Pulse laser cleaning machine user manual

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www.scotle.com

Foreword

Welcome to use the handheld laser cleaning products produced by Shenzhen Scotle Technology Group Ltd. For better use and maintain your laser equipment, please read this manual carefully before using this product. All laser operators must use personal protective equipment when using our laser machines. To avoid the hazards caused by lasers, please strictly follow all warnings and safety tips in this manual to prevent unnecessary risks. Our laser machines are safe and reliable by following this manual and applying reliable laser safety measures.

If the user has any comments and suggestions during use, please feel free to give us your advice to help us continue to revise and improve. Thank you again for using the products of Shenzhen Scotle Technology Group Ltd.!

During the operation, maintenance and service of this equipment, in order to ensure the safety of the operator, please do not disassemble the equipment privately. This product has no parts, components and assemblies that the user needs to repair by himself. Our company will not provide warranty service for damage to the equipment or accessories caused by the laser dismantled privately.

Our company certifies that this laser machine has been thoroughly tested and inspected. The inspection before shipment meets the published specifications. When you receive the machine, please check whether the packaging and parts are damaged. If so, it may have occurred during transportation. If the damage is obvious, please keep evidence and contact Shenzhen Scotle Technology Group Ltd.

Contents

1. Safety Tips

1.1 Safety Level

The laser level of this machine is class 4. The NOHD distance is 20M. To ensure the safety of the user, please make sure that the following measures have been taken before using the machine:
① When using this machine, please use a suitable grounded power supply and corresponding voltage.
② Before operation, please wear special fiber laser protective glasses and gloves, the glasses should suitable for wavelength range 1070±20nm and conform to 0D6+ standard; do not look directly at the laser to avoid damage to the eyes or skin.
③ Before emitting the laser, the dust-proof cover of the field lens needs to be removed;
④ Make sure that all optical components are below eye level, and pay special attention to the height of the eyes when sitting on a chair.
⑤ Avoid operating this machine in a dark, humid, hot, and unventilated environment.
⑥ Make sure to operate the machine only after receiving safety training.
⑦ Keep the machine clean, maintain the machine regularly to prevent foreign matter from entering the cavity, otherwise it will cause functional contamination and functional impact of related parts;
For technical support, please contact the corresponding after-sales service department:
eBay after-sales:
AliExpress after-sales:
Amazon after-sales:
B2B and official website after-sales: sales10@scotle.com

1.2 Safety Range

1.2.1 Radiation Hazards

Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.The laser cleaning process will generate visible and invisible radiation. The level of laser radiation emitted through the laser aperture exceeds Class 1. The high-energy laser beam of the pulse laser cleaning machine directly irradiates the human body, especially the eyes and skin, which may cause serious damage on eye includes retinal burns. To prevent these injuries, special laser protection glasses suitable for wavelength range 1070±20nm and conform to 0D6+ standard must be worn, the safety barriers and warning signs must be set up in the operating area.

1.2.2 Skin Hazards

Exposure to infrared and ultraviolet radiation during laser cleaning can hurt the skin. Laser sparks can also cause burns. Laser processing can transfer a lot of energy into the parts to be cleaned, so the parts will be very hot even after cleaning. It is necessary to take precautions to prevent skin damage by wearing protective clothing such as flame-resistant gloves, hats, leather aprons, and other flame-resistant clothing, sleeves and collars should be

buttoned too.

1.2.3 Fire Hazards

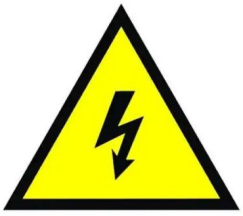
If flammable or combustible materials are close to the laser work area, the heat and sparks generated during the work process may cause a fire or explosion. Laser cleaning work can only be carried out when there are no flammable materials in the area. Fire extinguishers should be located nearby, easily accessible, and have personnel trained in their use.

1.2.4 Smoke Hazards

Laser cleaning "fumes" can consist of very fine particles and gases. Fumes and gases come from a combination of laser cleaning materials or shielding gases, paints, coatings, chemical reactions, and air pollutants. These fumes can adversely affect the lungs, heart, kidneys, and central nervous system. So better use this product in a ventilated environment and use a fume extraction system if necessary.

1.3 Safety Signs

As shown in the following table, all safety warning signs during the operation of the handheld laser cleaning machine (not limited to the signs on the laser body) include:

Safety signs	Name	Safety signs	Name	Safety signs	Name
	**Electrical Hazards**		**Grounding mark**		**Laser radiation hazard**
	**Explanatory label（an example label of 1500W）**		**Alternative label for laser aperture**		**Class 4 Laser alternative label**

Nameplate information (a sample nameplate of JPT 300W 220V pulse cleaning machine as follow):

huizhoushiyunshengshukongshebeiyouxiangongsi	
JPT 300W Pulse Cleaning Machine	
Product name: 300W Pulse Cleaning Machine	
Model NO: JPT300	
Rating Voltage : 200~240V	**Rating Frequency: 50Hz**
Laser Power:300W	**Rating Power:1500W**
Phase:L+N+PE	**Level: Class 4**
Origin:China	**Mfg year : 2025 . 02**
Address:	
huizhoushihuiyangquqiuchangjiedaoxihucunweipangtianhaichuangxinkejiyuanAdong5lou 512200 China	

1.4 Reference Standards

This product complies with EU harmonized legislation and complies with the above directives and standards only when installed in accordance with the manufacturer's specifications. European Community requirements for product safety
2006/42/EC Machinery (MD)
This directive requires laser equipment to comply with the following standards:
EN ISO 12100:2010
EN 60204-1:2018
EN ISO 11553-1:2020/A11:2020
EN ISO 11553-2:2008
EN 60825-1:2014/A11:2021
CDRH 21 CFR 1040.10

2. Product Introduction

2.1 Principle

The pulse laser cleaning machine uses high-energy laser pulses to irradiate the surface of the object, causing the

surface dirt to quickly expand, vaporize or reach the ignition point due to heat. In this process, the laser energy is absorbed by the dirt layer, generating instantaneous high temperature and high pressure, causing the dirt layer to quickly break and fall off. Due to the short pulse characteristics and high energy density of the laser pulse, the cleaning process has very little thermal impact on the object substrate, avoiding the thermal damage that may be caused by traditional cleaning methods.

2.2 Application

Since pulse cleaning machines can clean a variety of materials, including metals, plastics, ceramics, glass, fiber composites, electronic components, stone, etc. That makes pulse laser cleaning machines are widely used in many fields, mainly including industrial manufacturing, cultural relics protection, automotive industry, aerospace and other fields.

Industrial Manufacturing

In industrial manufacturing, pulsed laser cleaning technology can be used for processing metal surfaces and remove pollutants. It is environmentally friendly and no direct contact required, so it is suitable for the production of high-precision products. Compared with traditional chemical methods, laser cleaning reduces secondary pollution and improves production efficiency and quality.

Cultural Relics Protection

In cultural relics protection, pulsed laser cleaning technology can remove dirt on the surface of cultural relics without damaging the texture of cultural relics, so it is widely used in the cleaning works of museums and historical sites. This technology is particularly suitable for cleaning scenes of historical buildings and artworks.

Automotive Industry

In the automotive industry, pulsed laser cleaning equipment is used to treat the surfaces of various parts, such as rust removal, degreasing, etc. This technology not only improves efficiency, but also ensures the integrity and quality of parts.

Aerospace

Due to the high precision and high quality requirements of aerospace materials, traditional processing methods cannot meet the needs of cleaning. Pulse laser cleaning technology solves this problem and can be used for the maintenance of aircraft engine components, etc., ensuring high-precision cleaning effects.

