

User's Manual



KM-HMS-X00 Ultrasonic Wire Harness Welder

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I. Safety requirements and Warnings

This section explains the meaning of the various "safety precautions" symbols and logos in the manual and provides a super routine safety precaution for ultrasonic welding systems.

The following two signs appear in the manual. Please pay special attention to them:



Attention

"Attention" is used to identify possible dangers and give hints. Some key information that is used correctly is easily ignored



The omitted sections give special hints. Users should have some understanding of it.

Warning

Warning signs are used to warn of possible hazards and possible damage to equipment. Failure to comply will result in penalty



Personal injury or equipment damage of different degrees may occur.

Attention

The following precautions should be taken when using ultrasonic generator:

The manual will introduce the correct way to use the ultrasonic generator in detail. Please follow it strictly:

Operators should be properly trained before using the ultrasonic welder.

The power switch is in the OFF state before switching to the power supply.

Please replace the welding mould in the off state. There is a risk of damage to the instrument after replacing the welding mould in the on state.

Use power outlets with ground terminals to prevent electric shocks.

Ultrasonic welder in some cases will produce tens of thousands of volts of high voltage, do not open the casing without authorization.

Please do not touch the welding joint when working. Ultrasonic vibration may cause serious skin burns.

The default must ensure that the emergency stop switch is always in effect.

Before the maintenance and overhaul of the ultrasonic welder, the power supply should be cut off first.

Do not disassemble and adjust the machine without the permission of the manufacturer, otherwise all warranties of the manufacturer will be automatically invalid.

Tools, equipment or other objects that are no longer used or needed should be moved from the workplace to another place. Keep the workplace

Clean and tidy.

The operating parts and display parts of ultrasonic welding system should be kept clean at all times.

Try to ensure that the ultrasonic welder workplace has good ventilation conditions.

The noise level and frequency in ultrasonic operation are directly related to many factors.

Attention!

Large noise may be generated in the welding process. If the equipment is found to have a large noise, you can install a separator sound hood, it is necessary for the operator to wear protective devices (common headphones, soundproof cotton, etc.).





Warning!

When the ultrasonic welding parts heat will produce gas, be sure to ensure good air circulation.



Attention!

Various safety considerations are taken into account when designing and manufacturing ultrasonic welding systems.

Modifications or changes to the system may affect the safety of the machine running. Therefore, when a machine is modified or altered, the following things have to be kept in mind:

- Before using the parts provided by other manufacturers to modify the ultrasonic welding system, the original production of the ultrasonic welding system must be obtained. Contact the manufacturer to determine whether the parts are suitable for modification of the machine.
- If the customer makes such modifications or changes to the ultrasonic welding system without the permission of our company, it will automatically void all warranties of the manufacturer.

II. Equipment description

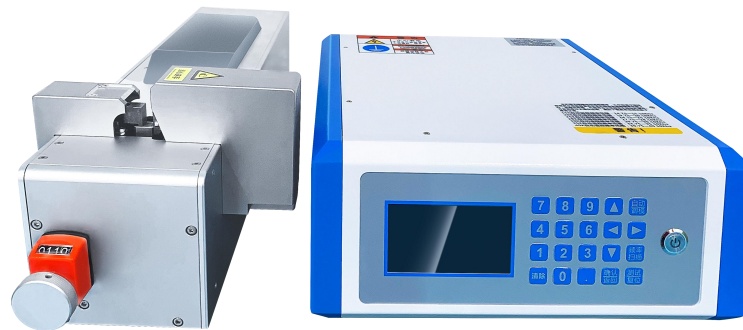


Figure 1 Ultrasonic Wire Splicer KM-HMS-X00

2.1 Equipment technical parameters

Generator Size	385*350*165(mm)
Rack Size	573*220*175(mm)
Frequency	20kHz
Air Pressure	0.5-0.6Mpa
Welding range	0.35-12mm ²

2.2 Equipment Structure

The ultrasonic wire splicer consists of:

- Wire splicer rack
- Ultrasonic Vibration system
- Ultrasonic generator

2.2.1 Wire Splicer Rack

The wire splicer rack is mainly composed of three parts: fixing device, pneumatic device and control device. Among them, the fixing device is for fixing the ultrasonic vibration system, the pneumatic device is to provide the air pressure required for welding, and the control device is an adjustment device composed of left and right sliders.

