

FIBERLUX^{NANO}

Use and Maintenance Manual

Translation of the original instructions

CE

Laser marker

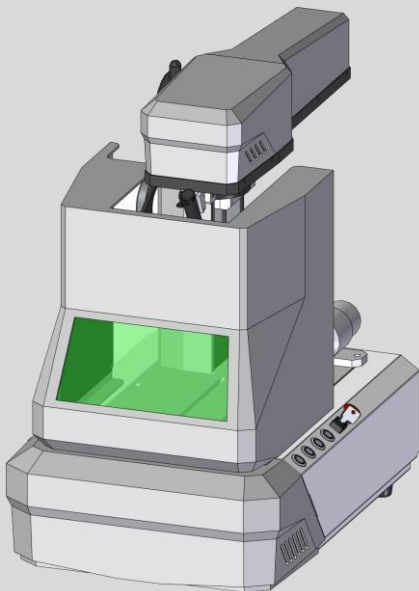
Model

FIBERLUX NANO

Versions

30 W

60 W



Serial number/s

from MKN01720

Year of manufacture

2022

Manual code number

UMF002

Revision / date

0.3 / March 24, 2025

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2 Warranty and responsibilities

2.1 Warranty

This Warranty covers the product to which it was attached at the moment of purchase.

This Warranty guarantees the product against any material manufacturing defects for a duration of THREE YEARS as from the original date of purchase, excluding consumable parts such as lamps, filters, protective glass, laser bar and all that is subject to wear; for the laser sources and the scanning heads of the markers, the guarantee of TWO YEARS will be applied.

If, during the guarantee period, material or fabrication defects should be found (at the original date of purchase), we shall repair or (at our discretion) replace the product or its faulty components under the terms and conditions set out hereunder, with no charge for the labour costs or the parts replaced. The servicing dept. reserves the right to replace the defective products or their components with new or overhauled products or parts. All the products and components replaced shall become property of the company

Operations under warranty shall only be carried out if the faulty product is presented within the warranty period together with the original purchase invoice or a purchasing receipt (indicating the date of purchase, the type of product and the name of the dealer).

ELETTROLASER S.R.L. reserves the right to refuse operations under warranty if these documents are not produced or if the information contained is incomplete or illegible. This Warranty will be annulled if the indication of the model or the serial number applied on the product has been modified, deleted, removed or made illegible.

This Warranty does not cover the costs and risks associated to the transport of your product to our Works.

The following is excluded from this Warranty:

- Periodical maintenance operations and repair or replacement of parts subjected to wear and strain
- Consumable material (components that require periodical replacement during the working life of the product, for example, tools, lubricants, filters, etc.).
- Damage or defects caused by improper application, use or treatment of the product for purposes that differ from the normal professional use.
- Damage or modifications to the product caused by improper use include:

Treatments causing damage or physical, aesthetic or superficial alterations;

Wrong installation or use of the product for purposes that differ from those foreseen, or non-observance of the installation and use instructions;

Improper maintenance of the product, not in conformity with the instructions regarding correct maintenance;

Installation or product use that does not conform with the technical or safety standards in force in the country where the product is installed or used;

Condition or defects on the systems to which the product is connected or into which it is incorporated;

Repair operations or attempts to repair by unauthorised persons;

Adaptations or modifications on the product without previous written authorisation from the manufacturer company, updating of the product out of limits of the specifications and functions described in the instructions manual, or modifications made to the product so that it conforms to national or local technical or safety standards in countries different to those for which the product has been specifically designed and constructed;

Negligence;

Unexpected events, fire, liquids, chemical or other type of substances, flooding, vibrations, excessive heat. inadequate ventilation, current peaks, excessive or incorrect input voltage supply, radiations, electrostatic discharges, including lightning other external forces and impacts

2.2 Exclusions and limitations

Except for that stated above, ELETTROLASER S.R.L. shall not issue any warranty (explicit, implicit, statutory, or other) for the product regarding quality, performance, precision, reliability, suitability for a particular use or other.

If this exclusion should not be totally or partially admitted by the applicable laws, ELETTROLASER S.R.L. shall exclude or limit its warranties to the maximum limit permitted by the applicable law.

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Any guarantee that cannot be completely excluded will be limited (within the permitted terms of the applicable law) to the duration of this Warranty.

The only obligation of ELETTROLASER S.R.L. within the framework of this Warranty consists in the repair or replacement of products based on these Warranty terms and conditions. ELETTROLASER S.R.L. shall not be held in any way liable for losses or damages regarding the products, services, this Warranty or other, including economic or intangible losses – the price paid for the product – loss of profit, income, data, possession or use of the product or other associated products- indirect losses or damages, incidental or consequential. This is valid for losses or damages deriving from:

- Impairment of functioning or failure of product or associated products following defects or lack of availability during the period in ELETTROLASER S.R.L. or other authorised service centre, with consequent stoppages, down times or interruption of activities.
- Imperfect performance of product or associated products.

This is valid for losses and damages in the framework of any legal theory, including negligence and any illegal actions, contractual infringement, explicit or implicit guarantees and strict responsibility (also in the case in which ELETTROLASER S.R.L. or the authorised service centre have been informed regarding the possibility of such damages).

In cases where the applicable laws prohibit or limit these exclusions of responsibility, ELETTROLASER S.R.L. excludes or limits its responsibility to the maximum limit allowed by the applicable right.

Some nations, for example, prohibit the exclusion or limitation of damages caused by negligence, serious negligence, intentional default, fraud and other similar actions. The responsibility of ELETTROLASER S.R.L. in the framework of this warranty shall not exceed in any case the price paid for the product, on the understanding that, should the applicable law impose higher limits of responsibility, these limits shall be applied.

2.3 Reserved legal rights

The national laws applicable grant the purchaser's legal rights (statutory) regarding the sale of consumable products. This warranty does not compromise the rights of the purchaser established by the laws in force, nor the rights that cannot be excluded or limited, nor the rights of the customer toward the dealer. The customer can decide to assert the relevant rights at his/her own exclusive discretion.

2.4 Seals

In some points of the machine there are seals. These seals are not to be removed or broken for any reason. In fact, the sealed parts are only to be opened exclusively by ELETTROLASER S.R.L. or the authorised service centre.



INFORMATION: The Customer's breakage or removal of the seals applied by the manufacturer on the machine will immediately annul the warranty.



CAUTION!: Only authorised, qualified and instructed technicians are permitted access to the machine internal parts .

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3 Use of the manual

This manual has been drawn up by the Manufacturer and is an integral part of the machine supply.

The information contained in the FIBERLUX NANO manual, is addressed to the persons assigned to the management and the maintenance of the machine.

The manual contains information that must be known by the qualified technicians, and that makes it possible to use the machine in safety.



OBLIGATION: All the persons involved, according to their specific tasks and responsibilities, are to read and ascertain that they have understood the contents of this manual, before the installation, use or any other operation to be carried out on the machine!

3.1.1 Definitions

- **Safety component:** a component or device used to ensure a safety function, the failure or malfunctioning of which could jeopardise the safety and/or health of the exposed persons (for example: fixed, mobile guard, electronic safety device, etc.);
- **Protective device:** device (not a guard) that reduces the risk, separately or associated to a guard
- **Operator:** the person or persons appointed to install, run, adjust, clean and move the machine or to carry out the maintenance.
- **Danger:** a potential source of injury or damage to health;
- **Exposed person:** any person who is entirely or partially in a hazardous zone;
- **Guard:** machine element used specifically to ensure protection by means of a material barrier;
- **Risk:** combination of probability and severity of an injury or harm to health that could arise in a hazardous situation;
- **Residual risk:** risk that remains after the application of protective measures;
- **Foreseen use:** use of the machine in compliance with the information provided in the instructions for use;
- **Rationally predictable improper use:** use of the machine in a manner that differs from that indicated in the instructions for use, but that could arise from easily predictable human behaviour
- **Hazardous zone:** any zone inside and/or near a machine in which the presence of a person constitutes a risk for the safety and health of that person.

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3.2 Structure of the manual

3.2.1 Division of the manual

This manual is divided into chapters. Each chapter in turn may be divided into paragraphs. On the external margin of each page (below) the number of the page is indicated with the total number of pages that compose the manual.

At the end of the manual there is the general summary to be used for rapid consultation.

3.2.2 Illustrations and tables

The illustrations and tables are usually placed near the text. If this is not possible, they are connected to the page and cross-referenced as connected illustration or connected table. All the tables and illustrations are numbered and have a caption (Tab. 2.2-1, Fig. 2.2-1, etc.).

3.2.3 Attachments

Attachments are all those technical documents that are an integral part of the Use and Maintenance manual, such as wiring and pneumatic diagrams, declarations of conformity of components, technical sheets, etc. These are contained at the end of the manual (after the summary and index of the figures).

3.3 Measurement units

The following measurement units have been used in this manual, as defined by the International System (SI), as specified in Standard ISO 80000-1. The measurement units normally used are:

- **Linear dimensions** – For the length, the metre measurement unit has been used, symbol [**m**], or its submultiples (centimetres and millimetres, i.e. [**cm**] [**mm**]). In some cases, the inch may be used;
- **Time** – The time measurement unit is the second [**s**]. Where deemed convenient, minutes may be used [**min**] and/or hours [**h**];
- **Weight** – For weight, the unit used is the kilogram [**kg**]. Where deemed convenient, grams [**g**] may be used;
- **Electric current intensity** -The electric current intensity is measured in Ampere [**A**];
- **Thermodynamic temperature** – The fundamental thermodynamic temperature unit, in the SI system, is the Kelvin degree [**K**]. The temperature unit used in this manual is generally the Celsius degree [**°C**]. Only when particular treatments regarding parts for which the manufacturer supplies the technical specifications, the temperature has been kept in degrees Fahrenheit [**°F**];
- **Luminous intensity** – The luminous intensity per surface unit is in [**lux**];
- **Flat angle** – The flat angles in accordance with the standards, are to be expressed in radians [**rad**]. In this manual they have been expressed in arc degrees, in the relation: $360^\circ = 2\pi$ [**rad**].

3.3.1 Derived units

The derived measure units are all based on the fundamental units already cited. As well as the derived unit of the fundamental metric units, in some cases some fundamental Anglo-Saxon units may be used, and their derived units.

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3.4 Preservation of the manual

3.4.1 How is the manual to be kept?

This manual, the declaration of conformity (original copy) and all the technical attachments are to be kept with care for the entire life of the machine, including the dismantling phase.

3.4.2 Where is the manual to be kept?

The manual is to be kept in a dry place, near the machine and, in any case, is always to be available for the qualified technicians in charge of the management and supervision.

3.4.3 How to duplicate the manual

Photocopying of this manual is only to be carried out from the original, since duplication from copies reduces the clarity of the images and consequently the information.



FORBIDDEN! Duplication of this manual is only permitted to obtain a back-up.

ELETTROLASER S.R.L. in compliance with the law, reserves the ownership of this manual, forbidding the transfer to third parties and/or unauthorised duplication.

3.4.4 What to do if it becomes lost or damaged?

If this manual should become damaged or lost, it is possible to request a conforming copy. When making the request, indicate the manual code, and the relevant revision index. This data can be found on the upper part of every page (Fig. 3-1).

code: UMF002

revision: 0.3

date: March 24, 2025

Fig. 3-1 – Manual identification data

3.4.5 What to do if the machine is transferred?

If the machine is transferred to other parties, the manual is to be handed over to the new owner.

3.4.6 What to do in the case of modifications to the machine?

Before making any type of modification on the machine, contact the manufacturer or the dealer to receive the necessary clarifications regarding the feasibility without altering the characteristics or the safety conditions.

If substantial modifications are made on the machine or the controls, the certification of the machine, and as a consequence, this manual, **can no longer be deemed valid**

4 General precautions

4.1 Working in complete safety

The safety instructions contained in the use and maintenance manual refer to the operations that can be carried out on the machine.

The safety symbols are inserted in the text in the points that require special attention. It is very important that these safety instructions are always observed. Non-observance could cause injuries to persons and/or damage to the machine or other fixtures.

Bearing this in mind, some basic safety instructions follow:

- Read, and fully understand this safety instructions section before starting operations for the machine installation, use, maintenance or repairs;
- Read and follow the safety indications contained in the text that refer to specific operations;
- Where foreseen, wear the relevant personal protective equipment (P.P.E.) such as protective goggles, gloves and safety shoes;

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- Know and observe the safety instructions specified by ELETTROLASER S.R.L., the general standards regarding prevention of accidents and the laws in force regarding safety

4.2 Safety signs

The symbols illustrated below are used (where applicable) in the use and maintenance manual. These symbols have been inserted to warn the personnel regarding the hazards or possible sources of danger. **Bear them in mind.**

Ignoring the symbols could cause personal injuries, death and/or damage to the machine or other fixtures.

As a general rule, the signs may be of three types (Tab. 4-1):

<i>Symbol</i>	<i>Form</i>	<i>Type</i>	<i>Description</i>
	Framed triangle	Danger signals	Indicate rules regarding hazards that are present, or possible
	Circular with slash	Prohibition signals	Indicate rules regarding actions that are to be avoided
	Solid circle	Obligation signals	Indicate information that it is obligatory to read and observe
	Circular frame	Information	Indicates useful information, that differs from hazards/prohibitions/obligations

Tab. 4-1 – Types of safety signs








According to the type of information to be imparted, symbols may be contained inside the signs that, by association of ideas help to understand the type of danger, prohibition or obligation.

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4.3 Symbols used

The symbols illustrated below are used in this manual.

These symbols have been inserted for a more instantaneous understanding of the activity performed/described ; they are generally contained in paragraph 7.4 and in chapters 8.

<i>Symbol</i>	<i>Description</i>
	Indicates control devices to be used. There may also be a text (e.g.: ON/OFF, Start/Stop), indication of direction of rotation, etc..
	Indicates locking/unlocking, opening/closing, tightening/unscrewing activities, to be carried out with tools (e.g. wrenches, screwdrivers).
	Indicates operations linked to the tools (assembly, disassembly, replacement).
	Indicates measuring, control operations (product dimensions, position of guides or stops).
	Indicates adjustment operations.
	Indicates checking operations
	Indicates lubrication operations.

Tab. 4-2 – Symbols used

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4.3.1 Danger signs



Generic hazard

This sign is used to highlight hazardous situations that could create damage to persons, to animals and objects. Non-observance of the rules connected to the sign could cause hazards.



Hazard deriving from live voltages

This sign is used to highlight danger of direct or indirect contact, electrocution, caused by presence of powered machine parts. Non-observance of the rules connected to the sign could cause serious harm or death.



Laser radiation hazard

This sign is used to highlight the hazard arising from the presence of sources that emit artificial optical radiations. Non-observance of the rules connected to the sign could cause risk of damage to the visual system.



Burns hazard

This sign is used to highlight danger of burns caused by contact with hot surfaces (> 60 °C). Non-observance of the rules connected to the sign could cause risk of burns on the hands or upper limbs.



Explosion hazard

This sign is used to highlight danger of explosion. Non-observance of the rules connected to the sign could cause explosions.



Fire hazard

This sign is used to highlight danger of fire. Non-observance of the rules connected to the sign could cause a fire.



Fatal hazard

This sign is used to highlight situations of serious danger or death of persons. Non-observance of the rules connected to the sign could cause serious harm or death of persons.

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4.3.2 Prohibition signs

**Generic prohibition**

This sign is used to highlight it is forbidden to carry out certain movements, operations or to perform certain actions. Non-observance of the rules connected to the sign could cause damage to objects, animals or persons.

**Do not touch**

This sign is used to highlight the operator is forbidden to touch a certain part of the machine. Non-observance of the rules connected to the sign could cause damage to the hands.

**Do not insert the hands**

This sign is used to highlight the operator is forbidden to insert the hands in a certain area. Non-observance of the rules connected to the sign could cause damage to the hands and/or the upper limbs.

**Do not smoke or use naked flames**

This sign is used to highlight it is forbidden to smoke and/or use naked flames. Non-observance of the rules connected to the sign could cause explosions and/or fire.

**Do not extinguish with water**

This sign is used to highlight it is forbidden extinguish flames and/or sources of fire using water. Non-observance of the rules connected to the sign could cause damage to objects, animals or persons

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4.3.3 Obligation signs



Generic obligation

This sign is used to highlight obligation of the operator to observe the rules. Non-observance of the rules connected to the sign could cause damage to objects, animals or persons.



Obligation to use certain P.P.E.

These signs are used to highlight the obligation to use certain personal protection equipment when performing the operations. Non-observance of the rules connected to the sign could cause serious harm or death of the operator.



Obligation to connect to ground

This sign is used to highlight the obligation to connect the machine to an efficient ground system. Non-observance of the rules connected to the sign could cause damage to objects, animals, or persons.



Obligation to disconnect the plug from the socket

This sign is used to highlight the obligation to disconnect the electric power supply plug before carrying out any other operation. Non-observance of the rules connected to the sign could cause damage to objects, animals, or persons.



Obligation to check efficiency of protections

This sign is used to highlight the obligation to check the efficiency of the protections (removed during maintenance, repair, cleaning, lubrication operations). Non-observance of the rules connected to the sign could cause damage to objects, animals, or persons.



Obligation to read the instructions

This sign is used to highlight the obligation to read the instructions (use and maintenance manual, technical sheets, etc.), before the installation, use or any other operation to be carried out on the machine!

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4.4 General information regarding the laser classification

The laser classification is realised in compliance with the standard:

- CEI EN 60825-1: 2014 Safety of laser products Part 1: Equipment classification requirements.

4.4.1 Potential danger of laser classes

The concept of laser is not enough to describe the danger represented by a device that emits coherent electromagnetic radiations.

The potential of risk may greatly vary according to the apparatus and the conditions of use. For this reason, the international standard recommends that each laser system is attributed to a specific class, so that the potential danger is immediately clear to all. The risk increases as the class increases.

4.4.2 Classification obligation

Those who place laser apparatus in circulation can only deliver the product to the user after having attributed it to one of the seven classes defined by the standards regarding laser (otherwise the user is to observe the strict ruling of class 4).

Class	Risks	Necessary measures
1	Harmless in normal operation ¹ .	No measures necessary.
1M	Harmless without optical instruments.	Warn the persons who use the optical instruments
2	Harmless if exposure is momentary	<ul style="list-style-type: none"> • Do not look directly in the laser beam; • Do not direct the laser on the face.
2M	Without optical instruments: as classe2.	Harmless.
3A	Eliminated.	Treat as class 1M or 2M.
3R	Limitedly hazardous.	Only to be used by qualified technicians.
3B ²	<ul style="list-style-type: none"> • Direct beam hazardous for the eyes • Diffuse radiation, not hazardous. 	<ul style="list-style-type: none"> • Designate the person for the laser safety; • Segregate the zone of use with architectural structures; • Control access; • Declare presence of laser at the entrance; • Only permit use by qualified technicians; • Wear protective goggles.
4	<ul style="list-style-type: none"> • Beam hazardous for the eyes and skin; • Diffuse radiation could be hazardous for the eyes; • Danger of fire. 	<ul style="list-style-type: none"> • Same precautions as for class 3B; • Use the necessary P.P.E..

Tab. 4-1 – Classification of laser as per standard CEI EN 60825-1:2014

According to the active material and the pumping source, the laser can emit in continuous mode (*cw = continuous wave*, with a duration of emission > 0.25 s), in pulsed mode or repeatedly pulsed, or emit its energy in a single enormous pulse.

¹ Under normal conditions lasers of class 1 are to be secure also without special instructions.

² If the safety depends on the instructions given, the harmlessness of the apparatus is to be indicated not by class 1, but by a declaration type : “No danger in the marked zone”.

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4.5 Effects of laser radiation on biological tissues

4.5.1 General

The mechanism with which the laser radiation causes damage is similar for all biological systems and can involve interaction of heat, transitory thermo-acoustic phenomena, photo-chemical processes and non-linear effects.

The grade of responsibility attributable to each of these mechanisms in the case of damage can be referred to some physical parameters of the radiation source, the most important of which are the **wave-length**, the **pulse duration**, the **dimension of the image**, the irradiance and the radiant exposure.

Generally, in exposures that exceed the threshold, the predominant mechanism widely depends on the duration of the exposure pulse.

Therefore, in incremental order of the pulse duration, **the predominating effects, in the following time intervals**, are:

- **For exposures in nanoseconds and less than a nanosecond**, micro-cavitation, transitory acoustic phenomena and non-linear effects;
- **From 100 μ s to a few seconds**, thermal effects;
- **More than approx. 10 seconds**, photo-chemical effects.

Laser radiation differs from the major part of other types of known radiations in the high radiance and collimation of the beam.

This fact, combined with a high level of initial energy content results in the transmission of large qualities of energy toward the biological tissues.

The main event, in any type of damage to a biological system caused by laser radiation, **is the absorption of optical radiation on the part of this system**. The absorption takes place at atomic or molecular level and constitutes a specific process of the wave-length. It is therefore the length of the wave that determines which tissue can be damaged by a particular laser beam.

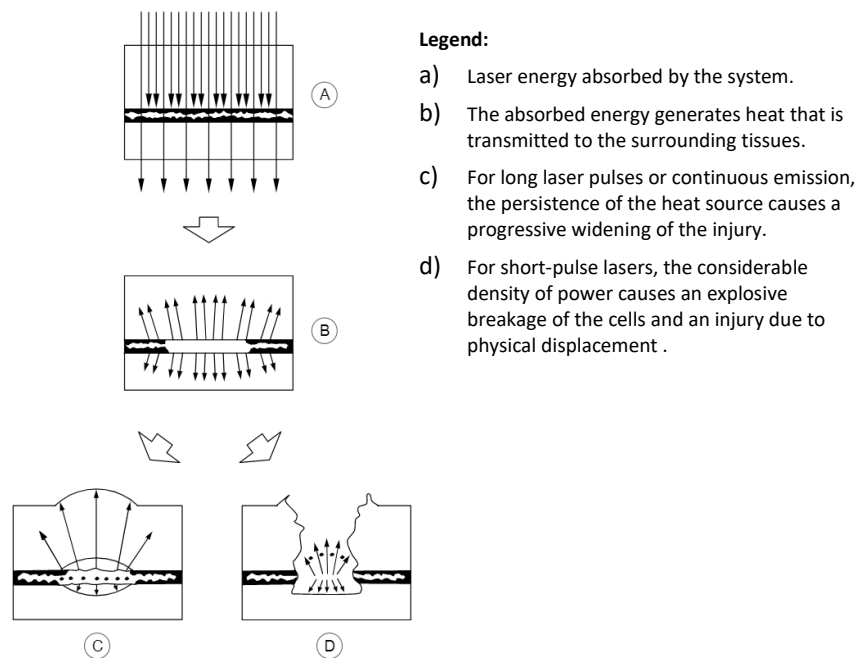


Fig. 4-1 – Examples of laser radiation as a function to the time of exposure and the dimension of the beam

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4.5.2 Hazards for the eye

4.5.2.1 Physiology of the eye

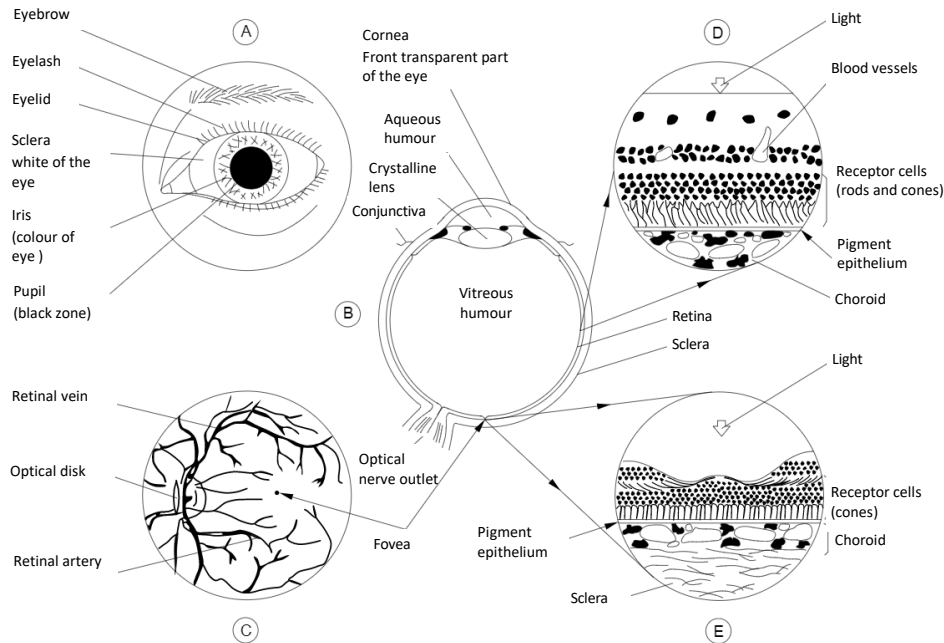


Fig. 4-2 – Physiology of the human eye

Section (A) of Fig. 4-2 illustrates a diagram of a left eye external structure.

The distance between the eyelids that cover it, limit the field of vision (FOV) of the eye to an almond-shape surface. The main elements of the eye front part are indicated.

Section (B) illustrates a diagram of a left eye horizontal section. The eye is divided into two parts, the frontal or anterior chamber limited by the cornea, the iris and the crystalline lens, and the eye rear chamber, limited by the retina, that contains the vitreous humour with a gelatinous appearance.

Section (C) illustrates the interior of an intact eye seen through an ophthalmoscope. This instrument directs a beam of light through the pupil and illuminates the eye interior permitting the observation. The image seen in this manner is called ocular fundus. It has a reddish colour, but it is possible to clearly distinguish the main vessels of the retina. The other main elements are the optical disk, which is white, and the fovea. The fovea is a small depression of the retinal surface that may be more pigmented than the retina which surrounds it and is the most distinct zone of sight. The fovea is the centre of the macula; a clear vision depends on the macula.

Section (D) illustrates the structure of the retina as it is seen on the section of its surface shown in Fig. 4-2 (B), but enlarged several hundred times as to the natural size. The retina is composed of several layers of nerve cells that cover the photo-sensitive cells: the cones and the rods; that is to say, the light that arrives on the retinal surface has to pass the layers of the nerve cells before reaching the photo-sensitive calls. Under the layer of cones and rods there is a layer called pigment epithelium that contains a melanin brownish-black pigment that contains both pigmented cells and blood vessels.

Section (E) illustrates the structure of the fovea zone enlarged several hundred times. There are only cones present. The nerve cells are radially displaced externally to this more distinct vision zone. The macular pigment that mainly absorbs the wave-lengths ranging between 400 nm and 500 nm, is situated in the Henle fibrous layer.

4.5.3 Pathological effects of laser radiation

4.5.3.1 Hazards for the eyes

Fig. 4-2 contains a brief description of the eye anatomy. The eye is particularly suitable to receive and transfer optical radiations.

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The relevant pathologies due to excessive exposure are summarised in the following Tab. 4-2. Lasers that emit radiations in ultraviolet and far infrared region are a hazard for the cornea, whereas radiations of systems that emit wave-lengths in the visible and near infrared region are transmitted to the retina.

<i>Spectral region³</i>	<i>Pathological effects on the eyes</i>	<i>Pathological effects on the skin</i>
Ultraviolet C (from 180 nm to 280 nm)	Photo-keratitis.	<ul style="list-style-type: none"> Erythema (sunburn); Acceleration of skin ageing process; Increase in pigmentation.
Ultraviolet B (from 280 nm to 315 nm)		
Ultraviolet A (from 315 nm to 400 nm)	Photochemical Cataract.	<ul style="list-style-type: none"> Darkening of the pigment; Photosensitive reactions; Burning of the skin.
Visible (from 400nm to 780 nm)	Photochemical and thermal injury of the Retina.	
Infrared A (from 780 nm to 1 400 nm)	Cataract, burning of the retina.	
Infrared B (from 1,4µm to 3,0 µm)	Aqueous humour Inflammation, cataract, burning of the cornea.	Burning of the skin.
Infrared C (from 3,0µm to 1 mm)	Burning of the cornea only.	

Tab. 4-2 – Pathological effects of laser in relation to the spectral regions

Lasers in the visible and near infrared regions are a particular hazard for the eye, because due to the property necessary for the eye to be able to effectively transfer the light, the strongly pigmented tissues are submitted to a high radiant exposure.

Lasers out of the visible light spectrum are very hazardous since there is no optical perception of the beam and there is less protection deriving from the eyelid reaction.

4.5.3.2 Hazards for the skin

Generally, the skin can support an exposure to the energy of the laser beam which is much greater than that of the eye. The biological effect of the skin radiation with lasers functioning in the visible spectral regions (from 400 nm to 700 nm) and the infrared region (over 700 nm) may **vary from a slight erythema to big blisters**.

An ash-grey carbonising is prevalent in the tissues with high surface absorption following exposure to laser with very brief pulses with a high peak power. This occurrence may not be followed by erythema.

Pigmentation, ulceration, scars on the skin and damage to the organs underneath can be a consequence of an extremely high radiation. It has been noted that latent or cumulative effects of the laser radiation are not frequent.

However, some limited research has suggested that, under particular conditions, repeated local exposures can sensitise small zones of human tissue, that causes modification of the exposure level for minimum reactions and aggravation of reaction in the tissues for these low level exposures.

In the wave-length interval between 1500 nm and 2600 nm, studies regarding the biological threshold indicate that the danger of skin injuries follow a similar path to that for the eye. For exposures up to 10s, the EMP increases inside this spectral region.

³ The spectral regions defined by the CIE are only synthetic notations, useful to describe the biological effects and may not perfectly agree with the spectral intervals indicated in standard CEI EN 60825-1.

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4.6 Classification and specific hazards of the radiation emitted by FIBERLUX NANO

FIBERLUX NANO in compliance with standard CEI EN 60825-1:2014 is classified as indicated in Tab. 4-3 below:

	FIBERLUX NANO 30 W	FIBERLUX NANO 60 W
Parameter		
Laser class	LASER Class 4	
Wave-length	1064 nm	
Type of emission	Pulsed	
Duration of pulse [ns]	10÷200	2÷500
Frequency of repetition [kHz]	2÷60	1÷4000
Maximum power emitted [W]	30	60
Maximum energy emitted [mJ]	1	2.0
Beam diameter (@input galvo head) [mm]	6-9	
Beam divergence (@output galvo head) [mrad]	38	
N.O.H.D ⁴ for direct or specular reflection radiation	20.2 m	
N.O.H.D for diffuse radiation	1.1 m	

Tab. 4-3 – FIBERLUX NANO classification as per CEI EN 60825-1:2014



CAUTION! Class 4 lasers are laser products for which direct observation of the beam and exposure of the skin are hazardous and for which observation of diffuse reflections can be hazardous. These lasers can often cause hazard of fire.

This laser emits a radiation in the non-visible spectrum and is therefore especially dangerous since it is not perceived by the human eye.

Non-visible laser radiation also reduces the protective effect (natural) of the eyelid reflection⁵.



CAUTION! Only the use of appropriate personal protection equipment can protect the operator against the effects of laser radiation.

OBBLIGATION: The Employer has the obligation to assess the risks deriving from exposure and select and make available appropriate personal protection devices for the operators.

⁴ Nominal Optical Hazard Distance.

⁵ The eyelid closes due to the effect of the reflection glare.

Laser marker - FIBERLUX NANO

4.7 Graphic signs and written warnings

The graphic signs and written warnings on the machine are indicated below. The signs have been inserted to warn the operator against hazards or possible sources of residual risks. Next to each graphic sign there is a written caption with the meaning of the sign. **Bear them in mind.**

For the location of the signs, see the following paragraph 4.7.5.



CAUTION!]: Ignorance or non-observance of the signs and warnings could cause personal injuries, death and /or damage to the machine and the fixtures.

4.7.1 Danger graphic signs and written warnings



Fig. 4-3 – Danger pictogram

This sign (with indication of the relevant voltage value) highlights the **danger** (residual risk) resulting from presence of voltage.



Fig. 4-4 – Danger pictogram

This sign highlights the **danger** (residual risk) resulting from exposure of the eyes and skin to direct or diffuse radiation.



Fig. 4-5 – Danger pictogram

This sign highlights the **danger** (residual risk) resulting from laser radiation near an opening (inside the welding zone).

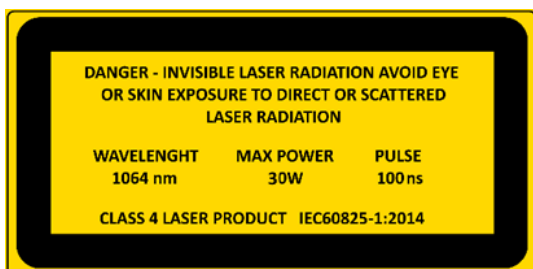


Fig. 4-6 – Explanatory label

This sign highlights the **danger** (residual risk) resulting from exposure of the eyes and skin to direct or diffuse radiation as well as providing some information regarding the features of the laser source.

Laser marker - FIBERLUX NANO

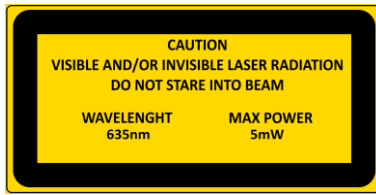


Fig.4-7– Explanatory label

This sign highlights the danger (residual risk) deriving from exposure of the eyes and skin to direct or diffuse radiation, as well as providing some information on the characteristics of the laser pointer.

4.7.2 Obligation graphic signs and written warnings



Fig. 4-8 – Obligation pictogram

This sign highlights the **obligation** to read and understand the operator manual before using the machine.

Non-observance of the instructions could cause death or serious injuries.

4.7.3 Other graphic signs and written warnings

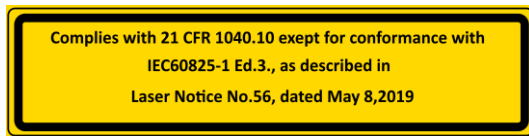


Fig. 4-9 – Conformity label

This sign highlights the conformity of the manufacturers to the FDA⁶ performance standards for laser products .

4.7.4 Label machine



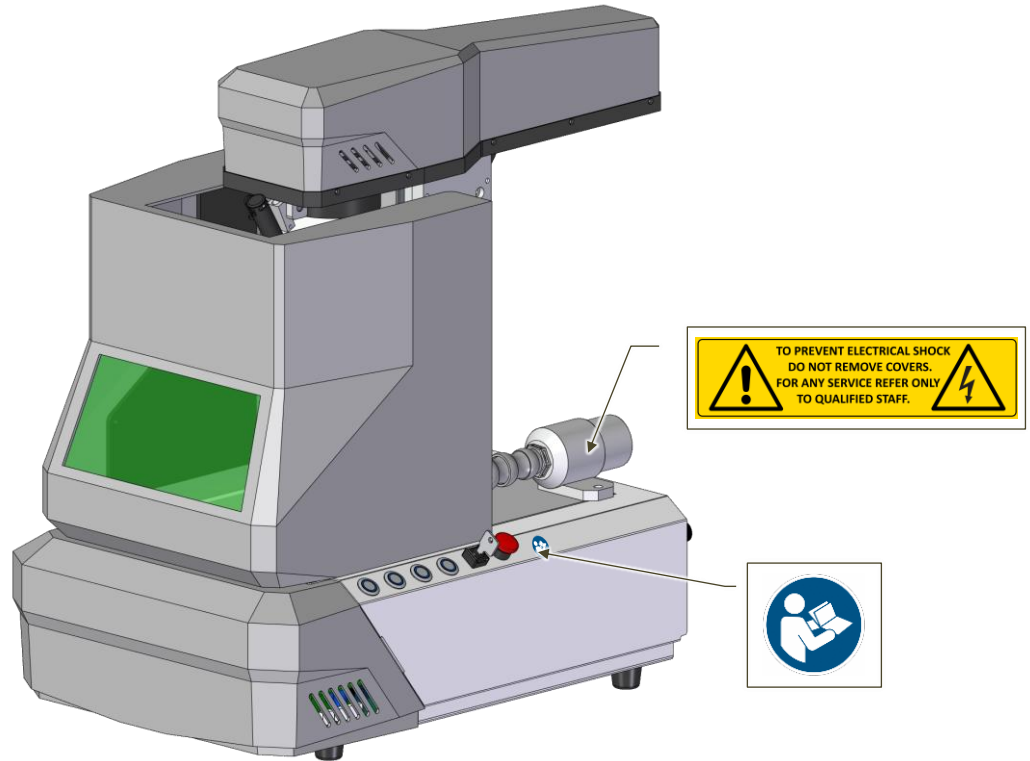
Fig. 4-10 – Label machine

Machine data label, model, serial number, manufacturer data, year of manufacture, origin, power supply voltage, laser energy, weight.

⁶ Food and Drug Administration's.

Laser marker - FIBERLUX NANO

4.7.5 Location of graphic signs and written warnings



4.7.6 Fig. 4-11 - Location of graphic signs and written warnings- view from front left side

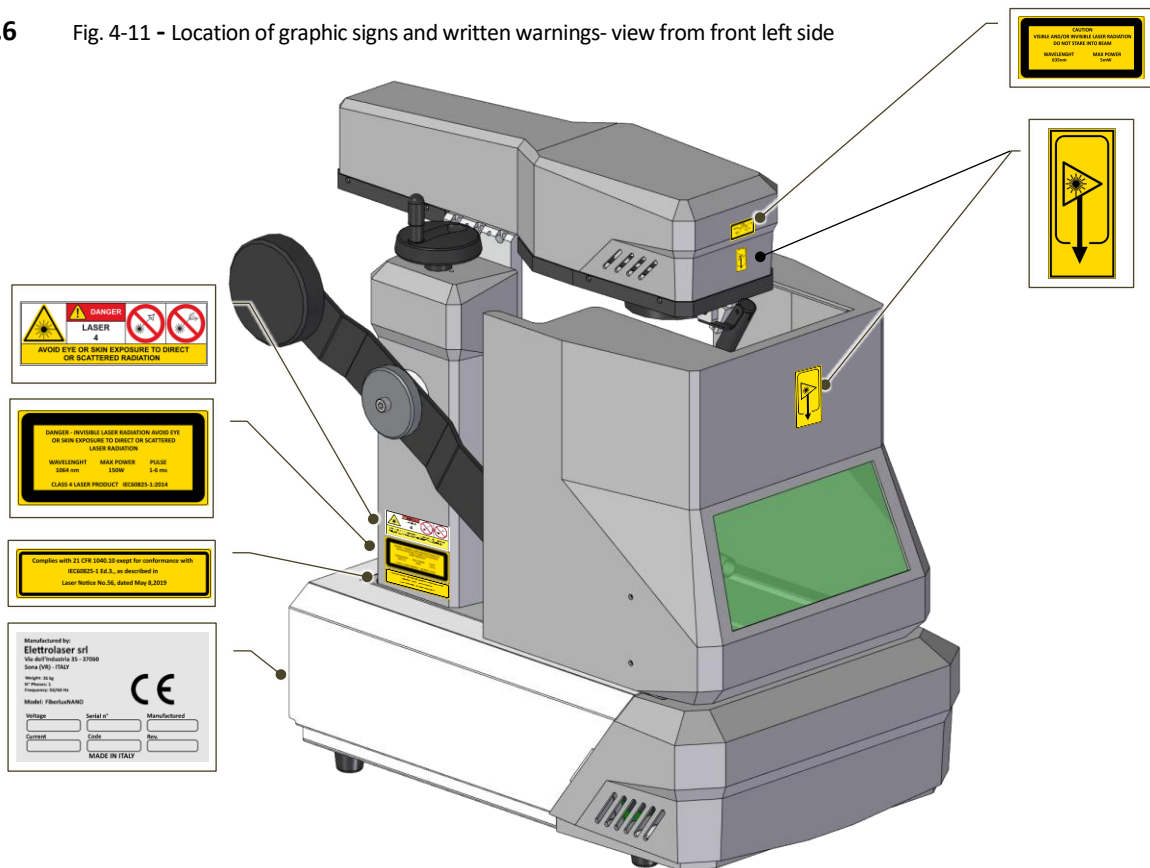


Fig. 4-12 - Location of graphic signs –laser scanner system internal view

Laser marker - FIBERLUX NANO

4.8 Physical and intellectual requirements of the personnel

These persons are to be able, also physically, to carry out the operations necessary and to familiarise with the safety instructions and standards. These persons are to have been trained (according to the tasks performed /assigned) to be able to use and /or maintain the machine in a safe condition.



CAUTION! Ignorance or non-observance of the signs and warnings could cause personal injuries , death and /or damage to the machine and the fixtures.



FORBIDDEN! The operators shall not work on the machine under the influence of substances that reduce times of reaction.

