Laser Marking System

F71XXC

User Manual

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Manufacturer

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Contents

1. Safety Guidelines

1. 1. Safety instructions

Warning!

The laser device supplied is a product of Class 4 laser.

Dangerous laser beam (Class 4) will possibly be emitted when

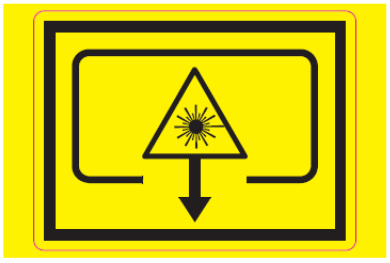
the beam guidance system is open.

Serious burns of eyes and skin and damage to property will be possibly caused.

Please read this operation manual carefully!

Be sure to observe the safety instructions!

1. 2. Warning label



1.3. Laser classes

The laser source adopts the working mode of pulse laser or continuous laser. It is of Class 4 and can emit an invisible (infrared) beam that is extremely harmful to eyes and skin.

The main hazards caused by laser radiation to human body are in eyes and skin. Laser radiation exposure to any part of body can cause burns. Exposure of any part of body to the flight light path of the laser device should be prevented to avoid injuries caused by misoperation. Such injuries are caused not only by direct laser radiation, but also by scattered radiation and reflection from the workpiece or packaging machine. The degree of injuries depends on the time affected, laser energy and wavelength.

In principle, laser devices can be divided into four classes of laser protection according to their potential hazards: Class 1, the safest; Class 4, the most harmful. A summary of these class definitions is shown below:

Class 1	Exposure to the laser radiation is harmless.
Class 2	Exposure to the laser radiation is harmless only when it is within a short period of time (maximum 0.25 second). Exposure to the laser radiation is harmful to eyes when an optical device focuses the radiation beam.
Class 3A	In other cases, the emitted laser radiation in the visible spectral range (400nm to 700nm) is harmless if it is within a short duration (maximum 0.25 second); the laser radiation in other spectral ranges is harmless even if the duration is long.

Class 3B	Exposure to the laser radiation is harmful to eyes and, in some specific cases, harmful to skin.
Class 4	Even if the radiation is diffused, exposure to the laser radiation is harmful to skin and seriously harmful to eyes. Laser radiation can cause hazards of fire or explosion.

According to the actual condition, this series of laser marking system is of Class 4.

If the beam exit (including the object to be marked) is properly shielded, the entire laser system that has been shut down will be of Class 1 (in normal operations, excluding the maintenance, repair and service work), and no additional protection is required during operations. Shielding can prevent laser radiation or reflection of laser beam.

Note: Shielding is not included in the scope of delivery.

Once the closed radiation shield or any part of the laser source housing is opened, the entire laser system will be of Class 4. In this case, appropriate protective measures must be taken to protect the people in the laser area from high-intensity radiation.

1. 4. Use

This laser system is only suitable for processing of material surfaces, which are heated locally by intense irradiation of Class 4 laser beam and are transformed accordingly. This system is mainly used for marking (of shelf life, lot number, serial number, etc.) on product surfaces.

With high energy level, the laser beam emitted by the laser source will cause personal injury and damage to property if used improperly.

- Do not use the laser beam to irradiate people or animals!

  Otherwise, it will cause serious damage to eyes or skin.

- Do not irradiate flammable materials!

  Please always take care to shield the laser beam properly. Take appropriate safety precautions, such as installing smoke alarm and fire alarm, in case of fire accidentally caused by marking of paper and other flammable materials.

- Do not irradiate the surfaces with reflective properties!

  Reflected laser beam is also harmful, in some cases even more harmful than the original laser beam.

- Do not irradiate the materials you are not familiar with!

  Some materials (e.g. polyethylene, polypropylene, glass) can be penetrated by laser beam, although they appear to be opaque to the human eyes.

- Explosion hazard!

  Be sure that no explosive material or vapor is present in the working area of laser beam.

- For safety reasons, unauthorized modification or alteration of the laser system is strictly prohibited.

  If the user changes the power data of the laser device or its intended function after the correction of the laser device that has been classed, the person or department having made the change shall be responsible for re-classing and re-marking of the laser device.

- Only the professionally trained personnel are allowed to operate the laser system when the laser source or the beam guidance system is ON. Be sure to observe the regulations concerning laser protection!

1. 5. Marking of the materials with strong reflective properties

Laser rays will possibly be emitted back to the laser source at the time of marking the materials with strong reflective properties. In this case, it is possible to cause some irreversible damage to the system, especially when the working distance is not set correctly.

At the time of marking such materials, please note that:

- Before the marking, check whether the working distance is set correctly. For this purpose, the materials with weak reflective properties (e.g. coated paper) should be used.
- Avoid marking the materials with reflective properties in the center of the marking area. At the time of positioning the workpiece, make sure that the marker is located at the edge of the marking area.
- Set the power of the laser source beginning from the minimum value, and then increase the power until a good marking result is obtained. If the marking cannot be done even with the maximum power, it means that the laser source cannot mark the materials.

1. 6. Protection and alarm devices

To ensure the operational safety of the laser marking system, the following instructions must be observed during operations:

- The laser marking system must be completely integrated into the production environment.
- Laser must never radiate on human body and must be shielded, depending on the type of laser, with glass, polycarbonate or steel (including plexiglass, perspex or stainless steel). The shielding must be able to prevent burn-through and resist diffuse reflection.
- Generally, the 5～10mm thick materials can resist the “scattered laser”.
- Make sure that nobody can enter the marking area during operations.
- The laser control switch must be turned off when the laser marking system is not in use.
- Appropriate protection or alarm devices and interlocking switch should be installed.

- The safety shielding system should be used in conjunction with an appropriate fume exhaust system.

Reminder: While installing the system, make sure that at least one alarm signal is always visible.

