

# ULTRASONIC GENERATOR

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## 1. Introduction and Overview

### 1.1. Safety requirements and warnings

This section explains the meaning of the various "safety caution" symbols and signs on the manual, and provides general safety precautions for ultrasonic generator systems.

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



"Attention" is used to identify possible dangers and give tips, and give special tips on some key information for correct use and parts that are easily overlooked. Users should have a certain understanding of it.

caveat



"Warning" is used to warn of possible dangers and possible damage to the equipment. Failure to comply will result in personal injury or equipment damage to varying degrees.



the ultrasonic generator must be used strictly in accordance with the prescribed method.

**The following precautions should be taken when using an ultrasonic generator:**

- The user manual introduces you to the correct use of the ultrasonic generator, please strictly follow it.
- It is important to **use a power socket with a ground terminal** to prevent electric shock.
- Before carrying out maintenance and inspection of the ultrasonic generator, the power supply should be cut off. Without the prior permission of the company, it is not allowed to disassemble the machine and adjust. Otherwise, all guarantees will automatically lapse.
- Ultrasonic generators can generate high voltages of tens of thousands of volts in certain locations under special circumstances. **Do not open the case without permission.**
- The emergency stop switch of the welding machine should be checked regularly to **ensure that the emergency stop switch is always effective.**
- Relevant technical data of ultrasonic equipment must be strictly observed. In particular, the rated parameters of the power supply and the operating environment of the system should be configured in full accordance with the relevant regulations.

**This equipment can only be adjusted by personnel who have read and understood this operating manual, and only by personnel who have been properly trained!**

**Before installing or commissioning the product, you should read this manual carefully in order to better use our products. Failure to follow these instructions may result in damage to the transducer/horn or mold.**

## 2. Introduction of basic information

**Intelligent fan control:** The fan starts when the ultrasonic is working, and stops when it is not working for 10seconds to avoid inhaling too much dust.

**Power limitation:** In order to be able to continue working around 800W, the actual power protection threshold of the generator is 1000W,

**Working mode:** automatic mode: long wave mode, suitable for cleaning/ cutting/ non-woven welding, etc.

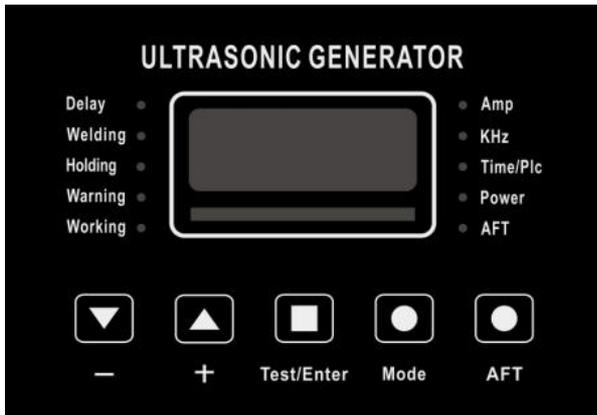
welding machine mode: Delay time ;  
Welding time;  
Holding time (curing time);

**Voltage:** 198-242VAC (50/60Hz), the output will be much weaker when AC110V is input, it needs some adjustment, direct use is almost only used for cutting applications.

**Volume:** 384mm \*240mm\*110mm

**Weight:** 7KG

**Color:** light gray



**Automatic frequency tracking:** The system automatically tracks the resonance frequency of the welding head. Compensate for detuning caused by heat and other reasons.

**Digital frequency control:** The operating frequency is digitally controlled by the microcontroller.

**Digital amplitude setting:** This feature allows users to set precise amplitudes according to application requirements, which provides a larger range and repeatability of settings than analog systems.

Amplitude can be adjusted in a large range: 20%~100% continuously adjustable, which is different from the disadvantage that traditional generators are difficult to work with low amplitude.

**High-speed microcontroller:** 32-bit ARM processor control.

**1 ms control and sampling interval:** 1000 times per second sampling and control of the welding process.

**LED and key operation interface are stable and reliable.**

**Slant start:** Ultrasonic energy supply and welding head start at the most suitable ascent speed to reduce the electromechanical pressure of the system.

**Diagnosis at startup:** During the startup process, the main components of the system are tested.

**All kinds of protection are complete:** including over power consumption of the whole machine, inverter tube overcurrent, inverter tube drive undervoltage, load overvoltage, the load frequency is out of range, over temperature, overcurrent of external devices (such as solenoid valve).