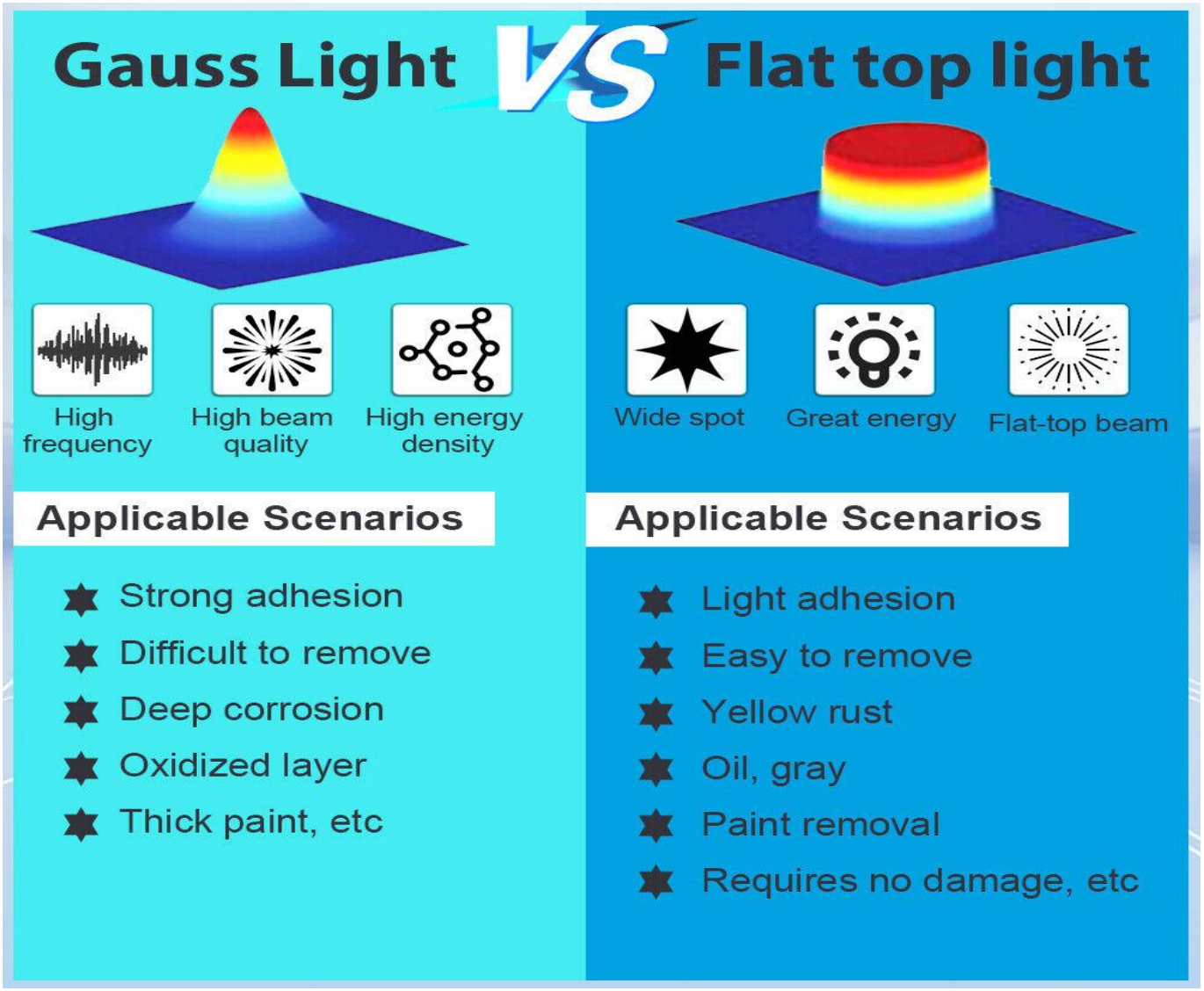
Other application areas

In addition, pulse laser cleaning technology can also be applied to areas such as building stone renovation, disinfection and cleaning of medical equipment. Its high efficiency and environmental protection characteristics make this technology widely used in these fields.

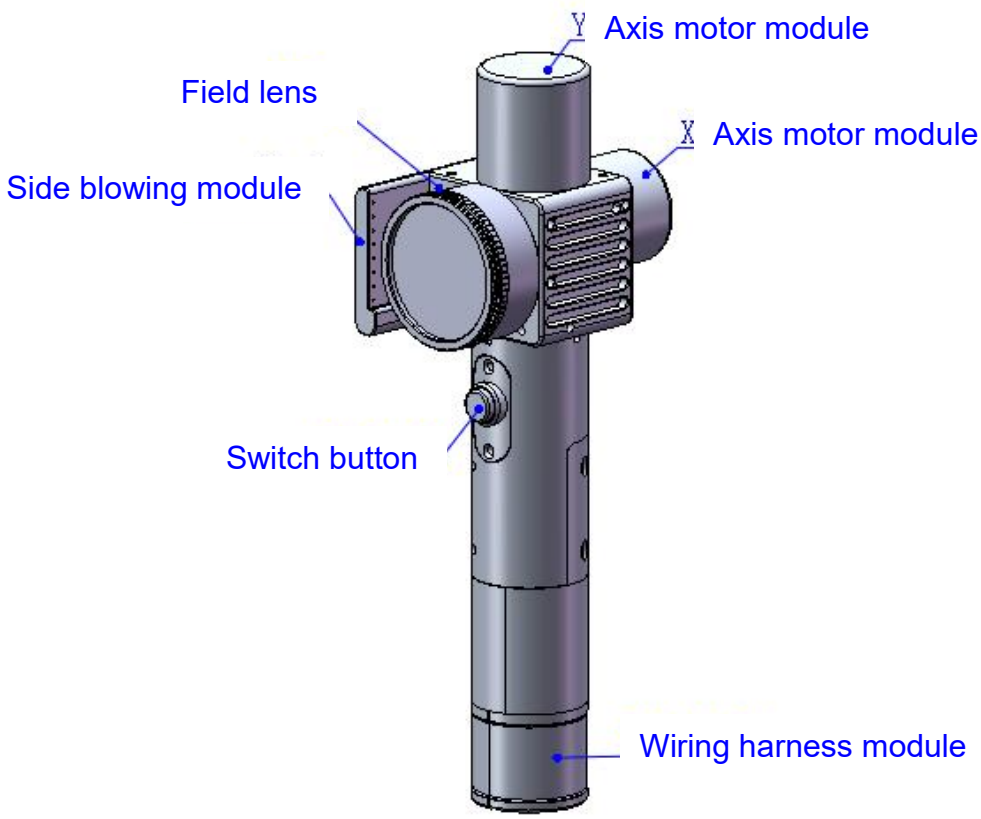
2.3 The difference between single-mode Gaussian light beam and multi-mode flat-top light beam

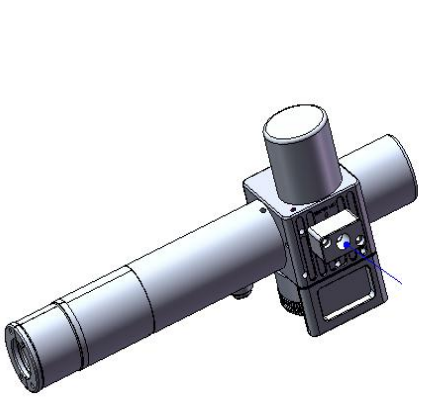
Theoretically, the single-mode and multi-mode of lasers refer to the mode type of laser beam propagation, its propagation mode can be a single mode or a mixture of multiple modes. In a single-mode laser, there is only one beam propagation mode, so the beam diameter and beam energy distributions are in Gaussian. In contrast, a multi-mode laser supports multiple propagation modes at the same time, so the beam diameter and energy distribution appear as a superposition of multiple wave packets, and its beam is similar to a flat-top light.