1. 7. Safety information about zinc selenide lens

Attention:

The surface of focusing lens is coated with zinc selenide, and contains traces of thorium, a radioactive substance. The same is true of all the laser marking machines on the market.

Zinc selenide

It contains ingredients that are hazardous to health!

If inhaled or swallowed, zinc selenide will cause poisoning and its dust will irritate the eyes and respiratory system. Therefore, do not eat, drink or smoke while in contact with zinc selenide. Wash your hands thoroughly after work.

Thorium

It will cause serious damage to health if inhaled or swallowed. The thorium layer in the lens is sandwiched between other layers, so that no radioactive substance will escape from the layer if the lens is not broken. Do not scratch the surface of lens.

There is no risk of radioactive radiation during normal use and cleaning of the lens.

How to deal with broken lens

Do not inhale the dust of the material! In case of broken focusing lens, please wear gloves to collect the fragments (avoid raising dust during cleaning of the fragments), and put the fragments into a sealed plastic bag, and then hand the bag to a professional department for disposal.

Maintenance of the focusing lens

If the lens becomes dirty, it must be cleaned thoroughly before operations.

The lens is not waterproof, so it must be cleaned with acetone or a detergent containing ammonia (such as Windex) and wiped dry with lens paper or cotton swab (Q-tip), and make sure that the surface of the lens is free of scratche.

1. 8. Hazards to eyes and skin

The laser system will emit Class 4 laser rays, which are emitted in the infrared region and are therefore not visible to the human eyes.

The high level of radiation will cause high heating of some areas and burns of tissues. Eyes are especially vulnerable to the radiation of laser rays, which will cause local heating and burns of cornea, resulting in impaired vision and even blindness.

Warning:

The personnel staying in the laser area must wear appropriate laser goggles while performing the maintenance, calibration and repair operations after the laser source or the ray guidance system is turned on. Do not look directly into the laser rays!

Appropriate laser goggles can protect against directly reflected or scattered laser rays.

An appropriate pair of goggles:

- Designed for the wavelength range of CO2 laser source.

  CO2 laser source has a wavelength of 10.6 μ m（9.3/10.2 for optional）.

  Please note the nameplate to avoid confusion! Another type of goggle is available for other models of laser source, for example, the protective glasses for Nd:YAG laser source, which cannot provide sufficient protection against the laser rays from CO2 laser source.

- Designed for the power range of laser source.

  The maximum output power of laser source can reach the following values：

  F7141C：40W， 10.6um

  F7142C：40W， 10.2um

  F7143C：40W， 9.3um

- Used for both continuous and pulse modes.

  The pulse frequency can be adjusted from 0kHz to 25kHz. The actual pulse frequency depends on the applications and the different models of laser source.

  Although skin is more tolerant to the intensity of rays than eyes, burns can damage skin tissues depending on the duration of radiation and the intensity of rays. Please wear appropriate protective clothing, and avoid the laser rays being directed at skin or clothing under any circumstance.

1.9. Maintenance and repair

The maintenance work described in the operation manual shall be done only by the professionally trained personnel. Repair work shall be done only by FASTJET maintenance service personnel or by their agents.

Reminder:

In order to enable you to perform all maintenance and repair work independently and competently, and ensure the safety of the operation and maintenance personnel, we will provide the following training:

- Technician training:

  The trainees can acquire all the necessary expertise to perform all maintenance and repair work of the laser system independently, reliably and professionally.

- Comprehensive training:

Technician training + Laser protection representative training. In addition to training on technician expertise, the trainees will also learn about the expertise necessary for the work of laser protection representative.

1. 10. Noise hazards

High-frequency noise will possibly be generated during the marking process.

Protect your ears and wear an appropriate hearing protection device.

1. 11. Fire and explosion hazards

With high output power, Class 4 laser source can ignite many materials. During the maintenance and repair with the laser source housing open and the beam guidance system turned on, fire prevention measures must be taken.

Flammable materials such as paper (circuit diagrams, post-it notes, wall advertisements, etc.), unimpregnated curtains, and wooden boards can be easily ignited by direct or reflected laser beams.

Be sure not to place a container with flammable or explosive solvents or detergents in the working area of the laser system. If an intense and invisible laser beam is accidentally directed at a container, it can quickly form an ignition source or cause explosion.

1. 12. Electrical safety

The laser marking system is manufactured in accordance with generally accepted technical rules.

An operator next to a working laser source or system component may possibly get into contact with components with grid voltage.

Please observe the regulations concerning working next to the energized equipment!

All the operations next to a working laser source, especially near electrical components, shall be done only by the specially trained personnel.

1. 13. Decomposition products

Attention:

Processing of materials with laser beams will result in decomposition products that are hazardous to health.

Tiny dust and vapor will be generated during laser marking. Depending on the type and composition of the material, they possibly contain decomposition products that are hazardous to health.

Therefore, we suggest installing suction device of adequate labeling dimensions with special dust-activated carbon filter, as needed. All the decomposition products should be extracted directly at the point of generation.

Please protect yourself and your colleagues from the health hazards of decomposition products!

In addition, the suction device protects the optics of the beam guidance system from contamination and possible damage by dust particles. We can offer you a variety of suction devices as accessories.

1. 14. Liability

Our company shall not be held liable nor provide any warranty for the personal injury, death or material damage arising out of:

- Use of the laser marking system for unintended purpose;
- Incorrect installation, commissioning, operation and maintenance of the laser marking system;
- The operating equipment with safety malfunctioning device, improperly installed or inoperable safety and protection devices;
- Failure to observe the instructions for transport, storage, installation, commissioning, repair and maintenance of the laser marking system in the operation manual;
- Opening of the laser source components;
- Unauthorized structural modification to the laser marking system;
- Unauthorized change to the beam and laser parameters;
- Failure to effectively monitor the components (refer to Section 5: *Maintenance*);
- Natural disaster, war and force majeure.

