



**FRIENDS★LASER**  
By Your Side

# **User Manual for FRZ-LCF200**

## **Laser Cleaning Machine**

**Suzhou Friends Laser Technology Co., Ltd.**  
Integrity Innovation Cooperation Sharing

Version: A0

The final interpretation right belongs to our company

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# Security information

## A. Safety signs

	May cause serious personal injury or even endanger life
	may cause general personal injury or damage to products or equipment.

## B. Laser Safety Level

According to the European Standard EN 60825-1, Clause 9, the device's internal laser belongs to 4 types of lasers. the product emits laser radiation at wavelengths around 1064 nm or 1080 nm, causing damage to the eyes and skin directly or indirectly exposed to such light intensity. Although the radiation is invisible, the beam can cause irreparable damage to the retina or cornea. Suitable and certified laser protective glasses must be worn during laser operation.

	In the operation of the product to ensure the entire wearing of laser safety protection glasses. Laser safety protection glasses have laser wavelength protection selectivity, so please choose the laser safety protection glasses according to the laser output band of the product. <b><u>When the laser cleaner is energized, it is forbidden to direct the laser output head towards someone's the person, and the laser output head is forbidden to illuminate the mirror surface of the strong reflective material.</u></b>
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## C. Security identification



1.1 Laser identification



1.2 Do not fold the fiber

## D. Electrical safety

- ① grounding the product through the PE line in the power cord, and ensure the grounding is firm and reliable.



Grounding disconnection will cause the product shell to be charged, which may cause personal injury to the operator.

- ② Ensure AC voltage supply is normal.



Wrong wiring or supply voltage will cause unrecoverable damage to the laser.

# 1 Preamble

## 1.1 Welcome

Thank you for choosing My Company FRZ-FLCF200SL hand-held laser cleaning machine products. this user manual provides you with important safety, operation, maintenance and other precautions. Therefore, before using this product, please read this user manual carefully and keep it properly. To ensure operational safety and the best condition of the product, follow the following precautions and warnings.

This user's manual is not a warranty. Correction of printing errors, modification of modification of the information mentioned, and improvement of the product are all explained at any time by star laser without prior notice.

## 2 Product description

Laser cleaning is a new technology based on the interaction of laser and material, which can achieve the effect of removing surface pollution and attachment. Compared with traditional cleaning methods, laser cleaning has the advantages of non-contact, no damage to the substrate, accurate cleaning , " green "environmental protection and on-line, especially suitable for high-speed on-line cleaning in designated areas.

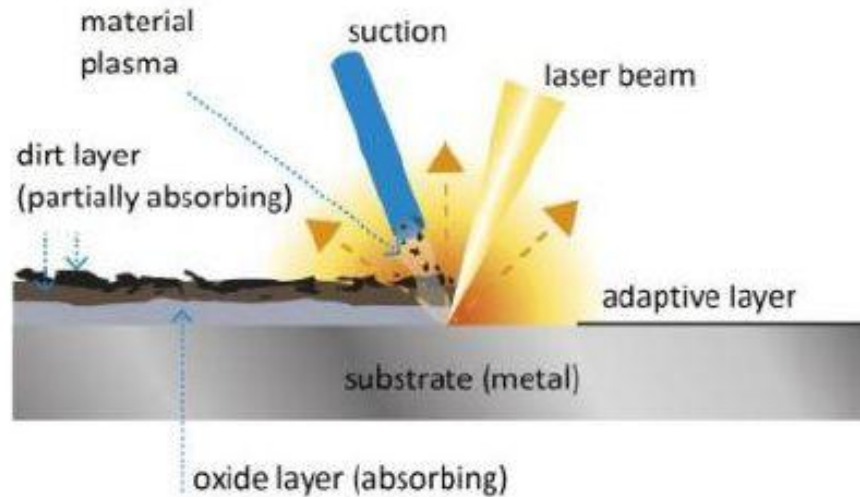


Figure 2.1 Laser cleaning schematic

The laser cleaning equipment produced by My Company is a new generation of high-tech products for surface treatment, which is easy to install, control and realize automation. Simple operation, power supply, open equipment, can be no chemical reagent, no medium, no dust, no water cleaning, can fit surface cleaning, cleaning surface cleanliness is high, can remove object surface resin, paint, oil stains, dirt, rust, coating, coating and oxidation layer, and the industry is widely used, covering ships, auto repair, rubber mold, high-end machine tools, tracks and environmental protection.

### 2.1 Equipment characteristics and implementation standards

#### (1) Equipment characteristics

- ◎ non-contact cleaning without damaging the matrix of the parts;
- ◎ accurate cleaning, can achieve precise position, accurate size selective cleaning;
- ◎ do not need any chemical cleaning liquid, no consumables, safety and environmental protection;
- ◎ simple operation, hand-held or with the manipulator to achieve automatic cleaning;
- ◎ ergonomics design, operating labor intensity greatly reduced;
- ◎ trolley design, with its own moving wheel, easy to move;
- High ◎ cleaning efficiency, save time;
- ◎ laser cleaning system is stable with little maintenance;

#### (2) Product implementation standards

My Company has passed the ISO 9001 international quality management system certification, the formation of medium

and small power laser processing equipment design, production and service quality assurance system.

