



ELETTROLASER

# MASTER S



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# LASER MASTER S

## GENERAL MANUAL

### USE AND INSTALLATION

	<p><b>IMPORTANT</b></p> <p>Verify carefully the content of this manual with particular attention to the warnings for the installation, use and the maintenance of this machine. This device and the relative instructions are for sole rights of personnel qualified in the unit use as that one that here will be described. Don't allow the installation or the maintenance of this machine to not qualified technicians. Contact directly Elettrolaser S.r.l. for every further explanation. The customer can request to the manufacturer a copy of this manual showing:</p> <ul style="list-style-type: none"> <li>x Exact model of the machine</li> <li>x The machine model number</li> <li>x A copy of the purchase invoice</li> </ul>
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The erroneous application of the practice use and/or of the procedures here described can bring the user to an exposure harmful to the laser radiations. Follow carefully the here-described procedures.

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### CONTENT GUARANTEE

The information included in this manual is subjected to modifications without notice. Elettrolaser S.r.l. will be not responsible for errors included in this document and incidental damages or consequent to the erroneous interpretation of this manual.

#### Document issues

Issue	Date	Approval	Valid from model n°	Notes
0	07/02/2015	G.M. 07/02/15	MA01840	

## USE DESTINATION

The machine **MASTER S** is destined to the welding of small size products in metallic material.



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### NOTE

It isn't allowed to change the use destination for which the system has been designed and produced. Elettrolaser S.r.l. declines every responsibility about the non-conformance use of the equipment of its production.

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## ELETTROLASER S.R.L. CONTRACTUAL GUARANTEE

The producer guarantees the defects absence, taking into consideration of the actual technological phase, about the new equipment type and for the duration of **two years** from the installation date c/o the customer included in the transportation documents. It being understood the limit of **two years**; the guarantee obligation spreads also to those equipment parts not produced directly by Elettrolaser S.r.l. with the exclusion of LED lamps for the welding room illumination, fuses, protection glass, fire lens and all consumable material. The producer lends guarantee proceeding at his discretion, in accordance with the technical requirements, to the repair or to the change if faulty pieces. In the case the producer admits a guarantee right the relative intervention costs are at his charge. The pieces that present material or working defects and those ones consequently damaged are changed. The changed pieces become of Elettrolaser S.r.l. property. For the changed after an intervention in guarantee, this is admitted up to the equipment guarantee maturity.

The guarantee right doesn't exist when the happened defect is in relation with the following cases:

- The buyer hasn't denounced the defects to the producer **within eight days** from the installation date, in writing o giving job for the execution of the relative intervention.
- The device or its parts have been used in different ways for the use to which have been assigned
- The device has been entrusted for the repair to an extraneous subject to Elettrolaser S.r.l. or the device or its pieces have had some modifications not authorized by Elettrolaser S.r.l.
- The prescriptions about the use and the maintenance of the machine included in this manual have not been respected
- The guarantee seals on the machine closure panels have been removed.

Besides the defects and the damages are excluded from the guarantee deriving from the normal wear or from natural events. It being understood on behalf of the buyer the performance right in guarantee in the terms above showed, it is excluded expressly that the buyer can request the contract solving, the machine change or the sale price reduction and the compensation of possible direct and indirect damages.

Possible omissions and/or negligence of the user, if provoke our technician intervention, allow the relative expenses debit on behalf of Elettrolaser S.r.l.

If during the guarantee period there is a defect Elettrolaser S.r.l. will provide to eliminate it freely in the full respect of the "guarantee conditions".

Elettrolaser S.r.l.

Stamp and sign for acceptance of the  
" guarantee conditions"



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## CHAPTER 1 SYMBOLS



### **Generic warning:**

This symbol shows the necessity of a careful reading of the manual or the necessity of an important manoeuvre or maintenance operation.



### **Laser warning:**

This symbol shows the exposition danger to the laser visible and invisible radiation. This symbol can be included also on the machine in correspondence of risk zones. In presence of this symbol so:

- x Don't introduce ever mirrors or reflecting objects in the welding room while the machine is in function.
- x Check the products exclusively from the peephole placed on the front nose.
- x Don't remove ever the curtains for the hands insertion.

During the machine use move the children and the people of small height.

It is advised to the user to protect the hands with adequate and approved working gloves.



### **Fire warning:**

This symbol shows the fire danger when inflammable materials are processed. This symbol shows the fire danger when the inflammable materials are processed. When there is fire danger, it is indispensable to follow the indications provided from the manufacturer during the put in service of the machine.

Don't weld where the sparks can meet inflammable material.

Remove all the inflammable materials near to the LASER welder. If this isn't possible cover them carefully with fireproof material.

Fire attention: keep extinguishers in the vicinity.



### **Explosion warning:**

This symbol shows that the gas contained in the cylinders is under pressure and can consequently explode if the cylinders aren't treated with the necessary cautions. Protect the cylinder from excessive heat and mechanical stresses.

Install the cylinders in vertical position and block them with a fixed support chain or with a proper cylinders case to avoid falls or knocks.

Maintain the cylinders far away from the welding place and from any electric circuit.

Use only regulation cylinders, pressure reducers, pipes and joints approved for the specific use; maintain them in good conditions together with the connected parts.

Don't expose the face towards the valve exit placed on the cylinder when this one is opened.

Maintain the valve always covered with a correct screw hood except when the cylinder gas is used or when the cylinder is connected to the machine.



### **Gas and fumes warning.**

The welding processes produce fumes and gas, breath they can be dangerous for the health.

Keep the head a long way from fumes, don't breathe the fumes.

Don't cover the grids placed on the machine.

Read with attention the supplied instructions about the different types of metals, cleaning substances and protection gas.

Prefer a wide room dedicated appropriately for the machine installation. If the room is of reduced sizes use it only if well ventilated. The protection gas used to weld can gradually change the air causing indisposition or death. Assure that the air that is breathed is healthy.

Don't weld near the degreasing, cleaning or vaporization areas. The heat could react with the vapours forming very toxic and irritating gases.

Check that the metals haven't impurities to provoke fumes or gases during the melting.



***Electric warning:***

This symbol shows dangerous voltages associated to the laser, or however of sufficient width to induce electric risk. This symbol can be showed also on the same machine in correspondence of risk zones.

Touch electric parts under voltage can provoke fatal damages or serious burns. The electric circuits are always under voltage when the machine is switched on. The not correct installation or the machine inappropriate grounding represents a danger.

Don't touch electric parts under voltage.

Remove the feeding plug from the net before to install or make maintenance to the machine.

Install correctly and connect to ground this machine following the use Manual and respecting the standards and local rules.

Switch off the machine after the use.

Don't use the weak cables, damaged, of insufficient section or mal connected.

Pay attention to have not cables near to heat sources.

Use only equipment in perfect conditions. Repair or change immediately the damaged parts.

Maintain all covering panels fastened and in their seats.



***Important warning:***

This symbol shows the necessity of a careful reading of the manual on behalf of the operator.

## CHAPTER 2 SAFETY

In this charter are discussed matters about the individual safety.

The performed tests demonstrate the safety and the laser reliability when is used properly. It is however necessary that the operator is informed about the precautionary standards ready to avoid possible damages to people or to the same machine.

### **Laser radiations**

The laser radiation is an electromagnetic emission with micrometric wavelength that is placed in the far infrared (CO<sub>2</sub> laser), in the near infrared (laser at Nd-YAG, Nd-YVO<sub>4</sub>), in the visible (laser He: Ne or Argon), or in the ultraviolet (eccimers laser).

It is believed not iodizing radiation. In the lasers MASTER S the emission of a crystal small bar is stimulated from the “optical pumping” generated from a power laser lamp. The continue bounce of the photons, between an anterior mirror and a back one, see to it that a positive reaction starts for which their number increase step by step, up to assume the concentration necessary to produce a beam that comes out from the anterior semi reflecting mirror. The reaction (that we can imagine as an “invisible light beam”) is after coincided and focused with some lens in a point, in which the intensity becomes so high to react with different materials causing a change for thermal effect.

For what described, the MASTER S laser radiation is invisible but, placing near the visibility threshold, makes sure that the eye receives it almost entirely without ever offer papilla reflex. If in addition to this that it is generally much intense results that it can be extremely harmful or lethal for the sight.



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#### **NOTE**

The direct vision of a laser beam can provoke **irreversible damages to the sight**

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To avoid permanent damage to the person it is necessary to follow some precautions.

All people, that can be exposed to harmful levels of laser radiations, must know when the laser is active, and in this case must wear the protective gloves.

The laser integrated in the machine, due to the high power, causes laser light reflected from the plane surfaces. The reflected light is potentially dangerous for the eyes and the skin. The electromagnetic emission with micrometric wavelength places in the far infrared and it is so invisible, it isn't so evident where the reflected beams are addressed.



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#### **NOTE**

**It is indispensable to protect from the reflected light beams**, because they can be sufficiently intense to create permanent damages to the eyes or to the skin

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#### **NOTE**

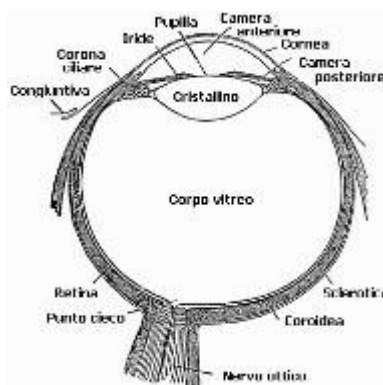
The laser in object comes into in **class IV**. Those lasers that can produce risks belong to the class IV, not only for the direct or reflected radiation, but also for the **diffused** radiation. These laser sources can present a remarkable risk for the skin and fire risk for inflammable materials.

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## 2.1 LASER RADIATION ABSORPTION

The human tissue absorbs the electromagnetic radiation in different way in accordance with the wavelength of the same radiation. Both the eye both the skin have their “presetting” to accept some wavelengths and they are more refractory to absorb others. In the eye specific case, the cornea and the crystalline let pass and reach up to the retina, also with different attenuations, all the wavelengths that go from 400 to 1400 nm, or range between the light in the visible up to the infrared IRA. So it must be noticed that the Nd:YAG lasers radiation (wavelength 1064nm), being included in this range, **requires a direct exposition of the retina.**

For what concern the skin the “biological window” is different in the absorption percentages but not different for the wavelengths. The exposition maximum values for the skin are many different, as easily intuible, respect to those tolerable from the eye.