2. Introduction to the Equipment

2. 1. Working principle of the laser marking system

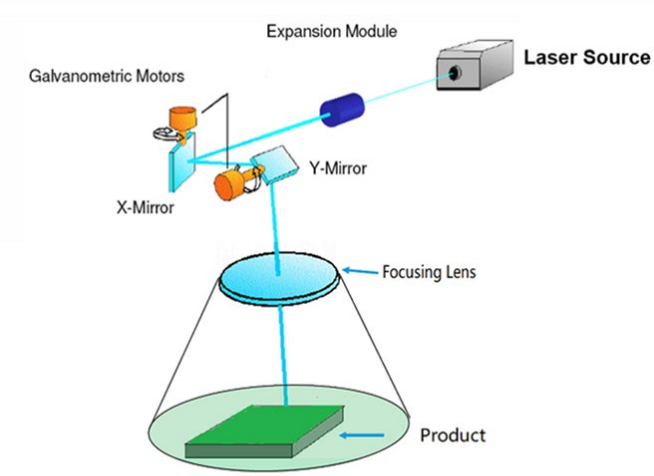
A laser source working in pulse or continuous mode produces an invisible laser beam with a narrow beam diameter.

In order to focus the laser beam better, it is first extended by means of a beam amplifier.

The extended laser beam enters the marking head and meets two moving reflectors, which guide the beam to scan along the traces of the selected format. The traces are subdivided into specific vectors (X and Y coordinates), and the marking is done on the product surface by the arrangement of the connected vectors. The laser beam moves in a “writing” manner on the product surface.

BSL control system in the power supply unit should conduct vector calculation and take control over the laser.

The refracted laser beam is focused by a focusing lens before it reaches the product surface, and the marking is generally performed at the focal point of the laser beam.



2. 2. Marking on product surface

Marking on product surface is done by applying an intense laser beam to the product material.

The laser beam is first focused on the surface of the material and heats the uppermost surface layer of the product, so that a color layer or color change of the material is obtained by heating.

The images and symbols to be marked on the product are first divided into individual vector lines, which in turn are subdivided into individual vectors.

The laser beam is turned off when it jumps from one vector line to the next, so that the material will not be marked.

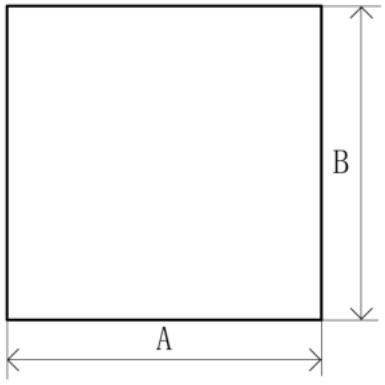
2. 3. Technical parameters

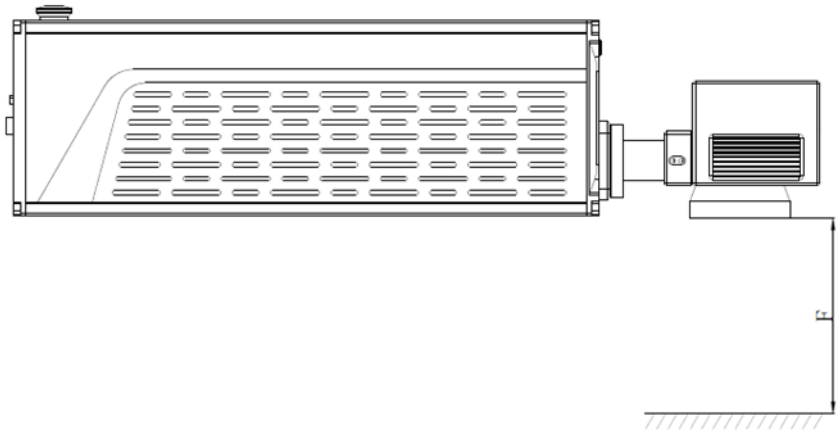
	Unit	F714XC
Laser type		Sealed CO2 laser source
Wavelength	um	10.6/10.2/9.3
Working mode		Continuous
Laser class		4
Maximun laser power	W	40
Maximum power consumption	VA	750
Supply voltage	VAC	220 single phase
Frequency	Hz	50/60
Working temperature	℃	5-40
Humidity	%	0-90 (non-condensing)
Cooling mode		Internal air cooling
Weight	Kg	19
Focal length	mm	135 (red light focusing)
Marking area	mm^2	110*110
Font		BSLA & TTF fonts
Control		Linux-based embedded operating system, color touch screen
Interface		RJ45、USB、RS232

Note: In case of any discrepancy with this manual, it is subject to actual conditions.

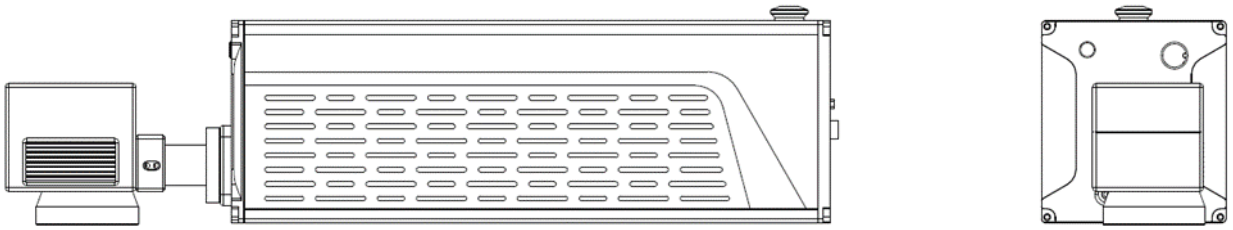
2. 4. Working distance & Marking area

Focal lens	Working distance (F) mm (red light focusing)	Width (A) mm	Height (B) mm	Marking area, mm²
73	57	50	50	50*50
100	84	70	70	70*70
160	135	110	110	110*110
230	226	140	140	140*140
254	240	175	175	175*175
300	291	210	210	210*210
327	314	250	250	250*250
450	401	300	300	300*300
592	565	400	400	400*400





2. 5. Appearance



3. Steps of Switching On/Off

3. 1. Installation

The installation and first operation of the laser system requires a great deal of expertise and experience. Therefore, this work must be carried out by FASTJET staff or its dealers.

