

# Operating instructions for the CTL9060 and CTL1290 laser machines



Laser engraving machine is a high-tech product that combines computer, laser technology, automatic control and optics into one machine. These machines are widely used in many areas: advertising, cutting of various materials, electronics, applied arts, funeral services, light industry, souvenir production, etc.

The main advantages of laser engraving machines:

An advanced laser is used, which replaces the traditional mechanical engraver.

If we compare these machines with mechanical engraving machines, then laser engraving machines have many advantages, here are the main ones:

No gripping devices are required, the work material is placed on the table surface, which is convenient and efficient.

There is no special requirement for the hardness of the material, thus increasing the range of their application.

High precision engraving on plastic, plywood, wood, etc.  
on the stone.

When using a CNC laser machine, **work** efficiency increases significantly.

Modern and convenient control panel: The laser engraving machine uses a modern keyboard that is reliable and easy to use, combined with a digital control system. Stepper motors are also used, which provide faster and higher accuracy of operation.

The operating interface makes operation easy.

The fully closing body makes the machine safer and more convenient.

Scope of application of laser engraving machines: The laser beam of the machine is capable of cutting and engraving all non-metallic materials, and when using special means (paste for metal engraving), it becomes possible to engrave metals. The positioning accuracy of the machine's laser head is 0.01mm, resulting in very high engraving and cutting accuracy.

The stepper motors used in the machine provide high speed and greater productivity. Depending on the material, when cutting and engraving, complex shapes of exclusive design are obtained. The versatility of the computer program for the machine allows you to obtain finished products by simultaneously cutting and engraving them.

One of the most popular materials for laser cutting and engraving is organic glass. When cutting it, the edges turn out to be mirror-like, the end melts a little. When joining the resulting workpieces, there is practically no optical gap. The scope of application of organic glass products is limited only by imagination. These are mainly advertising products and design and interior elements.

The next most popular material is wood and its derivatives. The material can be cut along a complex contour at a fairly high speed. The resulting products are used for the manufacture of furniture, complex parquet floors, souvenirs, and much more.

The list of materials can be continued endlessly. That's just him part: acrylic, anodized metal, cardboard, paper, coated metals, paranit, cork, crystal, crystals, fabrics, glass, quartz, laminated plastic, double-layer plastic, leather, marble, natural stone, artificial stone, melamine, plastic film, rubber, wood, ceramics.

## **Description of the equipment and its application.**

Description of equipment:

- Built-in FLASH memory with a capacity of 32 MB;
- LCD display with function keys, making control simple and convenient;
- Software is built into the program interface AutoCAD and CorelDraw and others, allows you to perform a variety of cutting and engraving tasks (vary power, cutting and engraving speed, change fill, etc.), control laser parameters to obtain different visual results;
- operating mode: raster vector graphics (BMP, HPGL (PLT), JPEG, GIF, TIFF, PCX, TGA, CDR, DWG, DXF);
- made on the basis of CO2 laser;

- as an emitter in the complexes, a sealed gas tube with a power of 80 W, the service life of which is up to 10,000 hours;

- Dimensions of the working field from 900\*600 mm to 1200\*900 mm, which allows cutting and engraving of large area products;

- high-precision motion control, which allows you to increase the speed of engraving and cutting, ensure precise and smooth movements of the laser beam;

- high-speed USB port for data transfer and control from one computer.

## **Installation requirements.**

Working conditions must meet the requirements listed below. Lack of suitable operating conditions may result in equipment malfunction or damage.

The indoor temperature should be between 15-35°C. When the ambient temperature is higher than the maximum intended, the equipment will overheat, causing damage. When the ambient temperature is below the minimum specified, rapid wear of the guides and jamming of the mechanisms for moving parts is possible

cars.

Humidity should not exceed 70%. Condensation may damage electronic components and pose a threat to operator safety.

