

## Automatic stainless steel laser welding machine

# **OPERATION INSTRUCTIONS**



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# STATEMENT

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#### - Vreface

Thank you for purchasing and using the automatic stainless steel belt laser welding machine. This manual is the use and maintenance information of this equipment. The products we supply to customers are not just the results of our design, but how to maximize the effectiveness of this equipment (operating technology) and maintain the best condition for a long time (safety maintenance).

In order to ensure the safety of the operator and maintain the excellent performance of the equipment for a long time, before using the equipment, please read this manual carefully and save it for subsequent use to avoid danger or damage to the machine during operation.

All parts of our products are guaranteed to be safe and reasonable. If the equipment is operated incorrectly or violates the operating regulations, it will directly cause equipment damage or injury to the operator. Now some precautions are described as follows:

1 , Operators need to pass relevant skills training before they can operate the equipment.

2 . When changing the fixture or repairing the equipment, the equipment is in manual state.

This machine equipment is upgraded or updated at any time without notice, please understand! If you have any further technical or use problems, please contact our company in time.

### 二、 Product working conditions

#### 2.1 Working conditions





·Ambient air range

Working hours	5 ~40℃
During transportation and storage	0℃ ~40℃
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·Air relative humidity

At 35℃ ≤50%

At 20°C ≤90%

•The content of dust, acid, corrosive gas and other substances in the surrounding air does not exceed the normal content.

The altitude does not exceed 1000 meters

·Grid voltage fluctuation: ≤±10% (when the grid frequency is the rated value)

·Grid frequency fluctuation: ≤±1% (when the grid voltage is the rated value)

#### 2.2 Working environment

The product should be placed in a dry, ventilated and dust-free environment away from direct sunlight, rain, gas vapor, chemical deposition and corrosive media that seriously affect the use of the equipment, and avoid violent vibration and turbulence.

### $\Xi$ 、Safety Precautions

#### 3.1 Electricity safety

The basic principle of preventing electric shock is not to touch the two poles of voltage electrical equipment at the same time. The specific precautions are as follows:

1 Sefore operation, you must wear qualified protective equipment, such as safety gloves, insulating shoes, and all labor protection equipment must be dry and undamaged;

2 Before servicing and testing the equipment, cut off the power supply to prevent electric shock.

#### 3.2 Mechanical equipment hurts





When the equipment is working, be sure to keep hands, hair, clothing and tools away from mechanical movement, pneumatic actuators and other operating mechanisms. Pay attention to pneumatic and mechanical pressure components that hurt people. Operators are not allowed to wear loose clothing and accessories.

#### 3.3 Comprehensive preventive measures

1、Ensure equipment power safety measures;

2、Only skilled electricians can work on high-voltage equipment;

3、The equipment safety warning signs must have clear signs and be readily available;

4. During the operation of the equipment, the lubrication and maintenance of the equipment cannot be carried out.

#### 3.4 Precautions for installation and debugging

1.After opening the package, confirm whether it is the model you ordered.

2.Check whether the equipment is damaged during transportation. If there is any damage, please contact our after-sales service.

3.Our company will not bear any responsibility for equipment damage or other losses caused by not strictly complying with the operating requirements specified in this manual.

4.After 7 days of installation and commissioning, our company cannot return the goods without reason.

5.Before installation and commissioning, please prepare 5 square meters of three-phase five-wire wires (the number of meters required according to your company's operating site), one 40A power switch, one bucket of purified water, about 20L, and several 10 mm air pipes. Compressed air less than 0.6MPa, steel strip materials, etc.

6.After installation and commissioning, our after-sales personnel will teach your company how to operate. Please be sure to send someone to study carefully.

