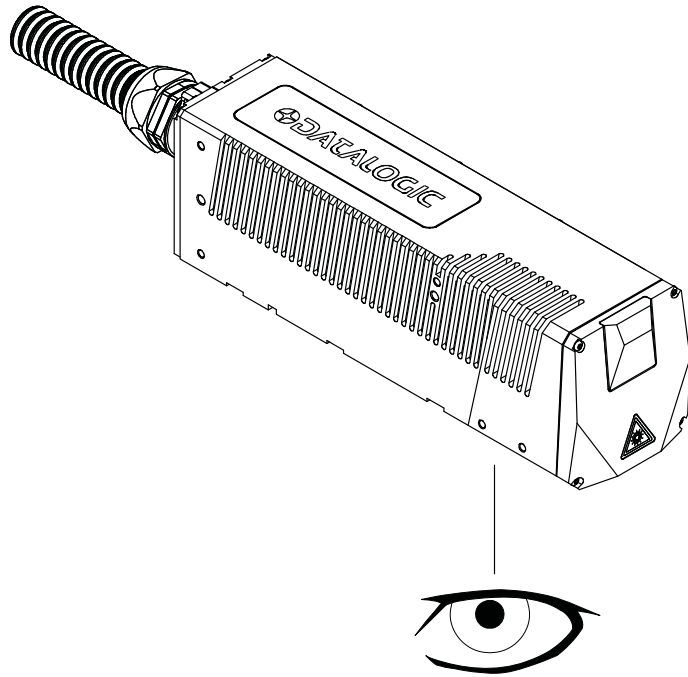
---

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



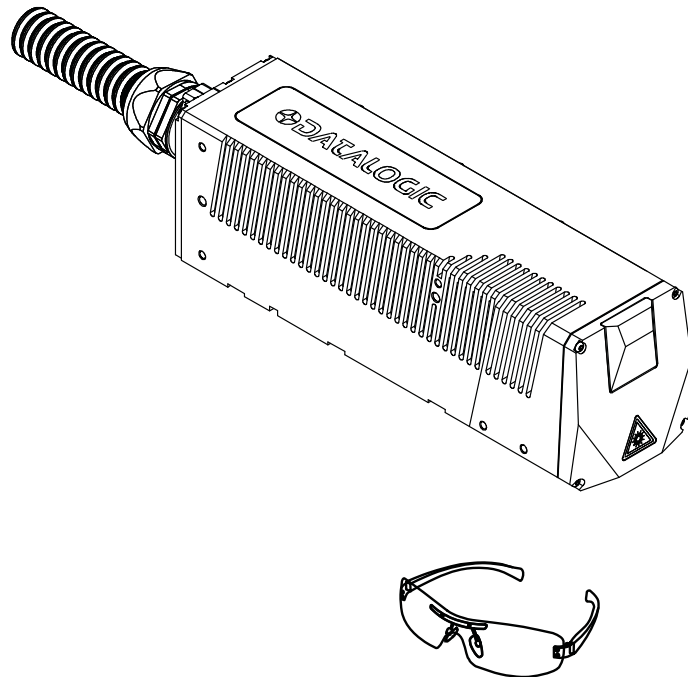
**It is crucial that you protect yourself against beams of reflected or direct light as they cause permanent damage to your skin.**





**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 form of electromagnetic emission in the wavelength range from the ultraviolet (e.g. from excimer lasers), through visible (e.g. HeNe or Argon lasers) and near infrared (e.g. Yb Doped Fiber and ND:YAG DPSS lasers) up to long infrared (e.g. CO2 lasers). It should be considered as non-ionizing Radiation.

In the Arex™ 400 laser marker, the laser radiation emission, at near 1 micron wavelength range, is obtained through a diode optical pumping of an Yb doped rare earth doped pulsed fiber laser. Depending on the model, the laser is a standard Q-switch or Fiber MOPA fiber laser system installed at the control rack. The laser optical radiation is delivered to the scan head through an armored fiber cable (inside the Head cable), and an isolated beam delivery optical system (IBDO). The laser beam exiting the IBDO is a collimated laser beam that is then processed inside the Scan Head through an optical scan system and F-Theta scan lens to scan and focus the laser beam at the marking plane.

The radiation of the Arex™ 400 laser marker is therefore invisible to human eye and thus not blocked by the natural pupil reflex and can result in severe damage to human eye and skin.

**WARNING**

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

Arex™ 400 laser markers are classified Class 4 according to applicable norms. This means that the laser radiation level emitted by these laser markers is dangerous even when not directly exposed to the laser beam. Partial reflected laser beam or scattered laser radiation surfaces can cause damage to human eye and skin. It is therefore mandatory that customer apply all applicable regulatory safety protection measures when integrating these laser markers into their machines including, but not limiting, to individual operator protection devices such as protective eye goggles, etc.

**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 from laser radiation output aperture.**

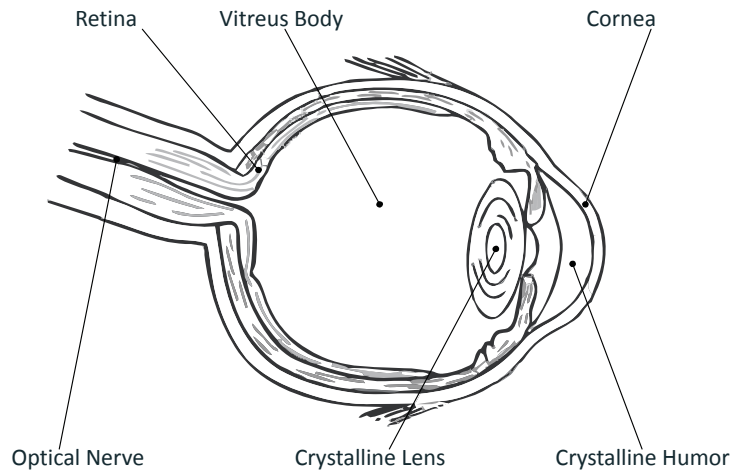
**WARNING**

**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 absorb 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 allow most of the radiation within the wavelength range of 400nm to 1400nm to pass and reach the retina (where are the vision sensors). This range includes the visible light as well as a near-infrared. The Arex™ 400 laser markers emit in the 1060nm range and thus can be focused by the eye lens at retina with serious risk of causing irreversible damage to vision sensors.

Regarding human skin, the tissue absorption 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 10 $\mu$ m), 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 Arex™ 400 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 scan head 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.



**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.**



**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 Cable Head, that connect control rack with scan head 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.



**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.



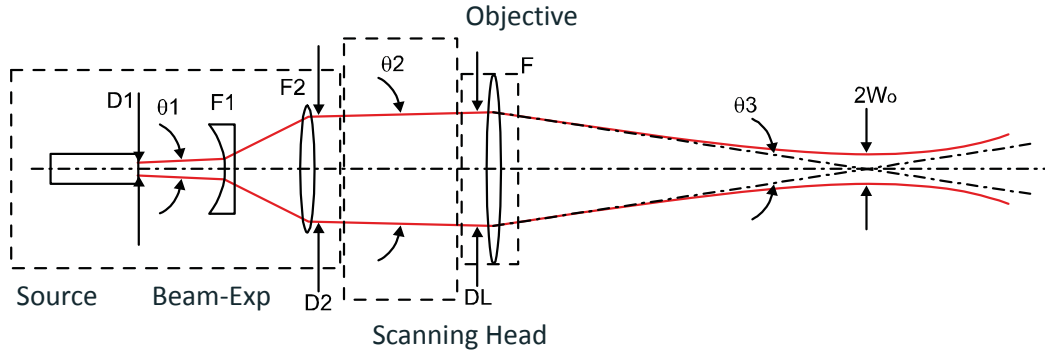
**Always use certified protecting goggles appropriated for the laser radiation characteristics to which you can be exposed.**



**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	1070 nm ( $\pm 10$ nm) 1065 nm ( $\pm 15$ nm) for Arex™ A20-X6X 1120 nm (Raman emission)
Laser Type		Q-Switched fiber laser MOPA fiber laser for Arex™ A20-X6X
Observation type		Direct radiation
Pulse energy		1 mJ @ 10 kHz for Arex™ 110-XXX 1 mJ @ 20 kHz for Arex™ 120-XXX 1 mJ @ 30 kHz for Arex™ 130-X6X 1 mJ @ 50 kHz for Arex™ 150-X6X 0.75 mJ @ 30 kHz for Arex™ A20-X6X
Pulse duration		100 ns 250 ns for Arex™ A20-X6X
Beam Diameter at F-Theta lens exit	DL	~ 6.0 mm
Beam divergence on the lens	$\theta_2$	0.8 mrad
Focal of the F-Theta lens	F	160 mm
Real divergence after the lens	$\theta_3$	31.2 mrad
Exposure time		10 s
Max beam scanning angle		$\pm 20^\circ$ each axis

## 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 Arex™ 400 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)
Arex™ 110-XXX	18.8 m	> 4.74
Arex™ 120-XXX	26.5 m	> 4.04
Arex™ 130-X6X	31.6 m	> 4.19
Arex™ 150-X6X	40.8 m	> 4.41
Arex™ A20-X6X	52.5 m	> 4.51

## 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 scan head.**

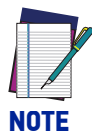
**Datalogic shall not be held liable for any damage caused by inadequate work from non-authorized personnel.**