The personnel can be divided as follows:

- Persons assigned to the transport, installation, dismantling and putting onto service;
- Persons assigned to non-routine maintenance (service);
- Laser safety warden;
- Persons assigned to the management

Each function has specific tasks, described below.

4.9 Persons assigned to transport

The operators assigned to transport are to be workers who have the necessary professional technical requirements to operate with specific equipment, for example lifting machine and accessories.

Activities that require simultaneous action of several workers are to always be coordinated by a person in charge of the operations.

The operator is to assess the possible risk of interference with other activities in progress by other workers on the installation site.

Laser marker - FIBERLUX NANO

4.10 Persons assigned to non-routine maintenance (service)

Standard EN 15628 (Maintenance – Qualification of maintenance personnel), identifies these three professional figures for maintenance personnel, for which it defines the relevant competencies necessary:

- Maintenance manager (indicatively with levels EQF 6 and 7⁷);
- Maintenance supervisor and maintenance engineer (indicatively with levels EQF 5 and 6);
- Specialised Maintenance Technician (indicatively with levels EQF 4 or 5).

The tasks of the **Specialised Maintenance Technician** consist in the independent execution of maintenance activities, including the following essential tasks:

- To perform or ensure the execution of the maintenance plans in safety, in accordance with the business policy;
- Promptly take action in the event of a failure or a fault, ensuring efficient operation of restoration;
- To perform or ensure the correct execution in compliance with the laws and procedures regarding safety, health of the operators and safeguarding the environment;
- Ensure availability of the materials, fixtures and equipment necessary to carry out the maintenance activities;
- Coordinate and/or supervise the maintenance operation activities;
- Ensure the quality of the maintenance activities;
- Use and ensure the use of ICT systems (Information and Communication Technology).



OBLIGATION!: NON-Routine Maintenance operations (service) are only to be carried out by personnel of ELETTROLASER S.R.L. or by dealers/installers authorised by ELETTROLASER S.R.L.

⁷ EQF is the European Qualification Framework, job description reference Standard that applies a system based on the results of learning obtained at the end of the training course. The results of the learning are defined in terms of Knowledge, Ability, and Competency. The overall result is an index ranging between 1 and 8, to identify in a rapid and univocal manner the level of learning reached in a certain environment.

Laser marker - FIBERLUX NANO

4.11 Laser safety officer (LSO)

In many countries around the world, in case of class 3B or 4 laser products, the employer must appoint a LASER SAFETY OFFICER. Consult local laws in this regard.

For European Union countries in the case of Class 3B or 4 Lasers, in compliance with Artificial Optical Radiation Directive 2006/25/EC, which requires that risk assessment must be carried out by qualified personnel, it is the Employer's responsibility to appoint the Laser Safety Officer (LSO) in the industrial, research and civil and environmental fields; he is a professional figure suitable for carrying out physical surveillance activities and/or assessment of direct and indirect risks relating to the use of optical radiation sources, which includes assessment intended as an estimate, measurement or calculation of exposure levels for workers.

The Laser Safety Officer (TSL) must possess the knowledge described below:

- Basic knowledge:
 - The electromagnetic spectrum of optical radiation,
 - The appropriate units of measurement (radiometric and photometric terms),
 - The operating principles of laser sources,
 - The emission characteristics of the laser radiation,
 - The modalities of interaction of the optical radiation with the biological tissue (photothermal, photoacoustic, photoablative, photochemical effects),
 - The physiology of tissues at risk and the effects of exposure to laser radiation,
 - The Maximum Permitted Exposure limits and the Accessible Emission Limits (EMP and LEA),
 - The classification of laser equipment,
 - Direct and indirect risks,
 - Characteristics of collective and individual protective devices,
 - National and international regulations on laser safety and related guidelines,
 - Differentiation concepts for laser classes and their characteristics,
 - How to evaluate laser risk zones,
 - How to evaluate protective devices;
 - The alignment procedures of the laser systems used,
 - The laser applications used in the area entrusted to its control;
- Specific knowledge:
 - The main industrial, research and civil and environmental applications,
 - The principles of quality assurance,
 - The appropriate safety measures depending on the risk class of the laser system,
 - The risks that may arise from the operation of lasers, such as electrical, chemical, fire, use of cryogenic agents and carcinogenic materials, atmospheric contamination, collateral radiation,
 - The procedures and means of risk control,
 - The methods of measurement and control of the emission parameters and of the safety systems of the laser sources.



INFORMATION! *The Laser Safety Officer (LSO) has the obligation to manage the interlock device and password to enable the machine, as specified by the standards in force.*

Laser marker - FIBERLUX NANO

4.12 Persons assigned to the management

The machine is to be managed by a professional operator, as described on the following paragraph 5.5, that also indicates his/her position and the tasks involved.

The operator is never to take action to perform operations on the machine that differ from the management, as described further on, except for those operations described in paragraphs 9.2 (routine maintenance) and 9.5 (machine cleaning); all maintenance operations that are NOT routine, repairs, or other actions not part of the normal management are to be carried out by the qualified technicians.



FORBIDDEN! *Never act on personal initiative to solve machine stoppage situations that are not strictly bound to the actual running operations.*

Never try to help the maintenance or tooling technicians.

4.13 Training of personnel

The machine is only to be used by qualified technicians who have attended the training period established at the time of the sale contract and that authorises the use. In any case the machine is not to be used by persons who have not been appropriately instructed regarding the correct functioning and the safety devices.



CAUTION! *ELETTROLASER S.R.L. shall not be held liable for wrong operations carried out by persons who have not been trained to use the machine, and/or caused by non-observance of the general safety and protection rules.*

4.14 Improper use

The machine has been designed for use exclusively for the purposes described in the specific section of the manual (paragraph 5.4). Uses that differ from those described in this manual shall be considered improper and hence not in conformity with the safety standards.



CAUTION! *A non-conforming use of the machine can cause personal injuries, death and/or damage to the machine or to the fixtures, in particular it could cause a dangerous exposure to laser radiation.*

A series of improper uses follow that could cause personal injuries or damage to the machine or the fixtures, for which ELETTROLASER S.R.L. shall not respond and refuses any responsibility:

- Unauthorised modifications or replacement of machine parts;
- Non-observance of the safety instructions;
- Non-observance of the instructions regarding installation, use, functioning, maintenance, repairs or if these operations are carried out by unqualified persons;
- Use of improper and incompatible materials or auxiliary fixtures;
- Non-observance of the workplace safety rules or the relevant laws in force.

Laser marker - FIBERLUX NANO

5 Characteristics and technical data

5.1 Description of the machine

The Laser Marker , series FIBERLUX NANO (Fig. 5-1), is able to mark or cut metal objects of small dimensions by means of a pulsed fibre laser source .

The machine can engrave, for example, logos, trade-marks, photo-engraving, texts, graphic drawings, flat surfaces, holes in layers and 3D bas-reliefs.

The machine consists of the following elements:

- Machine housing;
- Marking area with access door;
- Laser scanner system;
- Control and signalling devices.

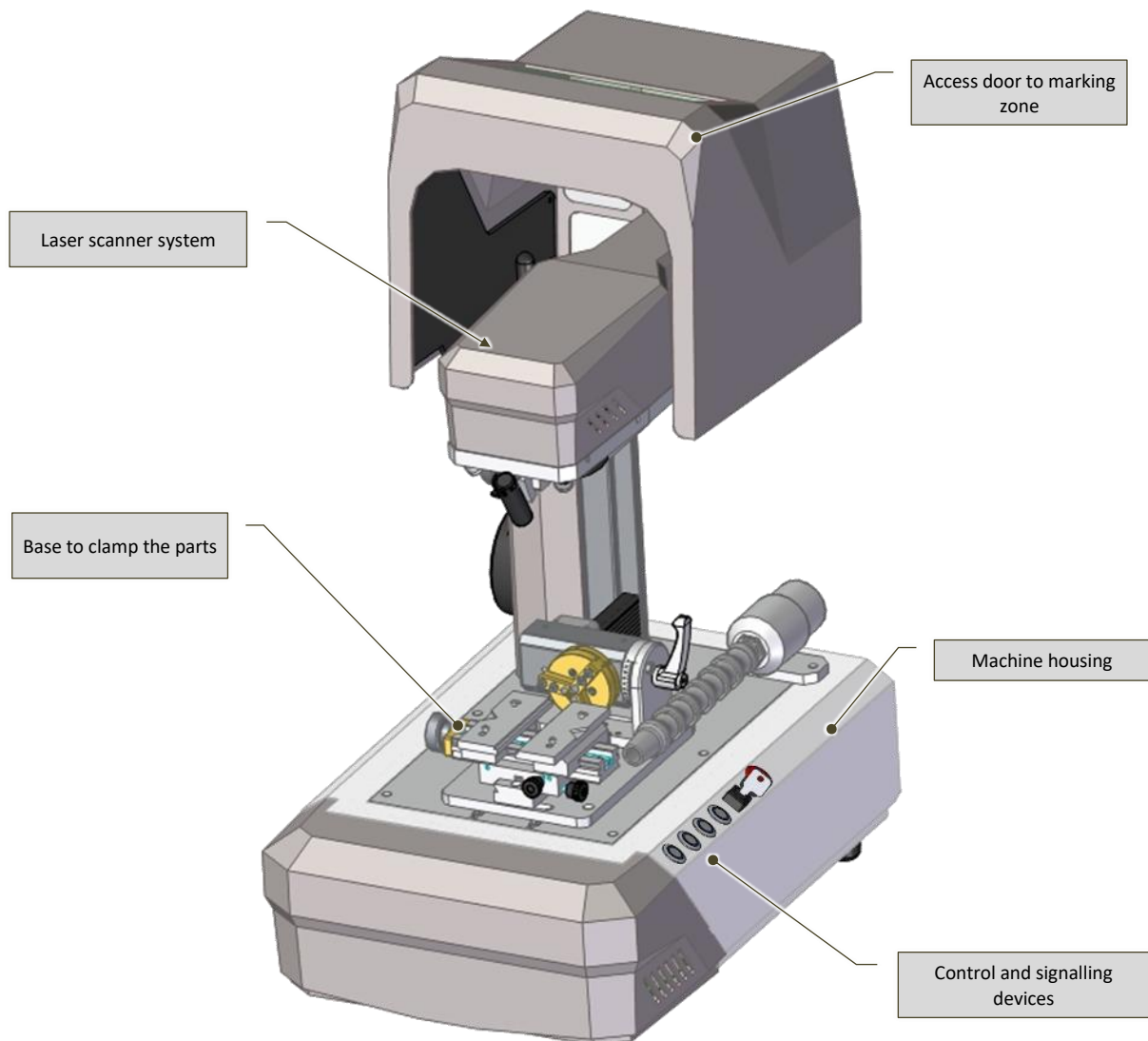
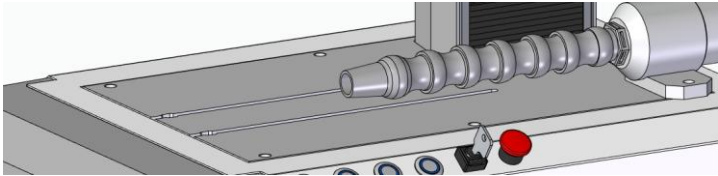
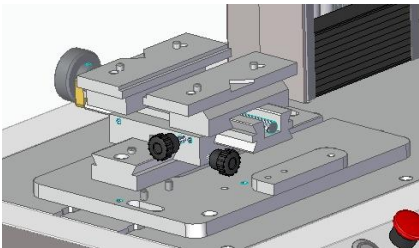
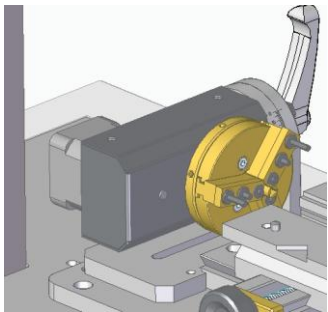
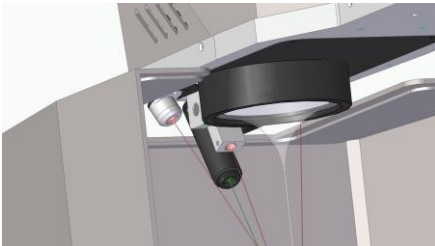
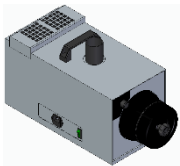



Fig. 5-1 – FIBERLUX NANO

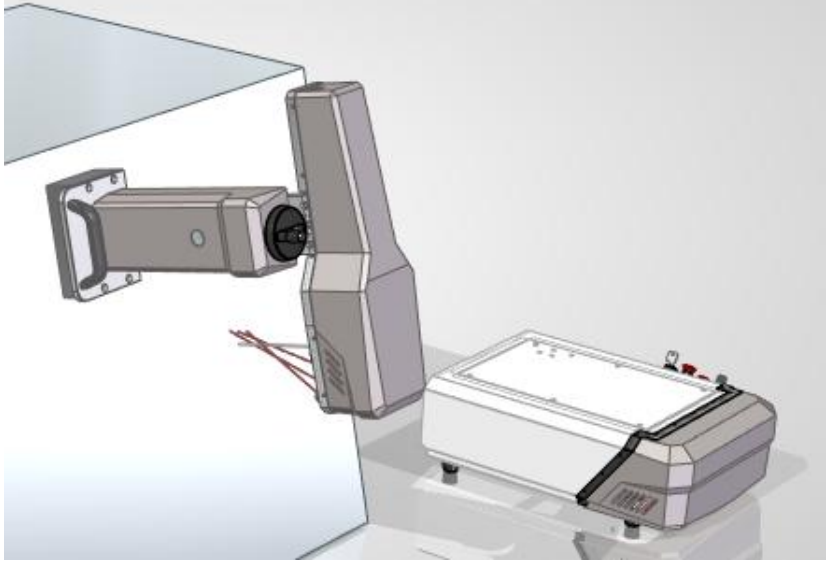
Laser marker - FIBERLUX NANO

5.2 Equipment

FIBERLUX NANO is supplied with standard or optional accessories, that can be ordered at the time of purchase or later, as indicated in Tab. 5-1 :

<i>Fiberlux NANO</i>			
Equipment			20W 30W
<p>Base for the marking</p> <p>To position and mount the parts clamping accessories.</p>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Part securing jaw</p> <p>For manual positioning along axes X-Y and the clamping (in different modes) of the part for processing.</p> <p><i>IMPORTANT NOTE: This accessory requires the presence of the base.</i></p>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Self-centring spindle</p> <p>To clamp and rotate (axis R) circular items and for external/internal engraving of rings and bracelets.</p> <p><i>IMPORTANT NOTE: This accessory requires the presence of the base.</i></p>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Camera</p> <p>Enables vision of the working area and facilitates positioning of the parts.</p> <p>Useful for remote assistance.</p>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Extractor</p> <p>To extract the fumes and recover 99.9% of precious metals.</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Compact</p> </div> <div style="text-align: center;">  <p>BF9</p> </div> </div>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Laser marker - FIBERLUX NANO

		<i>Fiberlux NANO</i>	
<i>Equipment</i>		<i>20W</i>	<i>30W</i>
<p>Column-magnetic collimator To move the laser column on a work plate not connected to the machine</p> 		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Tab. 5-1 – Machine standard equipment and optionals

Laser marker - FIBERLUX NANO

5.3 Technical standards applied and legal provisions

The machine has been designed in compliance with the following community standards regarding safety of laser products:

- EN ISO 12100:2010 Safety of machinery - general design principles – Risk assessment and reduction of risk;
- EN 60204-1:2018 Safety of machinery - Electrical equipment of machines - part 1: General requirements;
- CEI 76-11:2011 Safety of laser products – Part 14: Guide for the user (IEC TR 60825-14:2004);
- EN 60825-1:2014 Safety of laser products - Part 1: Equipment classification requirements;
- EN 61000-6-1:2007 Electromagnetic compatibility (EMC) - Part 6-1: General standards – Immunity requirements for residential, commercial, public and light industrial locations;
- EN 61000-6-3:2007/A1:2011/AC:2012 Electromagnetic compatibility (EMC) - Part 6-3: General standards – Emission for residential, commercial and light industrial locations;
- EN 61000-3-2:2014 Electromagnetic compatibility (EMC) - Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase);
- EN 61000-3-3:2013 Electromagnetic compatibility (EMC) - Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in low voltage supply systems for equipment with rated currents ≤ 16 A per phase and not subject to conditioned connection.

Also the following EU Directives have been observed:

- Directive 2006/42/EC of the European Parliament and the Council of 17 May 2006 regarding machines and that amends directive 95/16/EC (redraft);
- Directive 2014/30/EU of the European Parliament and the Council of 26 February 2014 concerning harmonising of Member State laws regarding electromagnetic compatibility (redraft);
- Directive 2014/35/EU of the European Parliament and the Council of 26 February 2014 concerning harmonising of Member State laws regarding introduction on the market of electrical material for use within certain voltage limits;
- Directive 2011/65/EU of the European Parliament and the Council of 8 June 2011 on the restriction of use of certain hazardous substances in electrical and electronic equipment;
- Delegated directive (EU) 2015/863 of 31 March 2015 containing amendments to annex II of directive 2011/65/EU of the European Parliament and the Council regarding the list of substances with restrictions for use.



INFORMATION! *Although the machine is in conformity with the applicable EU directives, it cannot be excluded that these may be (have been) implemented at local level (national) by specific legislation.*

5.4 Foreseen conditions of use

FIBERLUX NANO has been designed for the execution of the functions described in paragraph 5.1 of the manual.

The machine is to operate under environmental conditions as described in the specific section (Permitted environmental values) in Tab. 5-4.

The product on which the processing takes place is to have characteristics that comply, both regarding type and dimensions, with the specifications indicated in the relevant paragraph regarding the product characteristics (5.7).

Laser marker - FIBERLUX NANO





5.5 Residual risks

The machine has the workstations indicated in Tab. 5-2 below:




Work station	N° operators	Operations performed
In front of machine	1 operator	Machine power on/power off. Product loading/unloading. Start/stop marking / engraving /cutting cycle.

Tab. 5-2 –Work stations

In any case, under normal working conditions there are always residual risks present, which are described below (Tab. 5-3):

Phase	Risks	P.P.E. *
Transport and handling	Risks of impact and crushing: if there should be an incorrect use of any lifting and handling equipment, or during manual handling (accidental dropping of the machine).	
Installation, assembly and connections	Risks of impact and crushing: if there should be an incorrect use of any lifting and handling equipment, or during manual handling of a part (accidental dropping).	
	Risks of impact, tripping and falling: if the machine installation area is not sufficiently lighted.	
Product loading and unloading	Risks of electrocution and electric arc: if the machine is connected to an inappropriate /not-integral electrical plant or if the equipment has been damaged during transport or during assembly.	
	Risks of muscular-skeletal injuries: if the operator lifts incorrectly (or alone) material having a certain weight (see also paragraph 6.4).	
Adjustments and use	Risks of electrocution and electric arc: if the machine is connected to an inappropriate /not-integral electrical plant or if the equipment or the cable to the electrical mains is damaged, modified or altered.	
	Risks of exposure to laser radiation: direct observation of the laser beam and exposure of the skin are hazardous and the observation of diffuse reflection can be hazardous. These lasers often constitute a fire hazard, since they can start the combustion of inflammable substances, such as volatile substances, as well as methacrylate resins or plastics	 
	Residual risk caused by formation of fumes: The interaction of the laser beam with organic and inorganic materials causes formation of fumes and emissions that, in some cases could be harmful for health and/or toxic. It is therefore necessary to connect the machine to a fumes extractor (optional equipment).	

Laser marker - FIBERLUX NANO

<i>Phase</i>	<i>Risks</i>	<i>P.P.E. *</i>
	<p>Residual risks arising from presence of persons, near the machine who are not involved in the operations.</p>	
	<p>Risks of impact and crushing during manual handling (accidental dropping) of a machine accessory that has to be assembled/removed.</p>	
	<p>Risk of slight crushing during the closure of the automatic access door to the machine working zone (if supplied), if the hand is placed in the zone of its stroke. The movement of the automatic door can be seen by the operator.</p>	
	<p>Risks of impact, tripping and falling: if the machine installation area is not sufficiently lighted</p>	
	<p>Risks of electrocution and electric arc: the machine uses electrical energy, it is therefore necessary that only the qualified technician, taking the necessary precautions (EN 50110-1) operates on live or unpowered electrical parts. Removal of the covering or parts of it or the barriers is to be carried out exclusively by ELETTROLASER S.R.L..</p>	
Maintenance	<p>Risks of exposure to laser radiation: direct observation of the laser beam and exposure of the skin are hazardous, and the observation of diffuse reflection can be hazardous. Only carry out maintenance with the machine disconnected from the mains. Removal of the covering or parts of it or the barriers is to be carried out exclusively by ELETTROLASER S.R.L..</p>	 

* The employer is to assess within the specific environment of activity, that the P.P.E. are appropriate and sufficient for the residual risk connected to the use of the machine, also in relation to the presence of other risks involved in the activity.

Tab. 5-3 – Residual risks

These risks are reduced to an acceptable level if the personnel operate under appropriate conditions, as described at the beginning of this paragraph.

Laser marker - FIBERLUX NANO

5.6 Machine technical data

5.6.1 Technical data

Parameter	Description	Fiberlux NANO		
Machine dimensions	Minimum length of installation area	2450 mm		
	Minimum width of installation area	2750 mm		
	Minimum height of installation area	2700 mm		
	Maximum length of machine	652 mm		
	Maximum width of machine	392 mm		
	Maximum height of machine	629 mm		
Dimensions of accessories	<u>Securing clamp</u> Length x Width x Height	180x150x65 mm		
	Spindle Length x Width x Height	150x90x120 mm		
	Camera Length x Width x Height	70x15x15 mm		
	Pedestal Length x Width x Height	1000x700x1200 mm		
	Extractor Length x Width x Height	500x210x245 mm		
Connection	Electrical energy	Plug type Schuko EU or Type B USA		
Weights	Machine	Overall weight with packaging	50 Kg	
		Machine net weight without accessories		
	Accessories	<i>Standard</i> 30, 60	35 kg	
		Weight of securing clamp	1,5 kg	
		Weight of self-centring spindle	2 kg	
		Weight of pedestal	75 kg	
		Weight of extractor Compact	15 kg	
Weight of extractor BF9	17 kg			
Power supply	Electrical	Power supply voltage of the electrical equipment	230 V AC +/- 5% <i>(optional 110 VAC +/- 5%)</i>	
		Power supply frequency	50/60 Hz	
		Type of connection to ground circuit (IEC 60364-3)	TN-S	
		<i>Different electrical distribution systems are first to be verified and agreed with the machine manufacturer.</i>		
		Power supply voltage of auxiliary circuits	24 V DC +/- 10%	
		Mean power consumption	<i>Standard</i>	
Performance	Axis Z stroke	195 mm		
	Axis Z speed	5 ÷ 80 mm/s		
	Axis Z precision	0.01 mm		

Laser marker - FIBERLUX NANO

Parameter	Description	Fiberlux NANO
	Maximum speed of galvanometer head	
	<i>Standard</i>	5000 mm/s
	Marking /resolution area (dimension of spot)	
	<i>Focal device</i>	100x100 mm / 26μm
Laser data	Class	LASER Class 4
	Wave-length	1064 nm
	LASER crystal type	Yb - Doped Fiber
	Type of cooling	By air
	Type of emission	Pulsed
	Duration of pulse	
	<i>Standard</i>	30 100 ns at 60 kHz
		60 500 ns at 4000 kHz
	M2	< 2
	Maximum power emitted	
	<i>Standard</i>	30 30 W
		60 60 W
	Maximum pulsing energy	
	<i>Standard</i> 30, 60	1 mJ
Permitted environment values	Operating temperature	+5 °C - +40 °C⁸
	Storage temperature	-20 °C - +55 °C
	Environment temperature variations	max. 1.1°C / Min
	Average temperature	Not more than +35°C over 24 h
	Relative humidity range (RH)	65 % or less
	Vibrations	≤ 0.5 G
	Altitude	Up to 1000 m above sea level

Tab. 5-4 – Technical data

⁸ The electrical equipment is able to function correctly when the relative humidity does not exceed 50% at a maximum temperature of +40 °C. Higher relative humidity can be accepted at lower temperatures (e.g. 90% at +20 °C).

Laser marker - FIBERLUX NANO

5.6.2 Noise

The machine has been designed and constructed to reduce the acoustic emission level at the source. Under normal use conditions the acoustic power level of the machine is:

Acoustic pressure

Equivalent weighted continuous acoustic pressure (A)	< 70 dB
Instantaneous weighted acoustic pressure	< 130 dB

Tab. 5-5 – Acoustic pressure

The noise values indicated are the emission levels measured under normal use conditions as per the indications of standards EN ISO 3744, 3745, 3746 and 11200-11204. If modifications should be made to the machine, the aforementioned values could be submitted to variations and therefore have to be determined on the same.

The noise values indicated are emission levels, and do not necessarily represent secure operating levels.

Although a relationship exists between emission levels and exposure levels, this cannot be used in a reliable manner to establish whether or not further precautions are necessary. The factors that determine the exposure level to which the workers are exposed include the duration of exposure, the characteristics of the workplace and other sources of noise (number of machines, adjacent processes, etc.). Furthermore, also the exposure levels permitted may vary from country to country. In any case, the information cited will permit the machine user to better assess the hazard and the risks to which the worker is submitted.



CAUTION!: *The acoustic impact on the surrounding environment produced by this machine can be considered of little importance under testing conditions.*

In any case, it is to be considered that, in compliance with the laws in force (in the country where the machine is put on the market) the exposure to noise of the operator who manages these machines is to be assessed in the actual working conditions where the machine operates.

In compliance with the EU Directive 2003/10/EC, since the acoustic pressure produced by this machine, under testing conditions, does not create a personal daily exposure equal to or over 80 dB (A) for an operator who remains in the installation area in an appropriate and continual manner, the manufacturer is not obliged to take provisions with this information regarding the noise produced.

5.6.3 Vibrations

The vibrations produced are of a very minor entity, not sufficient to create a source of hazard for the operator.

However, the levels have been determined in accordance with standard ISO 5349 for vibrations transmitted to the hand/arm (HAV).

Vibrations emitted

Hand/arm vibrations	$\leq 2.5 \text{ m/s}^2$
---------------------	--

Tab. 5-6 – Vibrations emitted



OBLIGATION!: *No special precautions are necessary to protect the operator against effects of the vibrations produced. If anomalous vibrations should occur, the operator is to stop the machine immediately and inform the maintenance staff.*

Laser marker - FIBERLUX NANO

5.6.4 Degrees of protection

Electrical equipment degree of safety (IP⁹)

Degree of protection against foreign solid bodies (protected against dust)	2
Degree of protection against water (protected against sprayed water)	X
Degree of protection against access to hazardous parts	B

Tab. 5-7 – Degrees of protection

5.7 Characteristics of product to be processed

5.7.1 Technical data of workable products

The products to be produced (example in Fig. 5-2) consist of objects in any type of metal, including precious metals (such as gold and silver), which are to be engraved/cut to reproduce logos, trademarks, photoengraving, texts, graphic drawings.

As an example, the following can be engraved:

- Products in precious metals, such as rings, bracelets, badges, flat and slightly curved surfaces;
- Products in metal for which it is necessary to keep traceability (serial number engravings, Matrix date, QR code and bar code);
- Clock dials or metal frames for glasses.

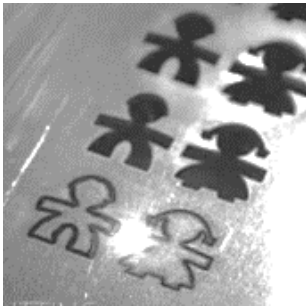


Fig. 5-2 – Example of cut product



Fig. 5-3 – Example of engraved product



Fig. 5-4 – Example of product with engraved curved or circular surface (with self-centring spindle accessory)

⁹ Secondo la norma CEI EN 60529.

Laser marker - FIBERLUX NANO

The dimensions of products that can be processed with FIBERLUX NANO vary according to the type of part clamping accessory used, and are indicated in the following Tab. 5-8.

Dimensional data of workable products		
Marking area	Maximum overall dimensions of space to be processed (L x W x H)	250x250x310 mm
Maximum marking dimensions (engraved/cut)	Maximum marking surface	
	<i>Focal device 100</i>	60x60 mm
	<i>Focal device 160</i>	110x110 mm
	<i>Focal device 210</i>	160x160 mm
With part securing clamp	Part minimum and maximum dimensions	1 - 90 mm on axis X 1 - 90 mm on axis Y
With self-centring spindle	Part minimum and maximum dimensions	Ø 8.5 -93 mm

Tab. 5-8 – Dimensional data of workable products



FORBIDDEN!: IT IS FORBIDDEN to use the machine to process materials that differ from those indicated. Do not process inflammable or combustible materials.



CAUTION!: Make sure that the metals to be processed have no impurities that could cause fumes or gas during the processing.

6 Transport and installation

6.1 Transport

The machine is usually delivered packed, with some possible accessories in a wooden case on a transport pallet. Other accessories, such as pedestal, are supplied separately, always in a wooden case on transport pallet.



INFORMATION! Any unnecessary packaging materials are to be disposed of according to the type and in accordance with the standards in force regarding management of waste..

6.2 Handling and unpacking



OBLIGATION! Observe the following provisions.

Machine loading and unloading is only to be carried out by the ELETTRROLASER S.R.L. personnel or personnel authorised by ELETTRROLASER S.R.L..

The wooden cases used for the machine transport are to be lifted and handled with a lift truck having an appropriate payload.

The lifting equipment is to have a payload equal to at least the weight of the package to be transported, increased by 20%.

For handling using a lift truck, see paragraph 6.3.

Take the wooden case containing the machine to the installation site, and after opening it:

- Take out all the elements and accessories supplied with the machine and that have been transported together with it, as for example the control pedal;
- Take out the machine and position it on a work surface (see also paragraph 6.7):

Observe the safety conditions described in paragraph 6.4,

Grip with both hands on the two lower edges,

Take care not to bump, drop the machine, to avoid damage to electrical parts or internal optical components.

- Remove the protective film.

It is now possible to proceed with the installation of the machine (see paragraph 6.7).

Laser marker - FIBERLUX NANO

6.3 Handling with a lift truck



CAUTION: Non-observance of the following instructions could cause overturning of the components to be transported, with consequent risk of injuries for the operator and damage to the machine.



It is reminded that improper use of the lifting equipment submits the operator to the following risks:

- **Contact with moving part of the lift truck;**
- **Falling of the load, especially on slopes;**
- **Overturning;**
- **Impacts between lift truck and other objects;**
- **Crushing of the operator between lift truck and other objects;**
- **Crushing of the feet by the lift truck wheels.**

6.3.1 General recommendations

The lifting and handling operations are to be carried out with appropriate equipment and by skilled persons trained for this type of manoeuvring.

- 1) Position the lift truck forks under the structure of the part to be lifted, centrally in relation to the load, so that it is balanced:
 - a) Make sure that the forks protrude from the opposite side of the load,
 - b) If necessary, place a piece of wood between the package and the forks to avoid damage to the package;
- 2) Before lifting the load, make sure that the forks have been inserted completely;
- 3) Check that the load is well balanced, lifting it by a few centimetres;
- 4) Only lift the load in stable position, never when in motion;
- 5) During the transfer, keep the load raised by the minimum height necessary;
- 6) With the lift truck, always follow routes without rough ground, humps or dips and that do not have steep slopes

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6.4 Manual handling of loads

Manual handling of the loads (MMC), is to be carried out under safe conditions to avoid overloading the spinal-lumbar section of the spinal cord.

Some safety instructions follow regarding the manual handling of loads.



CAUTION!: The lifting and handling operations are to be carried out in observance of the maximum weight to be lifted by one person¹⁰; use the specific lifting equipment to avoid risks of spinal-lumbar injuries.



FORBIDDEN!: Never lift manually products having a weight out of the permitted limits!

It is reminded that during manual handling, the operators may incur the following risks:

- Falling of the load;
- Crushing of the feet.

To avoid risks arising from incorrect handling of the loads, follow these general indications:

- Make sure that the floor is stable and without rough surfaces;
- Where possible, use appropriate transport devices (for example, hand trolleys Fig. 6-1, lift trucks or cranes);



Fig. 6-1 – Transport devices

- Keep a stable position;
- Bend the knees (with an angle of 90°) and use the leg muscles to lift the load. Lift the load slowly, keeping the back straight (Fig. 6-2);



¹⁰ 25 kg for men and 15 kg for women, in compliance with standard ISO 11228-1 (check also the limits specified in the national laws in force regarding health and safety of the workers).

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Fig. 6-2 – Lifting technique

- Avoid twisting the back (Fig. 6-3);

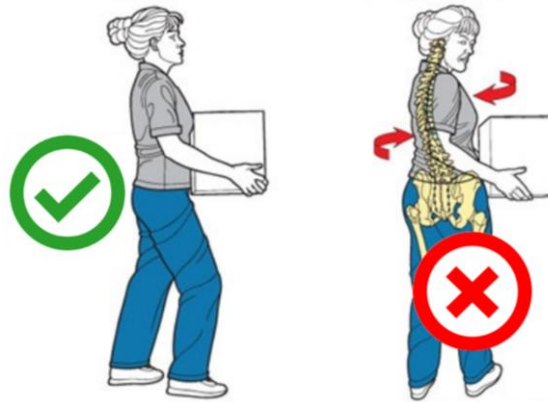


Fig. 6-3 – Handling technique

- Keep the load as close as possible to the body;
- Distribute the load on both sides;
- Maintain a clear view;
- At least two operators are required to lift cumbersome loads (Fig. 6-4);
- Observe the maximum weight limits for lifting by one person;
- If the load is too heavy or requires considerable physical effort for lifting, it is opportune to choose one of the following solutions:

Use auxiliary equipment,

Divide the load into several parts that can be transported separately,

Employ two operators to transport the load.

If it is necessary to move components by pushing or pulling, follow these general indications:

- Always work in a stable position;
- If possible, position the load on devices fitted with wheels;
- Push, preferably resting the back on the load and keeping the arms parallel to the body, if the load to be pushed is in front, take care to keep the back straight;
- Remember it is always preferable to push rather than pull;
- If it is necessary to pull, always use safe gripping points (that cannot break due to the pulling action).

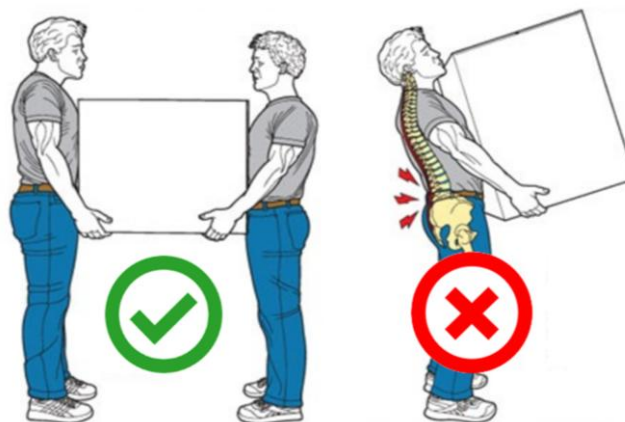


Fig. 6-4 - Handling technique

Laser marker - FIBERLUX NANO

6.5 Installation




CAUTION! Before starting the installation, carefully read the warnings indicated below.

Non-observance of these warnings could cause injuries, death or damage to the equipment.

ELETTROLASER S.R.L., shall not be held in any way liable regarding damage to persons and objects, caused by an installation carried out in an environment where there is one of the situations listed below.

6.5.1 Installation limits



FORBIDDEN! The machine is not to be installed in environments with explosive atmospheres, as specified by standard EN 60079-10-1 "Explosive atmospheres. Part 10-1: Classification of areas – Explosive gas atmospheres" and EN 60079-10-2 "Explosive atmospheres. Part 10-2: Classification of areas – Explosive combustible dust atmospheres". Machines and relevant components or apparatus to operate in explosive atmospheres are to have affixed on-board the marking  (ATEX) as specified by standard EN 60079-14 "Explosive atmospheres. Part 14: Electrical installation Design, selection and erection".



FORBIDDEN! The machine cannot be installed in environments in which an IP protection level over 2X is required.



FORBIDDEN! Since these lasers often constitute a fire hazard, the machine cannot be installed near inflammable materials.

Keep an extinguisher close-by.



CAUTION! Do not install the machine near degreasing, cleaning or vapourising zones.

The heat that could be generated during the machine functioning could react with the vapours, forming extremely toxic and irritating gases.

Laser marker - FIBERLUX NANO

6.6 Preparation of the installation site

The machine can only be installed in a specifically prepared site.

The site is to be an internal covered area with good ventilation.



INFORMATION! *As required by the standards in force, the installation site is to be able to house a laser class 4 (controlled laser zone CLZ).*

The installation area is to have minimum dimensions of 2450 x 2750 mm, to ensure adequate access to the machine and sufficient manoeuvring space around the machine. The minimum height of the building where the machine is installed is to be 2700 mm.

The customer shall prepare the power supply lines (electrical energy, compressed air). These networks are to be opportunely designed and dimensioned to ensure correct machine functioning and observance of safety standards.

The working environment is to have an autonomous lighting system.

The machine is to be connected to an appropriate extraction system for the fumes deriving from the processing (if not already included in the equipment).

The extraction system is to be connected to the coupling on the rear of the machine. This coupling is connected to the jointed fumes capture arm inside the machine.



CAUTION! *The marking processes produce fumes: inhaling them can be hazardous for the health.*



OBLIGATION! *The machine is to be connected to a fumes extraction system (if not supplied). The fumes extraction system is to guarantee an adequate extraction level in all the processing phases.*

The minimum extraction flow rate depends on several factors (environment, frequency of machine use, etc). Before being introduced into the environment, the fumes have to be filtered.

Laser marker - FIBERLUX NANO

6.7 Assembly

The machine is delivered completely assembled.

The only operations to be carried out before the machine start-up are the positioning, connection of the power supplies and fumes extraction and the installation of the laser marking Software on an external computer (not supplied), to manage the projects to be executed.

The machine resting plane (if in the supply the pedestal is not included) is to be stable and able to sustain the weight (see Tab. 5-4), perfectly horizontal with a height from the floor suitable to ensure operating ergonomics of the operator, and with dimensions appropriate to permit the processing.