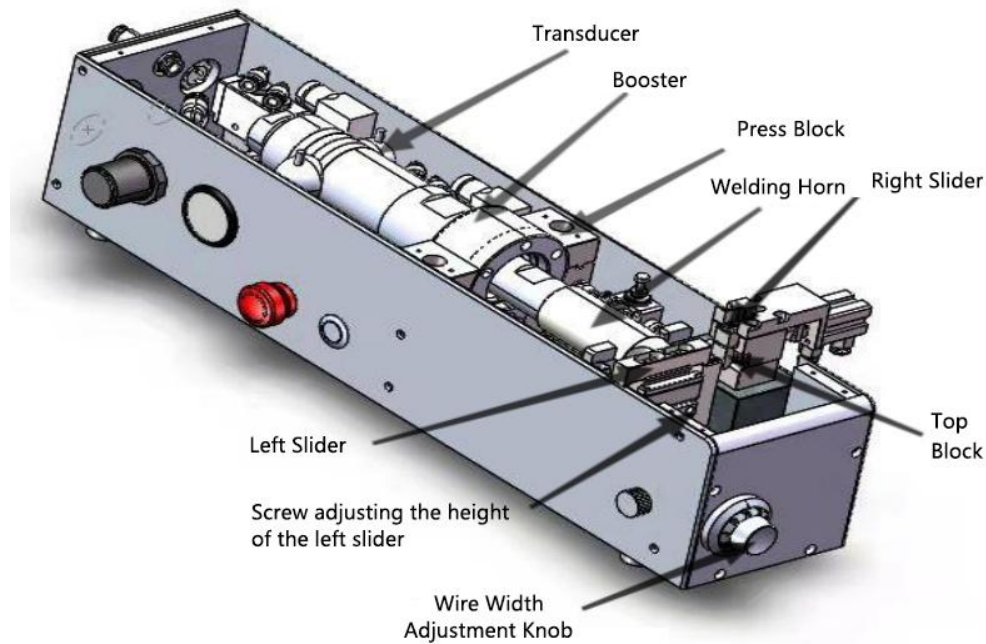


Figure2 Ultrasonic Wire Splicer Structure

2.2.1.1 Wire Splicer Rack Parts:

Parts Name	Description
Transducer, Booster, Horn	Composed of the vibration system of the whole machine
Press Block	Fix the vibration system to the rack of the machine
Left Slider	Control the width during welding; The two fixed screws of the left slider are used to set width to zero.
Top Block	For pressing motion during welding
Right Slider	Limit use. To prevent right-side deviation during welding.
Screw adjusting the height of the left modular	Adjust the up and down gap between the left slider and welding horn, to prevent left-side deviation during welding.

2.2.2 Ultrasonic Vibration System

The ultrasonic vibration system is a frequency-modulated acoustic unit composed of the following components:

- Transducer
- Booster
- Welding horn

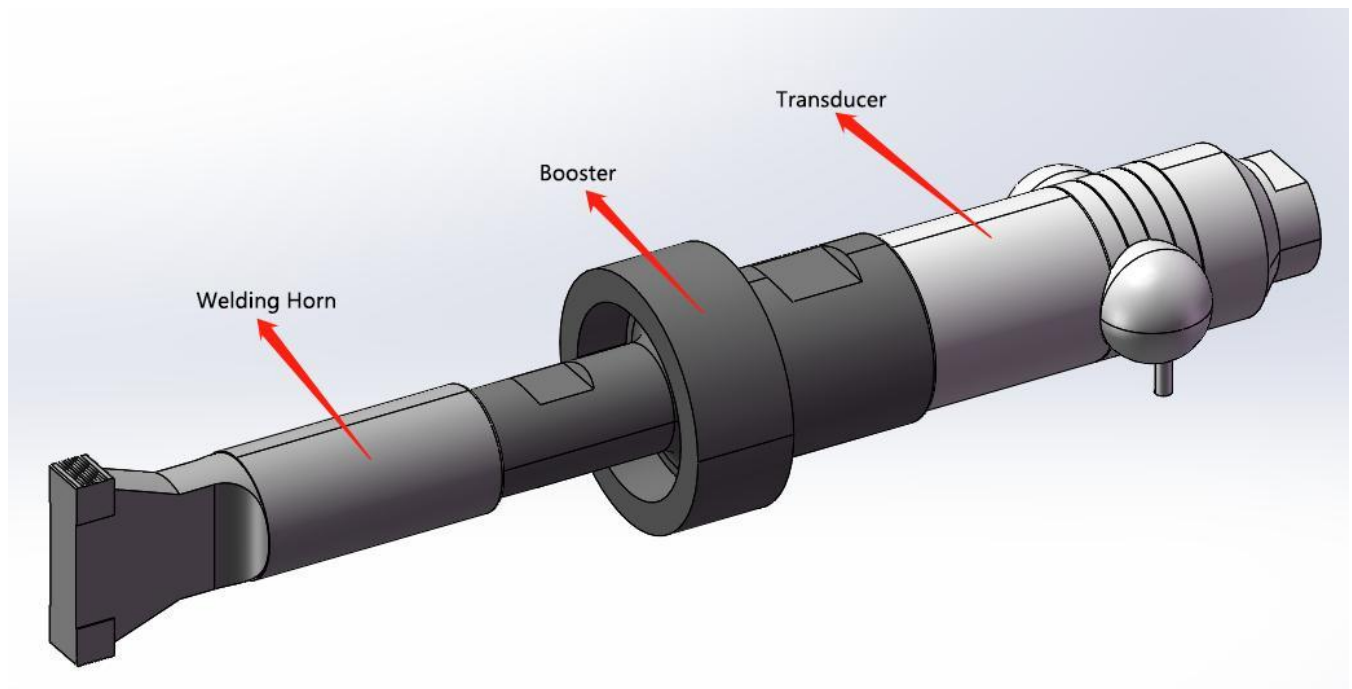


Figure3 Ultrasonic Vibration System

These three components are connected together using special bolts, and their connecting contact surfaces undergo advanced processing and grinding to achieve a high level of flatness. Insufficient flatness or unclean contact surfaces may result in significant self-energy loss. Each component is tightened using specialized wrenches to prevent loosening due to ultrasonic vibration.