### 四、Equipment introduction

4.1 Equipment picture:







#### 4.2 Equipment introduction:

Laser welding technology has been widely used in all walks of life, opening up broad prospects for high-quality, high-efficiency, pollution-free and low-cost current processing and production. It is widely used in glass lids, enamel pots, tea jars, hardware products, precision equipment, and medical care, craft gifts and other industries, The equipment rolls, cuts, and welds stainless steel strips. It has high speed, precision, low power consumption, low noise, safety and reliability, energy saving and environmental protection, small space occupation, large output, and reduced labor costs. It can be operated by one person or multiple Etc.Laser welding is a new type of welding method and one of the important aspects of the application of laser material processing technology. During laser welding, the laser beam is radiated to the processed object. After the surface of the workpiece is heated, the surface heat is diffused into the interior through heat conduction, and the laser is controlled. Parameters such as pulse width, energy, peak power and repetition frequency make the workpiece melt to form a specific molten pool, which will form a weld after cooling. The welding process is of heat conduction type, and the





advantages are large depth ratio, fast welding speed, small heat influence range, and small deformation of the workpiece.

#### 4.3 Equipment technical parameters (1):

Name	Unit	Technical parameters
Equipment size	mm	2100*1300*1900
Equipment weight	kg	1500
Chiller size	mm	470*565*900
Chiller weight	kg	70
Total power	KW	6.5
Diameter of steel ring	mm	120-600
Thickness of 500W laser	mm	0.18-0.35
welded steel strip		
Thickness of 1000W laser	mm	0.35-0.6
welded steel strip		
50 fixture welding width	mm	12-48
60 fixture welding width	mm	12-58
70 fixture welding width	mm	12-68

#### 4.3Equipment technical parameters (2):





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Required air pressure		Мра	0.5~0.7	
cooling method			water	
Ir	put voltage	V	380V Three-phase five-wire	
Rat	ed frequency	HZ	50	
Externa	al cable standard		5*3+3.5*2(U V W N PE)	
Welding speed		pcs/min	10-15	
Water tank volume		L	15-30	
Water medium			Distilled water/purified water	
Refrigerant			R22	
	internal diameter	cm	About 18	
Material	Outer diameter	cm	About 70	
TACK	Maximum load	kg	200	

#### 4.4 Equipment features:

1. The clamp adopts active feeding, stable parking can restrain inertial impact;

2. The feeding length is controlled by servo motor and reducer, with convenient length change and high control precision;

3. The equipment uses an eccentric wheel to press the material, and the operation is simple and convenient;

4. The circle is controlled by a servo motor plus a reducer, and the angle can be arbitrarily set and compensated according to the process;

5. The welding part is divided into two grippers by the plane head, which is convenient for operation, which reduces the scrap rate very well. The welding speed can be adjusted arbitrarily according to the thickness of the product;

6. The welding process can be monitored through the CCD online monitoring system, which effectively reduces the adjustment time;

7. According to the diameter of the steel belt, the material rack can be selected for vertical and horizontal two types;

8.Nitrogen protection is used in the welding process to whiten the welding surface, eliminate traces and increase appearance (requires 99.999% nitrogen concentration);





9.Pneumatic components adopt Taiwan Airtac executive parts, with long life and high reliability;

10.The equipment adopts Taiwan programmable controller as the main control unit, the circuit is simple, highly integrated and intelligent, which reduces the failure rate and is convenient for maintenance and maintenance.

11.The equipment has a wide range of application fields. It adopts touch screen digital input to control operation settings, which is simple and convenient to operate and easy to replace products.

#### 五、Maintain

#### 5.1 Equipment maintenance:

1.All the guide rails and screw rods are greased every six days. The surface should be cleaned before filling. The cylinder in the round seat should be removed every six days to clean and grease, and check whether the 0-ring is intact.

2. The pure water of the chiller is replaced every 30 days.

3.All mechanical moving parts shall be inspected every three days, and there shall be no looseness or damage.

4. The protective lens of the laser head, the pressure buffers, cylinders, and rubber strips are checked daily to see if they are working properly. If there is any abnormality, they should be adjusted and replaced in time.

5.Various faults encountered during the debugging process should have corresponding records, such as fault problems, solutions, etc., to facilitate the next rapid processing.