For the machine installation, proceed as follows:

- Position the FIBERLUX NANO on the working plane or the pedestal supplied (with braked wheels, Fig. 6-6), so that: It rests on all four supporting feet (Fig. 6-5);

The machine housing is not out of the resting surface;

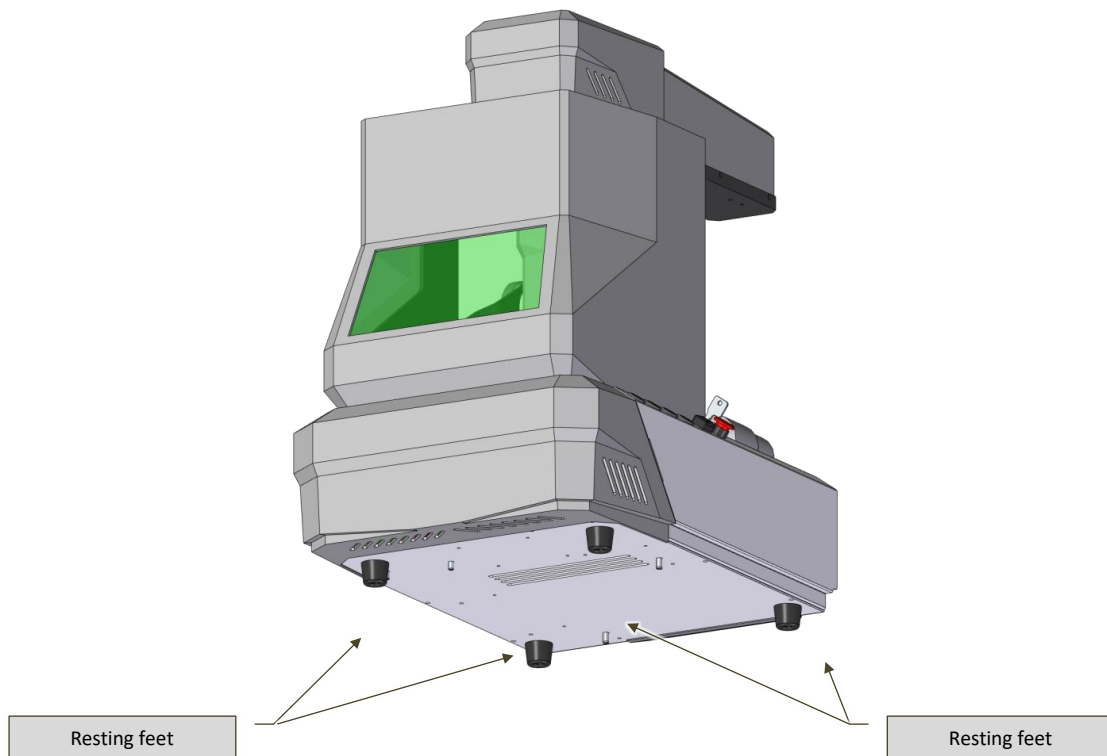


Fig. 6-5 – Machine resting feet

Laser marker - FIBERLUX NANO

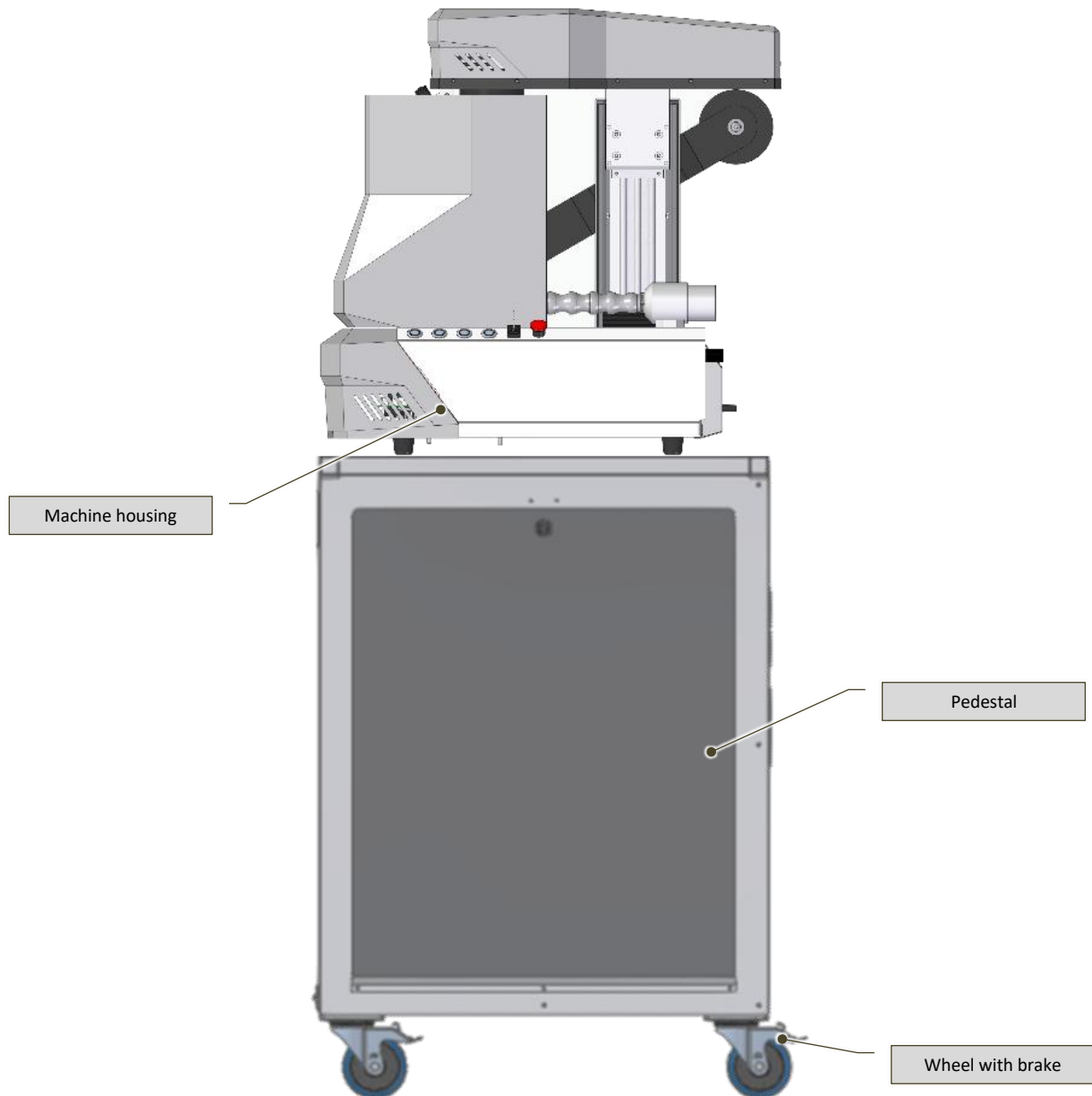


Fig. 6-6 – Machine positioning on the pedestal accessory



FORBIDDEN! *The pedestal (if supplied) is not to be used to move the machine.
The pedestal wheels are to be used only for small displacements.
The pedestal movement is only to be carried out on solid, flat (not sloped) floors without dips, steps or holes.*



OBLIGATION! *The pedestal wheels are always to be blocked with the relevant brake.*

Laser marker - FIBERLUX NANO

- Connect the machine control pedal:

Connect the shot control pedal to female serial port DB-9 (Fig. 6-7) located on the rear of the machine;
Position the control pedal on the ground, in front of the machine.

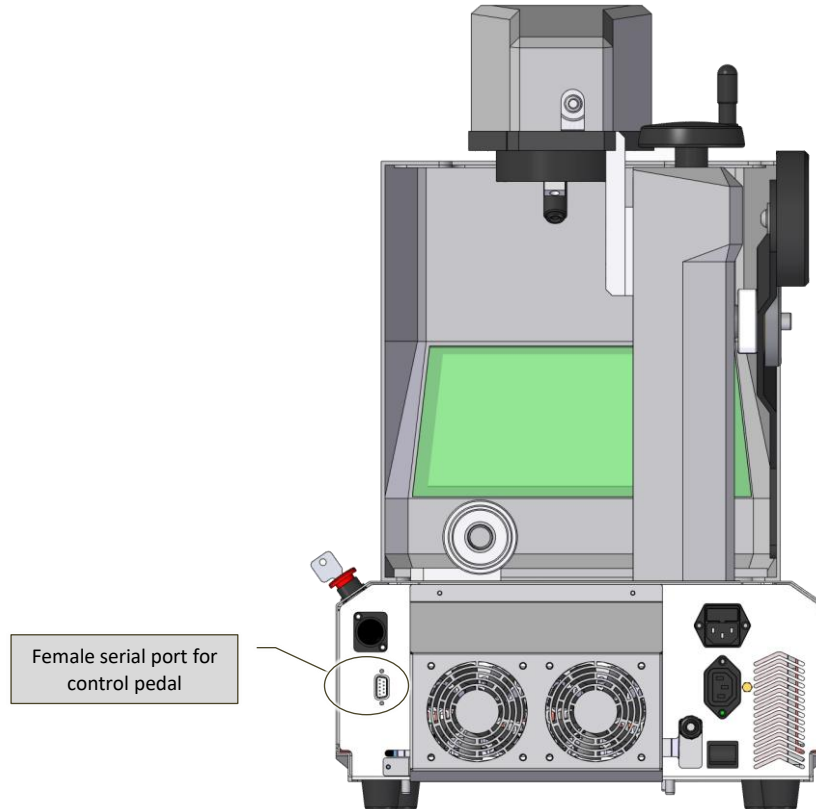


Fig. 6-7 – Location of control pedal connection socket

- Connect the machine to the electric power supply line (see paragraph 6.9);
- Connect the USB cable to the PC (not supplied);
- Connect the fumes extraction system (see paragraph 6.10);
- Assemble the accessories, if delivered separately (see paragraph 7.4);
- Install the laser marking Software on a computer (see paragraph 6.12).

6.8 Lighting



CAUTION!: On the installation site sufficient lighting is to be guaranteed for the use and maintenance operations .

Obviously, the optical lighting varies according to the type of activity; consult standard EN 12464-1 (paragraph 5.3) for detailed information regarding the type of activity and the working environment.

Laser marker - FIBERLUX NANO

6.9 Connection to electric mains

6.9.1 Provisions



CAUTION! The machine has to be connected to the ground system. Check the continuity of the ground to all the electrical equipment. The customer must provide connection points to the factory ground system, taking care to check that this conforms to the requirements specified by the laws in force.



OBLIGATION! For the machine connection to the electric mains, use only the electric cable supplied! Do not replace or change the connection plug. If necessary, contact ELETROLASER S.R.L..

6.9.2 Connection mode

Connect the power supply cable supplied to the power supply connector (Fig. 6-8) on the rear of the machine.

Insert the plug (Fig. 6-9 EU 220Vac or Fig. 6-10 USA 110Vac) in the socket of the power supply cable.

The power supply line to which the machine is to be connected is to be protected by a differential switch of appropriate capacity.

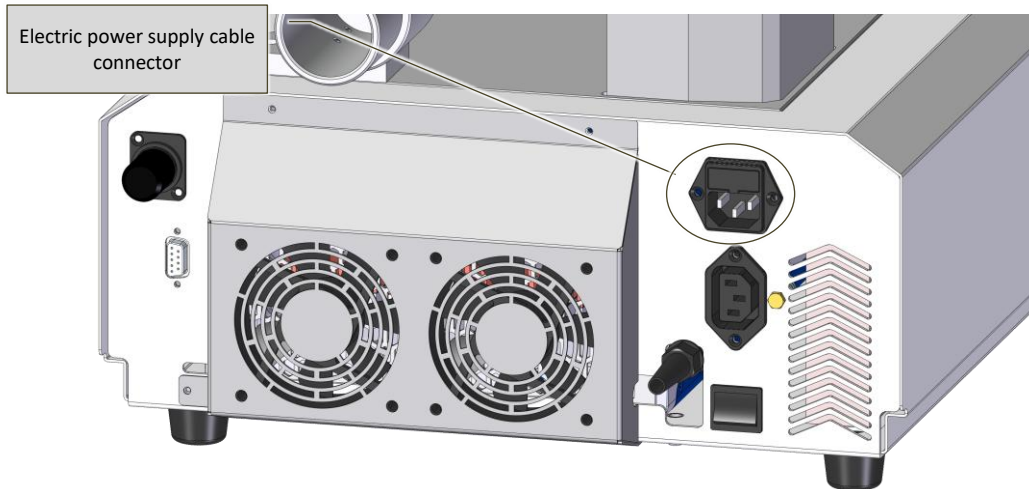


Fig. 6-8 – Electric power supply cable connector



Fig. 6-9 – Socket (Schuko) / plug 2 poles + ground EU 220Vac



Fig. 6-10 – Socket (B type) / 2-pin plug + grounding USA 110Vac

Laser marker - FIBERLUX NANO

6.9.3 Protection against electric shocks

6.9.3.1 Direct contacts

Direct contact is “the contact of persons or animals with live parts”, i.e. with hazardous live voltages (EN 60204-1).

All the electrical devices are inserted inside coverings for electrical materials that require the use of a tool for opening. Electrical materials that for technical requirements cannot be enclosed inside coverings must have suitable insulation according to the voltage and the use environment.

6.9.3.2 Indirect contacts

Indirect contact is “the contact of persons or animals with grounds¹¹ that result live in conditions of failure” (EN 60204-1).

For protection against indirect contacts the following method has been applied:

- Automatic interruption of power supply.

Coordination against Indirect contacts takes place checking that at the sign of failure to ground of a phase of the equipment, the protection devices that intercept the faulty current (fuses, automatic and differential switches) open the faulty circuit within a time compatible with the safety of the persons, in relation to the electrical energy distribution system.

For TT distribution systems, the faulty current that will generate in the circuit is to be such that the following relation takes place:

$$R_a * I_a \leq 50 \text{ V}$$

Where:

- **R_a** = ground resistor;
- **I_a** = current that causes the intervention of the protective device within the time specified by the standard;
- **50V** = conventional effective value of the safe voltage.

¹¹ Conducting part of electrical equipment that can be touched and that is not live under normal operating conditions, but that could become powered in the event of a failure (EN 60204-1).

Laser marker - FIBERLUX NANO

6.10 Connection to fumes extraction system

Inside the marking zone, the machine has a flexible tube to capture the fumes (Fig. 6-11); the position has to be adjusted manually by the operator as close as possible to the product to be processed, and, on the rear side, the outlet for connection to the extraction system (Fig. 6-12).

Connection to a fumes extraction system, whether supplied or not, it to be provided before putting the machine into operations:

- Connect the flexible tube of the extractor to the outlet \varnothing 50 mm for the fumes extraction located on the rear of the machine

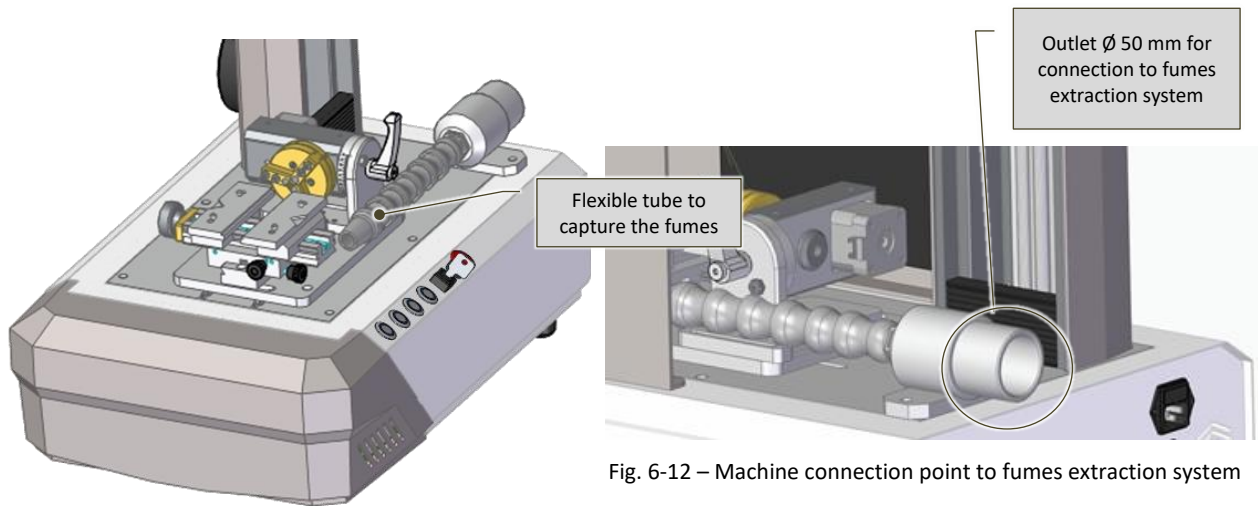


Fig. 6-11 – Flexible tube to capture fumes

Fig. 6-12 – Machine connection point to fumes extraction system



OBLIGATION!: It is necessary to ensure an adequate level of extraction for all the processing phases.



DANGER: The fumes generated during the processing can cause serious damage to health.



OBLIGATION!: If the machine is equipped with the Extractor accessory, see the original instructions of the part for the installation.

Laser marker - FIBERLUX NANO

If the machine is also supplied with the pedestal, proceed as follows:

- Open the front tippable door and insert the extractor inside;
- Connect the extractor power supply cable to the socket inside the pedestal;
- Pass the tube of the extractor through the rear opening of the pedestal and connect it to the outlet for the machine fumes extraction
- Pass the power supply cable of the extractor with the IEC C14 electric connector (male) to the IEC C13 socket (female) on the rear of the machine.

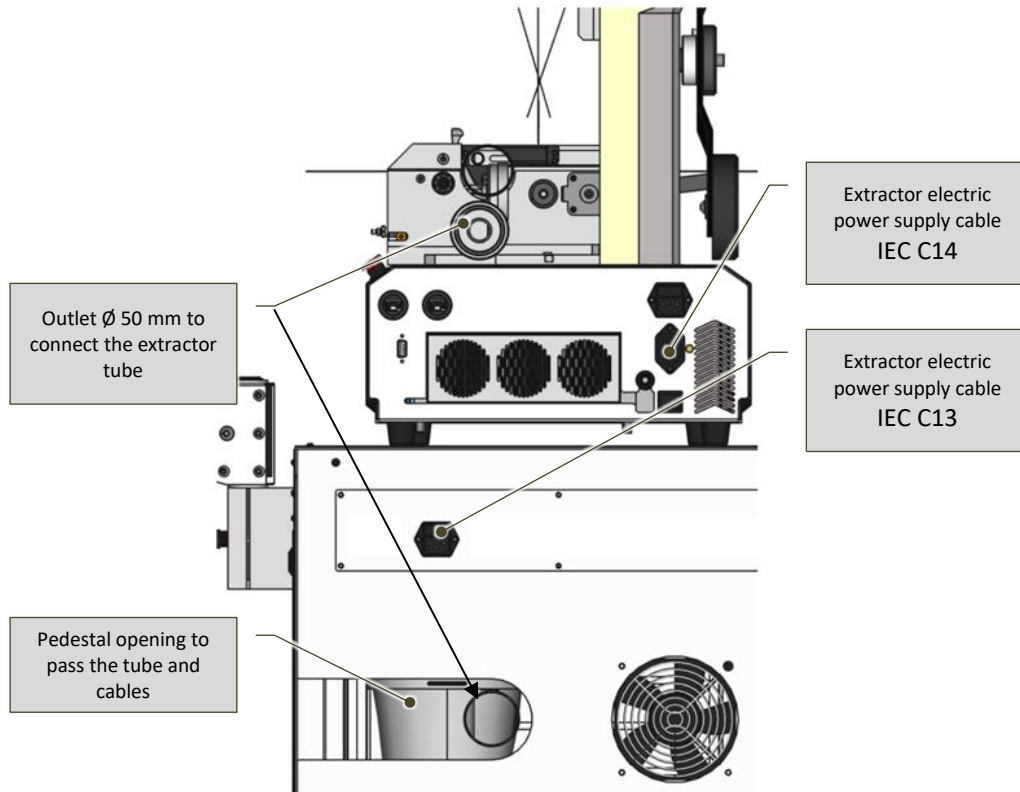


Fig. 6-13 – Quick coupling for pneumatic supply

Laser marker - FIBERLUX NANO

6.11 Other connections

On the machine there are other connection points indicated below:

On the rear of the machine (Fig. 6-14):

- Extractor accessory electrical connector IEC C14 for the power supply, via the cable supplied, if part of the supply;
- Cable with USB-A connector for machine connector to external computer where the laser marking software is installed;
- *Only for Version MF*, socket RJ45 for machine connection to external computer where the laser marking software is installed (as alternative to connection via USB);
- Female serial port DB-9 for connection of Pedal accessory and self-centring spindle, if part of the supply;
- Interlock (see paragraph 7.3.2)

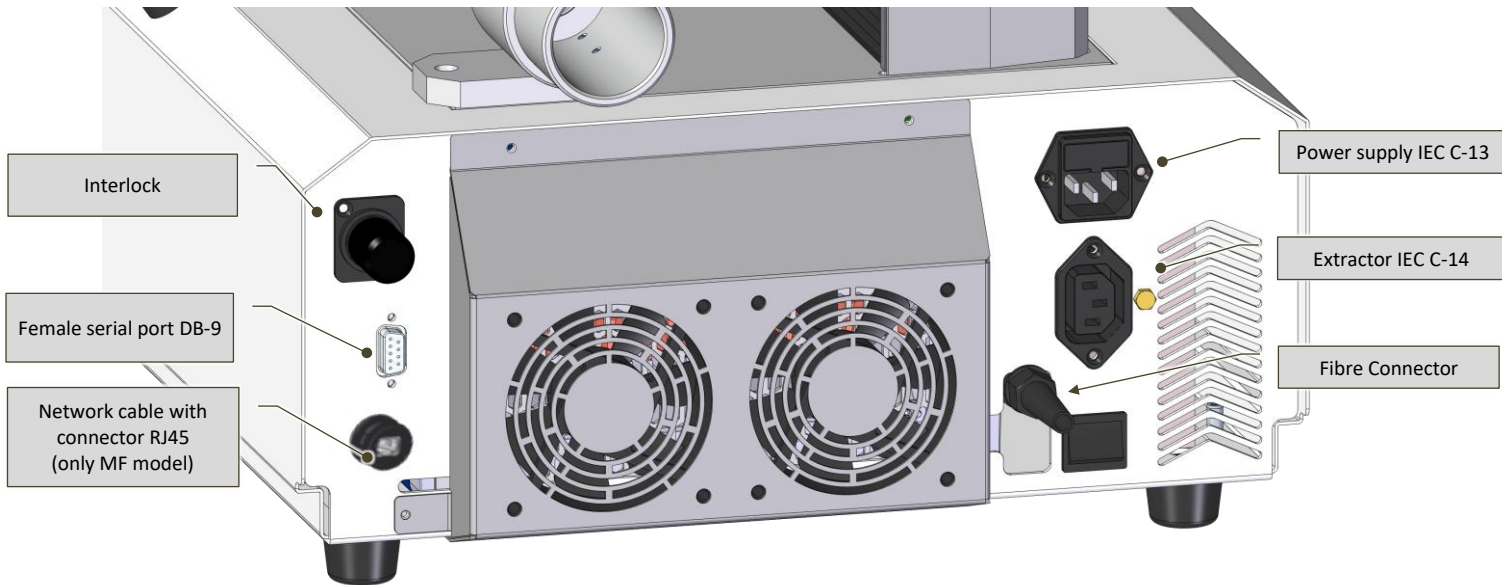


Fig. 6-14 – Location of further machine connection points -rear side view



Fig. 6-15 - Location of further machine connection points – right rear side view



Fig. 6-16 Location of further machine connection points – left rear side view

Laser marker - FIBERLUX NANO



CAUTION! The cables and connection points provided together with the machine and the accessories are to be used exclusively for the functions indicated above.

Do not connect systems, components or other that has not been supplied by ELETTROLASER S.R.L. or by the authorised dealer.

Only make the connections with the cables supplied by ELETTROLASER S.R.L. and as indicated.

6.12 Laser marking software installation

Together with the machine a laser marking software licence is supplied for the management of the projects to be executed with the machine.

To execute the laser marking software installation a USB key is provided together with the machine



OBLIGATION! To avoid undesired laser emissions or malfunctioning during the operating procedure, it is necessary to deactivate the suspension of Windows or any other energy saving mode.

6.12.1 Laser marking software for FIBERLUX NANO

The laser marking software for FIBERLUX NANO can be installed on a computer that has the following minimum requirements:

- Operating system:

Windows 10 - 32/64;

Windows 8 - 32/64;

Windows 7 - 32/64;

Windows Embedded Standard 7 – 32;

Windows Vista - 32/64;

Windows XP.

- Hardware requirements:

At least 8 GB of RAM;

CPU with high clock frequency;

Fast SSD or HDD.

To install the software proceed as follows:

- Switch on the external computer with an Administrator type user;
- Insert the USB unit provided on a USB port of the computer;
- Copy the "EzCad2" folder from the USB unit onto the hard disk of the computer, possibly in the main installation folder of Windows (C:);
- Find an unknown BJJZ device:

On Windows 8 / 8.1 / 10, click with the right key on Start, then select devices Management,

On Windows 7/XP, click on Start then with the right key on Computer, then click on Device Manager;

- Find the correct drivers for the unknown device in the installation folder of EzCad2, following the steps indicated in Fig. 6-17, Fig. 6-18, Fig. 6-19 and Fig. 6-20.

Lasermarker - FIBERLUX NANO

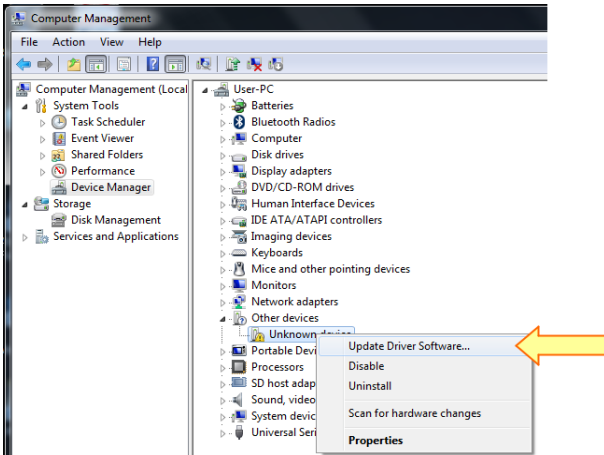


Fig. 6-17 – Unknown device identification

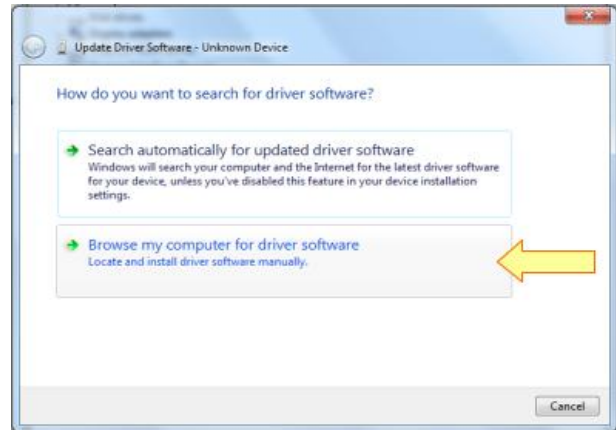


Fig. 6-18 – Driver search for unknown device

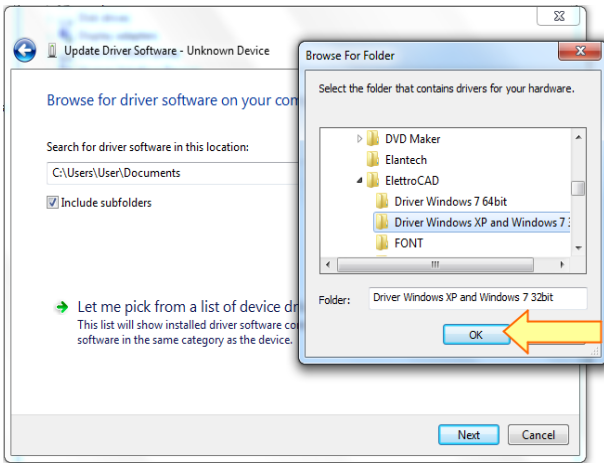


Fig. 6-19 – Driver path selection for unknown device

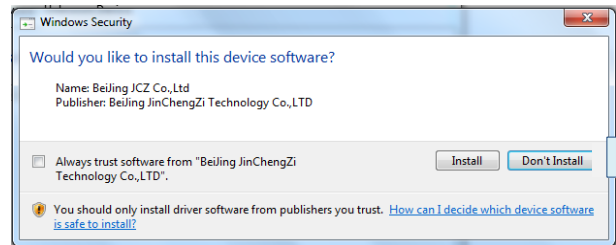


Fig. 6-20 – Software installation

Laser marker - FIBERLUX NANO

6.13 Management of machine keys

The machine keys (interlock bypass connector and command key/password) are handed over separately.

These keys are to be managed by the Laser Safety Officer (LSO).

Before putting the machine into service, the interlock contact has to be connected to the safety system in the room where the machine is installed.

The enabling password is to be appropriately kept by a Manager, so that it is only given to the technicians, so as to avoid unauthorised use.

Laser marker - FIBERLUX NANO

7 Operation

7.1 Machine operation

The Laser Marker series FIBERLUX NANO (Fig. 7-1), is able to mark or cut small metal items, by means of a pulsed fibre laser source.

The machine can engrave, for example: logos, trademarks, photo-engravings, texts, graphic designs, flat surfaces, layered hollows and 3D bar-relief.

The machine consists of the following elements:

- Machine housing;
- Marking area with access door;
- Laser scanner system;
- Control and signalling devices.

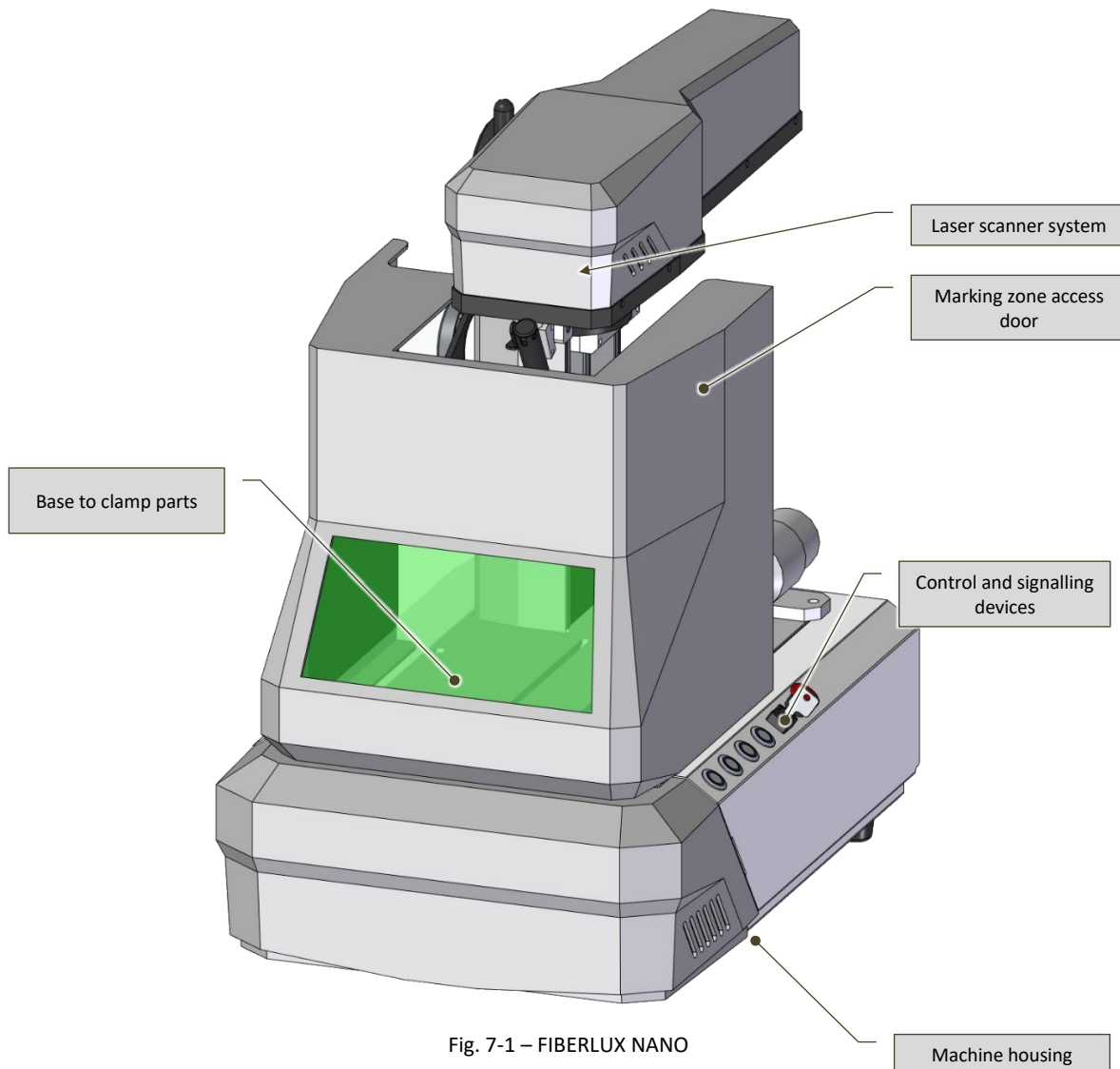


Fig. 7-1 – FIBERLUX NANO

Furthermore, the machine can be equipped with optional accessories (see Tab. 5-1).

Laser marker - FIBERLUX NANO

7.1.1 Operating principle

The physical principle which is the base of the laser electromagnetic radiation generation is the emission stimulated by light.

In fact, LASER is an acronym of *Light Amplification by Stimulated Emission of Radiation*.

This means that the laser is light amplified by a photonic chain emission, originated by a first photon (particle of light) that, interacting with an energised atomic system, stimulates the emission of two photons, these in turn, interacting with other atoms generate an “avalanche” effect.

The energising of the atomic system requires an external energy support in an appropriate form to be able to ignite the laser effect.

This technique, called “optical pumping” is obtained when the electromagnetic radiation emitted (by a luminous source) supplies an “active” material (material that, if stimulated, emits laser light), energising the atoms by absorption of energy.

Fibre lasers are special types of laser in solid state, pumped by diodes, where the active means is a special optic fibre.

This fibre, drugged with ytterbium (Yb), is the active means within which the light is amplified.

The active means is inside a wave-guide.

The pumping diodes provide the light necessary for the fibre activation to generate the laser light.

These diodes are only active during the marking.

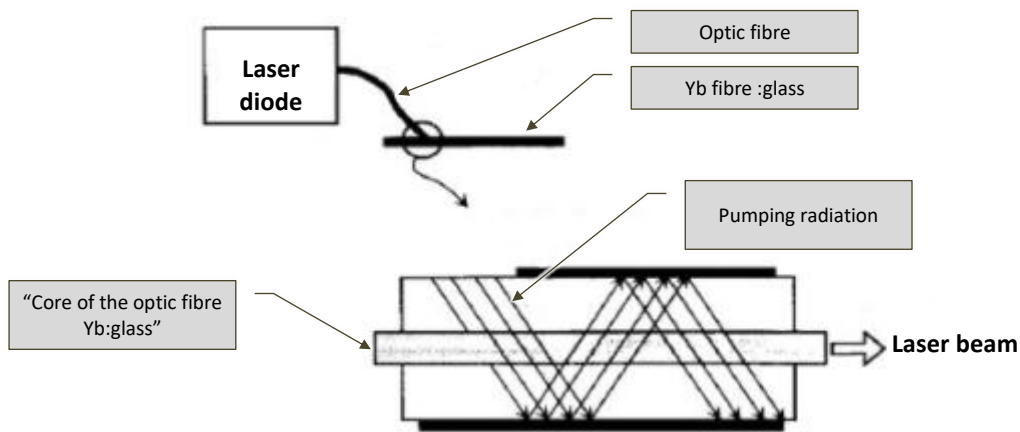


Fig. 7-2 – Operating principle

Laser marker - FIBERLUX NANO

7.1.2 Specific glossary

For better understanding of the contents of this manual, Tab. 7-1 below contains the relevant definitions of the terminology specifically referring to laser applications.

Term	Definition
Aperture, diaphragm	Aperture is intended as any opening in the protective covering or in other casing of a laser apparatus through which the laser radiation is emitted, thus permitting human access to this radiation. A diaphragm is an aperture that defines the surface on which the radiation is measured.
Beam	Laser radiation that can be defined by direction, divergence, diameter or by the scanning specifications. Diffuse radiation from a non-specular reflection is considered a beam.
Beam expansion	Combination of optical elements that increase the diameter of a laser beam.
Beam stop device	Device that interrupts a laser beam trajectory.
Diffuse reflection	Change in the distribution in space of a radiation beam when this is diffused in several directions by a surface or a means. A perfect diffuser eliminates every correlation between the directions of the incident and emerging radiation.
Class 4 laser apparatus	Every laser apparatus that allows human access to laser radiations that are over the accessible emission limits of Class 3B.
Stray laser radiation	Laser radiation that deviates from the foreseen trajectory of the beam. This radiation includes the unexpected secondary reflections by optic components on the path of the beam, the radiation deviated by misaligned or damaged components and the reflections of a part being processed.
Beam direct vision	All vision conditions in which the eye is exposed to a direct or specular reflected laser beam, different from the vision, for example, of diffuse reflections
Maintenance	Execution of the adjustments or procedures specified in the instructions for the user, supplied by the manufacturer together with the laser apparatus, which are to be carried out by the user to ensure the expected performance of the apparatus. This does not include functioning and service.
Ocular risk nominal distance (NOHD)	Distance on which the radiation or energy exposure of the beam is equal to the maximum exposure permitted (EMP) for the cornea. If the NOHD includes the possibility of vision optically assisted, it is called "extended NOHD".

Laser marker - FIBERLUX NANO

Term	Definition
Pulsed laser	Laser that supplies its energy under the form of a single pulse or a train of pulses. The duration of a pulse is less than 0.25 s.
Tool	Screwdriver, coin or any other object that can be used to act on a screw or similar type of fastening.
Transmission factor	Ratio between the radiant flow transmitted and the incident flow under certain conditions.
Visible radiation (light)	Every optic radiation able to directly provoke a visual sensation (IEV 845-01-03). Indicates the electromagnetic radiation for which the wave-length of the monochromatic components are within the range of 400 eand700 nm.
Part being processed	Object to be processed by means of laser radiation.

Tab. 7-1 – Specific glossary

Laser marker - FIBERLUX NANO

7.1.3 Machine housing

The machine housing (Fig. 7-3) consists of a base with resting feet, constructed in painted metal, that houses internally: the laser source including the fans for cooling by air, all the electronic power supply and control devices of the laser source, the management boards, the hardware modules to pilot the scanner system.

In the lateral part of the machine housing there are the machine control and signalling devices.

Above the machine housing base the other machine elements are secured.

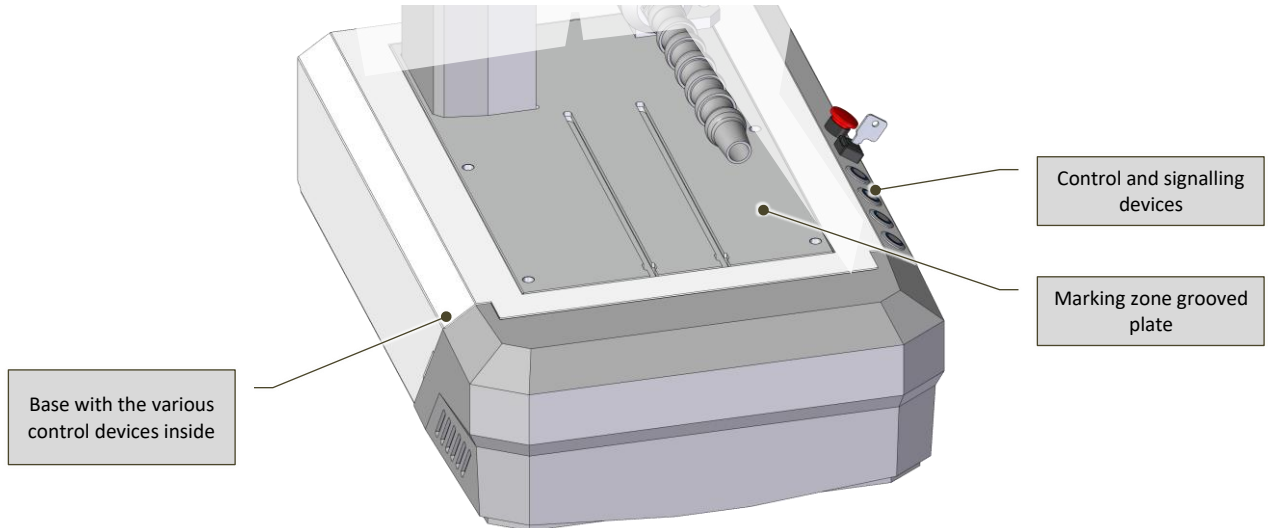


Fig. 7-3 – Machine housing – FIBERLUX NANO

Laser marker - FIBERLUX NANO

7.1.4 Marking area with access door

The marking area is the space over the machine housing where the part marking takes place.

Inside the marking zone there are the laser scanner system (see paragraph 7.1.5) and a plate with a series of grooves on which the accessories to clamp the part are secured.

The zone is circumscribed by the access door, so that when it is completely closed it impedes the laser radiations that could be diffused or reflected during the marking operations.

The access door slides vertically by a levered arm, and the lowering is braked by a counterweight.