In order to conduct installation smoothly, please make the following preparations at the installation site:

- Follow the steps described in the section “Unpacking”.
- Prepare all the connection parts in accordance with the section “Installation conditions” and the requirements of the dimensional and technical data files you received at the time of order processing.

If you have further questions, please consult FASTJET.

3. 2. Transport and storage

The laser system is a precision instrument involving laser optics. To prevent the laser system from damage, it is necessary to avoid strong mechanical effects (shock, vibration, etc.). Please consult FASTJET for any questions concerning transport and storage.

Transport

The laser system should be transported flatwise after removal of the packaging. Do not bend the power cable between the supply unit and the marking unit! Please turn off and unplug the laser system before transport!

Storage

Please store the laser system flatwise and take measures against dust and moisture. Do not expose the laser system or its accessories to sunlight!

The storage temperature should not exceed +65℃.

The laser system should be protected from freezing, which means that the storage temperature should not be lower than 5℃. The air humidity should be within the range of 0% to 90%.

3. 3. Unpacking

1. Open the packaging box, and remove the filling material.
2. Take out the individually packed components.
3. Check all the components for any damage caused by transport.

4. In case of any damage, please immediately notify the forwarding agency and FASTJET or its agent in writing. Please take good care of the packaging material and indicate the damage inside or outside.

5. Please carry the individual components to the installation site.

6. Please take anti-dust and anti-moisture measures for the individual components before starting operation.

3. 4. Installation conditions

Space conditions

For the standard dimensions of the laser system, please refer to the drawings in the chapter "Accessories".

For the equipment customized according to user's specific requirements, the dimensions are described in the installation drawings or in the dimensional and technical data files you received at the time of order processing.

Connection

A power socket is required for the operations of the laser system. For the relevant data, please refer to the dimensional and technical data files you received at the time of order processing.

Please note that the cable length of the laser system is approximately 5m when installing the power socket and selecting the installation site.

Environmental conditions

Temperature range: 5-40℃

Relative air humidity: 0-90%, non-condensins

3. 5. Fume Extractor

In order to remove the marking smoke and residue generated by the laser source during the processing of materials, which may be hazardous to human health, we recommend the installation of a fume extractor.

The fume extractor should be installed in such a way that the marking residue is suctioned away directly at the place where it is generated. This also prevents dust particles from contaminating the optical components of the laser system and gradually destroying them.

We can offer various fume extractor as accessories. If a fume extractor is included in the scope of delivery, the manufacturer's operating instructions will be accompanied.

3. 6. Switching on

- Please check the implementation of safety regulations.

- If there is a fume extractor, please turn it on.
- Press the power switch at the back side of the laser head.
- At the same time, the display screen lights up and the laser system is in the initialization state. The starting up will last 1-2 minutes, and the system will be in standby mode after the process is finished.
- Operate the touch screen system, call out the required marking template.
- Adjust the laser power and marking parameters to start marking.

3. 7. Switching off

- Press the STOP button to finish the marking process.
- Press the power button at the back side of the laser head to cut off the power supply of the machine.
- If there is a fume extractor, please turn it off.

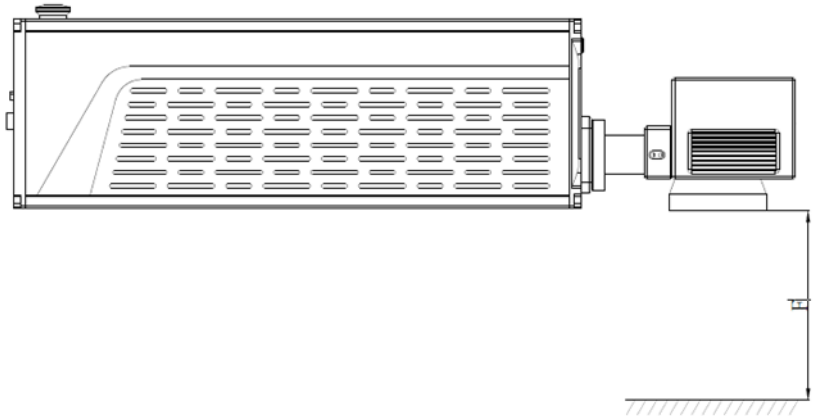
3. 8. Adjustment of working distance

When the laser is powered on, press the button on the scanning head housing to turn on the red light focus，then two beams of red light will be directed below the galvo, forming two red dots on the surface of the object to be marked. Adjust the upper and lower adjustment wheel on the laser stand to make the two red dots overlapped (or closest to each other).

Or, measure directly the distance from the lowermost edge of the field lens to the surface of the object to be marked. The working distance should conform to the specifications (refer to the parameters in Section 2.4).

Finally, it is necessary to adjust the printing head to make the marking effect as clear as possible (or observe bright and strong sparks when marking).

The actual value of working distance may be a little bit different from its theoretical value, please subject to the actual marking effect.



4. Operations of the Laser Marking System

See the software operation instruction manual for details.

5. Maintenance

5. 1. Maintenance instructions

The maintenance of the laser system only need to take a short time. Please perform maintenance work on time according to the specified maintenance cycle.

The design of the laser system enables you to complete all the due maintenance work safely and smoothly.

Attention:

- All maintenance work is only allowed to be carried out by the operation and maintenance personnel who have taken technical training!
- All maintenance work shall only be carried out after unplugging the power plug!
- The power supply must be disconnected before cleaning the laser system and peripheral equipment.
- Please record your regular maintenance work in the maintenance memo !

5. 2. Maintenance schedule

The maintenance cycle is set based on the working hours of laser system, which is about 10 hours per day, and a moderately polluted working environment.