2.2.2.1 Ultrasonic vibration system parts:

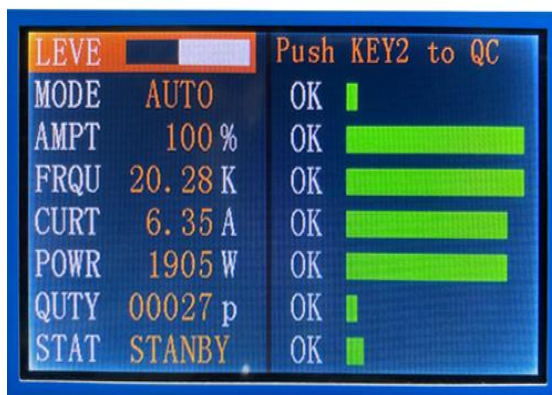
Parts Name	Description
Transducer	Device that converts high-frequency electrical energy into high-frequency mechanical energy.
Booster	It plays a role in altering the amplitude in the vibration system, used to achieve the desired welding amplitude and maintain a stable vibration process. By changing the shape and size of the booster, the amplitude can be increased or reduced.
Welding horn	The welding horn is responsible for transferring energy to the workpiece and generating vibration along the axial direction of the welding horn to achieve welding. In order to minimize slippage (relative movement) between the welding horn and the workpiece during high-frequency acceleration vibration, the goal is to transfer the energy to the welding workpiece as much as possible. Ultrasonic metal welding typically involves designing patterns on the welding surface of the welding horn and the mating surface of the base. The patterns can be square, diamond, or strip-shaped, and their size and depth are determined based on specific welding material requirements.

2.2.3 Ultrasonic Generator



III. Operation Instructions

3.1 Ultrasonic generator operation instruction



1.Click “Start” to enter into operation panel.(Attention: You need to enter into main menu during welding);

2.Click “Confirm/Back” to enter into setting menu;

TIM ACT1: Left move cylinder trigger time;

TIM ACT2: Press down cylinder trigger time;

TIM DELY: Welding horn wave delay time;

TIM WELD: Ultrasonic welding time;

TIME COLD: Hold time after welding;

TIM SHOK: Re-trigger wave time after trigger to avoid stick again.

AMP OUT: ultrasonic welding amplitude;

CTR MODE: Control welding effect by time;



3.Press the up and down keys to select and adjust: enter the value and confirm;

Frequency scanning: test the frequency of the transducer before starting up to ensure it can work normally;

If you encounter an abnormal alarm of the generator, you can press the frequency scan;

Test reset: touch the welding horn to check whether the welding horn wave normally.

IV. Placement instructions for wire to be weld

When welding wire harness, for the requirements on the position of the wiring harness, refer to the figure4:

>> You'd better place the wire on the welding horn, try not to lift the wire harness;

>>When welding multiple wire harnesses, lay them together in layers and place them at the bottom right, not all flat placed.

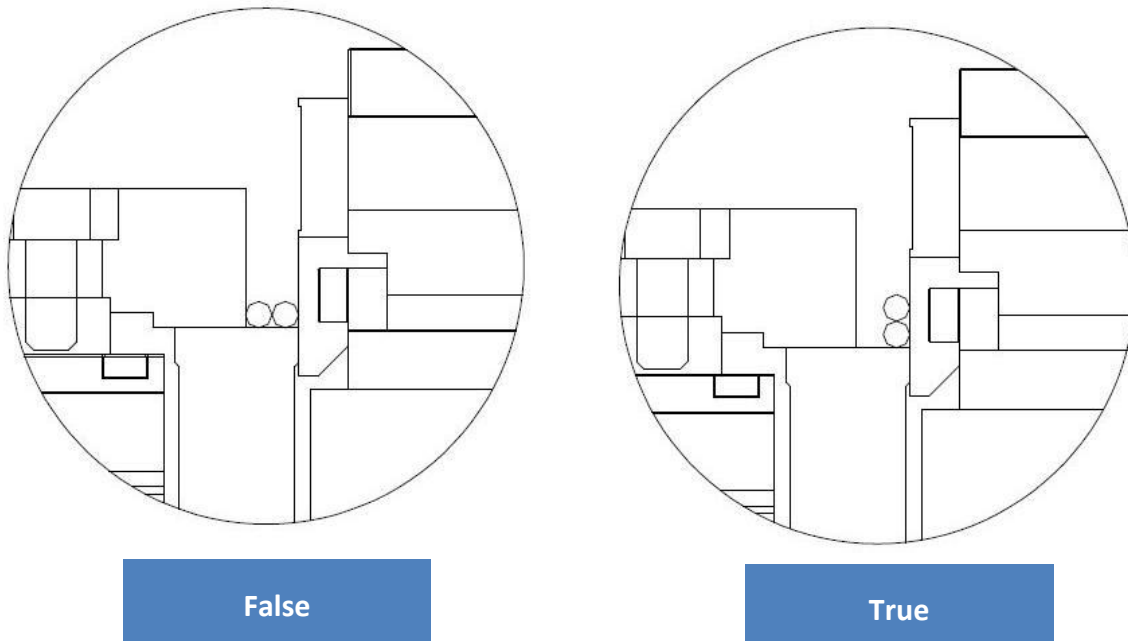


Figure 4

V. Instruction Details

>> Appropriate protective measures should be taken in the workplace, try to avoid the ultrasonic generator from getting wet, and pay attention to prevent dust and corrosive gas from entering the generator

