



OPERATING AND MAINTENANCE MANUAL

LS900 XP LS900 IQ LS900 ENERGY

ENGRAVING LASER / CUTTING LASER



M_LS900 XP IQ Energy_EN_B - Last updated: 11/2017 - Translation of the French original document



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A. Foreword

1. Appreciation

Thank you for choosing LS900 XP IQ Energy - Gravograph.

Gravotech is pleased to count you among the users of its engraving and traceability solutions.

For help, contact Gravotech.

For more information on products, visit www.gravograph.com website.

2. Information

	<p>To ensure security and productivity, read this manual before starting-up the equipment. It provides details about the installation and use of the equipment.</p> <p>Keep this manual in case you need to refer to it.</p>
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	<p>For the attention of users having an individual cardiac assist device fitted:</p> <p>Our equipment is designed and manufactured with the greatest care in order to guarantee their compliance with the EMC Directive currently in force. This means that the levels of electromagnetic emissions produced by this equipment when in operation are limited and do not exceed the thresholds defined by the Directive.</p> <p>However, multiple factors make it impossible to guarantee the total absence of risk for users having a cardiac assist device fitted. Consequently, it is recommended that standing for a prolonged period within less than 1 m (3.281 ft) of an operating machine should be avoided.</p>
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B. Legal notices

Last updated: 10/15

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C. Regulation observance

Last updated: 06/2017

EC declaration of conformity or declaration of incorporation supplied with the machinery

Type of machine	Directives - Standards
<p>Dot peen marking: Machine XF500p, XF500m, Medrix Id, MR7000 P5000PN, P5000EM, Impact, Impact eZ</p> <p>Scribing marking: Machine M10 Jewel, M20 Pix, B-Engraver RingCube, TagCube, MedalCube</p> <p>Sharpening by grinding: Machine CG30, CG100</p> <p>Bevelling: Machine B4, B6</p> <p>Engraving by milling: Machine IM3, TXL M20, M20 Jewel, M20 ABC, M20 Pen, M20 Energy, M20 Beauty Cube M40, M40 Deep vice, M40 Gift, M40 ABC IS200, IS200 TX, IS400, IS400 Volume, IS900 IS6, 7, 8000 - XP - XP Milling</p> <p>Hot foil stamping: Machine M20 Artfoil, M40 Artfoil</p>	<ul style="list-style-type: none"> - Machinery: 2006/42/EC - Low voltage: 2014/35/EU - EMC: 2014/30/EU - RoHS 2: 2011/65/EU
<p>Dot peen marking: Transportable machinery - Partly completed machinery XF520p, XF530p, XF530m</p> <p>Dot peen marking: Partly completed machinery XF510p, XF510m, XE310p, XE320p</p> <p>Scribing marking: Partly completed machinery XF510r, SV510</p> <p>CCU, Rack, TouchPad UC500, UC500 SV, UC300, UC520, UC Laser Racks IS</p> <p>Laser fume extractor ES10, ES20, ES30, ES40, ES50 LE120HP, LE140HP, LE150HP, LE190HP, LNI900</p> <p>Accessory: Partly completed machinery APF Rotary, APF Laser PFD500 TAG3500 Cylinder attachment DMC, DP RD1, RD2, RDM</p>	<ul style="list-style-type: none"> - Low voltage: 2014/35/EU - EMC: 2014/30/EU - RoHS 2: 2011/65/EU
<p>Dot peen marking: Portable machine XM700 M7000</p>	<ul style="list-style-type: none"> - Machinery: 2006/42/EC - Low voltage: 2014/35/EU - EMC: 2014/30/EU - RoHS 2: 2011/65/EU - Cells and batteries: 2006/66/EC
<p>CO2, Yag and fiber laser marking: Machine (gantry) LS100 Energy, LS100 Ex Energy, LS900 Energy LS100, LS100 Ex, LS900, LS900 XP, LS1000XP LS100 Ex Fibre, LS900 Fibre LS900 Edge</p> <p>CO2, Yag and fiber laser marking: Machine (galvo) Fibre100, Fibre200, Fibre300, Yag200 LW1, LW2 (LaserTop 2000) Laser Solution Hybrid-Series, Laser Solution Green-Series, Laser Solution CO2-Series</p>	<ul style="list-style-type: none"> - Machinery: 2006/42/EC - Low voltage: 2014/35/EU - EMC: 2014/30/EU - RoHS 2: 2011/65/EU <p>- Safety of laser products - Part 1: Equipment classification and requirements: EN 60825-1:2008</p> <p>- Safety of laser products - Part 4: Laser guards: EN 60825-4+A1+A2:2006</p>
<p>CO2, Yag and fiber laser marking: Partly completed machinery (galvo) – Class 4 TC500 TD412, TG400 Laser Solution Fiber-Series, TF410, TF420, TF430, TF450</p>	<ul style="list-style-type: none"> - Low voltage: 2014/35/EU - EMC: 2014/30/EU - RoHS 2: 2011/65/EU <p>- Safety of laser products - Part 1: Equipment classification and requirements: EN 60825-1:2008</p> <p>- Safety of laser products - Part 4: Laser guards: EN 60825-4+A1+A2:2006</p>

D. Required safety labels

Last updated: 12/2016

	Required safety labels	
Shared labels	 LASER RADIATION	 Electrical hazard
LS100 LS100 Ex LS100 energy LS900 LS900 XP LS1000 XP	 Flammable materials  Hot surface	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; padding: 5px;"> <p>AVOID EXPOSURE VISIBLE AND INVISIBLE LASER RADIATION IS EMITTED FROM THIS APERTURE</p> </div> <div style="width: 50%; padding: 5px;"> <p>CAUTION INVISIBLE AND VISIBLE CLASS 4 LASER RADIATION WHEN OPEN AND INTERLOCK DEFEATED. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION.</p> </div> <div style="width: 50%; padding: 5px;"> <p>LASER RADIATION DO NOT STARE INTO BEAM WAVELENGTH : 630-680 nm OUTPUT : 1 mW max CLASS 2 LASER PRODUCT</p> </div> <div style="width: 50%; padding: 5px;"> <p>THIS LASER SYSTEM CONTAINS A CLASS 4 CO₂ LASER IN A CLASS 1 ENCLOSURE. IT HAS BEEN CLASSIFIED AS CLASS 2 DUE TO THE PRESENCE OF A VISIBLE LASER DIODE</p> </div> <div style="width: 50%; padding: 5px;"> <p>NEVER OPERATE THE LASER SYSTEM WITHOUT CONSTANT SUPERVISION. EXPOSURE TO THE LASER BEAM MAY CAUSE IGNITION OF COMBUSTIBLE MATERIALS WHICH CAN CAUSE SEVERE DAMAGE TO THE EQUIPMENT</p> </div> <div style="width: 50%; padding: 5px;"> <p>CAUTION INVISIBLE CLASS 4 LASER RADIATION WHEN OPEN AND INTERLOCK DEFEATED. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p> </div> </div>
LS100 Ex Fibre LS900 Fibre	 Flammable materials  Hot surface	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; padding: 5px;"> <p>AVOID EXPOSURE VISIBLE AND INVISIBLE LASER RADIATION IS EMITTED FROM THIS APERTURE</p> </div> <div style="width: 50%; padding: 5px;"> <p>CAUTION INVISIBLE AND VISIBLE CLASS 4 LASER RADIATION WHEN OPEN AND INTERLOCK DEFEATED. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION.</p> </div> <div style="width: 50%; padding: 5px;"> <p>LASER RADIATION DO NOT STARE INTO BEAM WAVELENGTH : 630-680 nm OUTPUT : 1 mW max CLASS 2 LASER PRODUCT</p> </div> <div style="width: 50%; padding: 5px;"> <p>THIS LASER SYSTEM CONTAINS A CLASS 4 LASER IN A CLASS 1 ENCLOSURE. IT HAS BEEN CLASSIFIED AS CLASS 2 DUE TO THE PRESENCE OF A VISIBLE LASER DIODE</p> </div> <div style="width: 50%; padding: 5px;"> <p>NEVER OPERATE THE LASER SYSTEM WITHOUT CONSTANT SUPERVISION. EXPOSURE TO THE LASER BEAM MAY CAUSE IGNITION OF COMBUSTIBLE MATERIALS WHICH CAN CAUSE SEVERE DAMAGE TO THE EQUIPMENT TOXIC FUMES/PARTICLES MAY BE EMITTED BY THIS MACHINE</p> </div> <div style="width: 50%; padding: 5px;"> <p>CAUTION INVISIBLE CLASS 4 LASER RADIATION WHEN OPEN AND INTERLOCK DEFEATED. AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p> </div> </div>
Laser Solution Fiber-Series	<p>OPTICAL FIBER</p> <p>LASER APERTURE</p> <p>TOXIC FUMES / PARTICLES MAY BE EMITTED BY THIS MACHINE</p>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; padding: 5px;"> <p>VISIBLE AND INVISIBLE LASER RADIATION AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p> <p>CLASS 4 LASER PRODUCT</p> <p>PULSED YTTERBIUM FIBER LASER : 1064 nm PEAK POWER : < 100kW PULSED : > 10ns P.MEAN : < 100 W AIMING DIODE : 650nm 1mW max NF EN 60825-1</p> </div> <div style="width: 50%; padding: 5px;"> <p>CAUTION - CLASS 4 VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p> </div> </div>
Laser Solution Hybrid-Series	<p>LASER APERTURE</p> <p>TOXIC FUMES / PARTICLES MAY BE EMITTED BY THIS MACHINE</p>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; padding: 5px;"> <p>VISIBLE AND INVISIBLE LASER RADIATION AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p> <p>CLASS 4 LASER PRODUCT</p> <p>LASER DPSS PULSED : 1000-1200nm PEAK POWER : < 400kW PULSED : > 1ns FWHM P.MEAN : < 50 W AIMING DIODE : 600-700nm 1mW max NF EN 60825-1</p> </div> </div>
Laser Solution Green-Series	<p>LASER APERTURE</p> <p>TOXIC FUMES / PARTICLES MAY BE EMITTED BY THIS MACHINE</p>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; padding: 5px;"> <p>VISIBLE AND INVISIBLE LASER RADIATION AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p> <p>CLASS 4 LASER PRODUCT</p> <p>LASER DPSS PULSED : 520-540nm PEAK POWER : < 200kW PULSED : > 1ns FWHM P.MEAN : < 30 W AIMING DIODE : 600-700nm 1mW max NF EN 60825-1</p> </div> </div>
LW1 - LW2 (LaserTop 2000)	<p>LASER APERTURE</p> <p>OPTICAL FIBER</p> <p>TOXIC FUMES / PARTICLES MAY BE EMITTED BY THIS MACHINE</p>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; padding: 5px;"> <p>WARNING</p> <p>THIS MACHINE HAS A CLASS 4 LASER BOXED IN A CLASS 1 CASING THIS MACHINE IS CONSIDERED AS CLASS 2M DUE TO ITS VISIBLE DIODE LASER</p> <p>VISIBLE AND INVISIBLE LASER RADIATION DO NOT STARE AT THE BEAM OR OBSERVE IT DIRECTLY WITH AN OPTICAL INSTRUMENT</p> <p>CLASS 2M LASER PRODUCT</p> </div> <div style="width: 50%; padding: 5px;"> <p>CAUTION - CLASS 4 VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p> </div> <div style="width: 50%; padding: 5px;"> <p>CAUTION - CLASS 4 VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCKS DEFEATED AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION</p> </div> </div>

E. Introduction

1. Presentation

The LS900 IQ/ LS900 XP is an engraving, marking and cutting machine equipped with a CO2 laser source. The laser sources are air cooled.

The LS900 ENERGY is an engraving, marking and cutting machine equipped with a CO2 laser source with a high voltage supply and a water-cooled glass tube. A water chiller is supplied.

This type of laser offers very high quality marking on a wide range of materials.

2. Identification of the marking equipment

The marking equipment is identified by:

- 1 identification plate on the rear face

Have the model and serial number of the equipment available when contacting Gravotech.

3. Work station safety

- Turn off the machine before beginning any cleaning, maintenance or repair procedure.
- Never operate the machine without the protective covers properly mounted.
- Never operate the machine if the doors are damaged or do not close properly.

■ Air extraction system

- **Never operate the machine without a fume and gas extraction system that is properly configured, installed and maintained in good working order.**
- The gases and fumes from the marking process must be extracted from the machine and discharged outside.

Introduction

- Water chiller - only for ENERGY machines



Never operate the LS900 ENERGY machine without a properly operating water chiller that is correctly configured, installed and maintained in good working order.



In order to protect the chiller pump, it is strictly prohibited to operate it without demineralised water in the tank. To avoid damaging the pump, it is important to fill the tank before using it for the first time.

- It is important to check that the demineralised water level is always adequate. Cooling capacity begins to decline when the demineralised water level falls below the green area (NORMAL) on the gauge.



- Never drain the water tank while the chiller is in operation.
- Ensure that the air intake and air outlet are well ventilated. There must be a clearance of at least 8 cm (3.150 in) at the air intake and of 30 cm (11.811 in) at the air outlet.
- Beware of water condensation. In areas of higher ambient humidity and when the temperature of the water is below room temperature, condensation forms on the water pipes and cooled components. In this event, it is advisable to increase the water temperature or to warm up the pipes and cooled components.

Introduction

■ Handling the machine

- Never move or lift the machine without the assistance of lifting rings and an appropriate vehicle. Serious injury can occur if incorrect lifting techniques are used.
- The head must be handled with the greatest care.
- **Never subject the bridge X of the machine to a magnetic field (only for LS900 XP machines):**



- In the event of an extended period of non-use, unplug the power cable and protect the machine.
- Never move the head manually unless the machine is jammed mechanically.
- Never pour or spill liquid on the machine (drinks, cleaning products, etc.) except where recommended by Gravotech (Example: Lubrication).