# APPENDIX D

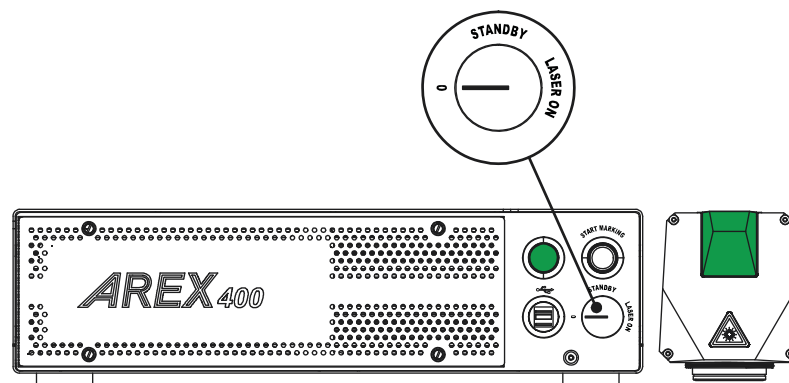
## USING MARKING SOFTWARE

### HOW TO CREATE AND EDIT GRAPHICS LAYOUT



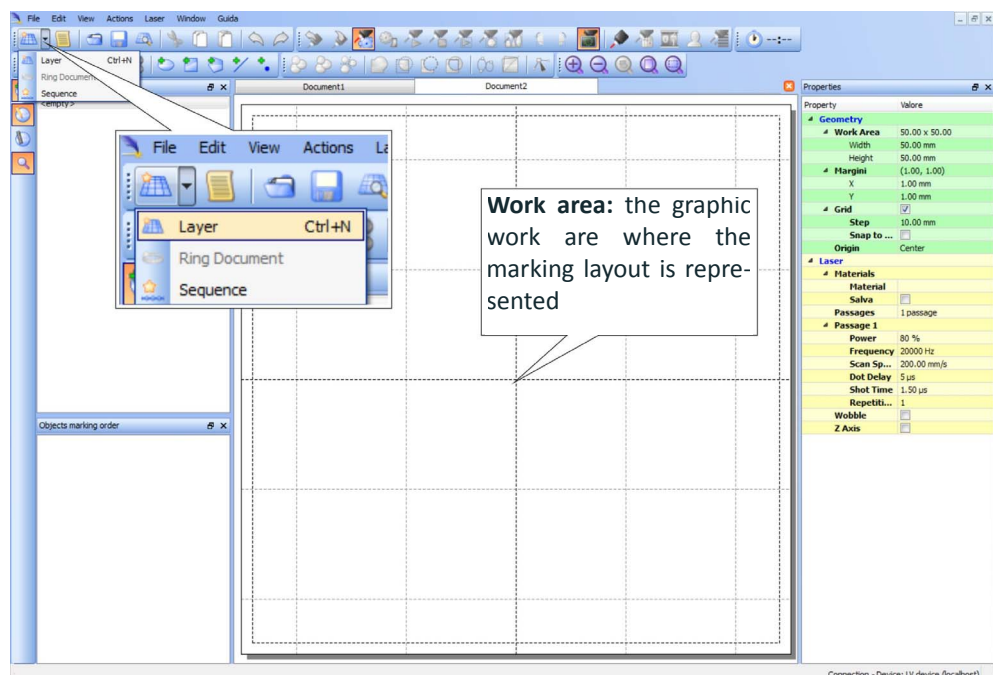
NOTE

This example considers that the laser marker is controlled in **Key Selector** mode (see “Key Selector mode” on page 44).

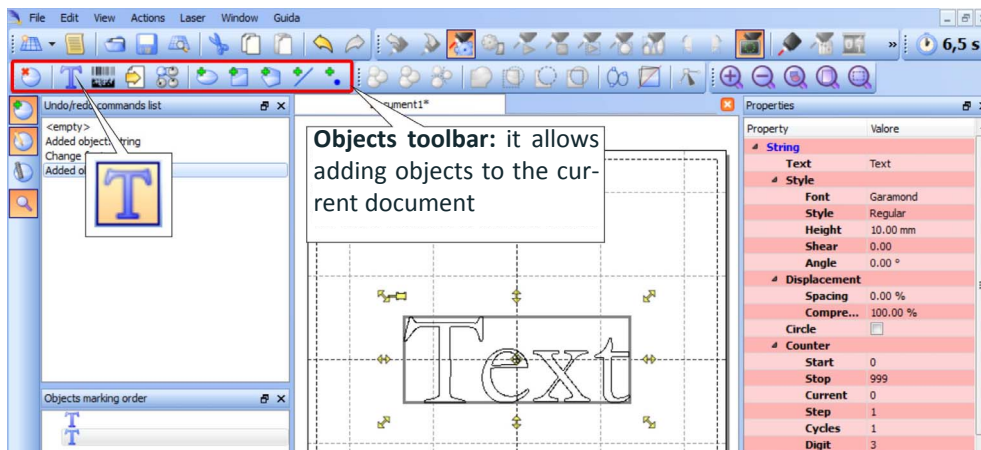


In “WAIT FOR START” state, double click the **Laser Editor** icon to start the layout editor application.

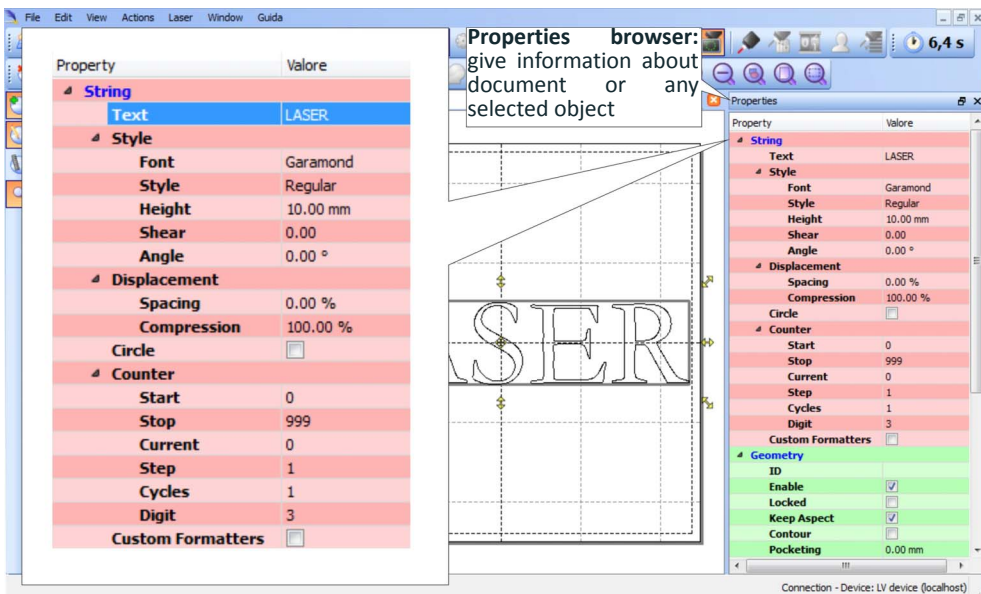
Click on the document type selector and choose **Layer**:



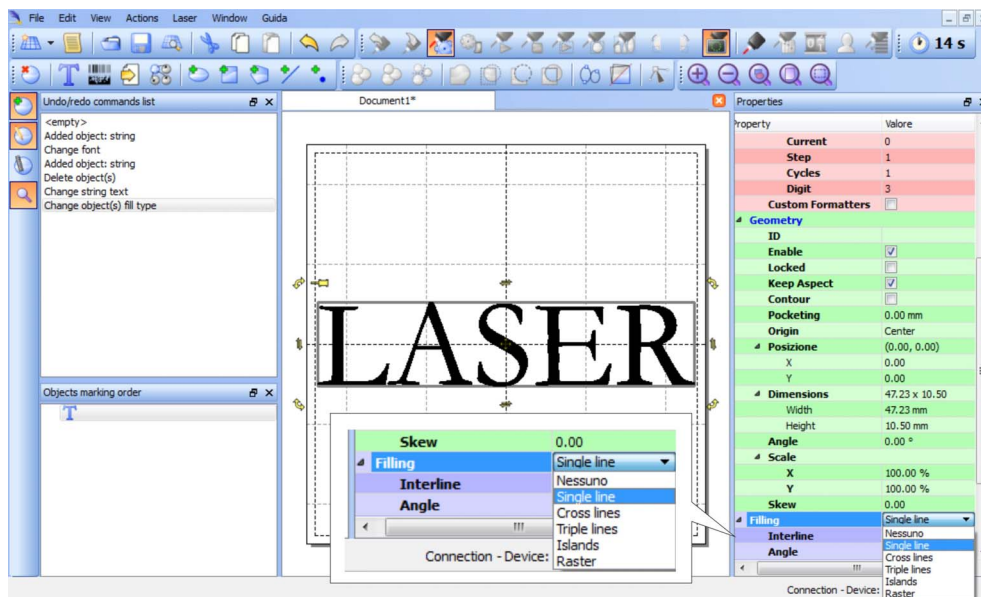
Click on the **Text String** icon in the **Object toolbar** to add a string object to the layer:



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**:

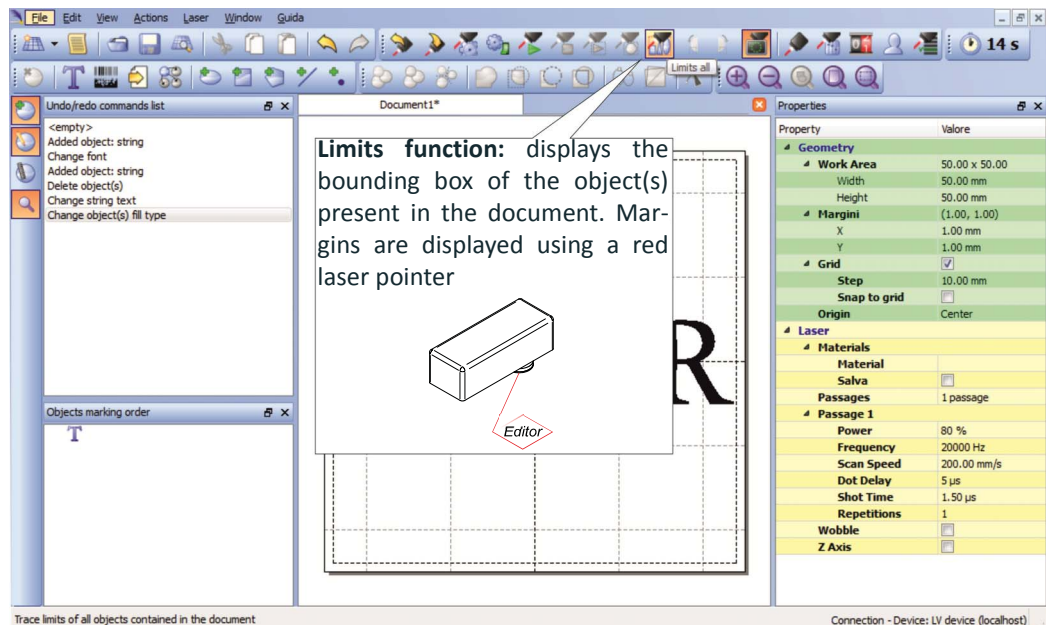
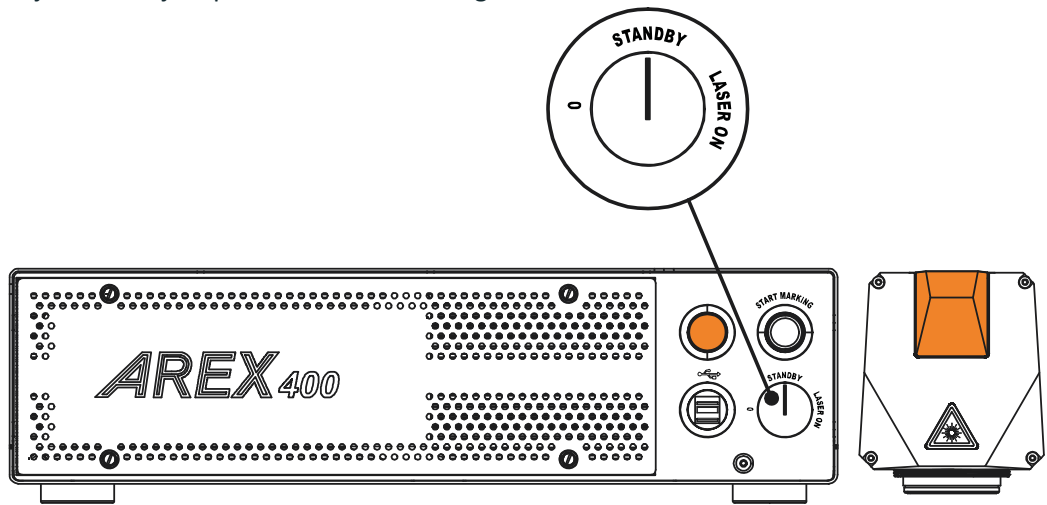