>>In order to ensure the normal use of the ultrasonic wire harness welder, please connect the ground wire well so as not to interfere with the normal operation.

VI. Use Steps

6.1 Unpack

- Please check the package carefully, and if any damage is found, please notify the relevant shipping company and us.
- The ultrasonic wire harness welder has been tested and adjusted to the best condition before leaving the factory.

- In order to avoid damage to the equipment, the user must read this manual carefully and perform test welding before putting it into use after unpacking.

6.2 Air pressure

- Air pressure input port(In front of the pressure reducing valve and filter provided by the ultrasonic controller):

Minimum air pressure: 0.5Mpa

Maximum air pressure: 0.6Mpa

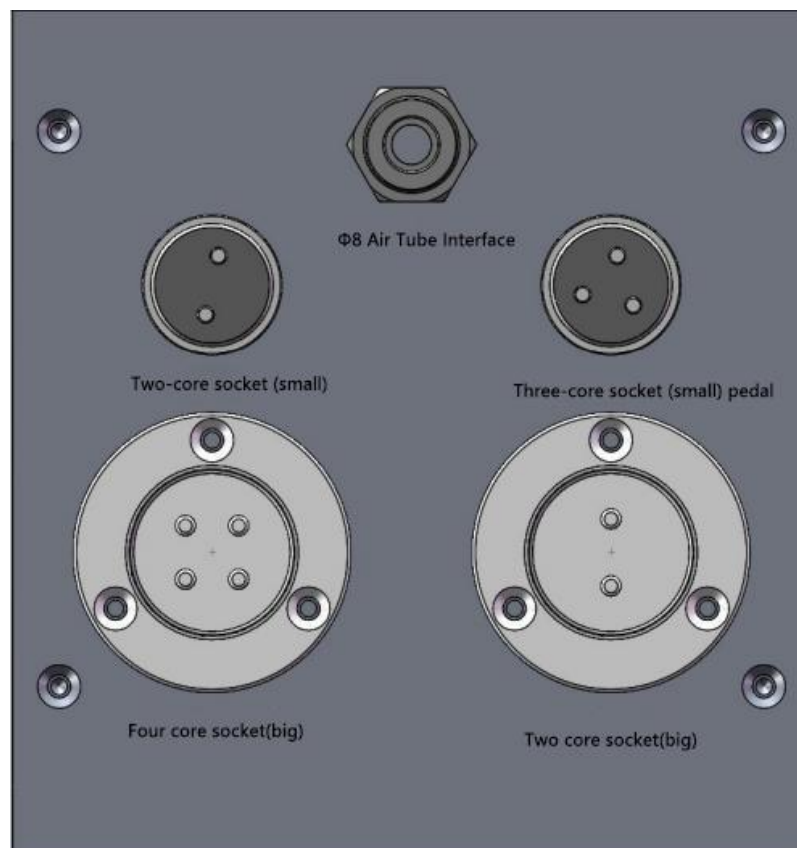


Attention

The specific air pressure setting is determined by the square number of welding wires. When the input air pressure is lower than the air pressure value required for welding, the function of the welding machine will not be guaranteed, please pay attention!

6.3 Connection between welder and generator

The ultrasonic generator is connected with the welding machine by a cable bus, see Figure5, connect the cable to the corresponding aviation socket, and tighten the nut.



Backside of Rack



Backside of Generator

Figure 5

6.4 Start the ultrasonic generator

>>Check that the emergency stop switch on the frame is not pressed down;

>>Press the start button of the generator;

>>Press the test button of the generator(not more than 5 seconds), to check the ultrasonic vibration under no-load state.

>>Adjust welding parameters needed(such as welding time, welding pressure, amplitude, welding width,etc.);

>>Put the wire to be welded on the area of the welding horn, after that, press the pedal.

>>Check the firmness of the welding workpiece, check the deformation of the wire, if it does not meet the requirements, please adjust the welding parameters on time, and re-test the welding.

>>Confirm ideal welding parameters and ideal welding results.

>>Confirm that the welding effect meets the requirements of the welding specification and put it into production.



Attention

Fingers are prohibited to the welding area during the working process the equipment.

VII. Welding horn adjustment and replacement

Every time you replace the welding horn or replace worn parts, it may be difficult to ensure that there is no relative displacement between the welding horn and the device or module due to the size of the device or the installation method, and two problems are prone to occur:

>> The gap between the fixture and horn is too small, or even contacted each other, in which case, due to the high energy of the ultrasonic wave, the pattern of the fixture and horns may be damaged, that influence the welding effect. It will destroy the welding horn while this case occurs many times.