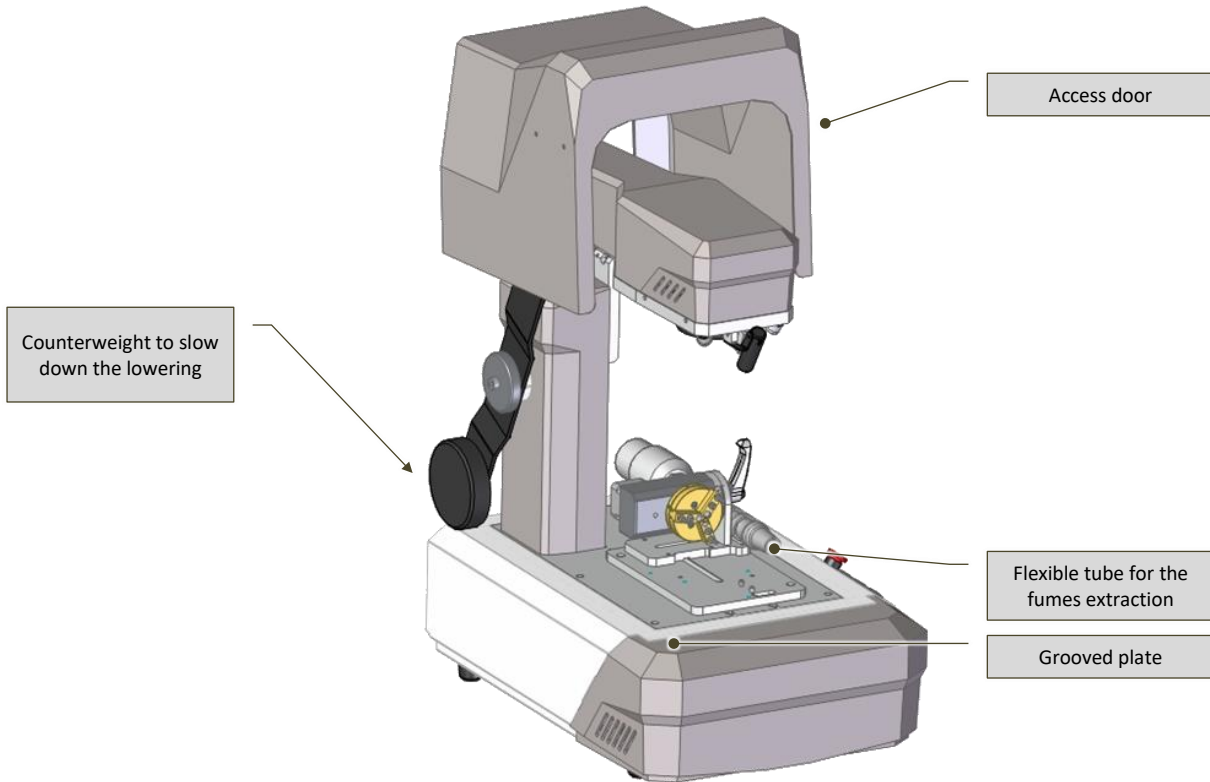


Fig. 7-4 – Machine housing with access door to marking zone

Laser marker - FIBERLUX NANO

7.1.5 Marking area with access door

The laser scanner system performs the laser marking and cut.

This system consists of a linear manual slide, the optic head of the laser source and the galvanometer head.

The galvanometer head is the device that deflects the laser beam released by the optic head of the laser source and that moves it along axes X-Y, to project the image to be marked on the product, passing through a focalising lens (focal device).

Movement of the laser beam along axes X-Y is obtained by two mirrors, inside the head, which rotate on perpendicular axes, by means of galvanometric rotary motors.

The galvanometer head (with optic head of the laser source) is mounted on the electric linear slide, which is positioned vertically, secured to the grooved plate of the machine housing.

The linear slide consists of a carriage that slides along two shafts with bushings, moved by a manual system.

The sliding parts are protected by bellows.

The linear slide moves along axis Z of the galvanometer head, enabling the focussing of the laser beam, according to the focal length of the lens and the position and dimension of the product to be processed.

Inside the head there is the class 1 laser pointer, that makes it possible to see the path that the laser beam follows through the galvanometer head, since it points to the centre of the machine processing area.

On the front of the head there is a second class 1 laser pointer, for the adjustment of the galvanometer head along axis Z to focus the laser beam.

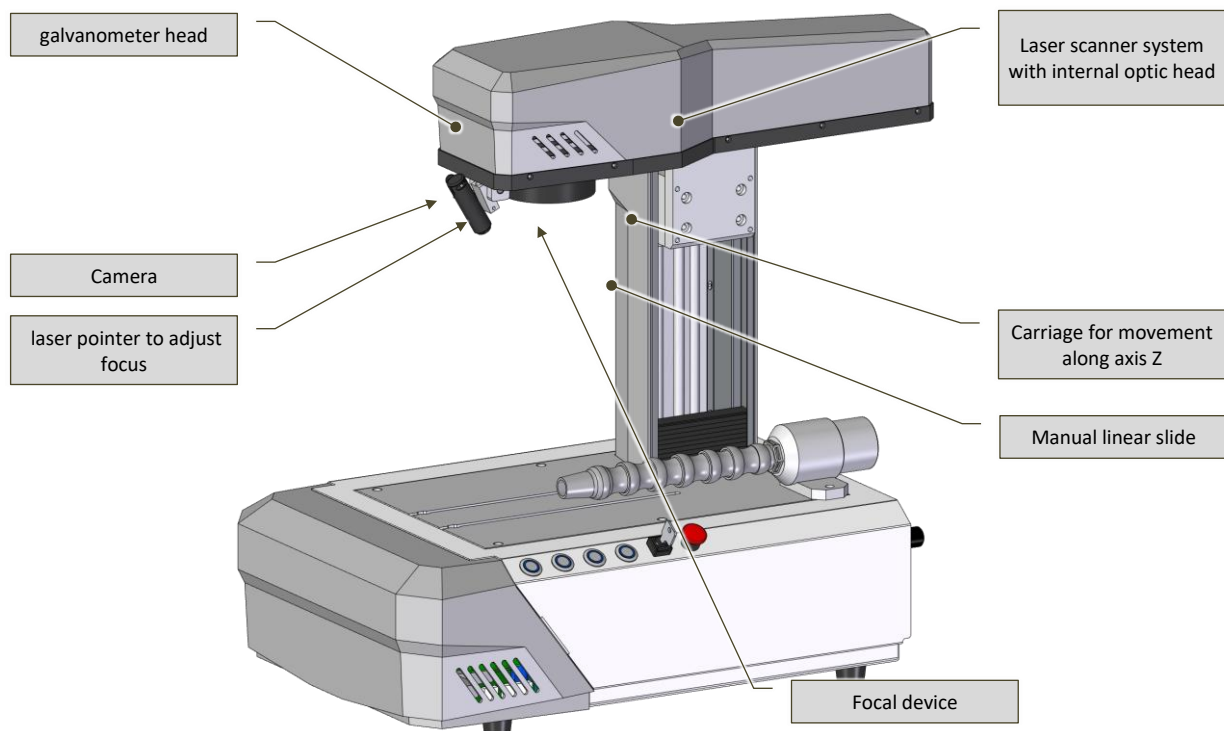


Fig. 7-5 – Laser scanner system – view of machine without access door to marking area

Laser marker - FIBERLUX NANO

7.2 Control and signalling devices

7.2.1 Control and signalling devices of FIBERLUX NANO

The following figure (Fig. 7-6) illustrates the control, signalling and emergency devices installed on FIBERLUX NANO and described in Tab. 7-2.

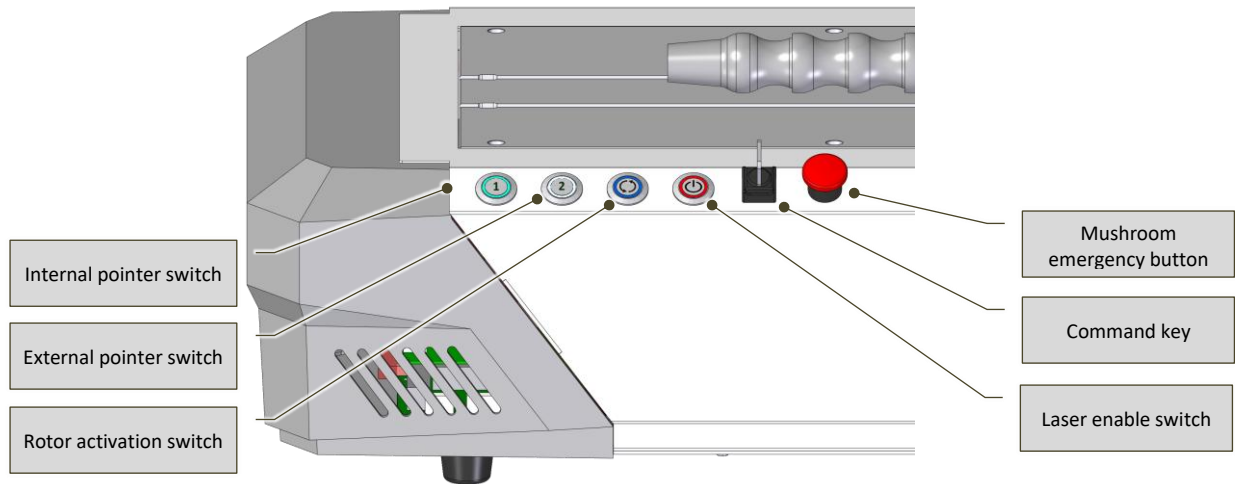

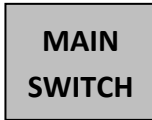




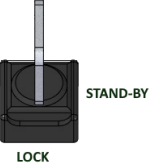




Fig. 7-6 – Control devices of FIBERLUX NANO

COMMAND	INDICATION
 <p>Main switch</p> <ul style="list-style-type: none"> I: machine electrically powered; O: machine electric power supply off. 	
 <p>Internal laser pointer switch</p> <ul style="list-style-type: none"> I: pointer on; O: pointer off. 	<p>1 – Green luminous ring alight.</p> <p>ON</p>
 <p>External laser pointer switch</p> <ul style="list-style-type: none"> I: pointer on; O: pointer off. 	<p>2 – White luminous ring alight.</p> <p>ON</p>
 <p>Rotor activation switch</p> <ul style="list-style-type: none"> I: rotor activated O: rotor stopped 	<p>Blue luminous light indicating rotor activation.</p> <p>ON</p>
 <p>Laser enable switch</p> <ul style="list-style-type: none"> I: source enabled; O: source disabled. 	<p>Amber laser emission warning light: lights up during actual laser emission</p> <p>ON</p>

Laser marker - FIBERLUX NANO

COMMAND	INDICATION
 <p>Command key</p> <ul style="list-style-type: none"> LOCK : laser source deactivated. In this position the key can be removed from the selector; STAND BY: laser source enabled. 	<p>The key can only be removed in the LOCK position</p> <p>LOCK</p>
 <p>Red mushroom emergency stop button</p>	

Tab. 7-2 – Control and signalling devices of FIBERLUX NANO

7.2.2 Control pedal

The following figure (Fig. 7-7) illustrates the control pedal to start the marking cycle.



Fig. 7-7 – Control pedal

Laser marker - FIBERLUX NANO

7.3 Safety devices

The machine is equipped with some safety devices illustrated in the paragraphs that follow.

7.3.1 Emergency button

The emergency buttons (Fig. 7-6), when activated, permit the operator to stop the machine in an emergency situation. The protruding shape (mushroom) allows easy activation with the palm of the hand.

These buttons are always red and have a yellow highlighting ring at the base.

After these buttons have been pressed, they have to be released manually by rotating the button clockwise or pulling it toward you.

7.3.2 Interlock

The interlock is a safety device (to be inserted **before the first use** of the machine); if not inserted this impedes switching-on of the laser and the functioning of FIBERLUX NANO.

To use the interlock it is necessary to “set in remote” the contact on the relevant safety system (for example: opening local work door, or safety barrier, where installed).



OBLIGATION!: *The interlock management is the responsibility of the laser safety officer (see paragraph 4.11). The interlock connection with the foreseen safety system is to be carried out by qualified maintenance technicians (see paragraph 4.9).*

For further information regarding this installation, contact the manufacturer.

7.3.3 Power-on Password

With the password to power-on (Fig. 7-6) it is possible to enable, and therefore use the machine.

The password is to be kept by the laser safety officer, so that it cannot be used by unauthorised persons.



OBLIGATION!: *The password is to be kept by the laser safety officer (see paragraph 4.11), who shall only give it to the operator trained to use the laser apparatus, and who shall return it at the end of his/her working shift.*

7.3.4 Marking zone laser filter

The laser filter on the access door is an optic glass opaque to laser radiations of 1064 nm, which constitutes the marking zone inspection window (Fig. 7-4) of FIBERLUX NANO.

It has a grey-green appearance and is perfectly transparent.

Laser marker - FIBERLUX NANO

7.3.5 Guards

The guards are the parts of a machine used in a specific manner to provide protection by means of a fixed barrier. According to the construction, the guards may be called cover, shield, door, total segregation guard, etc.

A guard may act alone, and is therefore only effective when it is closed, or it may be associated to an interlock device with or without guard locking; in this case protection is ensured whatever the position of the guard

The descriptions follow of the types of guards used on FIBERLUX NANO (Fig. 7-8):

- **Mobile guard:** guard that is usually mechanically connected (for example by hinges or guides) to the frame of the machine or to a fixed element nearby, and that can be opened without the use of tools;

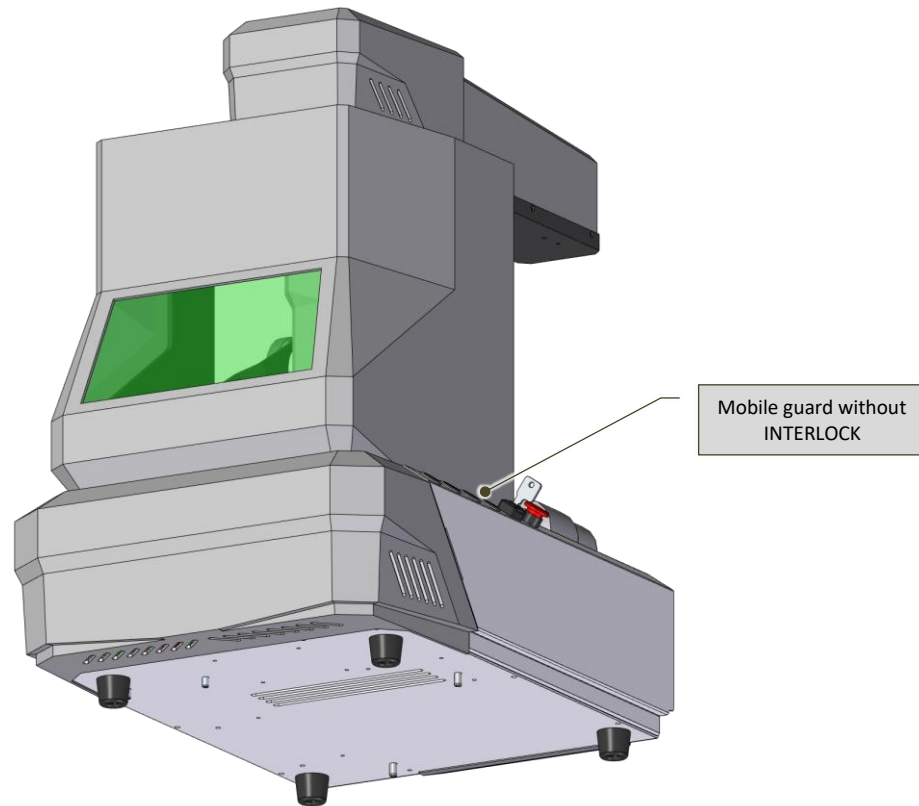


Fig. 7-8 – Example of guards

Laser marker - FIBERLUX NANO

7.4 Preliminary adjustments



CAUTION! Ignoring the preliminary adjustments can damage the machine and/or the fixtures installed.



CAUTION! All the preliminary adjustments are to be carried out with the machine stationary (the laser source is to be disabled).

If, to carry out the adjustments, it should be necessary to activate machine devices, follow the indications contained in chapter 8 "Instructions for the operator".

Before starting the machine, it may be necessary to make a few preliminary adjustments, described in the following paragraphs.

7.4.1 Assembly of the base for marking





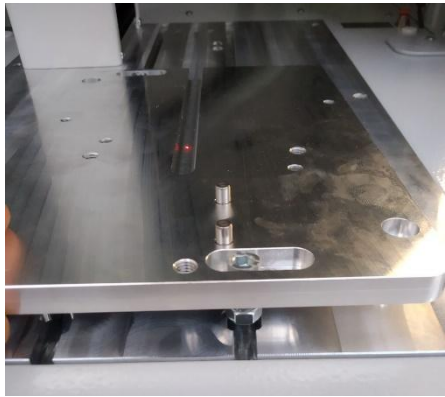


INFORMATION! The assembly of the base for marking is only necessary if this item has been purchased after the purchase of the machine.

To assemble the base for the marking, follow the sequence of operations described in Tab. 7-3.

Symbol	Action	Feedback / note
	Insert the two socket head screws in the slots on the base. The head is to face toward the upper side of the base where there are the two accessory location pins.	

Laser marker - FIBERLUX NANO

Symbol	Action	Feedback / note
	<p>Screw, without tightening, the nuts on the two screws, on the opposite side of the base</p>	
<p>Position in front of the machine, with the access door raised and galvanometer head lifted as high as possible.</p>		
<p>Keeping the base with the groove to position the accessories facing upward and in lengthwise direction, insert the first nut in the groove on the furthest left of the marking zone plate.</p>		
	<p>Move the base forward, so that the first nut slides along the groove of the marking zone plate and insert the second nut in the groove furthest on the left of the marking zone plate.</p>	

Laser marker - FIBERLUX NANO

Symbol	Action	Feedback / note
	Move the base so that pointer 1 points at approx. halfway along the accessories positioning groove and on the low edge of the right slot of the groove.	
	Move axis Z of the galvanometer head so as to focus (pointer 2 and pointer 1 are to overlay).	
	With the laser marking software, draw a line on the coordinate of the Y, having a length of 80 mm and width 0 mm. Project the preview of the line just drawn on the base.	
	Move the base so that the preview of the drawn line is projected on the length of the accessories positioning groove lower edge.	
	Taking care not to move the base , tighten the two socket head cap screws with a 5 mm hex wrench, to secure the base to the marking zone plate.	


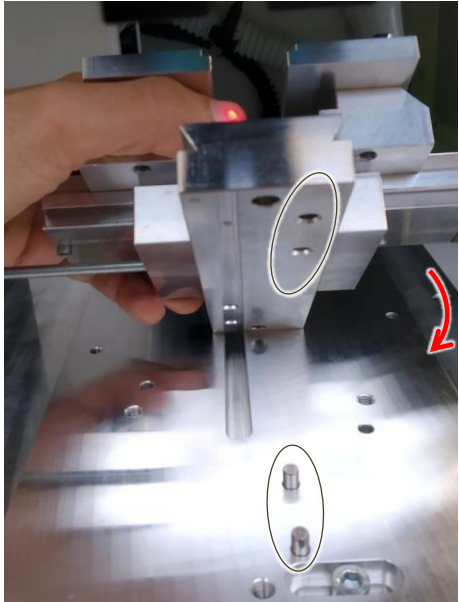

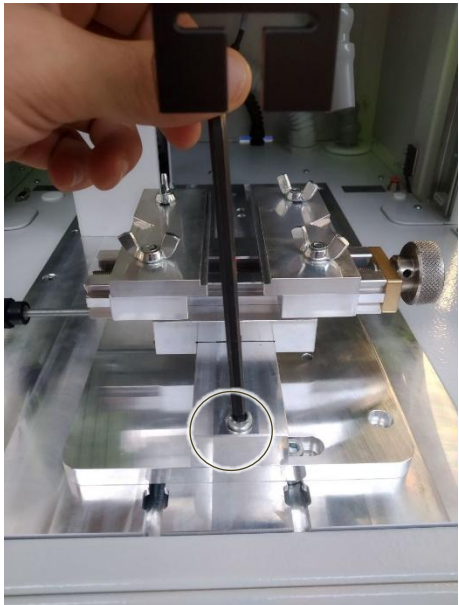
Tab. 7-3 – Assembly of base for parts clamping

Laser marker - FIBERLUX NANO

7.4.2 Parts securing jaw assembly

The part securing jaw has to be secured to the parts clamping base of the machine.


To assemble the parts securing jaw, follow the sequence of operations described in Tab. 7-4.

<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	Position on front of the machine, with the access door raised and galvanometer head lifted as high as possible.	
	Position the parts securing jaw on the base, matching the base location pin with the clamp centring holes.	
	Secure the clamp to the base, tightening the socket head locking screws with 5 mm. hex wrench	

Laser marker - FIBERLUX NANO

Symbol	Action	Feedback / note
	<p>Use the metal knob to open or close the jaws.</p>	
	<p>Loosen the 4 wing screws to remove the jaws and change the orientation according to the item to be processed.</p>	
<p>Clamping to the linear and parallel edges of the part:</p> <ul style="list-style-type: none"> With the 4 wing screws, secure the jaw with the straight grooves facing upward and directed one toward the other. 		
<p>Clamping a circular shaped part:</p> <ul style="list-style-type: none"> With the 4 wing screws, secure the jaw with the triangular grooves facing upward and directed one toward the other. 		
<p>Sandwich clamping of the part:</p> <ul style="list-style-type: none"> Remove the jaws; After positioning the part on the clamp, reposition the jaws to rest over the part. Clamp the jaws with the 4 wing screws. 		

Laser marker - FIBERLUX NANO

<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	<i>The part sandwich clamping is to be used to carry out the cut engraving.</i>	

Tab. 7-4 – Assembly of parts securing clamp


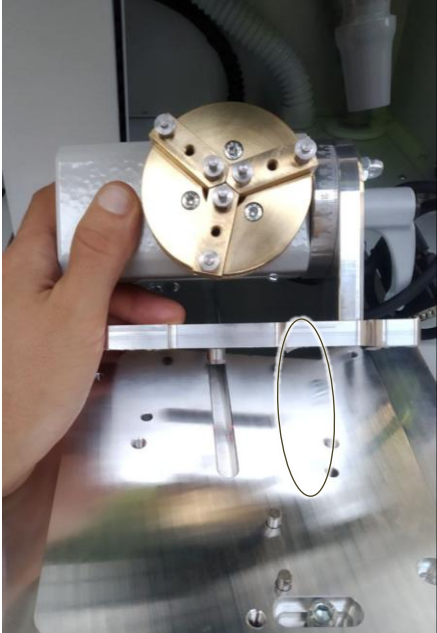

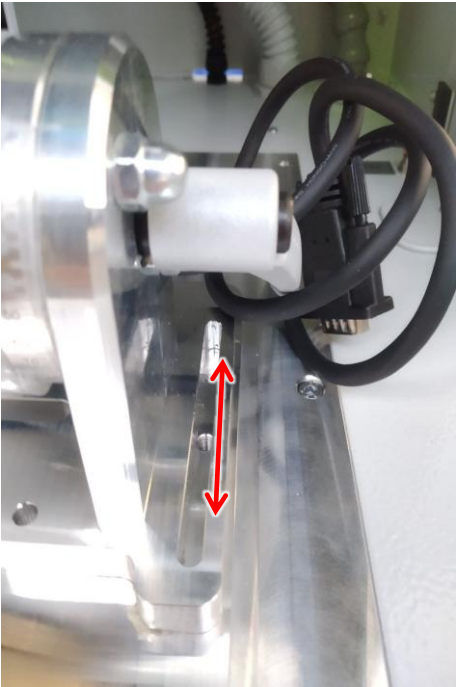
To remove the parts securing clamp, follow in reverse the sequence of operations described in Tab. 7-4.above

Laser marker - FIBERLUX NANO


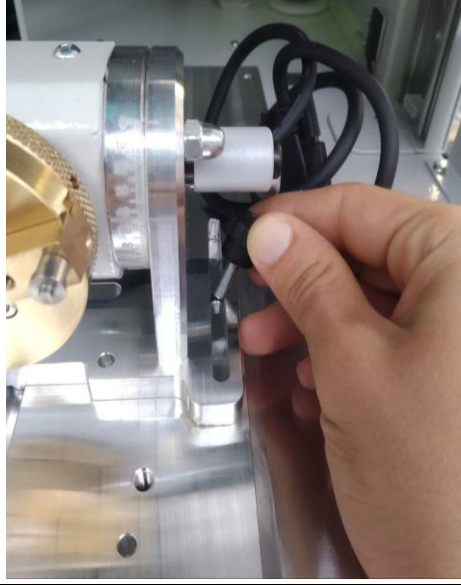
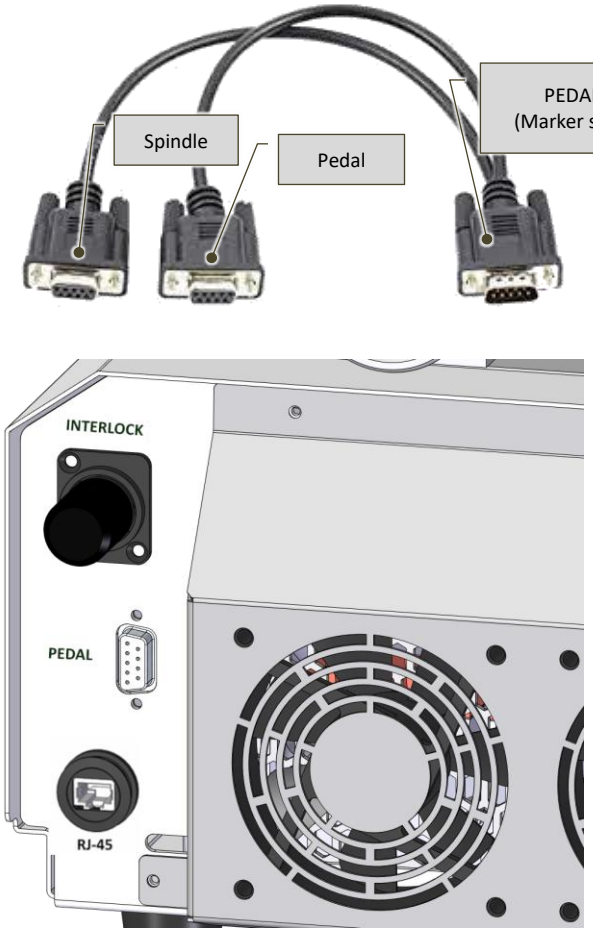
7.4.3 Self-centring spindle assembly

The self-centring spindle has to be secured to the base to clamp machine parts.

To assemble the self-centring spindle, follow the sequence of operations described in Tab. 7-5.

Symbol Action	Feedback / note
 <p>Position the self-centring spindle on the base, matching the spindle location pin with the accessories positioning groove of the base.</p>	
 <p>Move the spindle forward/backward on the machine base so that it is in the centre of the working field</p>	

Laser marker - FIBERLUX NANO

Symbol Action	Feedback / note
 <p>Clamp the self-centring spindle in position, tightening the relevant screw with the knob. Subsequently it is possible to reposition it along the base accessories positioning groove.</p>	
<p>Connect the spindle motor cable to connector DB-9, located outside the marking zone on the rear panel with the splitter cable, pedal + spindle.</p>	

Tab. 7-5 – Self-centring spindle assembly

To remove the self-centring spindle, follow in reverse the sequence of operations described in Tab. 7-5.above

Laser marker - FIBERLUX NANO

8 Instructions for the operator

8.1 Safety instructions



CAUTION!: Non-observance of the safety instructions that follow could cause injuries, death or damage to the machine.

The machine is to be put into operation by “qualified technicians” in compliance with the relevant indications specified in this manual.

Some checking procedures follow, that are to be carried out before and after putting the machine into service.

8.1.1 Checks to be carried out before starting the machine

- *Check that the clothing of the operator is suitable. The operator must not wear loose clothing, wristwatches, rings, necklaces or other similar items. Long hair is to be gathered up;*
- *Check that there are no unauthorised persons in the machine operating area;*
- *Check that there are no foreign objects (tools, rags, etc.) inside the welding zone, especially specular surfaces such as chrome-plated parts, mirrors, aluminium film etc.: these surfaces could generate hazardous reflections of the laser beam within the welding zone;*
- *Check that the personal protection devices to be used meet the requirements of the relevant laws in force. The operator must wear protective goggles that are clean and in good condition and, if different to those supplied together with the machine (see annex A4 List of specific P.P.E.), they are to conform with standard EN 207 and be appropriate for the type of laser (see Tab. 4-3).*

8.1.2 Checks to be carried out and how to act after starting the machine

- *Stop the machine immediately if it emits anomalous noises after the start-up. Only restart the machine after removing the cause of the noise;*
- *Stop the machine immediately if there are faults signalled by the operator panel. Only restart the machine after finding and removing the fault;*
- *Only remain in the operator intervention area;*
- *Never leave the machine unsupervised when it is in operation.*
- *Do not allow persons to approach the machine during operation;*
- *Supervise correct running of the machine processing cycle, stopping it immediately in the case of anomalous functioning;*
- *Do not deactivate protection and safety devices;*
- *When it is necessary to move away from the machine, close the software to disable the machine.*

8.1.3 How to act in the case of fire/outbreak of fire

- *If there is a fire or outbreak of fire, it is necessary that the operator immediately stops all the machine extraction systems (if installed). Ventilation carries air rich in oxygen and favours the development and spreading of the fire;*
- *Take action rapidly with portable extinguishers (CO₂ extinguishers are recommended) . The extinguishing agents without extraction could cause the air to become unbreathable. Act rapidly and with extreme caution. Only remain inside the room for the time strictly necessary;*
- *If it is not possible to control the fire, leave the room taking care to close the doors.*

Laser marker - FIBERLUX NANO

8.1.4 Actions that are not permitted



The following uses of the machine are strictly forbidden:

- **FIBERLUX NANO is a machine designed for professional use.**
- **IT IS FORBIDDEN to use the machine if it shows signs of alteration or damage (especially breakage or deformation of the machine housing, the access door to the processing area or the internal inspection window) or if the machine emits noises or there are indications on the operator panel. Do not attempt to repair the machine. Machine repairs are only to be carried out by the manufacturer.**
- **IT IS FORBIDDEN, during machine use, to look into the marking zone through the front brush or the slots for passage of the parts when the sheet-puller accessory is used. The inspection window is only to be used to view the marking zone.**
- **IT IS FORBIDDEN to observe the laser source, even if equipped with personal protection devices to protect the eyes! No personal protection device to protect the eyes is able to protect the eyes against direct radiation!**
- **IT IS FORBIDDEN to use the machine to process inflammable or combustible materials. It is reminded that many metals (e.g. magnesium, sodium, aluminium) are easily inflammable (in particular if of small dimensions).**
- **IT IS FORBIDDEN to introduce or place in the marking area materials that differ from the item to be processed, for example tools, supports or other objects. The marking zone is always to remain empty. Supports to clamp the part that differ from those supplied by ELETTROLASER S.R.L. are to be in metal, in material that is not inflammable and does not reflect.**
- **IT IS FORBIDDEN to use the machine to process products that differ from those indicated in paragraph 5.7.1. Never attempt in any way to process materials different to those indicated, or that are inflammable;**
- **IT IS FORBIDDEN to use the machine in environments where there could be an explosive atmosphere (dust or inflammable gasses). The laser radiation could be a source of ignition of fire or explosions.**

8.1.5 Provisions for safe use



CAUTION: to ensure safe use of the machine the following indications are to be scrupulously observed:

Only use the machine after wearing appropriate personal protection devices to protect the eyes and the skin against effects of laser radiation laser, as prescribed by the Employer;

- **Pay special attention to the marking of reflecting materials, since a reflecting surface could deviate the laser beam;**
- **Before starting the marking activity, always make sure that the access door to the zone is completely closed;**
- **Only use the machine with an extractor connected to extract the fumes generated during the operations through the adjustable captive point inside the machine. Do not re-emit the extracted air into the environment before filtering the fumes, which are harmful. Carefully assess the hazard of emissions that could form during the marking. It could be necessary to use personal protection devices. In any case, during the marking, carefully follow these indications:**
 - **Only use extractors appropriate for the purpose;**
 - **Do not cover any parts of the machine;**
 - **Carefully read the instructions regarding the types of materials that can be processed with the laser;**
 - **Use the machine in a well ventilated room ;**
 - **Only mark clean surfaces. Several substances used for degreasing and cleaning of the parts may react, producing fumes that could be harmful for health.**

Laser marker - FIBERLUX NANO

8.1.6 Less evident hazards

CAUTION! Both the qualified operator and the ELETTROLASER S.R.L. technical staff who operate on the machine are to bear in mind other less evident hazards, that are often underestimated in the workplaces:

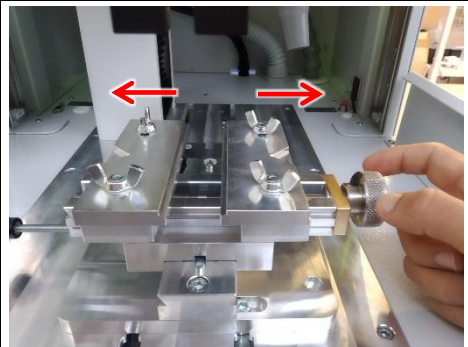
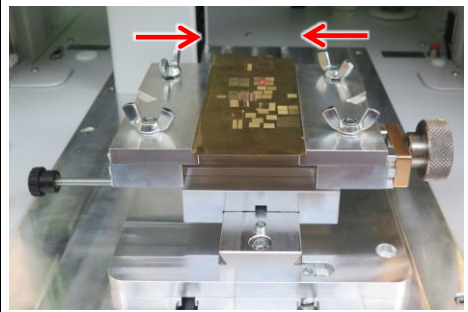
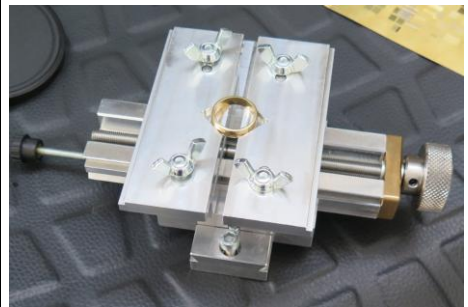
- *Protruding parts of the machine;*
- *Parts of the machine that for functional requirements may have sharp surfaces and/or sharp edges*
- *Electrostatic loads that are still present after shut-down;*
- *Hot machine parts.*

8.2 Product loading and unloading

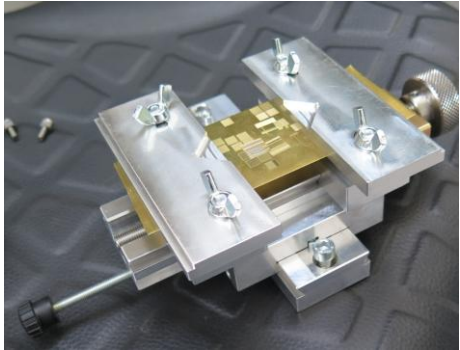

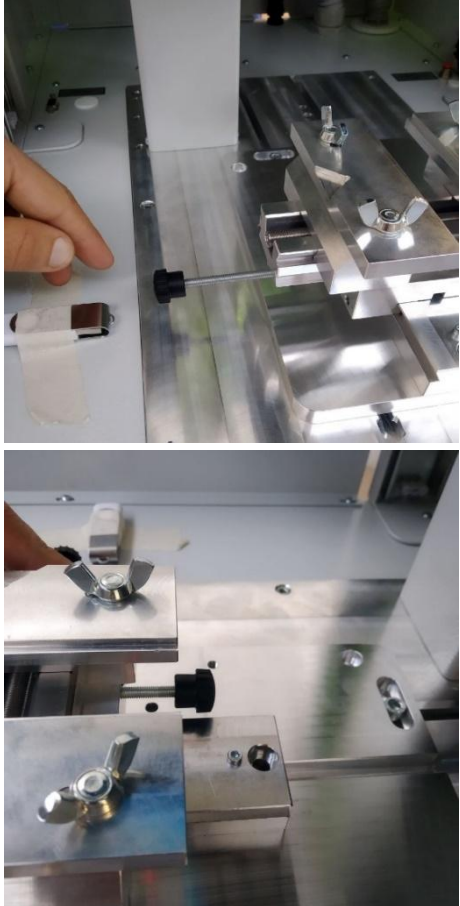
The product is loaded manually, onto the part securing accessory provided for the type of production to be performed.

8.2.1 Product loading and unloading on the part securing clamp

To load the product to be marked on the part securing clamp, follow the sequence of operations described in Tab. 8-1.

Symbol	Action	Feedback / note
	Position in front of the machine, with the access door raised and, if necessary, lift the galvanometer head to be able to insert the product into the marking zone.	
	Use the metal knob to open the jaws as necessary.	
	<p>If the clamping is on the linear and parallel edges of the part:</p> <ul style="list-style-type: none"> • Position the part on the straight grooves of the jaws; • Hold the part with one hand, and with the other, act on the metal knob to close the jaws, so as to clamp the part. 	
	<p>If the clamping is on an edge of the part that is not straight:</p> <ul style="list-style-type: none"> • Position the part on the triangular grooves of the jaws; • Act on the metal knob to close the jaws, so as to clamp the part. 	

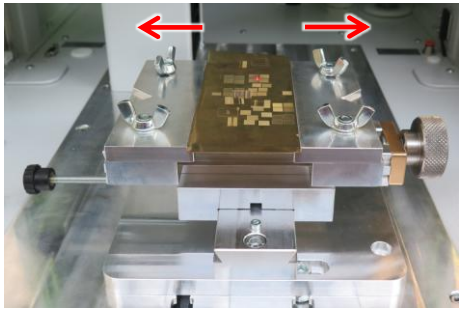
Laser marker - FIBERLUX NANO

Symbol	Action	Feedback / note
	<p>If the clamping is “sandwich” type:</p> <ul style="list-style-type: none"> • Loosen the 4 wing screws that secure the jaws; • Remove the jaws; • Position the part on the clamp; • Re-position the jaws; • Lock the jaws with the 4 wing screws. 	
	<p>If it is necessary to adjust the position of the part along axes X and Y of the clamp:</p> <ul style="list-style-type: none"> • Loosen the axes X-Y clamping knobs of the clamp; • Move the jaws group of the clamp along the X direction guide and/or along the Y direction guide; • Tighten the axes X-Y clamping knobs . 	

Tab. 8-1 –Product loading on part clamping jaw

Laser marker - FIBERLUX NANO

After terminating (or interrupting) the marking cycle, to unload the processed product from the part securing clamp, follow the sequence of operations described in Tab. 8-2.


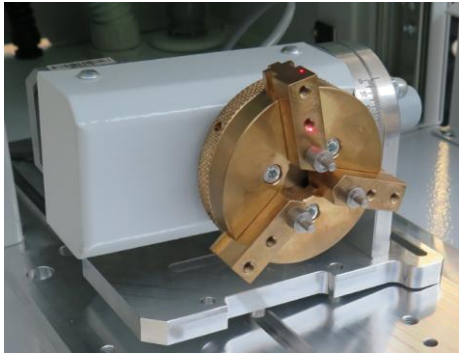

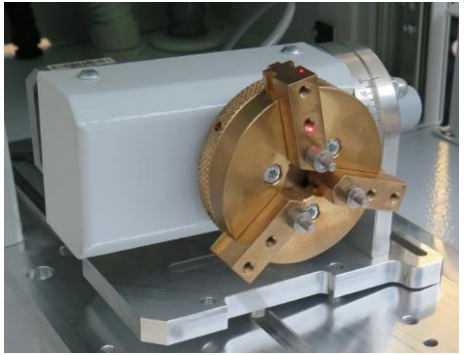
<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	Open the access door to the marking area, lifting it.	
	If the part has been clamped using the jaw grooves: <ul style="list-style-type: none"> • Use the metal knob to open the jaws. • Remove the processed part 	
	If the part has been clamped in "sandwich": <ul style="list-style-type: none"> • Loosen the 4 wing screws that secure the jaws; • Remove the jaws; • Remove the processed part from the clamp. 	

Tab. 8-2 – Product unloading from the part securing clamp


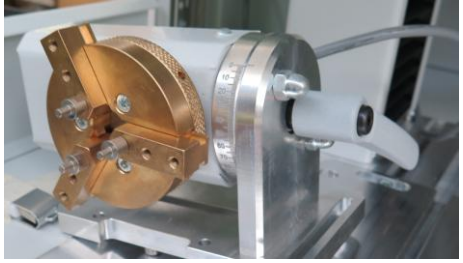


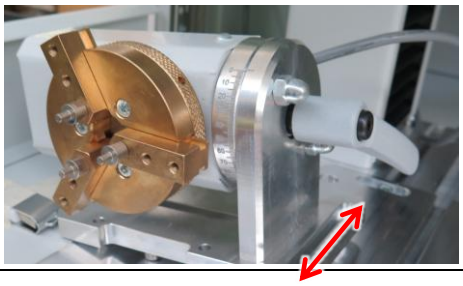

Laser marker - FIBERLUX NANO

8.2.2 Product loading and unloading on self-centring spindle

To load the part to be marked on the self-centring spindle, follow the sequence of operations described in Tab. 8-3.

Symbol	Action	Feedback / note
	Position in front of the machine, with the access door raised and, if necessary, lift the galvanometer head to be able to insert the product into the marking zone	
	Switch off the machine.	
	According to the depth/thickness of the product to be processed, select the type of gripper to be used from the two sets supplied with the accessory.	
	According to the dimensions of the product to be processed, screw the three grippers on one of the three threaded holes of each of the three slides for the spindle clamping.	
	Act on the knurled part of the spindle to move the part clamping grippers nearer or away as necessary.	
	If the marking is to be performed on an external surface of the part, position it so that the grippers are placed on the internal perimeter.	
	If the marking is to be performed on an internal surface of the part, position it so that the grippers are placed on the external perimeter.	
	Hold the part with one hand, act on the knurled part of the spindle to move grippers nearer or away so they clamp the part.	

