BG03S

Laser welding joint of 3KW galvanometer

User manual

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Preface

Thank you for purchasing our products!

This manual for BG03S galvanometer laser welding joint installation debugging made a detailed description, so that you can quickly start using this product; If you need to know anything else, you can consult our company directly.

Due to the continuous updating of product functions, the products you receive may differ from the statements in this manual in some aspects. I would like to apologize here!

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If you find any errors in this document, please inform us as soon as possible.

For the benefit of our customers, we are constantly trying to ensure that our products are up to date with the latest technology.

Version description:

Release date of this edition:		12/1 2023/12				
Historical version	**Release date**	**Brief introduction of changes**	**Editor**	**Editing date**	**Peer reviewer**	**Review date**
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Disclaimer

- We reserve the right to change the design for improving the quality or expanding the application mode and based on the production process.
- Our company is not responsible for any loss or accident caused by wrong operation or improper handling of our products.
- Disassembling the product will forfeit all warranty claims, excluding the normal replacement of worn parts and components required for maintenance or commissioning operations.
- Unauthorized alteration of products or use of inappropriate spare parts will directly lead to the invalidation of warranty and liability exemption.
- It is recommended to use only the spare parts provided by our company, or hand them over to our company or a designated professional team for installation.

Usage regulation

- Ensure that the product is used in a dry environment.
- Ensure that products are used in the environment required by EMC standards.
- Products are only allowed to run within the parameters specified by technical data.

Personnel responsibilities

- Familiar with the basic regulations of work safety and accident prevention, and have received equipment operation guidance.
- Read and understand basic safety instructions and operations.
- Must have studied relevant regulations and safety instructions and understand possible hazards.
- Comply with relevant regulations and implement corresponding protective measures.

Safety instructions

● Prevent electric shock

1) The components of the laser head, such as the electrical interface and the attached fasteners, may not be fully protected by the ground wire due to limited functions. These parts may carry low voltage. When installing electrical equipment, please pay attention to taking electric shock prevention measures for relevant personnel.

2) Note that the equipment should be grounded as required.

● Prevent danger

1) Never place your hands or other body parts under the laser head.

2) Repair and maintenance work can only be carried out after the power is turned off.

3) Do not exceed the specified maximum pressure.

4) It must be ensured that the laser head is in normal condition at all times.

5) All fasteners such as bolts and nuts must be tightened.

● Laser protection

1) Avoid direct or scattered radiation to eyes or skin.

2) Do not look at the laser beam, even in the condition of wearing optical equipment is not feasible.

3) Use special laser protective eyepieces that meet the requirements of relevant standards.

● Prevent waterway corrosion

To avoid corrosion, use the prescribed coolant and observe the relevant requirements and specified maintenance intervals.

● Noise prevention

When the protective gas pressure is high, in order to prevent people from being harmed by noise, the corresponding measures should be specified or explained, and observed.

● Storage and transportation

1) Comply with the storage temperature range allowed by technical data.

2) Take reasonable measures to prevent fire, vibration or impact.

3) Do not store in or near the magnetic field.

Directory

1 Product description

1.1 Introduction of product structure

1	QBH interface
2	Collimating assembly
3	Monitoring component
4	Galvanometer body
5	Beam combination assembly
6	Field mirror
7	Air knife assembly

1.2 Product characteristics

- Equipped with standard QBH fiber interface, compatible with most mainstream fiber lasers;
- Standard XY2-100 protocol with higher compatibility;
- Quick disassembly design of field mirror protection mirror makes lens replacement convenient and quick;
- A variety of optical ratios are optional, which is suitable for various welding environments;
- Optimize the design of air knife and protect the lens more fully;

- Efficient water cooling design, continuous processing is more stable;
- Rich expansion, can be equipped with CCD monitoring, visual positioning, etc.

1.3 Technical parameters

Optical fiber interface	QBH
Applicable wavelength	1070 ± 10nm
Laser power	3000W
Optical aperture	20mm
Collimating focal length	100mm
Focal length of field mirror	254mm/customizable
Swing control protocol	XY2-100
Power supply	± 15V5A (150W)
Welded panels	120mm*120mm (254mm field mirror) -Customizable
Maximum welding speed	3000mm/s
Number/size of mounting screws -Back-mounted fixation	6pcs M5
Pipeline interface -Air knife	2 × φ 10 quick insertion connector with air pressure not less than 5bar
-Water cooling	φ 6 quick insertion joint, maximum pressure 5bar, minimum flow rate 1.6 L/min
Operating temperature	15 ℃ ~ 35 ℃
Weight of laser head	About 8.5 kg
Alarm signal	Drive abnormal alarm (indicator light)
Extended function	CCD monitoring, visual positioning, etc

1.4 Mechanical dimensions

1.4.1 Laser head mounting dimensions-BG03S11Z2

1.4.2 Laser head mounting dimensions-BG03S11Z5

- For size parameters of other models, please contact relevant business personnel of our company for consultation.

- Non-standard fittings of double-layer air knife in the figure.

