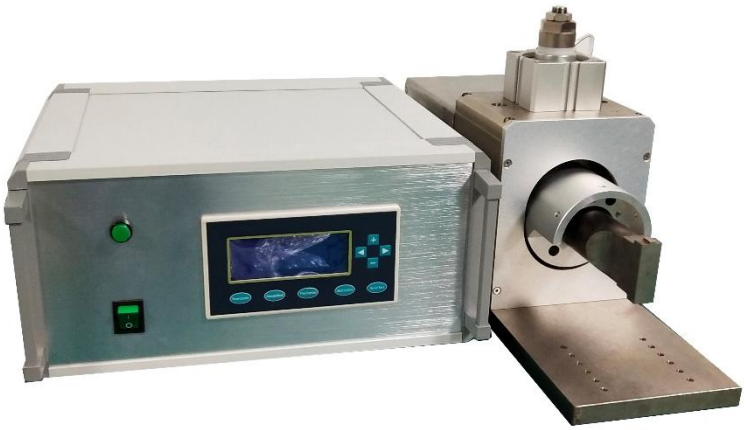
Ultrasonic Metal Welding Machine

Instruction Manual



Catalog

Security requirements and warnings

This section explains the meaning of the symbols and signs of danger, warning and attention, and provides the general safety precautions for the ultrasonic metal welding system.

The following three signs will often appear in the manual, please pay special attention to it:

This symbol indicates: If you ignore this label and make operations, it will lead to serious property damage, personal injury, or even death.

This symbol indicates: If you ignore this label and make operations, although without causing injury, but may bring additional work such as rework or re-commissioning and so on.

This symbol indicates: If you ignore this label and make operations, may result in varying degrees of property damage, personal injury and other content.

Before using the machine, should pay attention to the following matters.

1. Before any electric connection, the power supply is determined to OFF state.
2. No professional and technical personnel is strictly prohibited to open the ultrasonic generator for testing and maintenance and other operations.
3. Use a power outlet with a ground terminal to prevent electric accidents, and to ensure that the rack is effectively grounded.
4. Ultrasonic generator can produce high voltage, do not open the upper cover of

the state operation.

5. Do not put your hand welding head under downward pressure and ultrasonic vibrations might cause injuries.
6. When using the welding head, do not put your fingers between the welding head and die.

1. Ultrasonic metal welding system introduction

1.1 System overview

Ultrasonic metal welding system consists of two parts, ultrasonic generator and welding machine frame. This machine has the advantage of compact structure, easy to install, easy to operate, mobile and flexible, and easy to maintain. Ultrasonic frequency is 25kHz, rated output power is 2000W. Using Japan imported control devices, the precise control of the various parameters of the welding process. Welding linear guider frame equipped with high quality, to ensure the stability of head movement. Once the welding parameter is set, no need to adjust the equipment, it can be automatic, fast, accurate and continuous implementation of the welding process, thereby greatly improving the efficiency of the work.

Fig. 1.1 Ultrasonic metal welder generator

Fig. 1.2 Ultrasonic metal welder frame

1.1.1 Ultrasonic signal-generator

The ultrasonic signal generator is composed of ultrasonic power amplifier module, a system control module which can control the machine frame and the ultrasonic circulation time sequence and the input/ output signals and other peripheral circuits. The ultrasonic power amplifier module can convert the AC power of 50Hz to the 20kHz high voltage signal that drives the transducer.

The ultrasonic power module includes ultrasonic power amplifying unit and a control unit with a monitoring system protection function, and can automatically cut off the ultrasonic energy in welding machine failure, so as to provide equipment safety and reliability is high and the welding generator set.

Monitoring system protection function will respond to the following:

1) Generator power module and other circuit detection temperature is too high.
2) The impact of high pressure is too large, welding head, transformer or transducer looseness.
3) Generator circuit fault.
4) Cable fault between generator and transducer.

1.1.2 Ultrasonic welding machine frame

Ultrasonic welding machine frame is mainly composed of the transducer, head mounting bracket, a bottom mould mounting base, and ultrasonic horn hoisting system.

The transducer/ head module mounting bracket is used for locking and circumferential direction before and after adjusting welding head position, ensure welding in the welding process is relatively stable position.