The laser engraving machine should operate at a stable voltage, avoid sudden surges. If the voltage fluctuates, the device will not work correctly. If the voltage is too high, the power supply of the machine will be completely damaged. To prevent fire and machine breakdown due to high voltage, install a voltage stabilizer at 3000W.

The laser engraving machine must be well grounded. Poor grounding will shorten the life of the laser tube, and high voltage discharge is destructive to the electrical circuit and can be life-threatening. Make sure the machine is well grounded!

Avoid closed, cramped spaces and areas without ventilation. The workplace should be located close to the ventilation device.

The fueled  
and a certified fire extinguisher.

The work table should be located next to the engraving machine, the operator can place the necessary tools, materials, drawings, etc. on it.

***Persons who do not have experience with the device or who have not been instructed during commissioning are not allowed to work, otherwise the company will not be held liable***

*for any breakdowns that occur.*

## Machine installation

The machine must be lifted and carried using belts! Pass the belts only between the stand and the base of the machine; raise and lower it carefully.



When installing the laser engraving machine, there must be at least 1 meter of free space on all sides for cleaning and maintenance. It is necessary to leave more free space in front of the machine for ease of operation and movement of material.

First, the machine must be freed from all packaging materials.

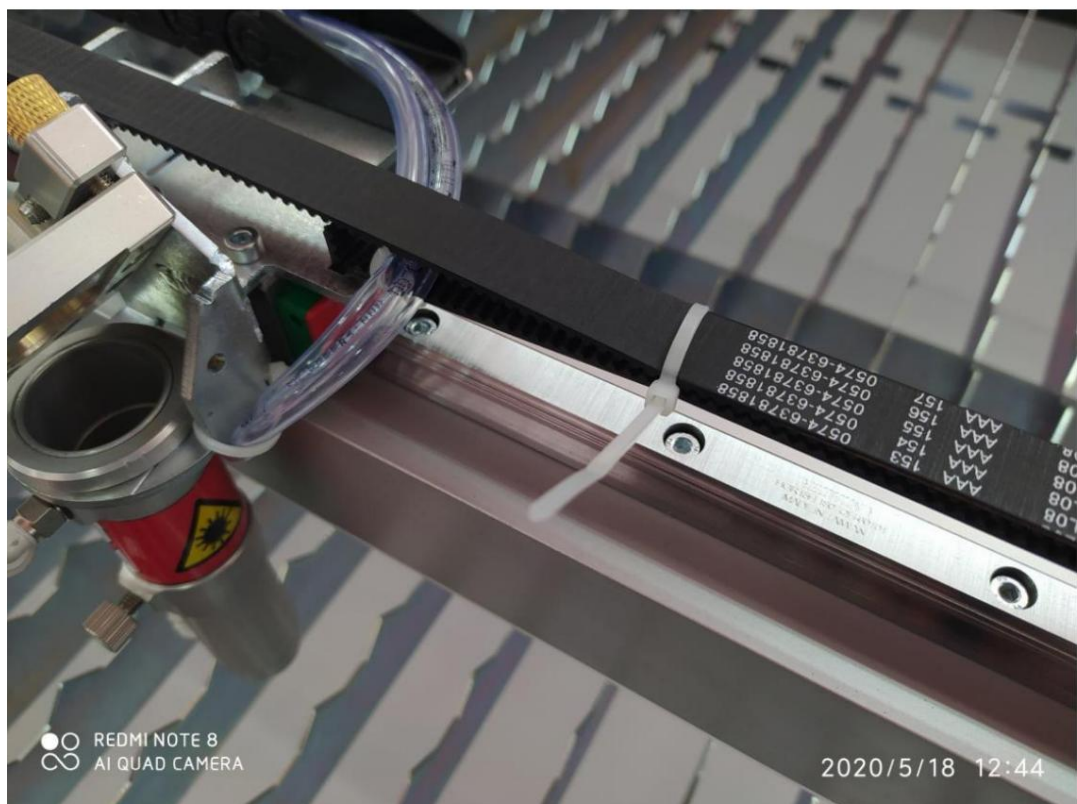
Carry out an external inspection, open the package with the lamp and make sure that it is not damaged.