Laser marker - FIBERLUX NANO

Symbol	Action	Feedback / note
	<p>If it is necessary to adjust the inclination of the part (inclination angle of rotation axis R):</p> <ul style="list-style-type: none"> Loosen the locking handle of the accessory; Rotate the spindle group so that the spindle is inclined as required, using the scale contained on it; Clamp the position of the group, tightening the lock handle of the accessory. 	
	<p><i>If it is necessary to engrave on the external surface of the part, adjust the spindle inclination at 0°.</i></p> <p><i>If it is necessary to engrave on the internal surface of a ring, initially adjust the inclination of the spindle at approx 15° (to subsequently correct according to the project to be used).</i></p>	
	<p>If it is necessary to adjust the centring of the part as to the marking preview:</p> <ul style="list-style-type: none"> Loosen the screw with position clamping knob near the right edge of the spindle base; Move the accessory forward/backward; Lock the accessory position, tightening the clamping screw . 	
	<p>Check that the spindle and the part do not interfere with machine parts during the rotation.</p>	

Tab. 8-3 – Product loading on self-centring spindle

Laser marker - FIBERLUX NANO

After terminating (or interrupting) the marking cycle, to unload the processed product from the self-centring spindle follow the sequence of operations described in Tab. 8-4.

<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	Open the access door to the marking zone raising it.	
	Act on the knurled part of the spindle to move the grippers away or nearer to free the processed part.	
	Remove the processed product from the marking zone.	

Tab. 8-4 – Product unloading from self-centring spindle

Laser marker - FIBERLUX NANO

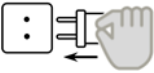





8.3 Preparation for start-up

Before starting the FIBERLUX NANO it is necessary to make sure that the electrical plant of the building where it will be inserted, has been activated. To start-up this plant, follow the indications provided by the respective manufacturer-installer

Before starting the machine, make sure that the fumes extraction system is connected to the machine connection outlet and, if it is not part of the supply, that it is already active and functioning.

8.4 FIBERLUX NANO power-on and start-up

To power-on and enable the FIBERLUX NANO functioning, follow the sequence of operations described in Tab. 8-5.

<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	Check that the plug is inserted in the mains socket (see paragraph 6.9)	
	Check that the red “EMERGENCY” button has not been pressed.	Is necessary reset, turning the mushroom.
	Check that the preliminary adjustments have been carried out (see paragraph 7.4) and that the focal device and part clamping accessory required for the processing to be performed are present	
	Act on the main switch and set it in position “I”.	
	Act on the Command Key, setting it “STAND-BY”.	
	Access the marking zone and remove the protective covering of the galvanometer head focal device.	

Tab. 8-5 – FIBERLUX NANO power-on and start-up









Laser marker - FIBERLUX NANO

8.5 FIBERLUX NANO functioning





The FIBERLUX NANO Laser Marker can only work with the laser marking software in operation on an external computer, connected to the machine via USB communication port.

After switching on (powering) and starting the machine, the marking cycles can be performed as indicated in the following paragraph 8.5.1.

8.5.1 Marking cycle execution with external computer

Symbol	Action	Feedback / note
	Check that the external computer (not part of the supply) is powered and connected to the machine through the specific cable with USB connector.	
	Start the laser marking software installed on the external computer.	
	Enter the software enable password.	
	With the laser marking software create/open a project and, if necessary, process the entities or import them.	See paragraph 8.6.3 e 8.6.4, or paragraph 8.6.5.
	Make sure the entities to be marked are positioned at the centre of the working field: <ul style="list-style-type: none"> Select the entities; From the tool bar, click . 	As an alternative, after selecting the entities, use the rapid control: key C of the computer keyboard.
	Load the part into the machine marking area (see paragraph 8.2) and position it so that the centre of the marking to be executed on the part corresponds to the point indicated with pointer n°2.	
	If necessary, focus the laser source.	See paragraph 8.6.1.
	View the preview of the entity to be marked on the part, pressing the “Red “control area on the main page of the software.	The preview can be seen through pointer n°1. To interrupt the preview, press the “STOP” control area or the Esc key on the keyboard.
	If necessary, adjust the position of the part (acting directly on the part or on the securing accessory) in relation to the preview, according to where the marking is to take place.	
	Position the flexible tube to capture the fumes as close as possible to the part. Make sure that the tube cannot be hit by the laser beam.	The beam of pointer n°1 must not intercept the flexible tube of the fumes capture

Laser marker - FIBERLUX NANO

<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	Close the access door to the marking area.	Warning: the laser marker are CLASS 4 even with access door closed.
	Enable the laser source, pressing the “ON/OFF” key	The amber luminous ring of the switch remains off: it switches on when the laser emission starts.
	Check that the fumes extractor is active.	If the machine is equipped with the Extractor accessory, see paragraph 8.6.9.
	Start the marking cycle, pressing the “Mark” control area on the main page of the software.	As alternative, press the control pedal. If the “Mark Selected” option is selected, only the entities selected in the software working area are marked.
	Wait until the marking cycle finishes.	As alternative the cycle can be stopped: <ul style="list-style-type: none"> • Pressing the “STOP” control area; • Pressing the Esc key on the computer keyboard.
	After the marking cycle has finished, it is possible to open the access door to the marking area and remove the product	If the “Continuous” option has been selected, the marking cycle repeats continuously, it is therefore necessary to press the “STOP” control area to stop the machine.





Tab. 8-6 – Execution of a marking cycle with external computer

Laser marker - FIBERLUX NANO

8.6 Operating functions for FIBERLUX NANO

8.6.1 Focussing the laser source



To focus the laser source, follow the operations described in Tab. 8-7.

<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	Position a test piece on the part securing accessory.	
	Press key "1" to activate the external pointer	
	Press key "2" to activate the internal pointer	
	Press key "↻" to activate the rotor.	
	Act on the crank to lift or lower the galvanometric head along axis Z, so that the pointer n°1 and pointer n°2 coincide on the part.	

Tab. 8-7 – Focussing the laser source

8.6.2 Laser marking software opening/closing

To open and close the program, follow the operations described in Tab. 8-8.

<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	To open the program, click twice on the *.exe file installed in the external computer.	
	To close the program, click on File → Esc in the menu bar	The program closes. If a project is open and this has been modified, the pop up window asking to save is shown.

Tab. 8-8 – Program opening/closing

Laser marker - FIBERLUX NANO






8.6.3 Creation, saving and loading of a project

Through the laser marking software it is possible to create, modify, load a work project.



INFORMATION!the work projects are saved in a specific folder of the computer.

To create, save, load a project, follow the sequence of operations described in Tab. 8-9.

Symbol	Action	Feedback / note
	To start the creation of a new project, click on File → New in the menu bar .	In the window working field the drawing table is shown.
	To save the project, click on File → Save as in the menu bar	The “Save with name” pop up window is shown where it is possible to assign the File Name to the project. Do not modify the file format: the file format has to be .ezd.
	Type the name to be assigned to the file in the “File name” field and click on Save .	
	To open an existing project, click on File → Open in the menu bar.	The “Open” pop up window id shown.
	Select the file and click on Open .	

Tab. 8-9 – Creation, saving and loading of a project





Laser marker - FIBERLUX NANO

8.6.4 Image import in a project

To import an image, the laser marking software is compatible with the following formats.

- BMP - Bmp Files (*.bmp);
- JPG - Jpg Files (*.jpg);
- JPEG - Jpeg Files (*.jpeg);
- GIF - Gif Files (*.gif);
- TGA - Tga (*.tga);
- PNG - Png (*.png);
- TIF - Tif (*.tif);
- TIFF - Tiff (*.tiff);
- AI – Adobe Illustrator (*.ai);
- PLT – HPGL Plotter (*.plt);
- DXF – Drawing Exchange Format (*.dxf);
- JPG – Jcz Poin cloud Files (*.jpc);
- SVG – Scalabe Vector Graphics (*.svg);
- NC – G Code Files (*.nc);
- G – G Code Files (*.g);
- BOT – Gerber bot Files (*.bot);
- GBR – Gerber bot Files (*.gbr);
- DST – TAJIMA Dst Files (*.dst).

To import an image in a project, follow the operations described in Tab. 8-10.

Symbol	Action	Feedback / note
	To import an image, from the tool bar click on  .	As alternative, to import a vector image click on  from the tool bar The “Import” pop up window is shown
	From the “Import” pop up window, call up the path in which the file of the image to be imported is present, select it, then click on Open .	

Tab. 8-10 – Import of an image in a project

Laser marker - FIBERLUX NANO

8.6.5 To create the entities of a project

Within the work area of the program, once a project has been created or opened, it is possible to create all the geometric and non-geometric objects, called entities, to be engraved on metal products with the machine



INFORMATION!: *The centred frame on the working field of the program indicates the limits of the machine working area.*

The dimensions of the objects created in the program work area have a ratio of 1:1 as to that which is actually reproduced on the machine.

It is reminded that the zero (0) on axis X and Y of the program work area is the red dot of pointer 1.

Through the “Objects” tool bar, it is possible to create the entities: dot, straight line, curved line, rectangle, ellipse, circle, polygon, text, bar code, images.

After selecting the type, it is possible to draw the object in the work area with the mouse.



INFORMATION!: *Each object created has one or more entities.*

All the entities of a project are listed in the frame on the top left of the program.

When selecting an entity that has been created in the work area, it can be modified from the owner board of the object (see paragraph 8.6.6), in the frame on the bottom left of the program



INFORMATION!: *According to the object selected, the owner board shows different set-up parameters .*







INFORMATION!: *the overall dimensions of the project entities are the actual dimensions that will be reproduced on the object to be marked;*

The centre of the work area where the entities are displayed in the software correspond to the centre of the work area of the machine (seen through 2).

Laser marker - FIBERLUX NANO

8.6.5.1 Set-up of the marking pen associated to an object

To set-up the marking pen to be used during the marking of an object, follow the operations described in Tab. 8-11.

<i>Symbol</i>	<i>Action</i>	<i>Feedback / note</i>
	Select the object in the work area.	
	Click with the right key of the mouse on the pen to be applied to the object from those in the marking parameters area	If the object is an image, the correct pen to select is "Bitmap"
	Click on "Apply to pick object" from the drop-down menu displayed.	
	If necessary, deselect the "Use default param" option from the marking parameters area and modify the properties of the marking pen.	

Tab. 8-11 – Set-up of the marking pen associated to an object










Laser marker - FIBERLUX NANO

8.6.6 Project set-up to mark an imported image on the part

The machine can engrave images imported directly from Internet, from a smartphone or from a camera.

After having imported the image and adjusted the object parameters, apply the pen for marking named “Bitmap”.

A common procedure method for a good quality of the photoengraving is to gloss beforehand the surface where the image is to be engraved.

Symbol	Action	Feedback / note
	Import an image.	See paragraph 8.6.4.
	Set the parameters of the object properties board.	See paragraph 8.6.5.
	<p><i>The brightness and contrast characteristics have influence on the power used by the machine when marking the image</i></p> <p><i>The higher the resolution, the more time required for the marking cycle.</i></p>	
	Apply the “Bitmap” marking pen to the object. If necessary, according to the type of material of the part, modify the “Bitmap” pen parameters.	See paragraph 8.6.5.1.
	Create a rectangular object in the area to be occupied by the image object.	Make sure that the Rectangle circumscribes the Image to be marked.
	Position the object at the centre of the work area: <ul style="list-style-type: none"> Select the entities; From the tool bar, click on . 	As alternative, after selecting the image, use the rapid control key C on the computer keyboard.
	Arrange the objects in the entities list area so that first the Rectangle object is marked, then the Image object	
	Apply the Filler to the Rectangle object with parameters similar to those of the cleaning.	See paragraph 8.6.5.1. If the cleaning does not have a sufficiently high power for the type of metal used, increase it slightly so that the result of the background obtained is clean and very bright

Tab. 8-12 – Project setting for marking of an imported image on the part

Laser marker - FIBERLUX NANO

INFORMATION! *Engraving of an image is one of the machine functions that requires a more experienced operator: according to the settings of the pen for the marking, completely different results can be obtained.. It is recommended to carry out tests on samples so as to obtain the required result.*



INFORMATION! *The marking cycle of a vector image on a part clamped on the self-centring spindle accessory , is controlled from the specific Marking window with split – RotaryMark (not from the main page of the software).The minimum parameters to be set in this window are the following:*

- *If the vector file is to be divided into sectors manually, the option “Mark by split line” has to be selected. The hatched red segments that are displayed in the preview are to be correctly positioned between one sector and the next;*
- *If instead it is wished that the vector file is divided into sectors automatically, the values of the “Axis Step”and “Split Size” fields have to be equal;*
- *If the marking is to be inside a ring, it is necessary to select the “Invert” option.*



INFORMATION! *The marking cycle of an image on a part clamped on the self-centring spindle accessory , is controlled from the specific Marking window with split, SplitMark2 (not from the main page of the software).*

The minimum parameters to be set in this window are the following:

- *The values of the “Axis Step” and “Split Size” fields have to be equal;*
- *The PartDiameter parameter has to have the actual diameter of the ring.*

Laser marker - FIBERLUX NANO

8.6.7 Project settings for the marking of a part clamped on the self-centring spindle

Marking of a ring (or a bracelet) is divided into segments and during the transition from one segment to another, the laser stops.

The two marking and rotation phases continue until the process is completed

To make this process possible, after the object has been developed /imported, the work has to be divided into segments.

To prepare a project for the marking of a part clamped on the self-centring spindle, usually wording to be engraved on a ring, follow the sequence of operations described in the following Tab. 8-13.

Symbol	Action	Feedback / note
	Create the object Text2D.	See paragraphs 8.6.5 and 8.6.6.
	If necessary develop the object Filling.	See paragraph 8.6.6.
	Position the object at the centre of the work area: <ul style="list-style-type: none"> Select the entities; From the tool bar, click on 	As alternative, after the image has been selected, use the rapid control: key C of the computer keyboard.
	Set the Marking characteristics for the object.	See paragraph 8.6.5.1.
	<p>From the Marking window with split - Ring TextMark, set the dimensional parameters of the product:</p> <p>a) If the external surface of the product is to be marked:</p> <p>Insert the product outer diameter;</p> <p>Make sure that the “Ring inside” option is not selected;</p> <p>b) If the internal surface of the product is to be marked:</p> <p>Insert the product inner diameter;</p> <p>Make sure that the “Ring inside” option is selected.</p>	
	From the Marking window with split - Ring TextMark, press the “Light” control area.	The preview can be seen through pointer n°1.
	If necessary, adjust the position of the part (acting directly on the part or on the securing accessory) in relation to the preview according to where the marking is to be made.	

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Symbol	Action	Feedback / note
	After closing the access door to the marking zone, start the marking cycle, pressing the “Mark” control area on the Marking window with split - Ring TextMark.	

Tab. 8-13 – Project settings to mark a part clamped on the self-centring spindle



INFORMATION! The marking cycle for a part clamped on the self-centring spindle accessory , is controlled by the specific Marking with split window (not from the main page of the software).

8.6.8 Settings to perform a micro-cut

The micro-cut function can cut a specific shape or an object from a metal plate.

This function is used to produce charms or other flat parts.

To perform the micro-cut in the Marking board, activate the advanced Wobble option of the pen used for the engraving.

The amplitude and the distance of the Wobble option have to be set.

The number of passes is set according to the material of the part and the thickness.

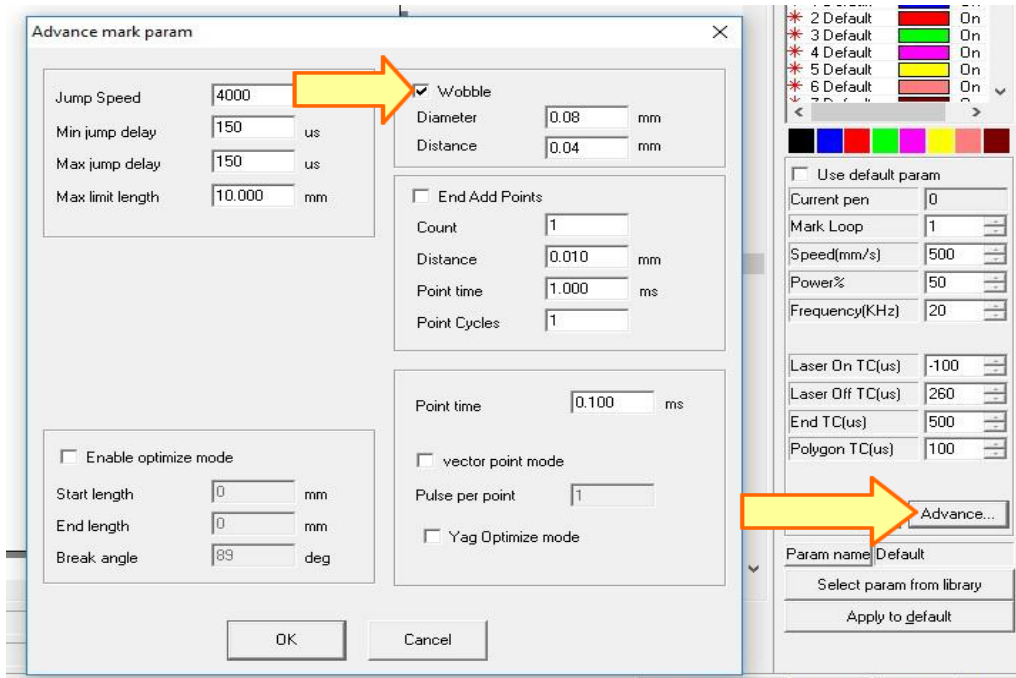


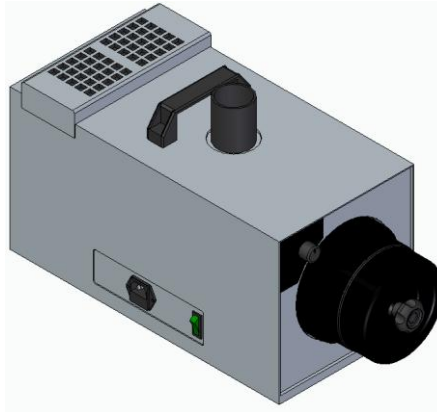
Fig. 8-1 – Example of pen setting for the “cut”

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8.6.9 Extractor accessory management

If the machine is equipped with the Extractor accessory, this will start to operate automatically during the marking. For the connection see paragraph 6.11.

8.6.9.1 Compact model vacuum cleaner - Technical data



<i>Parameter</i>		<i>Description</i>	<i>Standard</i>	<i>Brushless</i>
Dimensions		Length	600 mm	
		Depth	220 mm	
		Height	300 mm	
Masses		Total weight with packaging	15 Kg	
Diet	Electric	Power supply voltage	230 V AC +/- 5% <i>(optional 110 VAC +/- 5%)</i>	
Energy consumption			1.2 kW	0.6 kW
Air flow			55/70 m3	

Tab.8-14- Compact aspirator technical data

Laser marker - FIBERLUX NANO

8.6.9.1.1 Compact filter cleaning and replacement



ATTENTION !: All cleaning operations must be carried out with the machine stopped, after having disconnected the power supply. Only in this way can you be sure that an untimely start-up cannot occur while the cleaning staff is working.



OBLIGATION !: In all cleaning operations it is mandatory to wear suitable individual protective devices for the respiratory tract and eyes.






The suction filter, composed of two elements, must be checked according to the use of the marker: generally once every 2/3 months.

Regular cleaning extends the life of the filter avoiding frequent replacements.

If maintenance is not carried out and / or the filter is too impregnated, it is necessary to replace it.

Symbol	Action	Feedback / notes
	Turn off the machine and remove the plug from the socket.	
	Loosen the locking knob.	
	Remove the black protective casing.	

Laser marker - FIBERLUX NANO

Symbol	Action	Feedback / notes
	Act on the wing nut to unlock the filters and gently extract the first element.	
	Loosen the fixing nut of the second element with a size 14 wrench.	
	Remove the second element, paying attention to the plastic washer.	



Tab.8-15- Compact aspirator filters replacement

Collect the residues of precious materials by gently shaking the filters on a cloth. Vacuum the remainder with an industrial vacuum cleaner suitable for the treatment of metal waste.

If the filter is heavily impregnated, replacement is necessary.

Reassemble the filters following the instructions in reverse order.

Laser marker - FIBERLUX NANO
8.6.9.2 Aspirator model BF9 - Technical data


<i>Parameter</i>		<i>Description</i>	<i>Standard</i>	<i>TO*</i>
Dimensions		Length	300 mm	
		Depth	300 mm	
		Height	315 mm	
Masses		Total weight with packaging	17 Kg	
Diet	Electric	Power supply voltage	100-260 V AC +/- 5%	
Energy consumption			0.04 kW	
Air flow			130 m3	

* A: activated carbon filter

Tab.8-16- BF9 aspirator technical data

Laser marker - FIBERLUX NANO

8.6.9.2.1 Cleaning and replacement of filter model BF9



ATTENTION !: All cleaning operations must be carried out with the machine stopped, after having disconnected the power supply. Only in this way can you be sure that an untimely start-up cannot occur while the cleaning staff is working.



OBLIGATION !: In all cleaning operations it is mandatory to wear suitable individual protective devices for the respiratory tract and eyes.



The suction filter, composed of two elements, must be checked according to the use of the marker: generally once every 2/3 months.

Regular cleaning extends the life of the filter avoiding frequent replacements.

If maintenance is not carried out and / or the filter is too impregnated, it is necessary to replace it.

Symbol	Action	Feedback / notes
	Turn off the machine and remove the plug from the socket.	
	Unhook the side catches and remove the gray top cover.	
	Remove the top filter cloth.	

Laser marker - FIBERLUX NANO

<i>Symbol Action</i>	<i>Feedback / notes</i>
<p>Remove the rack filter.</p>	
<p>Apply the anti-slip protective cover. Dispose of in accordance with the statutory provisions of the country.</p>	
<p>Fit the new filter following the operations in reverse order</p>	

Tab.8-17- Replacement of BF9 aspirator filters

Collect the residues of precious materials by gently shaking the filters on a cloth. Vacuum the remainder with an industrial vacuum cleaner suitable for the treatment of metal waste.

If the filter is heavily impregnated, replacement is necessary.

Reassemble the filters following the instructions in reverse order.

Laser marker - FIBERLUX NANO

8.7 Problems, causes and solutions (*troubleshooting*)

In the table that follows (Tab. 8-18) a series of potential problems that could occur are indicated (caused by incorrect use/functioning of the FIBERLUX NANO and 7 or due to a fault). These could cause:

- Poor quality of the processing (and consequently of the product);
- Insufficient efficiency /throughput;
- Hazards for the machine and/or the operator.

The possible cause/s for each problem and the solutions to apply are indicated.

IF it is not possible to solve the problem with the solutions suggested, contact the Elettrolaser Technical Service: see chapter 12 to request intervention.

#	Problem	Solution/s
1	NO SUCTION	<ul style="list-style-type: none"> • Check that the aspirator power cable is connected correctly. • Clean and / or replace the aspirator filters.
2	NO LASER	<ul style="list-style-type: none"> • Check the focus • Use a piece of black paper and check if there is a minimum of laser output. • Check focal cleanliness (see paragraph)
3	SPINDLE DOES NOT TURN	<ul style="list-style-type: none"> • Check that the connector is properly inserted (see paragraph 7.4.3)
4	MARKER DOES NOT TURN ON	<ul style="list-style-type: none"> • Check the power supply cable (see paragraph 6.9.2) • Check the condition of the power supply fuse (see paragraph 6.9.2)
5	NO INTERNAL POINTER	<ul style="list-style-type: none"> • Check that the focal cover has been removed (see paragraph 8.4).
6	SOFTWARE WORKS ONLY IN DEMO MODE	<ul style="list-style-type: none"> • Check the connection of the USB / RJ45 cable (see paragraph 8.5)

Tab. 8-18 – Problems, causes and solutions



OBLIGATION!: If it should be necessary to replace a fuse, use only original spare parts of the same type as that to be changed. Contact ELETTROLASER S.R.L. for further explanations.

Laser marker - FIBERLUX NANO

9 Maintenance

9.1 Maintenance safety standards



OBLIGATION!: All maintenance operations that are NOT routine are only to be carried out by qualified technicians (see paragraph 4.9) of ELETTROLASER S.R.L. or their authorised dealer with all the necessary technical skills to carry out these operations in absolute safety and in full compliance with the relevant standards and laws in force.



CAUTION!: Non-observance of the safety instructions that follow could cause injuries, death or damage to the machine.



CAUTION!: Every maintenance operation is to be carried out with machine stationary, after removing the machine electric power supply sources. Only in this manner there is the certainty that an unexpected start-up cannot happen while the maintenance technicians are working.



CAUTION!: Some components of the electrical equipment may remain live after the electric voltage has been cut-out.



CAUTION!: Machine maintenance, where it is necessary to open the covering panels is only to be carried out by qualified technicians (see paragraph 4.9) of ELETTROLASER S.R.L. or their authorised dealers.



CAUTION!: If, during maintenance carried out by the specialised technicians of ELETTROLASER S.R.L. it is necessary to work with visible laser tracking, the working area becomes a LASER safety area of class IV. In this case, all the persons present are to wear the necessary protection devices (special protective goggles for the wave-length indicated (1.064 nm)), or otherwise leave the area involved. To carry out the maintenance and service operations it is recommended to reduce the area involved to a minimum with fixed walls or protective curtains.

9.2 Routine maintenance

9.2.1 Safety signals check

Every six months check (in the foreseen points, see paragraph 4.4), the integrity and the legibility of all the indications applied to the machine.

Laser marker - FIBERLUX NANO

If the labels or indication notices are found damaged, replace them.



CAUTION!: Absence of the safety indications could expose the worker to hazards, since possible residual risks may not be perceived.

9.2.2 Marking zone infrared filter

The infrared filter of the welding zone inspection window **is always to be visually checked** (functioning integrity check) **every time the machine is used**.

In the case of broken filter, the machine is not to be used until the filter glass is replaced.



OBLIGATION!: Replacement of the infrared filter of the marking zone is to be carried out by the ELETTRROLASER S.R.L. technical service.



CAUTION!: Use of common glass or filters that are not certified could result in the escape of radiation hazardous for the eyes and skin of the operator. Only use certified filters.

9.2.3 Guards

The guards are to be checked **at least every 6 months**.

Check the following:

- Check for leaks or damage to any part of the guard, in particular if this causes a reduction of the safety function;
- Replace parts subject to wear (e.g.: flexible shielding);
- Check the wear of gaskets and anchorage points;
- Check for deterioration caused by corrosion, temperature variations, chemical effects.

In detail, the brush (flexible shielding) **is always to be visually checked** (check functional integrity) **every time the machine is used**. In the case of breakage, absence, excessive kinking, creasing or wear of its elements, do not use the machine until the brush has been replaced.



FORBIDDEN!: Never remove, dismantle or modify the cladding panels of the machine housing bearing structure or parts of the same. Only the specialised ELETTRROLASER S.R.L. technicians can, if necessary, access the internal parts of the machine.

Laser marker - FIBERLUX NANO

9.3 Non-routine maintenance (service)



OBLIGATION!: These procedures are **ONLY** to be carried out by qualified expert technicians of ELETTROLASER S.R.L. (or personnel authorised by ELETTROLASER S.R.L.).

To contact ELETTROLASER S.R.L. see chapter 12 (Service)

9.3.1 Checks and maintenance on safety devices

The integrity and functioning of safety devices are to be checked **at least every six months** by a qualified, expert technician (specialised maintenance technicians. see paragraph 4.9).

9.4 Other maintenance operations

FIBERLUX NANO has to undergo an overhaul and extraordinary maintenance every time there is a malfunctioning or loss of power, or in the case of failure of laser source, which is able to operate for approx. 50 thousand hours.

These operations are to be carried out by qualified expert technicians of ELETTROLASER S.R.L. (or personnel authorised by them).

9.5 Machine cleaning



CAUTION!: Every machine cleaning operation is to be carried out with the machine stationary, after removing the electrical power supply source. Only in this manner there is the certainty that an unexpected start-up cannot happen while the cleaning operators are working.

To clean the machine or some parts of it, the following precautions are to be observed:

- **Do not clean electrical equipment using water or other fluids. To remove any deposited dust, only use a clean brush or a dry cloth;**
- **Do not use compressed air or jets of water to clean the machine. If necessary, use a vacuum cleaner;**
- **Do not clean the surfaces with alcohol or solvents. Use only the specific detergents;**
- **Do not clean the lenses and filters with solvents or other inflammable substances;**
- **Dispose of the cleaning materials observing the relevant standards in force. Do not abandon the materials used or the cleaning residue in the environment.**

It is necessary to periodically remove the accumulation of dust and/or processing residue to avoid the dispersion of the same in the working environment.

The frequency of the cleaning depends on the amount of residue accumulated. In any case, it is advised to carry out the clean *every day* at the end of shift.

Removal of the residue is to be carried out manually with an industrial vacuum cleaner appropriate for the purpose.

To clean the cooling fan, always use a normal vacuum cleaner. The operation is to be carried out periodically according to the use.



OBLIGATION!: During all the cleaning operations it is obligatory to wear appropriate personal protection devices to protect the respiratory tracts and the eyes .

Laser marker - FIBERLUX NANO



CAUTION!: Do not use compressed air for cleaning. Use an industrial vacuum cleaner.

9.6 Spare parts

If it should be necessary to procure spare (or consumable) parts, contact the service dept. (see chapter 12).

10 Machine storage conditions

10.1 Temporary putting out of service

If it should be necessary to put the machine out of service for short periods, it is sufficient to disconnect the socket from the electric mains.

10.2 Putting out of service for long periods

If the machine is to be put out of service for a long period, it is to be carefully cleaned. Subsequently repeat the operations described in paragraph 10.1.

After these operations, place the machine and accessories in the original packaging.

Laser marker - FIBERLUX NANO

11 Machine dismantling

11.1 Machine dismantling

The machine is to be dismantled by an operator with the specific authorisations to carry out this activity. In any case it is necessary to bear in mind some operations that are obligatory before the demolition and in any case after putting out of service.



FORBIDDEN! It is strictly forbidden to dispose of the machine or parts of the same through the normal urban solid waste collection service (even if Separated collection).



OBLIGATION!:

- Remove the coolant liquid from the machine, as indicated in the maintenance chapter;
- Remove any accumulators from the machine (buffer batteries, dry batteries, etc.). The removed accumulators are to be disposed of in compliance with the relevant standards in force;
- Remove the identification plates from the machine then destroy them as well as any other documents related to the machine (manuals, diagrams, etc.).

11.2 General standards regarding disposal of industrial waste

Since there are different modes of observation in force in the separate countries, the provisions imposed by the laws and authorised bodies of these Countries are to be observed.

For the EU countries, the reference standards are the following:

- Directive 91/156/EEC on waste;
- Directive 91/689/EEC on hazardous waste;
- Directive 94/62/EC on packaging and packaging waste.

The machine, on the basis of the standards in force, after decommissioning, is classified as special waste.

For countries outside the EU. the relevant legal provisions have to be checked and applied.

11.3 Waste management by the companies



CAUTION! The following provisions are not applicable if the holder of the waste is a private person.

Management of waste is the group of activities carried out to manage the entire process, from the production of the waste through to the final disposal, including the collection, transport, treatment, recycling.

The policy applied by the EU deals with this matter of waste with a series of priorities that include:

- Reduction of production of the waste through development of clean technologies, design and marketing of products that do not contribute to the production of waste and pollution, enhancement of technologies to eliminate presence of hazardous substances in waste;
- Prevention of production of waste by the correct assessment of the impact on the environment of each product during its entire life-cycle;
- Recovery of waste by re-use and recycling also for energy purposes.

Laser marker - FIBERLUX NANO

Only regarding the material that it has not been possible to re-use and then recycle, effective disposal solutions have to be applied such as sending to waste disposal sites.

For the waste resulting from production activities of any type., a careful verification is required and a check on the entire supply chain by the producer of the waste.

Producers of **special, hazardous and non-hazardous** waste, in particular shall:

- Code or classify the waste they produce;
- Keep them in observance of the temporary storage conditions;
- Provide for the recovery or disposal through **authorised bodies** (disposal or recovery by third parties);
- Observe the administrative obligations.



CAUTION! *The environmental ruling, regardless of the country of destination – is vast and complex (and in continual evolution), it is advised to carefully study this (also with the aid of personal consultants for these matters), to check the obligations and provisions to be applied.*

CAUTION! *The environmental ruling foresees heavy sanctions of various types in the case of lack of and/or incorrect application.*

Laser marker - FIBERLUX NANO**12 Service**

To request service or to order spare parts, the following data which is contained on the EC Plate attached to the machine has to be indicated:

- **MODEL** of the machine;
- **SERIAL NUMBER**;
- **YEAR** of manufacture.

The request is to be addressed to:

ELETTROLASER S.R.L.

Via dell'Industria, 35 - 37060 Sona (VR) Italy

Phone: +39 045 6082415 / Fax +39 045 6088650

email: info@elettrolaser.com

web www.elettrolaser.com

Technical service is available from Monday to Friday from 8:30 to 12:30 and from 14:00 to 18:00 (Rome GMT).

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Laser marker - FIBERLUX NANO**A1 Copy of CE Declaration of conformity**

dichiarazione di conformità

declaration of conformity

Allegato II A - 2006/42/CE

Annex II A - 2006/42/EC



La sottoscritta ditta:

The undersigned company:

ELETTROLASER S.R.L.**Via dell'Industria, 35 - 37060 Sona (VR) ☎ +39 045 6082415**

Dichiara sotto la propria responsabilità che la MACCHINA nuova:

Declares, under its own responsibility, that the new MACHINE:

Modello:

Model:

FIBERLUX NANO

Tipo:

Type:

Marcatrice laser**Laser marking machine**

Matricola/e:

Serial n:

Anno di fabbricazione:

Year of manufacture:

2022

Descritta in appresso:

Described below:

La Marcatrice laser è una macchina che consente di marcare o tagliare oggetti in metallo di piccola dimensione, mediante una sorgente laser pulsata in fibra.

The Laser Marking Machine is a machine that allows you to mark or cut small metal objects by means of a pulsed fiber laser source.

È conforme alle seguenti Direttive Comunitarie:

Is compliant with the following Community Directives:

Direttiva Macchine - Machinery Directive

2006/42/CE

(ex 98/37/CEE - 89/392/CEE - 91/368/CEE - 93/44/CEE - 93/68/CEE)

Direttiva Compatibilità Elettromagnetica - Electromagnetic Compatibility Directive

2014/30/UE

(ex 89/336/CEE)

Direttiva RoHS III - RoHS III Directive

2015/863/UEmodifica dell'allegato II della direttiva 2011/65/UE
amendment of Annex II to the Directive 2011/65/EU

Direttiva RoHS II - RoHS II Directive

2011/65/UE

Soddisfa gli obiettivi di sicurezza indicati dalla Direttiva bassa tensione (2014/35/UE).

It meets the safety objectives given in the Low Voltage Directive (2014/35/EU).

Tuttavia, come previsto dal paragrafo §63 della Linea Guida all'applicazione della direttiva "macchine" 2006/42/CE, redatta dalla Commissione Europea imprese e industria, la presente Dichiarazione CE di conformità NON fa riferimento alla Direttiva bassa tensione.

However, as indicated in paragraph §63 of the Guidelines on how to apply the Machinery Directive 2006/42/EC, written by the European Commission for business and industry, this EC Declaration of Conformity DOES NOT refer to the Low Voltage Directive.

Soddisfa, ove pertinenti, i requisiti delle seguenti Norme Armonizzate:

*Satisfies, when pertinent, the requisites set by the following harmonized rules:***EN ISO 12100 – EN 60204-1 – CEI 76-11 – EN 60825-1 – EN 61000-6-1 – EN 61000-6-3 – EN 61000-3-2 – EN 61000-3-3**Costituzione del fascicolo tecnico:
Constitution of the technical file:

Responsabile:

Technical File Manager:

Ing. Guerrino Ferrarini

Luogo di conservazione:

Storage:

Via dell'Industria, 35 - 37060 Sona (VR)

Nome:

Name:

Guerrino Ferrarini

Posizione:

Position:

Quality Manager**Sona (VR)**

Firma:

Signature:

Luogo e data:

Place & date:

24/05/22

Laser marker - FIBERLUX NANO**A2 Machine safety keys delivery report**

At the time of delivery of the "Laser Marker" machine identified by the following data:

Series: FIBERLUX NANO

Model:

Serial number:

Year of manufacture:

The Manager for the use and maintenance Mr. _____ of the Company _____, user of the machine, hereby declares to have received the complete set of keys, namely:

- For the series FIBERLUX NANO: interlock connector and Command Key or enabling password;

as described in the instructions for use and maintenance, necessary for the machine use.