The bottom mold mounting base used for installing and fastening the bottom mould and adjust the bottom formwork flatness, relative stability and its head position has a direct impact on the quality of welding;

Linear guide hoisting system driven welding head to complete welding process.

1.1.3 Pneumatic system

Pneumatic system consists of solenoid valve, cylinder, throttle, and pressure gauge, pressure regulators and filters and other components.

The solenoid valve and the cylinder with the completion of the lifting process of ultrasonic welding mold.

Throttle valve for regulating welding head rising/descending speed.

The pressure gauge shows the current pressure.

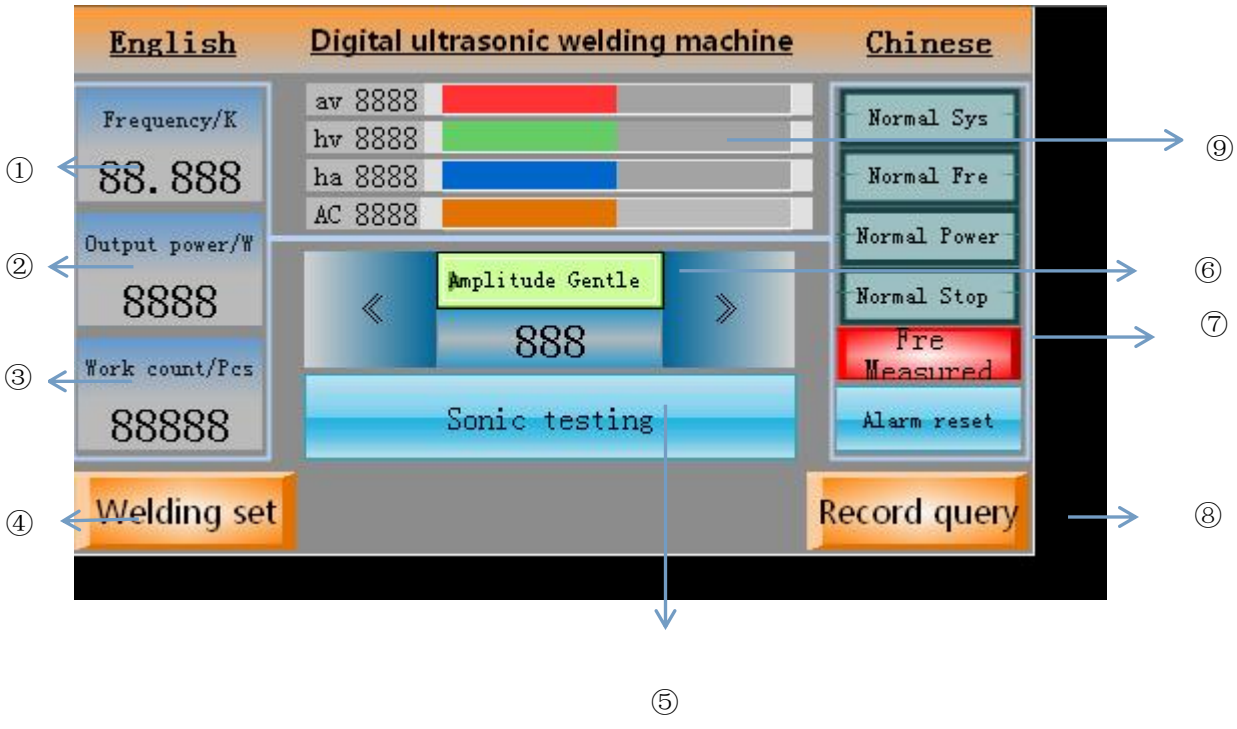
Pressure regulating valve to adjust the current system of gas pressure.

Filter on the intake air to filter, in order to avoid the air in the water, oil and other debris into the solenoid valve, cylinder and other devices to cause damage to the upper and lower pneumatic motor system.

2. Input / output interface of ultrasonic generator Control input port

（1）Connect the generator is equipped with air plug, 15-pin port, power cord, be sure to press the emergency stop cable wiring diagram is closed, press the power switch, the display as shown below.

（2）Until the lights on the bottom right of the touch screen "com" flicker, click to enter the system.