### 3.Environmental requirements

Try to use this equipment in an environment that meets the following conditions, which will help the working life of the generator:

Environmental factors	Range of application
Operate/Working temperature	0°C to 55°C
Save/Shipping temperature	-25°C to +70°C
Relative temperature	30% to 90%, without condensation



warning

*To ensure that the ultrasonic generator has good ventilation, care must be taken not to cover the generator's ventilation openings. It is strictly forbidden to use this equipment in adverse environment such as corrosive gas. The inhaled air will flow through the internal circuit module. Use in the environment with corrosive gas may greatly reduce the service life of the equipment.*

### 4. Packing list

Name	qty	Name	qty
ultrasonic generator	1	user manual	1
1.5meter cable	1	DB9 connection kit	1
2pins aviation plug	1		

When receiving the equipment, unpack it

Check the packing list for missing items;

Check the appearance to confirm whether it has obvious damage

Whether the power-on test equipment works normally

The user manual may be given by sending a PDF file.

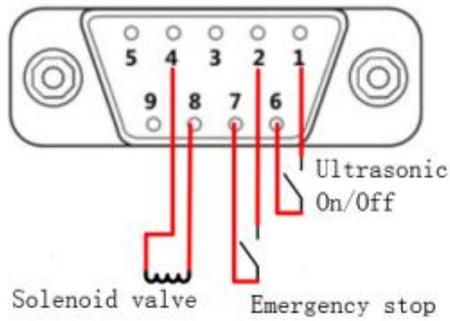
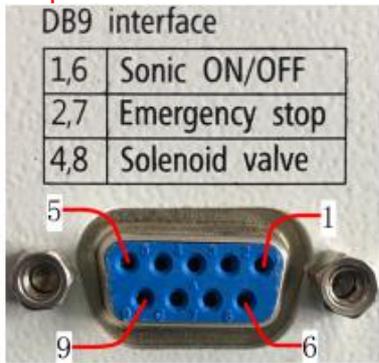


Warning

*Ultrasonic generators have sophisticated components and structures and are sensitive to static electricity. If they are dropped or impacted during transportation or transportation, the circuit of the generator may be damaged.*

# 5. Interface definition

## DB9 port



We will include a DB9 connection kit with the generator, which is very easy to use.

1,6	input	24V voltage, connect is <b>start</b> , typical application is to connect a normally open micro switch or self-locking switch
2,7	input	24V voltage, <b>emergency stop</b> when connected, typical application is to connect a normally open micro switch or self-locking switch
4,8	output	24V output voltage, connected to a <b>solenoid valve</b> for controlling the lifting and drop of the welding head of the cylinder.

Besides, pins 6, 7, 8 are the same ground, so 6/7/8 can share a wire.

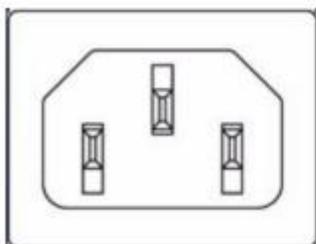


## Ultrasonic output port

1	+, connect to the transducer positive pole
2	-, connect to the transducer negative pole, connected to the earth wire and generator case.

## Power input port

Fuse: 250VAC , 15A





### Attention

The power plug must be inserted into a socket with a ground terminal. The adaptable power supply range of the ultrasonic signal generator is 220VAC ± 10% 50/60Hz. The minimum diameter of the power connection cable is 1.5mm<sup>2</sup>.