2 Installing laser head

2.1 Mechanical installation

2.1.1 Connect laser fiber

⚠️	Carry out all maintenance and repair work on the laser head only at a clean station.
	Before connecting the laser fiber every time, remove all dust and dirt from the fiber plug.
	In order to prevent dust and dirt from accidentally entering the optical fiber socket, it is recommended to place the laser head horizontally when connecting optical fibers.

- Place the laser head horizontally and loosen the ① QBH steel sleeve counterclockwise;
- Align the "Unlock" part of the locking ring with the arrow;
- Check the end face of the optical fiber to ensure that the end face of the optical fiber is not contaminated;
- Remove the protective cover on the optical fiber socket;
- Align the red mark of the optical fiber output end with the QBH red mark and insert it directly to the bottom;
- Rotating the locking ring to the "Lock" position;
- Rotate and lock ① QBH steel sleeve clockwise until it is locked;
- Slightly twist the optical fiber output end to ensure that the optical fiber output end is reliably connected with the laser head.

ⓘ	If the site environment is dusty, it is recommended to use masking paper for further sealing treatment at the optical fiber connection.

2.1.2 Fixed laser head

Use 6pcsM5 screw to install the laser head perpendicular to the machining surface to ensure the installation is tight and avoid the vibration of the laser head.

2.2 Waterway

Use φ 6 water pipe to connect the laser head with the chiller, a is connected to the water outlet of the chiller, and h is connected to the water return of the chiller.

The circulating waterway of laser head has been connected before leaving the factory, using φ 6 water pipe, and the circulating sequence of waterway is b-c, d-e and f-g.

(i)	Pay attention to the connection size and the maximum bearing capacity of pipeline interface.
⚠	To avoid corrosion, comply with the relevant regulations and prescribed maintenance intervals of manufacturers of machinery and equipment or laser sources and cooling equipment.

2.3 Gas path

(Air knife is optional) Use 2 x φ 10 air pipe to introduce compressed air to the air knife (air pressure is not less than 5bar).

2.4 Electrical installation

2.4.1 Interface definition

BG03S laser welding joint uses standard XY2-100 protocol to realize the oscillation of laser head galvanometer, and uses the equipped DB25 connection cable to connect the laser head with the DB25 interface of the control board. The DB25 interface pins are defined as follows:

Pin number	Signal name	Describe
1	XY2_CLK-	Follow-up clock
2	XY2_CS-	Chip selection signal
3	XY2_X-	X-channel data
4	XY2_Y-	Y-channel data
14	XY2_CLK +	Follow-up clock
15	XY2_CS +	Chip selection signal
16	XY2_X +	X-channel data
17	XY2_Y +	Y-channel data
Others	NC	Empty foot position
9, 10, 22	+ 15V	+ 15V power supply
11, 23, 24	GND	0V
12, 13, 25	-15V	-15V power supply

2.4.2 Electrical connection

BG03S laser welding joint uses electronically controlled split motor drive cable.

During installation, the finished cable should be used to connect the laser head to ± 15

V switching power supply and galvanometer control board. The total power of the control board and galvanometer laser head power supply should be no less than 150W (+15 and-15 outputs are at least 5A, and HF150W-D-L ± 15 V dual output switching power supply is recommended). The connection mode is as follows:

3 Install the control board

3.1 Electrical part

3.1.1 Board power interface (J1)

The galvanometer control board and galvanometer can be powered by the same ± 15V switching power supply, and the control board only needs to be connected with the switching power supply + 15V and GND

Pin number	Board identification	Direction	Remarks
1	+ 15V	Input	Connected to switching power supply + 15V
2	GND	Input	Connected to switching power supply GND
3	-15V		Don't answer

3.1.2 Board Signal Interface (J2)

USB2.0 interface, communication interface between control board and host computer

3.1.3 Board galvanometer instruction (J3, DB25 female head)

Control signal and power supply interface of DB25 mother head and galvanometer system

Pin number	Name	Description	Pin	Name	Description
1	Clk-	Clock signal-	14	Clk +	Clock signal +
2	Sync-	Synchronization signal-	15	Sync +	Synchronization signal +
3	X_data-	X galvanometer signal-	16	X_data +	X Galvanometer

					Signal +
4	Y_data-	Y galvanometer signal-	17	Y_data +	Y galvanometer signal +
5	X_fb-	X galvanometer feedback-	18	X_fb +	X Galvanometer Feedback +
6	Y_fb-	Y galvanometer feedback-	19	Y_fb+	Y Galvanometer Feedback +
9/10/22	+ 15V	Galvanometer power supply + 15V	11/23/24	GND	Power reference point
12/13/25	-15V	Galvanometer power supply-15V	7/8/20/21	NC	Standby

3.1.4 User input signal (J5)

The general input I/O interface circuit is as follows.

In order to ensure normal signal reception, the current must be greater than 2.5 mA at low level, that is, VCC-VinL > 8V, and if the power supply voltage is 24V, VinL should be less than 15V.