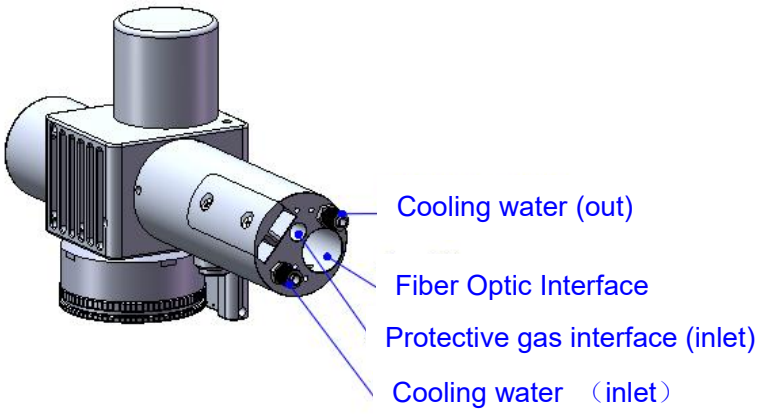
In the application of laser cleaning, the difference between Gaussian light and flat top light is very important, especially when facing precision workpieces, you must understand the cleaning requirements first and then choose the laser. So what is Gaussian light? Gaussian light is similar to normally distributed light, its laser energy in the middle is strong but weak at the edge, and the spot distribution is uneven. The advantage of this spot is that the energy is concentrated and the transmission is farther. The disadvantage is easy to damage the base material. Flat top light is named relative to Gaussian light. Its spot distribution is more uniform. When facing precision instruments, it can perfectly remove pollutants without damaging the base material.



2.4 Machine Structure


Y Axis motor module
Field lens
X Axis motor module
Side blowing module
Switch button
Wiring harness module


Gas interface
(side blowing)


Cooling water (out)
Fiber Optic Interface
Protective gas interface (inlet)
Cooling water （inlet）

2.5 Packing List

3. Technical Parameters

JPT 200W 300W

Parameter For Pulsed laser cleaning machine

Machine like

Laser power	200W	300W
Model number	FW-200	FW-300
Supply Voltage	AC 100~120V/ 200~240V	
Total Power	1000W	1500W
Laser power	200W	300W
Cooling Method	Air cooled	
Laser working mode	Pulsed	
Fiber cable Length	5M	
Laser source brand	JPT	
Laser gun model	FWH50-10A	
Light beam	Single mode Gaussian light	
	Multi-mode flat-top light	
Scanning speed	≦30000mm/s	
Optical interface	QCS Ø17	
Wavelength range	1070±20nm	
Field lens	Default F210 (F160/F254/F330 optional)	Default F254 (F160/F210/F330 optional)
Scan range	125*125mm (Max)	145*145mm (Max)
Effective aperture	Ø25	
Cleaning type		
Working Environment temperature	5~40 ℃	
Machine Size	70*50*64cm	
Machine Weight	52KG	

GZTECH 200W 300W

Parameter For Pulsed laser cleaning machine

Machine like

Laser power	**200W**	**300W**
Model number	FW-200	FW-300
Supply Voltage	AC 100~120V/ 200~240V	
Total Power	1000W	1500W
Laser power	200W	300W
Cooling Method	Air cooled	
Laser working mode	Pulsed	
Fiber cable Length	5M	
Laser source brand	GZTECH	
Laser gun model	FWH50-10A	
Light beam	Gaussian beam	
	Single mode laser	
Scanning speed	≦30000mm/s	
Optical interface	QCS Ø17	
Wavelength range	1070±20nm	
Field lens	**Default F210** (F160/F254/F330 optional)	**Default F254**(F160/F210/F330 optional)
Scan range	125*125mm（Max)	145*145mm（Max)
Effective aperture	Ø25	
Cleaning type		
Working Environment temperature	5~40 ℃	
Machine Size	70*50*64cm	
Machine Weight	52KG	

Accessories Specifications:
Auxiliary air pressure: ≤1Mpa
Gun Tip：FWH50-P10A
Control system：Relfar

4. Operation Steps

4.1 Unpacking Inspection

Unpack and check whether the machine is in good condition. Check whether any accessories are missing by comparing them with the accessories list on the packing list. If any accessories are missing, please take a photo and contact the relevant after-sales personnel.

4.2 Machine Installation

4.2.1 Air compressor connection

It is recommended to connect an air compressor before use the machine. The air compressor can effectively prevent smoke from contaminating the lens, thereby increasing the service life of the machine. This product does not come with an air compressor, so the users need to prepare one by themselves. It is recommended that the air compressor specification power is greater than or equal to 750W, air volume is greater than or equal to 15L, and mpa is greater than or equal to 0.2.

Air compressor

Note: When your air compressor pipe size is 6mm, then press the blue part on the machine port and pull out the transparent pipe , insert your air compressor pipe directly. If your air compressor pipe size is 8mm, then connect your air compressor to the port for 8mm pipe (refer to following 2 pitures).

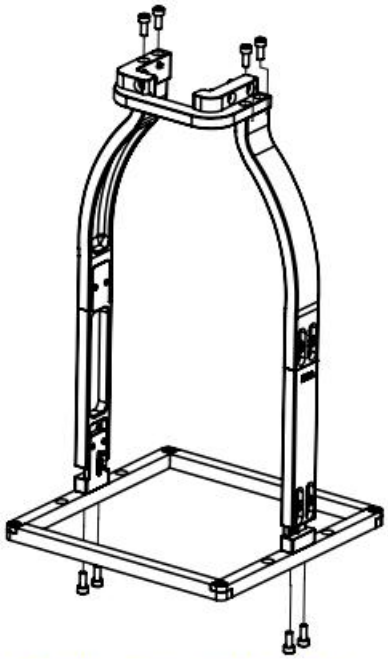
4.2.2 Positioning frame installation

Users can choose to install the positioning frame according to their needs.The best focal length is when the positioning frame installed; If using without the frame, then move the gun head up and down until the light spot is the brightest to get the best focus length.

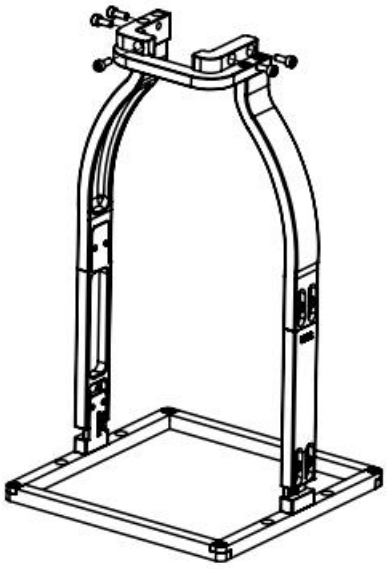
① The positioning frame can accurately locate the scanning and cleaning objects. The frame can be fixed with lower screws, or it can be scanned and cleaned in a universal moving way.

② Large-format cleaning does not require this frame, while small-size cleaning does, please refer to following detailed diagram of the frame installation.

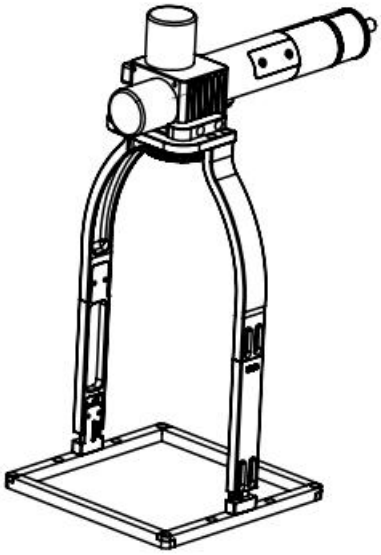
Note:The height of the bracket for the machine with different field lens is different.