My Company sets detailed standards for the working environment and working conditions, basic technical requirements, cooling requirements, laser radiation safety, electrical safety, test methods, inspection and acceptance, packaging and transportation, etc. The international standards cited in this standard are:

IEC820-86 Electrical safety of laser equipment and facilities

IEC 60825-1 Radiation Safety, Equipment Classification, Requirements and User Guide for Laser Products

IEC60068-1 Basic Environmental Test Procedures for Electronic Products

GB/T 6360 (China) Specification for Laser Power and Energy Measuring Equipment

ISO11146-1 Test Method of Laser Radiation Dispersion Angle

GB/T13741(China) Method for measuring laser beam diameter

GB/T13863(China) Laser Radiation Power Test Method

## 2.2 Operating environment and related parameters

Operating environment	
Content	FRZ-LCF200
Supply voltage	Single phase 220V $\pm$ 10%、50/60Hz AC
Power consumption	$\leq$ 1500W
Working environment temperature	5 $^{\circ}$ C $\sim$ 40 $^{\circ}$ C
Working environment humidity	$\leq$ 80%
Optical parameters	
Average laser power	$\geq$ 200W
Power instability	$<$ 5%
Laser Working Mode	Pulse
Pulse width	13-500ns
Maximum monopulse energy	2mJ
Power regulation range (%)	0-100( Gradient Adjustable)



Repeat frequency (kHz)	1-3000 (Gradient Adjustable)
Fiber length	5m
Cooling mode	Air cooling
Cleaning Head Parameters	
Scan range (length * width)	0mm-145mm, continuously adjustable; supporting 9 scanning modes
Scanning frequency	The maximum is not less than 300Hz
Field mirror focal length (mm)	210mm ( Optional 160mm/254mm/330mm/420mm)
Depth of focus	About 5 mm
Mechanical parameters	
Machine size (Length, width and height)	About 617mm*469mm*291mm
Size after packing (Length, width and height)	About 760mm*560mm*480mm
Machine Weight	About 28Kg
Weight after packing	About 48.2Kg
Cleaning head weight (excluding optical head)	<0.9Kg
Mode of operation	Handheld

## 2.3 Product structure

### (1) Structure of Cleaning Head



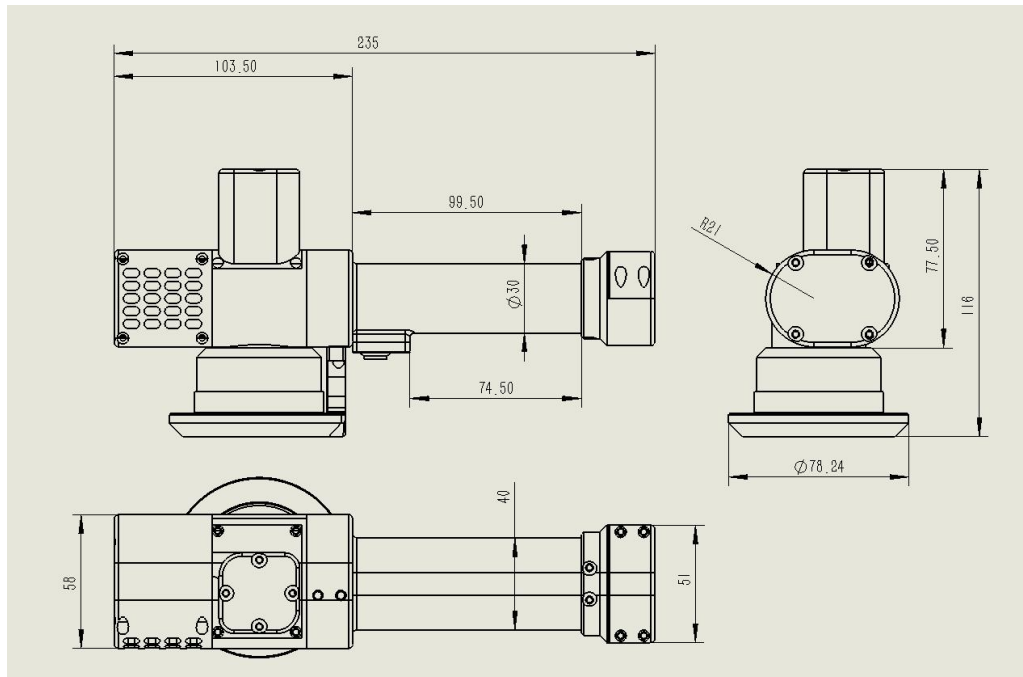


Figure2.1 Structure of FRZ-QCDXYP200 Cleaning Head

Distance sensor: TOF laser ranging sensor measures the distance from the workpiece to the field mirror, and the digital tube displays the distance in real time. The green circle on the homepage represents within the focal range of the field lens, and the red circle represents outside the focal range of the field lens. The distance parameter is only for display and does not interlock with other signals.



## (2) Overall Dimension



Figure2.3 Overall Dimension of FRZ-LCF200 Laser Cleaning Machine

2.4 Configuration list

Table 2.1 FRZ-LCF200 laser cleaning equipment configuration list

Name of name	Model specifications	Units	Quantity	Remarks
Laser cleaning mainframe	FRZ-LCF200	Table	1	
Laser cleaning head	FRZ-QCDXYP200	Sets	1	
Process database	Built-in	Sets	1	
Laser protective glasses	SD-3	Payment	1	
protect the lens	48*3	Pcs	5	
Lens cleaning kit		Pcs	10	

## 3 Installation and Application of Laser Cleaning Machine

Precautions before use:

- Check whether the appearance of the product is abnormal and whether the output cable is damaged;
- Please correctly insert the quick plug according to the label of the control box;
- Please correctly intervene in the power supply to ensure that the power supply wiring is in good contact;
- Check and ensure that the cleaning head protects the lens inside and outside without dust;

### 3.1 Operation Steps

**Step 1:** Take out the hand-held cleaning gun in the chassis, ensure that the button switch on the handle is loosened, and remove the dust cover of the lens at the front of the laser cleaning gun;

**Step 2:** Take out the external power line to energize, turn on the total power switch, open the key switch;

**Step 3:** Turn on the start button to power on and initialize the system.

**Step 4:** After the system is started, set the laser cleaning parameters on the laser cleaning host interface.

**Step 5:** After laser parameters are set, press the laser enable button on the laser cleaning touch screen (before pressing the button, make sure that the button switch on the handle of the handheld head is loosened).

**Step 6:** Put on laser protective glasses, aim the head of the gun at the cleaned workpiece, press the switch button on the handle of the finger, and the head of the gun can be cleaned with light (please connect the external control line on the laser cleaning host for automatic use, and switch the laser control through the external control signal).