At high level, the leakage current must be less than 0.25 mA, that is, VCC-VinH < 0.8 V. If the power supply voltage is 24V, VinH

Be greater than 23.2 V.

Pin	Name	Description	Pin	Name	Description
IN_A			IN_B		
1	I0	General purpose input I/O	11	I10	General purpose input I/O
2	I1	General purpose input I/O	12	I11	General purpose input I/O
3	I2	General purpose input I/O	13	I12	General purpose input I/O
4	I3	General purpose input I/O	14	I13	General purpose input I/O
5	I4	General purpose input I/O	15	I14	General purpose input I/O
6	I5	Universal input I/O (for object detection input in flight)	16	I15	General purpose input I/O
7	I6	General purpose input I/O	17	I16	General purpose input I/O
8	I7	General purpose input I/O	18	I17	General purpose input I/O

9	I8	General purpose input I/O		19	I18	Pause signal
10	I9	General purpose input I/O		20	I19	Stop signal

3.1.5 User Output IO (J6)

O0 ~ O7 is 500mA current output IO, and the circuit is as follows:

Numbering	Signal name	Maximum output current	Description	Numbering	Signal name	Output current
J6_A				J6_B		
1	I24V	Input, user I/O power supply	The power supply current shall be greater than the sum of I/O input and output currents	11	O8	6mA
2	ICOM	User I/O power supply		12	O9	6mA
		Reference ground				
3	O0	500mA	Marking instructions, dedicated IO	13	O10	6mA
4	O1	500mA	Light indication, special IO	14	O11	6mA
5	O2	500mA	Alarm indication, dedicated IO	15	O12	6mA
6	O3	500mA		16	O13	6mA
7	O4	500mA		17	O14	6mA

8	O5	500mA		18	O15	6mA
9	O6	500mA		19	O16	6mA
10	O7	500mA		20	O17	6mA

3.1.6 CW, QCW Mode Switching (J4)

J4, DB9 mother head, serial port, for YLR laser CW, QCW mode switching. The interface is defined as follows:

Numbering	Definition	Description	Numbering	Definition	Description
2	TXD	Data transmission pin	3	RXD	Data receiving pin
5	GND	Reference ground	1/4/6/7/8/9	NC	

3.1.7 Laser Control Interface (J7)

J7, DB25 male head, used to control laser output and power, part of the interface is defined as follows.

Numbering	Name	Type	Description
13	+24V_laser	Input	Digital signal power supply of laser control circuit (connected with 24V switching power supply)
25	Laser_gnd		
16	AN0	Output	0 ~ 10V analog signal +, used to control laser energy
1/4/14	AGND		Analog ground, analog signal reference ground
5	Red_laser	Output	Laser red light control pin
10	enable	Output	Laser enable signal
23	DGND		5/9/10/17 Reference Ground
24	Modulation+	Output	Forward input of laser trigger signal
12	Modulation-	Output	Negative input terminal of laser trigger signal
6	OUT4		Application for energy spectroscopy, do not connect non-energy spectroscopy
21	IN1		Energy splitting response signal, do not connect non-energy splitting

3.2 Board mounting dimensions

3.3 Overview of IO Function and Wiring Schema

3.3.1 Interface overview

Interface	Describe	Remarks
J1	Board power input	15V, shared switching power supply with laser head
J2	USB communication interface	Use usb line to connect to industrial computer
J3	Digital signal output of galvanometer	
J5	Universal input IO	
J6	Signal power supply and custom signal output	The first three signals are occupied by the system
J7	Laser control signal output	

Indicator light	Action
LED1	Negative power indicator
LED6	Forward power indicator
LED3	Board idle indicator lamp
LED4	Indicator lamp in board operation
LED5	Board error indicator
LED8	IO 24V Power Supply Indicator

4 Install and debug galvanometer software

4.1 Software installation

● Open the installer, select the corresponding installation language and click OK;

● Click next;

● Enter the installation password in the window: JK0803 (capital letters);

● Select the installation path and click next;

● Create the Start menu, default path, and click next;

- Create Desktop Shortcut, check Create Desktop Shortcut, and click next;

- Click Install to start the installation;

- Install. net 4.0. Some systems have their own. net environment package, which can be directly clicked to close. If the system does not have its own. net package, click to continue the installation;

- Install the driver, select USB (V6) driver version for PDU1000-YLR-V6K3 card, and click next;

- Note: If you have used V3 driver before, you should uninstall V3 driver first, otherwise it will affect the connection between the computer and the board;

- Select No Motion Control Card and click next directly.

- Check to install dongle driver, and click next;

- Select V6 and USB to install the card library, click next, and then install it;

- PDUMotion galvanometer control software is installed.