F. Unpacking

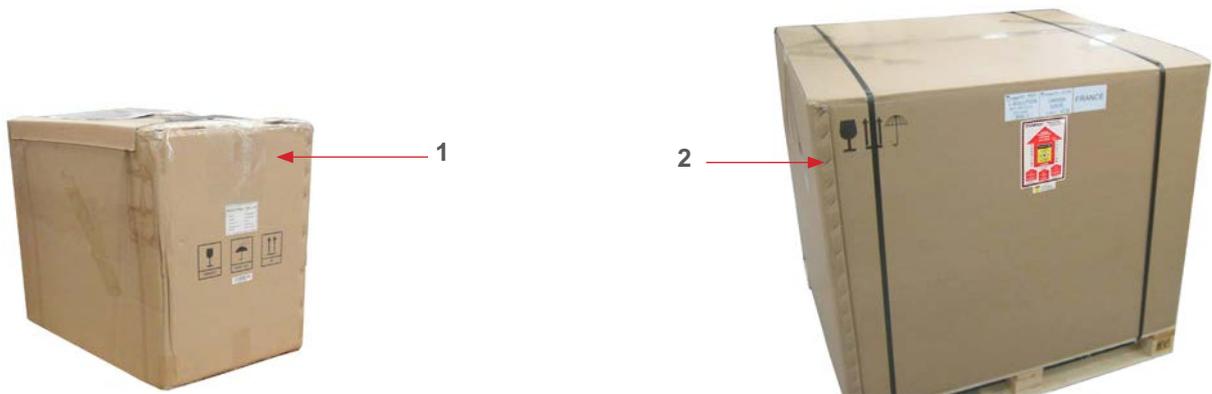


The machine should be carried in its packaging using a lifting system that can lift 400 kg (881.849 lb) or more.

1. Unpacking

only for ENERGY machines:

1. Separate the 2 parcel(s).



1. *Water chiller*
2. *LS900 ENERGY*

For all machines:

2. Cut and remove the packaging straps.



1. *Strap(s)*
2. *LS900 XP - LS900 IQ - LS900 ENERGY*

Unpacking

3. Remove the cardboard.



1. Strap(s)
2. LS900 XP - LS900 IQ - LS900 ENERGY

4. Remove all the protective elements.



1. LS900 XP - LS900 IQ - LS900 ENERGY

5. Remove the machine from the packaging (1 person(s) on each side).

6. Remove the water chiller from the packaging (1 person(s) on each side) (only for ENERGY machines)

Check that nothing is missing from the parcel. If anything is missing, contact Gravotech.

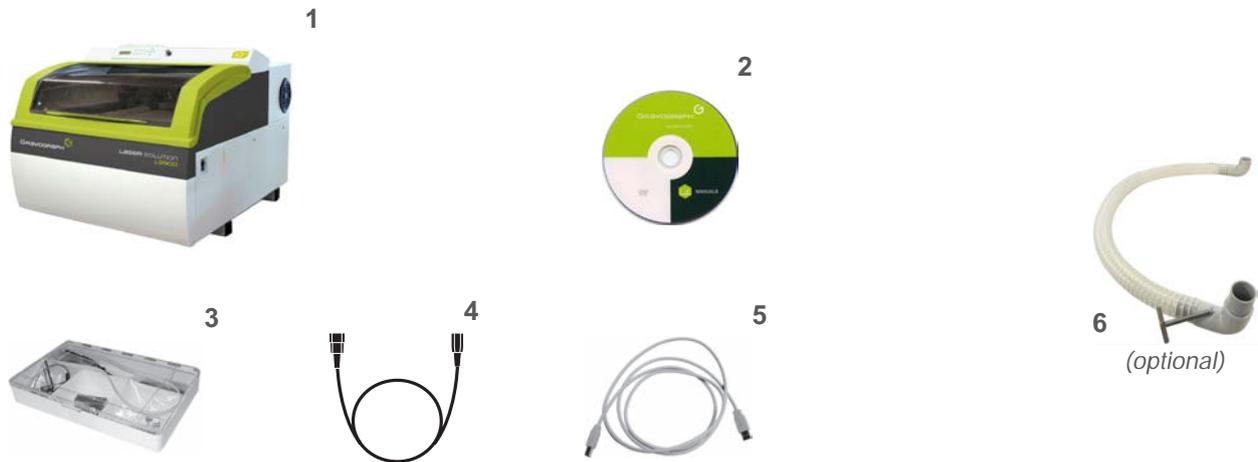
Keep the packaging in order to move the machine safely. This packaging is designed to protect the machine during shipping (return for repair...).

The packaging complies with European recycling standards.

Unpacking

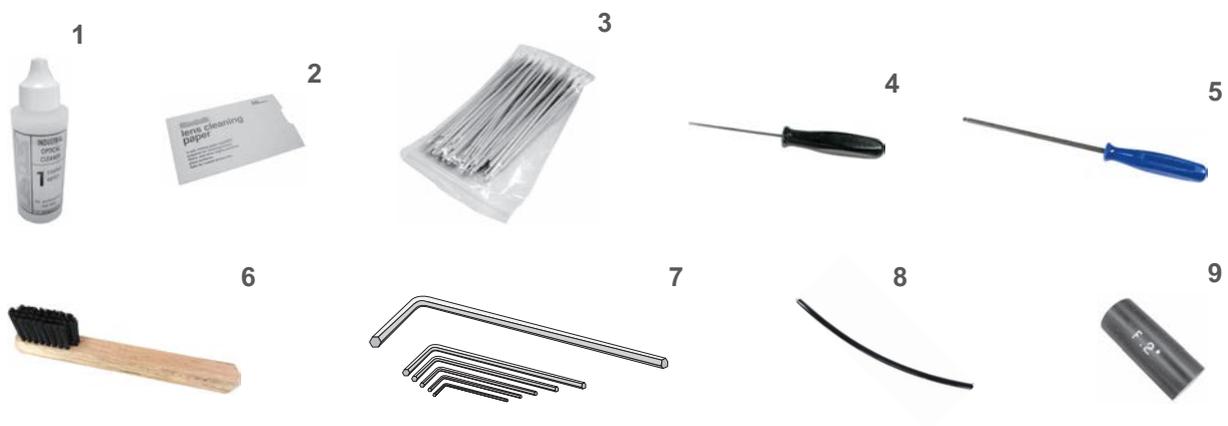
2. Package contents

■ Package contents - Machine



1. Machine: LS900 XP - LS900 IQ - LS900 ENERGY
2. 1 CD-ROM with user manual
3. Toolbox
4. Power cable
5. USB cord
6. Suction hose (optional)

■ Toolbox: Content



1. 1 bottle(s) of cleaning solution
2. 1 packet(s) of lens cleaning wipes
3. 1 packet(s) of cotton buds for mirrors
4. Driver
5. Ball-tip hex key
6. Brush
7. Set of 6 keys
8. Compressed air hose for air assist (Length: 100 mm (3.937 in) - Tube diameter: 4 mm (0.157 in))
9. Autofocus adjustment gage - LS900 XP - LS900 IQ - LS900 ENERGY

Unpacking

■ Package contents - Water chiller - only for ENERGY machines



1. *Water chiller*
2. *Cardboard box*

■ Cardboard box: Content - only for ENERGY machines



1. *Power cable*
2. *Water hose(s)*
3. *Outlet connector*
4. *2 Hose clamp(s)*
5. *O ring*

G. Laser safety

1. Recommendations and safety regarding laser devices

■ Personnel safety

THIS MACHINE HAS A CLASS 4 LASER BOXED IN A CLASS 1 CASING. THIS MACHINE IS CONSIDERED AS CLASS 2M DUE TO ITS VISIBLE DIODE LASER (Red).

- The machine is considered as Class 1 when the door is closed. In this case, the security enclosure of the LS900 XP/LS900 IQ/LS900 ENERGY is locked and sealed against potential Laser radiation emissions under normal working and safety conditions. The modification of locking systems, or the removal of these systems or labels designed for safety, will result in exposure to hazards from the Laser beam. Any modification is prohibited. The LS900 XP/LS900 IQ/LS900 ENERGY is closed, locked and labelled to ensure that it works in complete safety. The labels and security devices must not be removed or concealed by the operator.
- The machine is considered as Class 2M when the door is opened (emission power equal to or less than 1 mW). In this case, the security shutter in the Laser module closes to avoid any risk of Laser emission. The marking can only be carried out if the door is closed.

If the machine is being integrated, the installer is responsible for ensuring the final equipment conforms to current legislation. Observe EN 60825-1 standard concerning the controls and signage (access panels, doors, emergency stops...). Example: application of safety pictograms, installation of suitable guards, use of the electrical safety channel provided on the equipment (non-exhaustive list).

Only trained personnel aware of the risks posed by the machine are authorized to use it. Only Gravotech personnel, or persons authorized by Gravotech may service the elements that constitute the marking machine. Any intervention by unauthorized third party would exclude Gravotech's liability.

Laser radiation is invisible, but exposure, direct or scattered, is hazardous to skin and eyes.

Do not use this marking equipment in an explosive environment. No inflammable material should be located within the machine enclosure near the reflected beam (operator's shirt, curtains, wall covering in non-synthetic material: fire hazard). For safety reasons, never operate the machine without constant surveillance.

This laser can produce dangerous diffuse reflections. It may lead to skin and eye injuries as well as a fire risk. Its use requires extreme caution. Fire prevention and protection equipment is the user's responsibility. Do not look at the Laser beam continuously when marking, even through the protective glass. The light intensity may strain the eye.

The ENERGY laser sources must be cooled by means of a water chiller with the capability to control a minimum flow and a maximum water temperature. Do not modify or disable the chiller's safety devices.

Laser safety

2. Using the Passthrough feature - Class 4 - (optional)



	<p>When one of the retractable doors is open, the machine is no longer considered as Class 1 (in a secured area) but as Class 4. A controlled laser zone should be defined.</p>
---	--

Operators and service personnel must receive laser safety training. Carefully read the "Laser Safety" chapter. For help, contact Gravotech.

It is mandatory that the operator wear eye protection with the suitable filter lenses. (D LB4 @ 10600 nm). Any person standing in proximity to the laser must obey the same safety instructions.

Laser safety

3. Work station safety

- Proposed warning label at the entrance to the laser controlled zone (Using the Passthrough feature - Class 4)

	Specific hygiene and safety instructions - Personnel laser radiation protection
	Concerned industrial use installation:
	Use:
	Installation:
	Restricted area
	The room in which this sign is posted is defined as a restricted laser area:
	in normal production phase (1)
	maintenance and setting phase (1)
(1)
	Regulation in the restricted area
	Access to the restricted laser area is regulated. Only competent personnel having attended proper training can remain during the operation: this implies medical aptitude and laser safety training.
	Any person authorized access to the restricted area is to observe the rules provided by the employer.
	(1) To be filled in or crossed out.

Laser safety

■ General Instructions

	<p>Avoid any exposure to laser radiation.</p> <p>Do not put hands or an object in the laser beam's trajectory.</p> <p>Never stare into the primary laser beam.</p> <p>Do not direct the beam towards other persons, openings or windows.</p> <p>Avoid direct eye exposure to diode laser beam.</p> <p>Do not remove protection hoods or short-circuit the securities.</p> <p>Electrical interventions on the system can only be carried out by competent LT/HT personnel.</p> <p>In the event of an incident or even doubts concerning the functioning of the installation, inform the person in charge of laser safety.</p>
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■ Wearing safety glasses

Under normal conditions of use, the machine operates at Class 1 - 2M: protective goggles are not necessary.

	<p>Laser radiation safety glasses are mandatory whenever in an area where laser radiation emission exceeds class 3B AEL.</p>
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<p>Name and address of the doctor in charge of medical exams for personnel occupying the laser restricted area:</p> <p>..... Tel:.....</p>
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<p>Name and address of person in charge of the observance of laser security regulation in the restricted area:</p> <p>..... Tel:.....</p>

Laser safety

4. optical components

■ Safety precautions

	<p>The various optics included in this machine contain ZnSe (zinc selenide).</p> <p>When handling the optics, protective gloves should be worn.</p>
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- Particular attention is required when handling, fixing and cleaning these elements.
- Do not apply uneven pressure.
- The entire optical system (mirrors and lenses) in the beam guiding zone must be cleaned regularly.
- Do not use hard objects or tools to clean the surface.
- Never touch the optics with the bare hands.
- Never use the same cleaning cloths more than once.
- Discontinue the use of lenses showing signs of scratching or impact.

Dirty optics absorb the laser radiation and can be destroyed as a result. Cracked or damages lenses release particles which cause serious damage to health through inhalation or ingestion. This can cause irritation to the eyes, skin and respiratory tracts.

For information on first aid measures and on handling scratched or cracked ZnSe lenses, refer to the manufacturer's safety data sheets. By default, take the protective measures described in the paragraphs below.

■ Protective measures in the event of thermal decomposition or scored or scratched lenses

Deposits in the form of red or white powder and an unpleasant smell indicate that thermal decomposition of the ZnSe has occurred. Selenium oxide and zinc oxide vapours are formed. There is a risk of poisoning through inhalation or ingestion.

- 1. Remove the debris, using a safety mask or breathing filter to prevent inhalation or ingestion.**
- 2. Wash the hands after any contact with the coating of a scratched lens.**

■ Protective measures in the event of a broken lens

If a lens has been damaged or cracked during an operation, precautions must be taken to remove and clean it.

- 1. As soon as an unpleasant smell is detected, switch off the machine.**
- 2. Hold your breath.**
- 3. Leave the vicinity of the machine.**
- 4. Wait for at least 30minute(s) for the chemical reaction to run its course.**
- 5. Wear appropriate protective clothing (respiratory protection,safety glasses,protective clothing,rubber or plastic gloves).**
- 6. Ventilate the room.**

Laser safety

7. Return to the machine, checking for any smells.
8. Remove all the fragments of the lens.
9. Avoid raising or dispersing dust.