NOTE

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:



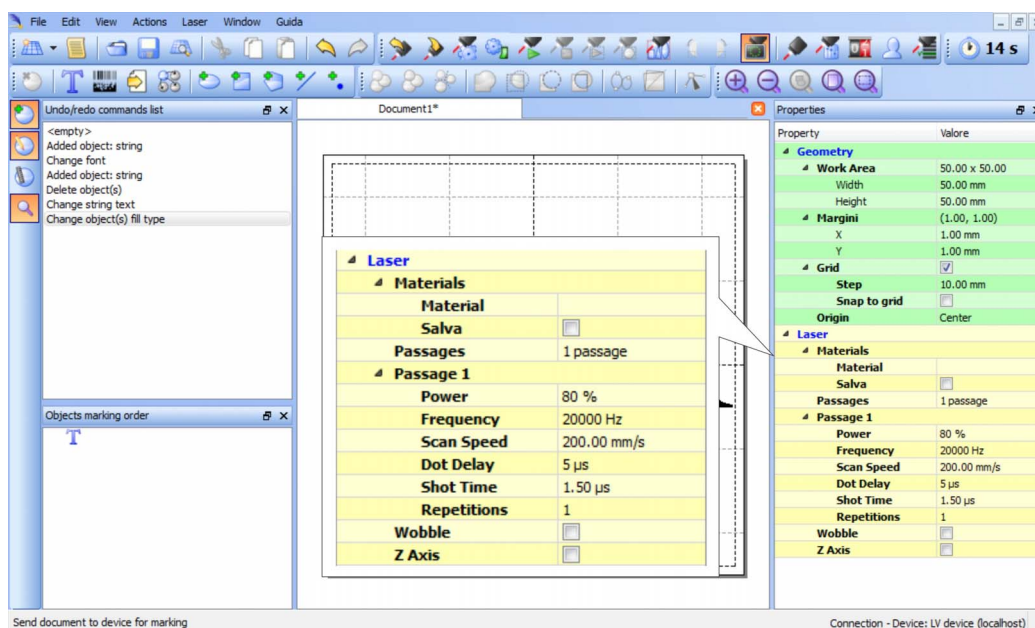
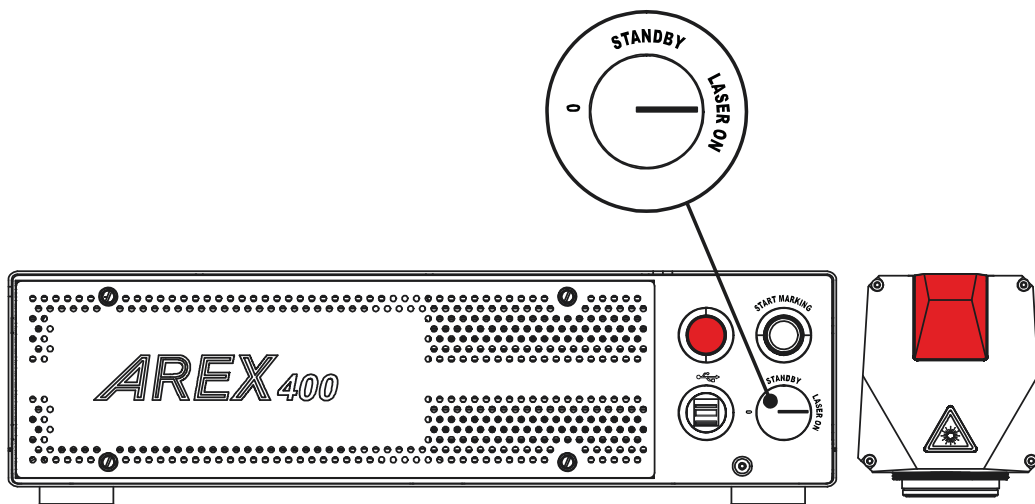
**Marking highly reflective materials might cause optical feedback into laser marker. This may result into irreversible damage of the optical components of laser marker.**

**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**:

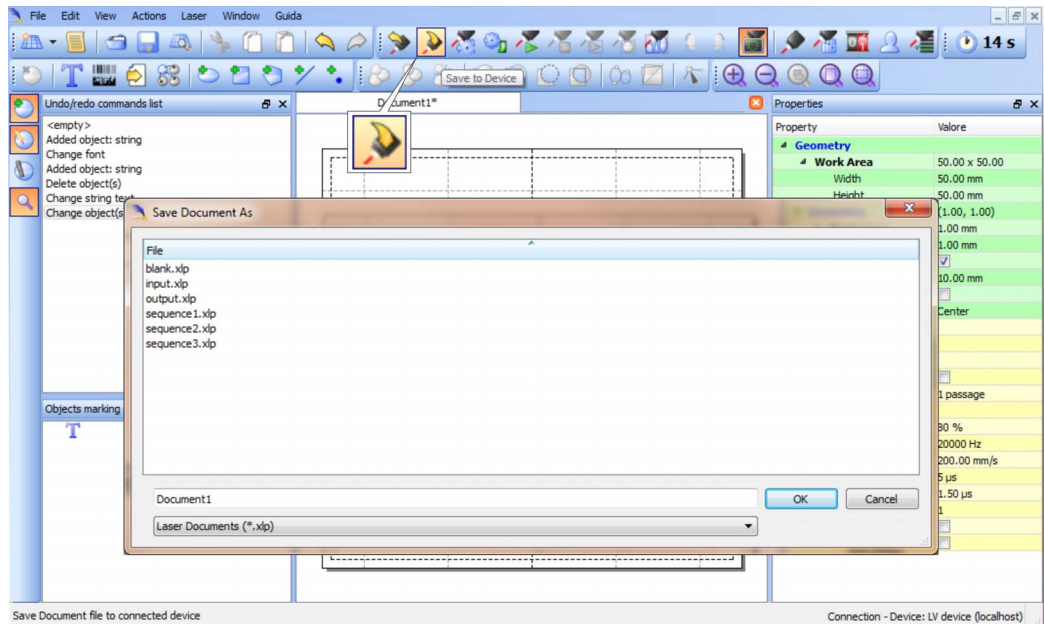


Press the **Send Marking** button in the **Laser Toolbar** .

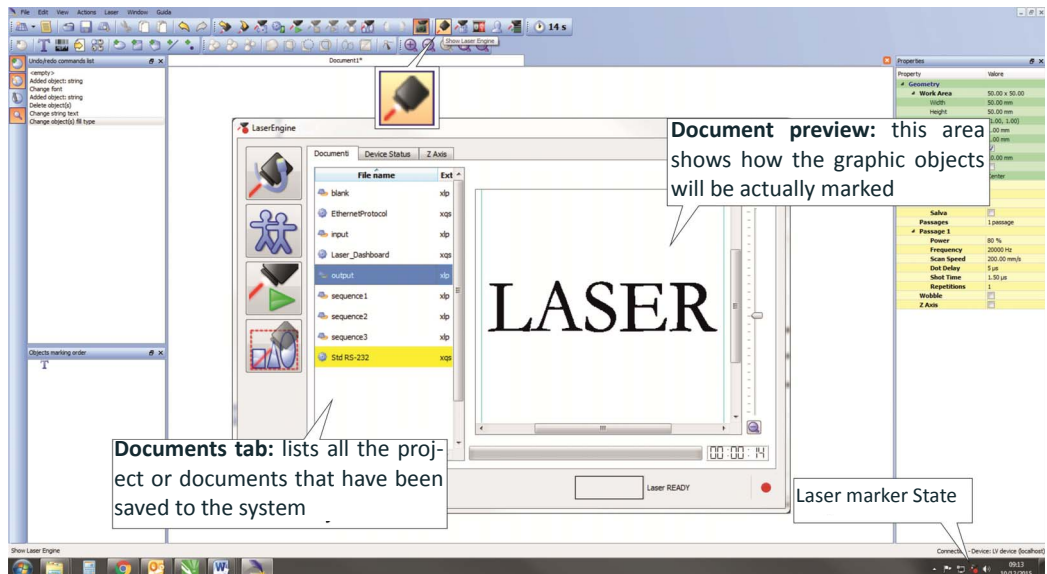
## HOW TO USE COMMAND BOX SIGNALS TO MARK LAYOUT

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:



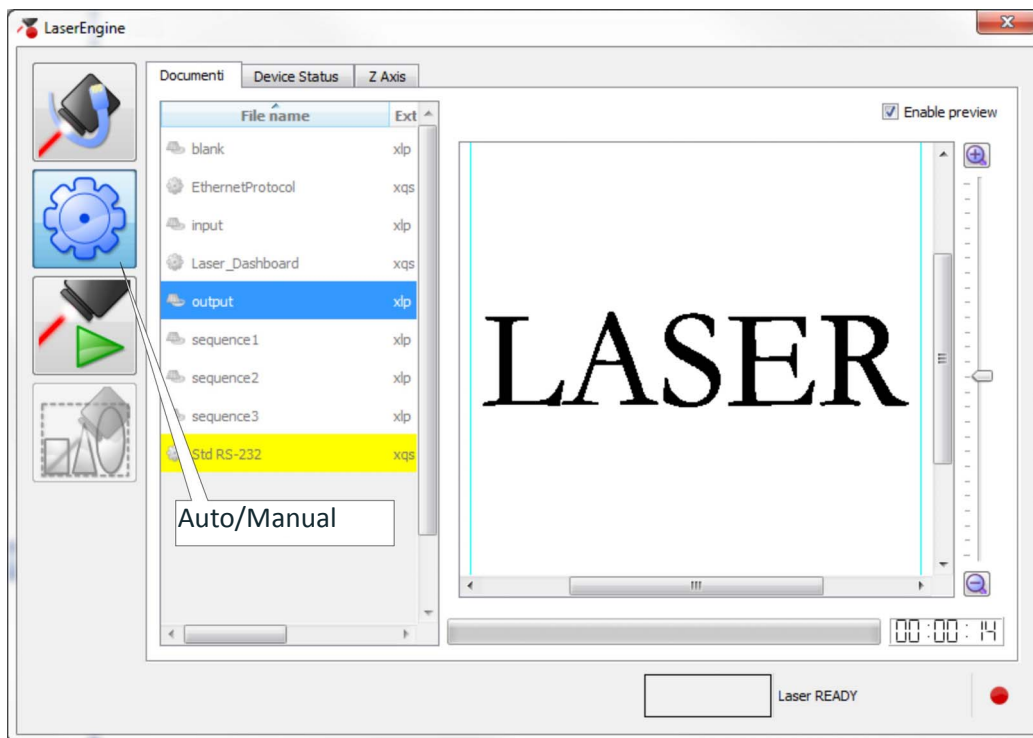
Click on the **Show Laser Engine** button to display Laser Engine window:



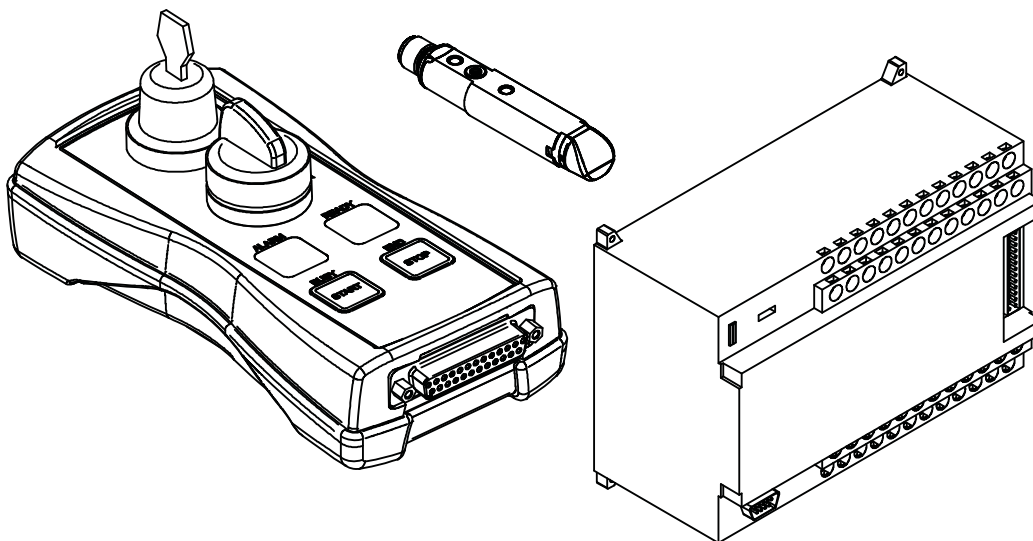
**AUTO/MANUAL Mode** button allows switching between the two available working modes:

- 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.

# APPENDIX E

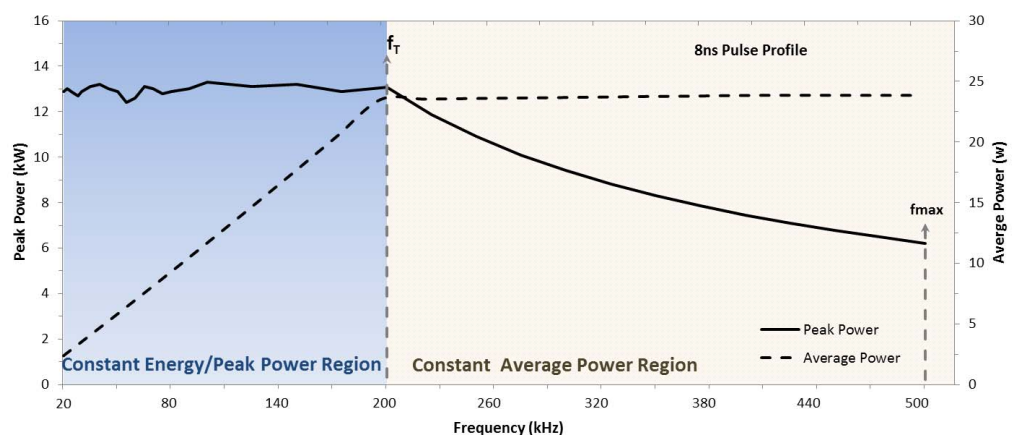
## MOPA FIBER LASER

### LASER MARKER OPERATIONS

The Arex™ A20-X6X is a very flexible laser marker based on a master oscillator power amplifier (MOPA) architecture, that allows the user for a wide selection of pulse profiles and pulse repetition frequencies.

Depending on the Pulse Profile selection and pulse Frequency the laser will generate pulses with stable output energy/peak power or stable laser average power.

The following picture illustrates the pulse peak power and laser average power dependence on the frequency, for the entire operating frequency range.



**Figure 1: Typical average power (dash line) and peak power (solid line) dependence on the frequency for the 8 ns the pulse profile**

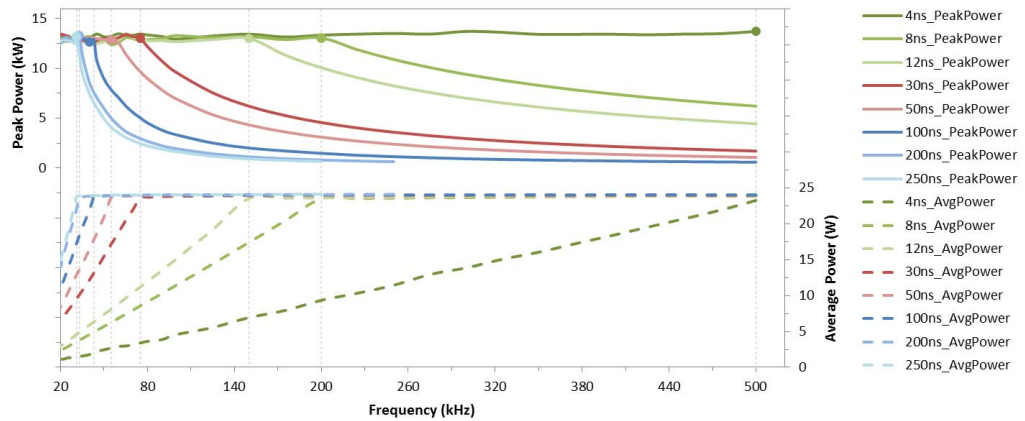
As shown, when the laser is operated with Frequency above the pulse transition Frequency ( $f_T$ ) (typically 200 kHz for the 8 ns pulse profile) the average power (dash lines) remains constant while the pulse energy/peak power (solid lines) will change. This is the more common operating region for most applications. Datalogic designates this region as the “Constant Average Power Region”.

A characteristic of the Datalogic Arex™ A20-X6X laser marker is that user is allowed to operate the laser at pulse repetition frequencies that can be reduced down to 20kHz and up to 500kHz (depending on Pulse profile selected). If the laser was allowed to operate down to lower frequencies without any restriction, the pulse energy would keep increasing until reaching non-linear thresholds that would result in laser performance degradation or even self-destructive failure. To prevent the laser marker from reaching these undesired conditions, while allowing the user to set the laser pulse frequency freely, Datalogic implemented laser internal safety controls to allow stable pulse peak power/energy below the transition frequency ( $f_T$ ).

Thus, within the extended operating region below the transition frequency, the pulse energy/peak power will remain constant (as illustrated in the figure above). Datalogic designates this extended region as “Constant Energy/Peak Power Region”. This region is ideal for applications that require changing of the laser pulse frequency while keeping pulse energy or peak power constant.

The maximum frequency of operation ( $f_{max}$ ) depends on the pulse profile setting: for Pulse Profiles 4 to 100ns,  $f_{max}$  is 500kHz; for Pulse Profile 200ns the  $f_{max}$  is 250kHz, and for Pulse Profile 250ns  $f_{max}$  is 200kHz.

The Arex™ A20-X6X shows similar behavior for all other pulse profiles, within the same operating conditions. For each pulse profile there is a maximum allowed input frequency ( $f_{max}$ ) and a Transition Frequency ( $f_T$ ) (refer to your device Test Report for details about your specific laser). As illustrated in following picture, below the transition frequency, the pulse peak power and energy will remain constant for all pulse profiles.



**Figure 2: Typical average power (dash line) and peak power (solid line) dependence on the frequency for the typical pulse profile available - 4ns to 250ns. Note that, typically,  $f_T = f_{max} = 500\text{kHz}$  for 4ns Pulse Profile**



## Pulse Profile

Datalogic's Arex™ A20-X6X laser marker includes 8 factory preset pulse profiles, user selectable through software interface (see “Lighter™ Pulse Profile Configuration” on page 123).

The following figures illustrates the typical pulse shape of these pulse profiles at 200 kHz frequency.