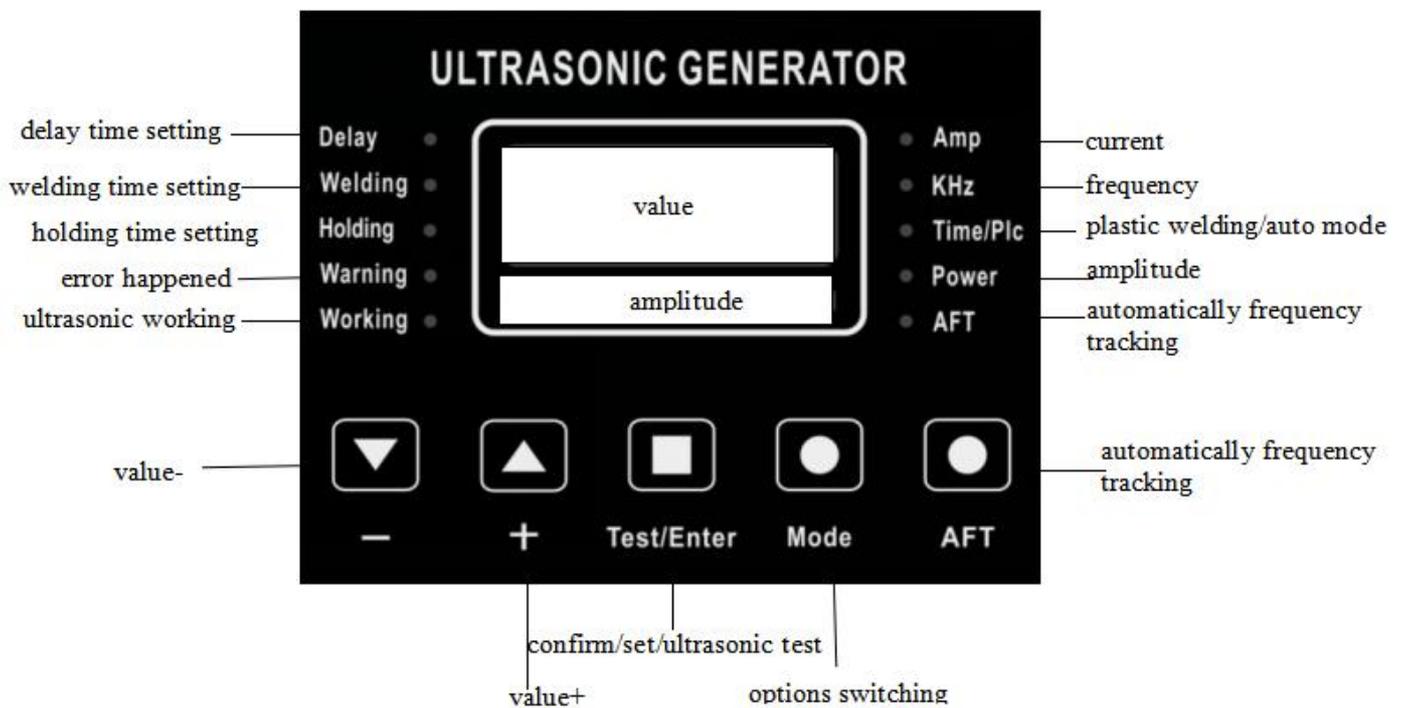
### Attention

When designing and manufacturing generators, we have fully considered various safety factors. Modifications or certain changes to the system may affect the safety of the device during operation. Therefore, when modifying or modifying the equipment, keep the following in mind:

- Before modifying the ultrasonic welding system with components provided by other manufacturers, you must contact our company to determine whether these components are suitable for retrofitting the machine.
- If the customer makes such modifications or changes to the ultrasonic generator without the permission of the company, all the manufacturer's guarantees will automatically become invalid.

## 6. Display interface and parameter introduction

### 6.1、 Set interface



**Button function:**

+ : value/setting increase

- : value/setting decrease

Test/Enter: A combination of sonic test and input confirmation. When the Test/Enter button is pressed for more than 0.8 seconds, it is a sonic test function, used for no-load test mode.

When the Test/Enter button is short-pressed, it is used to confirm entering the setting state, or the confirmation after the data is set.

Mode: The Mode button is used to select the display mode of the digital display. In the normal display mode, if it is originally in the Amp display state, press once to enter the KHz display state; press it again to enter the Time/Plc display state; press again, Enter the Power display state; press it again to return to the Amp display state, and so on, and cycle the display.

AFT: One-key frequency chase function. After a short press, the ultrasonic generator will automatically track the resonance frequency of the mold or transducer (vibrator).

**Lamp function:**

Amp: When the Amp light is on, the data displayed on the digital display is the current, which is X.X ampere. If the mold is too small, press the sonic test key, the current displayed may be 0.0A, which is normal.

KHz: When the KHz light is on, the data displayed on the digital display is the frequency, which is XX.XX KHz, which is the working frequency of the mold.

Time/Plc: When the Time/Plc light is on, the digital display shows the current working mode of the ultrasonic generator. If PLC is displayed, the working mode of the ultrasonic generator is the automatic mode, and the ultrasonic generator's wave transmission time is only controlled by the external PLC.