■ Arrangements for disposal

	<p>The ZnSe dust and the lens must be collected and disposed of as hazardous waste. They must be placed in hermetically sealed containers or plastic bags together with the fragments, brush, shovel and protective clothing used in the operation.</p> <p>Never dispose of optical components with household waste. And do not allow them to enter drains or water circuits.</p> <p>The equipment must be disposed of at an appropriate collection point for processing, sorting, and recycling of Waste Electronic and Electrical Equipment (WEEE).</p> <p>The removal of this waste must comply with the rules and laws in force within the user's country.</p>
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Laser safety

5. Potential hazards related to materials worked with

■ Fumes and toxic particles

	<p>Laser marking certain materials emits dangerous fumes and particles that may be toxic and/or damage the equipment. In this case, adapt an extraction system (with filtration if necessary) to the marking station.</p> <p>The user must check the compatibility of marked or engraved materials with the laser type..</p>
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The processing of parts using this type of Laser causes thermal and photo-electric (molecular) deterioration of the material. Even micro-quantities of the by-product (soot or fumes), created during Laser marking, may accumulate over a long period. Some of these by-products may prove to be hazardous to humans.

Health side-effects to the operators may include poisoning, allergies or cancer.

Here are some examples of the most sensitive materials:

- plastics and rubber
- painted materials
- anodized and galvanized metals
- ceramics
- materials containing lead or mercury

	<p>Do not cut, engrave or mark PVC-based (polyvinyl chloride) materials. The fumes are extremely toxic and can chemically destroy the metal parts of the machine.</p>
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For a more detailed list of the risks related to the material worked with, consult Annex A of the ISO 11553-1:2005 standard.

Laser marking certain materials emits dangerous fumes and fine particles that may damage health. The fumes and fine particles may damage the equipment.

Recommendations: Use an adapted extraction system with 3 levels of filtration: a pre-filter for large particles, a HEPA filter (retaining 99.97% of 0.3 μ particles) for fine particles and an activated carbon filter for dangerous fumes. The fume capture inlet should be as close as possible to the marking area.

The user must observe national legislation in force concerning chemical agent exposure limits.

For more information, contact us.

Laser safety

■ Examples of secondary radiation risks

The use of a class 4 laser device can generate:

- A risk of fire or explosion due to materials or inflammable substances
- UV radiation
- X rays
- high intensity visible light when marking on certain materials

6. High voltage safety - (only for ENERGY machines)

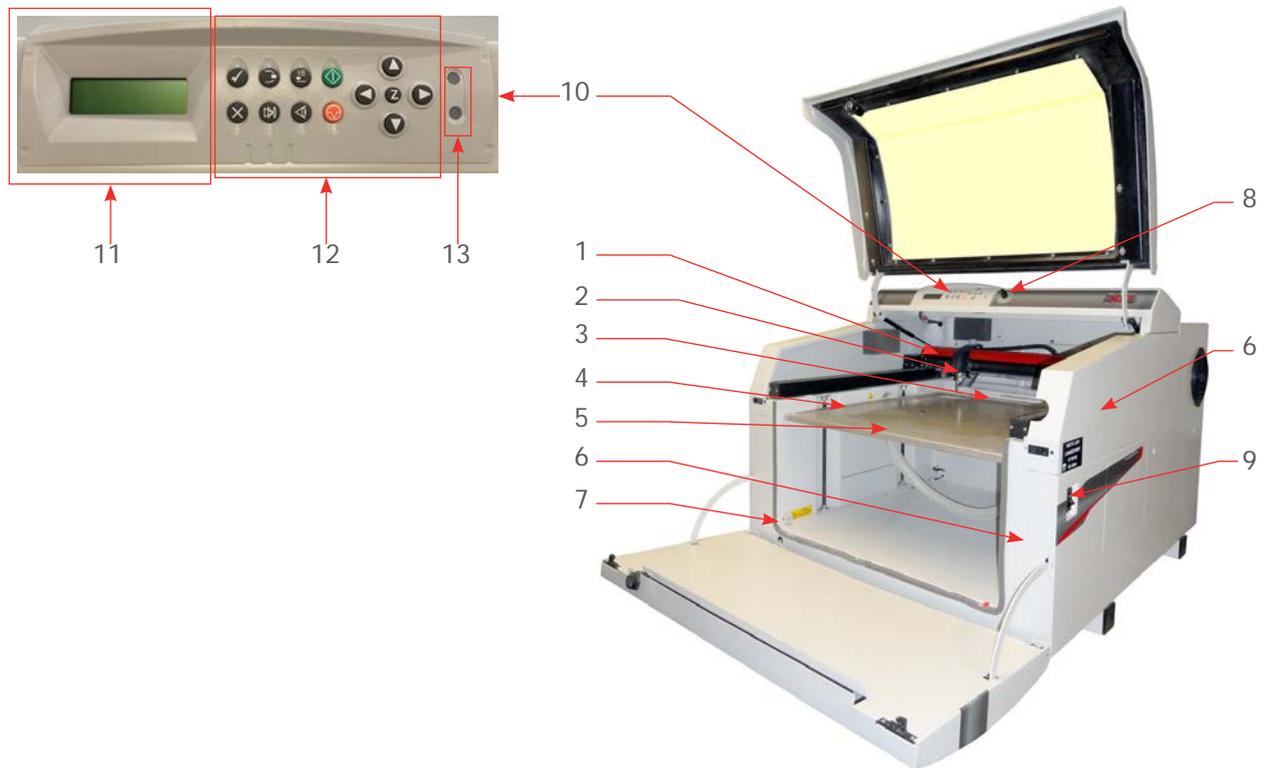
The sealed glass laser tube is supplied with high voltage (>20kV) by the anode located at the back of the laser source (left-hand side of the machine).

	<p>The high voltage is completely isolated. To prevent any risk of serious electric shock, the plastic cover must always be in place when the machine is switched on.</p> <p>Wait for 5 minute(s) before disconnecting the high voltage supply and replacing the glass laser tube. A fatal voltage nevertheless remains inside.</p> <p>Never open the high voltage supply. Only an approved Gravotech technician is authorised to carry out this operation.</p>
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H. Description of the machine

1. Front view of the machine

■ Engraving table



1. X bridge
2. Head
3. Ruler: X
4. Ruler: Y
5. Engraving table
6. Frame
7. Rotary device connection (optional)
8. Air assist: Adjustment button
9. General stop button (On / Off switch)
10. Control panel
11. LCD screen
12. Keyboard
13. Green light -Red light



Always switch the machine off before connecting or disconnecting the cylinder attachment (optional)

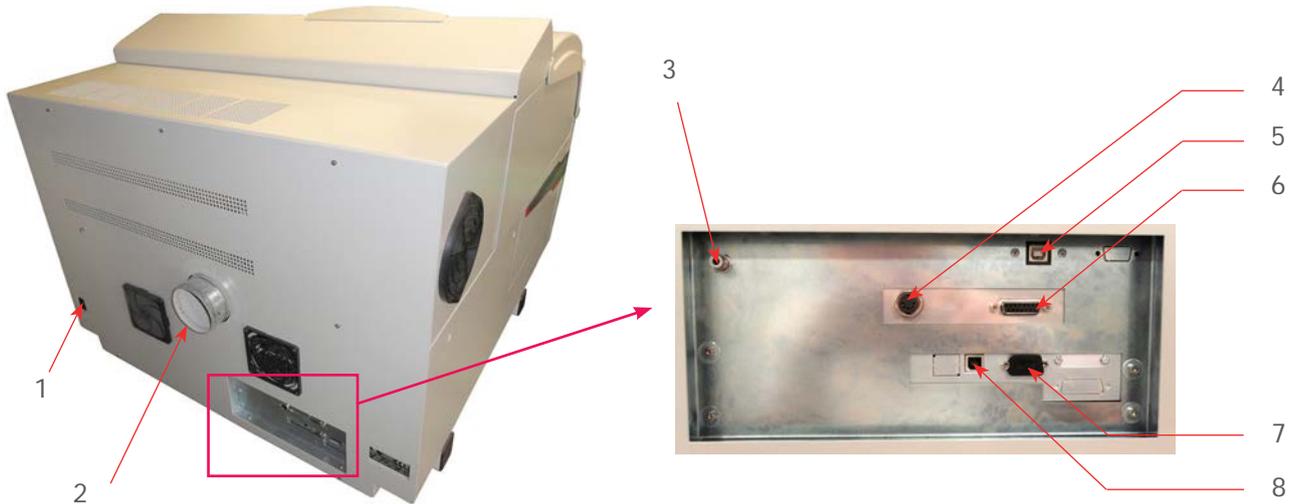
Description of the machine

2. Rear view of the machine

Each connection meets one of the following safety levels:

- Dangerous voltage.
- SELV (Safety extra-low voltage).

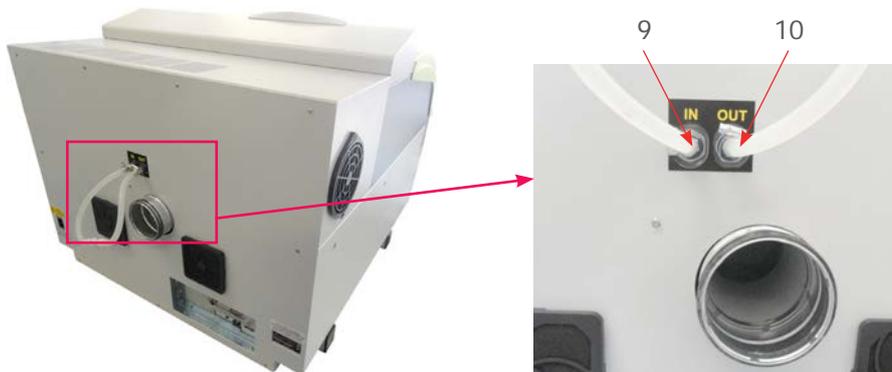
View of connectors



For all machines:

1. Power inlet / outlet - Dangerous voltage
2. Opening for air evacuation hose to air extraction system
3. Pneumatic connection for tube - Air assist
4. Input/output link: Air extraction system - SELV
5. Port: USB - SELV: Print and Cut
6. Standard input/output link - SELV
7. Do not use (The protective cap should not be removed under any circumstances.)
8. Port: USB - SELV: PC

only for ENERGY machines:



9. Hot water outlet (OUT) leading to the water chiller.
10. Cooled water intake (IN) coming from the water chiller.



To avoid the risk of electrocution, always unplug the power cable before removing the protective cover.

Description of the machine

3. Water chiller (only for ENERGY machines)

An industrial chiller is supplied with the machine, for the purposes of water cooling the ENERGY laser sources.

■ Front view



1. *Temperature controller*
2. *Insufficient flow alarm (Red light)*
3. *Air inlet (Air filter)*
4. *General stop button (On / Off switch)*
5. *Normal flow (Green light)*

■ Rear view



1. *Water tank intake*
2. *Cooling water intake (water to be cooled)*
3. *Water level gauge*
4. *Drain*
5. *Alarm output connector*
6. *Power inlet / outlet (with fuse)- Dangerous voltage*
7. *Cooling water outlet (cooled water)*
8. *Air outlet*

I. Recommendations for installation

	<p>The physical installation and connections must be done by a Gravotech approved technician.</p> <p>Turn off the machine before any intervention.</p>
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1. Physical installation

- Place the machine on a horizontal, stable and clean surface that can support 100 kg (220.462 lb) or more.
- Check that the engraving table is level in both directions (Adjust with a spirit level.)
- Place the machine in a clean, ventilated environment. Choose the location that offers the shortest and most direct route to the air extraction system (See: "Air extraction system (optional) ").
- Avoid small, confined, unventilated spaces. Some materials continue to emit gases for a few minutes after laser marking or cutting. The presence of these materials in a confined, unventilated room could contaminate the room.

	<p>To provide good ventilation and prevent the laser source, power supply and/or control unit module from overheating, leave a clear space of 20 cm (7.874 in) all around the machine. The back of the machine should be kept clear and should not be close to any items of furniture. It must not be placed on a shelf or installed in a corner.</p> <p>Overheating could seriously damage the machine and lead to major costs.</p>
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This marking equipment is designed to function at a room temperature between 10 °C (50 °F) and 35 °C (95 °F).

- If the equipment is stored at a temperature inferior to 10 °C (50 °F) or superior to 40 °C (104 °F), leave it 24h at a temperature between 10 °C (50 °F) and 35 °C (95 °F) before start-up. The dew point ambient temperatures must be below 10 °C (50 °F).
- Ambient light is enough to light the equipment properly. The machine has a lighting system inside the work area.
- Arrange the work area so that the operator can quickly and easily access all the external parts of the machine. Do not obstruct the movement of the moving parts of the machine.

	<p>Make sure the connector screws are properly tightened to prevent the cables from becoming disconnected while the machine is switched on. This could cause permanent damage to the circuit boards.</p> <p>The power cable must always be easily accessible (Power shut-off device).</p>
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Recommendations for installation

2. Water chiller (only for ENERGY machines)

The ENERGY laser sources must be cooled by means of a water chiller with the capability to control a minimum flow and a maximum water temperature. A water chiller is supplied.

The cooling parameters are preset in order to guarantee water temperature regulation with the triggering of a temperature alarm in the event of over-temperature.

Ensure that the air intake and air outlet are well ventilated. There must be a clearance of at least 8 cm (3.150 in) at the air intake and of 30 cm (11.811 in) at the air outlet.

The temperature must always be set above dew point temperature in order to prevent condensation.

The air intake and outlet filters must be cleaned regularly in order to prevent an accumulation of dust from obstructing the air flow.

Recommendations for installation

3. Air extraction system (optional)

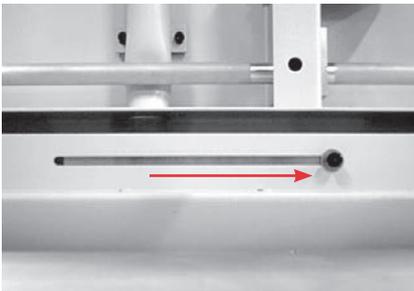
	<p>Never operate the machine without a fume and gas extraction system that is properly configured, installed and maintained in good working order. Laser marking certain materials emits dangerous fumes and fine particles that may damage health.</p> <p>Call an approved supplier to install an extraction system that complies with safety requirements and local regulations.</p>
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Fumes are extracted to the air extraction system through a hose connected to the opening at the back of the machine. This hose is not supplied with the machine but with the extractor.