**Step 7:** After use, loosen the switch on the cleaning head, turn off the enable button on the laser cleaning touch screen, press the start button, turn off the key switch, pull down the main power switch, cover the dust cover of the playing mirror, insert the cleaning gun back into the host placing box, and unplug the power plug.

## 3.2 Software control interface

### 3.2.1 Boot interface

Boot into the boot waiting interface as shown in Figure 3.1. Displaying this interface means that the screen and the control board are being connected. If the connection is normal (the process lasts about 10 seconds), it will jump to the operation interface. If it does not jump for a long time, the screen and control may be The board connection is not normal, please power off to check whether the connector is correctly and firmly connected.



Figure 3.1 Software startup interface

**Note: The software interface LOGO, equipment model, company information, etc. can be customized, this picture is only for description (the same below)**

### 3.2.2 Set interface

After the system is initialized, it will enter the operation interface. Before using the cleaning equipment, you should first click the "Settings" button in the lower left corner of the operation interface to enter the cleaning system setting interface, as shown in Figure 3.2. The system version and the underlying version number can be displayed in the system setting interface. The galvanometer scanning compensation, laser type, field lens coefficient, etc. can be set.



Figure 3.2 System setting interface

- Y-axis compensation: adjust the galvanometer, fine-tune the scanning shape deviation that may be caused by refraction or other reasons, generally do not modify, keep the OFF position; If the parameter is set to 50, change the password: 123;
- X, Y coefficients: field lens/focusing lens settings, different field lens/focusing lens focal lengths or actual working distances are inconsistent, the actual scanning width and height can be corrected by the field lens coefficients; change the password: 123;

Field lens model	X factor	Y coefficient
F100	56	56
F160	84	84
F210	110	110
F254	135	135
F330	150	150
F420	195	195

- Language switch: Set the system language mode, currently supports 16 kinds including Chinese, Traditional Chinese, English, Russian, Japanese, Spanish, German, Korean, French, etc.;

Chinese	English	Traditional Chinese	Russian	Japanese
中文	English	中文繁体	Русский	日本語
Spanish	German	Korean	French	Polish
Espanol	Deutsch	한국어	En français	Polski
Hungarian	Italian	Finnish	Swedish	Czech /Estonian
Magyar nyelv	Italiano	Suomi	Sverige	Čeština
				Eesti

- Distance function: off by default;
- Temperature setting: default 100°C;

## 3.3 Operation interface

The operation interface provides 9 cleaning modes, which can be switched by clicking the scanning mode option on the interface (circular switching): Linear Mode, Rectangular 1 Mode, Rectangular 2 Mode, Circular Mode, Sine Mode, Helix Mode, Free Mode ,Ring and rotate.

The database number can be selected on the operation interface of each mode, and the laser cleaning parameters can be displayed and set, including: laser power, laser frequency, pulse width (valid for pulsed laser) or duty cycle (valid for continuous laser), scanning mode, scanning speed , the number of scans and the scan range (width, height).

### (1) Straight line mode

In this mode, the scanning mode is straight line, and the interface is shown in Figure 3.3.

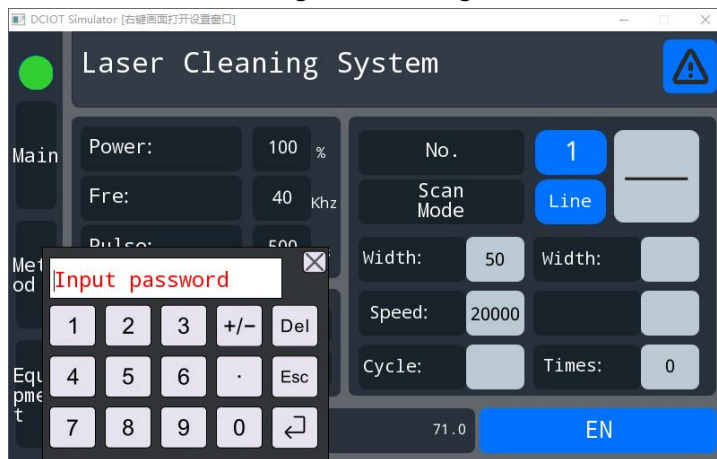


Figure 3.3 Operation interface of linear scan mode

- Serial number: Select the database number and call out the process data stored in the corresponding serial number, the default number is 0;change the password: 123;
- Laser power: setting the average output power of the laser, ranging from 10% to 100%;
- Frequency: laser pulse repetition frequency setting, range 1~4000kHz;
- Scanning speed: the moving speed of the spot where the laser is focused on the surface of the workpiece, and the upper limit of the scanning speed is related to the scanning width;

Scan width (mm)	Scanning speed mm/s (upper limit)
Over 50	30000
40-49	18000
30-39	14000
20-29	12000
10-19	6000
5-9	3000
3-5	2000
1-3	1000

- Scanning width: set the linear scanning width, the range is 5mm~Mx (the value of Mx is related to the size of the field lens/focusing lens);

Field lens type	Scanning range Mx(mm)
F160	105
F210	140
F254	160
F330	185
F420	300



- Scanning times: used in special circumstances, you can set a specified number of scanning times, stop light after reaching the number of times, and always emit light by default 0;
- Enable: After the parameter setting is completed, click the enable button, the system and the laser are in the light-emitting ready state;
- Pulse width: set according to the actual needs of the site, the range is 1~1000ns;
- Edge coefficient: edge extinction, eliminating the strong points at both ends of the laser, the default is 0, the maximum can be set to 2000, it can be set appropriately according to the actual needs of the site, it is recommended to set 500 when using this function; change the password: 123;
- Extinction delay: cooperate with the edge coefficient to effectively eliminate the strong points on both sides, the default is 0, it is recommended to set 0.5 when using this function; change the password: 123;

## (2) Rectangle one pattern(single axis cleaning system does not have this mode)

In this mode, the scan mode is a rectangle, and the interface is shown in Figure 3.4. The definitions of power, frequency, pulse width (duty cycle), scan speed, scan width, and scan times are the same as the range and linear mode, and will not be repeated here (the same below) .