4.2 Software problem troubleshooting

4.2.1 Error code

Error code	Solutions
H0007	There is no dongle
H0033	The dongle driver is not installed
H0031	Wrong dongle model
H0041	If the software is infected, reinstall the software once after antivirus and replace the ini folder
H0042	Install a new version of dongle driver

4.2.2 Card opening failed

● Check whether the hardware connection is normal and check the hardware connection;

● Check whether the driver of PDU series laser control card is installed correctly:

Seeing PD-PRO in Device Manager means that the device driver was installed successfully

● Reinstall the driver, find the Drivers\ PengDin path in the root directory of the marking software, and then select the USB or PCIe driver.

● If you have used the V3 version, you need to uninstall and delete the driver, install the V6 driver again, unplug and plug the USB Update Device Manager, and observe whether the V6 driver is installed.

● Whether the patch selection of software PDU_1000 library version number is correct;

Re-select the library version, find the Drivers\ PDU library path under the root directory of the marking software, then select the driver corresponding to V6,

select all the files in the folder, copy to the root directory of the marking software, and replace the original files.

5 Software usage

5.1 Debugging laser

5.1.1 Red light correction

- Connect the board, laser and galvanometer;

- Open the software, and the words "PDU card opened successfully" appear in the upper right corner, indicating that the software connection card is successful;

- Create a new project;

- Measure the working distance of the galvanometer with a ruler or draw a point to center, emit light from the point, adjust the height of the galvanometer, and find the focus of the laser according to the intensity of the marking laser.

5.1.2 Correction BOX: Manual correction

- Select "BOX Correction";

- Select "red light ratio";

- Set the zoom ratio to 1, click OK, and wait for the save to be completed;

- Adjust the speed of laser and red light. The speed of laser is recommended to be faster, just mark it, and the speed of red light can be slower, which is convenient to observe the path of red light. The parameters of layer 1 are used by default, and standard correction is selected;

- Set the "Maximum BOX Correction Area". It is recommended that the value of "Maximum BOX Correction Area" be slightly larger than the value of "Test Rectangle Size".

- Set the values of "Test Rectangle Size" and "Test Rectangle Size" as the actual required marking size or galvanometer format;

- Select galvanometer 1 or galvanometer 2 to be X-axis;

- Turn on the red light, click OK, and observe whether the path of the red light is appropriate;

- Turn off red light and check to turn on laser;

- Measure whether the lengths of X and Y axes are equal to the "Test Rectangle Size" set in c with a ruler. If the measured lengths are not equal, find the galvanometer corresponding to X (Y) axis, click the calculation button, fill the measured length in the pop-up window, and click "Calculate". Then click "Laser Test" to repeat the test until the measured length is equal to the set length of "Test Rectangle Size"; g. If

the printed rectangular line is curved, find the galvanometer corresponding to the X (Y) axis and adjust the value in the galvanometer; (2) If the printed rectangle is parallelogram, find the galvanometer corresponding to X (Y) axis and adjust the value in the galvanometer; ③ If the printed rectangle is trapezoidal, adjust the galvanometer

- The value of; Repeatedly adjust until the required rectangle is printed;

- Observe whether the printed coordinates of X and Y axes meet the requirements, which can be adjusted by setting the corresponding relationship between galvanometer and X (Y). If the direction of X (Y) axis is opposite, check "Reverse"; i. The default galvanometer center point is (0, 0), and the position of galvanometer center point can be changed according to actual needs, but the offset should not be too large, and the "center offset" should not be changed without special requirements; The function of "rotation angle" is to adjust the angle of galvanometer coordinate system, which can be changed according to the marking direction requirements, and should not be changed without special requirements.

- j. Check "Turn on Red Light" and click "Execute Correction" to observe whether the red light running track coincides with the rectangle printed by laser. If not, set "Zoom Ratio (X, Y)" to adjust the red light running track; Click "Red Light Test". If the spot does not coincide with the origin of laser printing, set "Center Offset (X, Y) and adjust the position of the spot.

6 Software interface and tools

6.1 Page layout

1. The basic menu is a software system-level setting, including vision, camera, laser, BOX correction, platform motion card, IO and other setting functions;

2. Marking process column: edit marking tool parameters and sort the process;

3. Marking toolbar: including graphics, bitmap, CAD, CCD and other tools;

4. Canvas: Display graphics;

5. Information prompt bar: display marking information and CCD information;

6. List of documents;

7. Connection status of galvanometer card

8. Graphic editing: edit the size, position and filling of process objects;

9. Process object layer;

10. Laser parameters: Debug the laser marking process.

6.2 Marking toolbar

Legend	Tools	Instructions for use
	Single point	Click the "single point" icon, determine the position of the good point on the canvas, and then click the left mouse button, and a "point" object will appear.
	Straight line	Click the "straight line" icon, click the left mouse button on the canvas to determine the starting point of the straight line, move the mouse, click the left mouse button again to determine the end point of the straight line, and click the right mouse button to "finish"; If you need to draw continuously bent lines, just click the left mouse button several times.
	Polygon	The default is rectangular. Click the icon to select other multilateral graphics
	Circle (arc)	The default is round. Click the icon to use other arc drawing tools
	Lattice	Click the "dot matrix" icon, determine the position of the dot matrix on the canvas, click the left mouse button, a pop-up window appears, and set the row and row number and spacing of the dot matrix in the pop-up window.
	Character	Edit character text and enable text variables: serial number, date, time, serial communication, network communication, etc.
	Two-dimensional code	Select the barcode type (one-dimensional code and two-dimensional code) and set the code content
	CAD	Import finished CAD graphics, currently can import dxf, plt format files.
	Bitmap	You can import pictures in. bmp format.
	Delay	Marking delay tool.
	Curve	Draw a curve.
	SCR script	Edit script
	Time variable	General scripts or customizations are used as variables