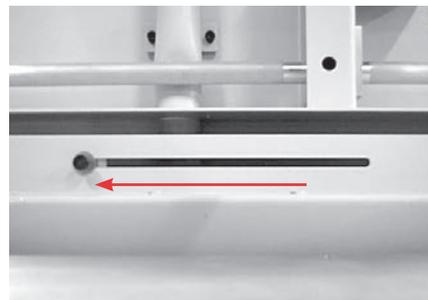


1. Opening for air evacuation hose to air extraction system

2 modes are available:



Head mode (extraction at head): Most efficient mode but requires a powerful vacuum extraction system



General mode (general extraction): Used to adapt an extraction system that has a good flow rate but not much suction. An air intake is provided in the double door.

	<p>Avoid combining the 2 modes.</p>
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Recommendations for installation

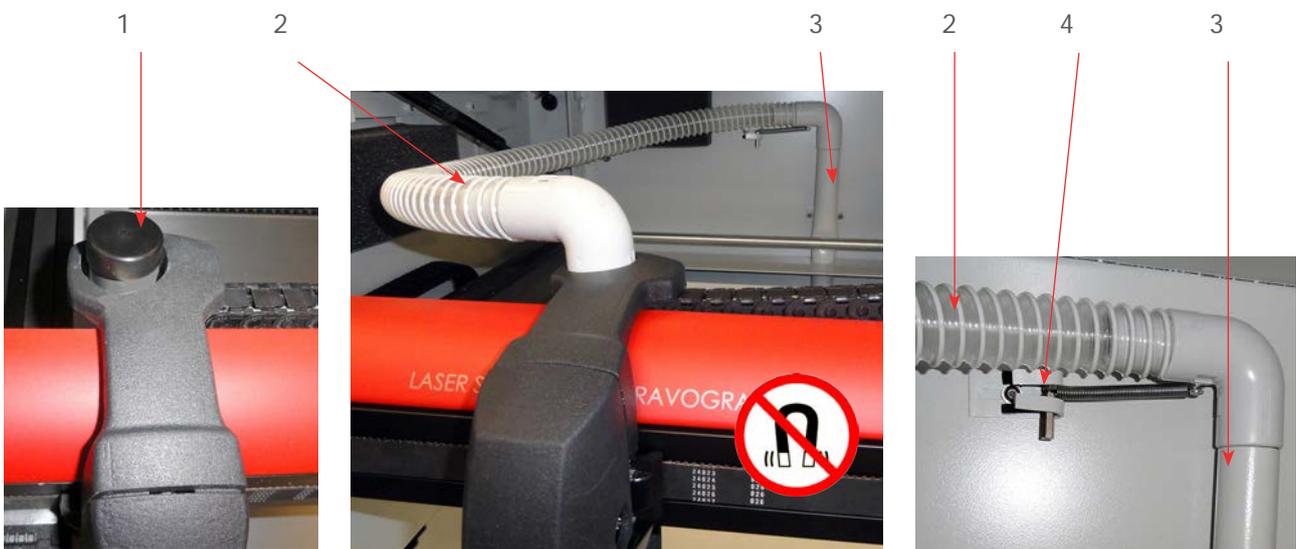
■ Head mode (option: Suction hose)

	<p>Before selecting head mode, install the suction hose on the machine. Install the hose only for engraving work at slow speeds of movement (Maximum: 1 m/s). At high speeds, it could be pulled off and damage the machine.</p>
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Suction hose: Installation:

1. Remove the protective cap on top of the head. Gently install the hose in place of the cap.

Do not press too hard on the head, otherwise it could be displaced or damaged.



1. Protection cap(s)
2. Suction hose (optional)
3. tube
4. Mounting point

2. Install the suction hose on the tube at the bottom of the engraving area. Attach the spring to the mounting point.

	<p>Always remove the suction hose before switching to general or high-speed head movement mode.</p>
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Air extraction system - Minimum characteristics:

	Head mode	General mode
Air flow rate	>150 m ³ /h	>300 m ³ /h
Under vacuum (Maximum)	>20 kPa	>0.5 kPa
Hose diameter	100 mm (3.937 in)	100 mm (3.937 in)

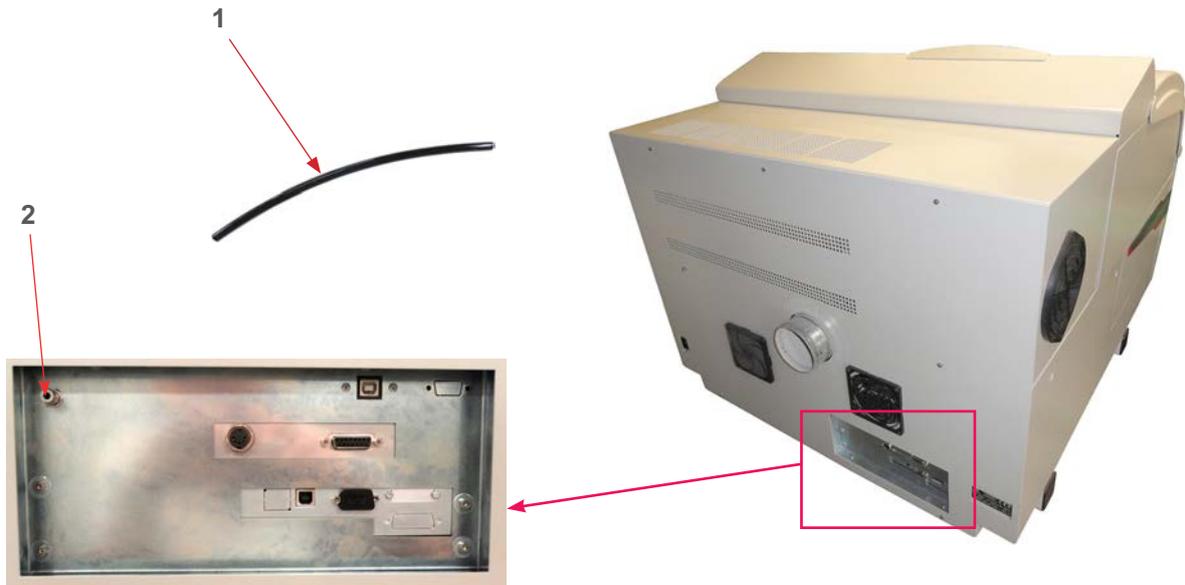
Recommendations for installation

4. Air assist (option: Air compressor)

The operation of the air assist system (blown air) requires the use of an air compressor (not supplied).

Configuration: Air flow rate: 12.4 l/mn(Minimum)

Use the compressed air hose supplied to connect the machine to the air compressor.



1. Compressed air hose for air assist (Length: 100 mm (3.937 in) - Tube diameter: 4 mm (0.157 in))
2. Pneumatic connection for tube - Air assist

Recommendations for installation

5. IT requirements

Hardware	Minimum configuration of the PC	Recommended configuration
Microprocessor	Dual Core	Quad Core
Frequency	2.7 GHz	2.4 GHz
RAM	2 Go / GB	4 Go / GB
Hard disk	3 Go / GB available	6 Go / GB available
DVD: Internal drive	16X DVD-ROM	16X DVD-ROM
Mouse	2 button(s) Windows®-compatible	2 button(s) + Thumbwheel - Windows®-compatible
Keyboard	Windows®-compatible	Windows®-compatible
Port(s)	2 USB port(s) available: - Protection key - Machine	4 USB port(s) available: - Protection key - Machine 1 - Machine 2 - Machine 3
Graphics card	NVIDIA Or ATI Radeon 512 Mo / MB	NVIDIA Or ATI Radeon DX10-compatible - 1 Go / GB
Monitor	17" - 1024 * 768 pixels	22" - 1280 * 1024 pixels
Peripheral(s)		Printer Twain scanner

The machine is an output peripheral, like a printer.

6. Software compatibility

Program Laserstyle:

Operating system	Version 32 bits	Version 64 bits
Windows® 7 SP1 - 8 - 10	-compatible	-compatible
Windows® Vista SP2	-compatible	-compatible
Windows® XP SP3	-compatible	Not -compatible
Windows® 2000	Not -compatible	Non-existent
Windows® 98	Not -compatible	Non-existent

Recommendations for installation

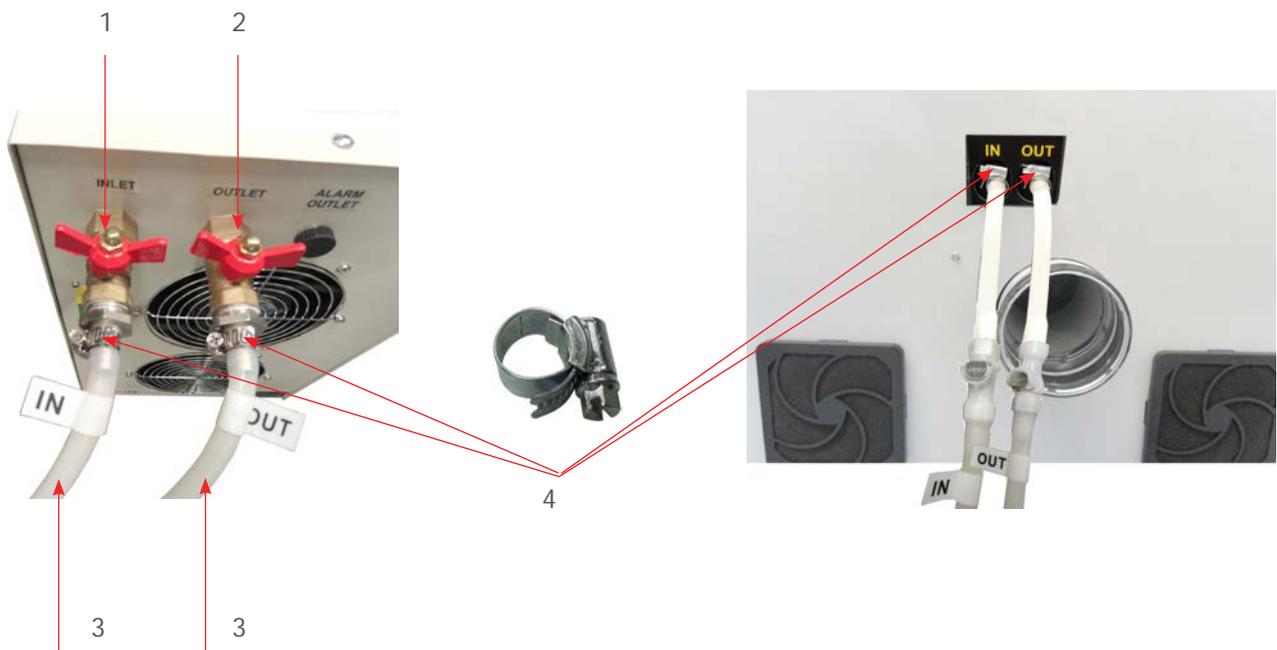
7. Connecting/disconnecting the water chiller - Filling the tank (only for ENERGY machines)

■ Initial installation (if necessary)

1. Remove the caps present on the water intake and outlet of the machine (retain them).



2. Fix the water hoses to the cooler and to the machine, using the hose clamps.

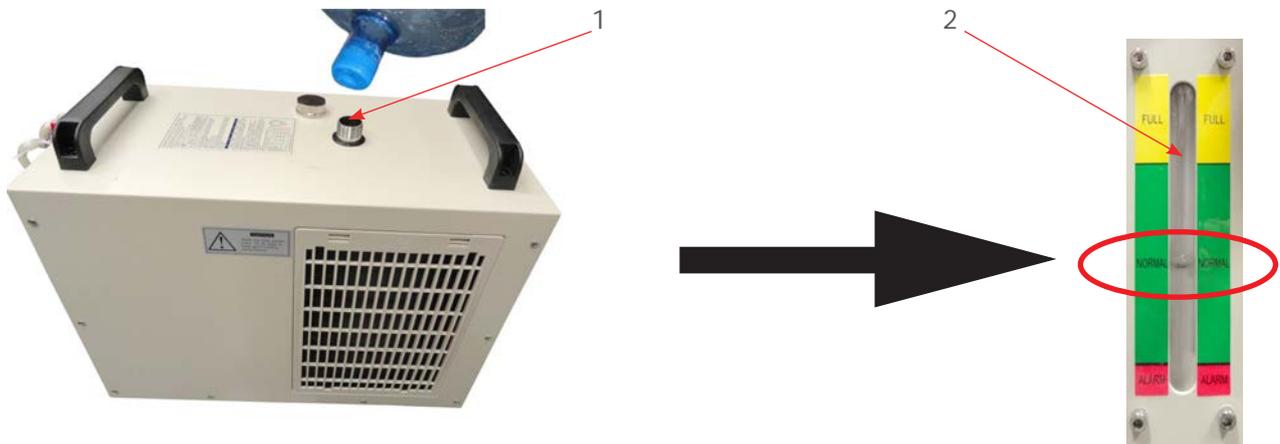


1. Cooling water intake (water to be cooled)
2. Cooling water outlet (cooled water)
3. Water hose(s)
4. Hose clamp(s)

Recommendations for installation

■ Filling the tank

1. Fill the tank with demineralised water until the water level reaches the green area (NORMAL) on the gauge. To avoid any contamination, it is recommended that a biocide be added to the demineralised water.



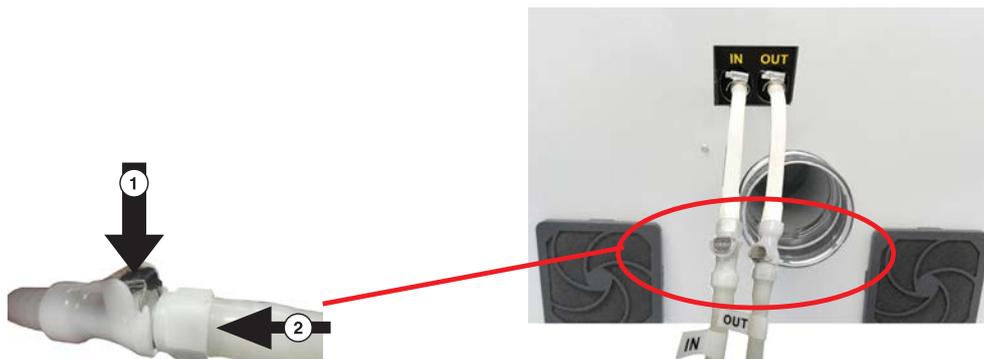
1. Water tank intake
2. Water level gauge



In order to protect the chiller pump, it is strictly prohibited to operate it without demineralised water in the tank. In order to ensure optimal performance, it is advisable to keep the water level in the tank within the green area (NORMAL) on the gauge.