Maintain for at least two hours at room temperature if the equipment was previously exposed to negative temperatures.

Place the machine on a hard and level surface.

Next, you need to open all the side, front and rear doors.

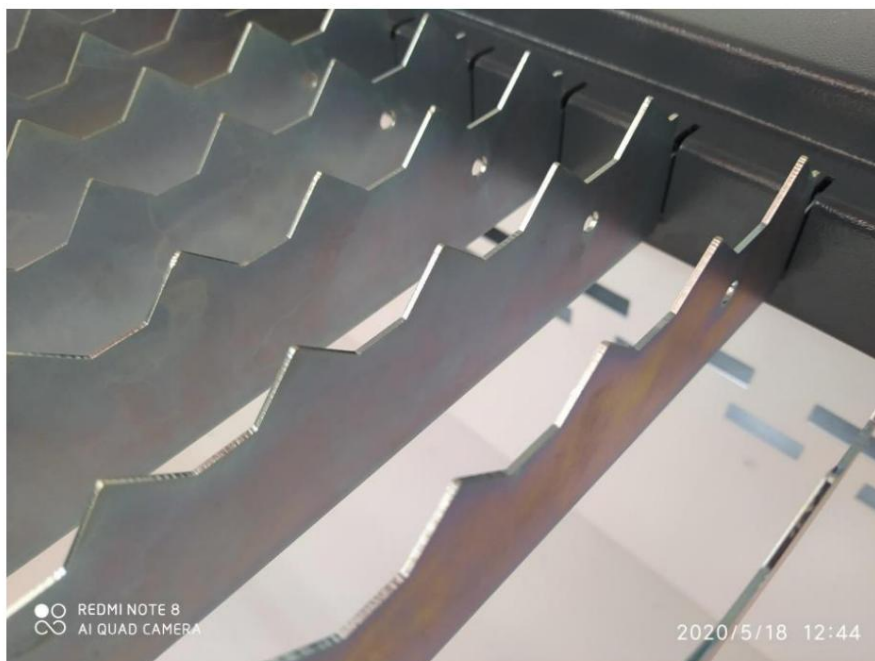
Remove the fasteners from the drive belts. Manually check the free movement of coordinates.



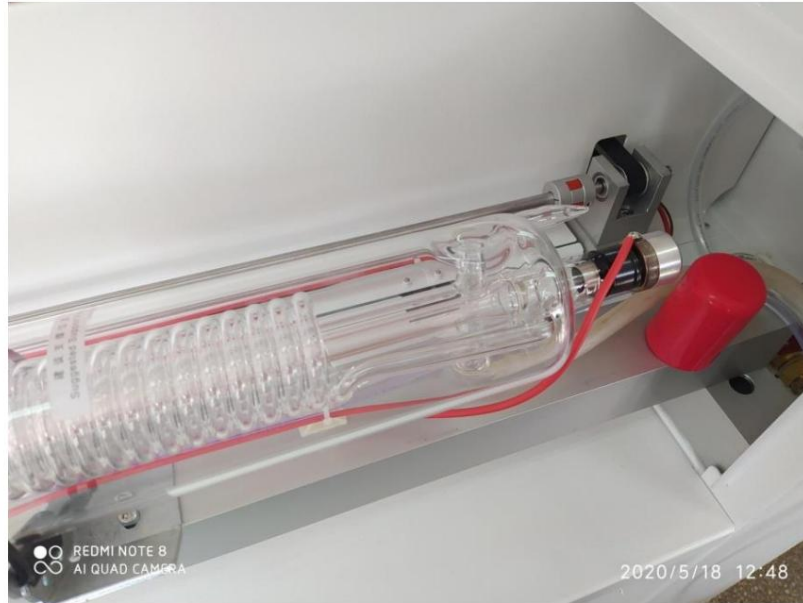
We level the machine. The level should be at least 400mm long. Make sure the tool you are using is in good working order! Place a level on the aluminum surface of the left side guide, then the right side, and make adjustments using the machine's leveling feet. After moving the machine to a new location, leveling must be repeated.