	Marked rectangular ROI	Execute only the graphics inside the box selection, but not outside the box selection
	Call subdocument	Other documents are called during the execution of this document
	IO Output	Customize an IO output signal in the process (detailed explanation is at the bottom of the table)
	IO input	Customize an IO input signal in the process (detailed explanation is at the bottom of the table)
Note: The tool editing pop-up window will pop up when you click the tool for the first time. When the tool has been added to the process bar, double-click the tool in the process bar to edit it again		

IO output:

IO output tool. Double-click the icon to add an IO output tool in the document flow. The following figure shows the interface of output settings. If the document needs to be downloaded offline, "Buffer Output" needs to be checked, and "Master IO System" and "Auxiliary Operation Control IO System" can be selected in IO System Selection. IO No.8 output shown in the figure, if you need to output a group of IO signals, you can check multiple IO (both the marking card and the operation control card are valid at low level, only need to check "mask"). You can also use the "IO Delayed Reset" function to reset automatically.

IO input:

IO input judgment. Double-click the icon to add an IO input judgment tool to the document flow. The following figure shows the output setting interface. You can choose "Wait for IO input" and "Judge IO input". The following is an example of waiting for No.8 IO input (active low). If the waiting time is exceeded, the document will terminate. If you choose Infinite Wait, the program will always wait for No.8 IO input. Jump cursor can be set in judging IO input.

6.3 Layer and laser parameters

Each layer corresponds to a set of laser parameters. We can also change the name of the layer and the color of the layer in the parameters. Click on the name of the layer, and the parameter bar will display the layer name, layer color and parameter data corresponding to the current layer. The parameter data includes processing number, processing speed, power, etc. After changing the parameters, click Apply to save the current layer parameters.

● Number of machining: indicates the number of repeated machining;

● Speed: Indicates the processing speed. Under the same conditions, the faster the

speed, the lower the laser energy density acting on the surface of the processed workpiece, which is realized as insufficient laser energy, and vice versa;

● Empty speed: refers to the speed at which one solder joint jumps to the next solder joint after soldering is completed;

● Power percentage: The total power of the laser multiplied by the power percentage is the maximum peak power of the output of the laser;

● Waveform number: call the built-in waveform of the laser (applicable to some lasers);

● Frequency: indicates the number of times of light emitting in one second. The greater the number of light emitting, the greater the laser energy output (see the following figure for the matching relationship between frequency and the corresponding restrictions such as built-in pulse width and power);

● Duty cycle: the duty cycle of continuous laser output light;

● Red light speed: the speed of red light preview.

Advanced

● Marking delay: the delay of galvanometer when emitting light;

● Maximum jump delay: This delay is used when the set maximum jump distance is exceeded;

● Minimum jump delay: the minimum jump delay of galvanometer, the actual delay changes linearly between the maximum and minimum when it does not exceed the maximum jump delay distance;

● Maximum jump delay distance: used in conjunction with jump delay. When 0, the

minimum jump delay does not take effect, and the maximum jump delay is used globally;

● Jump delay: When the galvanometer jumps to the specified position, delay the time of JumpD before starting other movements. Single point time: the continuous light emitting time of a single point in the process;

● Extension line length: The distance of acceleration and deceleration before and after turning off the light, and the laser in the extension line section will not emit light;

● Built-in pulse width: the larger the pulse width, the greater the single point energy. Parameter correspondence:

Peak power = total laser power * power percentage

Pulse width * peak power = single point energy

Single point energy * frequency = output power

Output power/speed = power density

Single-point waveform

Just set gradual (initial stage) and gradual (ending), and the intermediate time will be automatically calculated according to the total light output time; When setting the waveform, consider the delay time (corner delay, marking, jump, switching light). Spot welding reference waveform, as shown in the figure, only takes effect when enabled is checked.