① The frequency of ultrasonic
② The output power of ultrasonic
③ Weld counter
④ Welding set
⑤ Ultrasonic test button

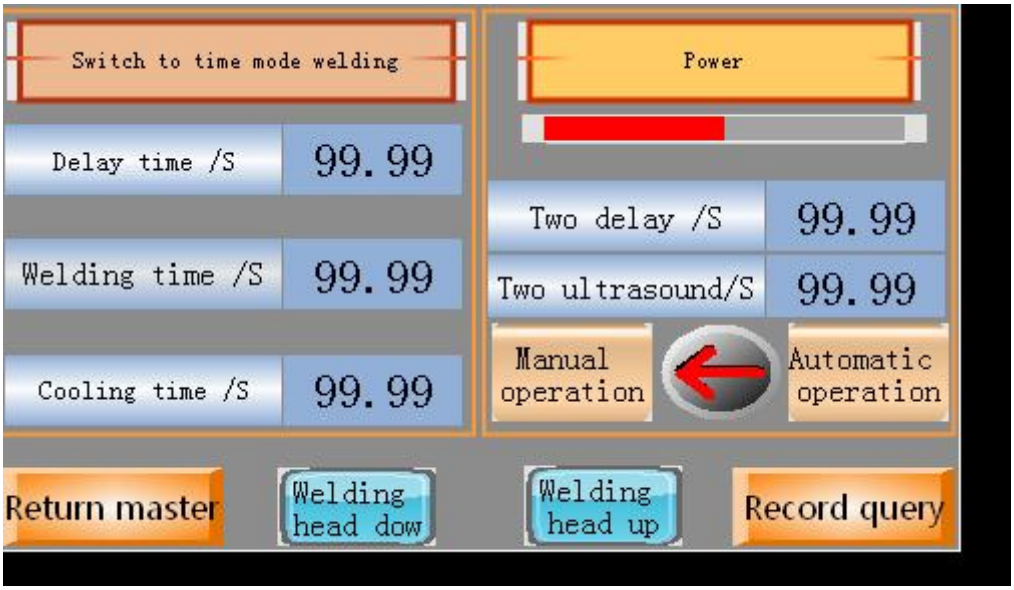
⑥ The amplitude of ultrasonic setting, by "《" and "》" to adjust the amplitude, can also click on the "amplitude" enter the desired amplitude

⑦ System status and alarms

⑧ Record query

⑨The real-time parameter of the ultrasonic

(3) Time mode setting



① Pre Time(s): After trigger(by pedal or PLC), will waiting some time before start welding, usually is waiting for the head come down.

② Weld Time(s): The duration of ultrasonic welding.

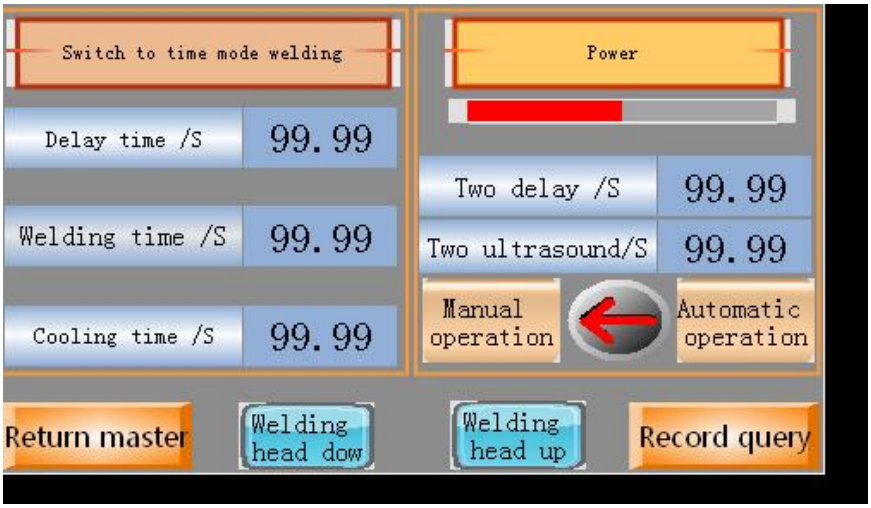
③ Cool Time(s): The time required for cooling and solidifying plastic pieces.