**Picture 1: Eyeball**

For what concern the damage mechanism that the absorbed radiation can cause depends also it from the wavelength. The short wavelengths (ultraviolet UV-C 180-280nm, UV-B 180-280nm, UV-A 315-400nm) provoke generally photochemistry effects: cataract or crystalline opacification for the eye, melanin coloration or reddening for the skin. Major wavelengths (infrared: IR-a 780-1400nm IR-c 3000-10 E6nm) provoke generally thermal effects: retinal detachment and photocoagulation for the eye, burning for the skin.

The provoked damage degree depends obviously from the **quantity of absorbed radiation** and from the **sudden power** of the radiation source.



## 2.2 CLASSIFICATION AND DANGEROUSNESS

The regulation has established different lasers dangerousness classes on the basis of their ability to produce damages to people from laser in class I (essentially safe in every condition) to the laser of class IV dangerous in different conditions.

The laser of class III show the label "ATTENTION" and that would not damage the eye for a momentary vision (thanks to the palpebral reflection of self-defence from a visible intense radiation), but that can present a great danger if observed through microscopes or magnifying glasses. Other lasers belonging to the same class but with label "DANGER" are in position to exceed the allowed maximum exposition level, yet over 0.25 seconds of time.

The lasers that belong to the class IV can produce risks, not only for the direct or reflected radiation, but also for the diffused radiation. These lasers source can present remarkable risk also for the skin and fire risk for inflammable materials. For these reasons the user must prepare all radiation excess measures to assure that it is ready at the end of its useful process. Besides the operator must be informed of the risks deriving from the laser radiation exposure and he must be provided with the proper D.P.I. (*individual protection devices*) consisting in certified protection glasses for the laser radiation.

## 2.3 RADIATION VISION CONDITIONS

The laser to the resonator exit is to be considered as a monochromatic light source highly corresponded and intense. For these characteristics it can be seen as a "Punctiform source" of great brightness. This allows that its "image" is after focused on the Retina in one very small spot with power density dangerousness high! If instead the beam becomes divergent and spreads on a not reflecting screen, then there will be a "large vision" of the image, with power density definitely less dangerous. Then different types of radiation vision can be distinguished in relation to the access way of the same radiation and consequently to the different dangerousness degree.

### ➤ Laser beam direct vision

This type of vision is the most dangerous and can show to the laser-opening exit, after that the optics have been removed. To avoid in every way! None protection glass can represent a valid defence means from the beam direct vision.

### ➤ Beam direct vision after speculate reflection

It can happen directing the beam on a reflecting surface.

The beam vision reflexes specular from a plain surface is extremely dangerous equal to the direct vision.

### ➤ Beam direct vision at the optical Fibre exit

It happens if the Optical Fibre is connected to the resonator. The beam vision results dangerous up to a remarkable distance. Filters and Glasses cannot guarantee the safety.

### ➤ Beam direct vision after focusing optics

It happens if isn't "killed" the Laser beam on an opportune absorber at the end of its useful route. The beam vision results dangerous up to a considerable distance. Filters and protection glasses can guarantee the safety for short expositions, on condition that are well dimensioned and certified type.

### ➤ Laser beam spread vision, after focusing optics

It is the more frequent vision condition for a device in operative way. The beam vision doesn't result dangerous if not on short distance, but opportune Filters and Glasses can guarantee the safety, also for long expositions.

**The Nominal Distance of D.N.R.O. Optical Risk for the laser MASTER S results inferior to 15m, for the direct or specular spread radiation, and inferior to 0.5m for the spread one! Only a suitable glass with Optical Density (D.O.) major of 4 can protect just now the sight from the accidental vision of the harmful laser radiation!**



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#### NOTE

Use always ocular protectors of certified conformance.

Remember that none glass can protect for a long time from the direct radiation!

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## 2.4 RISKS FOR THE EYES AND THE SKIN

The cornea and the retina, if submitted to an intense laser radiation, also of short duration, or to a less intense radiation but of long duration, can burn and can be damaged in irreparable way forever. This consequence is completely realistic in case of direct vision of Class IV laser beam. Also the skin can burn, if submitted to the focused direct radiation. Besides it is necessary to bear that with the main radiation also a collateral radiation can coexist in the ultraviolet: a long exposure can provoke skin carcinomas.

## 2.5 SAFETY GENERAL PRESCRIPTIONS

To not reduce the device safety degree occurs that the User has a conformance behaviour and is in the possible better safety conditions. It born so the necessity to develop an Operative Standard Procedure (P.S.O.) about the operations to perform for the starting and the out of service of the machine. This procedure, exposed near the installation, would be a reference for the Operator and will be written in his language.

The personnel training will be essential and it will be able to:

- x familiarize with the system functioning procedures
- x biological effect knowledge of the radiation on Eyes and Skin
- x needs understanding of Individual Protection Devices (D.P.I.)

## 2.6 COLLATERAL RISKS



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### NOTE

If the source use destination is changed, for example for the materials process applications, collateral risks can happen represented from the fumes and vapours production that can be irritating or toxic, if not removed and adequately filtered before to put back them again in the environment.

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### NOTE

It is recommended to **not change the use destination** without before have contacted the Manufacturer

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A further risk can be represented from the fire deriving from the process of materials different from those for which the machine is foreseen.



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### NOTE

When **flammable materials** are processed, being **fire danger**, it is indispensable to keep to the indications provided from the manufacturer during the machine starting.

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**NOTE**

Don't submit to the laser radiation **materials different** from those for which the machine has been manufactured

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The heaviest collateral risk, being able to result fatal, associated to a laser device is surely represented from the electricity.

This fact can happen when the warnings and the procedures imposed from the machine manufacturer aren't respected. Not authorized and unqualified personnel must not ever face any type of intervention on the electric part. The safety devices must not ever be removed and the efficiency must be checked periodically.



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**NOTE**

Don't work on the electric part if not experts. **Don't remove the protection devices.**

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**NOTE**

When **flammable materials** are processed, being **fire danger**, it is indispensable to keep to the indications provided from the manufacturer during the machine starting.

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If for example, in the use destination of the Laser source, during the working process the material has changes and produces fumes or irritant and/or toxic vapours, can result necessary to remove the working fumes and filter them before to put back again in the environment.

A further risk can be represented from the fire deriving from the process of materials different from those for which the machine is foreseen.



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**NOTA**

Don't submit to the laser radiation **materials different** from those for which the machine has been manufactured

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**NOTA**

When **flammable materials** are processed, as for example the plastic, being fire danger, it is indispensable to keep to the indications provided from the manufacturer during the machine starting

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## CHAPTER 3 SEALS

In some points the welding system presents some seals. The seals must not be, for none reason, broken or removed. The sealed parts in fact can be opened only and exclusively by Elettrolaser S.r.l.



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### NOTE

**The seals breaking or removal** on behalf of the customer put from the manufacturer on the laser system **allows the guarantee immediate decay** on all welding system.

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### ATTENTION

The manufacturer declines every responsibility about the not conformance machine use of his production.

It is **forbidden** the starting of the equipment before that the machine is **declared in conformance** with the actual directives

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### NOTE

The access to the internal parts of the electric equipment is allowed **only to the authorized personnel**, qualified and trained about the electric risks!

Elettrolaser S.r.l. declines every responsibility about the interventions on active parts on behalf of not trained personnel!

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### NOTE

The access to the internal parts of the laser resonator is allowed **only to the authorized personnel**, qualified and trained about the optical risks!





Elettrolaser S.r.l. declines every responsibility about the interventions on behalf of not trained personnel!




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### 3.1 SAFETY LABELS


The labels and the plates are applied on the equipment in conformance with the European safety rules. They must not be removed or damaged. For possible changes you can contact Elettrolaser S.r.l.

**Laser warning labels:**

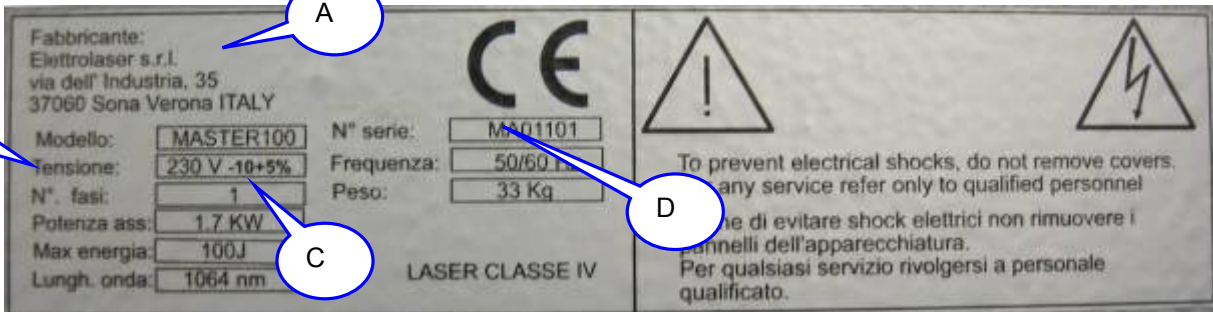
Label	Shape and type	Sizes (mm)
Laser N. 1	<p>Laser warning</p> 	<p>Side 22 Side 50</p>
Laser N. 2	<p>Laser class information</p> 	<p>104 x 52 52 x 26</p>
Laser N. 3	<p>Radiation information</p> 	<p>104 x 52 52 x 26</p>
Laser N. 4	<p>Laser exposure information</p> 	<p>56 x 40</p>

Laser N.5	<p>Laser technical data</p> 	104 x 25
Laser N.6	<p>Laser opening information</p> 	104 x 26
Laser N.7	<p>Radiation information</p> 	40x30

**Electric warning labels**

Label	Shape and type	Sizes ( mm)
Electric N.1	<p>Electricity warning</p> 	<p>Side 22 Side 50</p>

**Product identification label**



**Fabbricante:** Elettrolaser s.r.l.  
 via dell' Industria, 35  
 37060 Sona Verona ITALY

**Modello:** MASTER100    **N° serie:** MA01101

**Tensione:** 230 V -10+5%    **Frequenza:** 50/60 Hz

**N° fasi:** 1    **Peso:** 33 Kg

**Potenza ass:** 1.7 KW    **Max energia:** 100J

**Lungh. onda:** 1064 nm    **LASER CLASSE IV**

To prevent electrical shocks, do not remove covers.  
 Any service refer only to qualified personnel.  
 Per evitare shock elettrici non rimuovere i  
 pannelli dell'apparecchiatura.  
 Per qualsiasi servizio rivolgersi a personale  
 qualificato.