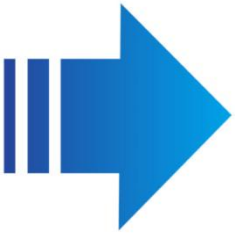
Step 1: Tighten the M4*10 cylindrical head screws on the bottom

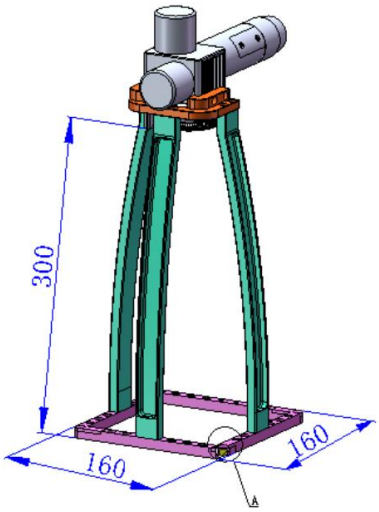


Step 2: Tighten the M4*10 cylindrical head screws on the top



Finished product diagram（F254 field lens)





4.2.3 Side blowing module installation

It is used to blow away the dust remaining on the surface of the object being cleaned.

4.3 Power On

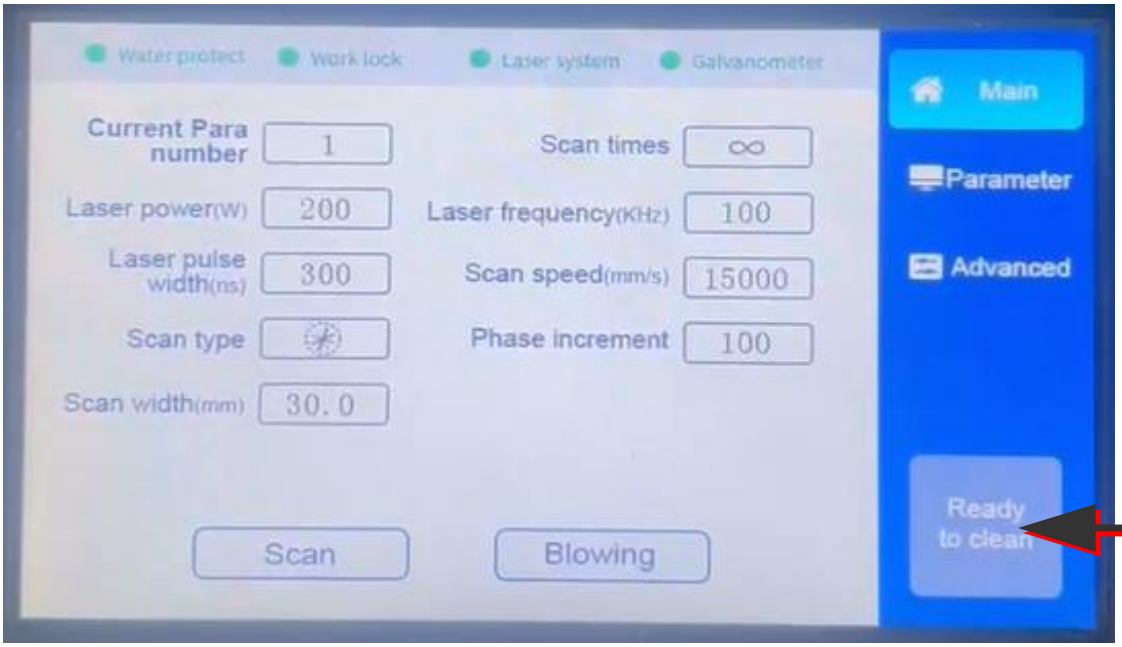
The system menu consists of [Main] , [Parameter], and [Advanced] interface. The [main] interface can set up various parameters related to scanning and laser, and can display the system and alarm status in real time; the [Parameter] can set system-related parameters, alarm parameters, and permission management; the [Advanced] interface can set up higher-level restrictive parameters, and a password is required to enter the advanced parameters.

①: Turn on the **laser switch** on the machine; ②: Open the **laser head protective cover**;

① **laser Switch**

② **laser head protective cover**

③: Click [**Ready to clean**] on the main interface;

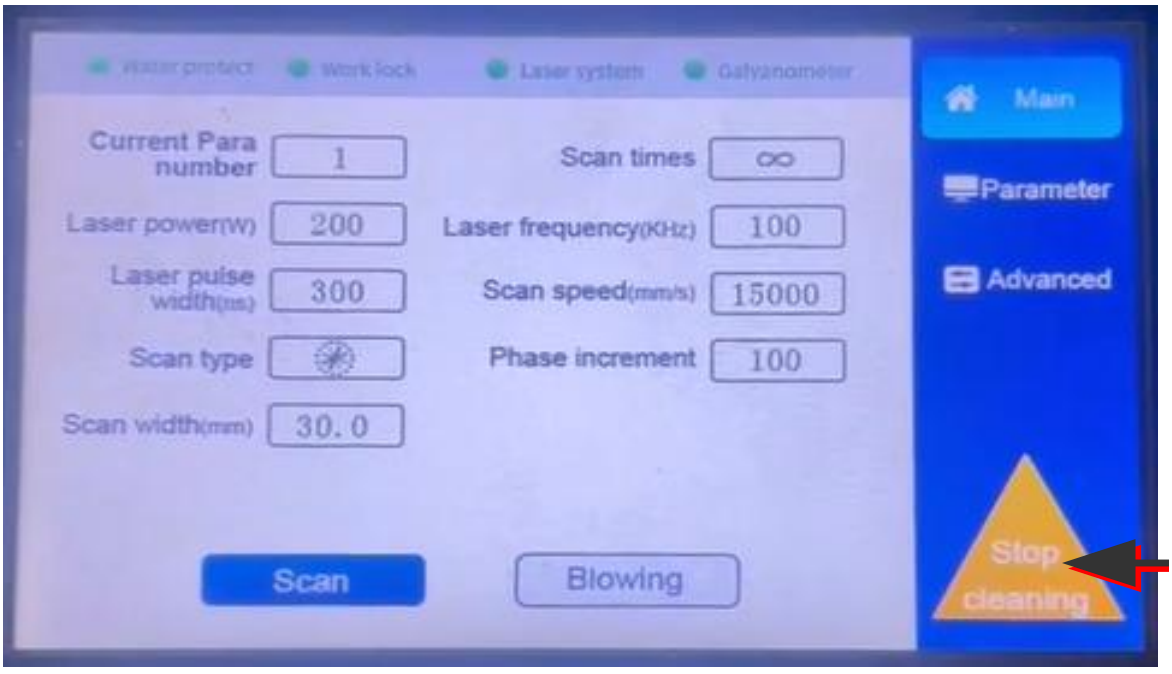


③ **Ready to clean**

④: Double-click the **laser head switch button** to start laser emission (single-click for preview). To stop the laser emission, single-click the laser head button again;

④ laser head switch button

⑤: After finishing the work, click [**Stop cleaning**] on the main interface, so the laser will not emit even if you double-click the laser head switch button accidentally.