④ Sec Delay(s): Waiting some time before shaking, usually is waiting for the head come up.

⑤ Shake Time(s): The duration of ultrasonic for shake the pieces down.

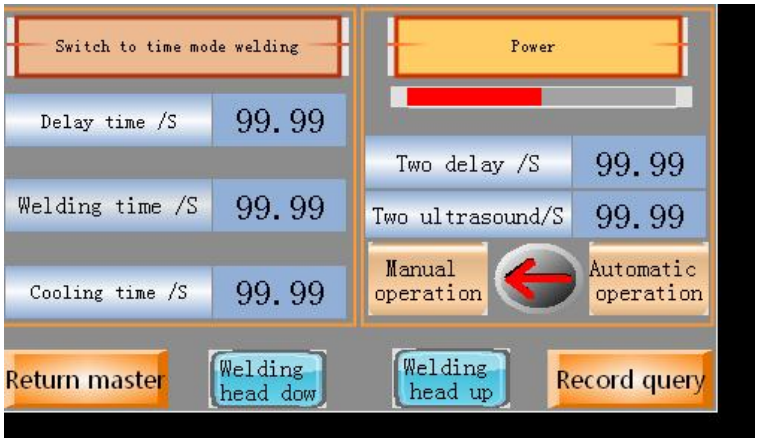
⑥ Manual/Automatic: The automatic process only working in Automatic mode. For the Manual mode, only use for mould adjusting.

(4) Energy mode setting



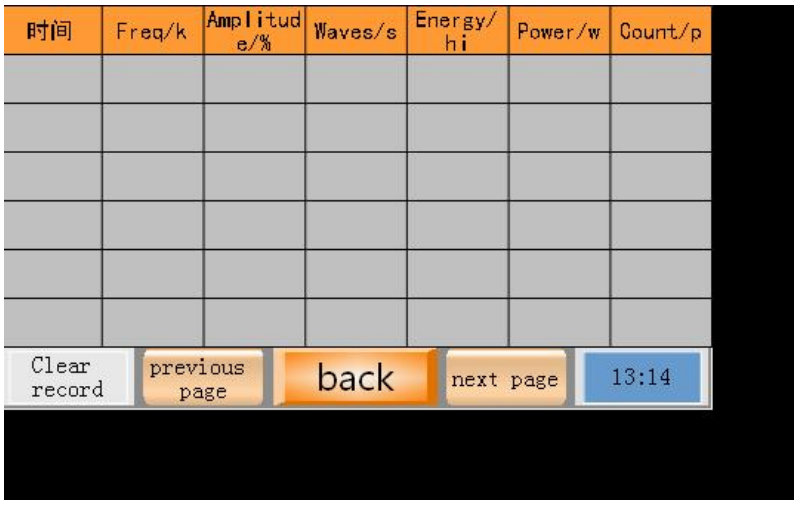
① Pre Time(s): After trigger(by pedal or PLC), will waiting some time before start welding, usually is waiting for the head come down.
② Weld Energy(J): The energy of ultrasonic welding.
③ Cool Time(s): The time required for cooling and solidifying plastic pieces.
④ Sec Delay(s): Waiting some time before shaking, usually is waiting for the head come up.
⑤ Shake Energy(J): The energy of ultrasonic for shake the pieces down.
⑥ Manual/Automatic: The automatic process only working in Automatic mode. For the Manual mode, only use for mould adjusting.

(5) Formula



The system can store hundreds of formula.
① Use Current Formula: Will set the current formula(which parameters displayed on "Formula Parameters" to current welding parameters.
② Copy Current Parameter To Formula: Will copy the current welding parameters to current formula.
③ Save: Save the parameter of current formula.
④ Previous: Go to previous formula.
⑤ Index: The index of current formula.
⑥ Next: Go to next formula

(6) History



Record the welding history.

3. Installation of ultrasonic welding system

3.1 Installation requirements

3.1.1 Space requirement

The welding frame must be installed on a horizontal plane in order to make the frame in a vertical state! The frame usually rely on manual operation, the pedal switch is operated, so they are usually mounted on a support table has enough strength, and highly suitable, convenient to the operator by sitting or standing for the operation of equipment. Welding frame of the left and right, the top and rear should be maintained with 15CM space to facilitate debugging operations.