Date:

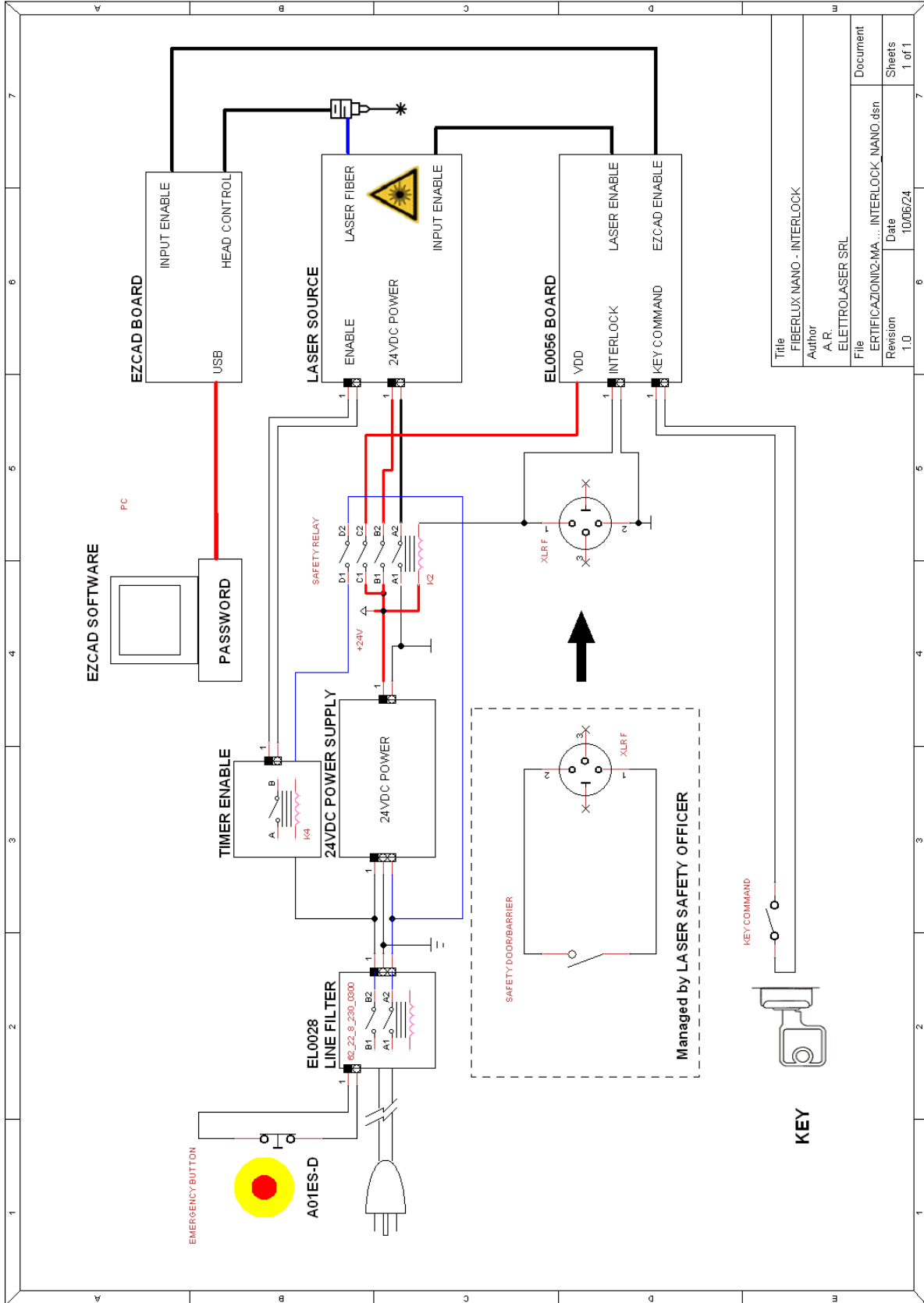
Stamps and signatures:

The Manufacturer

The Company manager

Laser marker - FIBERLUX NANO

A3 Schematic



Laser marker - FIBERLUX NANO**A4 List of specific P.P.E.****Model: LP-YHP Laser Safety Glasses**

Typical for: 1064nm

Transmittance: 60%

O.D5+ @ 800 - 1100nm

O.D7+ @ 1060 – 1070nm

L-Rating: 800 – 1100nm DIR LB5

1000 – 1070nm IR LB7

Protect Wavelength: 800 - 1100nm

Application: Diode and ND:YAG Laser Protection



Laser marker - FIBERLUX NANO

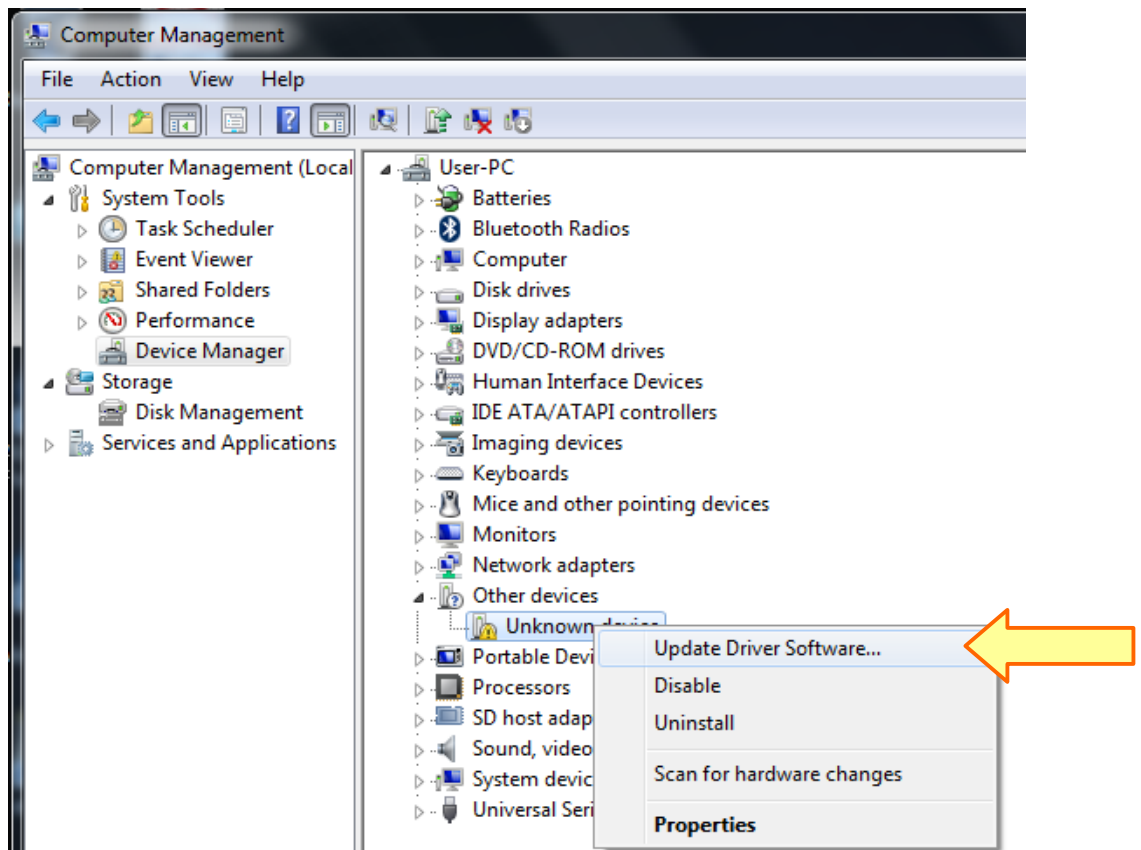
A5 Complete instructions of the Laser Marking Software

EzCad2

1. Software installation

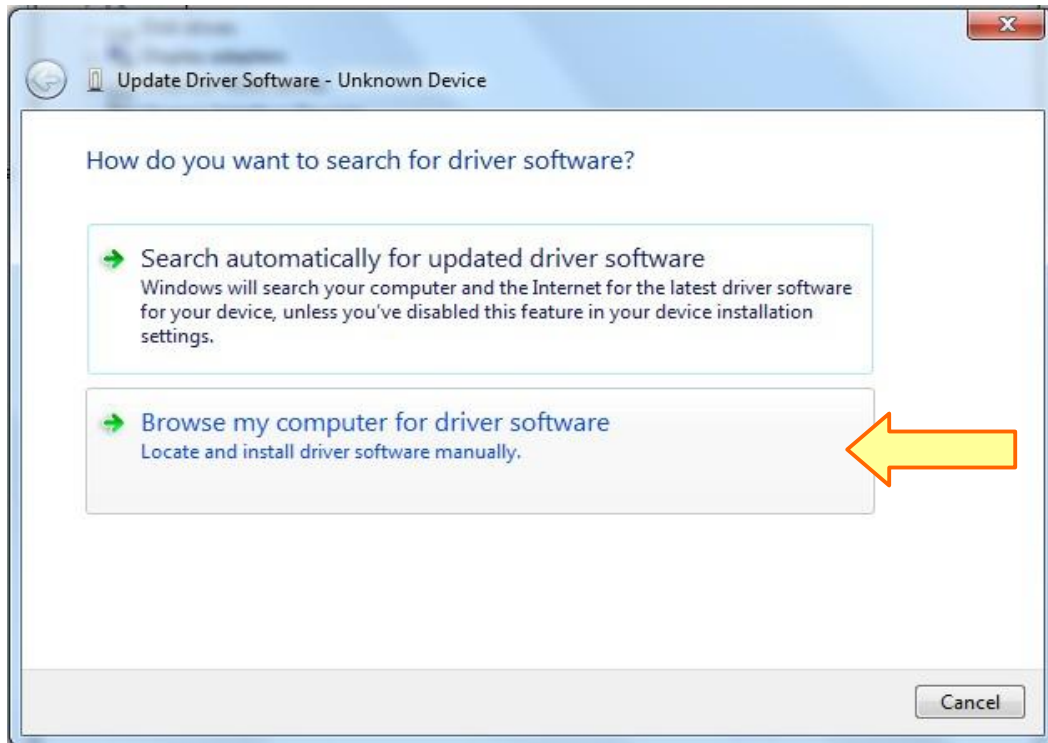
Procedure to install the control board:

- From the USB unit supplied, copy the folder **EzCad2** onto the hard disk of the PC. Preferably on the main installation folder of Windows (usually C :).
- On Windows 8 / 8.1 / 10 click on **Start**, with the right key, then select **Gestione dispositivi (Devices management)** and find an unknown BJJCZ device.
- On Windows 7/XP click on **Start** → **Computer** (right key) → **Device Manager**.
- Then follow the subsequent steps, finding the correct drivers in the installation folder of EzCad2.



Pi

Laser marker - FIBERLUX NANO



Pic. 1



Pic. 2

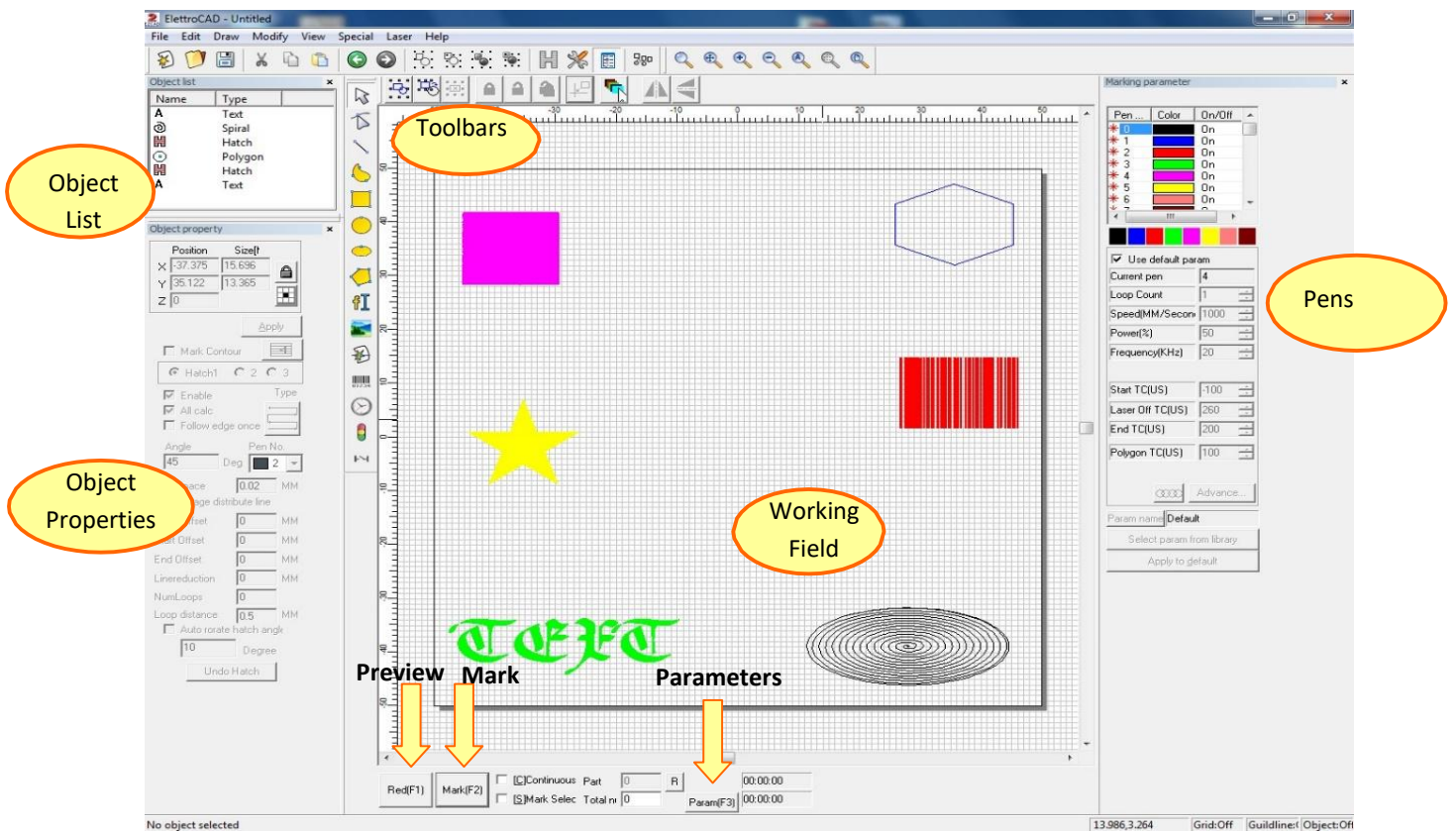
Laser marker - FIBERLUX NANO



Pic. 3

2. Software interface and Arrangement

Connect the computer to the machine with the USB cable, switch on the machine and, after about **10** seconds open



Pic. 4

EzCad2.exe (this is in the main installation folder of EzCad2). Interface (Pic.5):

In the upper part there are the drop-down menus of the main program (File, Modify, Design, ...) and the tool bar. The window I divided into four areas, On the top left there is the **Object List** of all the objects created and imported. Below

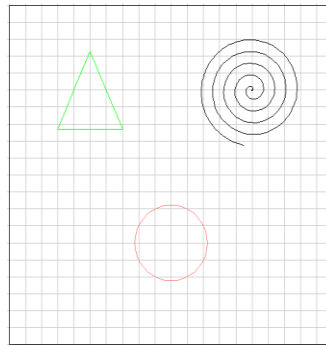
Laser marker - FIBERLUX NANO

there are the **Object Properties**. In the central zone there is the **Working field**. On the right it is possible to modify the Properties (Power, Speed, Frequency, ...) of each marking pen. Finally, at the bottom there are the controls for the machine setting, the marking preview and the start of the marking.

Pressing the button **Param (F3)** it is possible to view and set the main data of the marking board.

Pressing the **Red** button (**F1**) starts the preview and the following dialogue window is opened, pressing **Mark (F2)** starts the marking process. A marking window with the Stop button will be seen, to stop the marking if necessary.

2.1. Working field



Pic. 5

The working field is basically a graphic representation of the area in which it is possible to engrave, mark or cut. Every object created or imported in the software will be seen in this field. It is possible to modify the positioning of each object. The machine will perform the processing in the exact position as it appears in the working space.

By default there is a square on the background, this is the maximum effective area and may vary according to the target of the focal device mounted.

There is a short-cut to place a selected object in the centre of the working field; this is the "C" key on the computer keyboard.

2.2. Tool bar



Pic. 6

With the **New** (📄) command it is possible to create a new white file, use **Open** (📁) to load a file already saved and **Save** (💾) to save (and overwrite) the current file. With **Cut** (✂️), **Copy** (📄) and **Paste** (📄) it is possible to respectively cut, copy and paste a project in the working field.

Using **Join** (🔗) and **Disjoin** (🔗), some objects can be joined and disjoined, obtaining new objects with different properties.

With **Group** (🔗) and **Ungroup** (🔗), exactly as in the previous case, dividing again the entity obtained, it is possible to return to the original objects.

The **Filling** (🔗) calculates the filling of the hatching for the current objects. For further information regarding the hatching, see **Hatch (3.4)**.

Laser marker - FIBERLUX NANO

Using the **System Parameters** control it is possible to adjust the functions of the working field.
When the selection arrow is active, the following bar is displayed. (Pic.8).



Pic. 7

The second menu contains the following controls:

- Selects all the objects in the working field (📁),
- Selects all the objects except the object that has been selected (📁),
- Deletes the objects selected (🗑️),
- Maintains the characteristics of the selected objects (🔒),
- Unlocks the characteristics of the selected objects (🔓),
- Positions the selected object in the centre (📍),
- Selects the objects according to the pen used (🖌️),
- Mirrors the object as to axis Y (📐),
- Mirrors the object as to axis X (📐).

The drawing bar contains the main entities for drawing and control (Pic.9).



Pic. 8

This tool bar is used to create different objects, such as **dots** (📁), **straight lines** (📐) or **curved lines** (📐), **rectangles** (📐), **circles** (📐), **ellipses** (📐), **polygons** (📐), **text** (📄) and **bar codes** (📄).

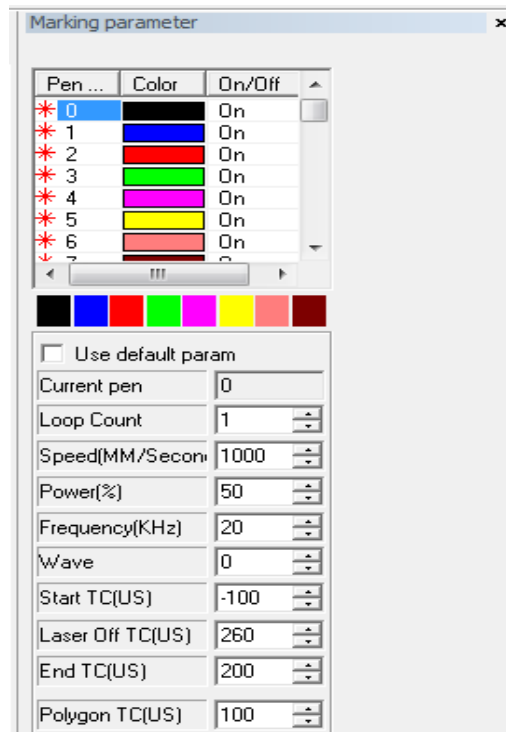
It is also possible to import a vector file choosing **Draw vector file** (📄), .dxf, .svg, .plt, .ai and many other formats, and import an image by pressing Draw bitmap file (📄) on format .jpg, .bmp, etc...

With the **time entity** (🕒) it is possible to set an interruption interval in the marking process, the object **IO input** (🚦) controls the marking process according to the input levels (high/low).

Lastly, with the entity **IO output** (🚦) it is possible to set the output at the required logic level. The same controls are available in the **Draw** drop-down menu.

Laser marker - FIBERLUX NANO

2.3. Pens



Pic. 9

On the right of the interface, the pens allow the user to customise the marking parameters. Each pen can be renamed. Here it is possible to find the main settings of the laser, such as power, speed, frequency, passes, etc.

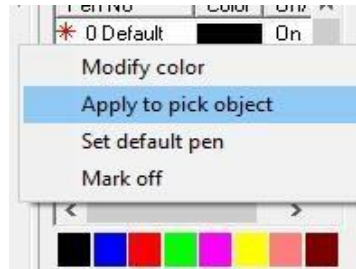
In the software, as default, the parameters appropriate for jewellery are supplied.

The pens can be saved inside the project. Each time this project is opened, the pens saved will also be opened.

For each pen, after the Use default param has been deselected, the following properties can be modified:

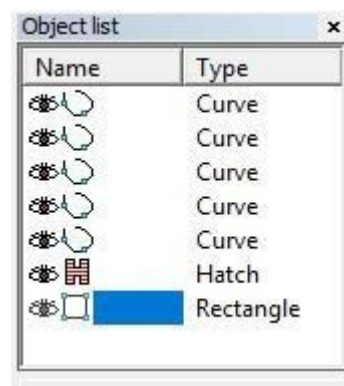
- **Loop Count**, the number of laser passes that will take place for the relevant object
- **Speed (mm/s)**, the engraving speed.
- **Power (%)**, the percentage of power used for the current engraving parameter.
- **Frequency (kHz)**, the laser frequency used for the current engraving parameter.
- **Laser On TC (μs)**, when the machine starts to engrave, the mirrors inside the head have to accelerate to define the engraving speed. Usually a slight delay is inserted so that the mirrors can reach the speed correctly.
- **Laser Off TC (μs)**, the laser shut-off delay after the marking has terminated.
- **End TC (μs)**, used to control the time that the software employs at the end of a series of vectors. The delay is required so that the software is always temporally advanced as to the hardware, so as to wait for the hardware concludes the necessary operations.
- **Polygon TC (μs)**, this parameter is used to control the time the software waits at the connection points of the vectors. To change the pen, select the object and click on the required pen with the tight key, then choose **Apply to pick object** (Pic.11).

Laser marker - FIBERLUX NANO



Pic. 10

2.4. Objects list

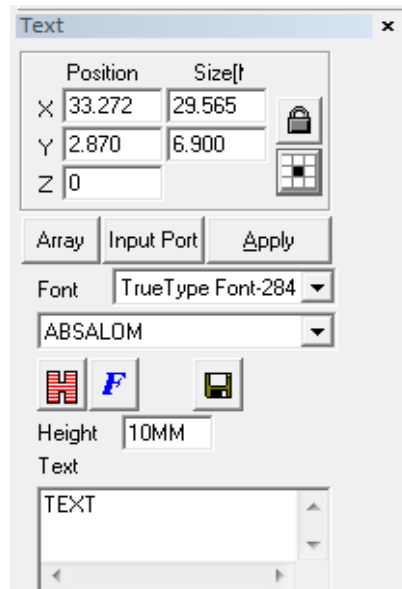


Pic. 11




Each object that is imported or created is automatically inserted in this list. It is very important to remember that the machine will act differently according to the order of this list, therefore it is possible to change the order of the objects simply dragging them with the left button of the mouse.

Laser marker - FIBERLUX NANO


2.5. Object Properties



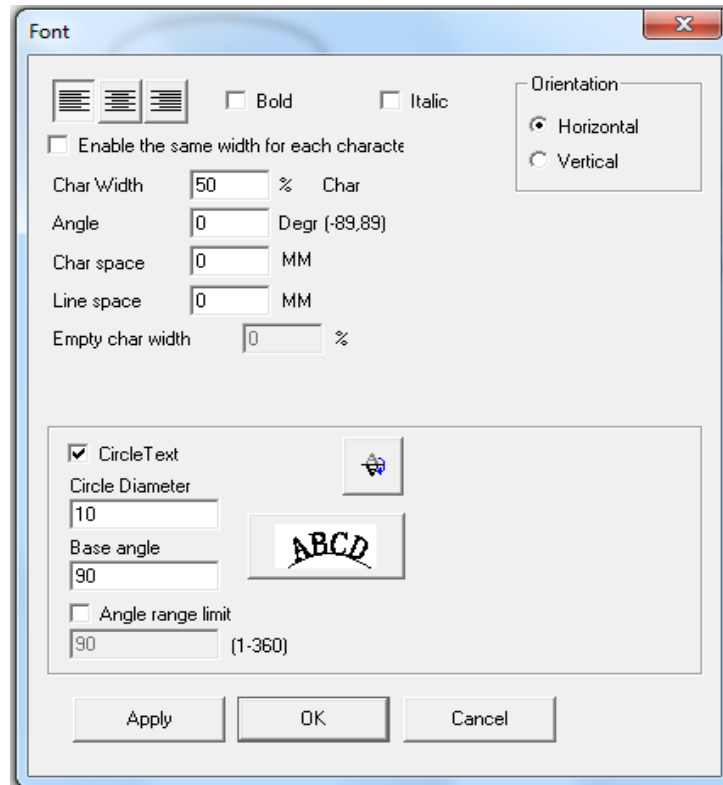
Pic. 12

Firstly, it is necessary to find the coordinates of the object as to the reference applied. The reference is indicated by the square () and in this case it is represented by the central point. Next the dimensions have to be found with the possibility to maintain the locked proportions (**padlock closed** ) or not (**padlock open** ). Using the keyboard the object can be moved or rotated, using the direction arrows and the combination Ctrl+directional arrows.

It is very important that each time the user modifies a field or changes the parameters, the **Apply** key (Pic. 13) is pressed to confirm the controls.

It is also possible to import the height, the character and the hatching. Pressing button , c
The window will be shown of advanced settings of the character, as illustrated in Pic.14.

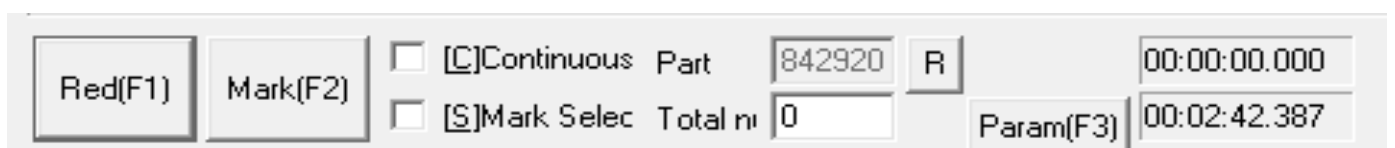
Laser marker - FIBERLUX NANO



Pic. 13

To give the text a radial effect, tick the **Circle Text** box and enter the **Circle Diameter** and **Base angle** parameters. To change the orientation of the text, press the **Vertical** key.

3. Marking and engraving



Pic. 14

The **Red (F1)** button is used to project a preview on the marking area. The **Mark(F2)** button is used to start the marking process.

With the Continuous option the marking process continues until it is interrupted manually, the **Mark Selected** option only sends in marking the objects selected, ignoring the other objects on the working field. To interrupt the marking process press the **Stop** button or the **Esc** key on the keyboard.

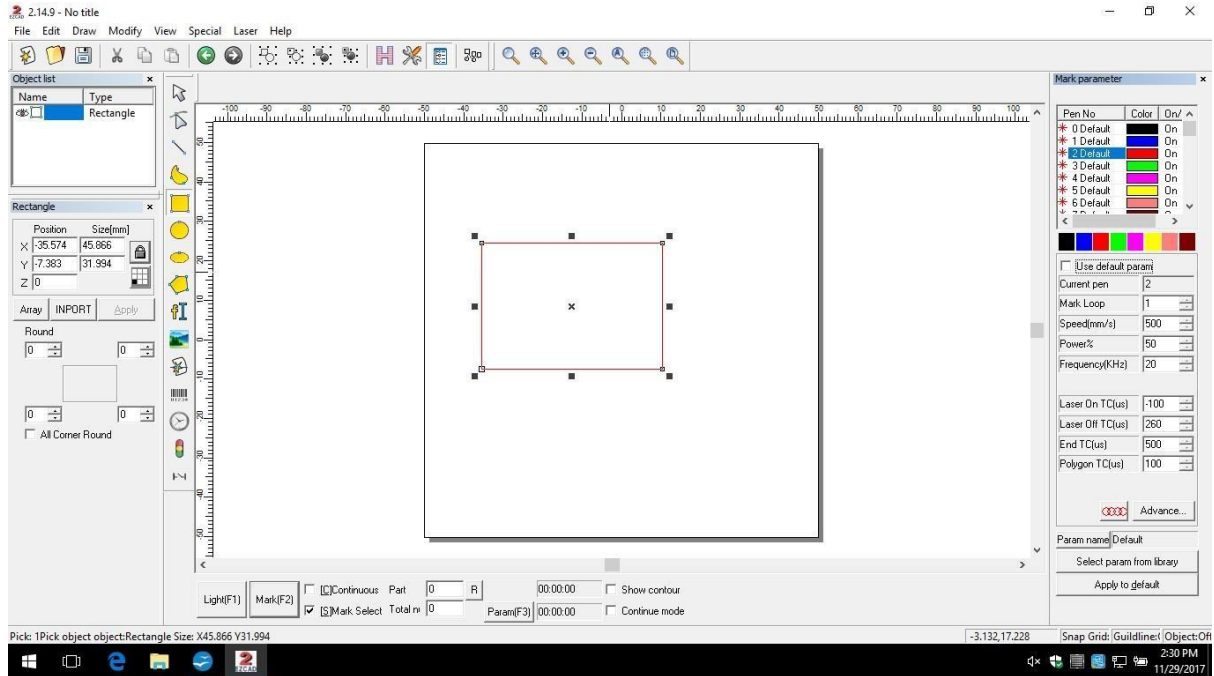
Lastly, with the **Param(F3)** button it is possible to set the properties of the laser control board.

Usually marking and engraving have the same meaning, but engraving is used to define a deeper marking.


Laser marker - FIBERLUX NANO

3.6. Create and Import

To create an object, one of the geometrical forms can be chosen from the **Draw** bar.



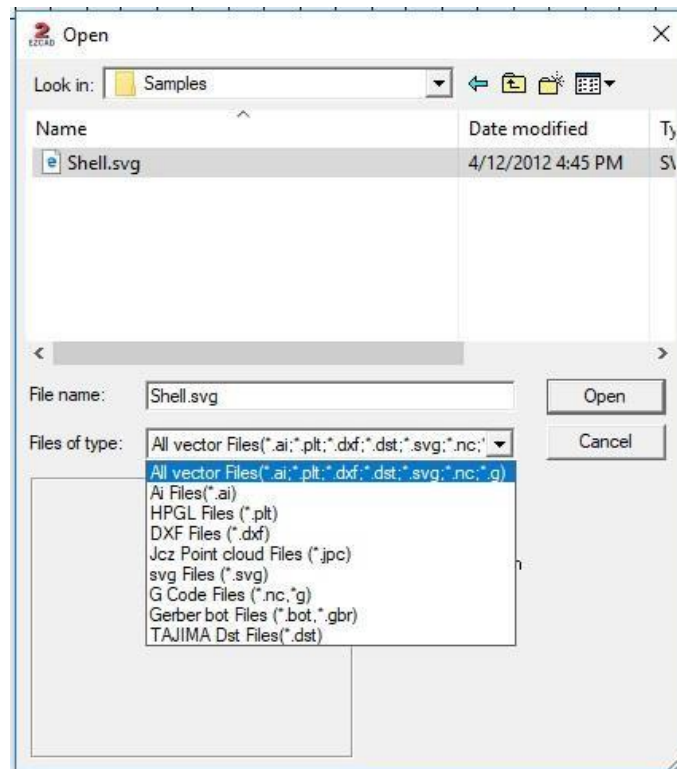
Pic. 15

To create a text, click on the **Draw Text** button () , after positioning on the work space, the properties can be modified as illustrated in Pic. 13.

EzCad2 is compatible with any font installed on the computer. If a new font is installed, the software has to be restarted to be able to recognise it.

To set a vector project, click on the **Draw vector file** button () . Any file with a format compatible with those shown in the list below can be chosen (Pic.17).

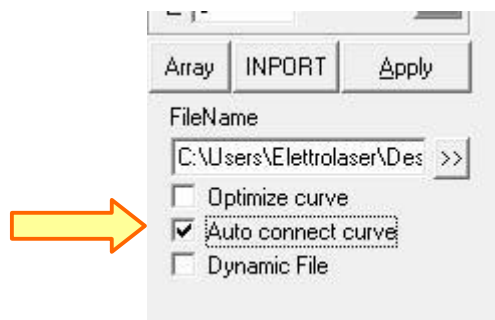
Laser marker - FIBERLUX NANO



Pic. 16

Once the object is in the working field, the user can modify the properties using the functions previously described, such as change the dimensions and apply different pens

It is possible that the vector file has some errors at the time of **Hatching**, in this case it will be necessary to select only **Auto connect curve** then click on **Apply** (Pic.18).



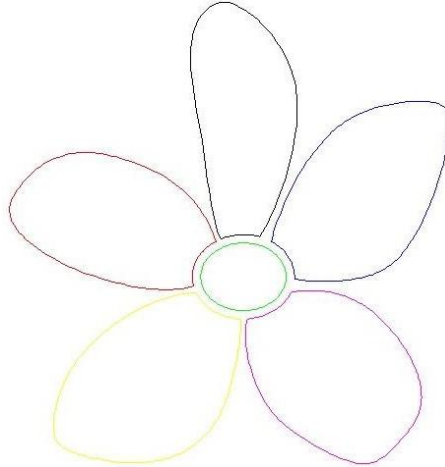
Pic. 17

Laser marker - FIBERLUX NANO


3.7. Object split

The software allows the user to modify practically every detail of the created or imported object.

In the figure below (Pic.19) it can be noted that the imported file has been divided to obtain the final object, where it is possible to set several pens on the same drawing.




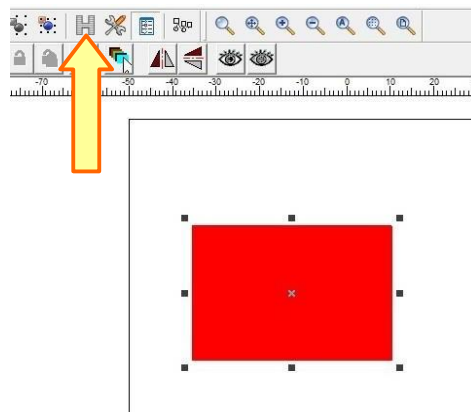
Pic. 18

This result has been obtained dividing the imported file using the **Ungroup** command (), different pens have then been applied to each polyline.

In this manner the user can decide, for example, which parts of the drawing will be cut and which will be engraved.

3.8. Hatch

Hatch () is a function to fill the selected object with a certain number of lines, so as to remove material inside the contour of the object. (Pic.20).

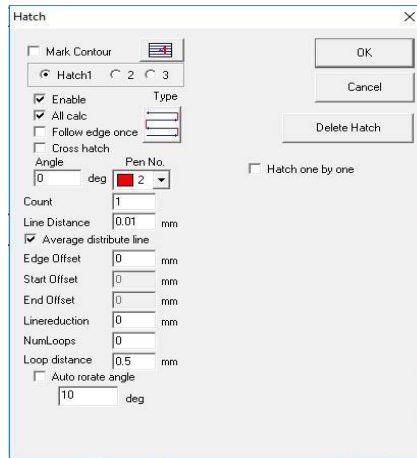


Pic. 19

As shown in Pic.21, from the hatching menu, it is possible to enter 3 different levels of hatching. In jewellery it is sufficient to apply Hatch 1 and 2, the distances suggested between the lines generated are 0.02mm or 0.01mm. The

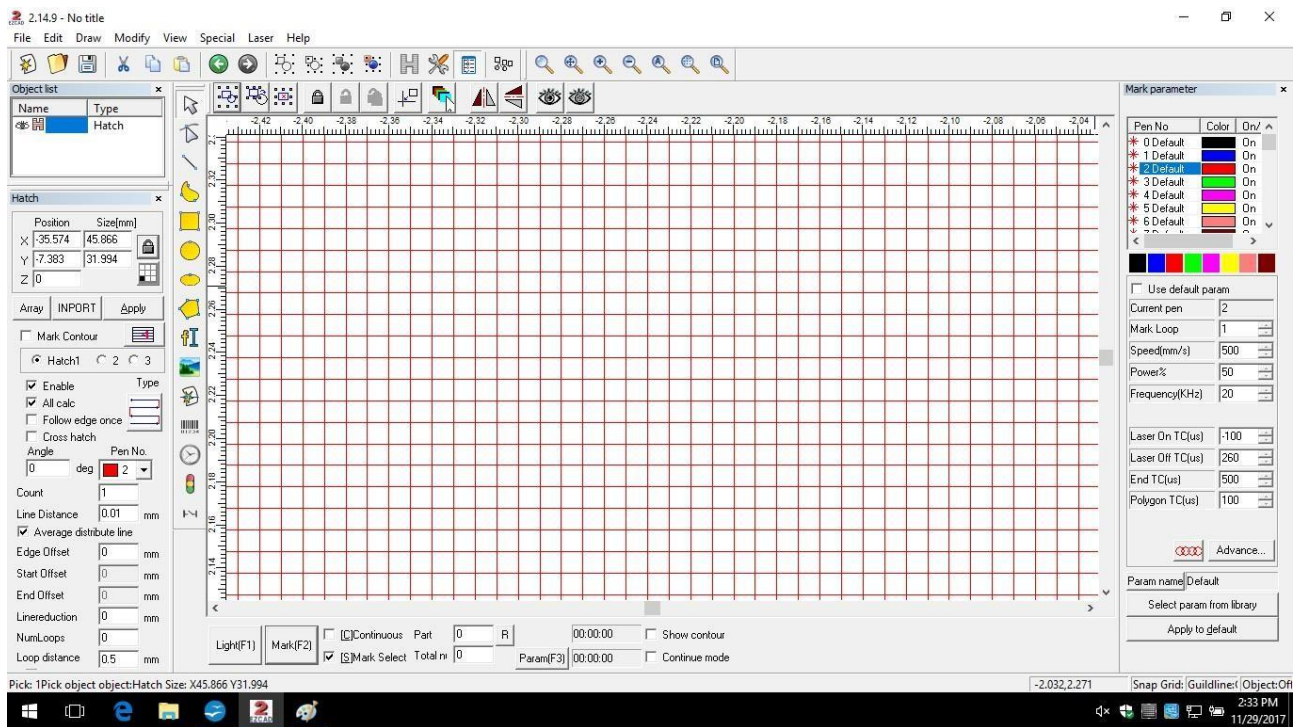
Laser marker - FIBERLUX NANO

best hatching results are obtained when the angles are set with a difference of 90° between Hatch 1 and Hatch 2 (for example 0° and 90° or -45° and 45°).



Pic. 20

In the following figure (Pic.22) it is possible to see a detail of how the hatching actually takes place.



Pic. 21

Laser marker - FIBERLUX NANO

3.9. Cleaning

Cleaning is the process that permits the user to have a clean and very bright marking/engraving. When the laser strikes the metal, it burns and this causes oxidation, for this a cleaning pass can be applied after the marking/engraving.

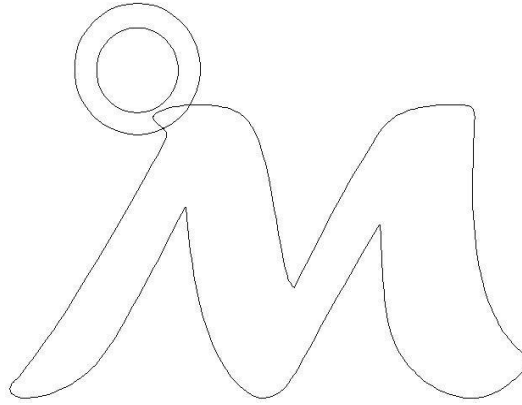
The general rules require that the cleaning is carried out with low power parameters. Elettrolaser supplies the pens set with the correct parameters according to the processing to be performed.

Usually a copy of the marked/engraved object is created to which the cleaning pin is applied.

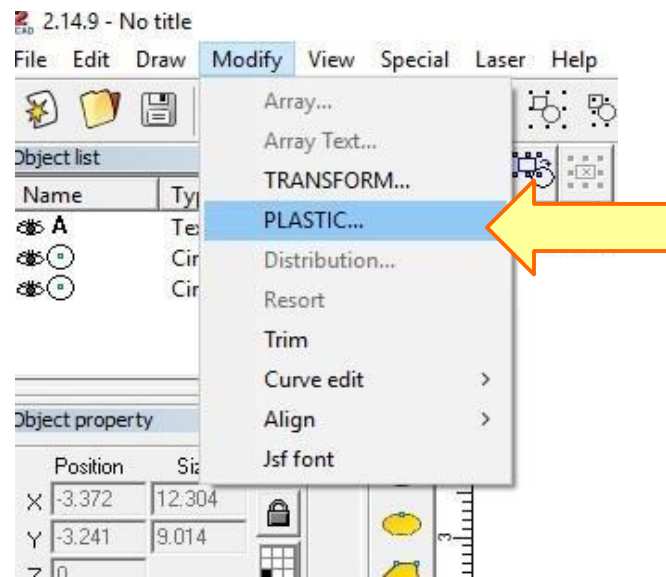
Laser marker - FIBERLUX NANO

3.10. Plastic Function

This function is very useful, especially in the jewellery industry. The user can modify the drawing (like that shown in Pic.23) to melt several polylines, Pic.24.



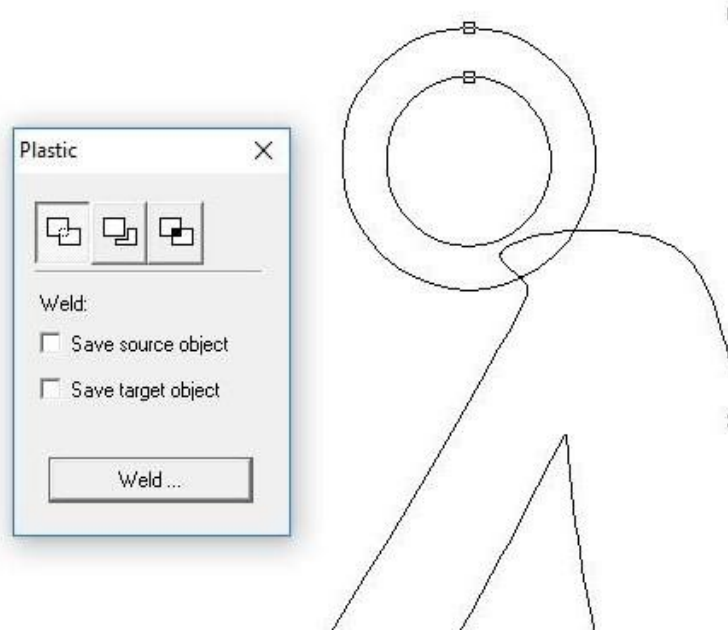
Pic. 22



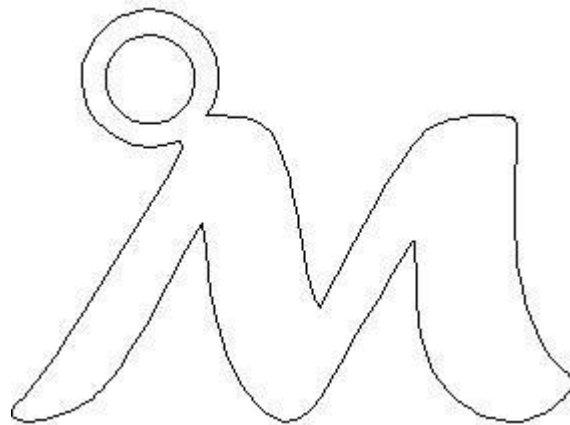
Pic. 23

In the following window displayed, Pic.25, the objects involved are all to be selected before applying the function.

Laser marker - FIBERLUX NANO



Pic. 24



Pic. 25

This function can be applied to every type of object, text and drawing. It cannot be applied to images.