If the display is X.XX and the Delay light is on at the same time, the working mode of the ultrasonic generator is the plastic welding machine mode, and the ultrasonic generator The transmission time is the time set internally.

Power: When the Power light is on, the digital display shows the amplitude percentage value, which can be set from 20%-100%.

AFT: When the AFT button is pressed, the ultrasonic generator will enter the one-key frequency tracking mode, the AFT light will be on, and after the frequency tracking is completed, the AFT light will turn off.

Delay: When the Delay and Time/Plc lights are on at the same time, the digital display shows the delayed transmission time in the welder mode.

Welding: When the Welding and Time/Plc lights are on at the same time, the digital display shows the wave time in the plastic welding machine mode.

Holding: When the Holding and Time/Plc lights are on at the same time, the digital display shows the holding time in the plastic welding machine mode.

Warning: When the Warning light is on, the digital display shows the alarm code, such as E-01, E-02, etc.

Working: When the Working light is on, the original state of the digital display will not change, only that the current ultrasonic generator is transmitting.

Light bar: represents the set amplitude of the ultrasonic generator from 20% to 80%, and lights 1-8 lights respectively.

**6.2. automatic mode (long wave mode, continuous working mode)**

Long press the Test/Enter button on the ultrasonic generator panel, turn on the power switch, enter the automatic mode (PLC), plastic welding machine mode switching interface; you can switch the control mode of the ultrasonic generator by pressing the +/- button.

When the digital display shows PLC, the ultrasonic generator can work in automatic mode.

When the digital display shows X.XX and the Delay light is on, the ultrasonic generator can work in the plastic welding machine mode.

After selecting the working mode, wait for more than 2 seconds, turn off the power switch, wait for the machine to discharge power, and then restart it to use it normally. (You can also press and hold the Test/Enter button after turning off the power switch to speed up the machine discharge.)



### Warning

*When the automatic mode is selected: the interface provides a reminder of the current working status, the Working light will be on, and the display is running, indicating that the sound wave is being output. At this time, you should be careful. If you are carrying a cutter mold, you should avoid touching the blade tip.*



### Warning

*In the case of continuous work (welding time exceeds 5S), it should be ensured that the work is performed at a lower power. It is recommended to be below 1/3 of the model power (such as 2000W models, continuous work should not exceed 666W). In order to prevent excessively rapid heating, extend the life of the mold, continuous output power can be appropriately increased under the enhanced heat dissipation conditions.*

## 6.3. Ultrasonic welding machine mode (various parameter settings)

1. Press the Mode button to adjust the display mode of the digital display to Time/Plc mode, and the Delay and Time/Plc indicator lights.
2. Press the Test/Enter button to enter the Delay time setting mode, the digital display and the Delay indicator will flash, then you can press the +/- button to adjust the delay time parameter.
3. Press the Mode button again to enter the Welding time setting mode. The digital display and Welding indicator will flash, then you can press the +/- button to adjust the welding parameters.
4. Press the Mode button again to enter the holding time setting mode. The digital display and the holding indicator light will flash, then you can press the +/- button to adjust the welding parameters.
5. After all parameters are adjusted, press the Test/Enter button to confirm, it will exit the parameter setting mode, and at the same time, the digital display will not flash.

## 6.4 Adjustment of ultrasonic amplitude

1. If you want to adjust the output amplitude of the ultrasonic wave, in the normal mode, press the Mode button to select the display mode of the digital display as POWER and the Power light is on.
2. Press the Test/Enter button to enter the amplitude percentage setting mode, and the digital display will flash.
3. Short press the +/- button to set the amplitude output size, 20%-100%.
4. After setting the parameters, press the Test/Enter button to confirm, the system will exit the setting mode.

**Sonic test:** The maximum limit of the sonic test amplitude is 40% of the total amplitude, even if your setting exceeds 40%, if you want to output more than 40%, you must use the external start. The purpose of this is to protect the mold to a certain extent and prevent irreversible damage caused by direct drive with large amplitude under abnormal