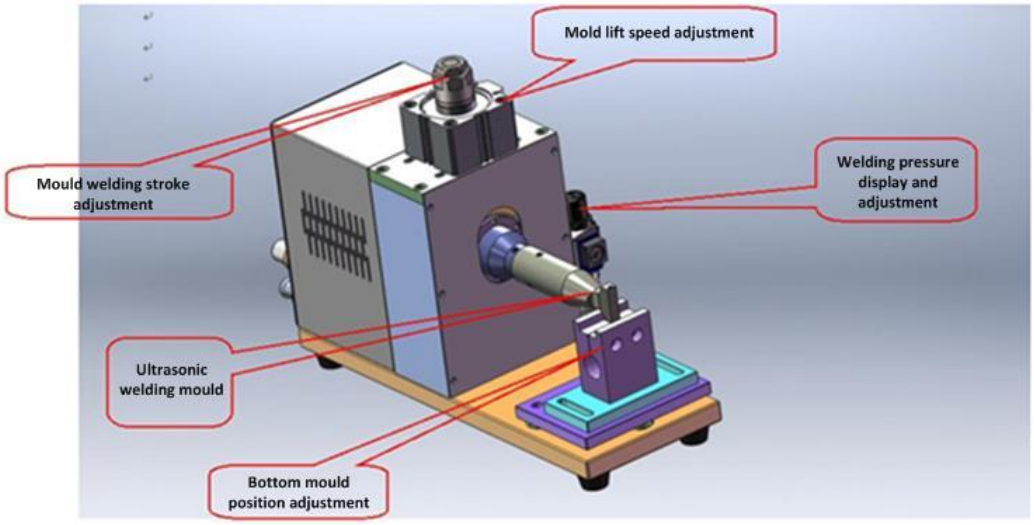


Fig. 2.1 Frame contour map

3.1.2 Environment requirement

The use of equipment / storage / transportation must meet the following requirements:

Operating temperature: +5°C~ +50°C

Save / transport temperature: -25°C~ +70°C

Relative humidity: 30%~75%

3.1.3 Air pressure requirement

The compressed air provided by the user for the welded frame must be clean, dry and free of lubricant, flow rate is 1.5L/min. In order to prevent the wet, dirty air into the metal welding machine damage, although the welded frame has been installed in an air filter, but the user supplied air through the drying pretreatment.

Air interface: standard gas joint with ϕ8mm plastic pipe.

3.2 System installation steps

3.2.1 Electrical system connection

Power line connection: Ultrasonic signal generator requires the user to provide input with single-phase grounding terminal and the voltage for the 220V AC 50Hz power and load current is not less than 10A, the power supply socket confirmation and matching with the power plug with random, then Insert the power plug into the socket on the machine.

Before inserting the power plug, the power supply voltage should be confirmed to a single phase AC 220V, and the power switch in the lower part of the generator is confirmed to be OFF.

If you country voltage is 110V, we will provide the Power transformer, can convert the 110V voltage to 220V voltage, should connect the power plug to the Power transformer.

The connection of the transducer: the radio frequency cable is inserted into the two hole RF plug of the rear side of the ultrasonic signal generator. The connection of the

radio frequency cable is complete, and the positioning notch is arranged at the installation time!

Prohibit direct equipment from non 220V power supply, If you country voltage is 110V, we will provide the Power transformer, can convert the 110V voltage to 220V voltage, should connect the power plug to the Power transformer.

RF cable connector with threaded locking sleeve, be sure to insert the threaded locking sleeve screwed to the bottom of the corresponding plug, the electrical connection or prone to failure and affect the welding effect, this connector does not support hot plug!

Rack control cable connector side with threaded locking sleeve, insert the corresponding plug in to a certain thread locking sleeve screwed to the bottom, or prone to electrical connection fault affecting welding applications.