Please pay attention to this case!

>> If the gap between the fixture and the welding head is too large, it is easy to run out of the wire during welding, or the batch front is too large, which will affect the welding effect.

How to adjust or replace the welding horn and worn parts:



Attention

In the process of adjusting the welding machine, it is strictly forbidden to trigger the ultrasonic wave to prevent damage to the welding horn and fixture.

After the adjustment is completed, it is strictly forbidden to trigger the ultrasonic wave for a long time. Generally, it is not suitable to trigger the ultrasonic wave for more than 5 seconds.

Every time the machine is adjusted, the pressing height of the top press block must be checked to prevent collision with the welding horn.

7.1 Steps for replacing and adjusting the welding horn

>> Disassemble the upper case and front cake of the wire harness machine, as shown in Figure2;

>> Loosen the fixing screw of the left module, and lift the left slider a little to facilitate the removal of the vibration system;

>> Loose the press block, take out the ultrasonic vibration system;

>> Replace the welding horn, and assemble it back in place;

>> Calibrate the welding horn;

>> Reinstall the press block and fix the vibration system.

7.1.1 Welding Horn Calibration Method

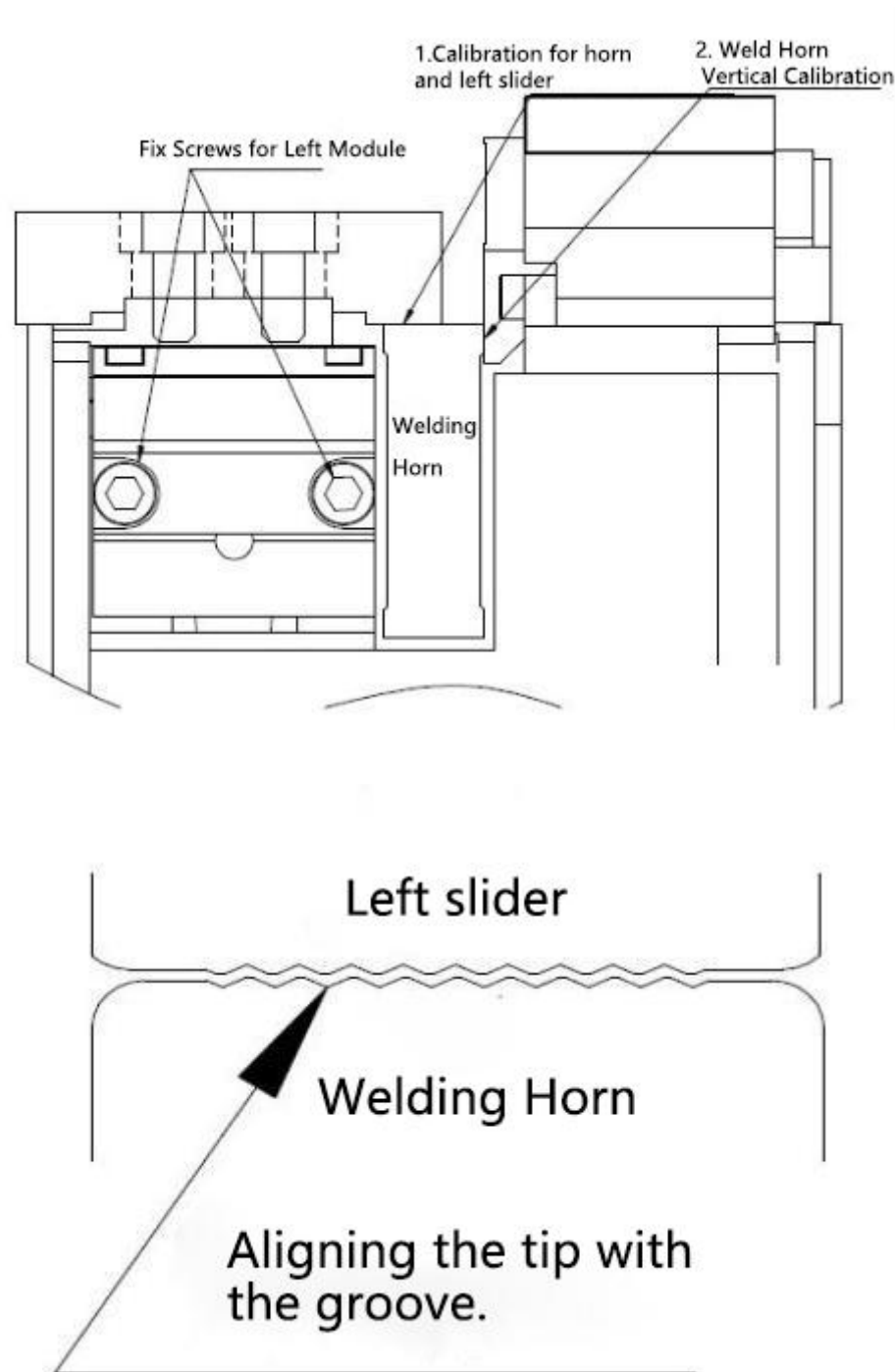


Figure 6

From Figure 6, we can see that the calibration of the welding horn is divided into two aspects:

>> Calibration between the welding horn and the left slider;

>> Welding horn vertical calibration;

7.1.1.1 Calibration between the welding horn and the left slider:

- >> Take out the right module;
- >> Fix the left module tightly to prevent displacement;
- >> Visually check that the tip is aligned with the groove;
- >> The alignment between the welding horn and the left slider is completed;
- >> The crest of the welding horn pattern is aligned with the trough of the left slider.