Linear waveform

For example, the welding time of wire or solder joint is 200MS: solder joint is the spot welding time set in advanced, and wire welding time: wire length/speed. Wire bonding waveform is set as follows:

0-20ms gradual: the first period of the initial light emitting section cannot be set, and the energy signal needs to be given in advance; 20ms is gradual: the energy rises from 30% to 50% within 20ms, and multiple periods can be set gradually. Setting 20-60ms according to specific requirements is the automatically calculated light emitting time: this period only shows so many times, and the actual light emitting time is the line length/speed. If the total light emitting time is 200ms, 50% of the actual light emitting time here is 165ms (200-20-10-5); If the total light emission time is 2000ms, only 30-70 is shown here, but the actual light emission time of 50% power is 1965ms (2000-20-10-5)

60-75ms fading out: the last time period of light emitting

60-70ms: within 10ms, the laser is reduced from 50% to 30%

70-75ms: 5ms time laser energy from 30%-0

Progressive: 02-09 a total of 8 segments can be set, the time refers to the light time, and the power is the power within the corresponding time. For example, in segment 02, 0-20ms, the corresponding power is from 30% to 50%, and the progressive power is best changed from small to large according to time. It is only necessary to set the gradual and gradual out time, and the intermediate uniform power light out time is automatically calculated by the software. Gradual out is the light off stage, and only

nine sections are opened. If the final solder joint energy is particularly large, the last period of time will be lengthened.

<mark>Note: A. The total time of gradual (gradual) alone cannot be greater than the total time of light emission, and the gradual + gradual time cannot be greater than or equal to the total time of light emission; The total light emitting time is less than the single point time set in "Basic Parameters";</mark>

6.4 Basic menu bar

Legend	Tools	Instructions for use
	New	Click the "New" icon to create a new file.
	Open	Open a file.
	Save the current file	Save only the current file.
	Save all documents	Save all currently open documents
	The previous/next step	Used to undo and return operations.
	Left alignment	The selected figure is aligned to the leftmost figure.
	Arranged up and down	The selected graphics are arranged at the same interval from top to bottom
	Right alignment	The selected figure is aligned to the rightmost figure.
	Upward alignment	The selected figure is aligned to the uppermost figure.
	Arrange left and right	The selected graphics are arranged at the same interval from left to right.

	Lower alignment	The selected figure is aligned to the bottom-most figure.
	Sort	Sort the marking order of the marking graphics.
	Combine/split objects	Select two figures to combine or select a combined figure to split it.
	Combined/split linear array	Select linear arrays to combine or select a combined linear array to split.
	Run	Realize red light preview and laser marking drawing. See the bottom of the table for details
	Teaching	Move the galvanometer through the mouse and keyboard to generate points at the corresponding positions of the canvas
	Horizontal mapping	Map selected objects by horizontal axis
	Vertical mapping	Map selected objects by vertical axis
	Object array	Array selected images according to rectangular and circular rules
	Curve alienation	Dissimilate lines or points according to certain rules. See the bottom of the table for details

Run

- Work: Click Start to display the current drawing file of laser operation.

● Red light preview: Clicking Start will show red light to run the current image file.

● Offline download: The current drawing file will be downloaded to the specified offline document.

● Frame preview: Preview the frame size and observe the proofing range.

● Select Work: When checked, only the selected graphics will be run.

● Cyclic work: Check to run the graph in a loop all the time.

● Loop interval: The interval between cycles.

Curve alienation

● Delete original data: Check to delete the original line; Original image display: Display the actual graphics after alienation, which is opened by default and not recommended to be closed.

● Enable relative speed: The relative speed is marked according to the time when the original line is completed. It is closed by default, but it is not recommended to open it.

● Resolution: The fine degree of the thin bar, too low will make the computer jammed, too high will make the graphics not smooth, the default 0.05.

1. Sinusoidal line:

- Starting angle: The angle at which the cosine starts.
- The period is equal to the pulse width and the amplitude is equal to the frequency height, as shown in the following figure:

2. Helix

3. Point column

- Generate point mode: point interval, generate a point every certain distance;

  Points, evenly distributed by the number of points;

4. Point rotation curve

- Spiral spacing: Line spacing
- Minimum radius: the radius of the innermost circle; Number of outer rings: welding times of outer ring trajectory; Number of inner ring: welding times of inner ring trajectory; Increasing radius: the value of increasing radius when the number of spiral turns increases; Direction problem: welding is from outside to inside or from inside to outside;
- Spiral radius: the size of spiral point;

5. Vertical 8 helix

6. Horizontal 8 helix

7. Dashed line alienation

6.5 Graphic editing bar

- Position X\ Y: the coordinates of the reference point of the figure, which can be directly filled in to change the position of the figure;

- Width, height and angle: The width, height and angle of the figure are referenced by the center point of the figure, which can be filled in and changed;

- Equal ratio scaling: After checking, the aspect ratio is locked, and when one parameter is changed, the other parameter will be automatically changed;

- Datum point: Set the position datum point of graphics;

- Fill: You can set multiple fills, select Fill 1, Fill 2 and Fill 3 settings;

  a．Whether to sketch the outline, when checked, marking will play the original figure, and if not checked, marking will only play the filling figure;

  b. Whether to fill, choose whether to fill, if the drawing figure is not closed, the system will force the first and last ends of the connection closed;

  c. Whether to walk around or not, check to select the marking times of the outermost circle of the figure;

d.FU_ Cylindrical Fill:

e.FU_ Integral bow fill:

f.FU_ segmented bow fill:

g.FU_ single padding:

h.FU_ Fill back and forth:

- Move the equivalent, use the keyboard arrow keys or click the increased triangle key to step the value.

  j. Center, so that the center point of the figure is centered to the center of the canvas.

  k. Apply, apply the current settings.