3.2.2 Welding mould (welding head) installation

The bottom of the mould with mounting holes, and tapping with M8 or M10, please install titanium screws and six angle wrench before installation, and then at the top of the horn is also tapping with M8 or M10, so the horn and mould share a titanium screw connection. Die with titanium screws installed in the horn with a wrench tighten. According to the mold, transducer structure and other installation requirements, the size of the titanium screw will have a small change in order to be

agreed upon.

Please make sure the titanium screw locking, the screwing degree does not rotate is appropriate, otherwise the welding will produce abnormal scream or overload!

3.2.3 Installation of combination of welding mold and transducer

1) Unplug the power plug, turn off the power switch, and make sure the system is closed.

2) Release the 2 locking screw welding fixture on the right side of the frame on both sides (counter clockwise to loosen, clockwise to tighten)

3) The center hole of transducer / assembled from the rear side of the frame head assembly jig is inserted in the insertion depth according to the installation position of the bottom mould adjustment assembly

4) The welding head is rotated to adjust the welding head is aligned with the direction of the lower die, then you can clamp the front and rear side of the four locking screws tightened, the initial installation of the horn assembly is completed.

Loosen and tighten the transducer / transformer / 2 screw head assembly fixture on the L recommended the use of random with the six angle wrench, tighten the degree to which does not move around and turn to!

3.2.4 Bottom mold installation

The bottom mold is a random distribution of accessories, installation is very

convenient, as long as the user according to the process to select the appropriate lines of a face up, no longer detailed. Can watch the video to install that, the video link is

Please be sure to fix the screw locking of the bottom die, and in the formal welding (test before welding) to the bottom die for leveling, otherwise it will seriously affect the welding quality of the instability.

4. Operation of the welder

4.1 Welding mode

According to the application requirements of metal welding, welding can be divided into 3 types: The manual welding head down mode, manual ultrasonic testing mode and automatic welding cycle mode.

4.1.1 The manual welding head/press head down mode

Used to check whether you have installed the welding head and mold alignment, for initially adjusting the relative position, follow these steps: Press the PLC MODE to MANUAL mode, then click the Cylinder button, the press head will down, click it again, the press head will up. Click the HORN UP button of the generator, the welding head will down, click it again, the welding horn will back to the beginning position (upper)

4.1.2 Ultrasonic testing mode

Check the horn for no-load condition power consumption and operating frequency, but also to test whether the welding head and the resonant frequency of the

generator is normal.

Follow these steps:

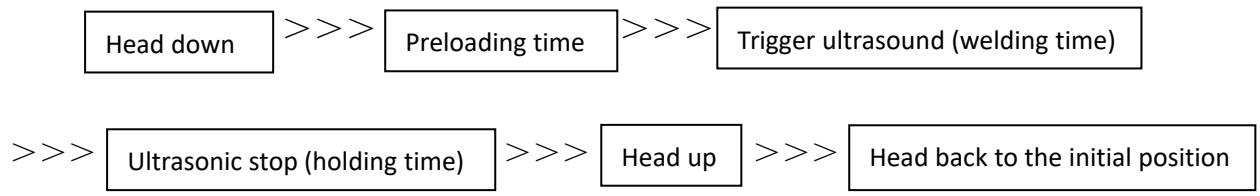
1) Confirm the system is in standby state (pressure, power supply, etc.), Press the “Sonic Test" button to automatically trigger the ultrasound, and the energy transfer to the mold.

2) Continue to test the time (press the duration of the button) after the stop ultrasound, please note that the duration of the press button is not more than 3 seconds, so as to avoid heat damage to the equipment, if there is abnormal alarm.

4.1.3 Cycle welding mode

This mode is most commonly used. When all welding parameters are adjusted to the optimum by test welding, soldering and have been satisfied with the results, all welding parameters are able to be saved or otherwise preserved, only this time in the standby state (pressure, power supply normal), depress the foot switch to enter the welding cycle mode.

Cycle welding process sequence is as follows:



Please check the video link for complete operation

4.2 General flow of initial welding operation

Usually changing new technology, new products, welding, replacement of the mold

or change the object after soldering process needs to be followed, the general flow to the welding operation also as previously described.

4.3 Common problems and treatment methods in welding operation

4.3.1 Welding is not strong

Method: increasing pressure to reduce the distance between the bottom mold and welding head, increasing ultrasonic time, increase the speed of welding head down.