⑤ Stop cleaning

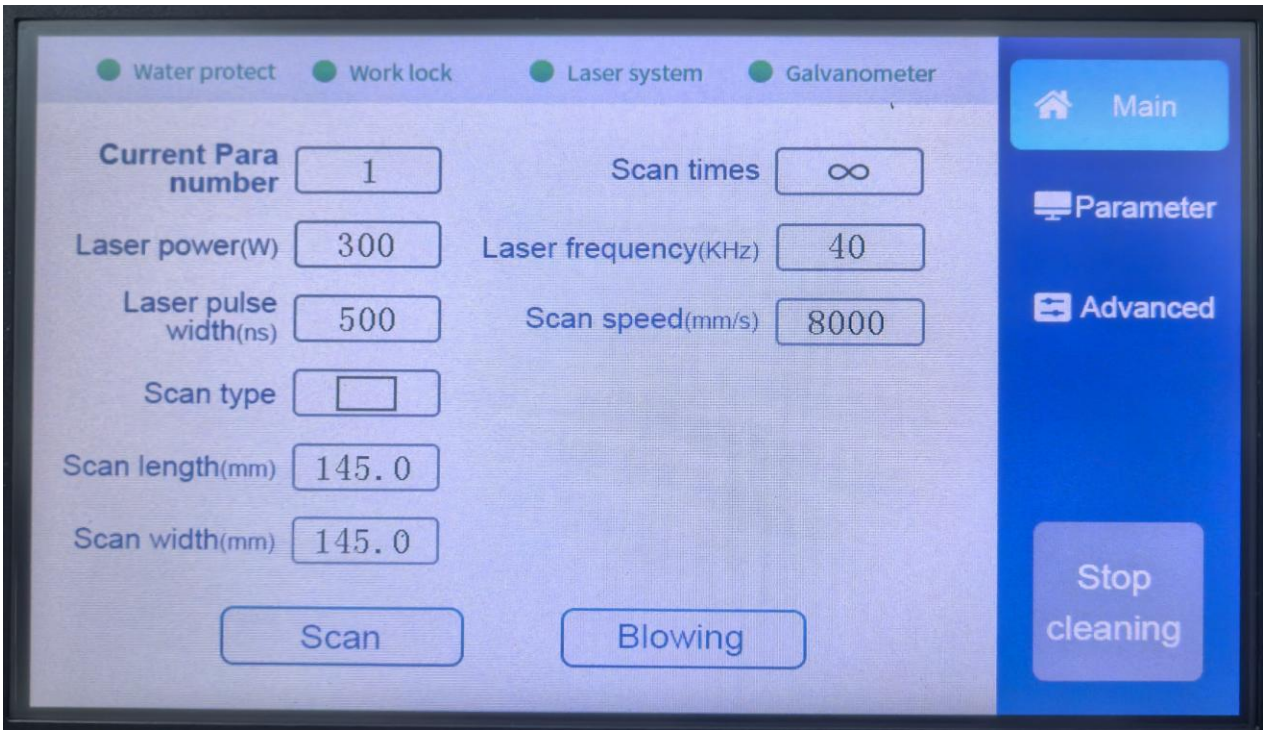
4.4 Parameter Settings

4.4.1 Cleaning parameters setting for different materials

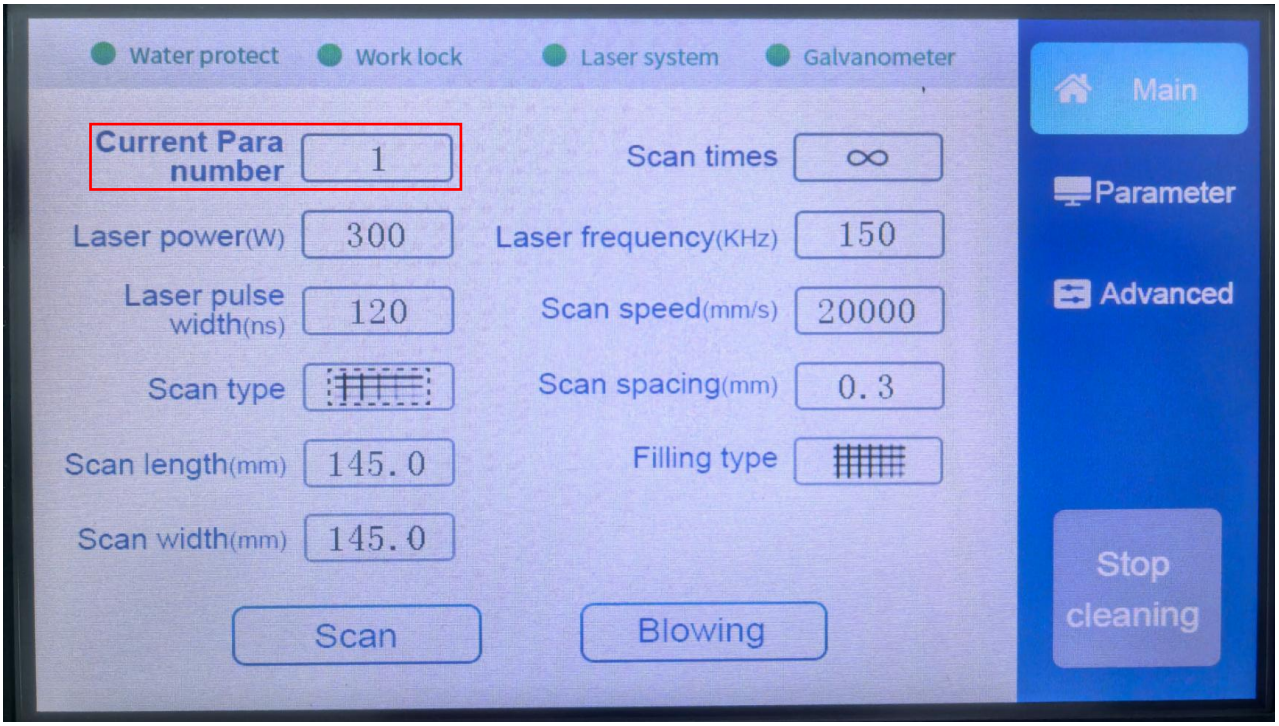
According to the cleaning materials and requirements, you can select parameters in the system process library, or refer to the following parameter settings:

CL2-200-5 Recommended Cleaning parameter table								
Materials	**Speed (mm/s)**	**Power (%)**	**Pulse Width (ns)**	**Frequency (Hz)**	**Lens Selection**	**Graphics**	**Filling space (mm)**	**Filling Angle**
Painting on wood	9530	100	100	150K	F254	Rectangle Filling	0.3	0°
Metal oxide layer	8000	100	200	64K	F160	Rectangle Filling	0.1	0°
Metal surface paint layer	8000	100	500	40K	F254	Rectangle Filling	0.15	0°
Steel rust layer	8000	100	500	40K	F254	Rectangle Filling	0.15	0°
Dirt and carbon deposits on metal surface	10000	100	500	40K	F254	Rectangle Filling	0.15	0°
Oxide layer on the surface of stone	3000	100	500	45K	F254	Rectangle Filling	0.26	0°
Stainless steel weld seam cleaning	6000	75	60	160K	F254	Rectangle Filling	0.06	0°
Glass surface cleaning	10000	90	200	64K	F160	Rectangle Filling	0.12	0°
Carbon steel surface cleaning	10000	80	100	200	F160	Rectangle Filling	0.06	0°

If the cleaning effect does not meet your requirements, you can also set these parameters in the [Main] Interface as following picture (Note: following picture is an example setting for 300W pulse cleaning machine, laser power setting as 300 means 100%, it is using F254 field lens with maximum scanning width 145mm. 200W pulse laser cleaning machine is using F210 field lens with maximum scanning width 125mm), there are 9 kinds of scan modes can be selected. Click the [Scan] button to preview the laser, and click the [Blowing] button to check whether the gas is connected and working properly.