Callout A: Manufacturer name  
 Callout B: Model name  
 Callout C: Power rating  
 Callout D: Safety warning text

This label shows the data about the manufacturer (Ref A), the electric specifications (Ref B), the generator power (Ref C) and the risk class of the laser machine (Ref D).

### 3.2 LABELS POSITIONING

The Laser warning labels are placed frontally, inside and outside the machine in the following way:



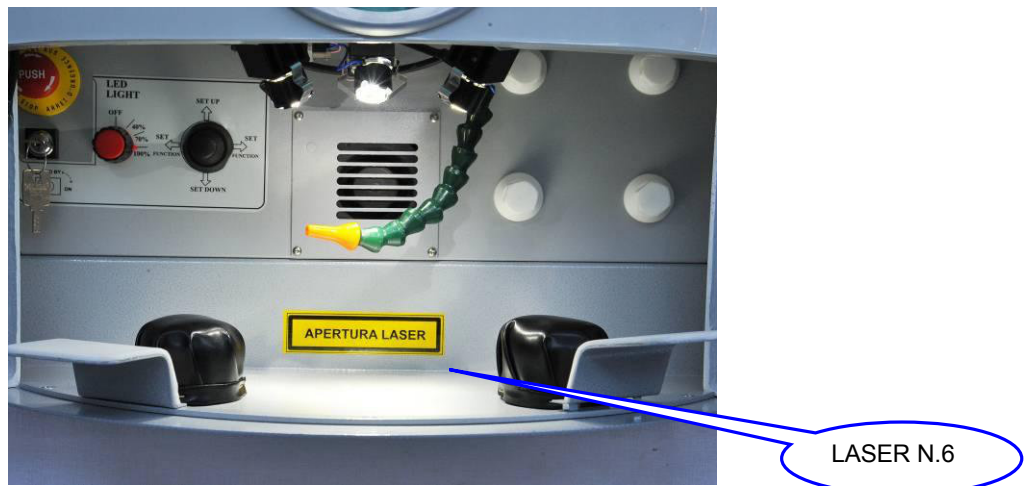
Picture 2: Behind laser warning labels



Picture 3: Frontal laser warning labels



Picture 4: Back laser warning labels



Picture 5: Internal laser warning labels

## CHAPTER 4 TECHNICAL DATA

### 4.1 LASER SPECIFICATIONS

SPECIFICATIONS	DESCRIPTION
Feeding VAC	230
Feeding system phases n°	1
Frequency Hz	50-60
Absorbed medium energy KW	1,7
Crystal LASER type	Nd:YAG
Wavelength nm	1.064
Impulse energy joule	0,1-130
Impulse duration msec	0,5-20
Repetition frequency Hz	0,5-40
Medium power W	65
Max peak power KW	6,5
Duty Cycle	80%
Spot LASER Sizes mm	0,2-2,0
Maximum pressure gas Argon of protection in exercise bar	1,5
Cooling type	Liquid
Fuse in socket	16 AT
Weight kg	33
Sizes cm	35X45X63

### 4.2 OTHER DATA

SPECIFICATIONS	DESCRIPTION
Work environment temperature °C	17-35
Maximum humidity in exercise %	65
Noising level dB(A)	<70
GUARANTEED AND CERTIFIED PURITY of the protection Argon %	99.8
Protection gas consumption l/min	2-4 con 1,5 bar

### 4.3 LAYOUT AND MACHINE DESCRIPTION

The physical principle that is the basis of the laser light generation is the phenomenon of the light stimulated emission. LASER in fact is the acronym of Light Amplification by Stimulated Emission of Radiation. It means that the laser is light amplified from a chain photonic emission, originated from a first photon (light particle) that interacting with an excited atomic system, and stimulates the emission of two photons and these ones interacting with other atoms give rise to an avalanche effect.

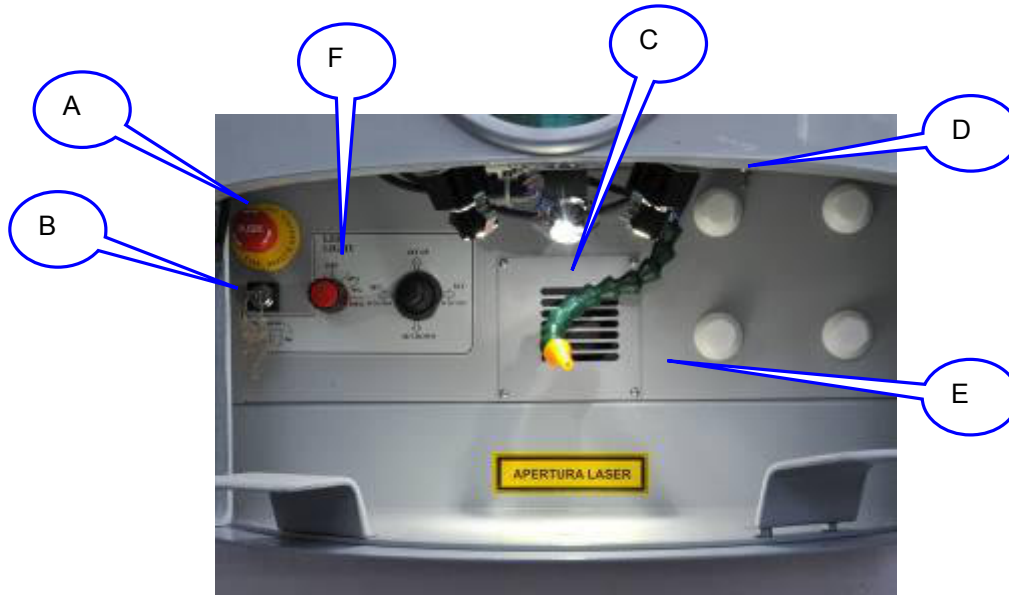
The atomic system excitation requires an external support of energy, suitable to be able to prime the laser effect. The “optical pumping” principle used by Elettrolaser S.r.l., is obtained when the light emitted from a luminous source investing the active material (material able to emit laser light) makes sure that the atoms excite for luminous energy absorption.

The laser effect amplification is obtained making cross more times the active material from the same light that emits. This is realized interposing the active mean between two opposed mirrors, or manufacturing and “aligning” that is defined “resonator”. When the resonator is perfectly “aligned”, the crystal and the mirrors are centred on the optical axle. The crystal faces, the front mirror and the back mirror face nearer the crystal, are parallel. In this optical con Picturation the extraction of the resonator laser energy is maximum, the beam is circular and approximately of uniform intensity. After that the laser beam has been amplified, it will be concentrated from a fire lens that can have different focal lengths and deviated inside the welding room from a mirror of 45°. In this way the energy is concentrated in few decimillimetres making possible in that point the metals melting.

The energetic intensity that the laser can concentrate is about 800-1000 KW/cm. To have a comparison it can tell that the sun rays, if focused with the same lens, have an energy intensity of 0.5 KW/cm.

## CHAPTER 5 CONTROLS DESCRIPTION

### 5.1 INTERNAL CONTROLS



Picture 6: Internal controls

Reference	Description
A	Stop emergency button
B	Switching on and Switching off key
C	Fumes suction fan
D	Protection gas regulator
E	Protection gas mobile spreader
F	Led lights set inside the room



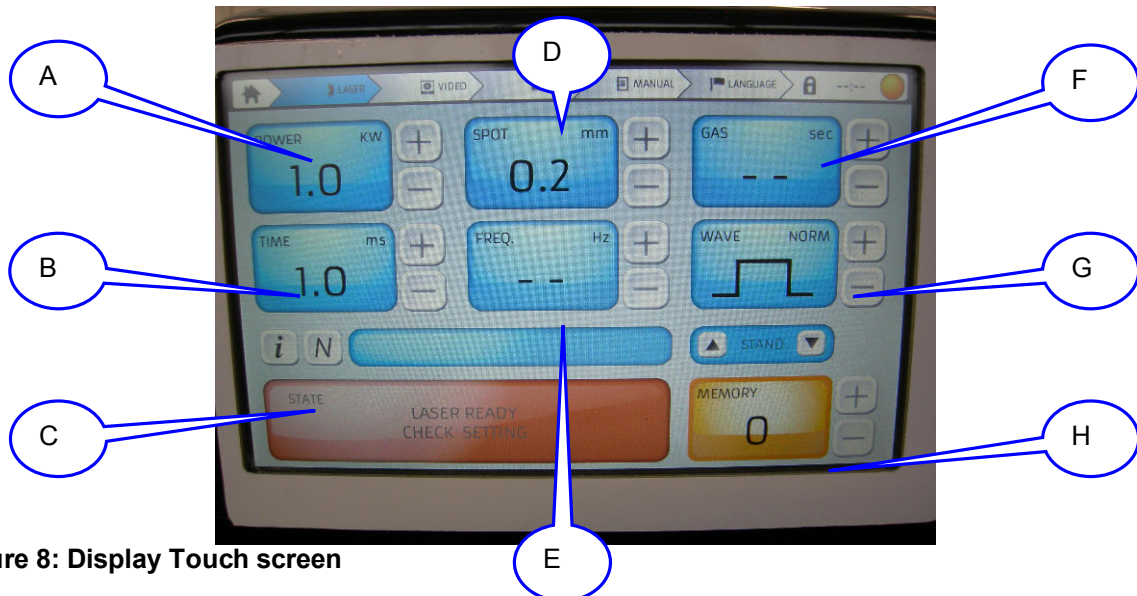
## 5.2 JOYSTICK CONTROLS



Picture 7: Joystick controls

Reference	Description
SET UP	Moving the joystick lever on the top it is possible to increase the parameters values: the highlighted parameter will be underlined from a line
SET DOWN	Moving the joystick lever on the bottom it is possible to reduce the parameters values: the highlighted parameter will be underlined from a line
SET FUNCTION RIGHT	Moving the joystick lever on the right it is possible to place towards right on the parameters showed from the display
SET FUNCTION LEFT	Moving the joystick lever on the left it is possible to place towards left on the parameters showed from the display