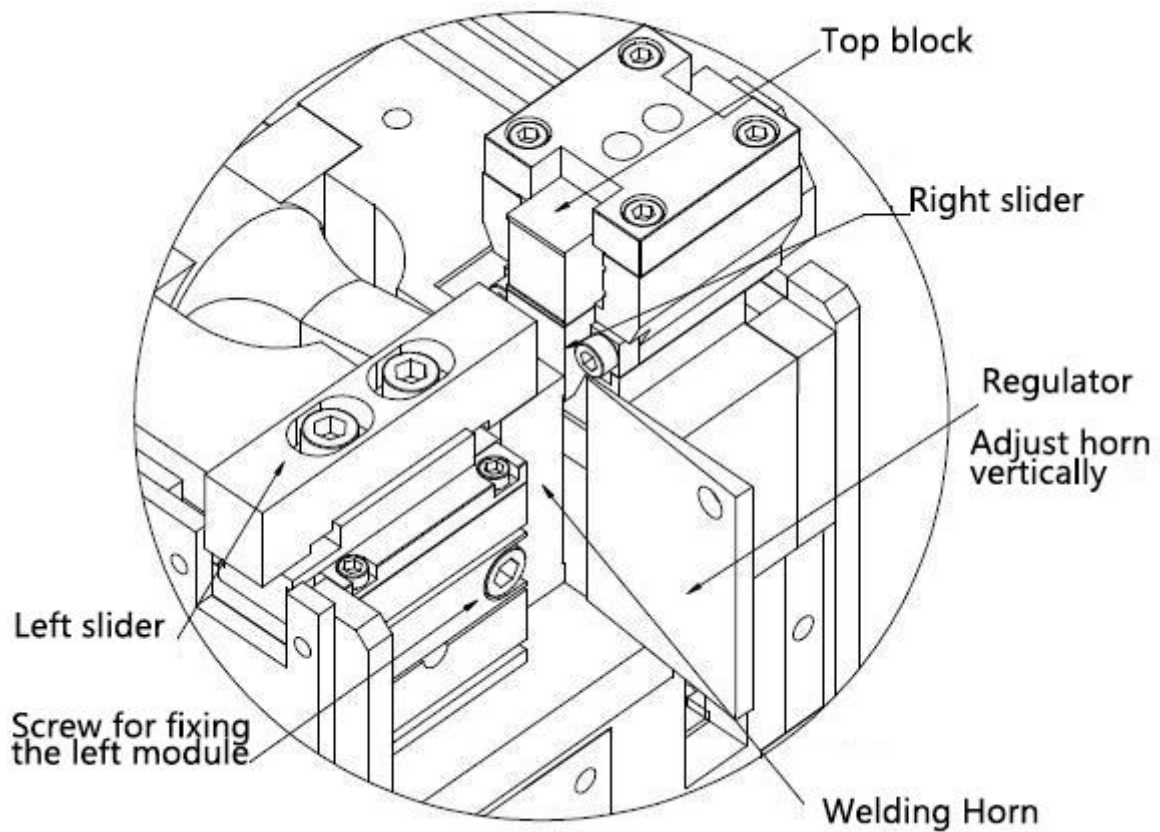


Figure 7

7.1.1.2 Welding horn vertical calibration

>> Take out the right module;

>> Use the regulator attached to this machine to insert into the gap between the welding horn and the right module, and stick it to the bottom surface and the right module;

>> Calibrate the angle of the welding horn, and observe the light leakage of the welding horn (Based on the small flats on both sides of the welding horn);

>> If there is no light leakage, the calibration is completed.

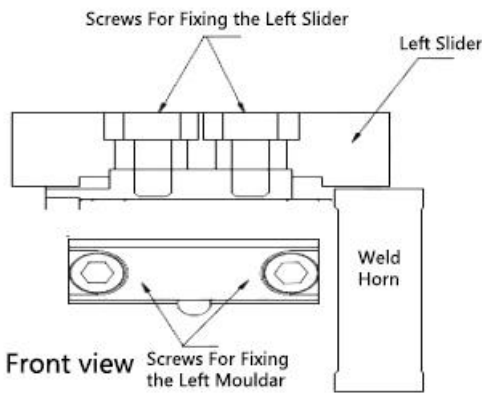
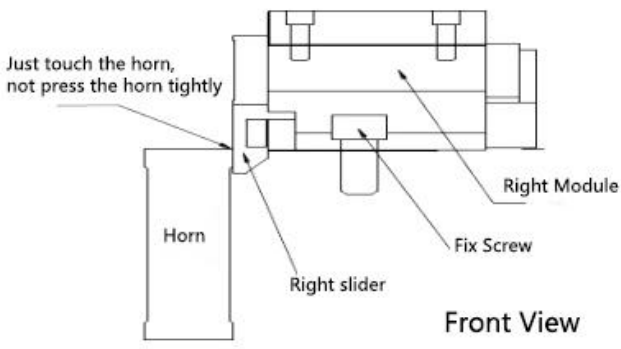