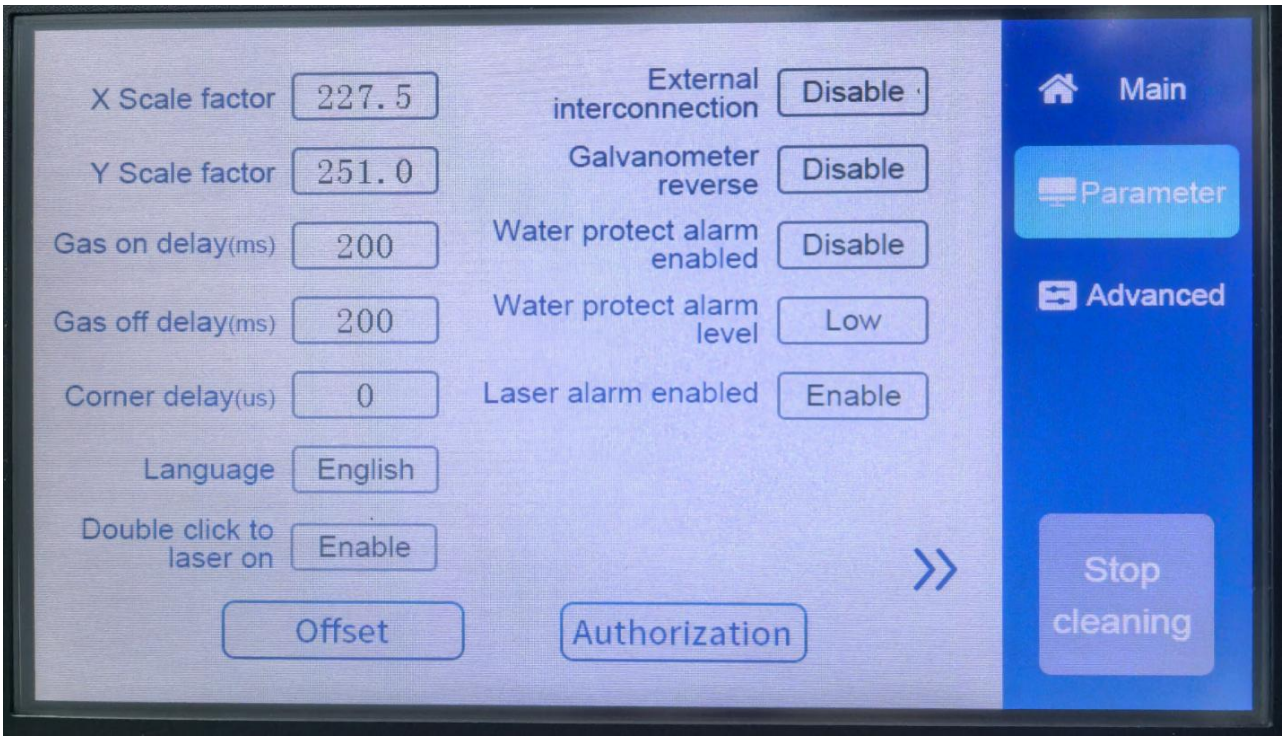
Metal surface cleaning can also refer to the following parameter settings (data from pulse 300W technology factory test).



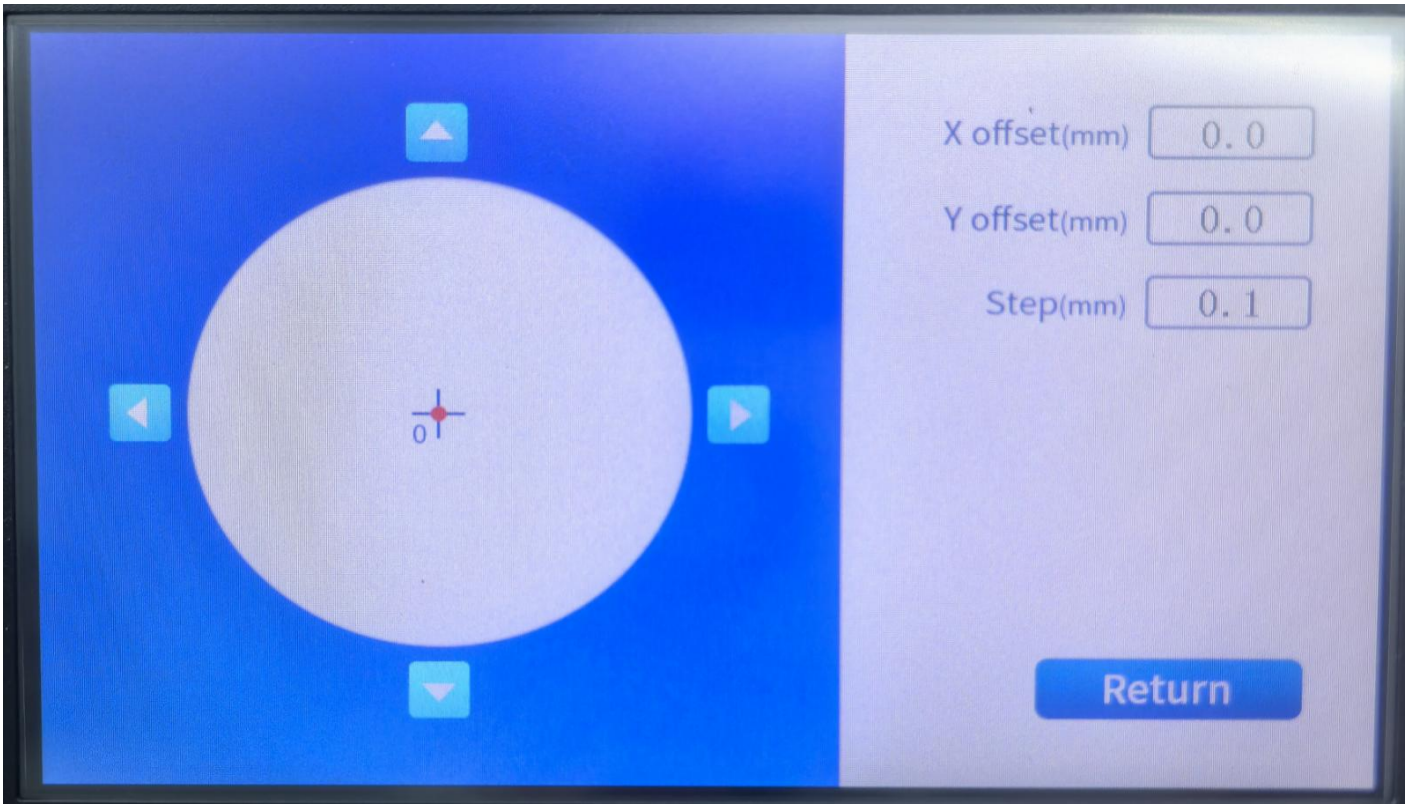
The “Current Para number” supports 9 different parameters setting for different cleaning works, such as 1 for wood cleaning, 2 for metals cleaning, 3 for leather cleaning..... After saved these parameters, you can enter the number directly to retrieve the saved parameters for the cleaning works you want, no need to set up again.