4.3.2 Welding surface damage (welding over)

Method: reduce pressure, increase the distance between the bottom mold and welding head, reducing time ultrasound, the rate of decline slowed welding head.

4.3.3 Generator overload (abnormal)

Method: reduce pressure, increase the distance between the bottom mold and welding head, increasing the preloading time, increase the trigger twice ultrasonic time (the interval between two automatic welding cycle is too short to be extended).

4.4 Adjust the welding parameters on the welding frame

4.4.1 Adjustment and setting of air pressure

Through the pressure regulating valve can be adjusted to the size of the current pressure of the system. To lift the lock ring, the left and right around the rotating pressure regulator knob clockwise to increase pressure and counter clockwise to reduce the pressure, adjusted to a desired pressure to press the lock ring.

4.4.2 Welding head ascending / descending speed setting

The adjusting knob through two throttle valve on the panel, the system can be the head up / down speed adjustable and set. Loosen the lock nut on the throttle valve,

the throttle valve according to the figure indicate the direction of rotation knob can reach the hoped speed, after confirming the spin lock nut, lock up / set current rate of decline.

4.4.3 Adjustment of the position of the welding head

In order to achieve maximum efficiency, need to be welded workpiece and welding head distance as small as possible, but to set aside enough space to replace the welded workpiece.

Through the top of the cylinder is located in the upper part of the frame of the adjusting nut of the system back to the initial state of the welding head on the lower limit position adjustment and setting.

First adjusting nut below the middle of the radial position of tight nut loosen, then turn the adjusting nut, if counter-clockwise, the welding head can be raised position; on the contrary, in a clockwise direction, the position of the welding head can be reduced . When adjusted to the appropriate location in the middle of the radial position of the nut screwed tight to the non-rotating until the welding head position adjustment after it is set, so to maintain proper spacing between the welding head and the weldment, achieve optimal welding results.

4.4.4 Adjust the position of the bottom mold

Bottom mold adjustments include: adjust the front and rear and bottom mold around the location, and the bottom level of the fine-tuning mode. Methods of operation as follows:

1) Position before and after adjustment: Loosen the left and right fastening screws,

locking can be adjusted to the appropriate position;

2) Adjust the position of the left and right: Loosen the left and right fastening screws, locking can be adjusted to the appropriate position;

3) Horizontal trimming: loosen the fastening screws in the direction of adjustment, and then adjust the roller flower nut, counter clockwise to rise, clockwise for the fall, to achieve the desired height after the lock above the fastening screws can be.

Normally, when replacing the welding head or welding parts, after the lower end of mold, be sure to re-welding head and Lower mold position adjustment, otherwise they will change the relative position of poor welding results, produce a lot of waste!

The detail adjustment steps can watch the operation video.

The accuracy and stability of the fastening position of the welding head and the bottom mold directly affects the quality of welding, the welding quality assurance make sure that the relative positions of both the mold and the bottom of the plane at its best.

4.5 Ultrasonic generator operation

4.5.1 Parameter setting

Item	Parameter
Max output power	2000 W
Working frequency	20 kHz
Mode	Automatic frequency tracking, Power adjustable from 0 to 100%

Automatic frequency tracking accuracy	±5HZ
Over current protect	10 A
Over current protect time	100 ms
Over temperature protect	85 ℃
Power stability	≤ 5%
Welding time	0.01~9.99S
Delay time	0.01~9.99S
Cooling time	0.01~9.99S
Shake time	0.01~9.99S
Max. stroke	20 mm
Air pressure	0.2-0.6MPA
Power supply	AC220V / 50HZ

4.5.2 Ultrasonic testing and adjusting

1) Check the machine power supply without exception, turn on the power switch;
2) Press the Sonic Test button and check the sonic, this ultrasonic welding machine has the automatic frequency tracking function, after the mold is installed, should press the Frequency Scanning button to test.

4.5.3 Output query

Process Monitor can query to the daily output, press the Reset counter button can clear reset.

4.5.4 Generator Security

The function is mainly used to inquire the problem that the machine works, can deduce the potential quality problem in the course of work, also can be used to evaluate the characteristic of the mould.