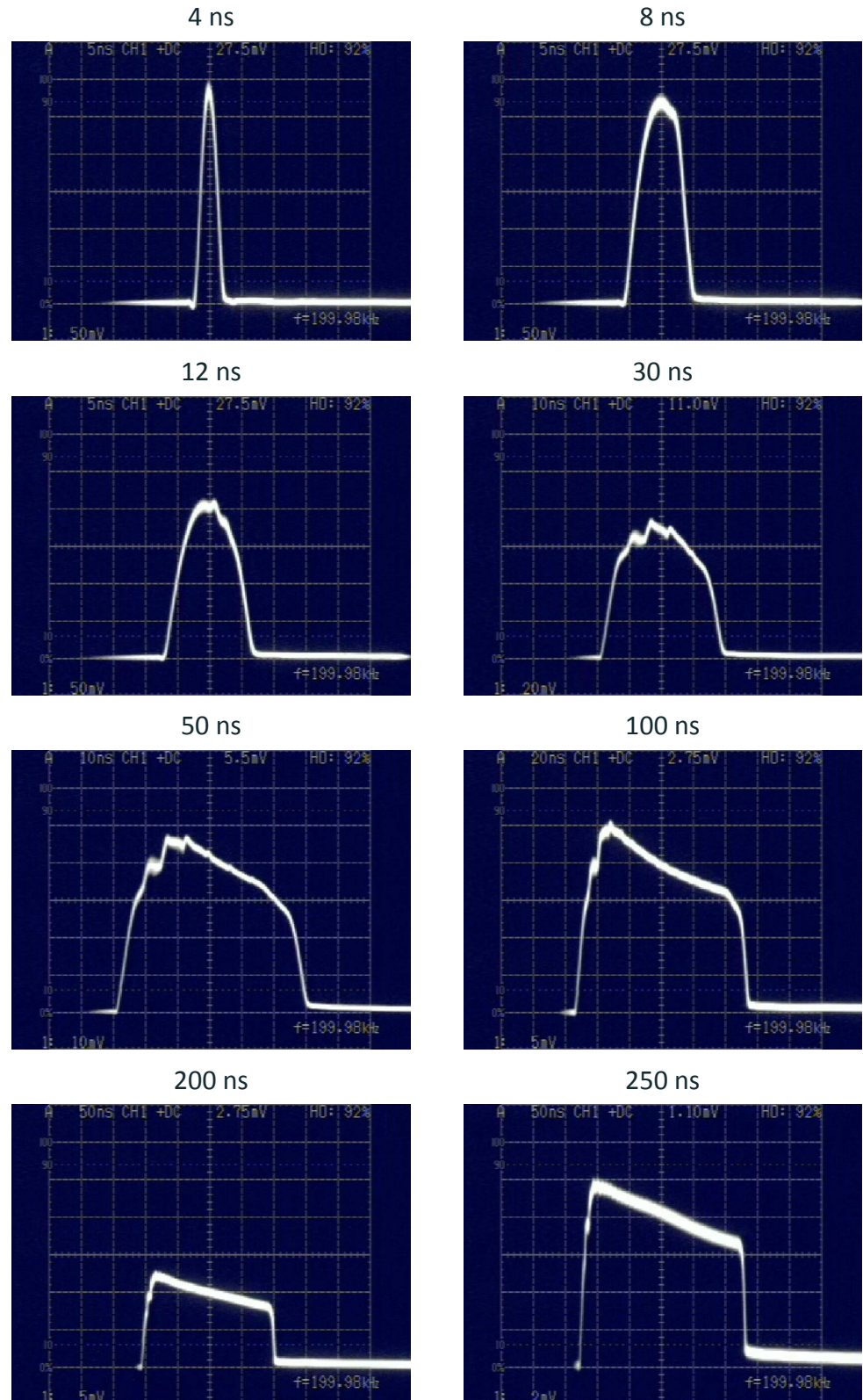
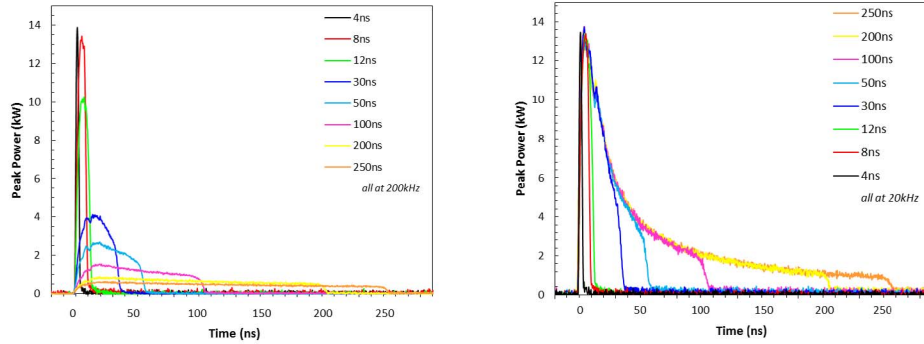


Figure 3: Typical optical output pulse shape for standard laser single pulse profiles at 200 kHz (bandwidth limited by 500 MHz oscilloscope)

For the longer pulse profiles (above 20 ns), the pulse shape varies with pulse frequency and Power level. Below the pulse transition frequency (fT), the pulse profile shape will remain invariant, i.e., will not vary with pulse frequency, while above fT the shape will vary with pulse frequency. Increasing the pulse frequency and/or decreasing the Power level will make the pulse shape less “leading peak” like and more “square” like.

The following pictures illustrates for some typical Pulse Profiles, the pulse shape variation in the “Constant Average Power Region” and the “Constant Energy/Peak Power Region”.



**Figure 4: Typical optical output pulse shape in the “Constant Average Power Region” at 200kHz (left) and the “Constant Energy/Peak Power Region” at 20kHz (right)**

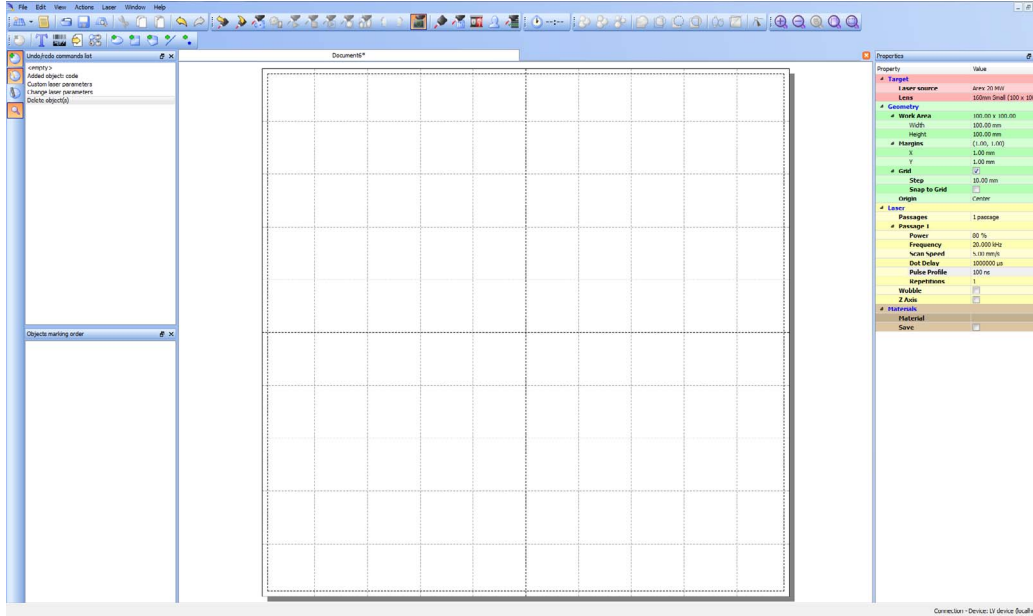
If operating below transition frequency (fT), the user can vary the pulse energy without any other setting change (namely Peak Power) by changing the Pulse Profile selected.

If operating above transition frequency (fT), the user can vary pulse peak power without changing pulse energy by changing the Pulse Profile selected.

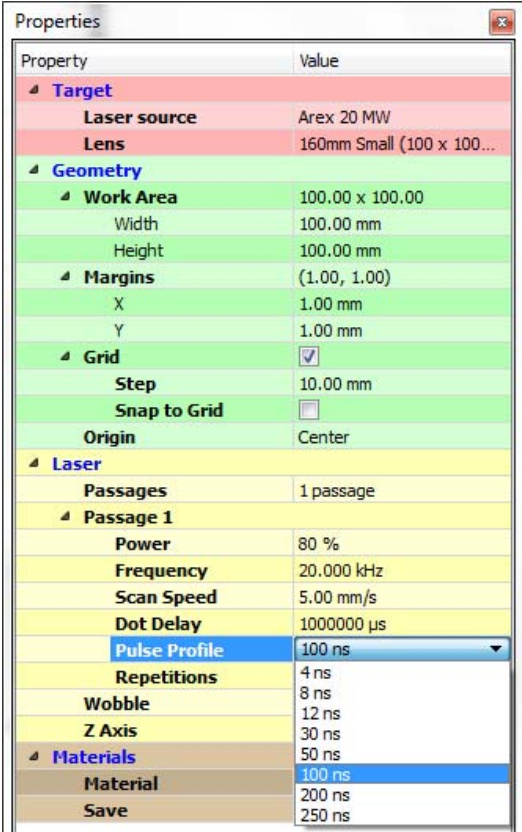
# LIGHTER™ PULSE PROFILE CONFIGURATION

## Creating a document with multiple objects using a single pulse profile

You can create documents with multiple objects, using the same pulse profile.  
To accomplish this, create a **new document**:



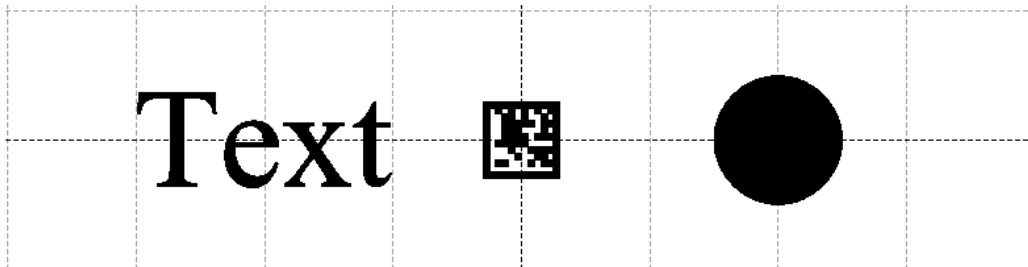
In the **Property** window, **Laser** section, select the **Pulse Profile** you want to use for the entire document:



Add the desired objects to the document using the **Insert object** toolbar:

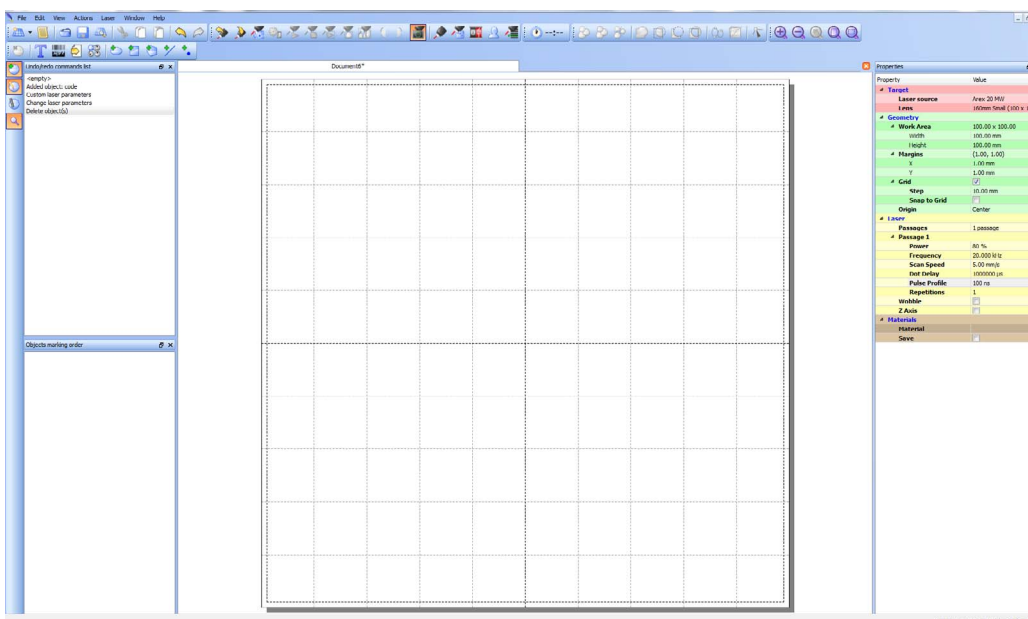


By default, the new objects use the same laser property as those set for the document. The new objects are shown in black color to indicate that their laser property are the same as those set for the document:



## Creating a document with multiple objects using different pulse profiles

You can create a document with multiple objects, each having its own Pulse Profile. To accomplish this, create a **new document**:

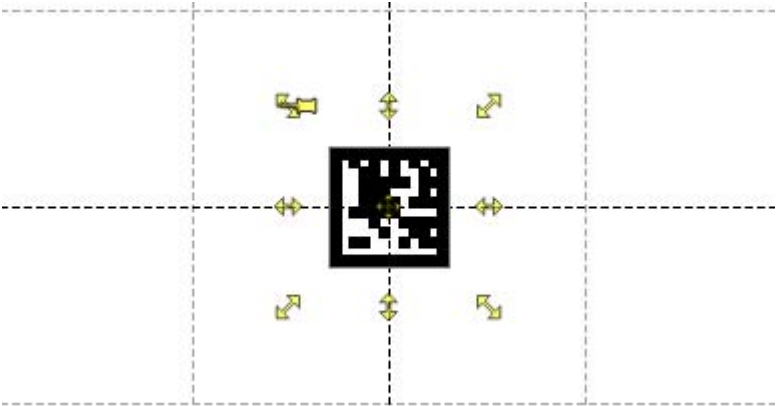


Add the desired objects to the document using the **Insert object** toolbar:

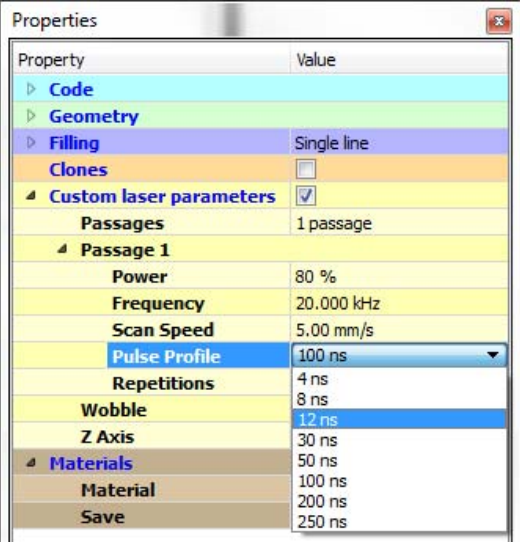


By default, all the added objects use the same laser property as those set for the document.

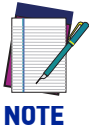
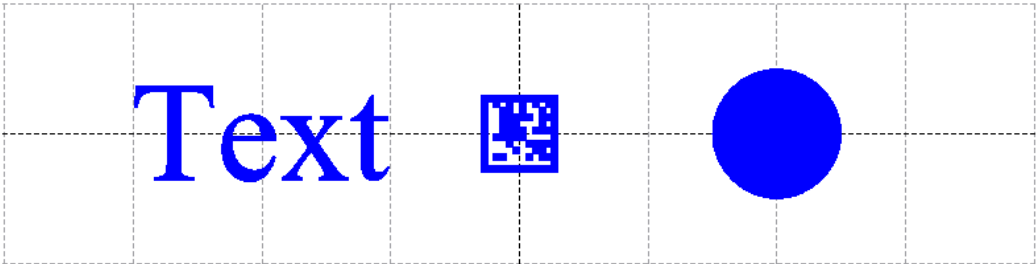
Select the object you want to change the **Pulse Profile**:



In the **Property** window flag the **Custom laser parameters** property and select the desired **Pulse Profile**:



The object will be shown in blue color to indicate that its laser property are different from those set for the document:



**NOTE**

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

# APPENDIX F

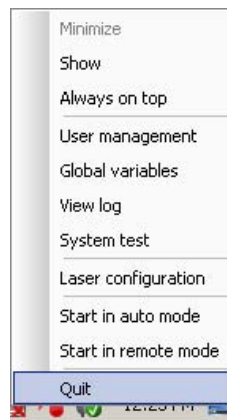
## MARKING SOFTWARE UPGRADE

---

### HOW TO UPDATE THE MARKING SOFTWARE

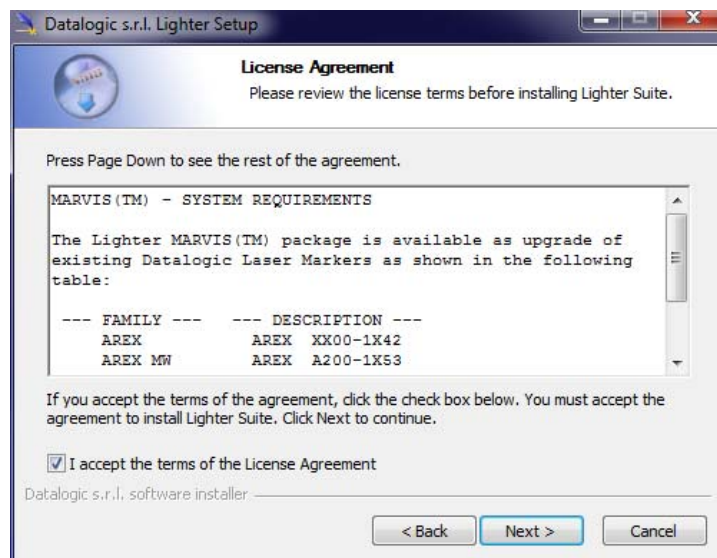
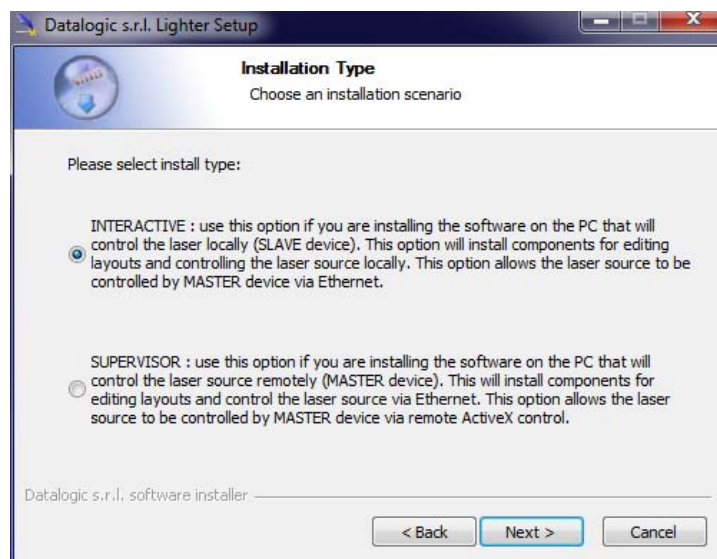
This document describes how to update the software version:

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

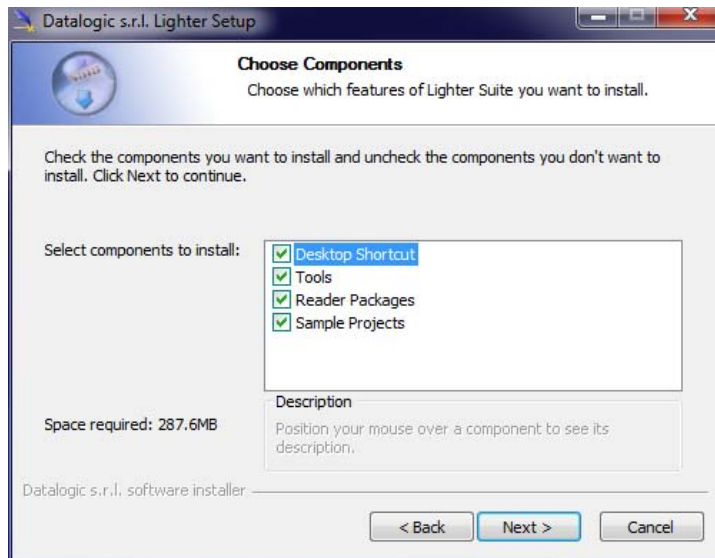


2. Run the new Lighter™ Suite installer from an external USB device.
3. Press **Next** to continue:

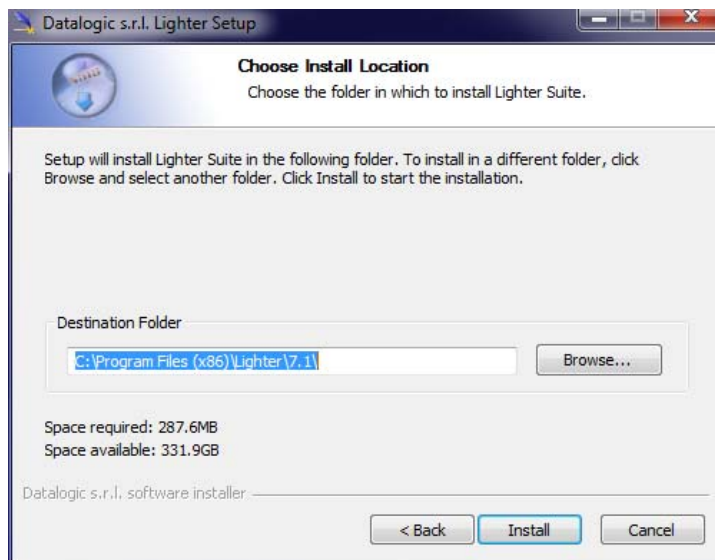


4. Press **I Agree** to continue:5. Check "*I accept the terms of the License Agreement*" and press **Next** to continue:6. Choose the *INTERACTIVE* installation type and press **Next** to continue:

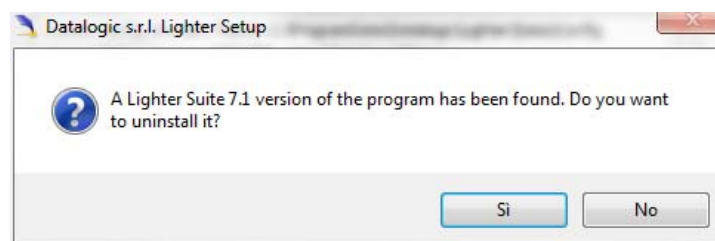
7. Choose the components to install and press **Next** to continue:



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

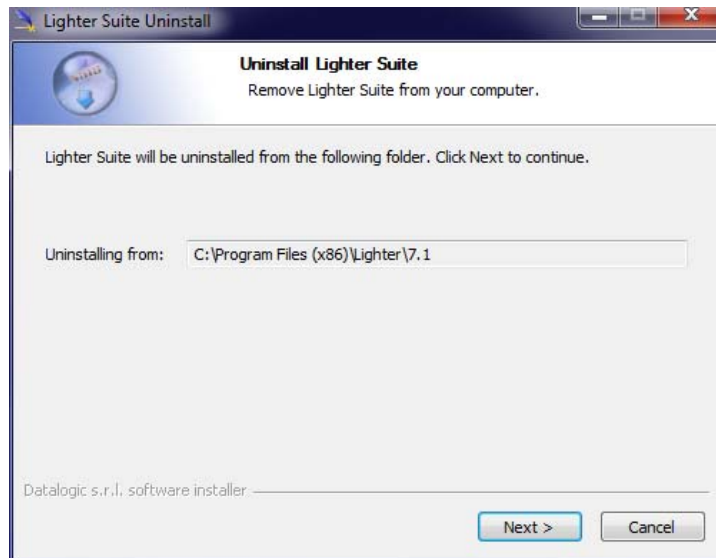


9. Press **OK** to uninstall the old Lighter™ Suite version

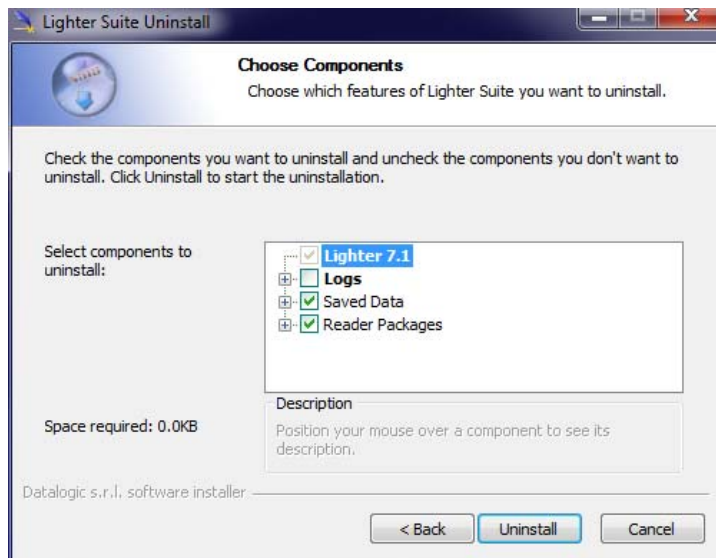




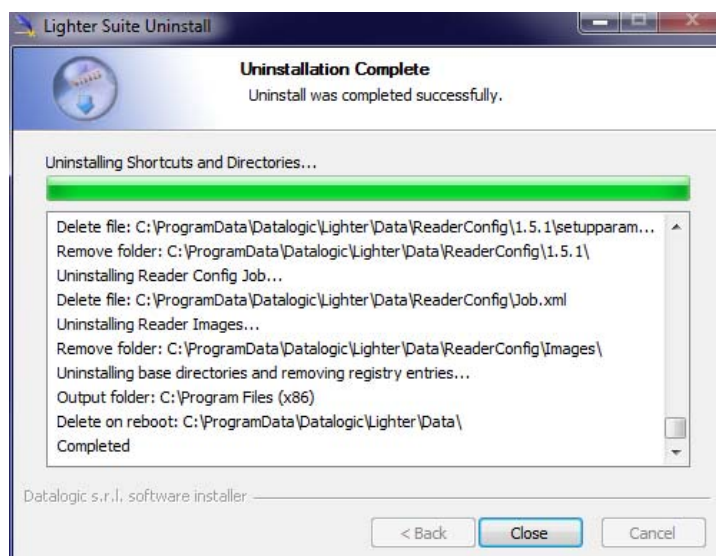
10. Press **Next** to continue:



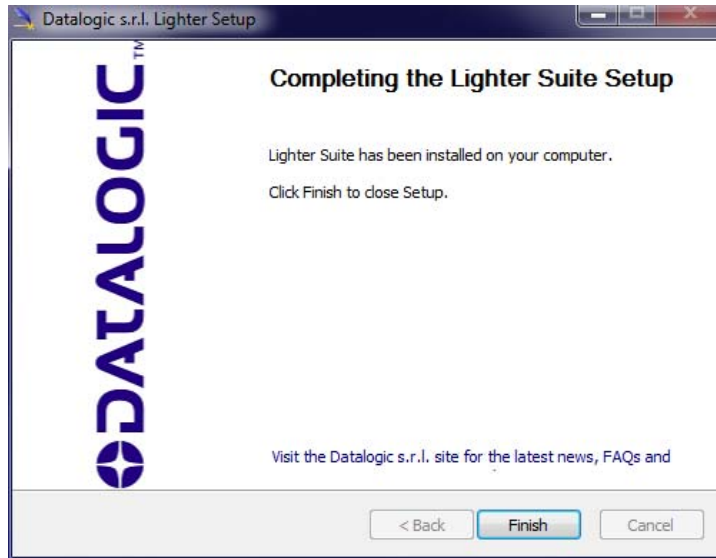
11. Select the components of the old Lighter™ Suite version to remove and press **Uninstall**:



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

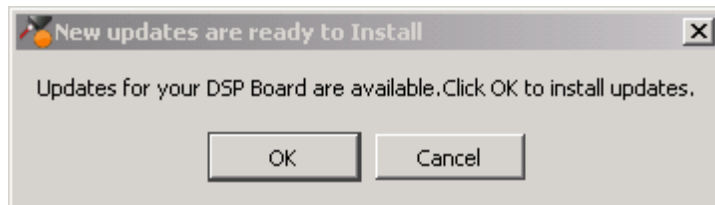


13. Lighter Suite will be installed. Press **Finish** to complete the procedure:

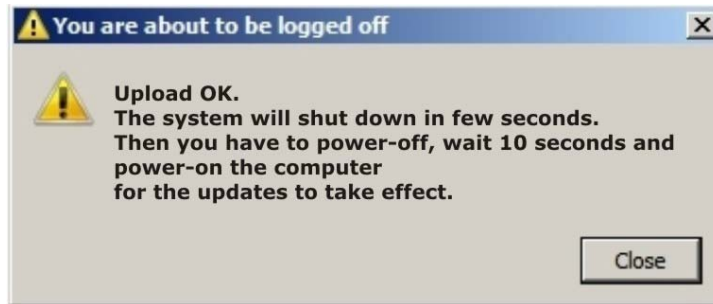


14. Depending on whether the Lighter™ Suite update includes any control board updates different procedure should be followed:

- 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!**

**CAUTION**

- 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 G

## RECOVER THE LASER MARKER

---

### OVERVIEW

The laser marker is provided with an **USB recovery disk** (see “Contents of the packaging” on page 10) 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.



**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.**



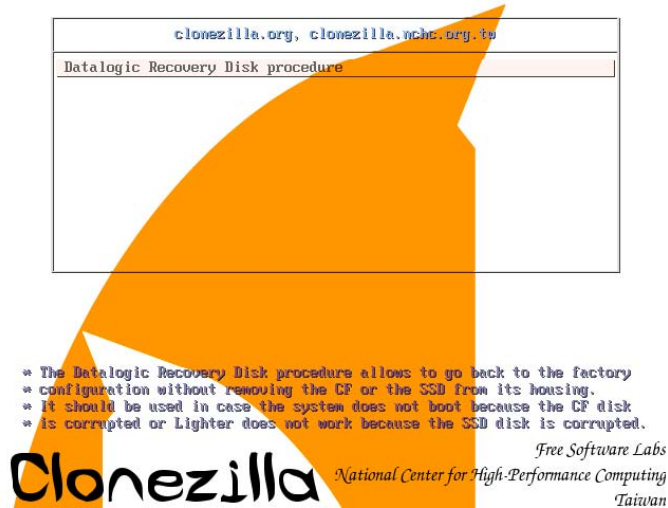
**NOTE**

**Images shown below are indicative only.**

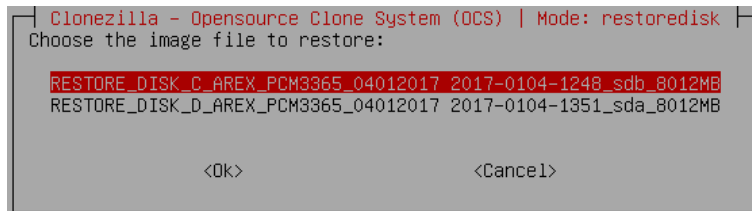
### Recover the system:

- 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

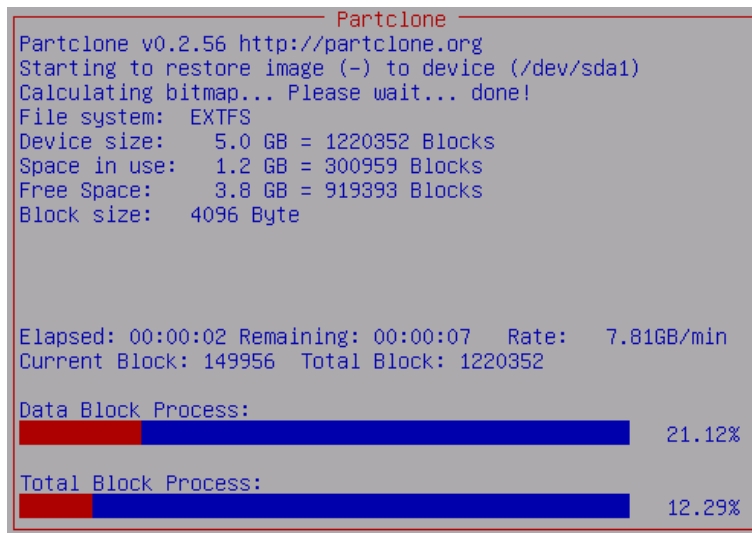
- Datalogic Recovery Disk procedure screen will appear:



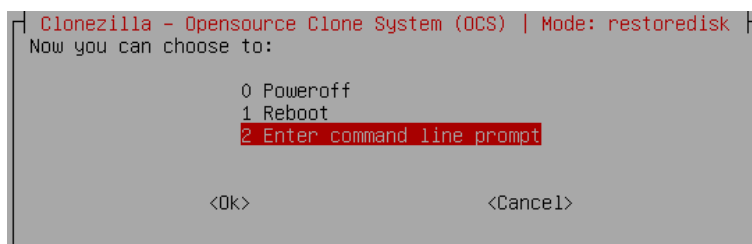
- Press **ENTER** key to continue
- Choose **RESTORE\_DISK\_C\_PCM3365** to restore *disk C:* and press **ENTER** key



- 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





## 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



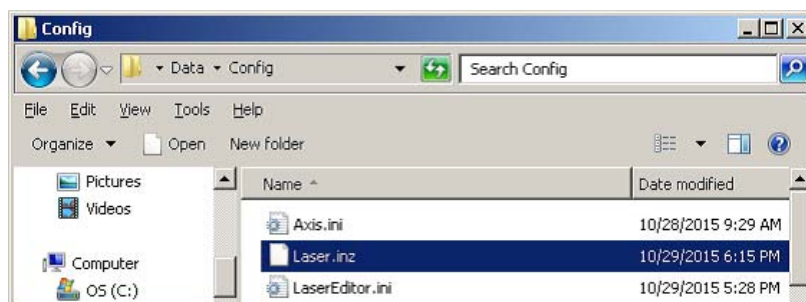
### NOTE

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 “Support Through the Website” on page vi.