Demineralised water must be used in the tank in order to prevent damage to the metal material.

2. Connect the water hoses between the cooler and the machine.



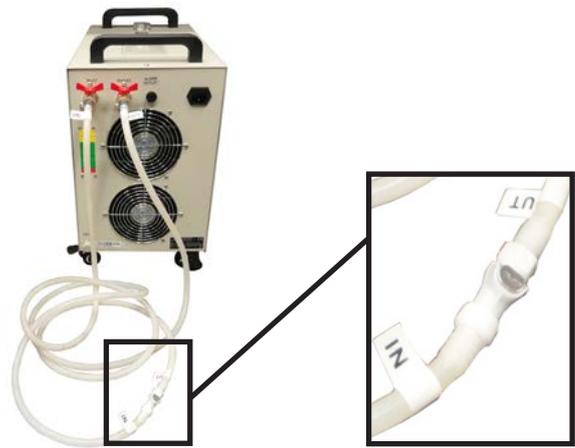
3. Open the water intake and outlet valves on the cooler.
4. Check that the drain plug is properly tightened.

Check that the hoses are properly connected. Make sure there are no leaks.

Recommendations for installation

■ Disconnecting the water chiller (shipping position)

1. Switch off the chiller.
2. Close the water intake and outlet valves on the cooler.
3. Disconnect the water hoses between the cooler and the machine.
4. Connect together the 2 water hoses attached to the machine. Connect together the 2 water hoses attached to the cooler.



Recommendations for installation

8. Electrical installation



The connection to the single phase power supply is made with a standard, 3 pin plug with grounding. Grounding must be done according to the regulations in effect to ensure the safety of the personnel.



Check that the electrical installation meets the requirements of the "Input power" label located close to the machine's power supply socket.

To avoid interference problems due to the external environment, observe the following:

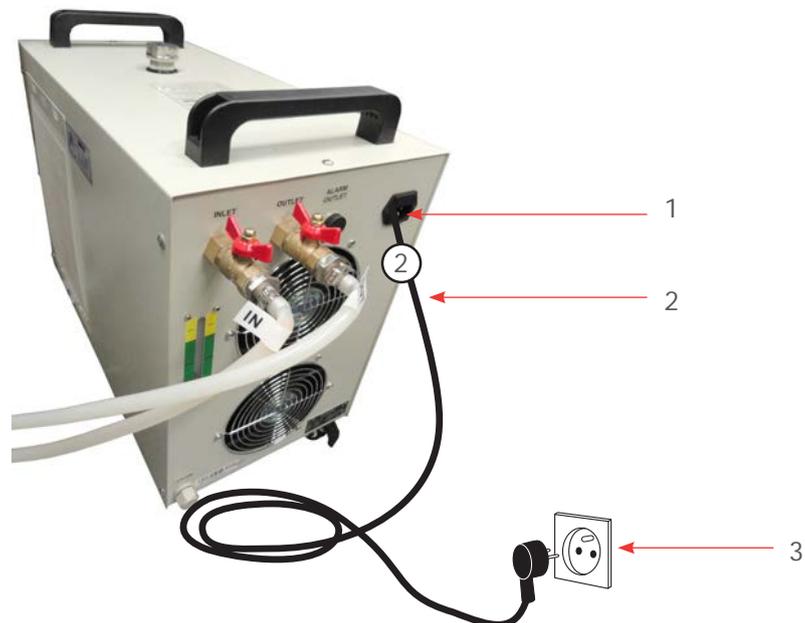
- Use the link cables supplied. They comply with EMC radio-frequency interference emission standards and provide protection from external electrical interference (compliant with EMC immunity and susceptibility standards).
- Bring the items of equipment to be linked as close together as possible to reduce the length of cable to be used.
- Separate the power cable from the link cable and make sure the power and link cables do not run through the same cable tray.
- Connect the machine direct to a mains power line and avoid connecting more than one device to that line (by plugging several devices into the same mains socket or into a multi-way adapter).
- Do not allow inductive or capacitive devices to be connected to the same mains power line as the machine (motors, solenoid valves, chargers, etc.).
- Avoid the installation of manual or automatic switching systems on the same mains power line as the machine (relays, timers, programmers, automatic circuit-breakers, automatic switches, etc.).
- Check that devices in the vicinity of the machine meet the standards for electromagnetic interference. Read the technical data sheet for each device. If they are non-compliant, move them as far away from the machine as possible.
- Use the Gravograph accessories.



Always switch the machine off before connecting or disconnecting a cable or optional accessory.

J. Connections - Installation

1. Power supply connection Water chiller (only for ENERGY machines)



1. Power inlet / outlet - Dangerous voltage
2. Power cable
3. Mains outlet

1. Connect the power cord to the chiller socket and then plug into the mains socket.

To cut the power supply to the chiller in the event of a major problem, unplug the power cord or actuate the general stop button on the chiller.

■ Switching on the chiller

Place the switch in the "I" position (On).

- The pump starts up immediately. The green indicator light illuminates and no alert is sounded.
- The screen displays the current water temperature.



Always switch on the chiller before the machine.

Check that the water cooling circuit is operating properly. Check that water cannot leak onto the electronic components of the machine.

Connections - Installation

■ Resolution of the problems: Water chiller

If the chiller does not switch on:

- Check that the power cord is connected correctly, on both the chiller side and mains side.
- Check that there is power to the mains plug.

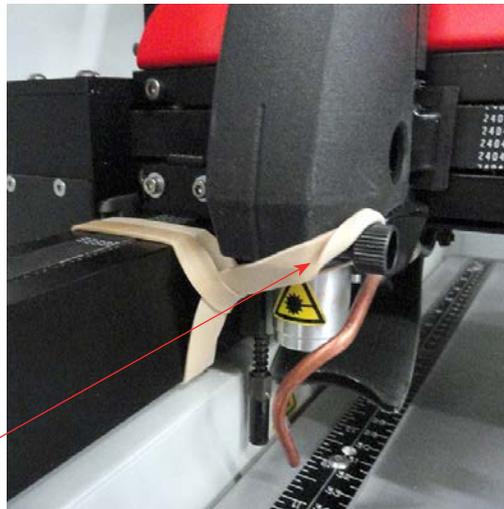
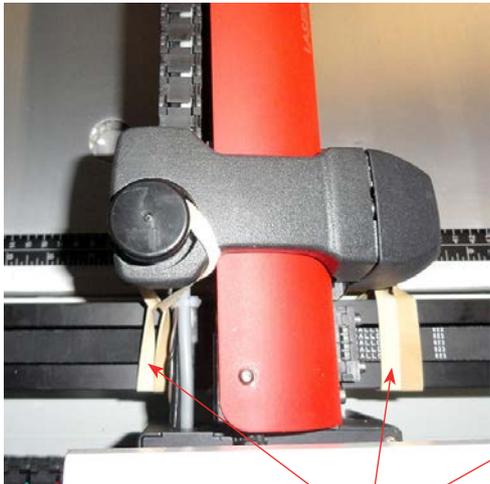
The chiller switches on but encounters a problem:

- Check that the intake and outlet valves are correctly opened.
- Check the water level in the tank.
- Check that the water hoses are correctly connected between the chiller and the laser machine.

K. Connections - Installation

1. Unblocking the head (shipping position)

To protect the head during shipping, it is immobilized using 2 elastic band(s). Remove them before operating the machine.

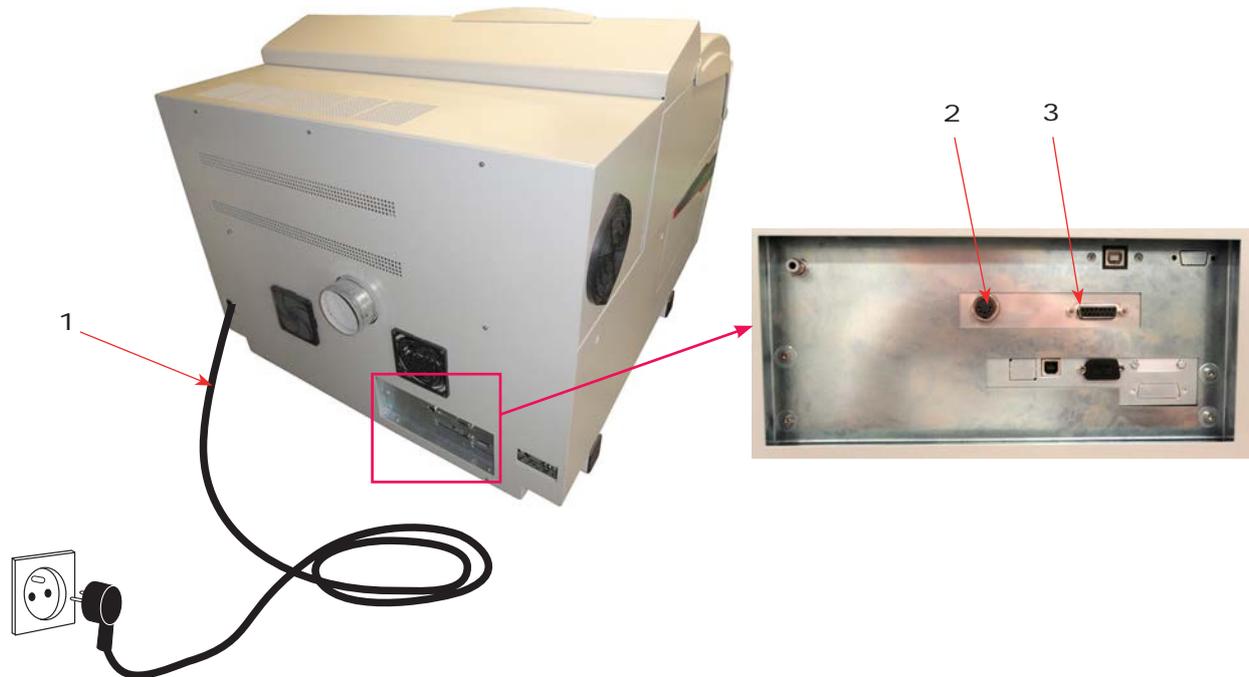


Elastic band(s)

Connections - Installation

2. Power supply connection - Machine

Rear view of the machine



1. Power cable
2. Input/output link: Air extraction system - SELV
3. Standard input/output link - SELV

1. Connect the machine/extraction system link cable on both sides.
2. Tighten the connector screws using the 3.5 screwdriver.



Make sure the connector screws are properly tightened to prevent the cables from becoming disconnected while the machine is switched on. This could cause permanent damage to the circuit boards.

3. Using the PLC function: Connect the user standard input/output link cable to the connector. See: "Using the PLC function (User standard inputs/outputs)".
4. Connect the female socket to the male connector of the power supply, then plug the power cable into a single phase electrical outlet.

To cut off the power to the machine if there is a serious problem, unplug the power cable or operate the On/Off switch (General stop button)

Connections - Installation

■ Using the PLC function (User standard inputs/outputs)

	<p>Before making any "user standard input/output" connections, check that the electrical and electronic characteristics of the different inputs and outputs are respected. Incorrect connection could permanently damage the machine electronics.</p> <p>Using the PLC function means that it is not just a matter of considering the machine on its own in order to ensure operator safety. The machine becomes part of a larger process (automated line). Consequently, the whole final workstation (machine + PLC + loading system) needs to meet regulatory safety requirements. In this case, the machine and equipment installer is responsible for the final work station's compliance.</p>
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The activation menu for the PLC function is accessed from the Configuration menu. This function is used to configure the machine as a PLC in an automated line. Once it has been activated, this function is used to operate the machine using signals sent through the PLC port.

To use the PLC function, configure the inputs/outputs (X-Y values to be defined):

4 Inputs	4 Outputs
I1 = X	O1 = Y
I2 = X	O2 = Y
I3 = X	O3 = Y
I4 = X	O4 = Y

4 inputs can be defined (I1 - I4): 5 X values available.
 4 outputs can be defined (O1 - O4): 6 Y values available.

Available inputs	Available outputs
X=0: No input wanted	Y=0: No output wanted
X=1: Start marking	Y=1: Laser fume extractor
X=2: Pause	Y=2: Pause
X=3: Return to origin (0,0)	Y=3: Origin (0,0)
X=4: Next file	Y=4: Air assist (Active state: High position)
	Y=5: Air assist (Active state: Low position)

One available input or output may be selected several times.

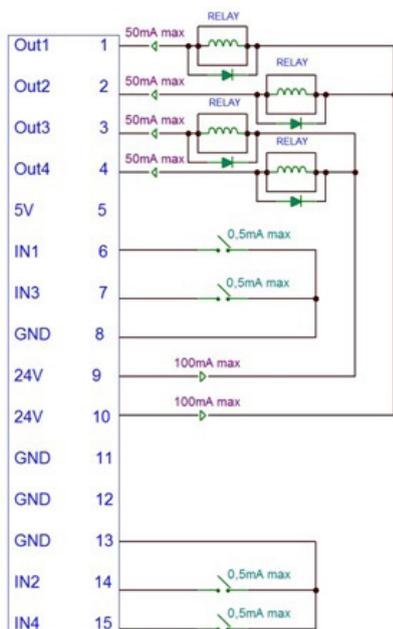
Connections - Installation

Input / Output characteristics (Sub-D15 connector)

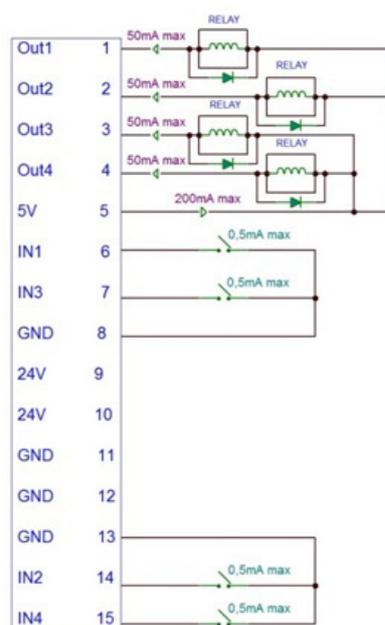
Number	Function	Type:	Comments
1	O1	Output NPN	Maximum current: 50 mA
2	O2	Output NPN	Maximum current: 50 mA
3	O3	Output NPN	Maximum current: 50 mA
4	O4	Output NPN	Maximum current: 50 mA
5	5 V	Available for powering the loads switched by the NPN outputs (O1 - O4)	Maximum current: 200 mA
6	I1	dry contact Input	TTL-compatible
7	I3	dry contact Input	TTL-compatible
8	Gnd	Grounding	The grounds are shared by pins 8-11-12-13.
9	24 V	Available for powering the loads switched by the NPN outputs (O1 - O4)	Maximum current: 100 mA
10			Maximum current: 100 mA
11	Gnd	Grounding	The grounds are shared by pins 8-11-12-13.
12			
13			
14	I2	dry contact Input	TTL-compatible
15	I4	dry contact Input	TTL-compatible

Note: The loads switched by the NPN outputs can be powered by 5 V / 24 V.