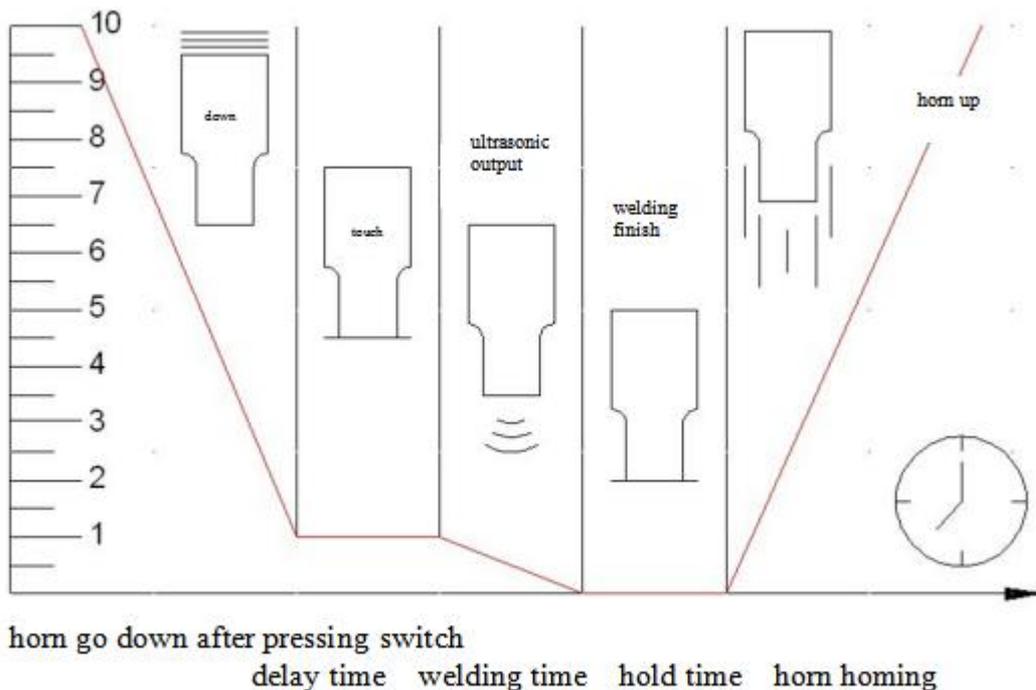
mold conditions (such as unlocked).



## Attention

*Any time you press the emergency stop switch, you can immediately raise the welding head, stop the ultrasonic wave and end a welding process, and return to the standby state.*

### 6.5、 The role of each parameter in the setting items:



**Delay time:** the time from pressing the welding button to trigger the action until the welding head is about to press the welding workpiece. That is, the time from the first stage to the second stage in the figure, which will be related to the cylinder stroke and the lowering speed. If you don't know how much to set, set a relatively large value, and then reduce it according to the situation. For example, 0.8s is good. 0~9.99s can be set

**Welding time:** After the delay time has elapsed, the welding head will press the welding surface and start to send ultrasonic waves to weld to the time when the welding is completed and the ultrasonic wave stops. That is, the time used in the third stage of the figure, this value is more or less directly related to power, air pressure, welding area size, welding depth, etc. 0~9.99s can be set

**Holding time** (also known as curing time/cooling time): After the ultrasonic wave is stopped in the fourth stage, in order to make the welding workpiece closely adhere to wait for cooling, sometimes the welding head needs to press the product for a period of time to make the welding workpiece adhere closely and cool, This time is the curing time. Corresponds to the fourth stage in the figure. The curing time is not necessary. In order to minimize the welding time and improve the efficiency, in most cases this parameter can be set to a minimum of 0.5s. The specific value depends on the actual welding effect. 0~9.99s can be set

## 7. The most common setting process for welding applications

Select the welding machine mode to start

1. Turn on and wait for the system to detect the working frequency to be completed and obtain the operating frequency
2. Set the amplitude to 60%, press the sound wave test, and observe whether the current is within 1A, the power is within 500W, and whether the listening sound is based on the crisp model frequency. If it is not within the scope, you should check whether the mold or transducer is abnormal, whether the mold is not tightened, cracked, etc.
3. Set the delay time: 0.5s, this time depends on the time from the welding head to the welding part, adjust as appropriate.
4. Set the welding time: 0.5s, this depends on the welding material/welding area and amplitude, etc. First set a more reasonable value, and then adjust as appropriate according to the results.
5. Set the holding time: 0.5s, this depends on the solidification time of the welding material and the melting degree of the welding. It is recommended to use a large value first, reduce it to a satisfactory value as appropriate, and speed up the process.
6. Test welding, continuously adjust the above amplitude / delay time / welding time / curing time and air pressure value of the rack, mold position, etc. according to the welding situation until a satisfactory result is obtained.