Installation of slats. We insert the lamellas into the machine table in accordance with the mark on the lamella (hole). All lamellas should be oriented with the mark in one direction.



Install the laser lamp. Carefully remove the lamp from the packaging and remove the protective packaging. Place the lamp on the prisms so that the positive contact is near the water input into the machine, <sup>A</sup> the negative output mirror is at a distance of 1-2 cm from the adjustment frame No. 1.



Turn the lamp so that the ebb for introducing water into the lamp, which is located near the red silicone insulator, is oriented down and the opposite one up. After this, remove the protective red insulator and connect the red cable, **put the insulator back on!!!** Connect the negative cable to the opposite edge of the lamp. We fix the lamp with clamping rubber bands, placing them on the hooks of the mounting prisms.





Place the water supply hose on the outlet that faces down, and the water discharge hose on the outlet that faces up.



We connect the chiller. Fill the tank with enough water so that the coil is completely submerged. The cooling circulating water must be clean, free from dust and dirt. Next, connect the hose that goes from the pump to the water supply to the machine, and the free end of the hose to the discharge.

Air connection. In the lower right compartment with the control electronics there is a coiled hose for supplying air to the machine (blue). Lead it into the housing hole at the back marked “cutting air” and secure it with a clamping gland. Connect the quick release coupling adapter. Connect the compressor.

Hood. The exhaust duct from the machine must be connected to the snail, and the other end from the snail should be led outside. The maximum distance from the car to the snail is 2m. From the snail to the street is 2 m. If the length of the chimney is longer, then it is necessary to install an additional snail.

The machine must be grounded. The machine is connected to a 220 V AC power supply, the total consumption of all equipment is no more than 3000 W, so make sure that your electrical wiring is reliable.

**Attention:** *It is forbidden to ground the machine to the neutral wire of the electrical network!*

Insert the power cable into the machine connector “Machine power 220V”

Connect the USB cable to your computer. Install the software on your personal computer. Without installing unique software, working on the machine is impossible. Necessarily

Upon completion of work, close the machine to avoid dust settling on the working parts!

If an insufficient amount of cooling water is detected in the tank, it is necessary to turn off the machine and the pump supplying coolant. Add water and run the pump for at least 30 minutes, or until bubbles come out of the system. If water does not flow, the laser tube will fail. The pump must be completely submerged in water. There should be no obstacles to the free circulation of water at the inlet and outlet.

## Preparing for setup.

Please ensure that the following requirements are met:

1. equipment is securely fastened;
2. the system is grounded;
3. There is enough pure distilled water in the water tank water;
4. The chiller and compressor are connected to the electrical network;
5. the equipment is securely connected to the network;
6. There should be no leakage of cooling water;
7. water temperature should be within 20 °C;
8. The machine must stand on a hard, level surface without vibrations.