If the daily use time exceeds the above limit, or the working environment is highly polluted, the maintenance cycle must be shortened accordingly.

Maintenance cycle

- Monthly: Please check whether the focusing lens on the marking head is polluted, and clean the focusing lens if necessary. Inspect whether the cooling air duct is blocked, and remove the blockage if blocked.
- Monthly or if when the monitor light is ON: If there is a fume extractor, please replace the filter bag (see manufacturer's operating instructions).
- Every three months (shall be done frequently in case of serious pollution): Please conduct a visual inspection of the laser system.
- Every six months: If there is a fume extractor, please replace the activated carbon filter (see manufacturer's operating instructions).

5. 3. Maintenance of air duct

Fan is located at the right side of the control unit, with air intake on the left side of the cabinet and air outlet on the right side of the cabinet.

Blocked air duct or fan failure may immediately cause risk of overheating, which may cause damage to the control unit. Therefore, air duct and fan must be checked once a month.

Important:

- Inspect the fan for noise. If any fan makes abnormal noise, replace it.
- The air vents must be checked regularly for cleanliness and must be cleaned if necessary.

Caution:

Do not use water flush to clean air vents.

5. 4. Cleaning of focusing lens

The focusing lens is on the end of marking head. It will be polluted by dust particles or suspended particles in the air, which will damage the focusing lens and have an adverse effect on marking. Therefore, the focusing lens must be cleaned regularly.

In general, you only need to wipe the side of the focusing lens facing outward. Please also check whether the side of focusing lens facing the marking head is clean, and clean it if necessary.

Warning:

- Part of the focusing lens is composed of coated zinc selenide, which has components that are harmful to human health.
- Please make sure that you clean the focusing lens with latex gloves! If you have touched the focusing lens with your hands, you must immediately wash them with enough water and soap. Please avoid scratching the surface of the focusing lens! Do not inhale material dust! If the focusing lens is broken, please pack the fragments in a sealed plastic bag and carry out biosafety disposal.

Attention:

- All optical components are high-precision and processed according to high requirements!
- Minor damage to the lens surface can gradually causing component damage, or poor marking quality, so stains on the surface can only be removed with optical cleaning paper and acetone.

Important:

- These materials are required for cleaning the focusing lens: optical cleaning paper, acetone, protective gloves.
- Please wear protective gloves when doing any work!

Clean the lens

Caution:

- Do not use the compressed air provided by the factory for cleaning.

- Never clean the lens with water because the lens is not waterproof.
- Please be careful when cleaning to avoid leaving scratches on the lens, which may reduce the quality of marking.

The lens must be checked for dust monthly and cleaned with canned (absolutely clean) compressed air if necessary.

For other dirt, the lens must be cleaned with acetone or a detergent containing ammonia (e.g. Windex) and lens paper or cotton swab (Q-tip) as follows:

- Please hold the optical cleaning paper with your thumb and index finger and apply a few drops of acetone to the edge of the paper. Or take an unused cotton swab (cotton tip) and soak one end in detergent.
- Please wipe the surface to be cleaned carefully and slowly with optical cleaning paper, or gently wipe the lens surface, only once for each place.
- Check the optical cleaning paper or cotton swab. If there is still dirt or oil contamination on it, please repeat the process with a new optical cleaning paper or cotton swab.
- Gently wipe the residual liquid off the lens with a new optical cleaning paper or the dry end of a cotton swab.

Attention:

- Do not touch the surface with protective gloves!
- Just use the cleaning paper or cotton swab gently!

Important:

- Please do not use brightener! This will ruin the focusing lens!
- Do not use contaminated optical cleaning paper and cotton swab.
- Take care to store the optical cleaning paper and cotton swabs at a clean place.

If the stains cannot be removed by the methods described above, or if the scratches on the surface of the focusing lens are too deep: Please replace the focusing lens with a new one.。

5. 5. Maintenance, repair and replacement records

We recommend that you note all the maintenance, repairs and replacements that have been carried out in the record.

The maintenance work to be carried out and the maintenance cycle shall be indicated in the maintenance record. Proper and timely maintenance work can minimize the malfunction of the laser system.

Additional repair and replacement records are available to support the maintenance work. You can make copies to keep a record of the work carried out throughout the life of the laser system.

6. Faults and Alarm code list

6. 1. Instructions

The possible faults, possible causes and troubleshooting measures are described in this section. The measures mentioned herein can be carried out by the operation and repair personnel who have received technical training.

Caution:

Any troubleshooting work mentioned herein shall only be carried out by specially-trained professional personnel! Please pay attention to the safety instructions!

6. 2. Description of faults

The laser will display messages on the control unit displayer. The messages and the appropriate operations are listed in the following table：

Code	Description	Possible cause	Possible result	Measures
W001	Production line moving too fast (product out of bounds)	Some marking content cannot be completed because the product has left the marking area before the marking is completed.	Unable to complete marking.	● Increase the trigger delay value, which usually requires a change in the position of sensor. ● Adjust the parameters to shorten the marking time. ● Reduce the marking size to shorten the marking time. ● Try using different fonts to shorten the marking time. ● If possible, change the lens with a larger marking area. ● Reduce the speed of production line, or increase the product spacing.

W002	Invalid trigger	Multiple trigger signals are received within the passing time of one product.	Some of the trigger signals are not executed to mark.	• Increase the product spacing accordingly. • Adjust the sensor sensitivity to make it more accurate for product detection.
W003	Fume extractor abnormal	Fume extractor is not activated, or its signal output is abnormal.	Fume cannot be collected and processed.	• Check whether the fume extractor is activated and working properly. • Check whether the signal cable is connected properly.
W004	Production line moving in the opposite direction	System receives a reverse motion signal from the encoder.	Distorted or incomplete glyphs.	• Check whether the production line is running reversely. • Check whether the encoder is installed properly. • Adjust the production line for smooth moving.
W005	Marking content is outside the marking area	Marking content is outside the defined marking area.	Incomplete marking.	• Reduce the marking size. • If possible, change the lens with a larger marking area.