## 8. Warning information and possible causes

No.	error code	reason
1	E-01	the display board and the MCU main control board cannot communicate
2	E-02	overcurrent alarm
3	E-03	load overvoltage alarm
4	E-04	power tube overheating alarm
5	E-05	load error alarm
6	E-06	frequency error alarm

### 8.1, E-01 display board and MCU main control board cannot communicate

The communication between MCU board and nixie tube display board is via 485. If the communication fails, this error will be reported.

Restart the computer after it is completely powered off (the LED is off).

Check whether the SATA connection cable between the MCU board inside the electrical box and the nixie tube display board is off or not plugged in place.

Contact us

### 8.2, E-02 overcurrent alarm

The system detects that the load current exceeds the internally set protection current value.

When this prompt occurs, you can try one by one:

Check whether the load is too large and reduce the load. For example: reduce the air pressure of the cylinder and reduce the load.

Check the generator, whether the mold is normal.

Try to increase the delay time to make the sound wave after pressing the product.

Re-manual frequency search

If there is no sound wave output, check the load line for short circuit.

### **8.3, E-03 load overvoltage**

The protection is triggered, indicating that the transducer is subjected to a very high voltage, and continued operation will likely damage it.

When this error occurs, you can try:

Reducing the amplitude makes the driving voltage lower.

Reduce the load, such as reducing the size of the mold, the air pressure value in the plastic welding machine mode, etc.

Replace the horn with a ratio of 1:2, which is what we suggest. The traditional 1:3 horn is more suitable for traditional self-excited ultrasound.

Re-search the resonance frequency

Check other possible causes, such as whether the mains voltage is abnormal, and whether the transducer chip is normal.

### **8.4, E-04 error: over temperature**

During the working process, the system will continuously monitor the temperature of the power inverter part of the generator to ensure that it can prevent further temperature rise and damage the equipment in time when it is over temperature. The temperature generation and heat dissipation have been fully considered in the design, and the protection will not occur under normal circumstances.

When this prompt occurs, you can try:

Improve the use environment, increase the heat dissipation space or provide external heat dissipation.

Check whether the vents are blocked and the fans are damaged.

Wait a few minutes for the temperature to drop, restart the computer and continue working.

### **8.5, E-05 error: load error IGBT overcurrent protection**

This protection shows that some reasons have caused a huge power consumption of the whole machine, which has exceeded more than 2 times of the rated power in a short time, and should be handled with great care.

When this prompt occurs, you can try:

Check the frequency is correct

Check whether the mold has been damaged, remove the mold or replace it with a mold that is confirmed to be good, and check again.

Whether the load is short-circuited, check whether there is a short circuit or insufficient voltage resistance in the load connection line and the plug, which leads to short-circuit overcurrent protection.

Other problems that cause serious overpower consumption.

### **8.6, E-06 error: frequency error**

Trigger the protection, indicating that the frequency has lost lock or the frequency of the transducer horn mould triplet exceeds the set range such as 28k range 28.3k~19.5k, the microcontroller frequency has not been adjusted to its own capacity limit or found correct working frequency.

When this error occurs, you can try:

Whether the load is connected to the mold during the frequency search, because the device searches for the resonance frequency with a very low amplitude. If the load is connected (such as searching the frequency in water), the driving capacity is not enough to drive the load to obtain correct feedback. Please search frequency with no load