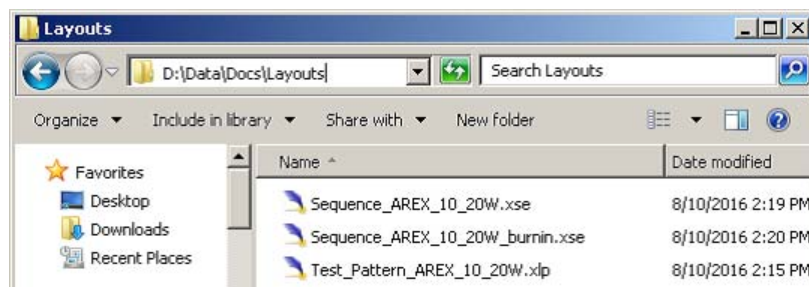
- An error message will advise you that Lighter™ configuration file is not present:



- 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

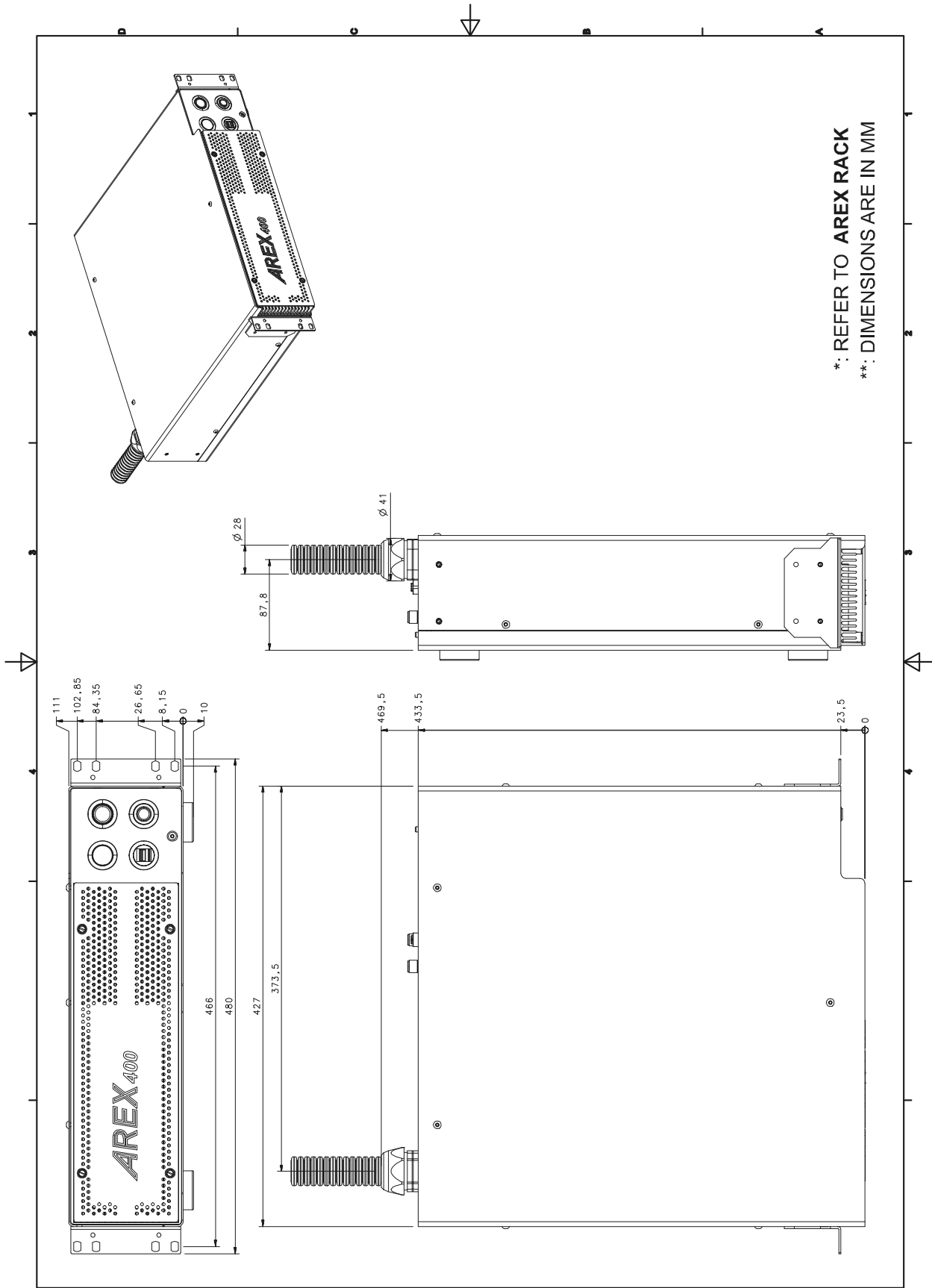


# **APPENDIX H**

## **MECHANICAL DRAWINGS**

---

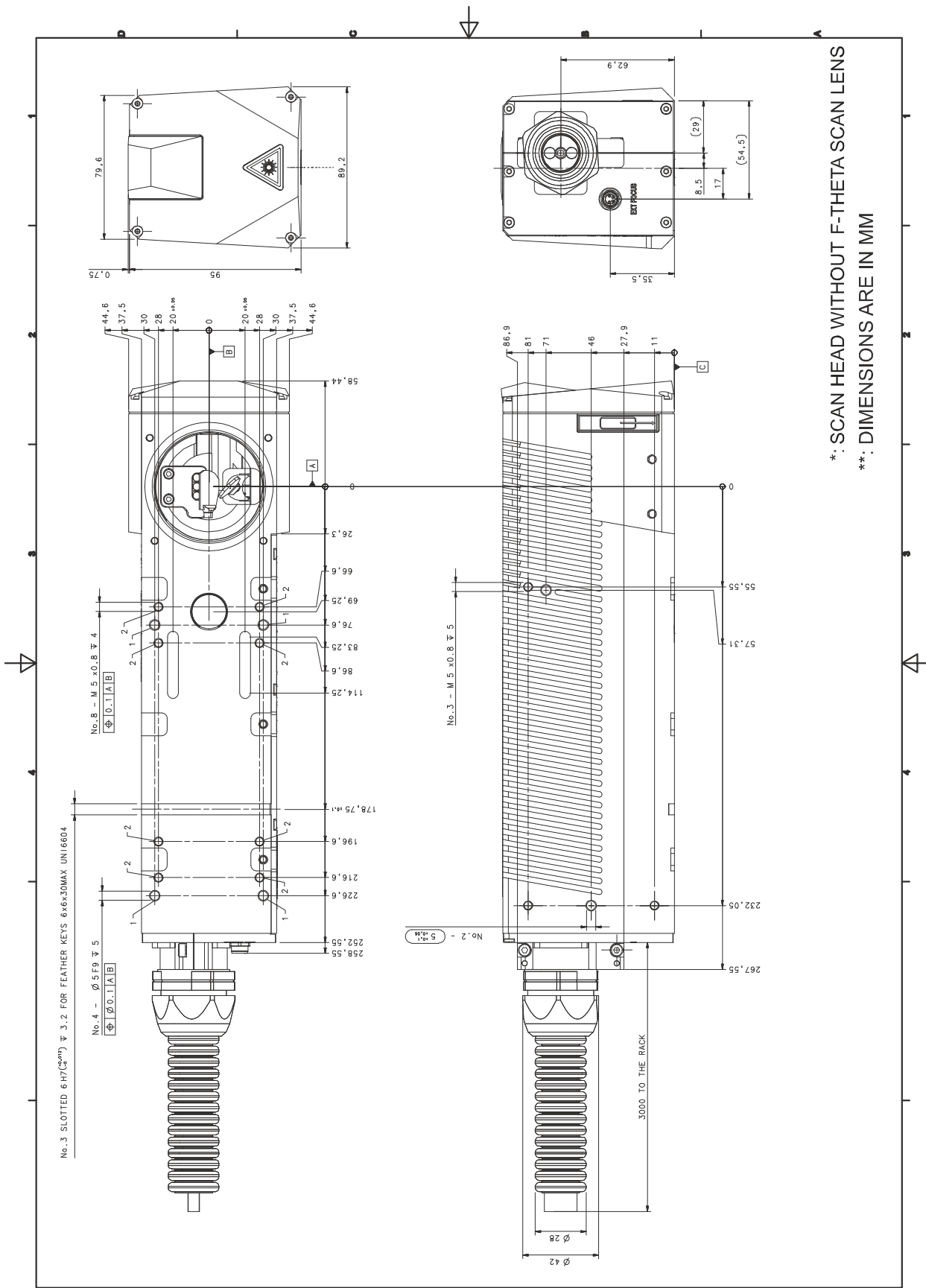
# CONTROL RACK



NOTE

Please refer to Datalogic website for detailed drawings.

# SCAN HEAD



\*: SCAN HEAD WITHOUT F-THETA SCAN LENS  
 \*\*: DIMENSIONS ARE IN MM



NOTE

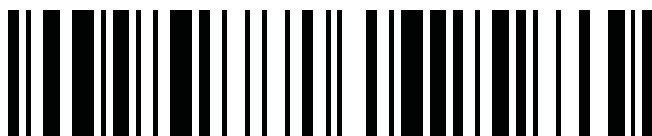
Please refer to Datalogic website for detailed drawings.

© 2018-2019 Datalogic S.p.A. and /or its affiliates • All rights reserved • Without limiting the rights under copyright, no part of this documentation may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means, or for any purpose, without the express written permission of Datalogic S.p.A. and/or its affiliates • Datalogic and the Datalogic logo are registered trademarks of Datalogic S.p.A. in many countries, including the U.S. and the E.U.



**Datalogic S.r.l.**

Via S. Vitalino, 13 | 40012 Calderara di Reno | Bologna - Italy  
Tel. +39 051 3147011 | Fax +39 051 3147205



821005644

(Rev E)

November 2019