Code	Description	Possible cause	Possible result	Measures
E001	Interlock status abnormal	The laser interlock switch for safety protection is not closed.	Unable to perform marking.	• Check whether safety guards are closed, such as a safety door. • Check whether interlock switch is damaged. • Check whether cables are connected properly.
E002	Product moving too fast, marking interrupted	Some marking content cannot be completed because the product has left the marking area before the marking is completed. If the warning occurs 5 times continuously, this fault alarm will be given.	Marking incomplete, marking will be terminated immediately.	• Increase the trigger delay value, which usually requires a change in the position of sensor. • Adjust the parameters to shorten the marking time. • Reduce the marking size to shorten the marking time. • Try using different fonts to shorten the marking time. • Reduce the speed of production line, or increase the product spacing. • If possible, change the lens with a larger marking area.
E003	Board connection abnormal	Communication failure between FPGA and master computer	Unable to start marking.	• Restart the laser system. • Check whether the cables and the connectors are connected properly. • Contact supplier service personnel.

E004	Trial period expired.	Master-computer encryption verification fails.	Unable to start marking.	● Restart the laser system. ● Contact supplier service personnel.
E005	Error of custom code	Custom code and preset do not match.	Unable to start marking.	● Check the last four digits of the hardware version in the system info screen; it should be 0000 normally. ● Restart the laser system. ● Contact the supplier to remark the custom code.
E006	Water chiller status abnormal	Water chiller not connected or working fails.	Unable to start marking.	● Check the state of the water chiller, whether it is running, whether the temperature is up to standard, whether there is an alarm etc. ● Check whether the connection cable is connected properly. ● Check the configuration setting, and whether the interlock function is enabled with the water chiller.
E007	Galvo abnormal	Galvo is not connected or working fails.	Unable to start marking.	● Check whether galvo cable is connected properly. ● Check whether galvo supply voltage is normal (±15VDC). ● Check whether galvo motor runs smoothly. ● Replace the galvo.

E008	Fiber laser source overtemperature	System received signal that the laser source overtemperature.	Unable to start marking.	• Check whether the working temperature is too high, and whether the air-filter is blocked. • Check whether the laser source cooling condition is normal, and whether the fan works properly. • Replace the laser source.
E009	Fiber laser source status abnormal	System received signal that the laser source status abnormal.	Unable to start marking.	• Restart the laser system. • Replace the laser source.
E010	Main oscillator of fiber laser source abnormal	System received an alarm signal of main oscillator of laser source.	Unable to start marking.	• Restart the laser system. • Replace the laser source.
E011	CO2 laser source over-voltage	System detected that the supply voltage of laser source is too high or too low.	Unable to start marking.	• Check whether the PSU of laser source meets the standard (48V). • Restart the laser system. • Replace the laser source.
E012	CO2 laser source error	System received signal that the laser source status is abnormal.	Unable to start marking.	• Restart the laser system. • Replace the laser source.

E013	CO2 laser source overtemperature	System received a signal of the laser source overtemperature.	Unable to start marking.	• Check whether the working temperature is too high. • Check whether the laser source cooling condition is normal, and whether the fan works properly. • Replace the laser source.
E014	UV laser source error	System received signal that the laser source status is abnormal.	Unable to start marking.	• Check whether the water chiller works properly. • Check whether the supply voltage of laser source is normal (24VDC). • Restart the laser system. • Replace the laser source.

7. Accessories

7.1. Wiring terminals

For Sensor (GX16-3pin connector), Only the sensor of NPN mode are accepted

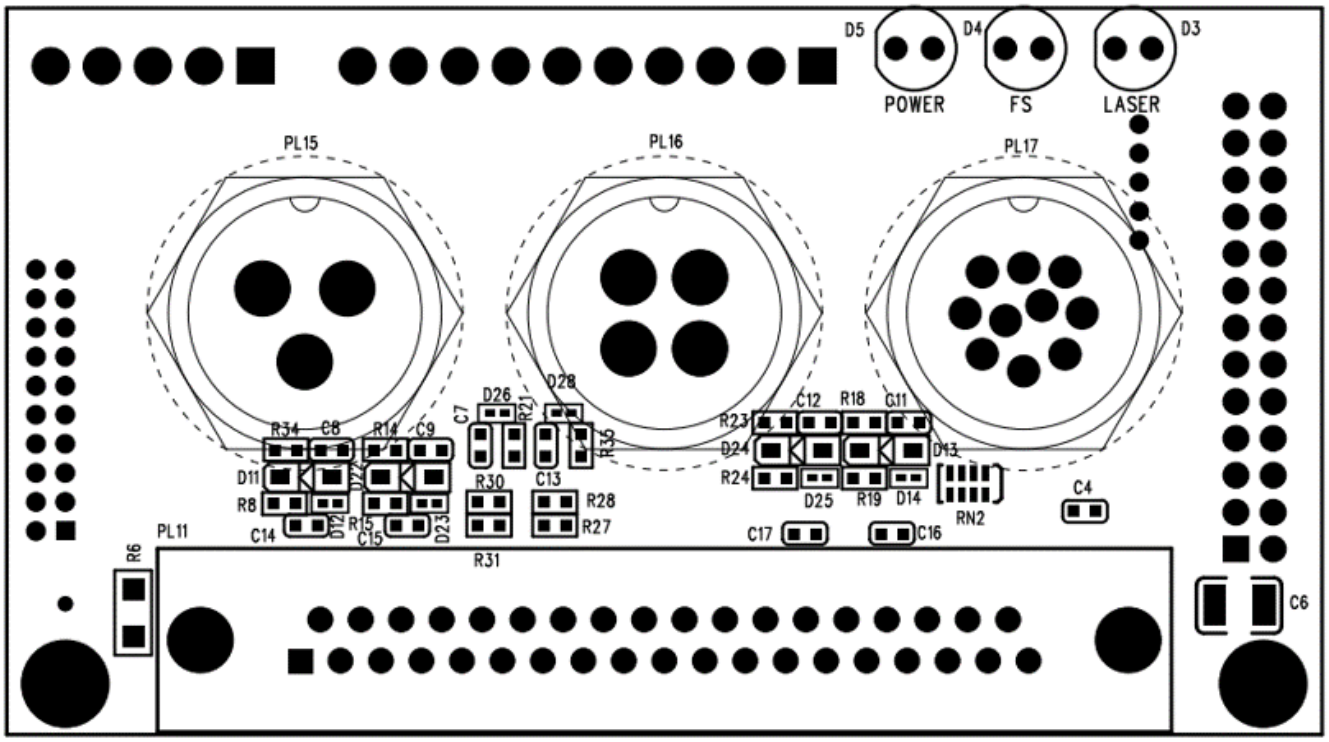
Pin NO	Function	Description
Pin1	IF_12-24V	Power
Pin2	TRIGGER	Output
Pin3	GND	0V(COMMON)