## Machine keyboard.





Moving along coordinates and entering settings menu button 



Rebooting the machine




Manual forced start of the laser beam




Laser manual movement speed head controller control buttons



Minimum laser power when pressed button  on the controller



Maximum laser power when pressed button  on the controller



**Exiting the menu without applying a setting**



**Applying the setting**



**Linking the laser head to the starting point**



**Traversing the layout around the perimeter of the described rectangle**



**Enter the file menu to select the downloaded programs for cutting or engraving**



**Start/pause**

## **Setting up mirrors (adjustment).**

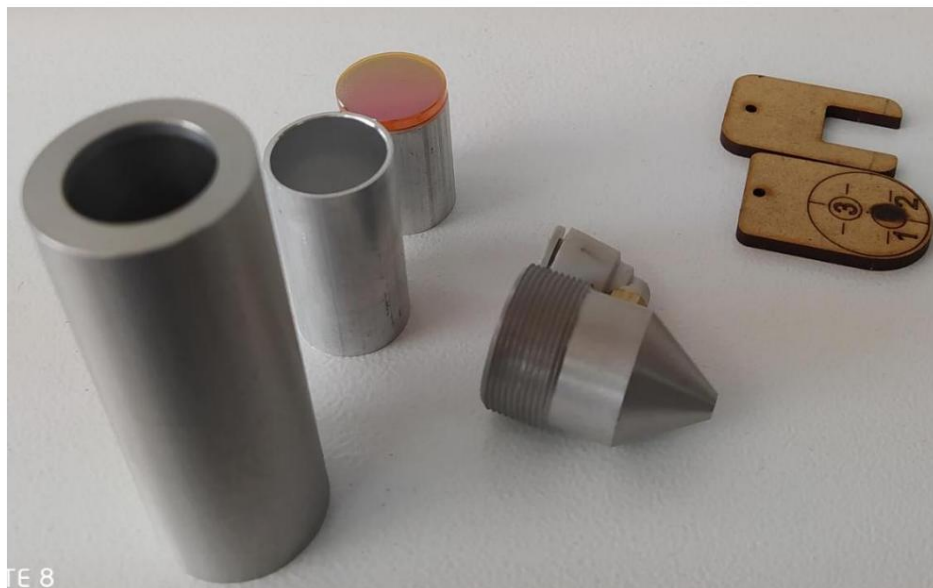
### **Note!**

When setting up, you must protect your eyes and ensure that parts of your body are not caught in the laser beam.

When operating the machine, DO NOT touch the power cord to avoid an accident. Adjustment must be done by two people. One adjusts the laser path, the second presses

on the "pulse" button. The laser used in this laser engraving machine produces an invisible infrared beam. Before making adjustments, make sure that there are no foreign objects in the path of the laser beam and that it is not directed towards people.

The operation of a laser machine is based on moving a laser beam along a changing trajectory. The laser tube, 3 mirrors, laser head and adjustment system set the laser trajectory. The accuracy of the laser movement determines the result of engraving and cutting, so the operator must correctly adjust the laser trajectory. The lens in the nose is located between two spacer tubes (the lower one is 25.8 mm, the upper one is 38.1 mm with a lens with a focus of 63.5 mm) and lies with the convex part up.



There is a tube connected to the side of the laser head through which air is supplied; it is necessary to cool the focusing lens and blow through the material cutting area so that the material does not catch fire.

To adjust the mirrors, sighting targets made of 3mm thick fiberboard are used,



when hit by a laser beam it leaves a mark. When adjusting the laser beam, safety precautions must be observed. It must be remembered that the path of the laser beam must be inside the machine and not go beyond its boundaries.

### **Adjustment:**

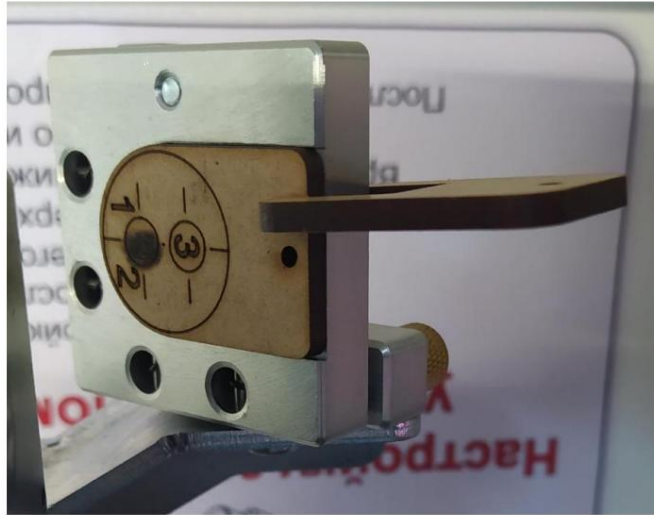
A: Turn on the water pump or chiller and make sure that water is circulating. All bubbles must come out of the lamp and the system must be completely filled with water,



then turn on the laser machine by turning the emergency stop/start button clockwise.