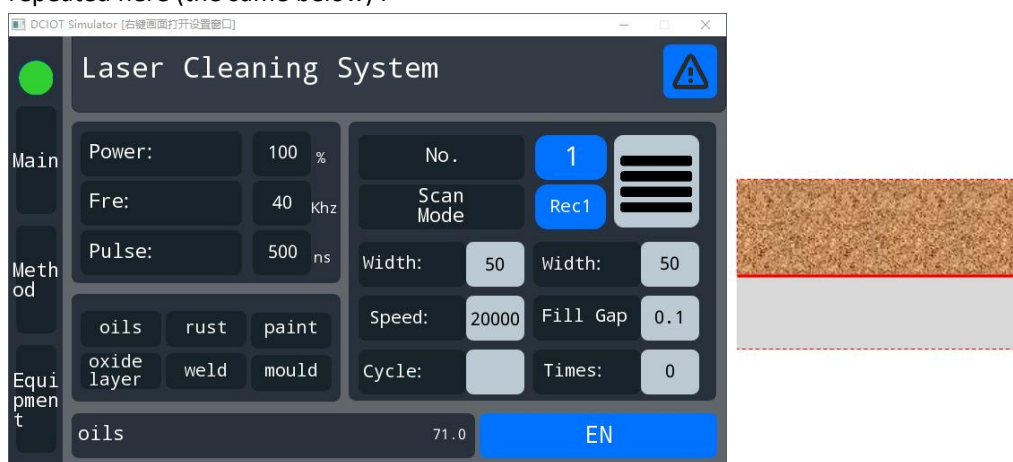


Figure 3.4 Rectangular scan mode operation interface

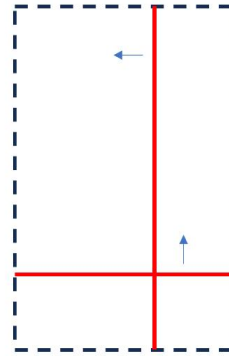
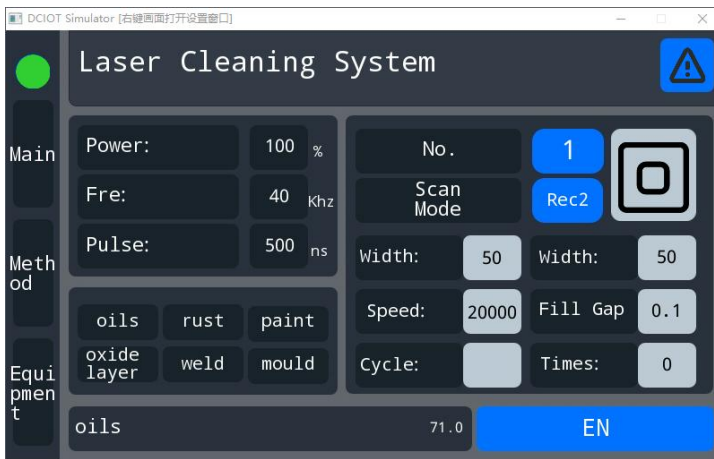
- Filling distance: Set the laser filling distance in the rectangle, the range is 0.01~1mm, which affects the spot overlap rate in the Y-axis direction, and the default is 0.1;
- Scanning height: Set the scanning height of the rectangle, the range is 1mm~My (the Mx value is related to the field lens coefficient);

Field lens type	Scanning range Mx(mm)
F160	105
F210	140
F254	160
F330	185
F420	300

## (3) Rectangular two pattern(single axis cleaning system does not have this mode)

The rectangle 2 mode is roughly the same as the rectangle 1, that is, the horizontal cleaning mode is added on the basis of the vertical cleaning of the rectangle 1.





**(4) Circular mode**(single axis cleaning system does not have this mode)

In this mode, the scan shape is a circle (as shown in Figure 3.5), and the scan range is only set to the circle diameter and filling spacing;

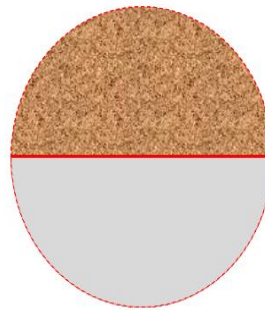
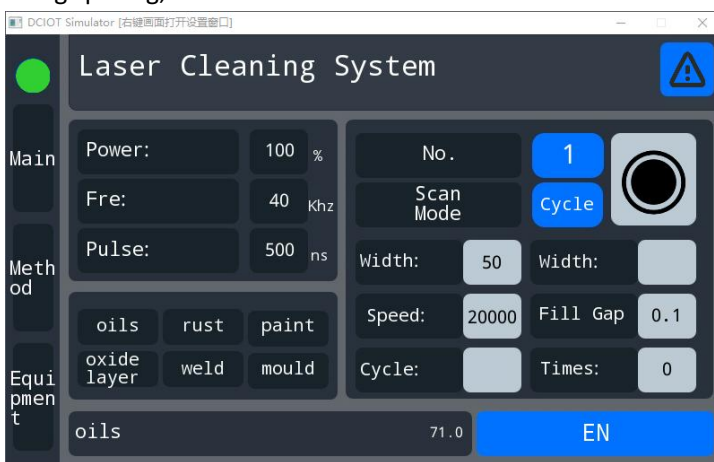


Figure 3.5 Circular scan mode operation interface

**(5) Sine mode**(single axis cleaning system does not have this mode)

In sine mode, the sweep waveform is a sine curve, and the operation interface is shown in Figure 3.6. In the sine mode, the sine cycle needs to be set: the cycle of the sine waveform in the X-axis direction, the smaller the number, the greater the waveform fluctuation frequency, the range is 1mm-100mm;