#### 5.2 Daily maintenance:

1.When working, the pressure of the gas source treatment unit must be adjusted to 0.5-0.6MPa

2. At least one filter drain operation should be carried out every shift (8 hours). Drainage method: cut off the gas source to treat the pressure gas in the two-piece air inlet and exhaust path. The pressure gauge value is 0. In this state, the filter automatically drains. After the operation is completed, it must be confirmed that the water collected in the filter has been discharged.

3. Check the oil level of the oil cup of the oil feeder once a week to ensure that there is oil in the oil cup. Use ISOVg32 or similar lubricating oil for the oil feeder. The oil output can be adjusted by the knob on the top of the oil feeder.





#### 5.3 Cooling system:

The maintenance of the cooling system is mainly to check the quality of the cooling water regularly. If the water quality becomes bad, turbid, and transparency becomes poor, it should be replaced with new water in time. Regularly check the amount of water in the water tank. If the amount of water is below min, it must be added in time. It is recommended to use deionized water or purified water. Regularly check whether there is water leakage at the connection of each water pipe. If there is water leakage, tighten the screws at the place to ensure that there is no water leakage. When the seal between the xenon lamp and laser rod and the cavity leaks, the main reason is that the rubber sealing ring is deformed or aging. The water still leaks after tightening the screw. The rubber ring should be checked carefully. If it has failed, replace the spare rubber ring.

#### 六、Common fault analysis and elimination:

Fault phenomenon	Cause of failure	Solution
1 No response	No power or phase loss	Restore power
at boot	Emergency stop switch is pressed	Right-hand emergency stop switch to the end
	The contactor failed to close	Check the contactor and control circuit
3、Water leaks at	Type 0 sealing ring aging	Replace type 0 sealing ring
both ends of the lamp and rod	The lights and rods are not installed	Adjust the position of the light and rod fixing card
	In lock light mode	Turn on the lock light switch
4、No laser output	The light path is not adjusted	Adjust the light path

#### 6.1、Handling of common abnormal laser problems

#### 6.2、Treatment of common problems of fixture

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Fault	Cause of failure	Solution
phenomenon		
There are cracks	1、 The seam alignment piece is pressed	1、Adjust the gap
in the welded	too tightly and the compensation is not	between the alignment
steel strip, and the	in place	piece and the aircraft
welding is	2、 The compressed rubber strips at the	head
incomplete	front and rear ends are damaged, which	2、Replace the rubber
	causes the steel belt to pull obliquely when	strip
	receiving materials.	





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1.The feeding rubber wheel is not pressed tightly.1.Check whether the feeding rubber wheel is not pressed tightly.Different feeding length3.The guide block and the straightening and positioning sleeve are not concentric, causing the steel belt to not be in the same straight line.2.Repair the worn rubber wheels in time, and replace they cannot be repaired.Lack of oil the circle cylinder leads to insufficient strokeThe front end is not tightly pressed, and the circle cylinder is short of oilRefuel in timeServo alarmCheck if the material is jammedClear the jam and power on againClear the jam and power on againThe steel belt runs outward from the cutter positionGenerally, the material of the steel strip is relatively soft and will appearUse soft copper wire to make a circle from the positioning pin, not to to ightThe weld is obliqueJamming switch shiftAdjust the nitrogen reguined is not uniform enough, the welding port is black, the welding port is black and yellowAdjust the nitrogen reguined is to large, the welding port is black, the not to tightNitrogen gas welding port is black and yellowThe nitrogen outflow is not uniform enough, the welding port is black, the welding port is bard co large, the welding port is black, the welding port is black and yellow1.Nitrogen gas welding port is black and yellowThe ruber of the aircraft head and the nitrogen flow is to large, the welding port is black, the wornNitrogen weld welding port is black and yellowThe ruber aga potevice and the aircraft head and the nitr					
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Uneven weld       2、 The surface of the aircraft head is worn       2、 Clean the surface of the aircraft head is gurface of the aircraft head and grind it flat	The steel belt runs outward from the cutter position The weld is oblique Steel belt jam alarm Nitrogen gas welding at the welding port, the welding port is black and yellow	Generally, the material of the steel strip is relatively soft and will appear Cutter base is skewed Jamming switch shift The nitrogen outflow is not uniform enough, the welding port is black, the nitrogen flow is too large, the welding port is yellow, and the nitrogen flow is too small 1. There is a gap between the flush	Replace the welding origin switch in time Use soft copper wire to make a circle from the position of the cutter seat and the positioning pin, not too tight Re-adjust the cutter base Adjust the jam switch appropriately left and right Adjust the nitrogen regulating valve		
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	The steel belt runs outward from the cutter position The weld is oblique Steel belt jam alarm Nitrogen gas welding at the welding port, the welding port is black and yellow Uneven weld	Generally, the material of the steel strip is relatively soft and will appear Cutter base is skewed Jamming switch shift The nitrogen outflow is not uniform enough, the welding port is black, the nitrogen flow is too large, the welding port is yellow, and the nitrogen flow is too small 1. There is a gap between the flush seam device and the aircraft head 2. The surface of the aircraft head is worn	Replace the welding origin switch in time Use soft copper wire to make a circle from the position of the cutter seat and the positioning pin, not too tight Re-adjust the cutter base Adjust the jam switch appropriately left and right Adjust the nitrogen regulating valve		