## 5.3 DISPLAY TOUCH SCREEN CONTROLS



Picture 8: Display Touch screen

Reference	Description
Ref. A	Visualize in Kw the impulse power. With two arrows placed on the pigeon-hole side it is possible to increase and reduce the power value from a minimum of 0.1Kw to a maximum of 7 Kw
Ref. B	Visualize the duration time of the welding impulse in milliseconds. With two arrows placed on the pigeon-hole side it is possible to increase and reduce the time value from a minimum of 0.1ms to a maximum of 20 ms
Ref. C	This area is dedicated to the visualization of the interface messages between machine and operator; different types of metals memorized in the memory cells are besides visualized or possible not grave error messages.
Ref D	Shows the measure in mm of the focusing point diameter of the laser beam on the piece to weld. With two arrows placed on the pigeon-hole side it is possible to increase and reduce the welding diameter from a minimum of 0.2mm to a maximum of 2 mm
Ref. E	Shows the shot repetition frequency of the laser impulse. With the arrows placed on the pigeon-hole side it is possible to increase or reduce the shot frequency from a minimum of 0.5Hz to a maximum of 30 Hz. It is besides possible to deactivate the repetitive shot function highlighting on the display two horizontal bars that are placed before of the position 0.5Hz. Instead moving in the position superior to 30 Hz the continue shot function SP will be visualized. Once set the desired frequency the operator will have to push the pedal continuing to shot. The set frequency value is however connected to the set power parameters (Kw) and time (ms). It will not be possible to work with high power and time values to the maximum frequency; in fact a self-regulation exists that reduce the frequency compared with the supplied power.
Ref F	Shows if the inert gas supplying is selected for the weldings protection and shows a remained supplying countdown time after the performed last shot. With two arrows placed on the pigeon-hole side it is possible to increase and reduce the gas supplying time after the last shot. Setting to "0"the operator will opt to weld without the protection inert gas use.
Ref. G	Visualizes graphically the actual LASER impulse wave shape. It is possible to choose between 5 different wave shapes. With two arrows placed on the pigeonhole side it is possible to access to a wave shape successive to that one showed from the display. The default program is "normal" or square shape.
Ref. H	Shows numerically what memory is set in this moment. In the third row from the side the name is showed that has been assigned to the same (Ref. Fig. 8): in this case in the memory 10 there is the yellow gold. With the arrows placed on side it is possible to refer the memories up to a maximum of 100. Pushing the same number, it is possible to access in a submenu in which it will be able to change the name to the memory and after save it in the desired position.

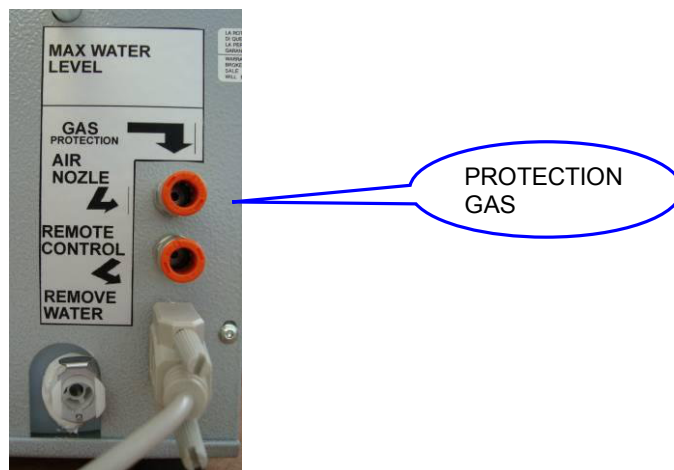
## CHAPTER 6 INSTALLATION

- Position the equipment on a bench or strong and steady support that is able to support the tooling weight (33 Kg). Before to lean the laser assure that the containing little basin of the welding material leans out from the bench and that the machine leans against four support stems (Fig. 9)



Picture 9: Machine below sight

- Connect if necessary the welding protection gas (Fig. 10).



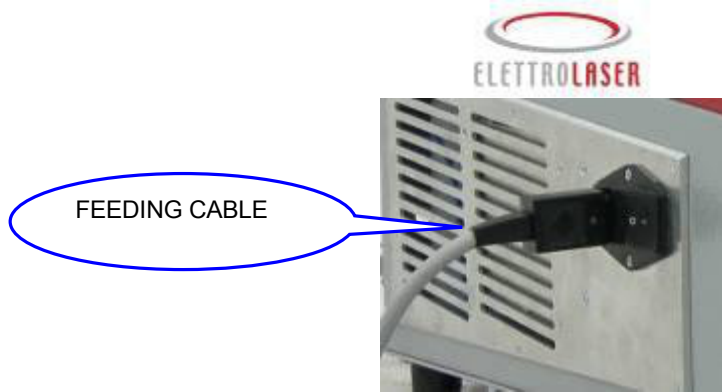
Picture 10: Protection gas connection



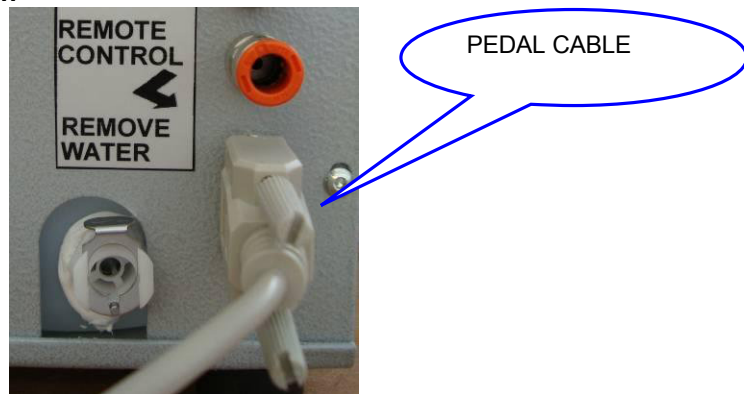
### NOTE

Apply in entry to the machine a protection gas pressure **not superior** to 1,5 bar

- Connect the machine to the feeding socket 230 Vac using the feeding cable in equipment (Fig. 11).



Picture 11: Feeding cable connection



Picture 12: Connect pedal cable

- Connect the pedal shot control connector placed on the back of the machine (Fig. 12).



**ATTENTION:**

Use only the equipment cable to the machine and don't substitute or change the connection plug. For this procedure contact always Elettrolaser S.r.l.

- Remove the oculars from the containers (Fig. 13) and fasten them on the binocular 45° pipe. To make this screw down and tighten the screw so to block the oculars (Fig. 13).



Picture 13: Oculars block

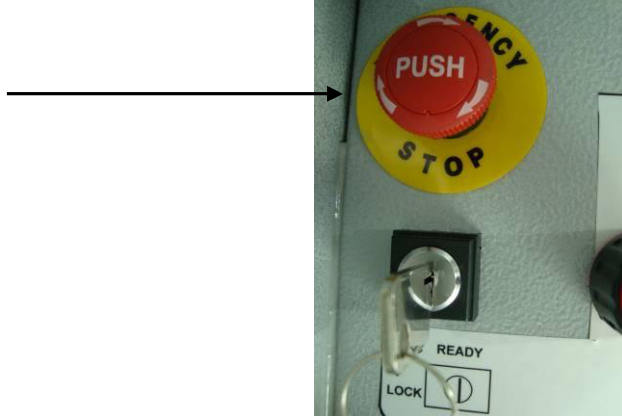


**NOTE**

For agreement due to the calibration of collimation laser, the ocular with the cross in its internal is placed on the right pipe. A different place is previously agreed with Elettrolaser S.r.l.

## 6.1 FIRST SWITCHING ON

Assure that the stop button inside the welding room is released and not pushed (Fig.14)



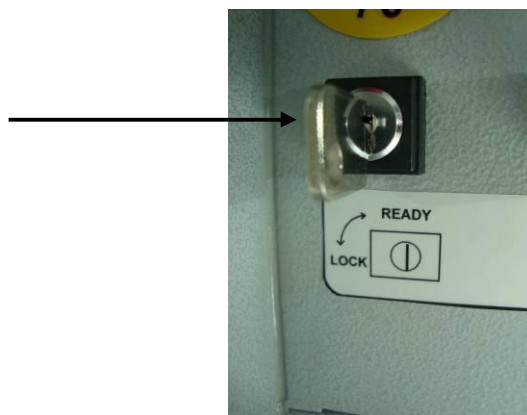
**Picture 14: Stop button**

Switch on the machine carrying in ON position the general switch placed on the left side of the machine (Fig.15)



**Picture 15: General switch**

Insert the key and put it in central position, with indication "STAND BY" (Fig. 16).



**Picture 16 : Switching on key**

At this point on the graphic display the initial screen will appear that will invite to the machine switching on with the indication “*PRESS START* “. At this point press “S” on the display.



**Picture 17: Switching on display**



**NOTE**

**Don't carry on** in the installation if the display isn't compiled as above described. Stop the installation procedure and consult the damages chapter or eventually call Elettrolaser S.r.l. technical service.

When you have pressed “S” on the display the default set values will appear and the inscription “*VERIFICATION VALUES LASER ACTIVE*” (Fig. 8).



**NOTE**

**Don't carry on** in the installation if the display isn't compiled as above described. Stop the installation procedure and consult the damages chapter or eventually call Elettrolaser S.r.l. technical service.

At this point the operator will be able to opt for:

- Select the welding parameters and work so normally acting on the pedal control
- Load the work parameters saved permanently in a memory cell through the cell number selection with joystick or touch-screen as described in the relative section of this manual.

## 6.2 WELDER SWITCHING OFF



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### ATTENTION

Switch off always the welder turn before the key on LOCK, to allow to the microprocessor to unload the internal condenser bench.

---

Position the key on LOCK and wait that on the display will appear the inscription “*LASER BLOCKED*”.

When the screen appears switch off the laser putting in position OFF the general switch placed on the left side of the machine (Fig. 18).



Picture 17: General switch



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### ATTENTION

Remove the key if it is opportune to prevent to foreign people the use of the welder.

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## CHAPTER 7 MAINTENANCE



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**ATTENTION**

In normal conditions of functioning this welder behaves as a LASER tool of class IV, with a Safety level LASER Class I; it is so a safe LASER welder and it isn't necessary to adopt particular protection measures for the operator and for the present people

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**ATTENTION**

Don't open ever the LASER panels, also with the switched off machine there can be parts always under voltage, possible electric shock.