Wiring example -
24 V inductive load

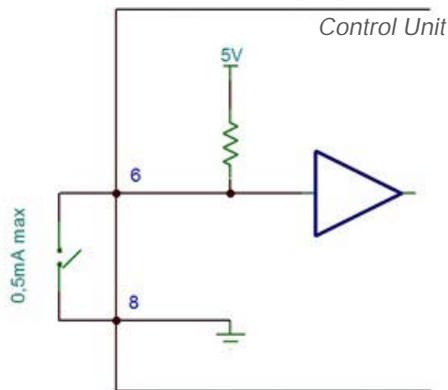


Wiring example -
5 V inductive load

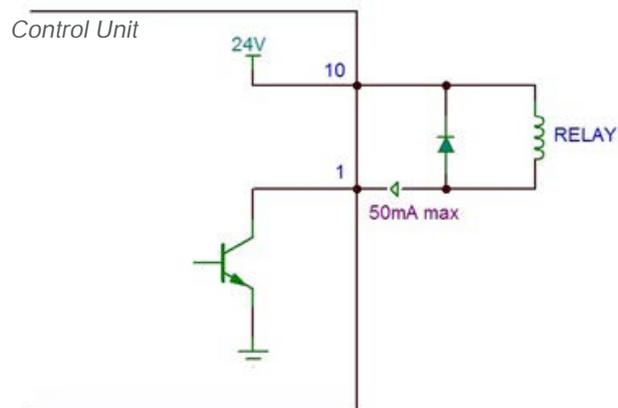


Connections - Installation

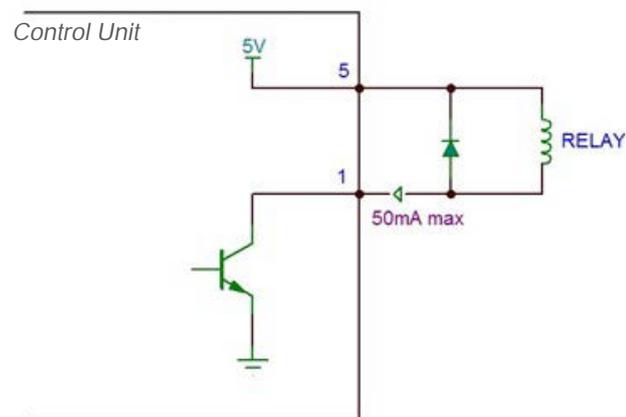
Example of wiring for an Input (I1)



Example of wiring for an Output (O1) - 24 V inductive load



Example of wiring for an Output (O1) - 5 V inductive load



When connecting inductive charges use an anti-parasite protection and a freewheeling diode to avoid damaging the Outputs.

Connections - Installation

■ Switching on the machine

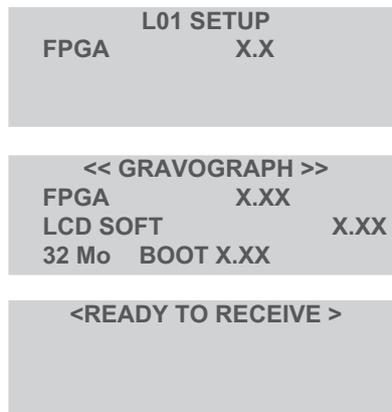


Always switch on the chiller before the machine (only for ENERGY machines).

Check that the water cooling circuit is operating properly. Check that water cannot leak onto the electronic components of the machine.

1. Place the switch in the "I" position (On).

The screens must follow on from one another:



The machine is ready for operation.



Do not load files until the display says "Ready to receive". This could cause incorrect loading of the file. Loading a damaged file could cause incorrect laser emission, which could damage the engraving machine.

■ Resolution of the problems

If the machine does not switch on:

- Check that the power cord is correctly plugged in to both the machine and the power supply.
- Check that there is power to the mains plug.

Connections - Installation

■ Power down: Machine - Water chiller

- 1. Machine: Put the On/Off switch in the "O" (Off) position.**
- 2. Water chiller: Set the general stop button to the "O"(Stop) position.**

Switch off the machine in the following situations:

- when the operator is permanently leaving the machine
- in the event of physical damage (something is dropped on the machine, fire, a liquid is spilled on the machine, etc.)
- mechanical/electrical/electronic faults suggesting a breakdown
- if there is a major problem or the machine is jammed mechanically
- forced restart
- the machine is jammed on the part to be engraved/marked
- the machine is jammed on an object in the work area
- external/internal cleaning
- filling the tank (Water chiller)

■ Restarting

If the machine or the operating program locks, the machine may need to be restarted.

- 1. Switch off the machine.**
- 2. Wait approximately 30 s.**

This waiting time must be respected. It prevents an electric surge likely to damage the machine's power supply.

- 3. Switch on the machine.**

Connections - Installation

3. Machine / PC connection

The machine installation and usage procedure is based on a PC-type computer running Windows®. For help, contact Gravotech.

Switch off the PC and the machine.

Follow the connection procedure for the type of link cable supplied with the machine.

The machine is supplied with a USB cable.

■ Machine / PC connection (USB connection)

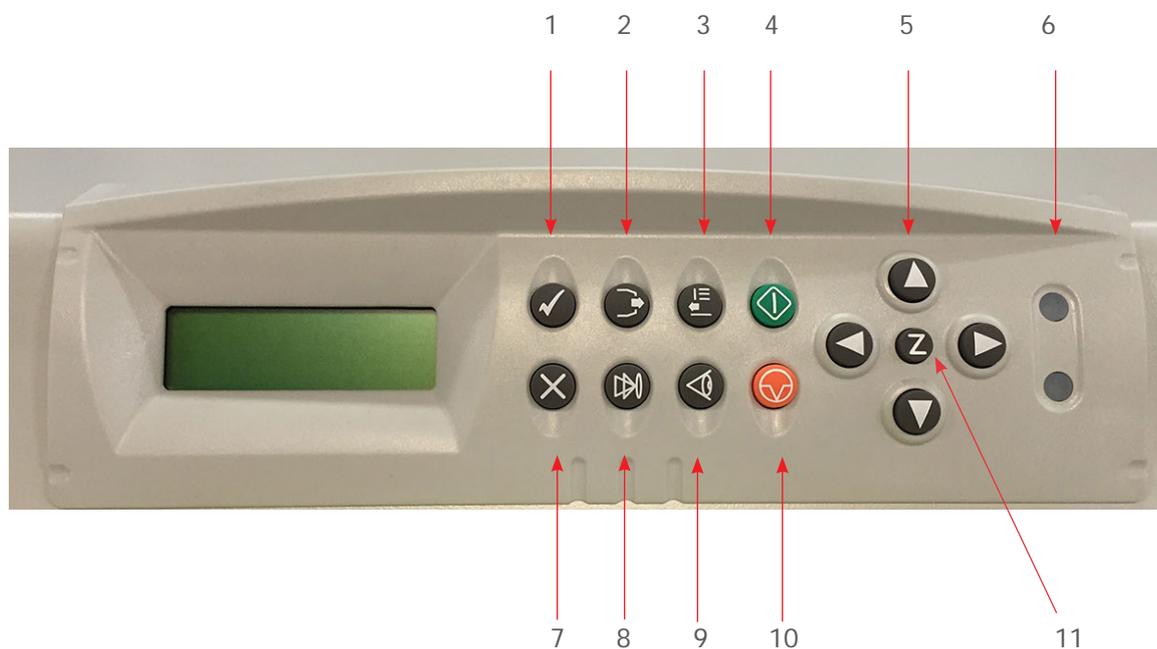
1. Connect the USB cable to the machine's USB port.



2. Connect the USB cable to the PC's USB port.

L. Operating instructions for the machine

1. Control panel



1. "Check" key
2. Air assist
3. Selecting a(n) file
4. Start - Start marking
5. Joystick
6. Green light - Red light
7. Cancel
8. Autofocus
9. Positioning pointer
10. Pause
11. Focus adjustment

Operating instructions for the machine

1		"Check" key	Access to the different menus Exit from current menu Move to next screen Move to next menu Validation of the entered data
2		Air assist	Activation of air assist during marking
3		Selecting a(n) file	Display of next file in machine memory, which becomes current file
4		Start Start marking	Start-up engraving
5		Joystick	Head movement (X, Y, Z) Move the cursor to different data entry areas
6		Green light - Red light	See: Indicator light(s)
7		Cancel	Exit from menu without applying change to last parameter Return to reception, during a pause, during end of reception, during end of engraving
8		Autofocus	Automatic focus adjustment (automatic Z Ref.)
9		Positioning pointer	Activation of a very low power laser beam, providing an indication of the marking position on the plate
10		Pause	Marking suspended
11		Focus adjustment	Manual focus adjustment (manual Z Ref.)
		On / Off switch	Switching on the machine Power down

Operating instructions for the machine

■ Indicator light(s)

The status of the lights varies depending on the machine activity.

Green light

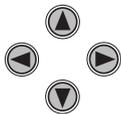
Status	Description
lit	Machine initializing
off	End of file processing and return to original position
	Machine ready to receive a file
	Interruption during file processing
	Pause

Red light

Status	Description
lit	Machine initializing
off	Machine ready to receive a file
	Pause
flashing	Marking in progress

2. Description of the human-machine interface

■ Joystick



The arrow keys (joystick) are used to move the X-Y axes manually. The joystick is mainly used for positioning the head directly above the material to be engraved.

X movement: Press and hold the key(s):  / 

Y movement: Press and hold the key(s):  / 

Diagonal movement: Press two adjacent keys.

The movement starts slowly, then accelerates as the key is kept pressed.

Movement in increments: Press the key(s) once, then release.

Operating instructions for the machine



This key is used to adjust the height of the engraving table.
The operator can adjust the vertical position anywhere within the area.

1. **To switch to vertical movement: Press the key:**

2. **Press and hold the key(s).** / .

The table moves vertically to the desired position.

3. **Release the key(s).**

4. **To confirm, press the key:** .

The vertical position is saved.

■ Access to the different menus

To access the machine menu(s):

1. **Switch on the machine.**

Wait until the following message appears on the screen:

<READY TO RECEIVE >

2. **Press the key:** .

■ PARAMETERS
FILE
INFO
CONFIGURATION

To select a menu, press the key(s) as many times as necessary: / .

To confirm, press the key: .

To cancel/exit, press the key: .

Operating instructions for the machine

3. Control panel: Water chiller (only for ENERGY machines)



RST: "Check" key

SET: "Function adjustment" key.

Red light D1

Status	Meaning
indicator light on	The controller is operating in intelligent control mode.
Indicator light not illuminated	The controller is operating in constant temperature control mode.
The light flashes.	The controller is operating in setting adjustment mode or is displaying ambient temperature values in the room.

Red light D2

Status	Meaning
indicator light on	The chiller is operating in cooling mode.
Indicator light not illuminated	The chiller is operating in isolation mode.
The light flashes.	The chiller is operating in energy saving mode.



The arrows enable the operator to adjust the controller, the display mode and the selection and adjustment of a setting.

In any mode, press the down arrow and the display shows the ambient temperature in the room.

■ Reset

Before starting the machine, press and hold down both arrows until the controller displays "rE".

The controller returns to normal operation, 6 second(s) after the keys are released.

All the factory settings for the controller are then restored.

Operating instructions for the machine

■ Temperature alarm function

When a temperature alarm is triggered, the error code and the temperature are displayed on-screen simultaneously. To stop the audible alarm signal, press one of the controller keys. The alarm remains displayed until its cause has been eliminated.

Error	Meaning
E1	Maximum ambient temperature exceeded
E2	Maximum water temperature exceeded
E3	Water temperature below the minimum
E4	Malfunction of the ambient temperature sensor
E5	Malfunction of the water temperature sensor

■ Flow alarm function

When an alarm is triggered, the red indicator light is illuminated and an audible signal is sounded. The green indicator light goes out.

Status	Indicator(s)	Normal flow indicator light (Green)		Flow alarm indicator light (Red)		Audible alert	
Cooling water circulation loop obstructed	⊗	Off	●	On	((()))	Yes	
Insufficient water alarm	⊗	Off	●	On	((()))	Yes	
Malfunction of the water circuit pump	⊗	Off	●	On	((()))	Yes	

■ General parameters



The parameters of the industrial chiller supplied with the ENERGY machines are preset (Initial setup). It is not necessary to change these parameters.

Press the (SET) button in normal mode. The red indicator light flashes. This indicates that the controller is in parameter setting mode.

- In constant temperature control mode, the screen displays the value of the set temperature (Parameter F0).
- In intelligent control mode, the screen displays the temperature difference between that of the water and that of the ambient air (Parameter F1).

Use the arrow keys to change the parameters.

After modifying the values, press the (RST) button to save and exit. The new parameters become active. Otherwise, press the (SET) button to exit setting mode without saving the new parameters.

If no button is pressed within 20 second(s), the controller automatically exits parameter setting mode without saving the modified parameters.