### 七、Operation essentials





#### 7.10perational readiness:

1.Connect the air source so that the indication of the pressure gauge is 0.5-0.7mpa.

2.Connect the 380V power supply, turn on the control box breaker switch, and turn on the emergency stop button on the lower panel to keep the machine energized.

3. When the cylinder servo motor is at the designated position, in the manual state, press any button on the manual screen on the screen to perform manual operation.

4.Automatic working conditions of the machine: the equipment does not have any alarms, the full axis reset is completed, and the equipment is in the automatic state.

#### 7.2Cylinder magnetic switch position determination

1.When the cylinders are in the original position and in position, the corresponding induction switches will light up respectively.

2. The position of the proximity switch is determined, please adjust as follows:

(1) Put the machine in manual mode and put the screen in manual screen.

(2) Press the cylinder button on the manual screen, and the corresponding cylinder will act to detect whether the sensor switch on the cylinder will be on. If it is not on, you can manually adjust it. If the manual adjustment is not on, the sensor switch may be broken or the line may be faulty.

Note: When any proximity switch is not inductive (not lit), the next action of the machine will not be able to be carried out, and it will also cause damage to the equipment or product. At this time, pay special attention to the maintenance or troubleshooting points.

### 八、Controller introduction

#### 8.1 Features of the control system

The control system of this machine adopts Delta PLC, Fanyi touch screen, Inovance servo driver and Inovance inverter. The steel belt feeding speed, welding speed, steel belt feeding length and welding position can be adjusted, which is more convenient for control.





#### 8.2Man-machine interface operation instructions

When the power is turned on, press the "Emergency Stop" button on the panel, the work indicator on the panel will light up and the touch screen will display.



•After the machine is powered on, the initial state of the touch screen displays the startup screen, which displays the device name, company address, contact number, three-language buttons and the "Enter Operation" button.

## Main operation interface.





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The host operates the touch screen to display the above screen. In the automatic state, the equipment does not have any alarms, the full axis reset of the equipment is complete, and the steel strip loading is completed and the steel strip manual cutting is completed, start the high-pressure button on the welding machine page, press the "start" button on the screen, and the machine You can weld the steel ring according to the set parameters. The corresponding sensor switch indicator light is also displayed on the screen, and the indicator light on the screen will be on. If it is not at the starting position, switch to manual, press the "reset" button, and the machine will automatically return to the starting position.

In the process of automatic operation, press the "Stop" button, the equipment will complete the welding of the current steel ring, and the equipment will automatically stop when it runs to the initial state. When the equipment fails, the corresponding alarm information will appear in the alarm information bar, which is very convenient for users to find out the corresponding fault in time. After the fault is handled, press the "Alarm Reset" button to clear the alarm information in the alarm information bar. If there is an alarm message such as a servo alarm, the device can handle the alarm message even if it is powered off and restarted.