6.6 Documents

Used to create, open, save and save drawing files.

6.7 Tools

6.7.1 Script compiler

- Script compiler: used to compile script files with special functions;

6.7.2 Expand buttons and output

- Add custom buttons and control them according to IO number;

6.7.3 Initial reset of galvanometer card

● Initialize galvanometer card.

6.7.4 Advanced Tools (Download Offline)

● Offline download

1. Set "Number of Offline Documents", the default number of software settings is 4, and the maximum support settings are 16; Settings-> System Settings-> Interface Function and Display; Number of Offline Documents drop-down box to select Quantity.

2. Click the "Run" button, or press "F6" to pop up the run box; Select "Offline Download" and then click "Start";

3. The pop-up window "Offline Download Document Number Selection" appears. We choose "No.00 Offline Document" as an example;

4. After offline download is completed, close the run box and open "Tools-> Advanced Tools-> Offline Download Settings";

5. We can see the offline document named "Platform" downloaded offline just now. Click the "File Parameter Setting" button under the offline document to set the trigger running document;

Triggering along the rising edge or falling edge of low level can be set in this window;

6.8 System settings

6.8.1 Journal:

You can save the software operation log to a folder in the software installation location.

6.8.2 Multi-document running:

Set the running mode, check the multi-document running, and the multi-document running option will be added in the main interface.

i. Click Multi-document Run to pop up the Multi-document Run box;

ii. Click to select a multi-document sequence, and then click the Add button to add documents;

iii. Click the "Add" button, double-click the document in the pop-up window to add the document, and close the pop-up window after the document is added; If you need to clear redundant documents, double-click the documents in the multi-document sequence to clear them; Click Save to save the current multi-document sequence;

iv. [Demonstration Work] If the laser does not emit light, it will perform red light

work, and the "Cycle Work" document will be executed cyclically;

6.8.3   Stay mode of galvanometer end point:

Choose the stop position of the end point after the operation, which can be used to

stay at the last point when teaching red light, so as to facilitate the observation of the

point.

6.8.4 Stepping in red light preview:

Check the red light teaching can move the object, when running red light preview, there will be more stepping options, through the keyboard up, down, left and right keys to control the graphics stepping.

6.8.5   User rights settings:

Default account password

Administrator: 7777 Password: 7777 Engineer: 6666 Password: 6666 Operator: 8888

Password: 8888

A. Turn on the permissions function. Click "Settings-System Settings", check "Enable User Rights Management", then check "Password Format Restriction", save and restart the software.

b. Edit permissions. Click "User Rights Settings-Enable Editing" and enter the administrator password. The default administrator account number is 7777 and the password is 7777

c. Assign permissions to technicians and operators, and check the corresponding permissions. Just save it.

d. Switch users. Click the user in the upper left corner of the software or restart the software to pop up the user login pop-up window. Select the permission type, and

then enter the account password to log in, and you can switch users.

6.8.6　Multi-card

The default card number of PDU card is 0, and the card number with the same name cannot be opened at the same time on the same industrial computer. When multiple cards need to be opened at the same time, the card number needs to be changed.

Let's take opening two cards at the same time as an example (one software supports opening up to four cards).

1. The industrial computer connects a card whose card number needs to be changed separately, and opens the software. The software shows that the card has been opened successfully. The serial port for card number modification is located in "Settings-System Settings-Advanced Parameters of Control Card".

2. Click "Modify Card Number"-"Fill in New Card Number"-click "OK", and then click "Save".

3. After modifying the card number, close the software, and the control card will take effect after being powered on again.

4. After modifying the card numbers of all control cards, set the number of cards to be opened at the same time in the software. "Settings--System Settings--Control Card Advanced Parameters". After filling in the number of cards, click Save to exit (this setting requires restarting the software to take effect) and close the software.

5. All the cards are powered on, and the industrial computer connects all the cards and opens the software.

6. In the software startup interface, there will be a prompt for the card number to be opened, and the software will open the card No.0 by default, so select a card other than the card No.0. Click the drop-down box, select the card number and then click OK. If there are multiple cards, the software will prompt to select the card number many times.

Note: If the software is set to open multiple cards, but only one card is connected to the industrial computer, it will not affect the function of a single card. Software opened a number of cards, each card has to be corresponding to a separate correction of BOX, in the running of the marking program is also required to select the card.

6.9 IO Communication Settings

6.9.1 IO display

● Used to detect input and output signals.

A. Edit the IO name, you can customize the IO name.

b. Test output. After checking, all IO output signals can be controlled by clicking.

6.9.2 Input Response Settings (IO Map Settings)

1. Open Enter Response Settings and select Multiple Documents.

Note: There are only 12 IO multi-document diagrams by default, which can be changed in system settings/interface functions and display/IO triggered multi-document count.