5. Maintenance of the welder

5.1 Frame routine maintenance

Check the transducer / transformer / welding components of the contact surface, if the surface is worn, they must be maintained; check and clean air filter components

5.2 Maintenance transducer / horn / horn assembly

When the transducer / transformer / horn contact component is flat and tight and free from scratches and corrosion, the working efficiency of the system is the highest. Do not contact closely will waste energy, make it difficult to debug, noise and temperature increase, and may cause damage to the transducer.

Don't use the polishing wheel or file to level transducer / transformer / welding head component contact surface.

1. Disassemble the transducer - the horn - horn assembly, wipe the contact surface with a clean cloth or paper;
2. Check that all contact surfaces. If the contact surface corrosion, clear;
3. A clean 400 (or smaller) emery paper affixed to the flat surface (such as a piece of glass);
4. The contact surface on the emery paper, hold the bottom line, then across the sand the smooth. Do not put downward pressure on its own weight is enough;
5. In the same direction on the emery cloth to draw two or three;
6. Rotate the parts to 120 degrees, hold steady, repeat 5th steps;
7. Then rotate the components 120 degrees, take the stable, and then repeat the 5th step action;
8. Reexamination of the contact surface. If necessary, repeat steps 2-5. Remember,

the number may need less aluminum materials, titanium material may be more.

9. Ultrasonic mold through professional design and inspection frequency, the output current stability, avoid cutting, drilling, grinding machine to change the mold structure and size and appearance, otherwise it will affect the stability and the service life of electric box head can't even try.

5.3 Air filter maintenance

The machine has a frame filter, the model for the manual drain type, and thus must be regularly maintained to remove deposits and oil filter on the cylinder and the gas line to ensure the smooth flow and clean.

Air pressure should be adjusted to zero before maintenance, cut off the main air passage, otherwise it would be possible to cause the frame to be damaged.

Maintenance steps are as follows:

1. The air pressure to zero to cut off the main air channel;
2. Remove the cylinder from the filter;
3. Remove the filter element from the filter;
4. Remove the float from the cylinder;
5. Clean cylinder body with household soap;
6. If the filter has a leak, please check the two O type sealing ring, if the O type sealing ring is damaged, you must replace the entire air filter;
7. Recover filter.

If the filter is stagnant water more than 1/2, should stop immediately discharged.

6. Brief failure analysis and countermeasure

6.1 Air filter maintenance

Problem	Solution
Welding is not firm	1. Increase welding time; 2. Increase pressure; 3; Increase amplitude
Excess weld	1. Reduce welding time; 2. Reduce pressure; 3. Reduce amplitude
After welding surface damage	1. Reduce welding time; 2. Reduce pressure; 3. Reduce amplitude 4. Check the horn and horn surface; 5. Check bottom mould; 6. Check the contact position of the welding horn and the bottom mould.
System overload	1. Reduce amplitude; 2. Reduce pressure; 3. Adjust power amplifier; 4. Replace high power welding machine; 5. Check the welding head and the contact surface of the horn.

6.2 Welder generator Fault Analysis and Countermeasures

Problem	Solution
Fuse fault	1. Power line short circuit; 2. Line filter damage; 3. Fault within the machine; 4. Fuse capacity is too small
Power switch is turned power light is off	1. Power line fault; 2. Filter damage; 3. Power switch is broken; 4. Fuse is broken; 5. Transformer is broken.
Power indicator light but the cooling fan does not turn	1. Bad fan motor; 2.Motor line fault;
Foot switch is depressed, the system does not work, power indicator light	1. Bad foot switch; 2. Pressure is too low; 3. Bad solenoid valve; 4. Program control circuit is broken.
Overload indicator light, but no ultrasound	1. Thermal relay action; 2. Bad bridge rectifier; 3. Protection monitoring system relay bad; 4. Protection monitoring system is broken; 5. The main circuit board bad;
Welding head down, do not stop after the ultrasonic waves, but the horn does not rise	1. Program control circuit is broken; 2. Deficient pressure
Welding head down, after a stop ultrasound, but the horn does not rise	1. Program control circuit is broken; 2. Protection monitoring center system relays bad