In the main operation interface of the touch screen, press the "Manual Operation" button once, and the screen jumps to the manual screen. To ensure safety in the manual state, press any corresponding button on the manual screen to have a corresponding action, such as the "feed forward" and "steel belt motor" buttons, and the button indicator will light up during operation. Manual is only convenient for debugging, maintenance and use, and should be used sparingly during normal production.

# Manual page<sup>.</sup>







In the manual screen, press the "welding station" button, the touch screen will enter the welding station operation, as shown in the figure above.

# Welding station operation.



In the operation screen of the welding station on the touch screen, in the manual state, press the corresponding buttons of "Hand Cylinder 1", "Hand Cylinder 2", and "Discharge Cylinder" in the interface, and the cylinder will act accordingly and the button indicator will light up. When the laser is powered on, there is no alarm, the high





voltage is turned on, and the safety is guaranteed, press the "welding start" button on the screen, and the laser will appear to test whether the light will be emitted and the size of the laser energy. Avoid using Contact with hands and look directly at the eyes to avoid damage to the opponents, eyes, and other parts of the body. Press the "Jog forward" and "Jog backward" buttons on the interface, and the welding station will move forward or backward, and you can see the changes in the current position of the welding servo. During the welding servo inching process, do not follow other The mechanical parts collide to avoid damage to the mechanical parts. Before pressing the "advance to receiving position" and "return to waiting position" buttons on the interface, ensure that the corresponding parameters on the parameter screen roughly match the actual position of the welding servo to avoid collisions.

In the manual screen, press the "rotation station" button, the touch screen will enter the welding station operation, as shown in the figure below.



## Rotary servo operation.

In the rotating servo operation screen of the touch screen, press the interface "forward jog" and "reverse jog" buttons, the rotating servo station will have corresponding rotating actions, and you can see the data changes of the current position of the rotating servo. After pressing the "Rotate 180 Degrees" button on the interface, the deflection station will be rotated 180 degrees. Press the "Parameter Setting" button on the main screen, touch the screen to enter the parameter setting screen, as shown in the figure above.









## Parameters page-

The parameter page is to set the commonly used parameters in the steel strip welding process. The product length is set by the diameter of the steel ring that the user needs to weld, and the welding width is set according to the width of the steel strip itself. The steel ring is divided into two feedings during the welding process. The length of the first feeding is defined by a length, which is mainly a butt joint at the two interfaces of the steel ring. During the welding of the steel ring, When welding or folding occurs, you need to adjust the parameters of a certain length. The activation or deactivation of the three-step feeding refers to whether the laser welding machine is connected to the subsequent machine of the crimping machine. If it is to be connected to the subsequent crimping machine, three Step feeding is enabled. If you just make steel rims separately, you need to disable the three-step feeding. Press and hold the blank space in the lower right corner of the parameter setting screen, the touch screen will enter the welding machine parameter setting screen. As shown in the figure below, this screen is to set the speed and position of the servo operation during the welding process. When the equipment is debugged and stable, the welding machine Basically, the parameters of the parameter screen need not be changed much.

## Welding machine parameter setting screen.





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			悍机参数画面设	置		
送料自动:	123.4	%	1段长度:	123.45	MM	主画面
送料手动:	123.4	%	等待位置:	-123.45	MM	
偏转自动1:	123.4	%	焊接长度:	12.34	MM	打孔延时:
偏转自动2:	123.4	%	接料位置:	123.45	MM	1.23 <sup>S</sup>
偏转手动:	123.4	%	结束位置:	-123.45	MM	夹料延时:
空走速度:	123.4	%	当前位置:	-1234.56	MM	1.23 S
手动速度:	123.4	%	钢带偏移长度:	12.34	MM	切料延时:
焊接速度:	123.4	%	6-11 H T 1-14	1.27		1.23 S
偏转补偿角度:	1.23	0	钢帘尤杆	: 1.23	5 5	
卸料时间:	打字时间:		前压紧延时:	后压紧延	时:	后压紧松开:
1.23 S	1.23	S	1.23 S	1.23	S	1.23 S