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**ATTENTION**

The maintenance of the open bodywork LASER welder, with the LASER ray trajectory on sight, can be performed EXCLUSIVELY from ELETTROLASER S.r.l. personnel or from the same expressly authorized.

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Elettrolaser S.r.l. skilled personnel will be able to adopt the necessary safety measures against the LASER ray radiations; and so, in case of intervention, these personnel is able to verify the equipment safety.

If during the maintenance intervention of Elettrolaser S.r.l. skilled personnel it is necessary to work with the sight LASER layout, the working area becomes a safety area for the LASER putting again in the class IV; in this event, all present people must put on special protection glasses for the showed wavelength (1.064 nm), or leave the interested area. To perform the maintenance and service operations, it is advisable to reduce at minimum the interested area with fixed walls or with protection curtains.



---

**ATTENTION**

For the execution of all operations about the LASER equipment keep scrupulously to the accident standards

---

To maintain the welder in accordance with the safety prescriptions it is important to keep to the following indications:

- x Change the leather protection barriers that close the entrances for the hands passage of the welding rooms as soon as some wears are pointed out.





- x In case of break, change the protection glass-filter of the inspection window to the welding room. Use for the change only the original spare part; common glasses or not approved filters can originate some radiation leaks dangerous for the operator eyes and skin.
- x Don't remove ever the filter inserted in the microscope lens
- x Don't insert ever in the welding room wide specula surfaces as chromium-plated particulars, mirrors, aluminium layers, etc. These surfaces could prime dangerous reflections of the LASER beam inside the welding room.

**The under listed maintenances can be performed from the user because don't behave any danger for the personal safety.**

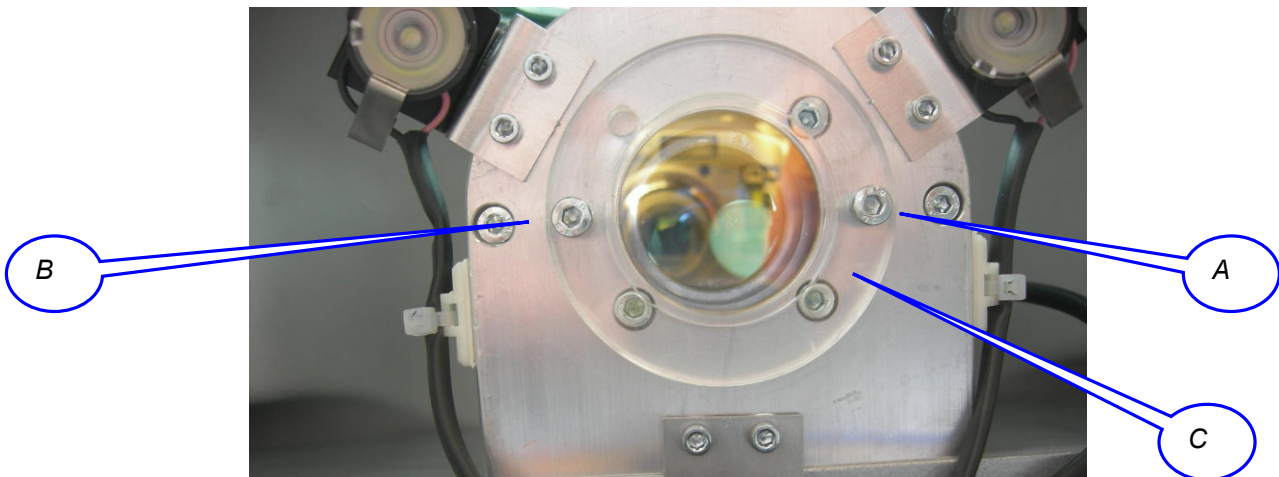
## 7.1 CHANGE THE PROTECTION SLIDE AR/AR

Every time that the protection slide is “dirty” is noted a reduction of the delivered power. So, to the presence of a strong concentration of metal sprays on its surface change the slide.

Check periodically the protection slide of the microscope lens that is placed inside the welding room. This special glass treated anti-glare @ 1.064 nm is fastened to the exit of the optical route through an aluminium nut; this nut is held from two screws.

For the change of the protection special glass layer, work as follow:

- x Unscrew two screws (Ref. *A* and *B* Fig. 19) of the support nut;
- x Disconnect the nut (Ref. *C* Fig. 19) from the optical body and so extract the slide
- x Clean the surface with a soft and not abrasive cloth
- x Don't try to take away the metal sprays eventually left
- x Reinserting the new glass in its place and position carefully the nut tightening it with two screws



Picture 18: Protection slide change



### ATTENTION

It is advisable to change the protection slide if there are metal sprays on the same, because the impulses generated from the LASER could overheat further, provoking, in some cases, also the glass breaking.

## 7.2 REALIGN THE POINTING CROSS

It can happen that the pointing cross for the welding isn't aligned to the effective shot point.

This could verify all times that the welder is moved or lifted.

Also a knock to the microscope could create the pointing cross misalignment from the effective shot point.

These little optical defects can in any way be compensated from a regulation that the same user can make.



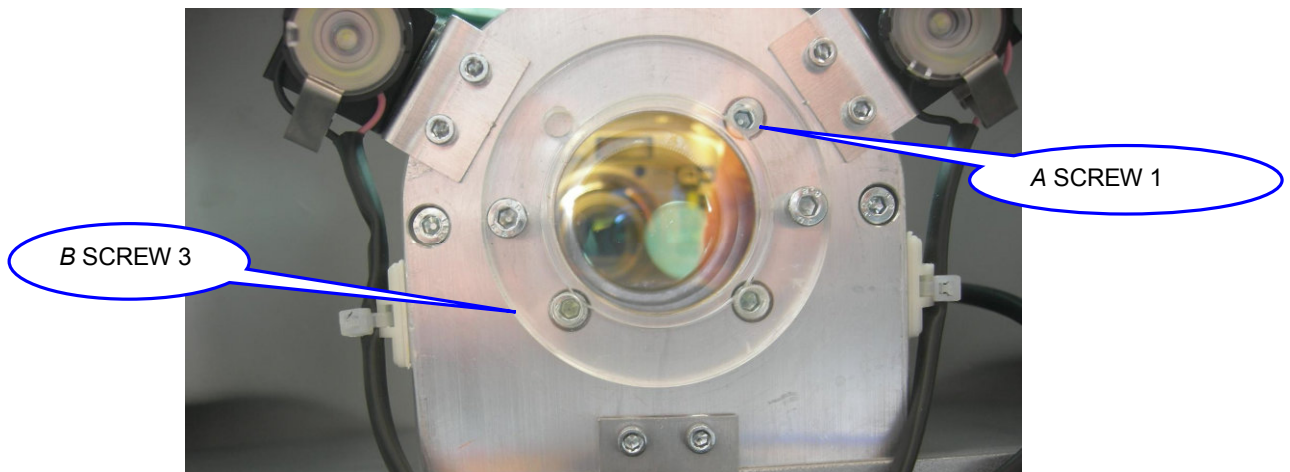
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### ATTENTION

During the alignment phases pay attention to the hands position that could interfere with the LASER passage.

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To set the cross alignment it is necessary to rotate lightly with the appropriate screw screwdriver from 3 mm, the screws 1 or/and 3 (Ref.A and B fig.20), that are placed inside the welding room near the protection slide case nut.



**Picture 19: Pointing cross realignment**

Before to carry out on these screws, it is advisable fasten very well in their seats both the stereomicroscope both the binoculars. To set well these last ones, it will need let run up to the bottom the oculars placed on its support pipes and rotate these as far as their dioptries positions coincide on 0; so the blinkers will be pressed around the oculars extremes.

To set the stereomicroscope, unscrew the same from its base (Ref.C, Fig.21), through the allen screw screwdriver from 2.5mm in equipment, and once pushed it firmly against the frontal edge of its base, in other words in the contrary direction where there is the user, screw it firmly up to immobilize it permanently in this position.



**Picture 20: Fastening of the Stereomicroscope**

So to verify the alignment, put in steady way with focus vision a sheet metal piece inside the welding room. And then hit with a low power single shot the sheet metal placed before.

Looking so inside the microscope, rotate with small movements the screws 1 and/or 3 (Fig.20) up to the cross overlapping with the point where the shot has hit the sheet metal. It is important to move only one screw at a time because they have a distinguished movement effect. The screw 1 in fact allows the vertical adjustments (or in north-south direction), while the screw 3 corrects the horizontal movements (or in east-west direction).

You will work progressively on these screws, alternating the action on one and on the other, many times what is necessary to obtain that both (focus pointing cross on the object, and the shot focus point) coincide perfectly or that are virtually and precisely overlapped.




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**ATTENTION**

Approach always to the alignment point with small movements and maintaining much steady the proof sheet metal.

**DON'T** screw ever completely the regulation screws.

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### 7.3 CHANGE PERIODICALLY THE REFRIGERATING LIQUID

When the machine is delivered it is already filled up of distilled water.

It is necessary to change periodically the internal refrigerating liquid (distilled water or demineralised) with the aim to avoid the formation of micro alga inside the cooling closed circuit that could reduce or block the thermal exchange efficiency.