Laser marker - FIBERLUX NANO

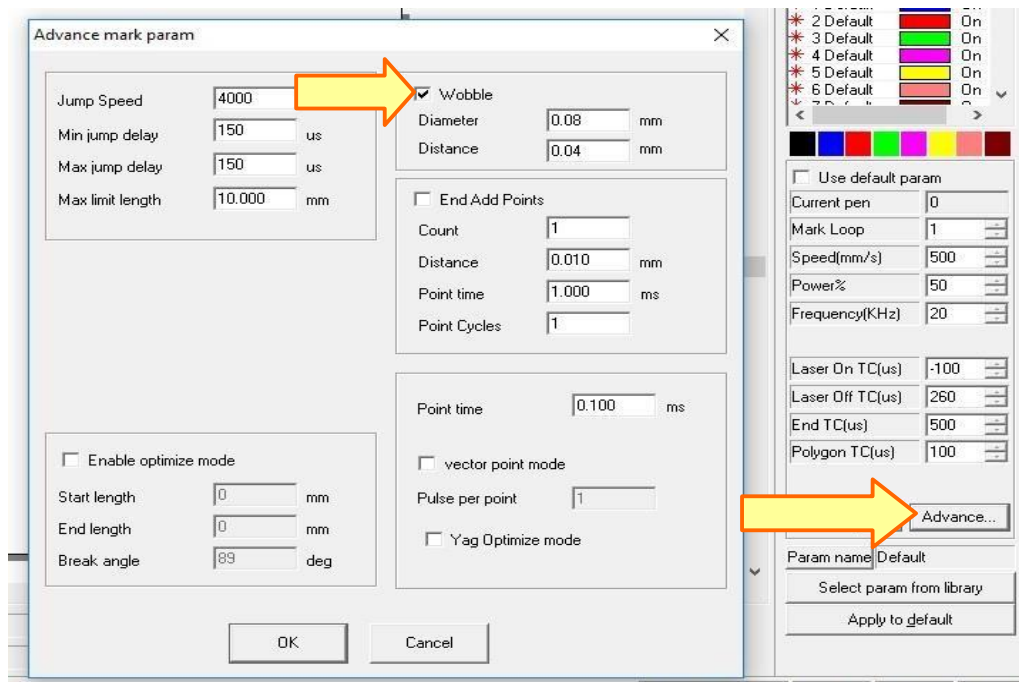
4. Cut

The cut, or micro-cut is the technique that permits the user to obtain an object from a blank plate or to remove part of an object from its original form. To use this function correctly, it is necessary to activate the **Wobble**, characteristic of the **Pens**.

With this option, the user can increase the diameter of the laser beam.

4.1. Wobble

To activate the **Wobble**, choose a pen. press the **Advanced...** button and the **Advance mark param** window will be displayed (Pic.27).



Pic. 26

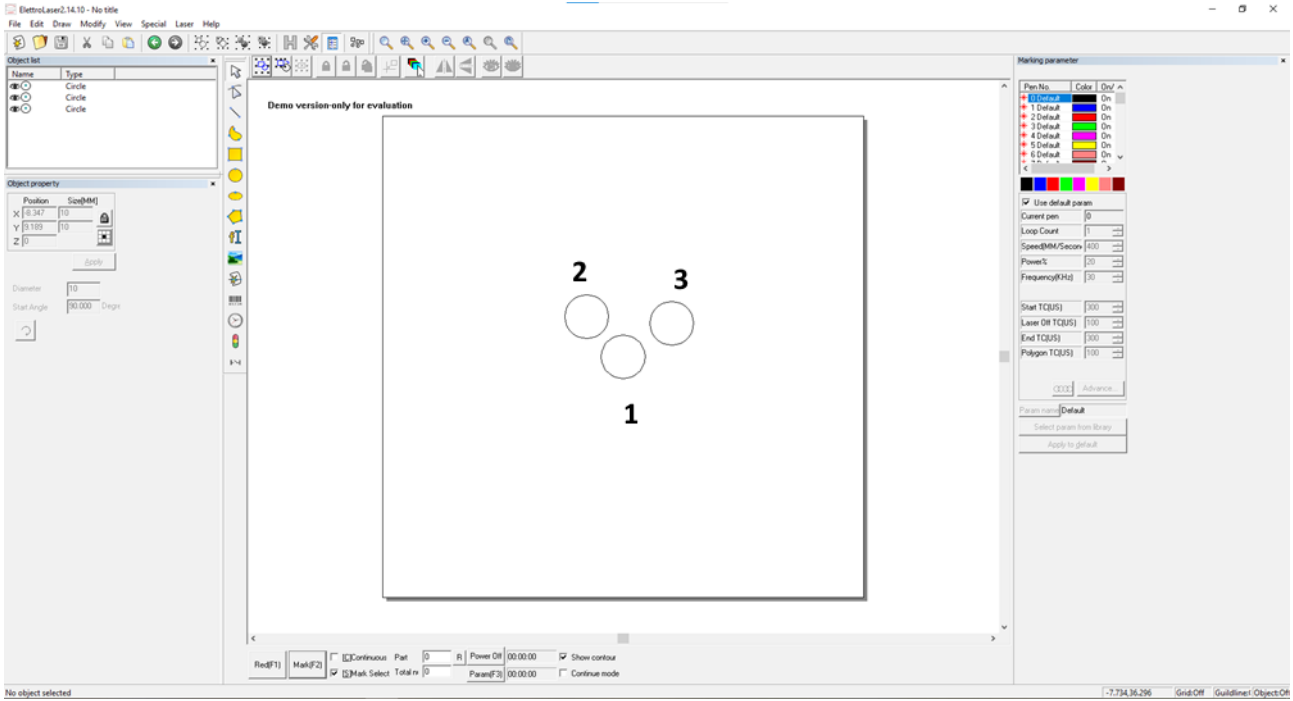
Enable the Wobble function and change the **Diameter** and **Distance** parameters. It is suggested to set them at **0.08mm** for the width and **0.04mm** for the distance. These two values will be varied according to the type of material and the thickness of the plate

It is then necessary to set the maximum power, **Power (100%)**, the peak frequency, **Frequency** according to the type of machine, and generally allow Speed (**100 mm/s**) It is now only necessary to apply the correct value on the **Loop** field so as to set the number of passes according to the thickness and type of material to be cut.

Laser marker - FIBERLUX NANO

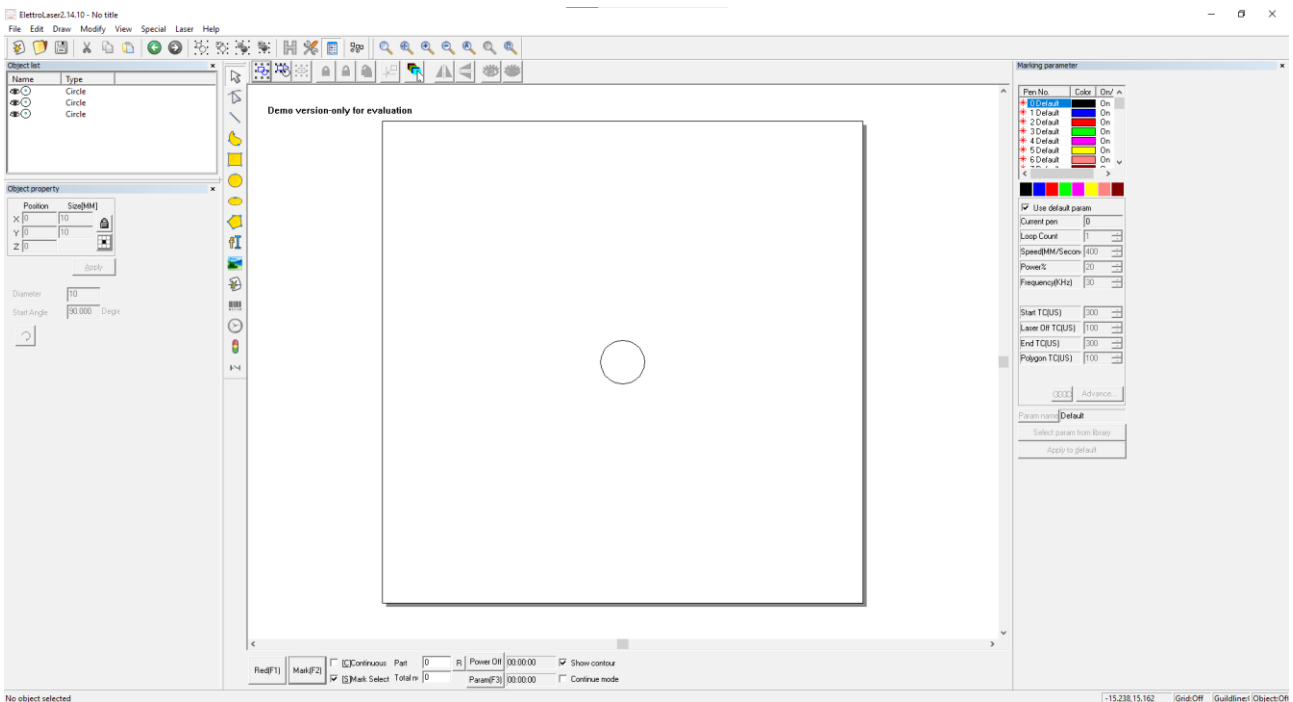
4.1. Three-phase cutting

On the ELETTROLASER software we create an object (eg a circle), and of this circle we make 3 copies



We position the 2 copies just created in the center of the work area by selecting them one at a time and pressing the “C” key.

In this way we will have our 3 perfectly overlapping circles



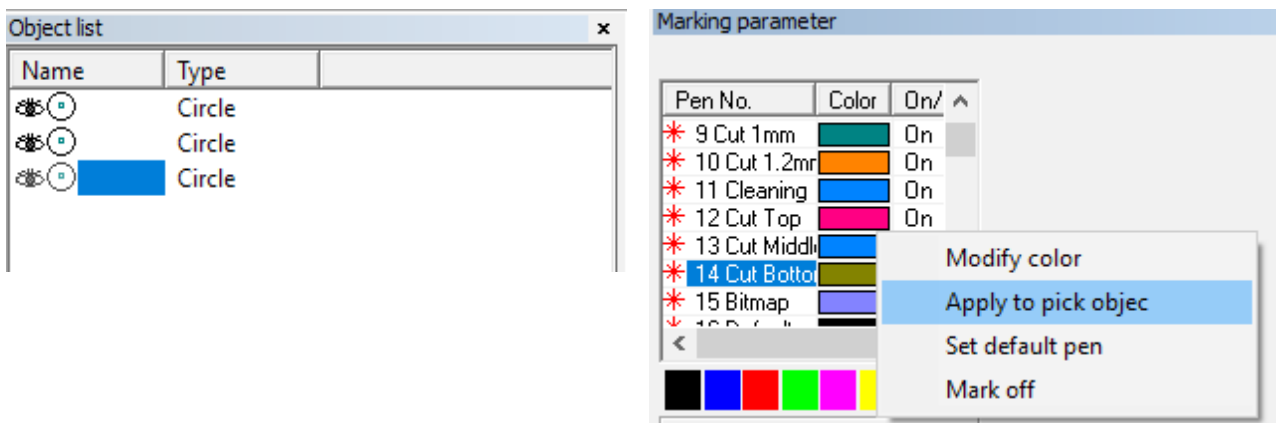
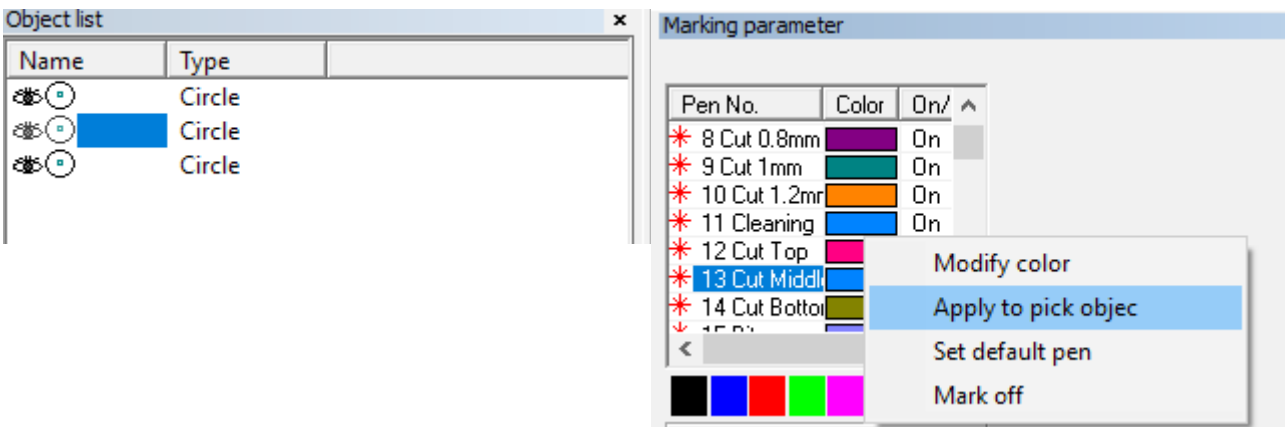
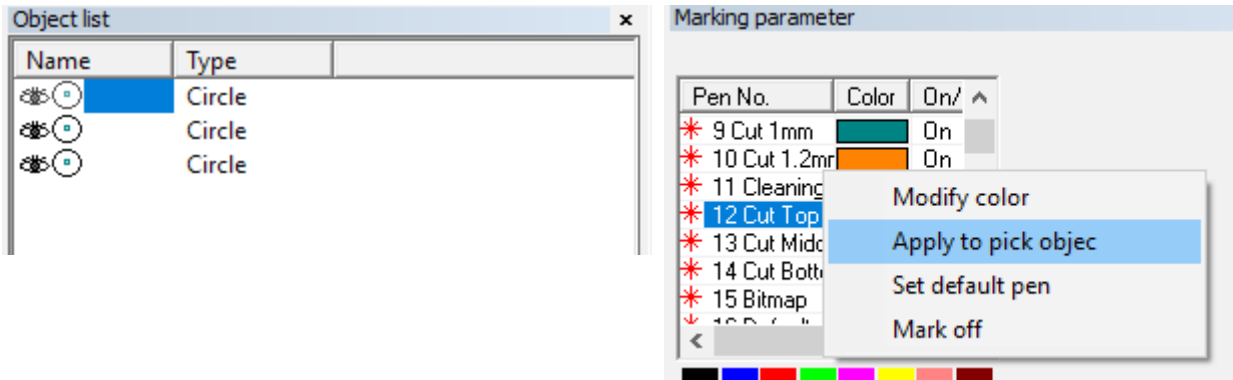
Laser marker - FIBERLUX NANO

Now apply the correct pens to the objects.

Apply the pen called "Cut Top" (12) to the first circle in the list of objects (on the right).

Apply the pen called "Cut Middle" (13) to the second object.

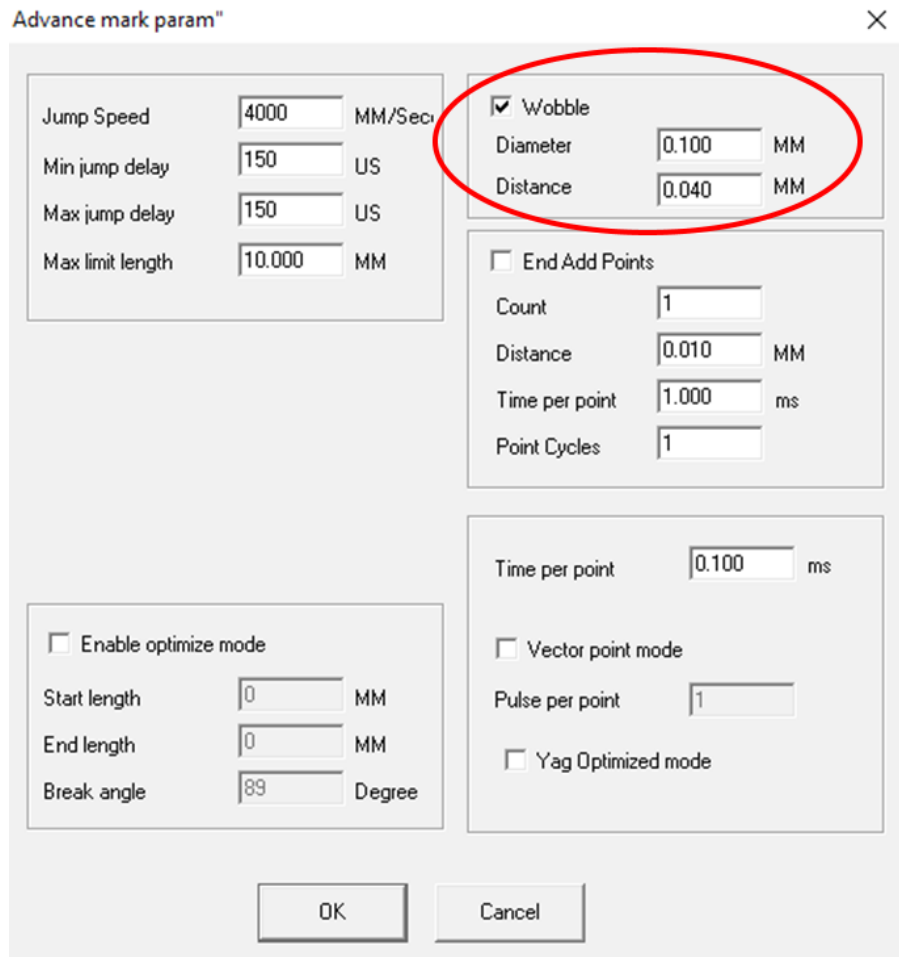
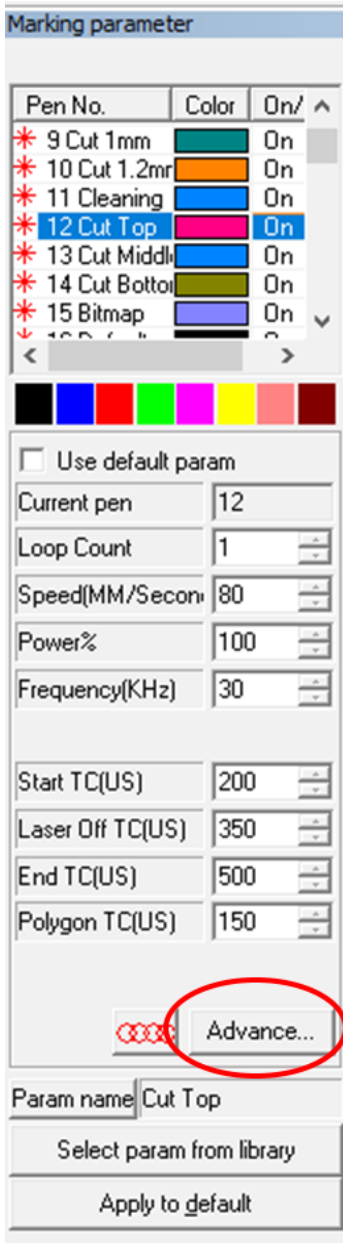
To the third and last object apply the pen called "Cut Bottom" (14).



Laser marker - FIBERLUX NANO

Once all the previous steps have been carried out, open the Wobble menu of the various pens.

Pressing on the item "Advanced" you enter the menu used to control the Wobble



Laser marker - FIBERLUX NANO**Diameter and Distance values for an optimal cut on different thicknesses****THICKNESS 0,6 mm**

Pen	Diameter	Distance
Cut Top	0.08	0.04
Cut Middle	0.06	0.04
Cut Bottom	0.04	0.04

THICKNESS 0,8 mm

Pen	Diameter	Distance
Cut Top	0.1	0.04
Cut Middle	0.08	0.04
Cut Bottom	0.06	0.04

THICKNESS 1 mm

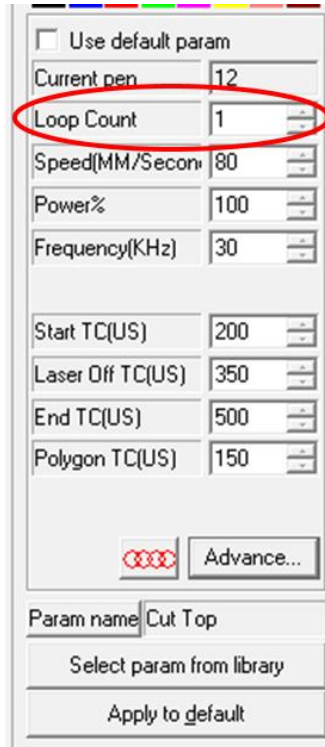
Pen	Diameter	Distance
Cut Top	0.11	0.04
Cut Middle	0.09	0.04
Cut Bottom	0.07	0.04

THICKNESS 1.2 mm

Pen	Diameter	Distance
Cut Top	0.13	0.04
Cut Middle	0.11	0.04
Cut Bottom	0.09	0.04

Laser marker - FIBERLUX NANO

Set the number of repetitions for the various objects in the “Loop Count” section (Fig.11).



The screenshot shows a control panel for a laser marker. At the top, there is a checkbox labeled "Use default param" which is unchecked. Below it are several numerical input fields with up and down arrows: "Current pen" (12), "Loop Count" (1, circled in red), "Speed(MM/Second)" (80), "Power%" (100), and "Frequency(KHz)" (30). Further down are "Start TC(US)" (200), "Laser Off TC(US)" (350), "End TC(US)" (500), and "Polygon TC(US)" (150). At the bottom of this section is a red laser icon and an "Advance..." button. Below the main panel is a "Param name" field containing "Cut Top", a "Select param from library" button, and an "Apply to default" button.

The number of possible repetitions varies by several factors:

- The power of the machine in use
- The thickness of the plate
- The hardness of the plate
- The reflection produced by the plate.

Generally for materials such as Gold or Silver, the cut is easier as they are soft materials to the cut.

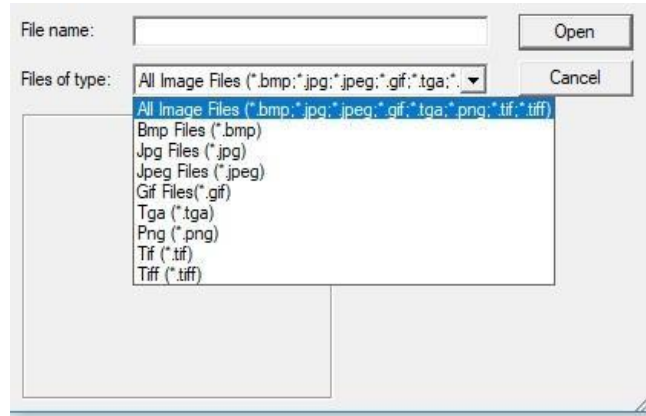
While if we work on Brass or Steel it is necessary to set more passes since they are less permissive to cutting being more resistant.


If at the first attempt, or after the number of repetitions, it does not cut completely, just repeat the cut again without moving the object.

Laser marker - FIBERLUX NANO

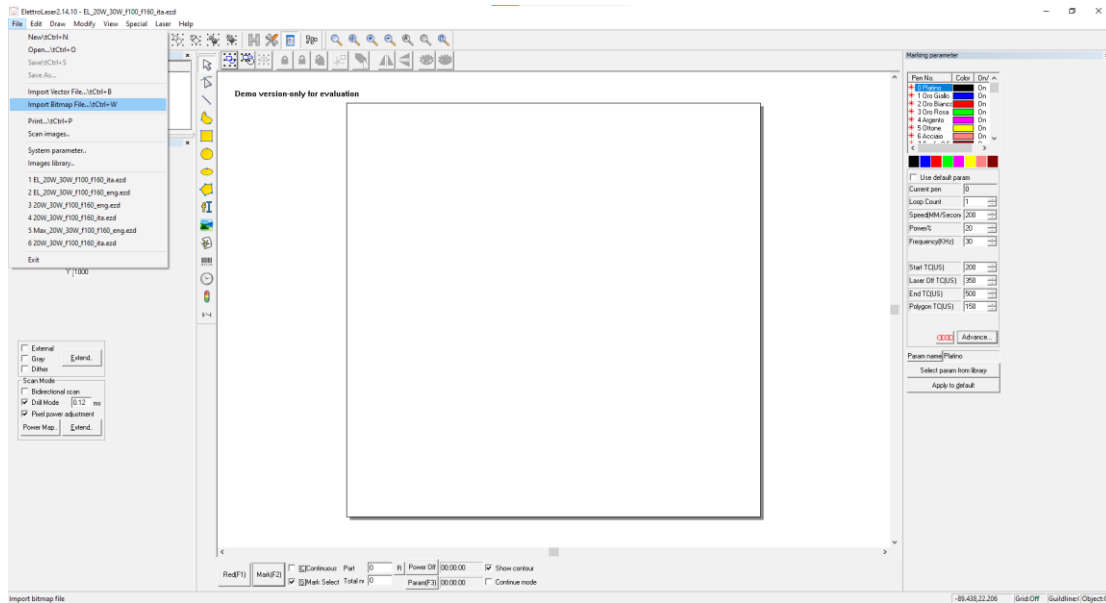
5. Photo Engraving

EzCad includes in its features the ability to engrave images, directly imported from the Internet, from a smartphone or a camera. In the figure below (Pic.28) we find the list of all compatible formats.



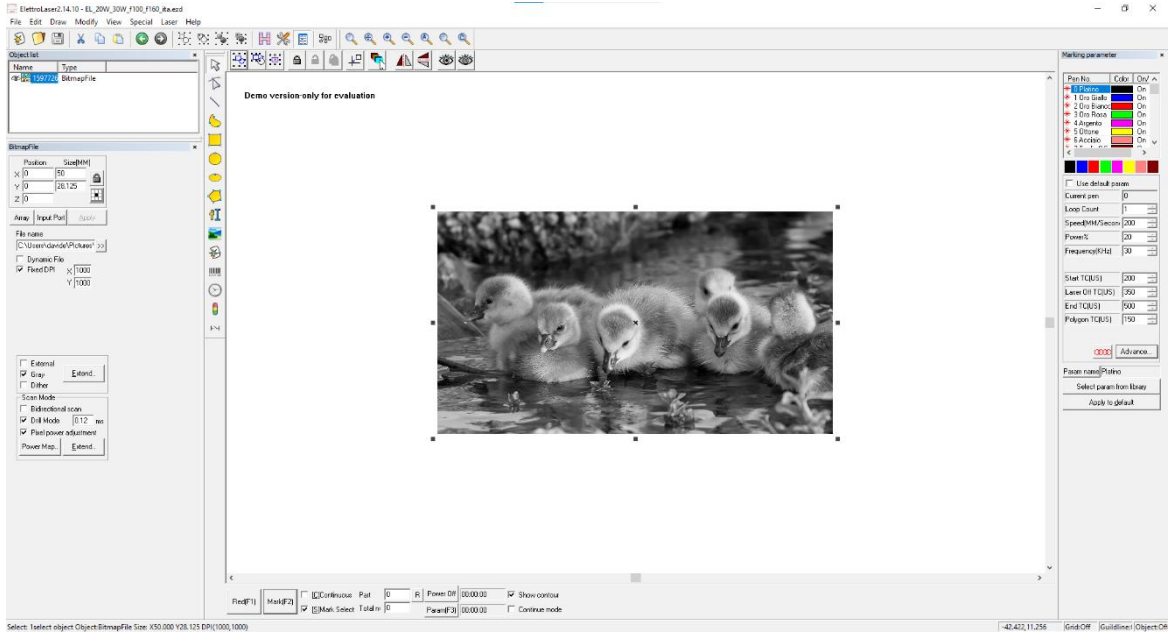
To import an image you need to press the Draw bitmap file button () , and then select the desired file by clicking Open.

Import the desired image into the ELETTROLASER software (File → Import Bitmap file).



Laser marker - FIBERLUX NANO

Change its size to the desired size.



Laser marker - FIBERLUX NANO

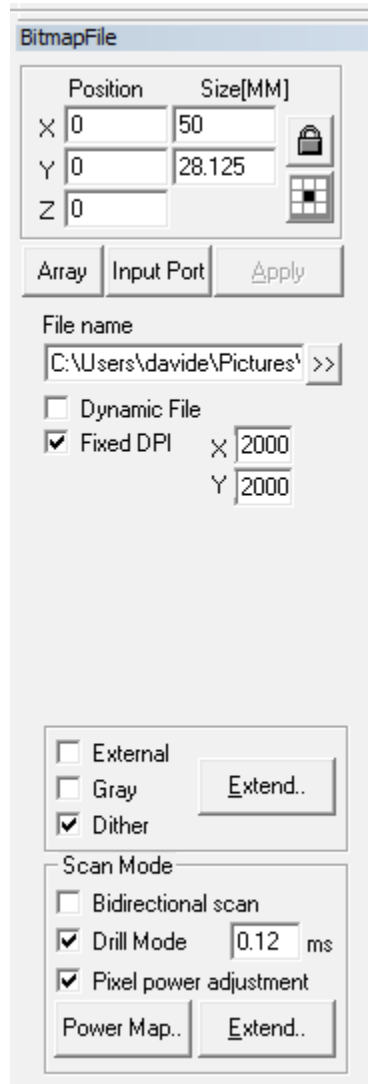
From the Bitmap menu on the left, enable the following ticks:

Fixed DPI and set the two values to x = 2000 and Y = 2000

Dither - to enable reading of the photo in dither

Drill Mode - Set its value on a scale from 0.08 to 0.12 (the higher the quality the photo will have, but at the expense of the speed of realization)

Pixel Power adjustment



BitmapFile

Position	Size[MM]
X 0	50
Y 0	28.125
Z 0	

Array Input Port Apply

File name
C:\Users\davide\Pictures >>

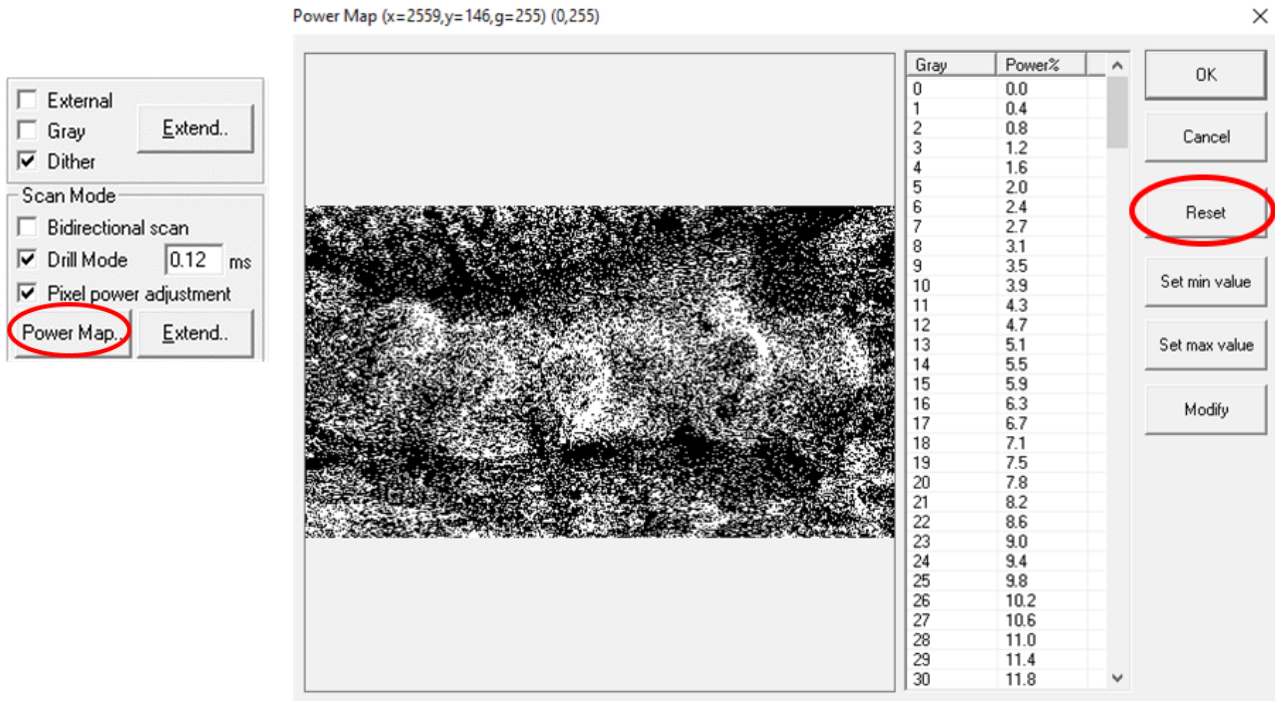
Dynamic File
 Fixed DPI X 2000 Y 2000

External
 Gray Extend..
 Dither

Scan Mode
 Bidirectional scan
 Drill Mode 0.12 ms
 Pixel power adjustment
Power Map.. Extend..

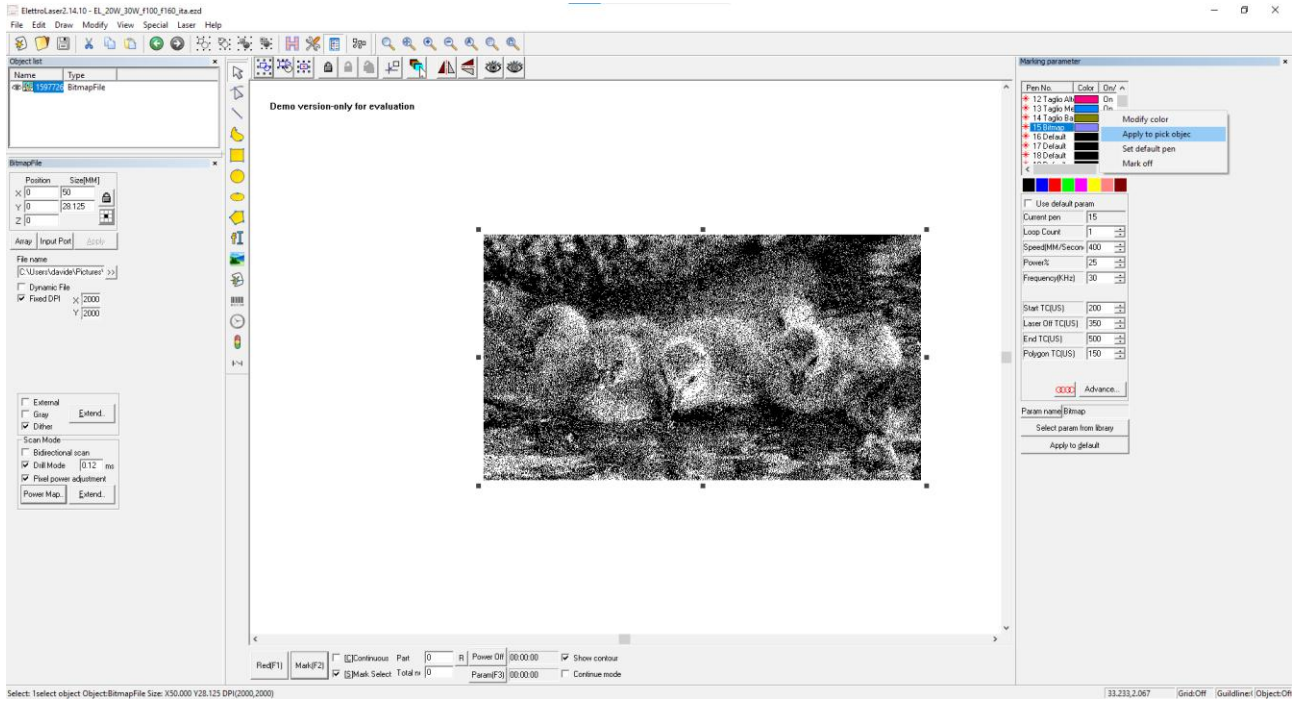
Laser marker - FIBERLUX NANO

Press on "Power Map" and from the window that opens press the "Reset" button



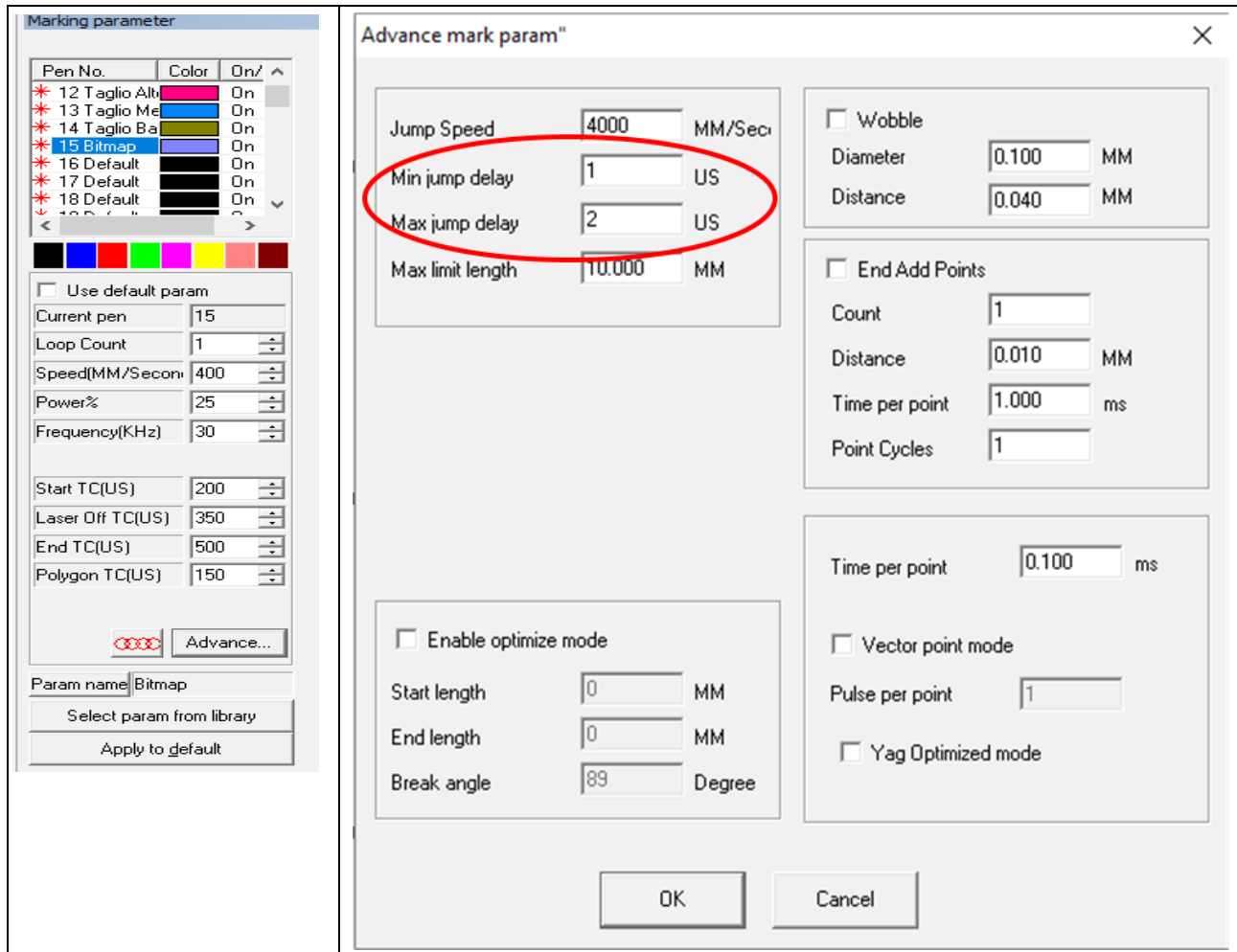
Laser marker - FIBERLUX NANO

Assign the Bitmap pen, correct for photoengraving.