The continuous welding energy setting page is for the welding energy during the welding process, in which time period the welding energy appears to achieve the best welding effect. The energy depends on the material and thickness of the steel strip. Generally, during the use process, steel The belt has no welding thickness, and the energy needs to be increased. The steel belt needs to reduce the energy when welding through. You need to click the "Save Settings" button after changing the parameters each time, and it can also ensure that the modified parameters are stored in the PLC. Every time after the laser power is turned on, there is no laser alarm, and the laser head will appear red light. At this time, you can turn on the high voltage and the red light will naturally be disconnected. At this time, the device can emit light, and it can be set according to the settings. The parameters are welded. Every time you turn off the power of the equipment, you need to turn off the high voltage first to avoid damaging the electrical components of the laser and prolong the service life of the laser. The screen also has the curve relationship between pulse width and amplitude during welding, and can also monitor the time and amplitude of continuous light emission during welding.

# Data display page.





·							
出光时间:12.345	S 保存设	200-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0-0	4.000 6.000	8.000 10.000			
脉宽: NO1:12.345 S	幅度: 123.4 %	脉宽: NO6:12.345 S	幅度: 123.4 %	通讯标志: 1 激光 <b>电源</b>			
NO2 : 12.345 S	123.4 %	NO7 : 12.345 S	123.4 %				
NO3 : 12.345 S NO4 : 12.345 S	123.4 % 123.4 %	NO8 : 12.345 S NO9 : 12.345 S	123.4 %	$\wedge$			
NO5 : 12.345 S	123.4 %	NO10 12.345 S	123.4 %	有画主			

In the event of a failure, it is necessary to re-debug or change to a new model steel ring, you can run the single-step mode, which is very convenient to find the problem points in the process of use. Click the "Single-Step Screen" button on the main screen to enter the single-step screen. In the device reset complete, no alarm, automatic mode, open the single-step screen "Run Mode" button, click the "Next" button, A single-step start of the device can be realized.

## Single step screen.







Click the "Yield Page" button on the main screen to enter the output setting page, and you can see the product count and cumulative count. The set output means that the device can realize the automatic shutdown function when the product count reaches the set output value. When the output is set to 0, the shutdown function for output reaching is not enabled. Click the "Clear" button, the value of the product count will be cleared.

# Yield setting page.







### 8.3 Servo parameter setting:

全自动激光焊机伺服参数表								
变频器参数 送料伺服参数 偏转伺服参数 焊接伺服参数								
F0-02	1	命令源选择	H02-02=0	方向选择0-正转,1反转	H02-02=1	方向选择0-正转,1反转	H00-00=14101	电机编号
F0-03	6	主频率源X选择	H04-07=1	报警选择	H04-07=1	报警选择	H02-01=1	绝对值系统选择
F0-10	100	最大频率	H05-02=4000	1圈脉冲数	H05-02=4000	1圈脉冲数	H02-02=1	方向选择0-正转,1反转
F0-12	100	上限频率	H09-00=1	自调整模式选择	H09-00=1	自调整模式选择	H04-07=1	报警选择
F0-17	0.5	加速时间1	H09-01=15	刚性等级选择	H09-01=15	刚性等级选择	H05-02=4000	1圈脉冲数
F0-18	0.1	减速时间1	H03-11=1	伺服上电使能	H03-11=1	伺服上电使能	H09-00=1	自调整模式选择
F4-01	12	DI2端子功能选择	RUN	使能状态	RUN	使能状态	H09-01=15	刚性等级选择
F4-02	13	DI3端子功能选择	RDY	准备状态	RDY	准备状态	H0C-00=2	伺服轴地址
F4-03	14	DI4端子功能选择					H0C-02=2	串口波特率设置
FC-01	15	多端指令1					H0C-03=3	MODBUS数据格式
FC-03	35	多端指令3					H03-11=1	伺服上电使能
FC-07	70	多端指令7					RUN	使能状态
					0		RDY	准备状态