B: Place the target in the mirror frame marked No. 2 and secure with a clothespin.



Move the machine portal using the up and down buttons to the position closest to you.

C: Press the "pulse" button which turns on the operation group of the laser engraving machine. A laser beam will be fired (the laser power must be set to no more than 40%). Make sure the spot you leave is centered in the hole marked 1/2. If it is shifted to the side, it is necessary to turn the adjustment screws on the frame marked No. 1 before loosening the brass nuts.



The upper screw reflects the beam up and down, the lower side one to the left and right. You should twist it carefully, little by little, so that the beam does not leave the target field. After adjustment, secure the result by tightening the brass nuts.

D: Next, we repeat the operation on mirror No. 3. If there is no clear fit in the circle with mark 3, then turn the adjustment screws on frame No. 2. Don't forget to tighten the brass nuts.

E: The last mirror adjusts the beam exiting the laser head through the exit hole. To do this, you need to stick a small piece of masking tape on the bottom of the spout, pressing it against the outlet hole so that after removing the tape, an imprint of the halo outline of the outlet hole of the spout remains on it.



After gluing, press the “pulse” button. The removed tape should have a hole punched with a laser and an imprint of the spout outlet around it. The two circles should be one in the center of the other.



If this does not happen, adjustments should be made using the adjustment screws on frame No. 3. A positive result must be checked in all corners and the center machine table.



## Beginning of work.

Turning on and operating the machine.

Before turning on the machine, it is necessary to check the condition of all connecting cables, the presence and level of cooling water. If the machine operates without coolant, the laser tube may crack (burst) due to overheating, thereby failing.

Turn on the compressor. Turn on the main power, turn the "emergency stop" button. Check if water is entering the laser lamp. Turn on your computer and connect it to the device using a USB cable.

**Install software and drivers for your OS version. See RDWorks installation instructions.**

Stopping the car. To stop the operation of the device, turn off the power of the laser machine, the ventilation system, the general power supply of the equipment, and the air supply system.

### **Note!**

Set the correct speed of movement and laser power in accordance with the need and specified technological parameters of the work, for high-quality performance of the work.

Carefully move the work material, and maintain the same height of the work material set by the focusing spacer. Do not move heavy objects on the working surface, as this prevents the laser head from moving. This may damage the laser head and damage the machine mechanics!

## Maintenance and care.

### **Attention!**

Before performing maintenance, the power of the laser engraving machine must be turned off. It is prohibited to carry out maintenance by persons who have not been trained and who have not read the instructions!

A clean and tidy work environment is the key to successful work. How long the engraving machine stays clean depends on the type of material being engraved,

operation of the cooling system, operating conditions and frequency of use of the machine. Dust accumulating in moving parts will lead to disturbances in the engraving process and premature wear of the moving system; soot accumulated on the optical mirror will lead to glass destruction and damage.

The mechanisms of the laser engraving machine must be kept clean. The workplace must be clean and dust-free.

When working with material, especially when cutting it, inorganic residues accumulate on the working surface, which must be removed regularly, because they will burn and smoke when the laser operates.

The receiving tray under the table must be cleaned regularly to prevent the accumulation of debris from catching fire.

With regular high-quality maintenance and compliance with operating rules, the service life of the laser tube can be increased.

The laser lamp becomes hot and requires sufficient water to cool it. The water must be clean, free of dirt and dust. The water temperature should be from + 17 to + 20°C. If the temperature is higher, this will negatively affect the service life of the lamp; if it is lower, then high voltage breakdown may occur due to condensation on the surface of the hoses!