2. The sequence number of multi-document starts from multi-document 00. The first tnh file in the project file list corresponds to multi-document 00, and the second one corresponds to multi-document 01.

Combine IO input response settings (example):

The combined IO input response is typically used for multi-document run triggers, assuming there are four IO input points (01, 02, 03, 04),

Active low, where (01, 02, 03) is used for document switching, and (04) is used for triggering runs, which need to trigger 7 multi-document runs. Here is how to set up "Multiple Documents 00", according to which you can set up other multiple documents.

Note: The combination IO setting needs to ensure the uniqueness of each group of IO responses and avoid setting to the initial state of the combination IO.

Event name	IO input point setting
Multi-document 00	☑ 输入 — 00-15: mask row checked 01,02,03,04; value row checked 02,03; 16-31: none
Multiple Documents 01	☑ 输入 — 00-15: mask row checked 01,02,03,04; value row checked 01,04; 16-31: none
Multi-document 02	☑ 输入 — 00-15: mask row checked 01,02,03,04; value row checked 04; 16-31: none
Multi-document 03	☑ 输入 — 00-15: mask row checked 01,02,03,04; value row checked 01,02; 16-31: none
Multi-document 04	☑ 输入 — 00-15: mask row checked 01,02,03,04; value row checked 02; 16-31: none
Multi-document 05	☑ 输入 — 00-15: mask row checked 01,02,03,04; value row checked 01; 16-31: none
Multi-document 06	☑ 输入 — 00-15: mask row checked 01,02,03,04; value row: none; 16-31: none

Additional IO Settings

IO interface of laser control card. The input and output states correspond to the input terminals I1-I20 and the output terminals O1-O18 of the laser control card respectively. After "Test Output" is checked, you can manually test the output for a single port. Note: The first three output ports are occupied by the system

(00, 01, 02).

In the IO parameter setting interface, open the drop-down list of "IO Input Response Settings", select the IO response object as needed, and check the Enable "Input" option box. According to the actual connection mode, the user can select the corresponding input port number on the motion control card between the serial number 00 ~ 15. According to the signal connection trigger mode, check the level mask value and set the trigger mode. Take the input as an example: "01 input low level, 02 input high level, 03 low level". When this set of signals is satisfied, this state is valid. As shown in the following figure:

The input response setting provides several commonly used IO response output objects, and the user can directly customize the IO output port indication.

For example, waveform 1 ~ 6, tricolor lamp, buzzer, red light indication, external control switching and laser alarm clearing. These IO settings to "-1" are invalid. The machine safety door/safety raster response mode can be set whether the software

enters the suspension state or the suspension state when the signal is input. Check "Program automatically calls IO reverse", that is, all IO states are reversed. Users can customize and edit according to the actual signal, and save the restart software to take effect after the parameters are modified.

Attachment: IO Input Response Settings List

Function	Functional description
Handwheel	Set IO handwheel signal
Machine ready	Set the machine ready signal, triggering this signal will stop the program running, and there is a safety alarm indication.
Machine safety door	Set the machine safety door signal, trigger this signal will stop the program running, there is a safety alarm indication.
Safety grating	Set the safety raster signal, which will stop the program running and give a safety alarm.
Emergency stop button	Set the emergency stop button signal to trigger this signal to stop the program.
Clear the alarm	Set the manual trigger clear alarm.
Laser alarm	Set the laser alarm signal.
Abort	Set IO trigger to stop running directly.
Run	Set one or more IO triggers to run directly.
Run red light	Set IO to trigger red light operation.
Suspend	Set one or more IO triggers to directly trigger pause.
Running pauses	Set one or more IO triggers to pause, and signal cancellation resumes operation.
Multi-document	By calling different document numbers to different IO signals, the process contents of different document numbers are executed.
Rerun the current document	When the document is paused, IO can be triggered to continue running the current document.
Rerun the document	Set one or more IO triggers a signal to continue running after the corresponding multi-document running is paused.

Foot tread	Set the pedal IO to trigger the currently displayed process.
Switch multiple solutions	Set IO trigger to automatically switch multiple solutions.

6.10 Host response settings

6.10.1 IO system

In the IO system, IO input signals can be configured and corresponding response actions can be set. Example: Configure "System Termination". This function can terminate the program.

1. Select "System Termination", and then click "Add a Group of Responses"

2. At this time, "System Termination" is added to the function list, which has not been enabled at this time, and IO response needs to be configured for the function. Click on the "System Termination" function in the selected list, and at this time we can rename, configure IO and delete functions.

3. Configure IO in several small steps. First select the card number, then select IO system (main control card IO), check "input", then check the corresponding IO number, and click OK.

6.10.2 TCP system

Set the server IP and port, check "Open Host Server", click OK, and restart the software service to take effect. The client sends corresponding instructions to the server, which can trigger the software to run or stop, and the offset can be set for the galvanometer in the running instructions. For example: _ PDMark (0, 20, 20, 90), which means to run document 0, offset in X direction

20mm, the offset in Y direction is 20mm, and the angle is rotated by 90.

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