#### ATTENTION

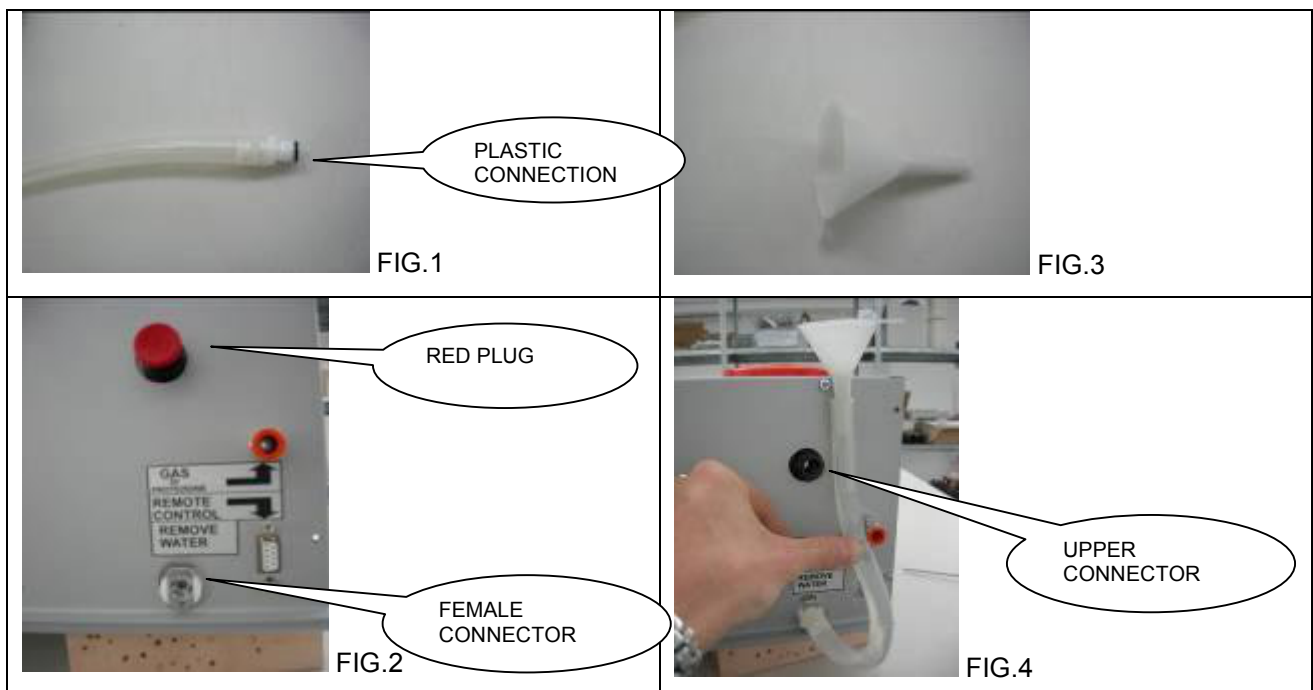
It is advisable the water change every two years and in particular before or after the end of the hot season.

### 7.4 HOW TO REMOVE THE WATER

- x Insert the plastic connection equipped with the MASTERS (Fig. 1) to the female connector at the right bottom of the rear panel (Fig.2)
- x Remove the red plug in upper position and let the water going out (Fig.2)

### 7.5 HOW TO REFILL THE COOLING SYSTEM

- x Insert the plastic connection equipped with the MASTERS (Fig. 1) to the female connector at the right bottom of the rear panel (Fig.2)
- x Remove the red plug in upper position (Fig.2)
- x Use the funnel equipped with the machine to refill the tank (Fig.3)
- x The maximum level will be find when you'll see the water coming out from the upper connector of the tank (Fig.4)
- x Plug the upper connector with the red plug and remove the plastic connection



Picture21: How to refill the cooling system

## CHAPTER 8 ERROR MESSAGES AND PROBLEMS RESOLUTION

The table shows all information about the errors visualizable on the graphic display.

ER.N°	MESSAGE	CAUSE	REMEDY
01	ERROR SIMMER	The laser lamp doesn't switch on	<ul style="list-style-type: none"> <li>A. Check the fuse</li> <li>B. Call the ELECTROLASER ASSISTANCE SERVICE</li> </ul>
02	NOT WORKING REFRIGERATING LIQUID	The refrigerating liquid doesn't move inside the cooling pipes <ul style="list-style-type: none"> <li>A. Not working pump</li> <li>B. Dirty or cloudy water</li> </ul>	<ul style="list-style-type: none"> <li>A. Check the fuses and call the ELECTROLASER ASSISTANCE SERVICE</li> <li>B. Check from the slits the refrigerating liquid colour and if it is present on the tank bottom a residual of rubble. In this case change and clean the cooling system</li> </ul>
03	REFRIGERATING LIQUID HIGH TEMPERATURE	The refrigerating liquid has reached the temperature mark of 55°: <ul style="list-style-type: none"> <li>A. High work cycle of the machines</li> <li>B. Insufficient liquid inside the tank</li> <li>C. Not working lateral cooling fan</li> <li>D. Too much dust or dirty left on the heat pump</li> </ul>	<ul style="list-style-type: none"> <li>A. Wait 15 min with the switched on machine up to that the error disappears; in contrary case call the ELECTROLASER ASSISTANCE SERVICE</li> <li>B. Check laterally the presence of the liquid in the reservoir and eventually add distilled water</li> <li>C. Check the fan functioning that must, in case of error 01, turn very quickly creating a sure inconvenience. In contrary case call the ELECTROLASER ASSISTANCE SERVICE</li> <li>D. Blow with compressed air through the slits to release the exchanger from the dust. Don't open without have before called and consulted the ELECTROLASER ASSISTANCE SERVICE</li> </ul>
04	HIGH ELECTRONIC TEMPERATURE	The internal thermostat inside the power electronic has noticed an high temperature <ul style="list-style-type: none"> <li>A. High work cycle</li> <li>B. Dust or dirty left on the back cooling fans</li> <li>C. Not working back fans</li> </ul>	<ul style="list-style-type: none"> <li>A. Wait some minutes that the error disappears and let's rest the machine for about 20 minutes.</li> <li>B. With the compressed air blow inside the back panel slits to see if there is or not presence of dust or other left on the fans. Before to open call the ELECTROLASER ASSISTANCE SERVICE</li> <li>C. Call the ELECTROLASER ASSISTANCE SERVICE</li> </ul>
05	RELAY INPUT	The machine doesn't weld	<ul style="list-style-type: none"> <li>A. check the connection of the power supply</li> <li>B. change the power supply</li> </ul>
06	LOW CONDENSERS VOLTAGE	The electronic has not loaded the condensers bench <ul style="list-style-type: none"> <li>A. The generator is broken</li> </ul>	<ul style="list-style-type: none"> <li>A. Call the ELECTROLASER ASSISTANCE SERVICE</li> </ul>
07	BLOCKED OPTICALS MOTOR	The motor that sets the shot diameter doesn't move	<ul style="list-style-type: none"> <li>A. Switch off the machine and switch on again. In this way the machine will perform again the motor check. If the error persists call the ELECTROLASER ASSISTANCE SERVICE</li> </ul>

## 8.1 OTHER ANOMALIES

PROBLEM	RESOLUTION
The machine switches on but is not in the START position	➤ Verify the key position inside the welding room
The display shows the parameters but the laser doesn't shot	➤ Check the machine connection with the pedal
In the microscope it sees that the shutter closes the sight and becomes dark but no effect on the welded piece is seen	<ul style="list-style-type: none"> <li>➤ Settable power and time are too low</li> <li>➤ MS5 zoom drum in not correct position</li> <li>➤ Dirty position glass (see chap. 7 MAINTENANCE)</li> </ul>
The lights inside the welding room don't switch on	<ul style="list-style-type: none"> <li>➤ Check the handle position for the intensity regulation inside the room (Ref. Fig. 4)</li> <li>➤ Check the fuses</li> </ul>
When I hit the smoke created from the welding rises towards the microscope blurring the sight	<ul style="list-style-type: none"> <li>➤ The filter on the internal fan of the welding room is too dirty</li> <li>➤ The fan is not working: check the fuse</li> </ul>
The protection gas doesn't flow when is pushed the pedal	<ul style="list-style-type: none"> <li>➤ Check on the display that the gas countdown is qualified</li> <li>➤ Check that the input pressure is not superior to 2 Bar</li> <li>➤ Check the flux regulator inside the welding room</li> <li>➤ Verify that in the back joint there isn't a strange object that blocks the passage</li> </ul>
Compressed air doesn't flow when the spreader is qualified	<ul style="list-style-type: none"> <li>➤ Verify that in the back joint there isn't a strange object that blocks the passage</li> <li>➤ Too low pressure</li> </ul>
The laser doesn't switch on	<ul style="list-style-type: none"> <li>➤ Verify that the switch placed on the back is in ON position</li> <li>➤ Verify that the emergency mushroom inside the welding room is released</li> <li>➤ Check the fuses</li> <li>➤ Verify electric net connection</li> </ul>

In case there is the possibility to change a fuse, replace it with another one of the same amperage and with the same type of intervention. It is advisable to use the fuse in equipment with the machine.

Contact Elettrolaser S.r.l. for possible clarifications.

## CHAPTER 9 SAFETY SYSTEMS

This LASER welder is equipped with a high number of safety systems to avoid that the LASER radiation can in any way escape to the check of the machine.

Here follow the list of these systems and their functioning description:

- x Resonator shutter
- x Microscope shutter
- x Microscope infrared filter
- x Welding room infrared filter
- x Openings protection (curtain of skin strip) for the hands introduction

### 9.1 RESONATOR SHUTTER

<b>Description</b>	This device is formed from a small flag controlled from an electromagnet and it is placed inside the LASER resonator. The shutter intervenes disconnecting the LASER run inside the resonator when the welder is in STAND-BY condition
<b>Scope</b>	The scope of this device is to prevent the generation of undesired LASER radiations
<b>Functioning</b>	During the electric feeding connection, before to turn the key control on START, the shutter is started up. When the key is on START the shutter release the LASER route, the welder prepares for the normal functioning. When the key turns on LOCK, the machine performs the switching off program, the shutter closes, and the control of the effective closure in the right time is performed.