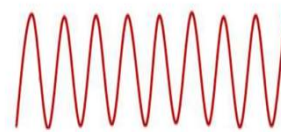
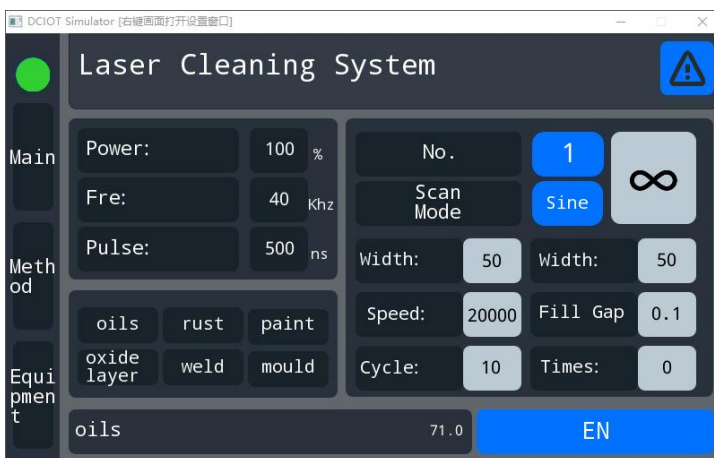


Figure 3.6 Sine sweep mode operation interface

**(6) Helix pattern**(single axis cleaning system does not have this mode)

In helix mode, the scanning waveform is a double helix curve, and the operation interface is shown in Figure 3.7. The parameter setting is consistent with the sine mode.



Figure 3.7 Operation interface of double helical scan mode

Series: Number of waveforms in spiral mode, ranging from 1 to 16;

**(7) Free mode(single axis cleaning system does not have this mode)**

In free mode, the width and frequency of the X-axis and Y-axis motors can be freely set within the range. In this mode, the scanning speed is not constant or even cannot be calculated accurately. There are many possibilities for the scanning waveform, which can be used as a supplement to the above five modes to adapt to more application scenarios.

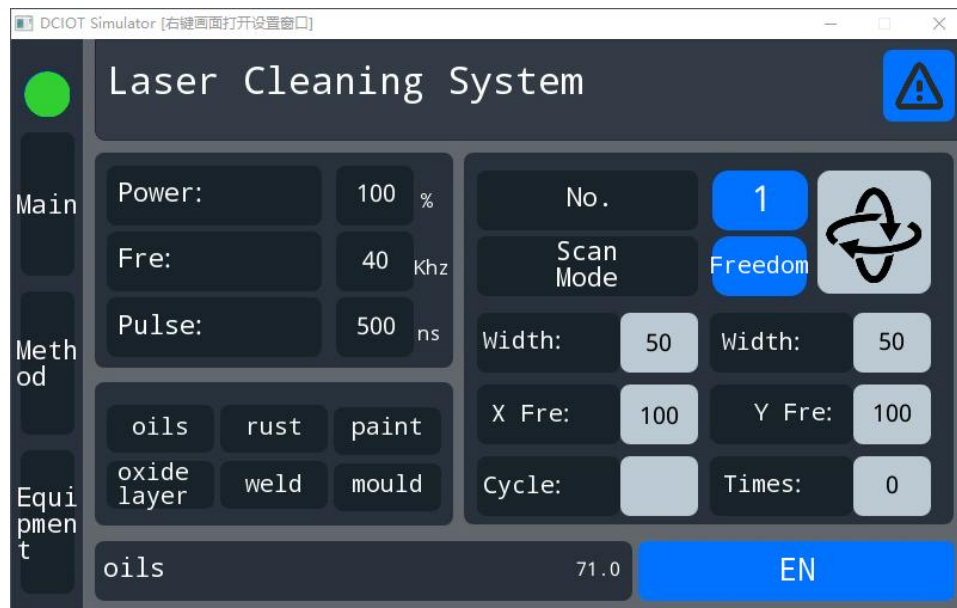


Figure 3.8 Free Scan Mode Operation Interface

- X\Y frequency: less than 300Hz;
- Scanning height: set the scanning height of free mode, the range is 1mm~50mm;

**(8) Ring(single axis cleaning system does not have this mode)**

This mode is a mode in which the ring gradually shrinks inward, as shown in Figure 3.9, where the filling distance is the speed at which the ring shrinks.

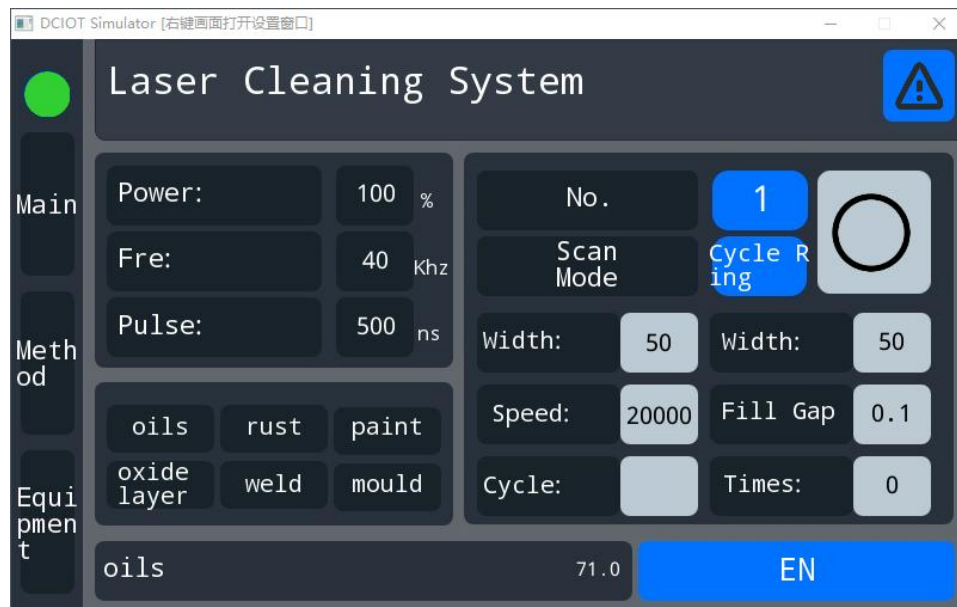
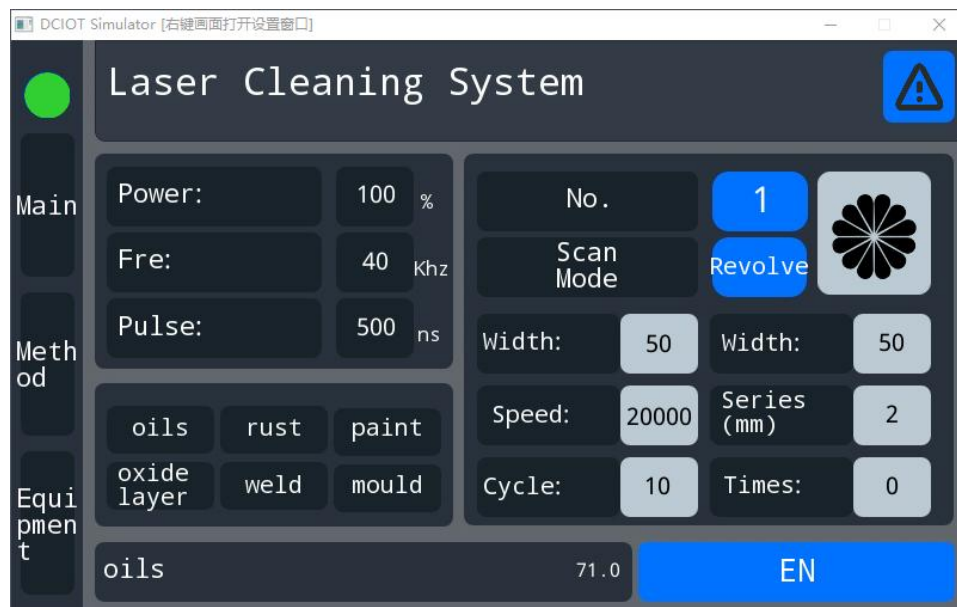