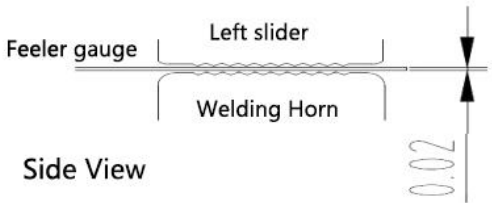
Attention

When calibrating the welding horn, two aspects should be carried out at the same time, and it should be inspected after completion. After the calibration is completed, the vibration system must be fixed to prevent the vibration system from loosening and colliding with the fixture when it starts to vibrate.

7.2 Adjustment for the gap between the left and right module

Every time the welding machine replaces the welding horn or worn parts, the gap between the left and right modules must be readjusted. The adjustment method is as follows:

Adjustment for the gap between the left slider and horn	Adjustment for the gap between the right slider and horn
	

 Side View	
Adjustment instructions: During the calibration process, tighten the fixing screws of the left slider and loosen the fixing screws of the left module. The left slider can move up and down. Please use a 0.02mm feeler gauge to adjust the gap. After calibration, please tighten the fixing screws of the left module and press "left and right" icon to detect whether the left module is tight and whether it moves smoothly.	Adjustment instructions: Loosen the fixing screw in the picture above, and the right slider just touches the welding horn, and try not to force each other to prevent damage to the welding horn or slider. Tighten the fixing screw and press the "up and down" icon to check whether the right module is tight and whether it moves smoothly.
Note: Before adjustment, the fixing screw of the left slider must be tightened.	Note: It can be adjusted with a 0.02mm feeler gauge, which is safer.

7.3 Wire width adjustment: turn left to wide, turn right to narrow

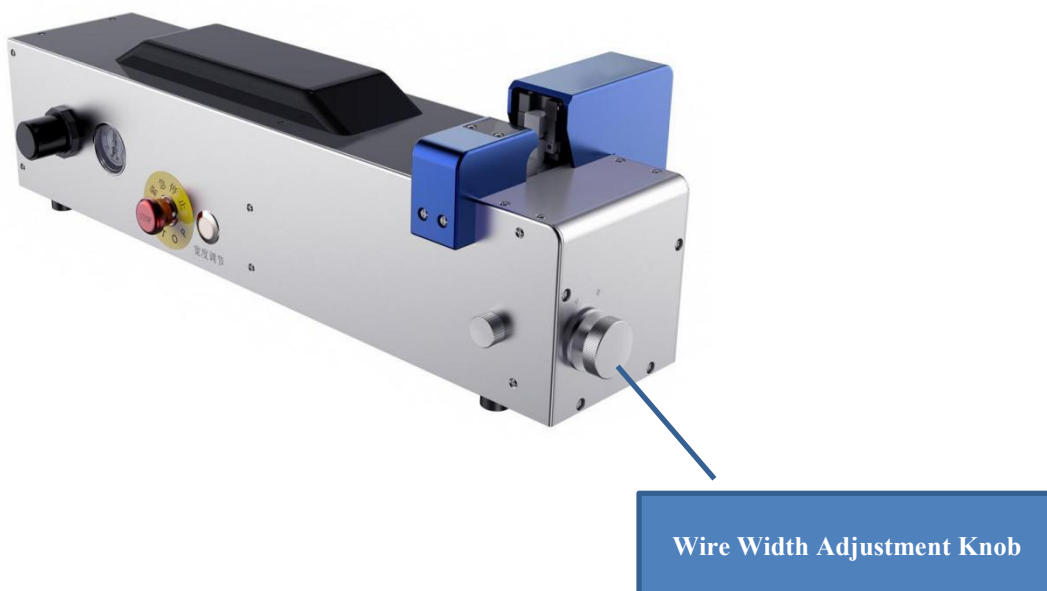


Figure 8

7.4 Replacement of welding surfaces

>> In order to maximize use of the welding horn, please replace the welding surface every 50,000 times of use, loop like this;

>> If the welding surface is severely worn, please replace the welding horn in time;

>> While replacing the welding surface, please check the wear of the left, right sliders and top block;

>> When the wear is serious, resulting in unsatisfactory welding results or excessive burrs after welding, or even some wires are not welded, please replace the welding tool in time.

VIII. Abnormal analysis, detection and replacement precautions of the vibration system

8.1 Abnormal analysis

The vibration system is abnormal when the machine is turned on or the machine works to the specified number of times.