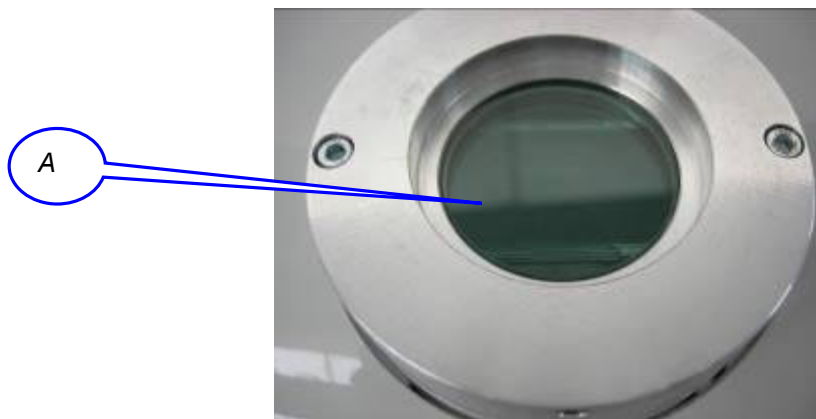


## 9.2 MICROSCOPE SHUTTER

<b>Description</b>	<p>This device is constituted from a liquids crystal filter (LCD) that if submitted to a well careful voltage dims completely. It is placed between the 45° mirror and the focus lens of the microscope. The shutter intervenes disconnecting the operator visive route through the microscope, in the moment that the LASER impulse provokes the melting of the piece to weld.</p>
<b>Scope</b>	<p>The scopes of this device are:</p> <ul style="list-style-type: none"> <li>x Prevent the operator dazdling provoked from the visible radiation light flash shed from the welding bath</li> </ul> <p>After it is possible to see that this protection is the second of three devices that prevent the anomalous route of the LASER radiation towards the operator eyes.</p>
<b>Functioning</b>	<p>The position of OPENED SHUTTER is the normal condition of this device both with machine in STAND-BY (resonator shutter ON), both in START (resonator shutter OFF).</p> <p>This allows the microscope use in any moment.</p> <p>After have turned the key on START, the shutter functioning logic s the following:</p> <ul style="list-style-type: none"> <li>x Pressure on the shot pedal</li> <li>x The microprocessor notices the pedal contact closure and controls the shutter closure</li> <li>x The microprocessor qualifies the LASER lamp switching on</li> <li>x The shutter is in ON condition for a time connected to the switching on time duration of the LASER lamp, plus a reasonable time to allow to the melting bath to cool and lose so, its brightness.</li> <li>x Back to the rest position with the surveying of the shutter complete opening.</li> </ul>

### 9.3 MICROSCOPE INFRARED FILTER

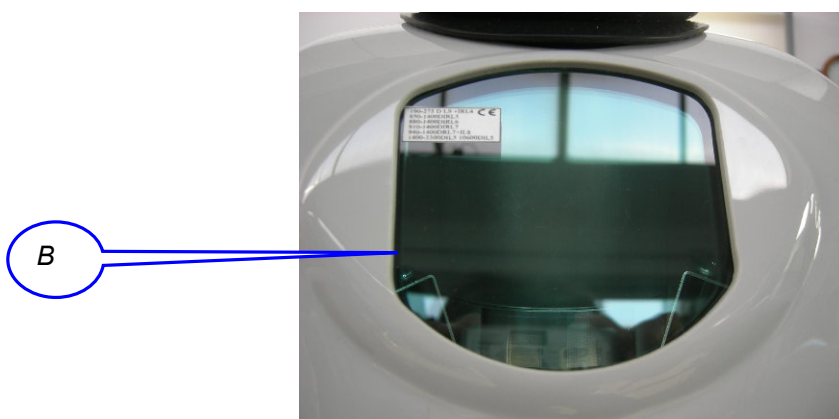
<b>Description</b>	This filter is an optical glass opaque to the LASER radiation of 1.064 nm. It appears to our eyes of light grey colour and perfectly transparent. It is placed inside the microscope. (Ref.A Fig. 24)
<b>Scope</b>	The scope of this filter is to preserve the operator eyes from leaks, also if absolutely improbable in this zone, of the microscope optical route of LASER radiation
<b>Functioning</b>	Being opaque to the wavelength of 1.064 nm prevents the passage in any direction of the used LASER radiation.



Picture22: Microscope infrared filter

### 9.4 WELDING ROOM INFRARED FILTER

<b>Description</b>	This filter is an optical glass opaque to the LASER radiation of 1.064 nm (Ref. B Fig.25). It appears to our eyes of grey colour and perfectly transparent. It constitutes the welding room inspection window and it is easily changeable.
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Picture23: Welding room infrared filter




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**ATTENTION**

In case of breaking this filter will have to be necessarily changed with a new one. For the own safety, use only original and approved spare parts.

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### 9.5 OPENINGS PROTECTION FOR HANDS INTRODUCTION

<b>Description</b>	Placed to the sides of the welder “nose”, two openings, that allow to the operator to introduce the hands and the pieces inside the welding room, are protected from curtains made of skin strips (Fig.23)
<b>Scope</b>	<p>It is necessary the presence of this type of protection for two main reasons:</p> <ul style="list-style-type: none"> <li>x Prevent every possible, also if improbable, leaks of radiations outside the welding room, to prevent harmful intense flashes both to the operator both to other people eventually present;</li> <li>x Prevent to the protection inert gas, as the argon, eventually in use in the welding phases, to exit easily from the welding room and so allows an efficient metals protection from a possible oxidization</li> </ul>
<b>Functioning</b>	This skin strips curtain obstructs the exile of harmful LASER radiations as of the protection inert gas from the welding room



Picture24: Hands passage




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**ATTENTION**

In case of breaking, lacking, excessive curling, skin strips bending or wear, it will have to proceed to the curtain change. For the own safety use only original spare parts.

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## **CHAPTER 10 SAFETY GENERAL PRESCRIPTIONS FOR LASER PLANTS IN WORKING ARRANGEMENT**

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### **10.1 INTRODUCTION**

When there is the problem to verify the Plant safety, the first step to perform is to locate what can be the dangers connected to the Plant functioning.

In the case that inside the Plant a LASER Equipment is installed, besides the usual Dangers deriving from the type and from the functioning way, it needs to bear a further Danger represented from the LASER Radiation (electromagnetic type radiation, prevalently infrared).

The safety of this type of Equipment is object of specific Standards, both from the electric point of view both from the radiations one (Not ionized).

From this derives that a careful observance of the technical advices offered from the specific Standards, takes to reduce the access Risk to the Danger to levels presumably in conformance with the Legislator will.

The Standards observance is up so, in equivalent way, both to the LASER Source Manufacturer both to the Source Integrating in the System both from the System User.

It understands then as an only way doesn't exist to increase the safety being able instead to locate different protection Systems.

### **10.2 PROTECTION SYSTEMS**

A general rule to respect is that "...where there is danger the Man must not be present and where there is the Man the danger must not be present ..."

With this point results immediately evident that the main way to follow is to interpose between the Man and the danger, a Barrier that reduces at minimum the access risk to the danger. Another way to follow is to found a set of mark measures that inform the people about the danger existence avoiding that they can come to contact, accidentally, with the danger. Finally remains the necessity of individual protection measures for the events where the risk can change in accordance with the operative conditions.

For the LASER equipment three types of protection measures have been located:

- A. Engineering devices
- B. Procedurals and Administrative
- C. Individual Protections

#### **ENGINEERING DEVICES**

For an industrial environment result to be the more opportune measures and consist of a set of shrewdness's that, in the design, manufacturing and Plant integration phases, take into consideration of the existent dangers and devices to minimize the risk. When applicable, all is realized endowing the plant of appropriate covers that enclose both the LASER both the work zone, preventing to the dangerous radiation to reach the external side of the cover.

Making so the acceptable emission limit (LEA) is reduced to a level such that a LASER classified danger (Class IV) doesn't emit towards outside a radiation superior to that corresponding to the Class I, judged dangerous.

## **STANDARDS PRESCRIPTIONS ON THE PROTECTIONS**

The protections or barriers or covers must be such to intercept the infrared radiation emitted from the LASER and to be such to resist to the drilling.

This prescription is easily feasible (for the small power LASER) through the sheet metal panels use that screen completely the radiation and resist indefinitely to the drilling for the radiation not focused on them. For high power LASER it is necessary to establish a drilling time necessary between an inspection and the successive or turn to active covers, able to feel the drilling (through interspaces and adequate sensors).

For the Nd-Yag, NdYVO4 Laser equipment it is sufficient a metallic material protection of thickness superior to 1.5mm to resist indefinitely to the laser radiation, not focused, of the annexed Laser source.

The access panels and the safety blocks must be designed so as to not allow the access to the dangerous radiation.

In accordance with the working type and/or intervention on the process, it can make necessary to remove covers or panels. In this case and if the panels aren't fastened solidly to the structure with screws that request the use of proper tools for their removal, occur equip these removable Panels with safety blocks that, busy, reduce the radiation in the permitted levels.

This is generally realized through an electric interblock with the power feeder of LASER excitation system. The interblock device, performing the safety function for the people, must be in conformance and approved for this use.

The observation optics must contain proper attenuators able to prevent the human access to the radiation superior to LEA of the class I.

There is often the problem to have an inspection Window able to observe the interaction between the LASER ray and the working material. In this case the Windows must include optical density Filters (D.O.) sufficient to knock down the not dangerous levels radiation. The D.O. necessary calculation must take into consideration of the Laser type, its functioning, the distance from the focus point, the observation direction, the exposure time, etc. also the filter, performing a safety function for the people, must be approved and certified.

### **10.3 PARTICULAR PRESCRIPTIONS FOR LASERS OF CLASS IV**

For the LASERS of class IV are prescribed the distance control, the key control, the emission warning, the attenuator.

For these LASERS occur that the Manufacturer put at the User disposal a shrewdness that allows an external safety easy addition to the same LASER. This is realized with the distance block connector, or of a contact that if it is opened blocks or reduces the laser emission.

The starting device must prevent that the not assigned personnel can yield operating the LASER. For this aim, a key control removable in off position is used.

When the LASER radiation is active occur inform the people of its presence. In this case an emission warning is emitted (generally a red flashing).

In the end it must be always present in shrewdness to stop temporary the LASER beam. It is realized from the source Manufacturer with beam attenuator or shutter.

## 10.4 CONTROLS POSITIONING AND PLATING

In accordance with the prescriptions occur that the control are placed in a zone outside from the access possibility to the radiation and that opportune and normalized warning labels are placed in well visible way for the people.

## 10.5 PRESCRIPTIONS FOR THE USER; ADMINISTRATIVE PROCEDURES AND OPERATIVE STANDARD PROCEDURE (P.S.O.)

The use prescriptions, that must be respected for the correct use of the laser equipment, are important to not thwart the Manufacturer efforts on the safety way and forces the User to the responsibility to use correctly the protections foreseen from the Manufacturer with the additional ones of his competence with also the obligation to develop a procedural internal standard turned to put the people, with an agreed behaviour, in the better safety conditions. They are turned besides to prevent that not authorized people can access in the area dedicated to the working with the LASER. In particular an Operative Standard Procedure must be defined about the manoeuvre to perform for the Equipment function and out of service. This procedure must be showed near the installation, as reference for the Operator, and must be written in the Operator language. However the personnel training results essential and it must be intended to the:

- x Familiarization with the system functioning procedures;
- x Appropriate use of the danger control procedures, warning signals etc;
- x Individual protection needs
- x LASER biological effects on the eyes and on the skin

## 10.6 INDIVIDUAL PROTECTION, INDIVIDUAL PROTECTION DEVICES (D.P.I.)

These devices must be seen as further safety measure with the completion of those protection systems showed in A and B and not as the main, or really, as unique safety measure! They identify in the ocular protectors and results evident that must be of well sure and certified conformance, resulting the last barrier between the eye and the radiation! The glass D.O. calculation must be performed in accordance with the standards recommendations foreseeing the worst observation conditions.