Figure 3.9 Ring Mode Operation Interface

### (9) Rotate

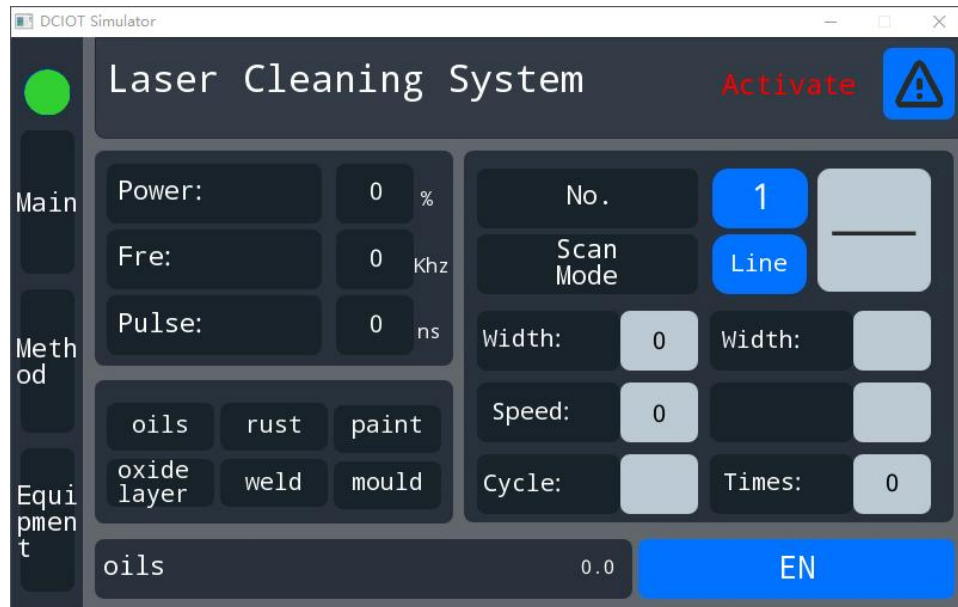


- The graph can be adjusted according to the period, series and other parameters;