Abnormal Cases	Solution
When replacing the welding horn, the connection surface is not clean, and the connection with the horn is not tight enough	Clean the connecting surface and check the tightness of the connection between the booster and the horn
The welding horn collides with the fixture too many times, resulting in damage or breakage	Replace the horn
When the welding horn reaches the limit life due to long-term use, the system will automatically alarm	Replace the horn

8.2 Steps for Manual Detection

In order to achieve the best working condition and maintain the performance of the machine, to ensure the normal operation of the vibration system, the vibration must be manually detected.

>> All parts of the rack must be tightened, and the welding horn should not touch the work object or fixture;

>> Turn on the power, and the power indicator light will be on;

>> Press the overload test button to check whether the resonance frequency of the vibration system is within the working range and whether there is any overload;

>> Generally, the sound of the ultrasonic wave is relatively stable and soft. If there is a strange sound, please replace the welding horn or check the looseness;

>> There is no abnormal sound, and normal work can be carried out.

For the entire ultrasonic metal welding machine, the welding horn is a consumable part and has a limited service life. The service life of the welding horn is affected by various factors, the main factors are the horn (hardened tool steel) and Hardness difference between workpieces (eg: non-ferrous metals) and welding time. Long-term welding will cause wear and tear on the surface texture, and even breakage. When there is a problem with the welding horn, the welding horn must be replaced.

8.3 Things to pay attention to when replacing:

>> Carefully observe whether the thread of the connecting bolt is complete, to avoid damage to the thread of the vibration system due to vibration, and replace it if necessary to prevent equipment damage.

>> Make sure the connection surface is clean, free from dust and foreign matter, and add heat transfer oil during installation to make the ultrasonic wave transmit better.

>> First tighten the bolts to the welding horn, and then loosen half a turn to prevent the bolts from being stuck on the welding horn, and then connect to the booster. To install the booster and the transducer, the bolt must be screwed onto the booster first, and then install the transducer. (The order cannot be reversed, please pay attention!)

>> After the replacement is completed, please do not install it on the machine immediately, but connect the cables first, and put the vibration system directly on the table to test whether the ultrasonic waves are abnormal or not:

>> If there is abnormal noise, please reinstall the vibration system;

>> Play the ultrasound intermittently for two or three minutes. The ultrasound should not be too long each time. Check the heating condition. If the heating is abnormal, please reinstall it (the connection surface may not be clean).

IX. Maintenance

9.1 Maintenance:

The requirements for equipment maintenance mainly as follows:

>>The daily and regular maintenance of equipment is the basis for maintaining the normal operation of equipment and an active measure to prevent accidents.

The first-level maintenance is carried out by the staff before or after the equipment is used, and the second-level maintenance is carried out by the equipment technician.

>> Keep the equipment in a neat, clean, safe and well-lubricated state through inspection, cleaning and wiping.

>> When cleaning the equipment, use mild detergents, and absolutely prohibit the use of irritating or corrosive detergents.

- >> Check the integrity of the equipment, whether the parts and accessories are missing or broken, replace the remaining parts in time, and repair the missing parts.
- >> Check whether the fixing bolts of the equipment are loose, buckled or broken, and fasten or replace the bolts to prevent connecting parts are detached.
- >> Check whether the safety protection device is complete, safe, flexible, accurate and reliable.
- >> Check whether the safety monitoring components are loose, and fasten them in time.
- >> Check whether the movement of each transmission part is free, whether there is wear and tear, etc., and carry out smoothing, polishing and lubrication in time.
- >> Check whether the lubrication system is working normally, and add enough lubricating oil in time.
- >> Check all kinds of pipelines, pipe fittings and brake pipes for open circuit and leakage.
- >> Check whether the electrical components are stable and normal, whether the wire connectors are falling off, loose, leaking, etc. Whether the wire sheath is aging or leaking, fasten the thread head in time, replace the old wire, and prevent leakage accidents.

9.2 Routine Maintenance:

No	Item	Cycle	Safeguard
1	Observe whether the thread of the connecting bolts is complete, and avoid breakage of the bolts by the vibration of the vibrating system. If the bolt is damaged, it needs to be replaced if necessary to prevent damage to the equipment.	A week	Power off operation
2	The connecting surface should be kept clean and dust and foreign matter should not appear. Heat transfer oil should be added during installation to make the ultrasonic transmission better	A month	Power off operation
3	First tighten the bolts to the welding horn, and then loosen half a turn to prevent the bolts from being stuck on the welding horn, and then connect to the booster. To install the booster and the transducer, the bolt must be screwed onto the booster first, and then install the transducer. (The order cannot be reversed, please pay attention!)	A year	Power off operation
4	After the replacement is completed, please do not install it on the machine immediately, but connect the cables first. Put the vibration system directly on the table to test whether the ultrasonic wave is abnormal: a) When there is a strange sound, please reinstall the vibration system. b) Ultrasound is played intermittently for two or three minutes. Each time the ultrasound is triggered, it should not be too long. Check the heating condition, please reinstall when the heating is abnormal (the connection surface may not be clean)	A year	Power off operation

X. Installation

- Installation conditions: The purchaser needs to provide **AC 220V three-hole power socket**. The installation and debugging of the equipment are the responsibility of the supplier, give the supplier some cooperation.