Operating instructions for the machine

Control parameters					
Order	Code	Functions	Range of values	Initial setup *	Notes
1	F0	Constant temperature	5 → 40	24	Constant temperature control
2	F1	Temperature difference values	-15 → +5		Intelligent control
3	F2	Cooling hysteresis	0.2 → 3.0	2	Constant temperature control
4	F3	Control mode	0 → 1	0	0: Constant temperature control 1: Intelligent control
5	F4	Alarm: Maximum water temperature exceeded	1 → 20	5	
6	F5	Alarm: Water temperature below the minimum	1 → 20	5	
7	F6	Alarm: Maximum ambient temperature exceeded	40 → 50	40	
8	F7	Password	00 → 99	08	
9	F8	Permissible water temperature: Maximum	F9 → 40		Intelligent control
10	F9	Permissible water temperature: Minimum	5 → F8		Intelligent control

Operating instructions for the machine

■ Advanced parameters



The parameters of the industrial chiller supplied with the ENERGY machines are preset (Initial setup). It is not necessary to change these parameters.

1. Hold the key down. ▲ Press the key. <SET> (For 5 second(s)).
2. The screen displays the value: 00.
3. Enter the current password (The password configured by default is 08.)
4. Press the key. <SET>

The red indicator light flashes (This indicates that the controller is in parameter setting mode.).

The screen displays the value: F0 (First parameter)

5. Select a parameter. ▲▼
6. Press the key. <SET>
7. Set the value of the parameter.
8. Press the key. <SET>
9. Select another parameter. ▲▼
10. Save the modified parameters: Press the key. <RST>

The screen returns to temperature adjustment mode.

If no button is pressed within 20 second(s), the controller automatically exits parameter setting mode without saving the modified parameters.

M. Using the machine

Example: Engraving a keyring

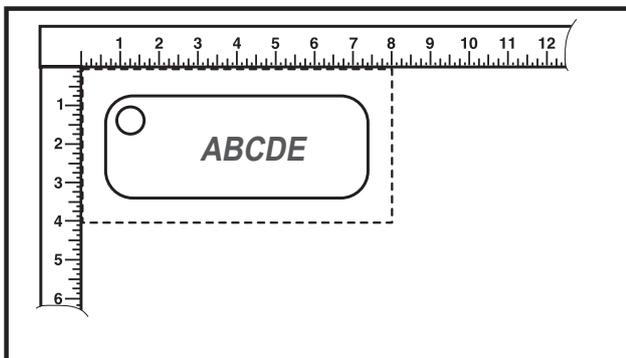
1. Switching on the PC / Switching on the machine

1. **Switch on the PC.**
2. **Wait until start-up is complete.**
3. **Switch on the machine.**

2. Creating the composition

1. **Adjust the page size to the maximum size of the engraving area in the graphics software (LS900 ENERGY / LS900 IQ / LS900 XP: 610 mm (24.016 in) x 610 mm (24.016 in)).**
2. **Enter the text to be marked. It should have a black fill and no contour.**
Example: Enter "ABCDE".
3. **Position the text in the top left corner of the page, depending on the position of the keyring on the engraving table.**

Screen (PC)



3. Setting the driver properties

Refer to the manual (L-Solution driver).

Using the machine

4. Transferring the file

1. **Check that the USB cable is correctly connected at both ends.**
2. **Check that the machine screen says "Ready to receive".**
3. **Click on: Print.. (Graphics software).**

Or Click on the icon: , Click on:  (GravoStyle/LaserStyle).

The file is sent to the machine. The transferred bytes appear on the machine's screen until the transfer is complete, which is confirmed by an audible signal.

Once the file is downloaded, the machine display updates automatically. The screen displays the file name and certain parameters.

5. Positioning the object to be engraved

To load and position the keyring on the engraving table inside the machine:

1. **Open the upper door**
2. **Position the keyring in the top left corner of the table, against the scaled rules.**

6. Focusing

Check that the table is low enough for the moving head not to touch the keyring.

Automatic focus adjustment (automatic Z Ref.): Using autofocus, the focal height is adjusted automatically.

■ Autofocus

Press the key.  Or Enable autofocus in the driver.

Autofocus is performed automatically at each engraving launch. Disable autofocus when engraving a set of plates of the same thickness. To save time, autofocus is only performed on the first plate.

Using the machine

7. Start-up engraving

1. **Switch on the air extraction system.**
2. **Select one of the 2 modes (See: Air extraction system (optional)).**
3. **Check that the object is correctly positioned in the engraving area.**
4. **Check the focus.**
5. **Check that the door is closed.**
6. **Check that the screen is displaying the file name.**
7. **Press the key.**  **(Control panel).**

8. Removing and reloading material

The laser beam is shut off once the machine has finished processing the material. The head goes back to the origin (top left corner).

Before opening the door, wait a few seconds for any remaining fumes emitted during the marking or cutting process to be removed by the extraction system. In the L-Solution driver, it is possible to enter a timeout value to set a delay before the air extraction system stops when marking is finished.

Open the upper door Remove the material.

Load the next material. If it is the same material as the one before and the same file is being executed, close the door. Start-up engraving: Press the key.



N. Adaptable accessories

List of accessories available upon request

1. Cylinder attachment

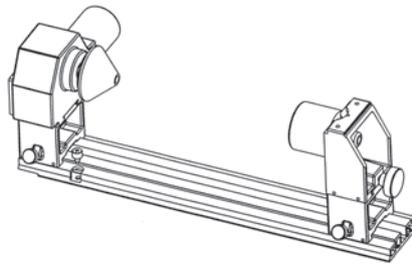
Used to mark cylindrical parts thanks to a rotary marking device. This accessory is designed to hold glasses, mugs, cups, etc.

This equipment is supplied with:

- Mount(s) (x 2)
- 1 cone(s) attached to the motorized end of the element
- 1 inverted cone(s) attached to the adjustable end of the element

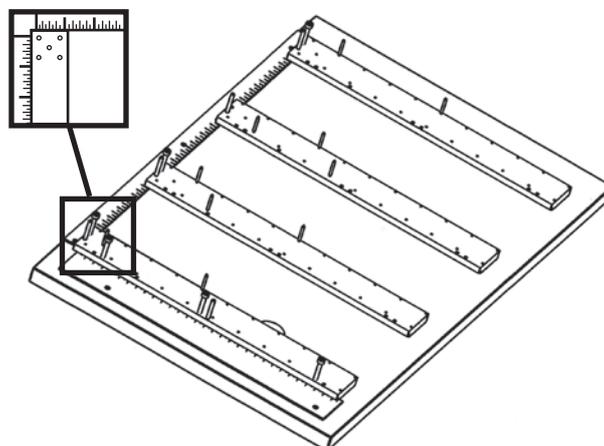
This accessory is placed on the engraving table.

Installation - Use: Refer to the manual.



2. Cutting out kit

Used to support the material to be cut at a distance from the surface of the engraving table to minimize the area of contact with the surface. The cutting out kit comprises 4 removable plate(s), pins (supports) and end stops. The plate to be cut out rests on the pins positioned in advance on 2, 3 or 4 of the removable plates which are arranged on the engraving table according to the dimensions of the part. In all cases place 5 pins (supports) at the location of ZRef (top left corner).



The cutting table redirects the exhaust air over and under the material to clear the engraving area of fumes.

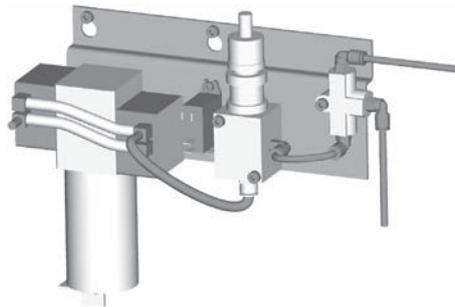
Adaptable accessories

3. Compressor kit (Air assist)

Used to deliver compressed air for the Air assist function without having to connect an external compressor to the air inlet (compressed air supply for air assist).

Compressed air: 1 Bar (14.504 PSI) - 12.4 l/min - Tap open

This accessory is pre-assembled on a plate to install on the machine.
Installation - Use: Refer to the manual.



4. Honeycomb cutting table

Used to support the material to be cut at a distance from the surface of the engraving table to minimize the area of contact with the surface. The cutting table redirects the exhaust air over and under the material to clear the engraving area of fumes.

To limit the reflection of laser beam, the honeycomb material is reflective only in the area in contact with the material.

Installation:

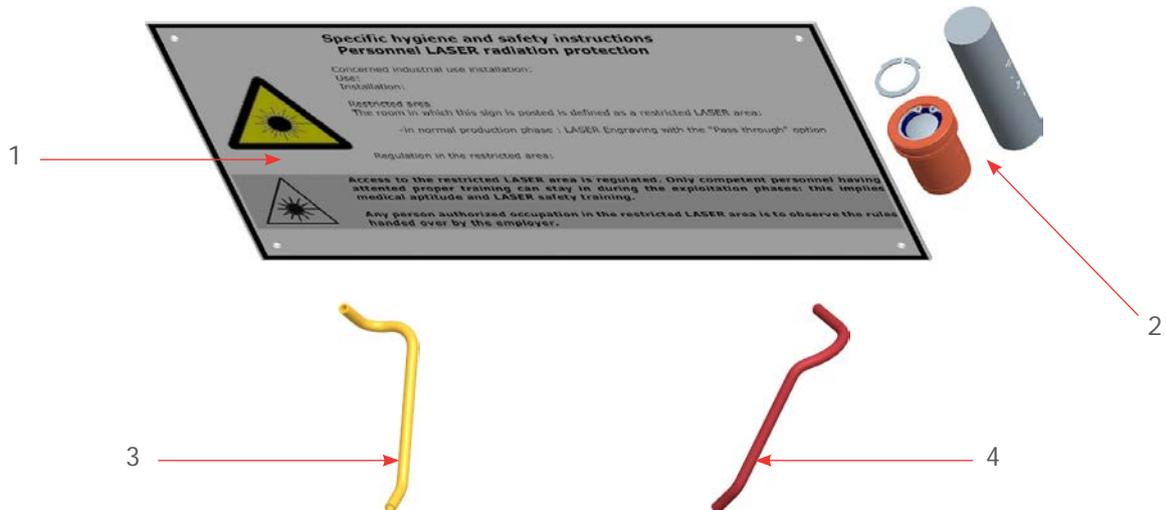
1. **Set the cutting table down on the machine's engraving table.**
2. **Place the cutting table so it is resting against the strips of the engraving table.**



Adaptable accessories

5. "Pass through" - (Class 4 laser)

Installation - Use: Refer to the manual.



1. Identification plate - WARNING: Class 4 laser
2. Lens(es) - 4" + Autofocus adjustment gage -4"
3. Air assist tube - 4" - LS900 XP
4. Air assist tube - 4" - LS900 / LS900 ENERGY

O. Preventive maintenance

1. General maintenance

	<p>Unplug the power supply plug before beginning any cleaning or maintenance operation.</p> <p>The mains power cable must be replaced immediately if it is cut or crushed, cracked or a conductor is stripped bare.</p>
---	---

The machine's maintenance needs depend on the type of material used, the quantity of material removed, frequency of operation, environment and the effectiveness of the air extraction system. It is the user's responsibility to define them.

Dust and debris that accumulate on the machine's components can cause irregular or imprecise engraving, or the loss of the engraving position and the premature failure of components.

The accumulation of fumes or dust on the optical parts can damage them, reduce the power of the laser or cause the premature failure of components.

Regularly cleaning the machine improves its operation, extends the life of parts and reduces the risk of failure.

Recommendations: Check and, if necessary, clean the machine every 8 hours of engraving/marketing or cutting.

If debris has accumulated on the optics and the movement system, clean the machine more frequently. If the system is relatively clean, you could extend the intervals between cleaning.

For help, contact Gravotech.

No internal parts of the machine require user intervention. Regular maintenance is limited to external cleaning of the engraving area and the optics.

To clean other parts of the machine, call a Gravotech technician.

2. Accessories provided

- 1 bottle(s) of cleaning solution
- 1 packet(s) of cotton buds for mirrors
- 1 packet(s) of lens cleaning wipes

Follow the handling instructions indicated on the product labels.

Preventive maintenance

3. Cleaning the system

■ Engraving table

1. **Switch off the machine. Unplug the machine.**
2. **Open the upper door**
3. **Remove any dust or debris inside the machine using a vacuum cleaner.**



Do not use a blower.

4. **Clean the surface of the engraving table with a soap solution, alcohol or acetone and paper towels. Never pour or spray solution into the machine.**

Dampen the paper towel or cloth with the cleaning solution away from the machine. Wipe the parts.

5. **Clean the glass with a chamois cloth and a soap solution. Do not use paper towels. Do not use solvent.**
6. **Use a soft cloth or paper towels and a soap solution to clean the casing. Do not use alcohol, acetone or any other aggressive product because it could damage the paint.**

■ Guides/belts

No user maintenance is necessary.

■ Fume extraction outlets

Clean with a vacuum cleaner and, if necessary, a brush.

Preventive maintenance

4. Optics maintenance

Visually inspect the mirrors, the laser beam window and the lens used for focusing, known as the focal lens, at least 1 time(s) a day.

	<p>Do not remove the lenses or mirrors to clean them.</p> <p>Never touch an optic with your fingers. Acids in the skin could destroy the coating on the optics.</p> <p>Use the Gravotech accessories.</p>
--	--

■ Mirror(s) / Lens(es)

Check the mirrors and lenses.

Clean them with a lens cleaning wipe (Access them through the mirror access.) To access the right-hand mirror and the window, remove the protective panel.



1



2

1



2

1. Mirror access
2. Lens(es)

Preventive maintenance

5. Autofocus adjustment

To adjust the autofocus, the machine must be fitted with a 2 in lens and the user must only use the gage marked 2".



Remove all the tools. Remove any object from the table. The head has to move at high speed towards the center of the table in order to perform the adjustment.