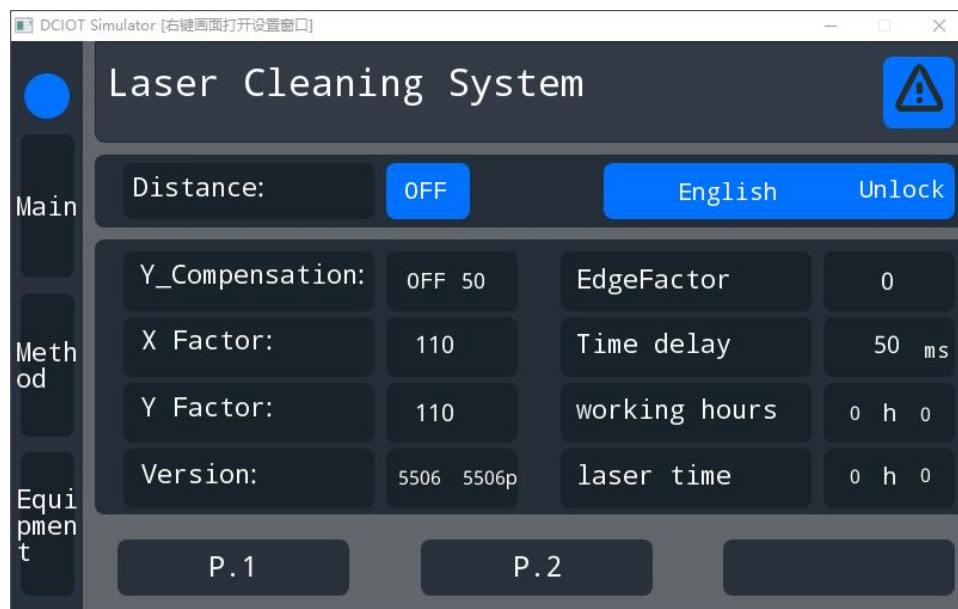
### (10) Database

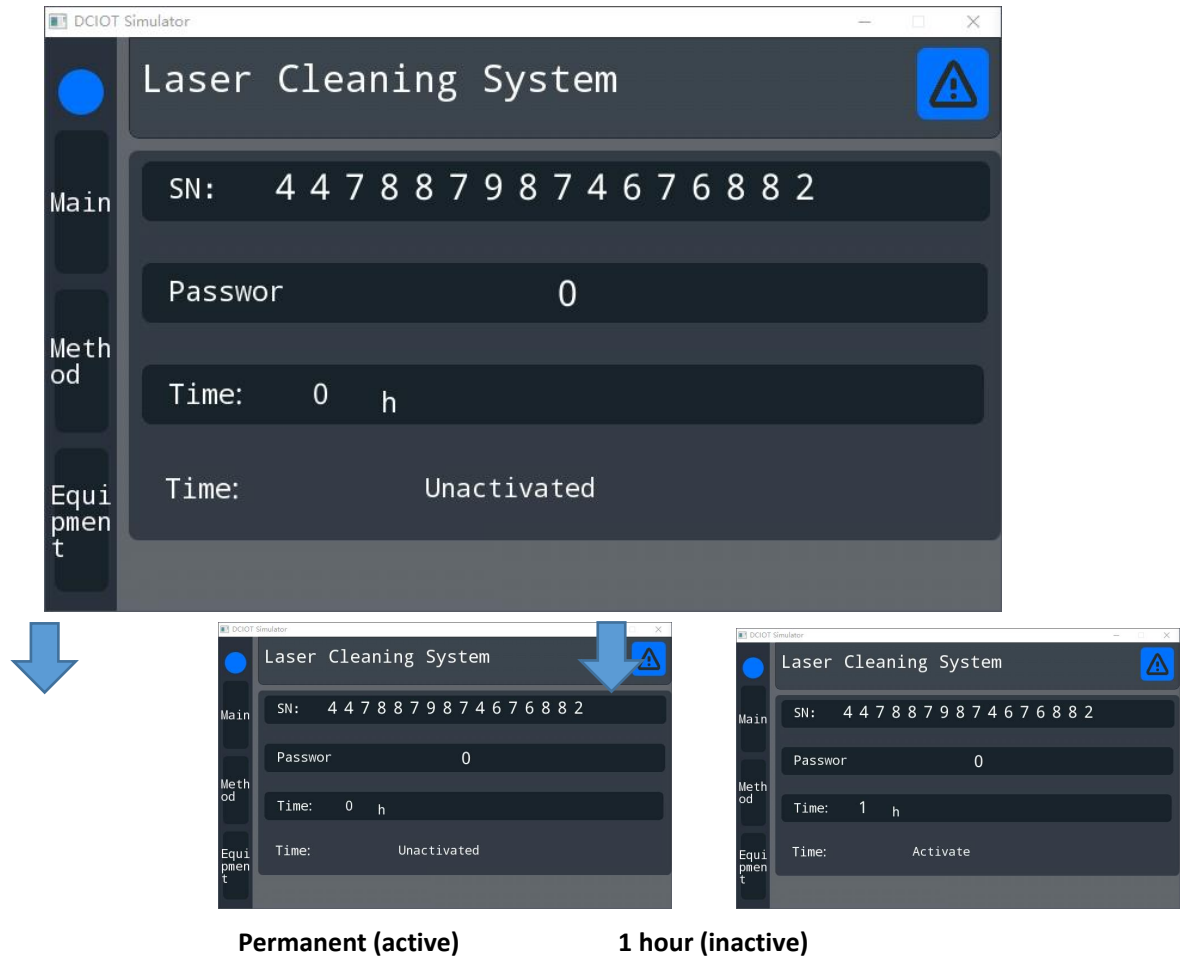
- Database: modification coefficient of the serial number, edge, the edge of extinction, coefficient of X, Y, Y compensation coefficient parameters, such as password, 123, will jump to the "database" interface, related parameters in the interface to modify;
- Slow rise time: after open the laser power from 0 to set data need time;
- Ramp down time: close the laser power from value fell to zero after the time required for;

### (11) Decrypt and set password



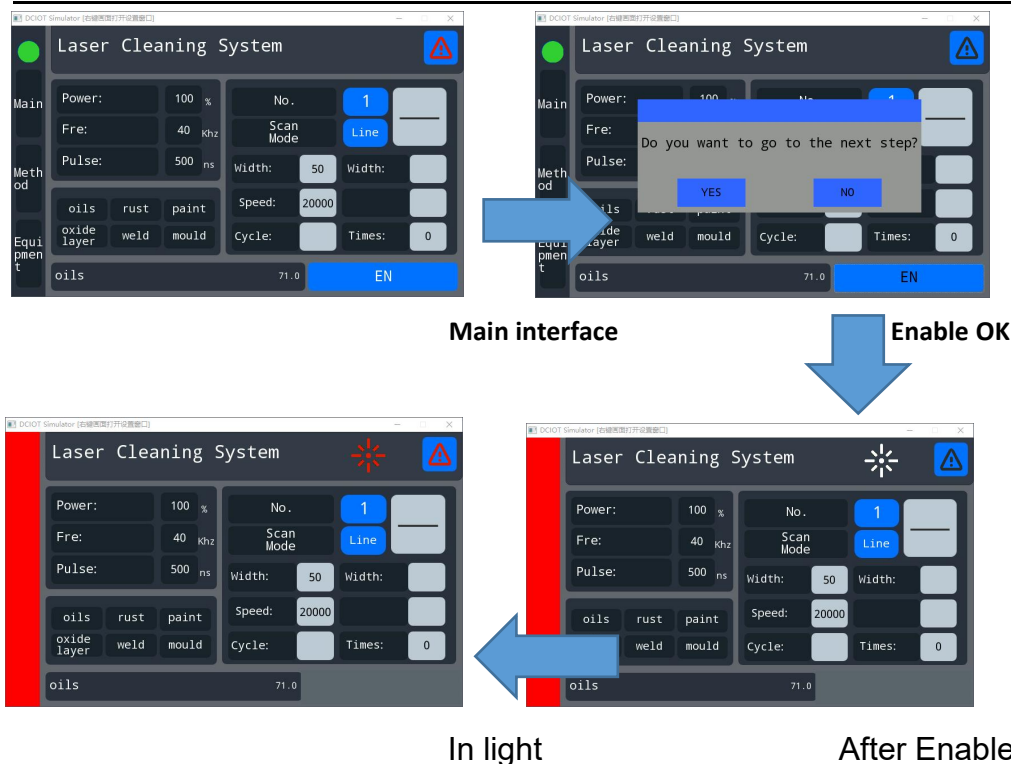
- During the trial process, the words "Please activate" are displayed in the upper right corner, indicating that the trial time has expired and decoding is required.