Manual frequency search again

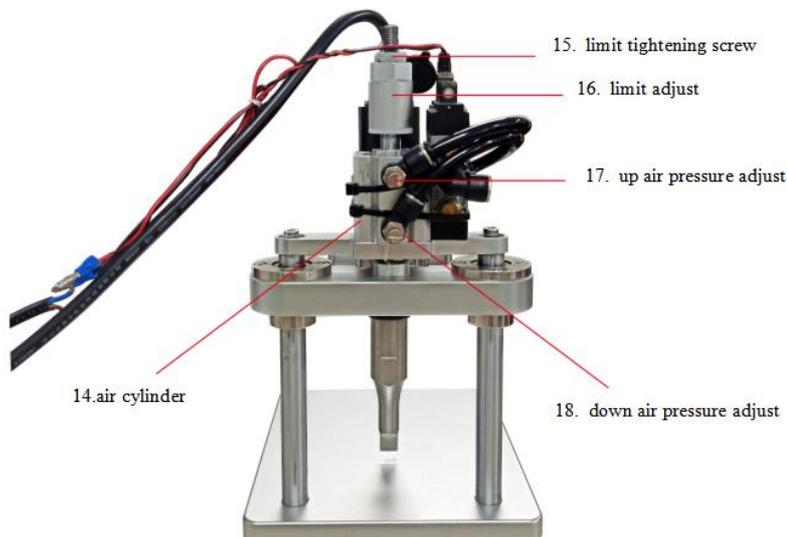
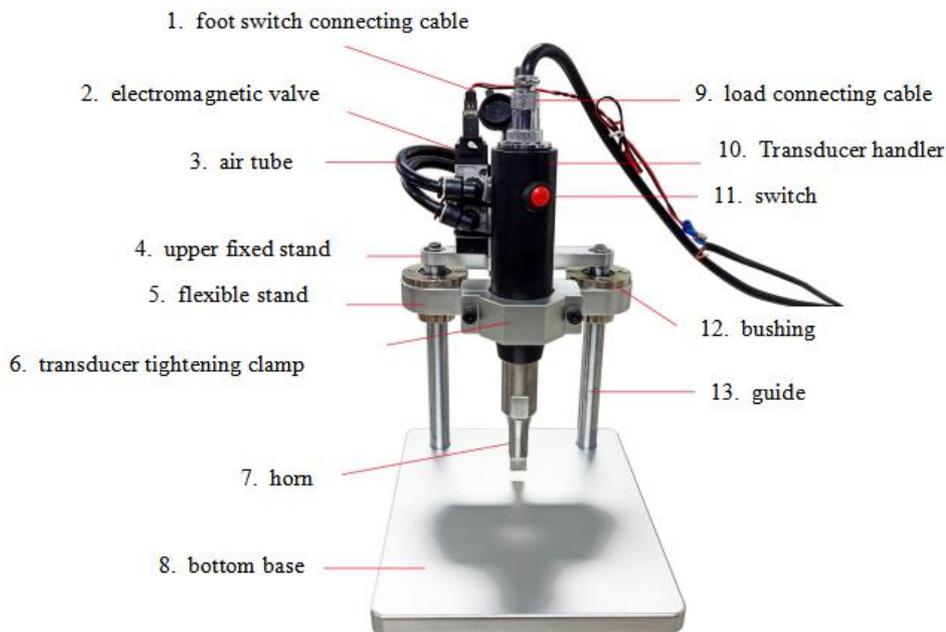
Check whether the welding head is cracked, not locked, slip wire and dirty and so on.

Check whether the direct connection line between the generator and the load is disconnected, disconnected or disconnected

Check whether the contact surface between the welding head and the horn is smooth and flat.

Replace a normal welding head test to confirm that the equipment is working properly and check whether the resonance frequency of the welding head is within the allowable frequency range of the equipment, such as 28k model between 27.3k-28.5k

## 9. Desktop spot welder structure details



## 10. Troubleshooting

- 1.If the mask ear welding is not strong, first check whether the ultrasonic generator is normal. If the generator is not faulty, please adjust the cylinder limit upward until the welding is firm.
2. If the lifting speed of the cylinder is too fast to cause the machine to shake, please turn off the air pressure adjustment on icon 17 a little.
3. If the alarm occurs during normal welding due to the contact between the tool head and the base, causing the generator to alarm, press the Test/enter key to remove the alarm fault.

## 11.About after sales

The ultrasonic generator provides one-year warranty service.The transducer is three month warranty, horn has no warranty. If there is any quality problem within the warranty, the device will not work properly (the appearance is not covered by the warranty), please contact us. We will solve it for you as soon as possible and resume production.

### 11.1 The warranty clause does not apply to:

- Any product that has been misused, not used according to the instructions, ignored (including insufficient maintenance), accidental, or user's incorrect installation, adjustment, or adjustment;
- Any product that is exposed to harsh environments, incorrectly repaired, or repaired without the use of our methods or materials;
- Use accessories not from our company (horn, transducer, or problematic welding head, etc.);
- Equipment damage caused by irresistible factors (natural disasters, etc.).

### 11.2 The warranty terms include:

Any quality problems that lead to abnormal production during the warranty period will not be charged for the warranty.

For parts replaced during the warranty period, the warranty period for new parts is the remaining period for replacing old parts.

Parts replaced after the warranty period will have a warranty period of 3 months.