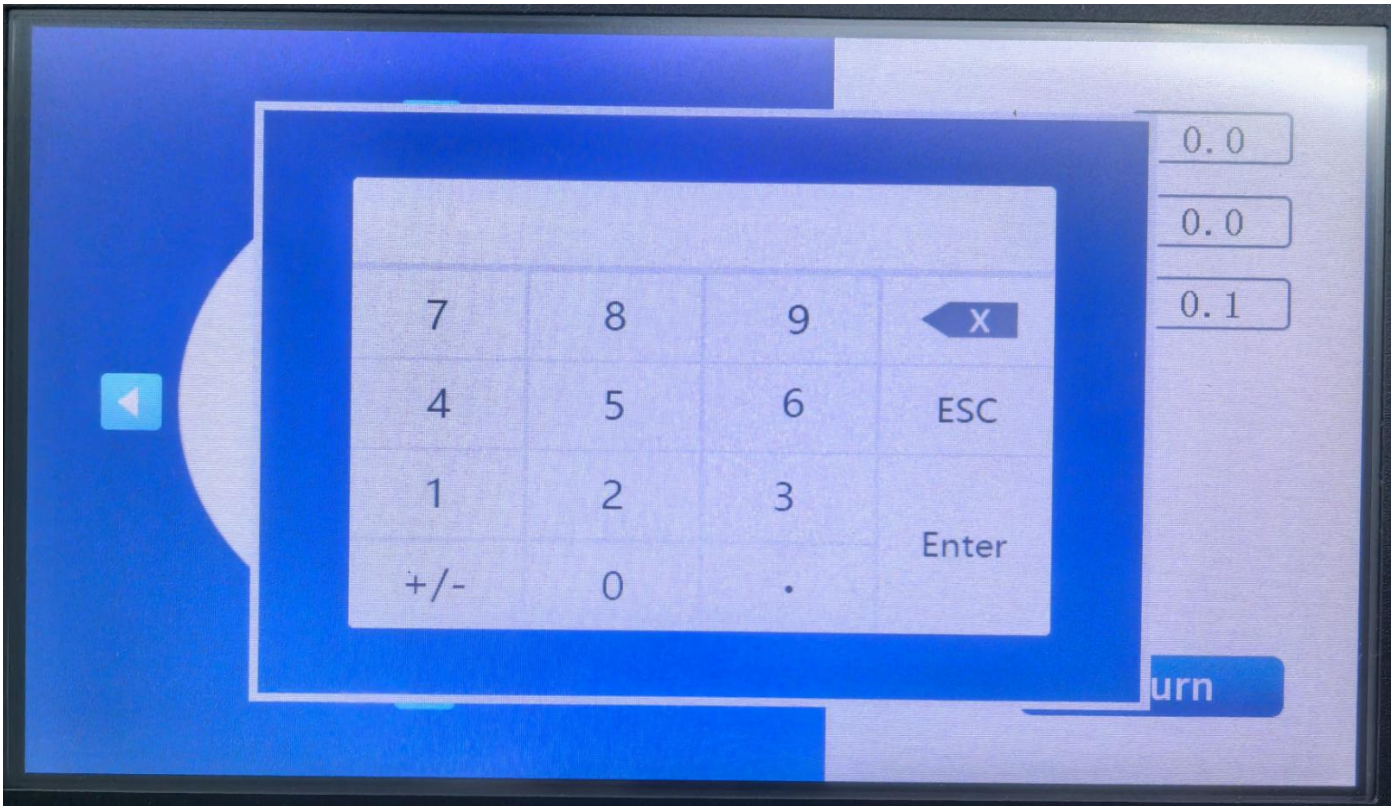
4.4.2 Other parameters setting

Language setting, switch to the [Parameter] interface to set up the language.