- The user can set the trial time or permanently decrypt it according to the on-site situation.

## (12) Others (light-emitting steps)



### 3.4 Attention in Use of Cleaning Machine

If this laser cleaner is used according to methods other than those specified in this use manual, it may cause the reliability and service life of this product to be reduced. Therefore, please read the following requirements and precautions carefully and operate with reference to relevant specifications when using.

- Electrical power supply of the cleaning equipment is 220 V 50Hz AC power supply;
- About 2m of ventilation must be left before and after the equipment. insufficient ventilation distance will likely cause internal laser failure to work!
- the normal operating temperature range of this cleaning machine is 0~40 °C . beyond this operating temperature range, it may cause the internal laser system to alarm without light. this is a protective behavior, which can effectively protect the long-term reliability of the equipment.
- This cleaning machine requires high environmental cleanliness, use or move cleaning machine process please carefully handle the skin head to prevent dust or other pollution, equipment in non-working condition, please cover the laser outlet with protective cover. The dust on the output end face of the hand holder may cause the lens to heat and damage, resulting in the equipment output power attenuation or unable to produce light.
- Clean maintenance equipment and hand-held head operation should be checked before the operation to ensure that the equipment is in power off state.
- In the course of operation, labor protective equipment should be worn according to regulations, and protective glasses must be worn near the laser beam.
- When the laser cleaner is electrified, do not directly watch the laser output head, do not point the laser output head towards someone's orientation, do not allow the laser output head to illuminate the high anti-material mirror at will.
- Do not place flammable and explosive items near the cleaning machine! Such items should avoid direct or reflective laser!**
- Try to avoid the use of the light outlet and cleaning surface in 90 degrees right angle, so as not to affect the service life of the equipment.
- No excessive bending of bellows, bellows bending radius  $\geq 100$  mm, to prevent damage to the corrugated tube fiber.

## 3.5 Frequently Asked Questions and Handling

(1) The equipment does not shine during use

- Equipment power supply and laser power supply and safety switch not on;
- Cleaning equipment from the workpiece is too large or too small, resulting in no visible light;
- In the process of use due to improper operation of the fiber broken;
- If the equipment is not light due to the above reasons, please contact the nearby dealer or agent.

(2) How to keep the set parameters

If the appropriate cleaning width and scanning frequency have been adjusted during the cleaning process, close the equipment after the completion of use (do not adjust the cleaning width button and scanning frequency button again), its adjusted parameters will not be lost.



## 4 Pre-sale and after-sales service

### 4.1 Service commitments

My Company adhere to customer-centered, fully understand customer cleaning needs, to provide customers with perfect, personalized installation, commissioning, training, maintenance and other pre-sale and after-sales service.

#### (1) Pre-sale services

Before signing the contract, the company provides customers with various production process plans, provide laser cleaning equipment technical advice, sample samples, equipment selection and other services.

#### (2) Installation debugging

Our company according to the contract, free of charge in the specified time to safely transport the equipment to the user designated installation site, and send technical service engineers on-site installation. In the case of user installation and commissioning spare parts are basically available, the technical service engineer will complete the installation and commissioning of the machine for the user within 2 working days to ensure that the installation and commissioning site environment is neat, clean and orderly.

#### (3) After-sales training

The company provides free technical training, after installation and commissioning, at the buyer's site or the seller's domestic training and maintenance center to the buyer operator technical training, until the operator reaches the basic normal use of the equipment, the main training content is as follows:

Basic Principles of Laser Cleaning Technology:

- Main Structure of Laser Cleaning Equipment
- Operation of laser cleaning equipment
- Adjustment of Laser Cleaning Process Parameters
- Maintenance of laser cleaning equipment

#### (4) After-sales commitment

- Equipment free warranty for one year (excluding human damage, broken fiber);
- Free technical consultation, process and software upgrade services;
- Maintenance services provided for life only for spare parts cost;
- Lifetime provides a wide range of hardware and software support.

### 4.2 Limitation of warranty

Damage to products and their parts (including optical fibers) caused by tampering, opening, removal, misloading and improvement caused by non-My Company personnel; or damage caused by misuse, negligence, or accident; or use beyond



specifications, abnormal installation and maintenance, damage caused by misuse or non-use in accordance with information and warnings in the user's manual are not covered by warranty. the customer is responsible to understand and follow the user manual and operating instructions on the scope of operation, the damage caused by the wrong operation is not guaranteed. accessories and other parts are not covered by warranty.

Within the scope of the warranty, if the buyer discovers the problem, it must make a request in writing within 30 days from the date of the discovery of the problem, which does not involve a third party (including the specified buyer, end user or customer), nor does it include parts, equipment or other products produced by non-My Company.

## 4.3 Technical Support and Product Maintenance

This product has no other built-in parts to be maintained by users, so the maintenance of spare parts should be carried out by My Company technicians.

Product in the process of use if any failure should be promptly informed My Company technicians, and troubleshooting.

All repair and replacement products must be placed in the original packing box provided by My Company, otherwise any product damage caused by this, My Company will have the right not to repair free of charge.

When the user you receive My Company products, please timely check whether the product is intact, accessories are complete, if there is any abnormal situation, please contact the carrier and My Company in time.

My Company will continuously develop new products. the product information listed in the manual may change without prior notice. All technical parameters shall be subject to the terms of the contract.

The warranty and service terms of the products are for user's reference only. The official service and warranty contents are subject to the contract.