1. Switch off the machine.
2. Close the door of the machine.
3. Switch on the machine.

The screen below appears:

```
L01 SETUP
FPGA      X.X
```

The machine emits an audible signal. The following screen is displayed for 3 seconds:

```
<< GRAVOGRAPH >>
FPGA      X.XX
LCD SOFT  X.XX
32 Mo    BOOT X.XX
```

4. While this screen is displayed, press the key:
5. Select the following menu:

```
LASER SETTINGS
TICKLE
RE-ALIGN MACHINE
USING TIME  XXX
```

6. To confirm, press the key:
7. Select the following menu:

```
X-Y ADJUSTMENT
Z ADJUSTMENT
ALIGNMENT MODE
```

8. To confirm, press the key:

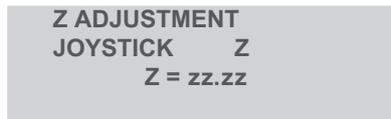
The head moves towards the middle of the engraving table. An autofocus is performed automatically.

Preventive maintenance



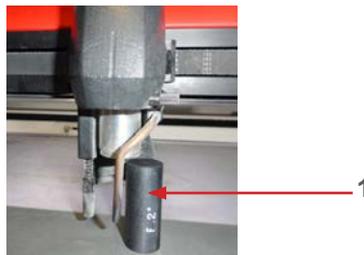
1. *Head*

The screen below appears:



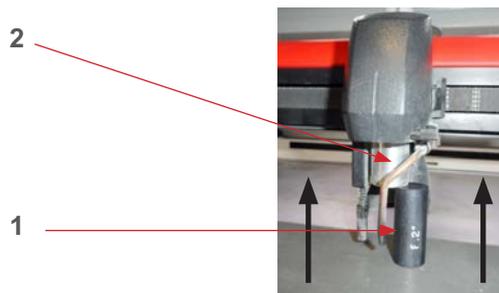
9. **Open the upper door**

10. **Place the autofocus adjustment gage in position on the engraving table, under the lens support of the head.**



1. *Autofocus adjustment gage*

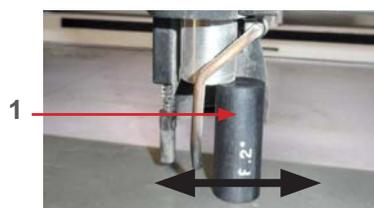
11. **Move the engraving table upwards until the lens support comes into contact with the gage.**



1. *Autofocus adjustment gage*

2. *Lens support*

12. **Check that the gage can slide slightly.**



1. *Autofocus adjustment gage*

Preventive maintenance

13. Remove the gage.

Do not forget to remove the gage at this point in the procedure, otherwise there is a risk of damage to the machine.

14. Close the door of the machine.

15. Press the key. Hold the key(s) down until Autofocus starts.

```
X-Y ADJUSTMENT
Z ADJUSTMENT
ALIGNMENT MODE
```

16. To cancel/exit, press the key:

```
LASER SETTINGS
TICKLE
RE-ALIGN MACHINE
USING TIME   XXX
```

17. To cancel/exit, press the key:

The following screen is displayed for 3 seconds:

```
<< GRAVOGRAPH >>
FPGA           X.XX
LCD SOFT              X.XX
32 Mo  BOOT X.XX
```

The screen below appears:

```
<READY TO RECEIVE >
```

Preventive maintenance

6. Setting point zero (Origin)

The screen below appears:

```
L01 SETUP
FPGA      X.X
```

The machine emits an audible signal. The following screen is displayed for 3 seconds:

```
<< GRAVOGRAPH >>
FPGA      X.XX
LCD SOFT  X.XX
32 Mo    BOOT X.XX
```

1. While this screen is displayed, press the key: 
2. Select the following menu:

```
LASER SETTINGS
TICKLE
■ RE-ALIGN MACHINE
USING TIME  XXX
```

3. To confirm, press the key: 
4. Select the following menu:

```
■ X-Y ADJUSTMENT
Z ADJUSTMENT
ALIGNMENT MODE
```

5. To confirm, press the key: 

The head goes back to the origin (top left corner). The pointer is lit (Red).

The screen below appears:

```
X-Y ADJUSTMENT
JOYSTICK  X-Y
X         X.XX Y         X.XX
```

6. Position a plate on the table (top left corner).
7. Set the laser pointer to the top left corner of the plate (Up - Down - Left - Right arrows).
8. Press the key.  Keep the key(s) pressed until the head returns to the origin (top left corner).

P. Technical specifications

1. Physical characteristics - LS900 / LS900 XP / LS900 ENERGY

	LS900 / LS900 XP	LS900 ENERGY
Dimensions (L x w x h): Machine	945 mm (37.205 in) x 1080 mm (42.520 in) x 810 mm (31.890 in)	
Net weight: Machine	Maximum: 170 kg (374.786 lb)	Maximum: 190 kg (418.878 lb)
Dimensions (L x w x h): Machine + Packing	1120 mm (44.094 in) x 1100 mm (43.307 in) x 1070 mm (42.126 in)	
Weight: Machine + Packing	Maximum: 230 kg (507.063 lb)	Maximum: 250 kg (551.156 lb)
Table surface	690 mm (27.165 in) x 655 mm (25.787 in)	
Engraving area	Maximum: 610 mm (24.016 in) x 610 mm (24.016 in)	
Weight: Permissible object	Maximum: 25 kg (55.116 lb)	
Dimensions (L x w x h): Permissible object	650 mm (25.591 in) x 630 mm (24.803 in) x 250 mm (9.843 in)	
Travel distance Z	250 mm (9.843 in)	
Surface flatness	< 0.2 mm (0.008 in)	

2. Engraving characteristics

Movement speed (scanning)	LS900 / LS900 ENERGY	Maximum: 2000 mm (78.740 in)/s
	LS900 XP	Maximum: 4000 mm (157.480 in)/s
Movement speed (Vector)	LS900 / LS900 XP / LS900 ENERGY	Maximum: 200 mm (7.874 in)/s
In "fast" mode (hare icon)	LS900 / LS900 XP / LS900 ENERGY	Maximum: 300 mm (11.811 in)/s
Movement speed (Z)	LS900 / LS900 XP / LS900 ENERGY	Maximum: 13 mm (0.512 in)/s
Repeatability	LS900 / LS900 XP / LS900 ENERGY	< 0.05 mm (0.002 in)

3. Noise emission of the machine (ISO 11201 standard)

		LS100 IQ / LS100 EX		LS100 ENERGY / LS100 EX ENERGY
		40 W	60/80 W	25 W
when awaiting engraving	LAeq - dB (A)	≤ 61	≤ 61	≤ 52
during nominal engraving (scanning)	LAeq - dB (A)	≤ 70	≤ 72	≤ 66

Technical specifications

4. Environment

Operating temperature	10 °C (50 °F) - 35 °C (95 °F)
Storage temperature	-5 °C(23°F) - 45 °C (113 °F)
Humidity level:	5 - 85 %

5. Laser characteristics

	LS900 / LS900 XP	LS900 ENERGY
Classification	CDRH: Class 2	CDRH: Class 2 (Pass-through: Class 4)
Source	CO ₂ / 40 W - 60 W - 80 W	CO ₂ - 25 W - (Water cooling)
Wavelength:	10600 nm (10.6 μm)	
Lens(es)	50.8 mm (2.000 in) ±2%	
Aiming diode: wavelength:	645 – 665 nm	

6. Electrical characteristics

	LS900 / LS900 XP 40 W 100–240 V	LS900 / LS900 XP 60 / 80 W 120–240 V	LS900 ENERGY 25 W 200–240 V
Nominal voltage	100 - 240 V	120 - 240 V	200 - 240 V
Absorbed current	Maximum: 15 A		Maximum: 2 A
Frequency	50 - 60 Hz		
Absorbed power	1600 W	2000 W	480 W
Protection(s)	Circuit-breaker(s): 2 x 16 A		

Technical specifications

7. Connections and cabling

Port: USB	1.1
Dedicated Inputs/Outputs	Sub-D: 15 point connector - Female
Inputs / Outputs: Air extraction system	DIN: 5 point connector - Female
Cylinder attachment	DIN: 8 point connector - Female
Air assist	Pneumatic connection internal diameter: 4 mm (0.157 in) Pressure: 6 Bar (87 PSI) (Maximum)
Air extraction system	internal diameter: 100 mm (3.937 in)
Air flow rate: - General mode - Head mode	Minimum: - 0,5 kPa - (0.07 PSI) / 300 m ³ /h - (6.54 yard ³ /min). - 20 kPa - (2.9 PSI) / 150 m ³ /h - (3.27 yard ³ /min).
Water chiller (only for ENERGY machines)	2 brass barb connectors D10

8. Firmware characteristics - driver

Languages (Firmware)	FR - EN - DE - IT - ES - NL - BR - HU - TR - PL - JP
File format	Gravograph binary encoding
RAM (Firmware)	32 Mo / MB - Storage of multiple jobs
Driver version	Minimum:7.04 (firmware: 3.41)
Operating system (driver)	Windows® 2000 - XP - Vista - 7 - 8 - 10

Technical specifications

9. Characteristics of the water chiller (only for ENERGY machines)

Dimensions (L x w x h): Water chiller	300 mm (11.811 in) x 500 mm (19.685 in) x 750 mm (29.528 in)	
Net weight	Maximum: 26 kg (57.320 lb) (Tank empty)	
Dimensions (L x w x h): Water chiller + Packing	480 mm (18.898 in) x 630 mm (24.803 in) x 830 mm (32.677 in)	
Weight: Water chiller + Packing	Maximum: 34 kg (74.957 lb) (Tank empty)	
Nominal voltage	220 - 240 VAC	110 VAC
Frequency	50 Hz	60 Hz
Absorbed current	1.4 - 2.1 A	
Absorbed power	500 W	
Cooling capacity	2361 Btu/h	
	700 W	
	595 kcal/h	
Coolant fluid	R-134a	
Water tank capacity	6 L	
Water flow	6 L/min	
Pump lift	10 m (32.808 ft)	
Environment	5 °C (41 °F) – 40 °C (104 °F)	
Temperature precision	+/- 1 °C (34 °F)	
Diameter of the water intake	Ø 10 mm (0.394 in)	
Diameter of the water outlet	Ø 10 mm (0.394 in)	
Switch	On / Off switch	
Indicator light(s)	2 LED - Alarm (Red) / Normal (Green)	
Castors	4	

Q. Appendix: Engraving menu

Last updated: 03/16

To access the machine menu(s):

1. Switch on the machine.

```
          SET UP
FPGA          X.X
```

```
<< GRAVOGRAPH >>
FPGA          X.XX
LCD SOFT      X.XX
32 Mo  BOOT X.XX
```

Waiting time: 3 s

```
<READY TO RECEIVE>
```

2. Press the key:

```
■ PARAMETERS
FILE
INFO
CONFIGURATION
```

To select a menu, press the key(s) as many times as necessary:  

To confirm, press the key: 

To cancel/exit, press the key: 

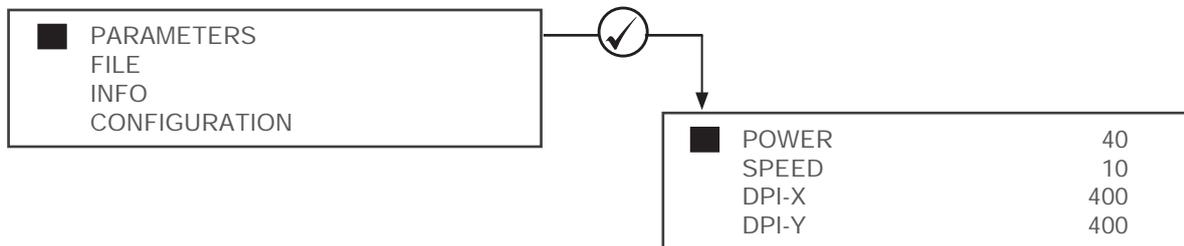
Selected option: 

Available sub-menu(s): >

Appendix: Engraving menu

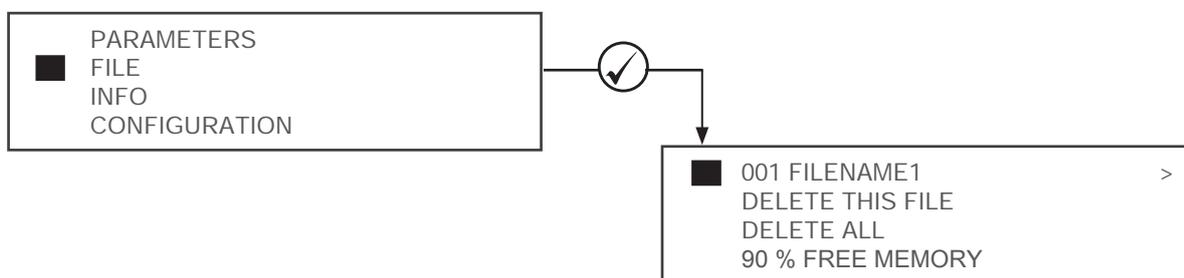
1. "Parameters" sub-menu

Used to manage the parameters for the current job.



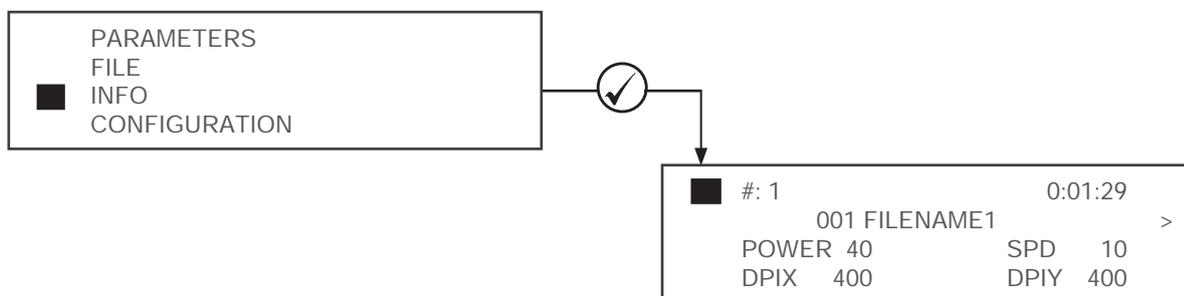
2. "File" sub-menu

Used to manage the files imported into the machine (Deleting files...).



3. "Info" sub-menu

Used to view the information related to the imported files.



4. "Configuration" sub-menu

Used to configure the general machine parameters.