In any case Remember that none glass can protect effectively the eye from the LASER beam direct vision!

## 10.7 RESIDUAL RISKS THAT THE USER MUST LOCATE AND ELIMINATE

They are risks deriving not from the LASER but from its use. Together with the main radiation, some collateral ones exist, of visible infrared type, and ultraviolet, that for their intensity, can represent a potential danger.

The LASER beam is able, for its high power density (irradiation), to prime the inflammable substances combustion as volatile substances (Solvent, patros, ethers, alcohols, etc.) and the methacrylate or plastic rosins.

The LASER beam interaction with organic and inorganic materials provokes the fumes and exhalations formation that, in some cases, can be harmful for the health and/or toxic!

In the Lens cleaning a highly inflammable and irritating for the eyes and for inhalation is used.

### **Warnings**

With the aim to minimize the residual risks occur to highlight the following warnings:

- Don't remove the lamps protections covers and the protection barriers
- Handling the lamps use glasses and gloves
- Conduct the LASER beam on possible inflammable materials
- Evacuate the fumes through a proper extractor fan



- Don't introduce the fumes in environment if not after the filtering
- Don't work with the under voltage electric system and removed protection barriers
- Don't perform regulations with the Laser in function
- Turn only to a skilled and authorized personnel

At conclusion if the considered prescriptions are satisfied, it is possible reasonably to think that working on a system containing a LASER source there aren't risks superior to those ones of any other activity!

## CHAPTER 11

# CONFORMANCE WITH THE CEE DIRECTIVES AND CE MARKING; ADDITIONAL INSTRUCTIONS FOR THE USER

### TERMINOLOGY

The international standard has standardized the terminology about the Lasers, their components, the accessories, the performances, etc. Here follow the particularly significant definitions and the recalls to the applicable sector standards are described.

Definition in accordance with the European standard EN 12626 (ISO 11553) Safety of machinery; Laser processing machines.

#### 1.1 **MACHINE,**

Together with connected parts or components, of which at least one in movement, with proper actuators, controls and power circuits joined together for a specific application, in particular for the process, the treatment, the moving or material packaging

#### 1.2 **LASER SYSTEM,**

Machinery where a Laser source is inserted that has sufficient energy to interact with the working piece, and it has all functional and safety aspects of a machine ready for the use.

#### 1.3 **MANUFACTURER**

Person or organization that assembles the laser system.

#### 1.4 **COMPLEX COMPONENT**

Element used for the equipment production, but that it cannot consider a machine not having an intrinsic function for the final use.

#### 1.5 **INSTALLED SYSTEM**

It is constituted from more machinery and/or systems arranged so as to produce a specific objective but not used to be placed on the market as single commercial unit.

#### 1.6 **ELECTROMAGNETIC COMPATIBILITY**

Device suitability, machinery, or a system to function in its electromagnetic environment in satisfying way, without introduce unacceptable electromagnetic disturbances for all that find in this environment, including both the emission requirements (disturbance produced from the device) both immunity (machine insensitivity) to the disturbances produced from the environment.

#### 1.7 **SECOND ENVIRONMENT**

Environment that includes all industrial users different from those ones connected directly to a low voltage electric feeding net that feeds buildings used for domestic use.

#### 1.8 **IN SITU**

Environment in which the equipment is installed for normal use on behalf of the final user and in which the equipment must be tested

#### 1.9 **ENCLOSED DISTRIBUTION**

Marketing modality in which the manufacturer restricts the devices supplying to suppliers, customers or users that, separately or together, have technical competences about the



E.M.C. for the electric and electronic equipment installation and that foresee, through technical specifications exchange to the “in situ” measurements of the outline effective conditions.

### **Reference documents and sector standards**

**CEI EN 60825-1: Safety of laser products. Part 1: Equipment classification, requirements and user's guide**

**CEI EN 61000-6-1: Electromagnetic compatibility (EMC). Generic standards. Immunity for residential, commercial and light-industrial environments**

**CEI EN 61000-6-3: Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments**

**CEI EN 60204-1: – Parte 1: Safety of Machinery - Electrical Equipment of Machines – Part 1: Specifications for General Requirements.**

### **Conformance to the Directives CEE and marking CE**

#### **3.1 CONDITIONS FOR THE CONFORMANCE TO THE EMC DIRECTIVES OF MASTERS LASER SOURCES**

The Laser sources conformances defined in the title of the present paragraph to the Directives about the Electromagnetic Compatibility are valid only for the here follow listed conditions.

3.1.1 THE SOURCES DEFINED IN THE TITLE OF THE PRESENT PARAGRAPH ARE COMPLEX COMPONENTS SOLD TO BE INCLUDED AS EQUIPMENT PART OR INSTALLED SYSTEM: SO THE SOURCE OPERATIVE CONDITIONS INSIDE THE SYSTEM MUST BE THOSE PRESCRIBED IN THE PARAGRAPH OF THE PRESENT PUBLICATION.

3.1.2 THE SOURCES DEFINED IN THE TITLE OF THE PRESENT PARAGRAPH ARE DEALED IN RESTRICTED DISTRIBUTION SYSTEM; SO THE INSTALLER AND/OR THE USER KNOW THE REQUIREMENTS ABOUT THE ELECTROMAGNETIC COMPATIBILITY.

3.1.3 THE SOURCES DEFINED IN THE TITLE OF THE PRESENT PARAGRAPH MUST BE INSTALLED IN ACCORDANCE WITH THE INSTRUCTIONS OF THE PRESENT PUBLICATION, AND BESIDES THE HERE FOLLOWED PRESCRIPTIONS MUST BE STRICTLY RESPECTED, INCLUDED THE IN SITU VERIFICATION OF THE FINAL RESPECT TO THE DIRECTIVES.

3.1.4 THE SOURCES DEFINED IN THE TITLE OF THE PRESENT PARAGRAPH ARE DESTINED ONLY TO THE USE IN THE SECOND ENVIRONMENT.

### **11.1 CONFORMANCE DECLARATION**

Elettrolaser S.r.l. declares that, in the conditions specified in the present document the MASTERS source results in conformance to the Community Directives of LOW VOLTAGE in accordance with the standards references described in the paragraph 2.

#### **NOTE FOR THE APPLICATION OF OTHER CEE DIRECTIVES**

The LASER sources aren't subjected to other CEE Directives, besides to those ones listed in the paragraph 2. Nevertheless, for applicative reasons, recalls in other Directives exist; in particular to comply with what requested in the art.4 of the Machines Directive CEI EN 61000-6-1, here follow is showed the incorporating declaration.



## MANUFACTURER DECLARATION

Elettrolaser S.r.l., WITH THE AIM OF WHAT REQUESTED IN THE MACHINES DIRECTIVE, declares that the MASTERS source must be installed in accordance with own instructions and it must not be in service up to that the machines haven't been declared in conformance with the above mentioned Directive.

## CHAPTER 12 TECHNICAL ASSISTANCE

### 12.1 WELDING PARAMETERS

	POWER	SPOT	TIME m/s	FREQUENCY	WAVE
<b>Oro Giallo sottile</b> <b>Yellow Gold thin</b>	2.0	0.2	2.0	5.0	SLO+
<b>Oro Giallo filo</b> <b>Yellow Gold wire</b>	2.4	0.4	2.4	6.5	SLO+
<b>Oro Giallo spalmato</b> <b>Yellow Gold spal</b>	3.6	0.7	3.6	6.5	SLO+
<b>Oro Bianco sottile</b> <b>White Gold thin</b>	1.5	0.2	1.6	6.5	SLO-
<b>Oro Bianco filo</b> <b>White Gold wire</b>	1.7	0.4	1.7	6.5	SLO-
<b>Oro Bianco spal</b> <b>White Gold spal</b>	2.3	0.8	2.1	6.5	SLO-
<b>Oro Rosso sottile</b> <b>Red Gold thin</b>	1.6	0.2	1.9	5	SLO+
<b>Oro Rosso filo</b> <b>Red Gold wire</b>	1.8	0.3	2.2	5	SLO+
<b>Oro Rosso spal</b> <b>Red Gold spal</b>	3.2	0.6	3.1	6.5	SLO+
<b>Argento sottile</b> <b>Silver thin</b>	3.7	0.3	3.7	5	NORM
<b>Argento filo</b> <b>Silver wire</b>	4.2	0.3	4.2	5	NORM
<b>Argento spal</b> <b>Silver spal</b>	4.5	0.4	4.5	4	NORM
<b>Platino sottile</b> <b>Platinum thin</b>	1.8	0.4	0.8	5	NORM

<b>Platino filo</b> <b>Platinum wire</b>	1.8	0.5	1	1.6	NORM
<b>Platino spal</b> <b>Platinum spal</b>	2.2	0.8	1.8	1.9	NORM
<b>Acciaio sottile</b> <b>Stainles steel thin</b>	1	0.3	1	6	NORM
<b>Acciaio filo</b> <b>Stainles wire</b>	1.2	0.5	1.2	7	NORM
<b>Acciaio spal</b> <b>Stainles steel spal</b>	1.8	0.7	1.8	7	NORM
<b>Titanio sottile</b> <b>Titanium thin</b>	1.8	0.7	1.8	7	NORM
<b>Titanio filo</b> <b>Titanium wire</b>	1	0.2	0.2	2.5	NORM
<b>Titanio spal</b> <b>Titanium spal</b>	1.0	0.2	0.2	2.5	NORM
<b>Palladio sottile</b> <b>Palladio thin</b>	1.6	0.2	1.3	5.0	NORM
<b>Palladio filo</b> <b>Palladio wire</b>	1.8	0.5	1.6	6.5	NORM
<b>Palladio spal</b> <b>Palladio spal</b>	2.4	0.7	1.8	8	NORM
<b>Alpacca sottile</b> <b>Alpacca thin</b>	1.6	0.7	1.4	5	NORM
<b>Alpacca filo</b> <b>Alpaca wire</b>	1.4	0.	1.4	7.0	NORM
<b>Alpacca spal</b> <b>Alpacca spal</b>	1.	0.9	1.9	8	NORM

For technical support, please contact us at the following:

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