The laser head guides must be clean. Clean them regularly with a cotton swab soaked in alcohol and lubricate the rubbing parts. Don't forget the swab inside the machine.

Everything in the machine must be dry, especially the mirrors, laser tube and power switch.

If you notice moisture, immediately turn off the power and remove the moisture.

To turn off the power supply to the machine, first press the "emergency stop" button, then disconnect the plug from the outlet.

Before turning on the machine, it is necessary to check the condition of all connecting cables, the presence and level of cooling water. If

If the machine operates without coolant, the laser tube may crack due to overheating.

### **Cleaning steps:**

1. Turn off the laser engraving machine, unplug it from the outlet.
2. Open the machine cover, collect dust and waste with a dust collector. Wash off the plaque with a soapy solution. with a towel.
3. To clean the moving system along the X, Y axis, use a paper towel and apply lubricant to the X, Y guides through special grease nipples on the linear bearings.
4. The water in the chiller must be changed every 3 months. The volume of water must be at least 20 liters.
5. To clean the slats, use a soapy solution. It is better to wash after pre-soaking.
6. Wash your hands before cleaning optical glass. Do not touch the optical glass to avoid damaging the protective film on it. Upon completion of the work, you should at least once visually verify that there is no soot or scratches on it.

A clean mirror does not require washing. Washing too often can damage it!

Use cotton material soaked in cleaning agent solution. Cotton material can only be used once. Repeat this operation until completely clean.

There is no need to remove the mirror from its frame to clean it! The lens for cleaning must be removed from the cutting head by unscrewing it. It should be disassembled over a table to avoid breaking it. The lower surface of the focusing lenses in the focusing mirror can become contaminated with volatile substances from the working surface, sometimes with dust. Clean as needed.

The surfaces of the reflecting mirrors and the laser head lenses are polished and coated with a thin layer of metal. The cleanliness of their surface affects the laser power, so they must be kept clean and maintained regularly. Keeping your lenses clean increases their lifespan.

Laser equipment uses three reflection mirrors and one focusing lens. Reflective mirrors are mounted on the first and second stands and the laser head. The focusing lens is located inside the laser head. The cleanliness of the optics affects the depth and quality of engraving and cutting. It is necessary to maintain their cleanliness in a timely manner using special optical products.

7. Cleaning ventilation. Very easy to maintain. When turning off the machine, it must be turned off. It is necessary to remove dust and dirt from it in a timely manner. To do this, you need to disconnect the snail from the machine. On the volute body, you should tighten the four side screws and remove the motor with the impeller. After cleaning, reassemble in reverse order and connect to the machine. The frequency of cleaning ventilation and ventilation ducts depends on the load of the machine and the type of materials used. If you do not clean the ventilation in a timely manner, this can lead to excessive smoke in the machine, room, and rapid contamination of optics and mechanics.

## **Technical time frame services:**

Maintenance times depend on the type of material being engraved, the quality of the engraving, the engraving time and the quality of the air absorption system. The operator can independently decide on the timing of maintenance. Inspection or cleaning every 8 hours of operation is recommended. The operator must set maintenance schedules to extend equipment life, create higher quality products and reduce downtime. Maintenance will take approximately 15 minutes per day.

## Precautionary measures.

### Safety and precautions

The laser system should not be left unattended during operation as the laser beam may ignite nearby objects, and therefore **a fire extinguisher should be kept near the laser engraving machine.**

Starting the laser machine is prohibited until it is turned on ventilation.

Remove all foreign objects, materials, manuals, etc. from the working surface of the laser engraving machine to prevent blocking its movement.

Make sure there are no small objects on the running surface. Lubricant should be applied every day after work.

Ensure the performance and optical quality of the materials being engraved, including:

- cooling requirements;
- speed of safe engraving;
- Ensure that the operator of the machine;
- has undergone thorough appropriate training;
- learned the safety requirements;
- mastered the engraving procedure;
- water cooling system is working;
- ventilation is working.