For Encoder (GX16-4pin connector), Only the encoder of NPN mode are accepted

Pin NO	Function	Description
Pin1	IF_12-24V	Power
Pin2	EnCo_SA	OUT A
Pin3	EnCo_SB	OUT B
Pin4	GND	0V(COMMON)

IO Extension (GX16-10pin connector)

Pin NO	Function	Description
Pin1	IF_12-24V	power, Directly connect to the power supply input of PL14_Pin1
Pin2	OUT0	Marking complete(NPN mode), Maximun 500mA
Pin3	OUT1	Ready to mark(NPN mode), Maximun 500mA
Pin4	IN0	E-STOP (in use), Active low, Maximun 10mA
Pin5	IN1	Serial number reset, Active low, Maximun 10mA
Pin6	IN2	Interlock, Active low, Maximun 10mA
Pin7	GND	GND
Pin8	NC	
Pin9	NC	
Pin10	GND	GND


D5
D4
D3
POWER
FS
LASER
PL15
PL16
PL17
D26
D28
C7
R21
R36
R34
C8
R14
C9
D11
D27
R8
D12
R15
C14
C15
D23
R30
C13
R28
R27
R31
R23
C12
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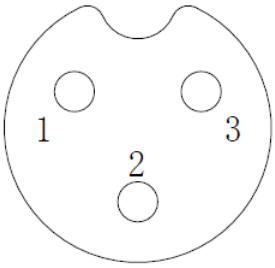
D25
R19
D14
RN2
C4
C17
C16
PL11
R6
C6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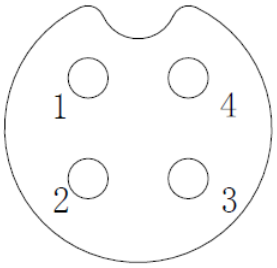
3
2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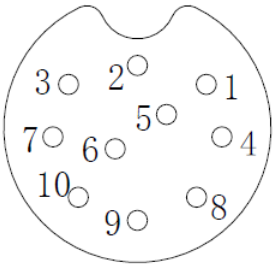
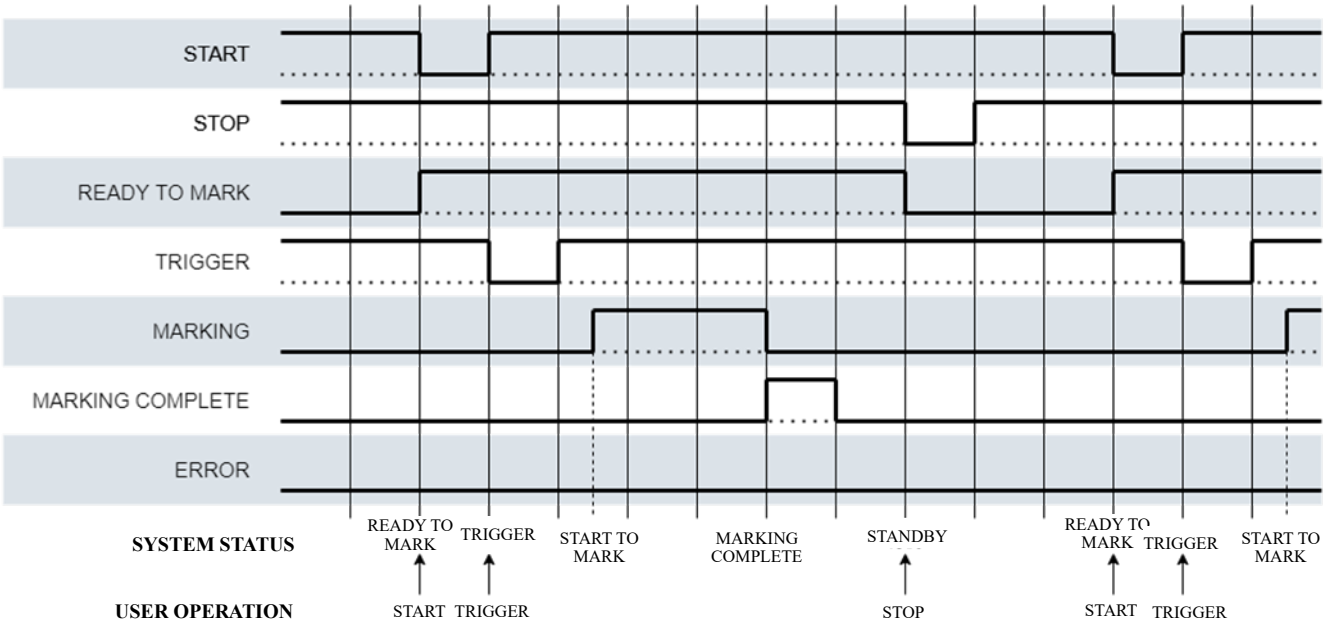
4
2
3