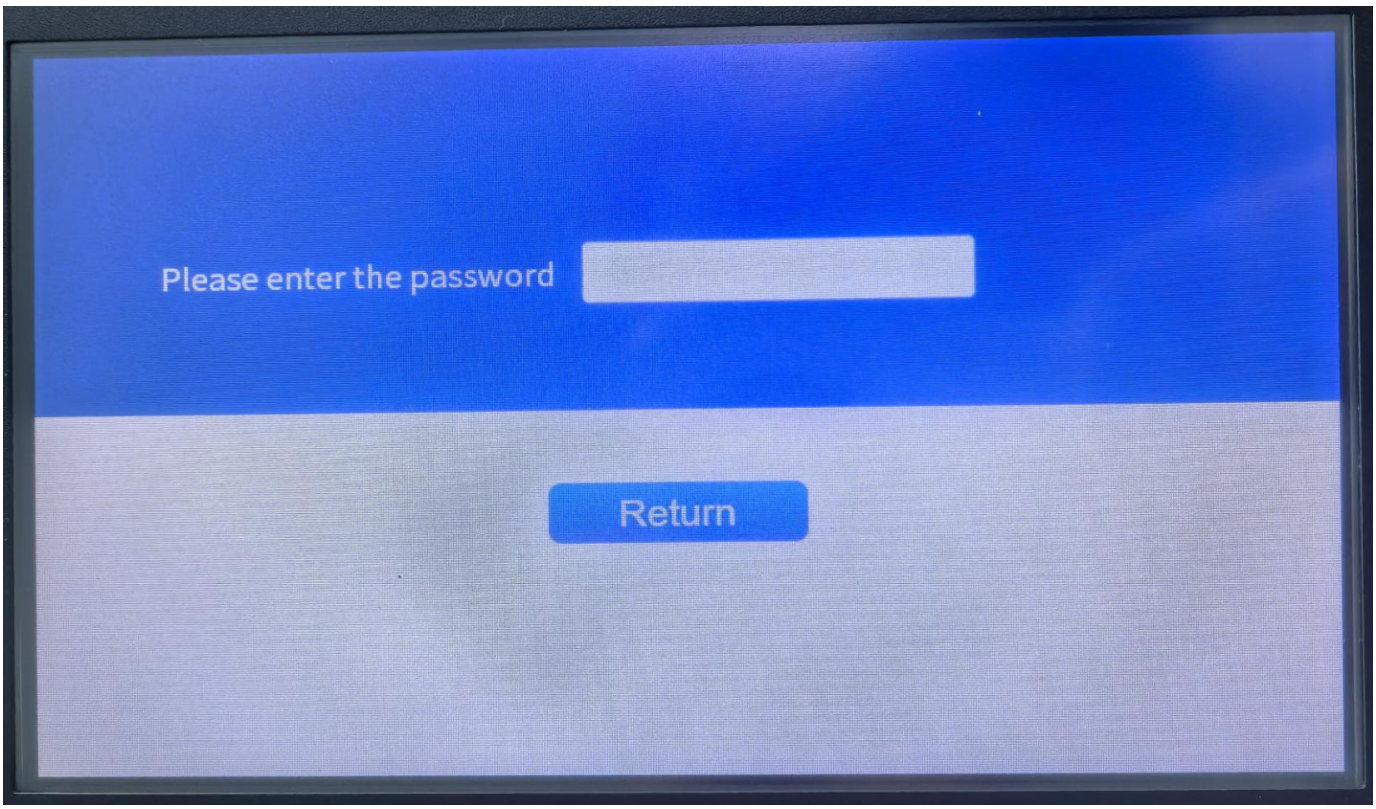


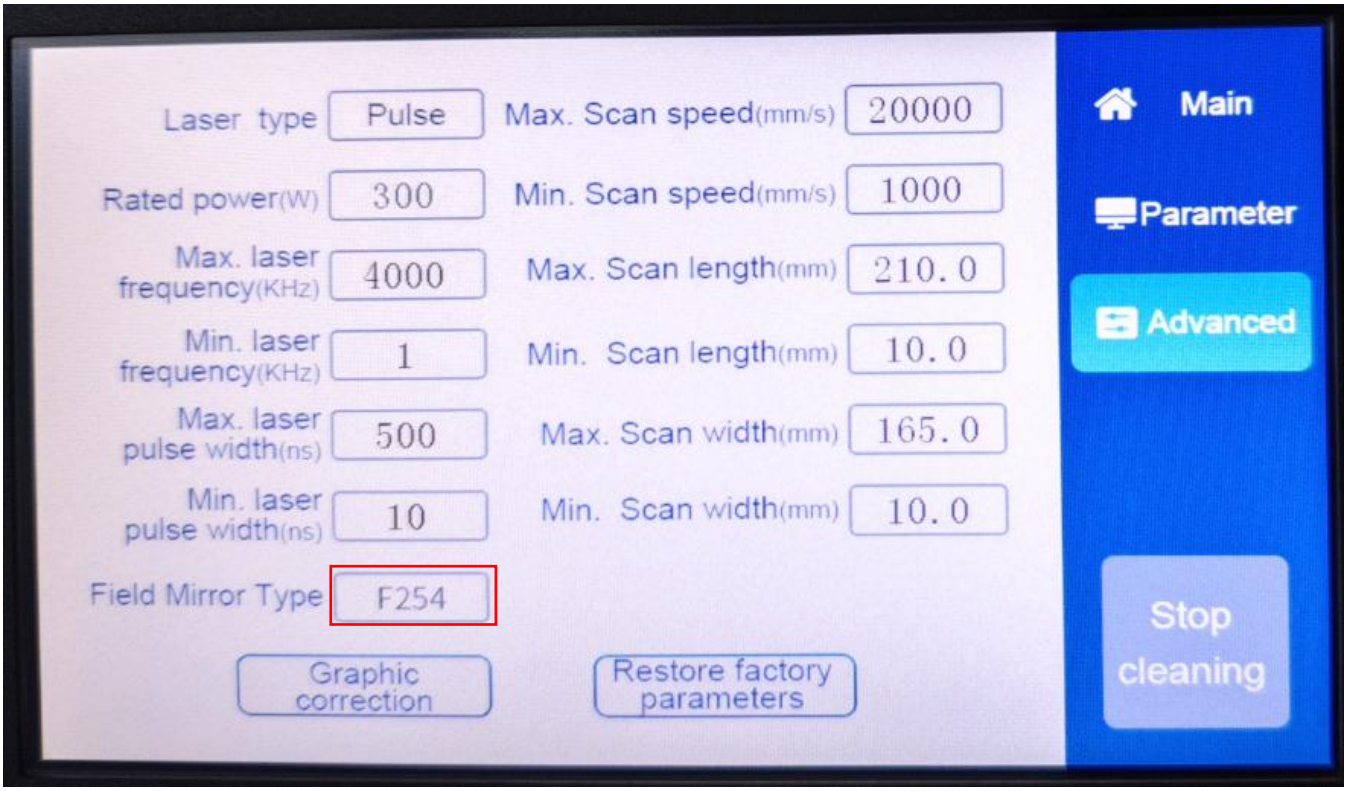
If the laser center is found to be offset, you can click [Offset] to adjust it. You can adjust it by pressing the up, down, left, and right buttons, or by entering numbers after XY offset on the right.





[Advanced] interface involved some general parameters of the machine which no need to set up, so we do not recommend to enter this page. If necessary, please contact the manufacturer to request the access password.





In this page you can also change the “Field Mirror Type” . Our machine is default using F254 for 300W type. When you changed the lens into others such as F210 from head, you also need to change from software for F210.

4.5 Starting Cleaning

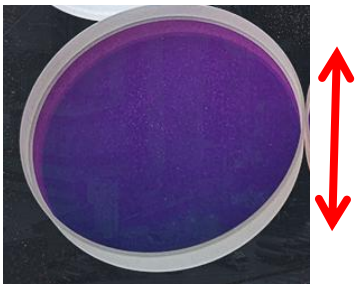
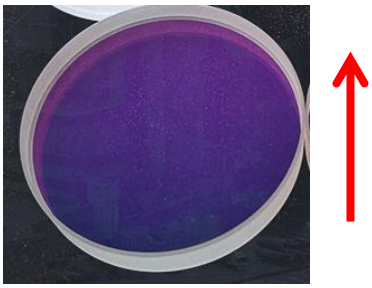
Start the laser cleaning program and observe the cleaning effect, adjust the parameters and move the cleaning head up and down to adjust the focal length if necessary. (The best focal length is when the positioning frame installed. When it is not installed, move the cleaning head up and down until the light is brightest and strongest, this is the best focal length).

4.6 End Operation

After cleaning is completed, single-click the laser head switch button to stop the laser emission, then click the [**Stop cleaning**] button on the main interface, and finally turn off the laser switch on the machine and disconnect the power supply.

5. Maintainance

5.1 Regular cleaning: Keep the surface of the device clean to prevent dust accumulation.
5.2 Optical lens cleaning: Clean the laser lens and protective lens regularly to avoid contamination that may affect the cleaning effect.
The operation methods and precautions of lens cleaning:
Tools: dust-free gloves or dust-free finger cots, dust-free wiping cotton swabs, Anhydrous ethanol(≥99.9%), and gas tank filled with dry and pure compressed air.
Spray anhydrous ethanol on the dust-free wiping cotton swab, place the lens directly in front of your eyes, gently pinch the side edge of the lens with your left thumb and index finger, hold the dust-free wiping cotton swab in your right hand, and gently wipe the front and back of the lens from bottom to top or from left to right in a single direction (do not wipe back and forth to avoid secondary contamination of the lens) and blow the surface of the lens with gas tank to confirm that there is no foreign matter on the surface of the lens after cleaning.


Note: All replacement parts are assembled in a dust-free workshop. Except for the first protective lens at the front end, other modules are prohibited from being disassembled in principle. If you must check the collimating lens,

focusing lens, and galvanometer lens, please place the product in a clean environment for disassembly.

Video for protective lens replacement: https://www.youtube.com/watch?v=NuPjnmQ35PM

6. Troubleshooting and Solutions

No laser emission:
Check whether the power supply and laser source well connected;
Check whether the machine voltage is consistent with the input voltage.
Check whether the machine is in the state of allowing light emission (after [**Ready to clean**] button clicked) and double-click the laser head switch button. For details, please refer to 4.3 power-on steps.
Poor cleaning effect:
Adjust parameters such as laser power and scanning speed, or check whether the lens is clean.
Equipment overheating:
Check whether the cooling system is working properly.
Others:
You can also contact the corresponding after-sales service personnel directly for related questions.

7. After-sales Statement

Warranty period: The machine with a warranty of 12 months from the date of purchasement.
Technical support: We provide free technical support whole lifetime. Any questions please contact the corresponding after-sales service department.
Repair service: Free repair during the warranty period, and appropriate fees will be charged out of the warranty.
Warranty range: We provide warranty services for products with defects caused by materials or production processes during the warranty period, and guarantee that the products meet the relevant quality and specification requirements mentioned in the document under normal use.
We provide repair or replacement services for the machines that fail due to materials or production processes during the warranty period. After repair or replacement , the machine still hold the remaining warranty period.

We do not provide warranty for following situations:
(1) Any tampering, opening, disassembly or modification on machines by personnel without the permission of our company;
(2) Damages caused by improper use, negligence or accident;
(3) Operation beyond the scope of machine specifications and technical requirements;
(4) Indirect damage to the laser source due to failure of user's software or interface;
(5) Use due to improper installation, maintenance or other abnormal operating conditions not included in this manual;
(6) Consumables are not covered by the warranty.
Customers are responsible for understanding the above information and operating in accordance with the user manual, otherwise the failure caused will not be covered by the warranty.

Important:

◎ Within warranty, customers must provide feedback within 30 days of discovering the fault.

◎ Shenzhen Scotle Technology Group Ltd. does not grant any third party or individual the right to repair or replace our products.

◎ To protect your rights, please be sure to contact the relevant after-sales department of our company as soon as possible after discovering the fault and apply for product repair or replacement service. If you need to return the product, please pack it in matching packages after authorization by our company and then return it to the place designated by our company.

◎ When any damage is found after receiving the product, you must keep the proof document so that we can claim rights from the transporter.

◎ Please do not send any product back to our company or any warehouse address without communication and confirmation.

◎ If the product is not within the warranty period or warranty scope, users need to pay the product repair costs.