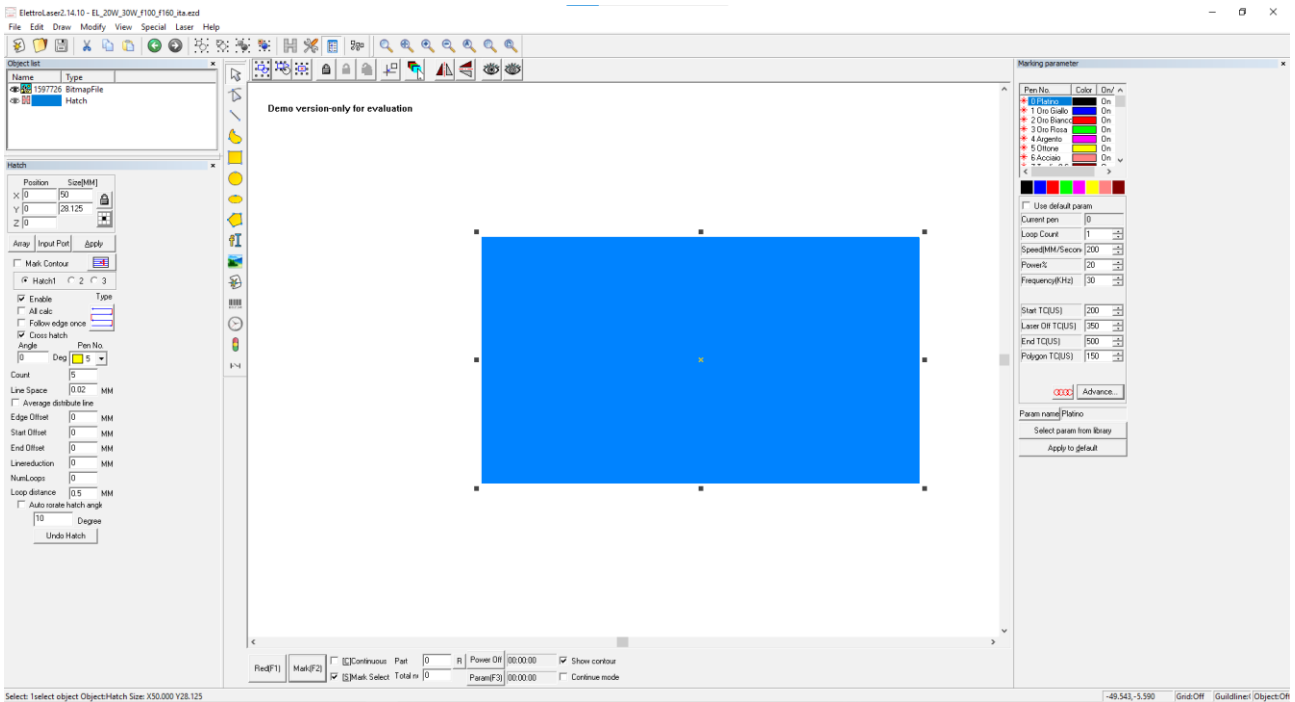
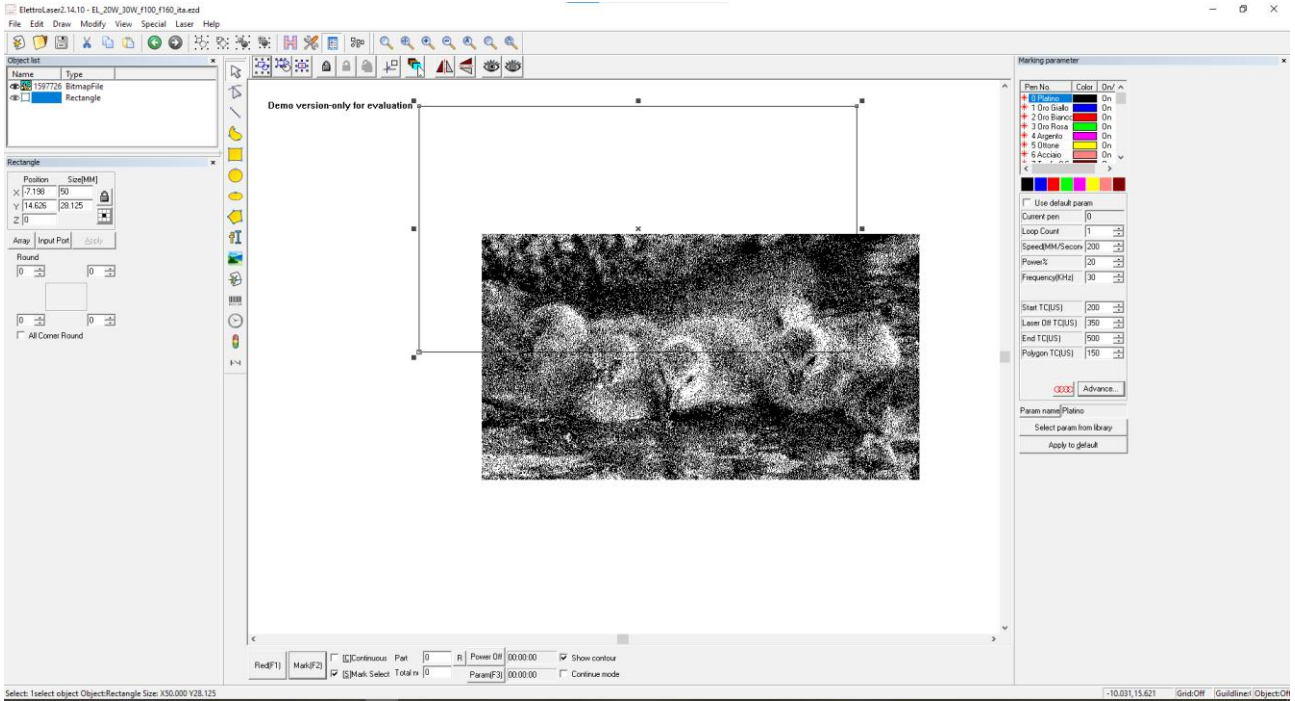
Laser marker - FIBERLUX NANO

On the photoengraving pen (Bitmap) press the item "Advanced" at the bottom, check that the values of "Min jump delay" and "Max Jump Delay" are set respectively to 1 and 2



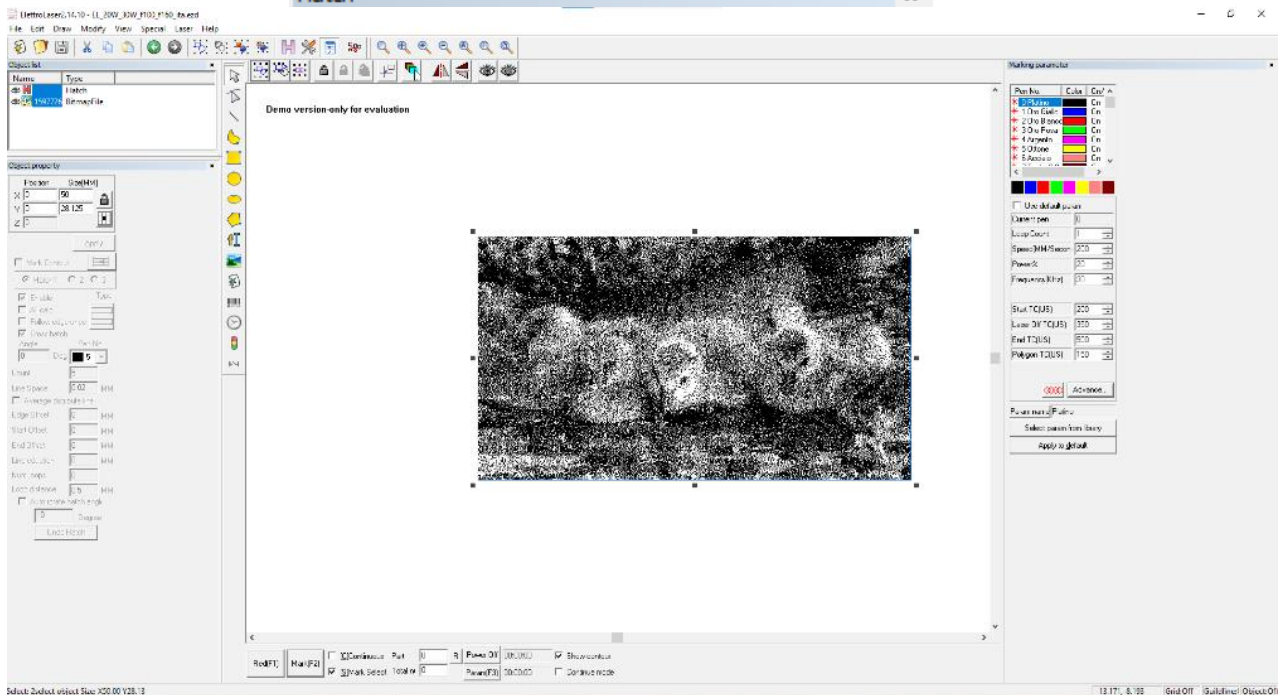
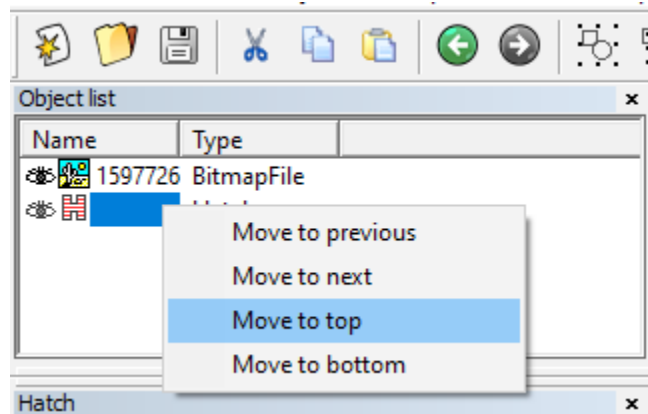
Laser marker - FIBERLUX NANO

Now you need to create a rectangle of the same size as the image. Apply the Hatch fill with engraving and cleaning and overlay it on the image.



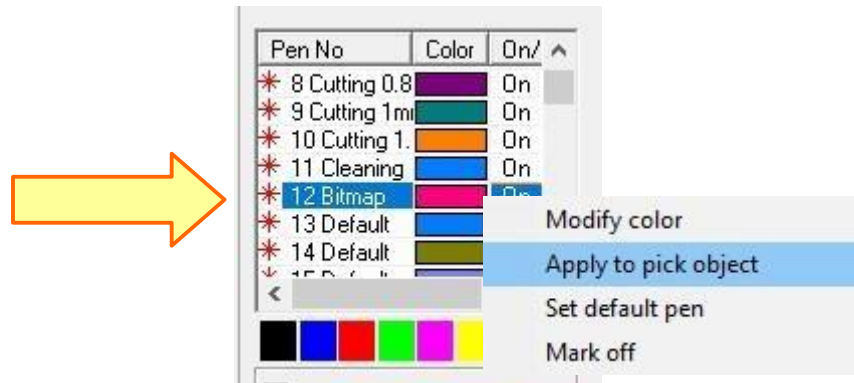
Laser marker - FIBERLUX NANO


Finally, correctly set the order of the entities on the Object list on the left (First the square engraving and then the photo) and the file will be ready to be engraved.



Set the correct pen (Bitmap) to the image, which may vary depending on the material that will be used, since each type of metal has a slightly different behavior when hit by the laser.

Laser marker - FIBERLUX NANO



A common method of doing this is to create a rectangle (Draw rectangle ) on the metal part where the image will be engraved. This method is applied in order to saturate the surface and obtain a better quality of the final image. Once created, modify the dimensions so that they correspond exactly to those of the image, apply Hatches 1 and 2 and assign a pen with parameters similar to those of the cleaning. If this does not have a high enough power for the type of metal used, increase it slightly until the result of the background obtained is clean and very bright.

The last step is to engrave the image by overwriting the previously prepared satin background. To achieve this in a single markup process, you can simply sort the objects in the Object list, as shown in Pic.32 (Hatch is the background, while BitmapFile is the image).




6. Projects with Rotary Support

To engrave and mark rings and bracelets, the Elettrolaser machines can be equipped with a high resolution rotary support.

This chapter describes how to use it in EzCad2.

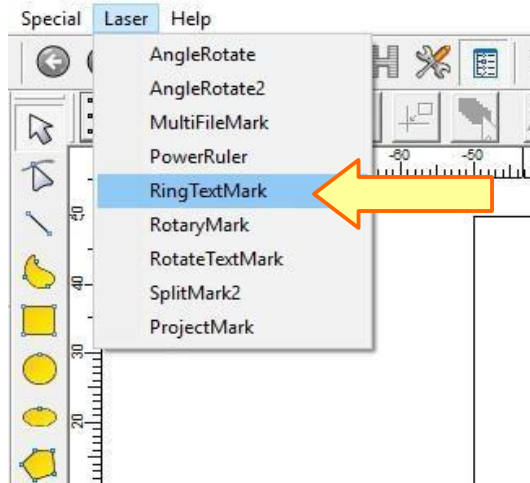
6.2. Texts Marking with Rotary Support

This function is the best choice when the user creates the text to be marked directly in EzCad2 .

Starting from **Draw Text** () , change the dimensions so that they are appropriate for the ring (or bracelet), choose the **Font** required and other options from the **Object list**, apply any Hatch then move the object to the centre of the working field, pressing “C” on the keyboard.

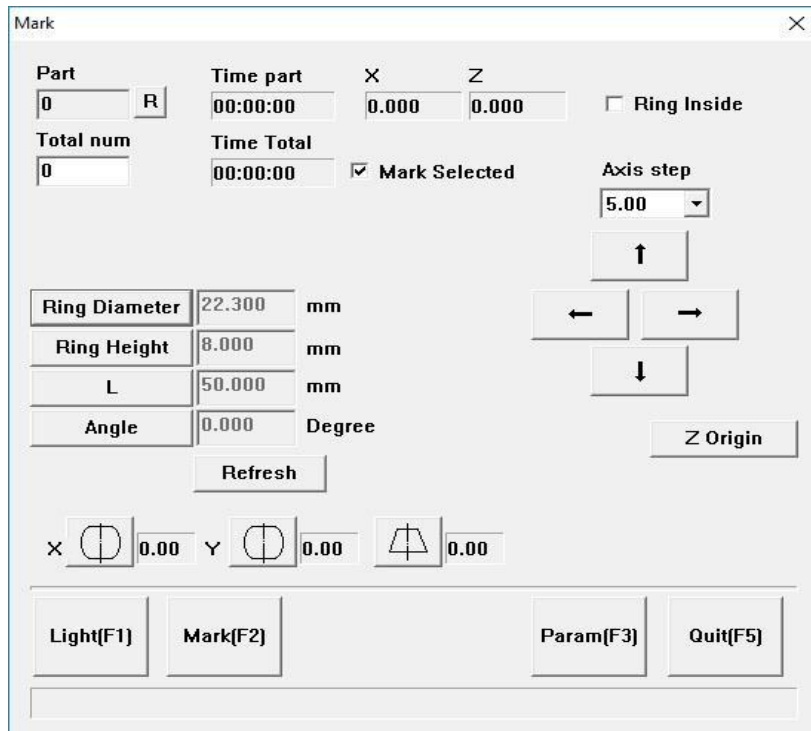
Click on **Laser** → **RingTextMark** as illustrated in the following figure (Pic.33).

Laser marker - FIBERLUX NANO



Pic. 27

Pic.34 illustrates the **RingTextMark** menu, where the user has access to several settings.



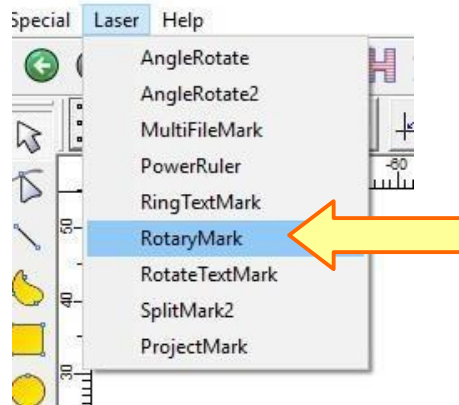
Pic. 28

The settings required are **Ring Diameter**, which is the actual measure of the ring, inner or outer, according to the surface to be engraved or marked, **Ring Inside**, to have the work executed inside the ring and as always the **Light (F1)** and **Mark (F2)** buttons respectively to project the preview and start the processing.

Laser marker - FIBERLUX NANO

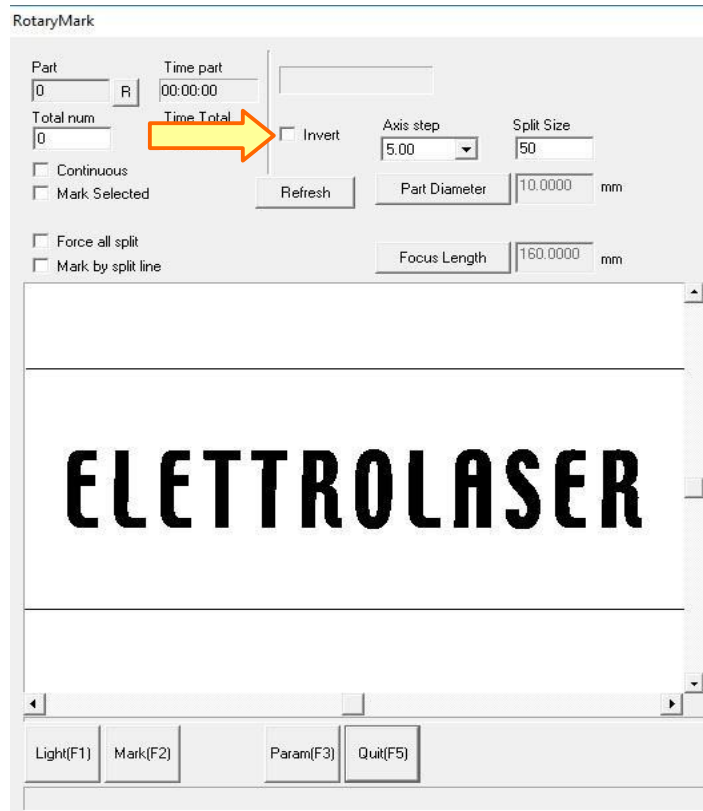
6.3. Marking of Vector files with Rotary Support

When the file that is to be marked or engraved is an imported vector file, the best method to use is the **RotaryMark** function, illustrated in Pic.35.



Pic. 29

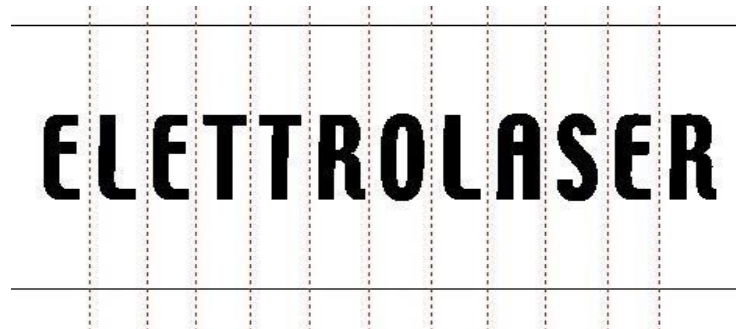
The window to set the marking of vector files on a ring is illustrated in Pic.36 with the default settings.



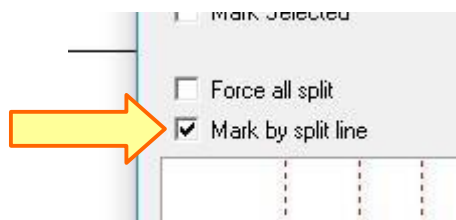
Pic. 30

To divide the vector file in sectors, click twice on the preview, trying to insert the red hatched segments between the parts to be divided (Pic.37) and choose the option **Mark by split line** as shown in Pic.38.

Laser marker - FIBERLUX NANO



Pic. 31



Pic. 32

If the **Part Diameter** field is correct, the work will be engraved correctly.

If the work is carried out inside the ring, it is necessary to activate the Invert option (Pic.36)

There is also the possibility to carry out the marking without manually assigning the split line. In this way the software will apply the lines automatically based on the two parameters illustrated in Pic.39.



Pic. 33

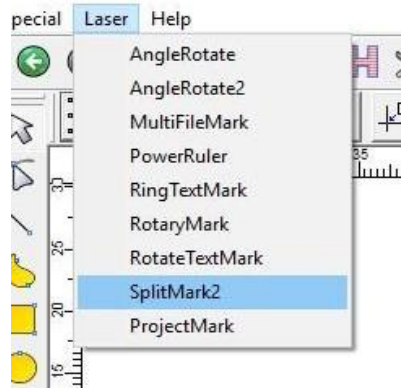
These two parameters are to have the same value. **Axis step** is the rotation executed by the spindle of the rotary support, **Split Size** is the measurement of the project part that will be marked at each rotation, Value in millimetres.

6.4. Marking of Images with Rotary Support

EzCad2 allows the user to engrave images with the rotary support, it is useful for very complicated drawings or for image files. The compatible image files are those illustrated in figure 28.

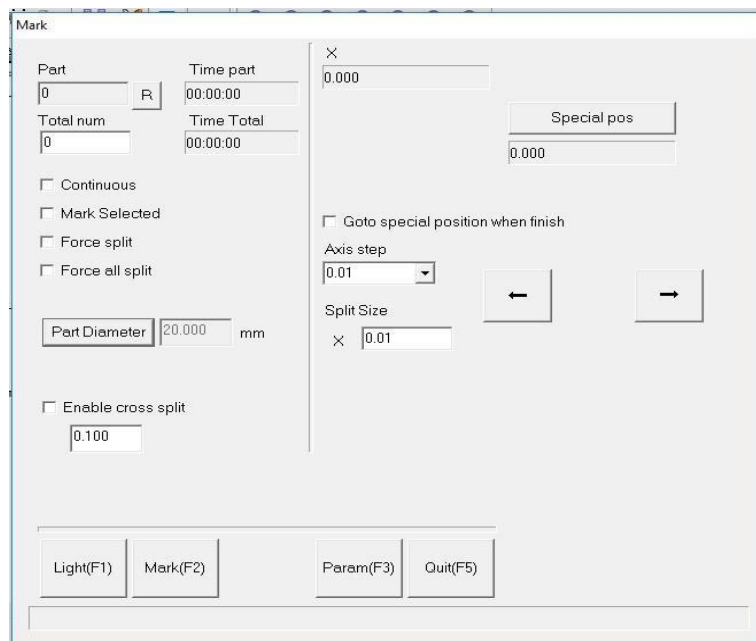
After setting the image as described in chapter 5. **Image Engraving**, open the menu **Laser** → **SplitMark2**, Pic.40.

Laser marker - FIBERLUX NANO



Pic. 34

the window shown in Pic.41 will open, where the user will have access to all the functions. It is suggested to keep **Split Size** and **Axis step** with the same value. To obtain a better result, the optimal value to set is 0.01 for both fields. It is important that **PartDiameter** is the actual dimension of the ring diameter.



Pic. 35

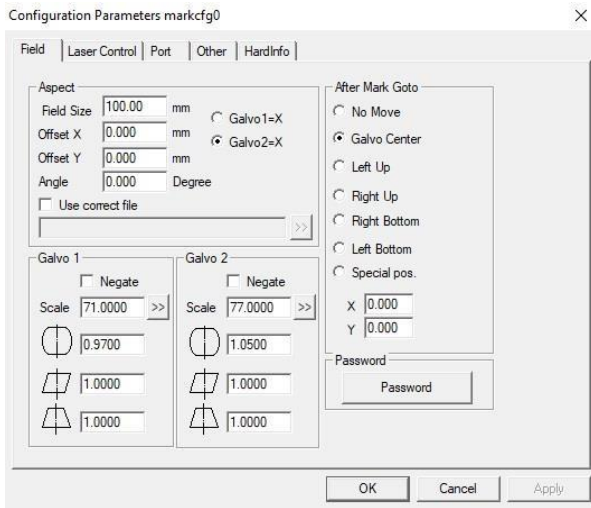
After **Mark(F2)** has been pressed, the marking process starts and the software will not allow any interruption. The user has to allow the machine to finish the work.

Laser marker - FIBERLUX NANO

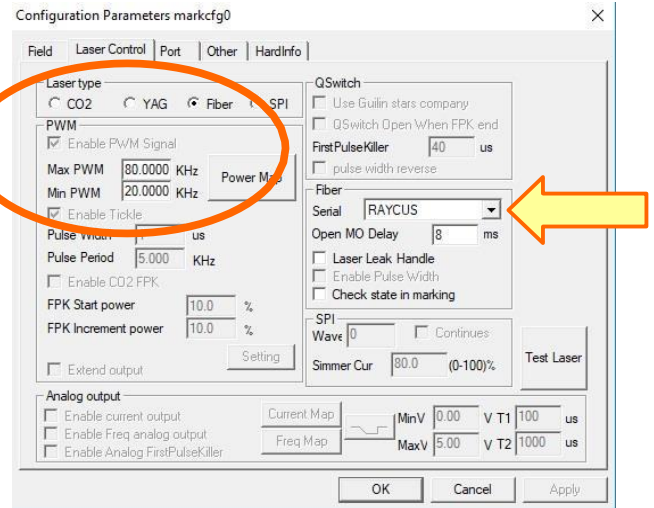
7. FAQs

FAQ.1. The machine does not engrave, it seems that there is no laser output. How can the main laser parameters be checked?

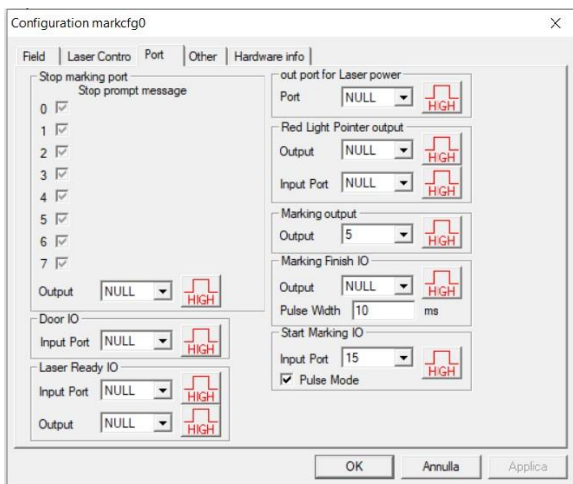
To restore the main functioning parameters, click on **Param[F3]** in the lower central part of EzCad2, and set the values as indicated in Pic.42, Pic.43, Pic.44 and Pic.45.



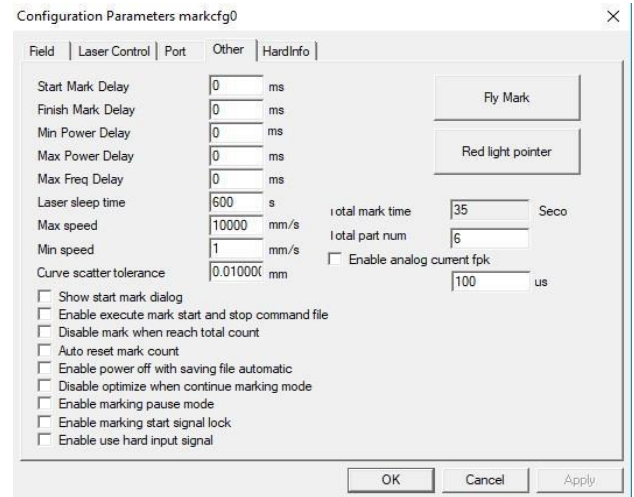
Pic. 36



Pic. 37



Pic. 38

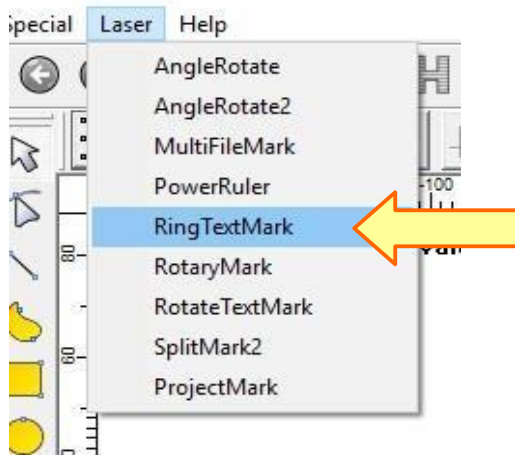


Pic. 39

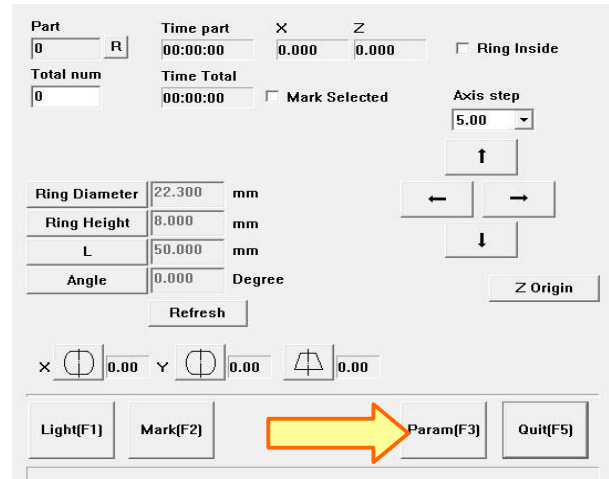
Laser marker - FIBERLUX NANO

FAQ.2. The rotary device does not function correctly, how can it be checked?

The rotary device is controlled automatically by the laser machine, after it is connected, the user can check if the spindle is electronically controlled. To carry out this test, rotate the entire spindle, if the rotation does not oppose resistance contact the Elettrolaser customer service, if instead the rotation opposes resistance, this signifies that the spindle is electronically controlled and the user can check the advanced parameters following the steps illustrated in Pic. 46 and 47.

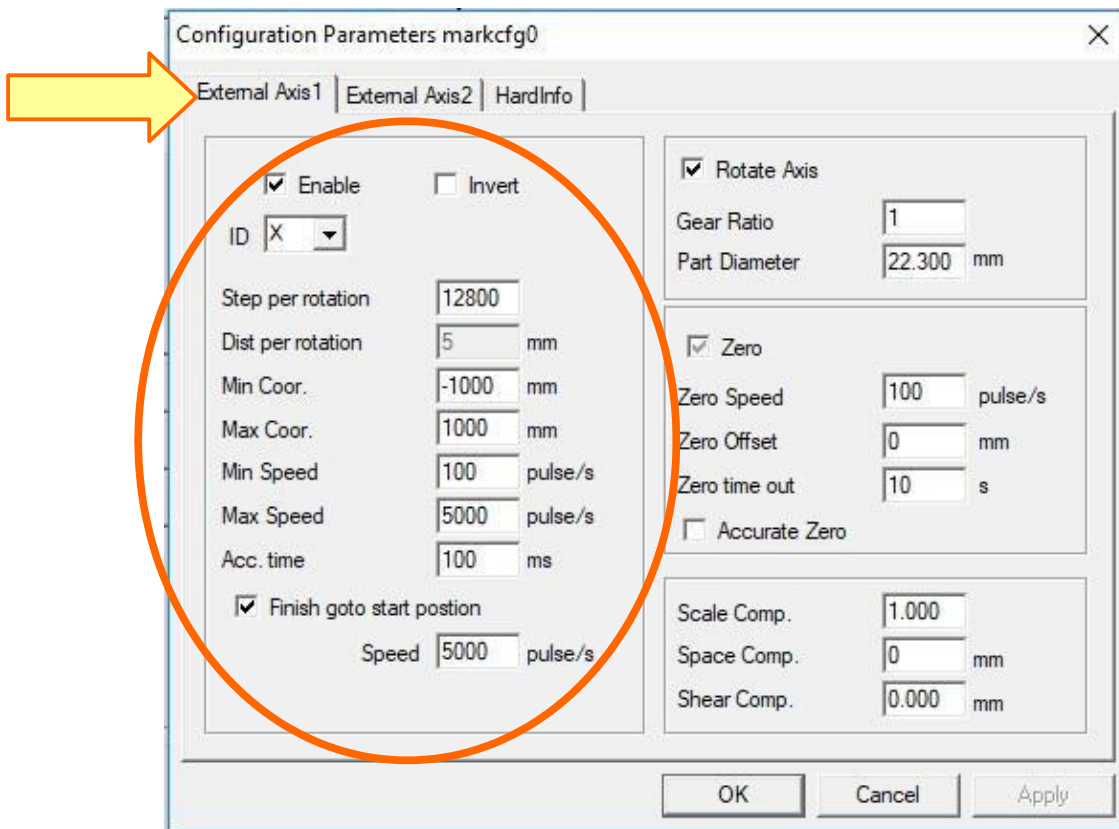


Pic. 40



Pic. 41

Click on **Param[F3]** as indicated in Pic. 47, the window shown in figure 48 will be displayed, check the parameters of the **External Axis1** board: make sure that **External Axis2** is not enabled, otherwise remove the tick from **Enable**.



Pic. 42

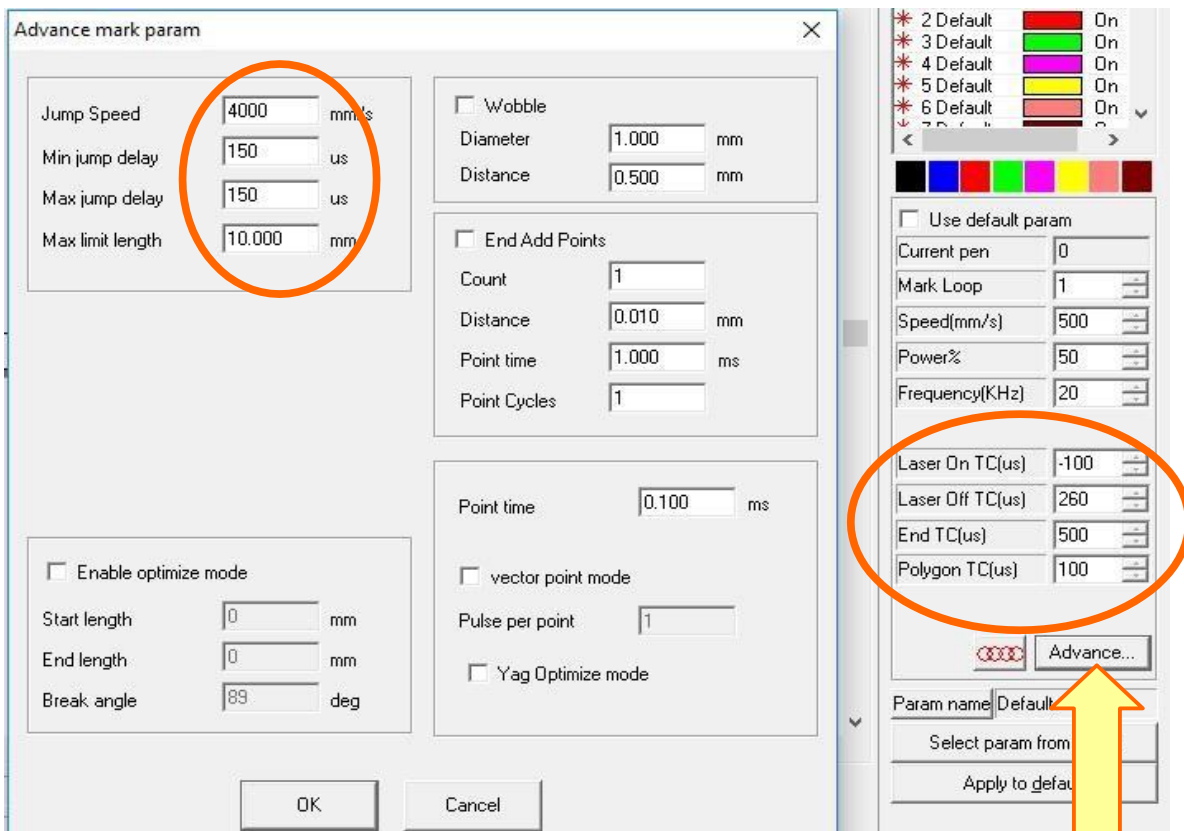
Laser marker - FIBERLUX NANO

FAQ.3. The pens have become lost, how to return to the original factory settings ?

There is a backup of the pen parameters in the USB key supplied with the machine kit. It is located in the folder ...\\html\\Install\\EzCad2\\ with the name **START FIBERNANO.ezd**

FAQ.4. The laser doesn't function sufficiently, there is a laser output but the quality is not satisfactory. Are there parameters to be checked?

The most common problem regarding this FiberNANO malfunctioning, is usually solved by setting the following parameters, as illustrated in Pic.49.



Pic. 43

Laser marker - FIBERLUX NANO

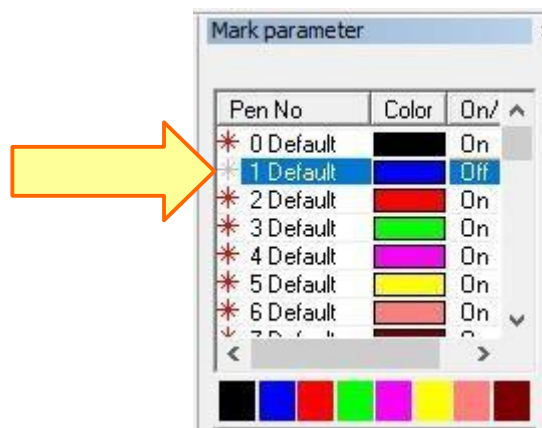
FAQ.5. When a file is imported, nothing is shown in the EzCad2 working field.

Check whether the object is in the **Object List**, it can happen that it is not centred on the virtual working field. In this case just press key “C”.

If the **Object list** is empty, this means that the imported object is not completely compatible, very often the vector files can be exported in many different ways, to solve this problem try to export the file from the drawing program in another format or use a different version of the file.

FAQ.6. The machine is configured correctly, but at times only with some pens, there is no laser output.

This problem may be due to accidental deactivation of the pens, in the Mark **parameter** menu, check that the laser icon is shown correctly next to the name of the pen, clicking twice the user can activate or deactivate the laser output for the selected pen (Pic.50).



Pic. 44

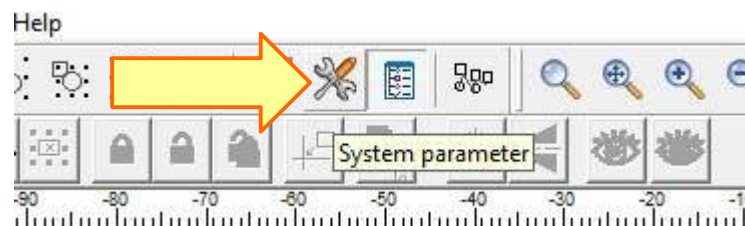
FAQ.7. After engraving a ring or a bracelet, the working field shows a wide rectangle and not the standard 100x100 how can it be reset?

The working field changes its dimensions when the rotary device is used, so as to show a preview of the object that is to be marked on the length of the ring/bracelet (Pic.51).



Pic. 45

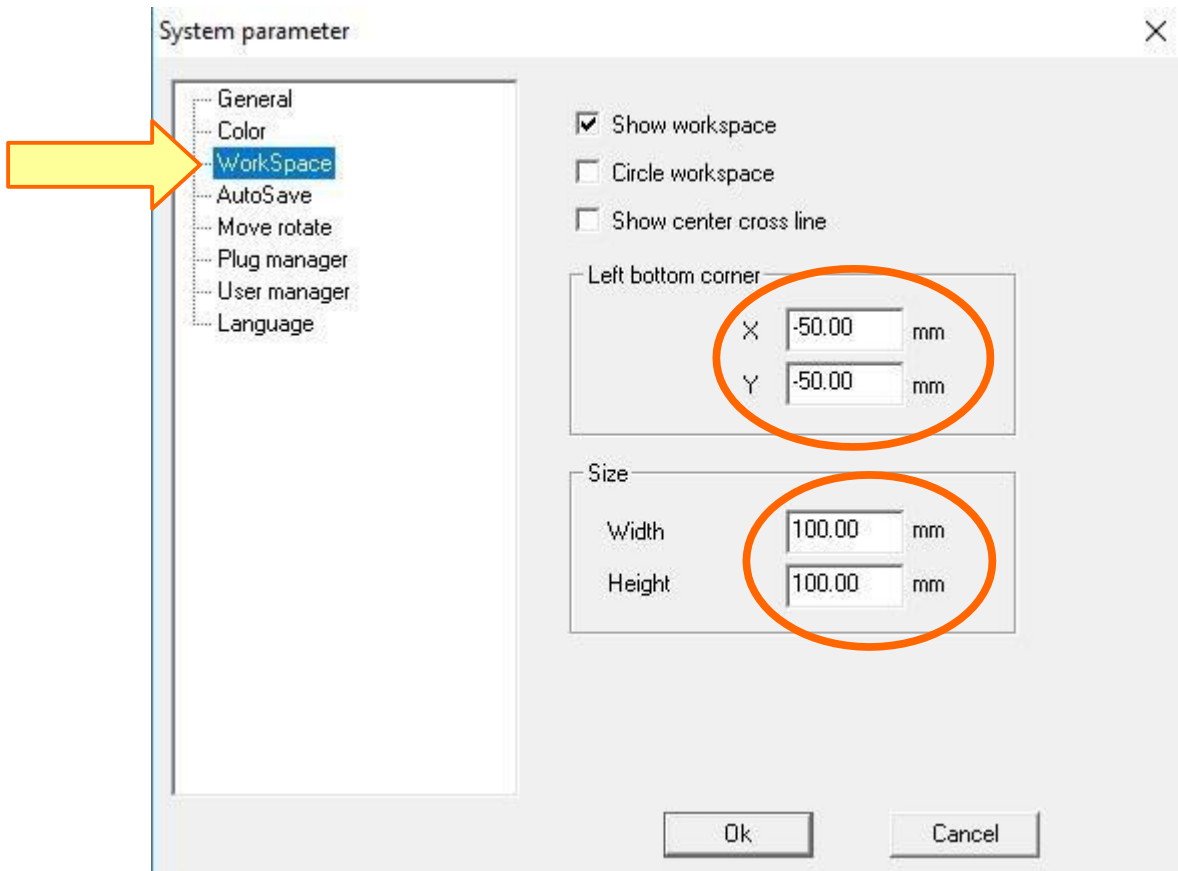
To return it to the default settings, select the System Parameters icon on the tool bar above, illustrated in Pic.52



Pic. 46

Laser marker - FIBERLUX NANO

The following window is displayed, choose the WorkSpace menu and insert the values indicated in the relevant fields (Pic.53).



Pic. 47



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Laser marker - FIBERLUX NANO