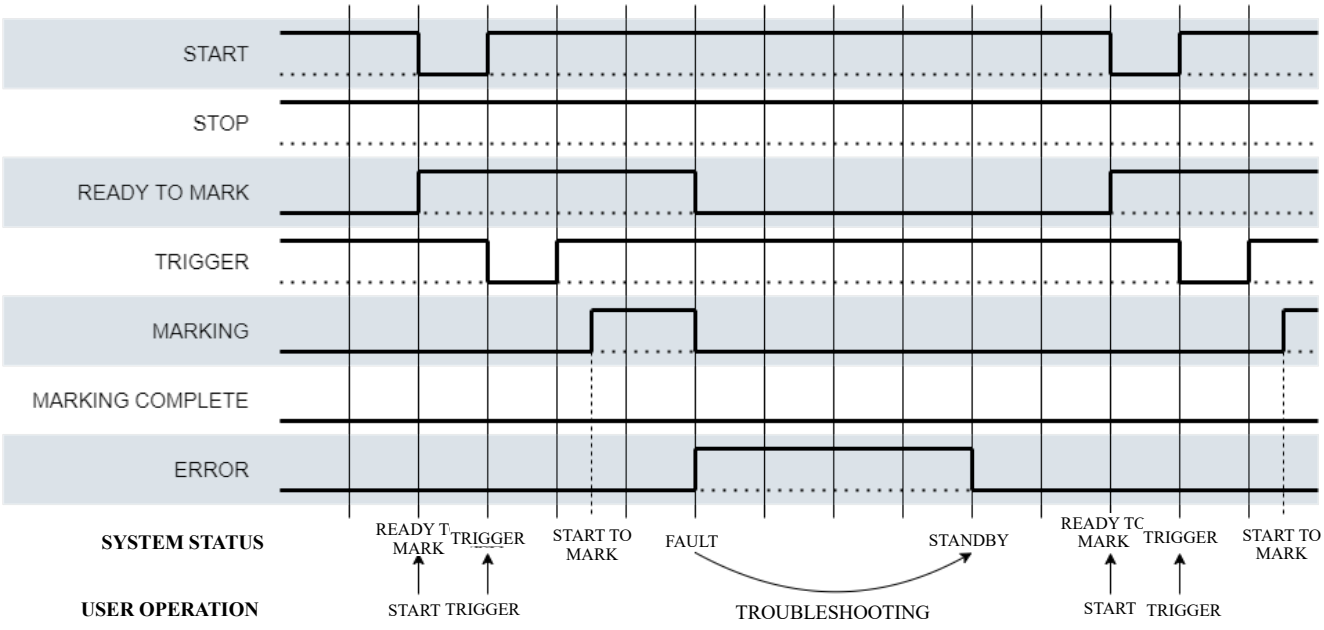

3
2
1
5
7
6
4
10
9
8

7. 2. Timing diagram

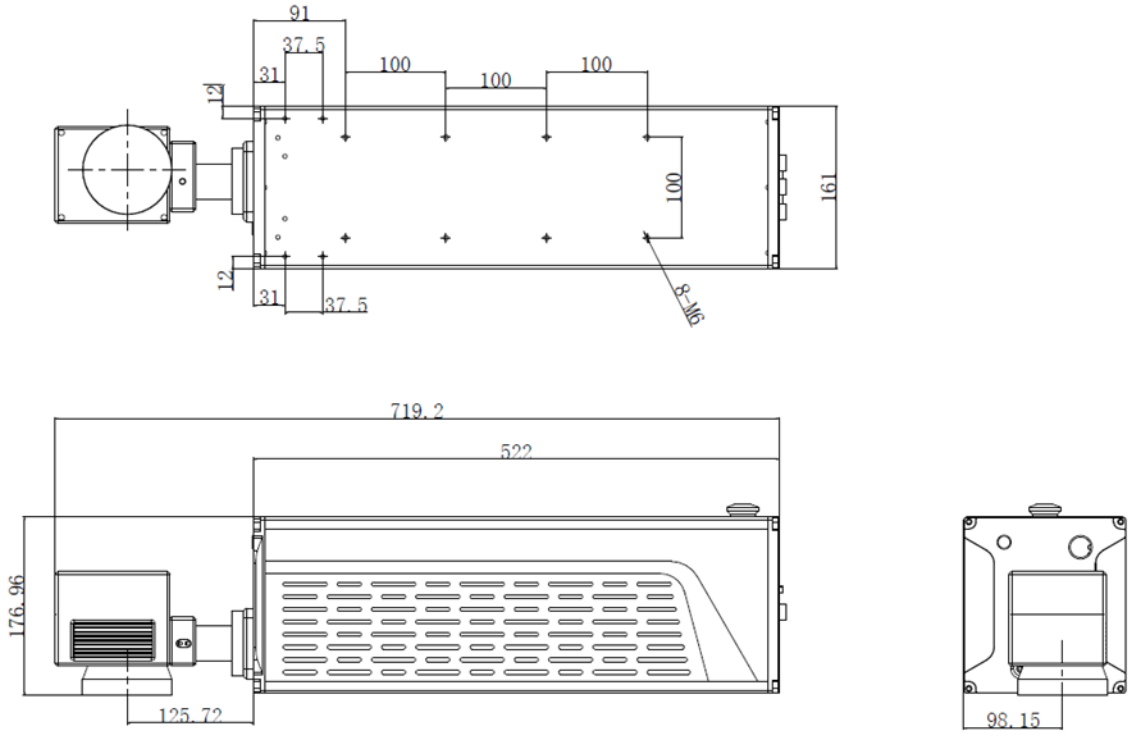
NORMAL OPERATION



FAULT SIGNAL



7. 3. Drawings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100
100
100
12
100
161
12
31
37.5
8-M6
719.2
522
176.96
125.72
98.15