Manual NO.: 9664

Ultrasonic Vibrator

The manual should be made available to all users of this equipment. For best results and maximum durability of the equipment, carefully read and follow all instructions. Failure to do so can lead to serious injury or catastrophic damage to the user, machine, supplies, or surrounding areas. All safety suggestions must be followed closely, and extreme precaution must be taken to ensure the proper use of the equipment by only qualified personnel who have read this guide.

For questions or concerns, e-mail service@ussolid.com, visit www.ussolid.com

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I. Summary

Ultrasonic Vibrator are indeed versatile tools with a wide range of applications in various fields. Their ability to induce cavitation in liquids and disrupt animal and plant tissues, as well as lyse microorganisms like yeast, bacteria, and spores, makes them valuable instruments in laboratories and industrial settings.

Some common uses of Ultrasonic Vibrator include:

- CHIP analysis
- Wastewater treatment for degradation of COD
- Environmental science for extracting organic matter from soil
- Pharmaceutical industry for extracting traditional Chinese medicine and plant extracts
- Life sciences for cell disruption, extraction, and crushing

- Preparation of composite materials by dispersing nanomaterials
- Homogenization and mixing processes such as accelerating dissolution, chemical reactions, synthesis, and oil-water emulsification

Their multi-functionality and effectiveness in various processes make Ultrasonic Vibrator essential equipment for researchers and professionals working in these diverse fields.

II. The Principle of Working

This device consists of an ultrasonic power supply and an ultrasonic transducer assembly, which includes a generator

or probe. The ultrasonic power supply transforms the incoming single-phase 110 VAC, 60 Hz electricity into a 19-26 kHz alternating electrical signal. The system includes components such as a power rectifier, power switcher, frequency conversion system, power amplifier, phase-locked frequency automatic tracking device, power regulator, power detector, power protector device, and microcomputer controller.

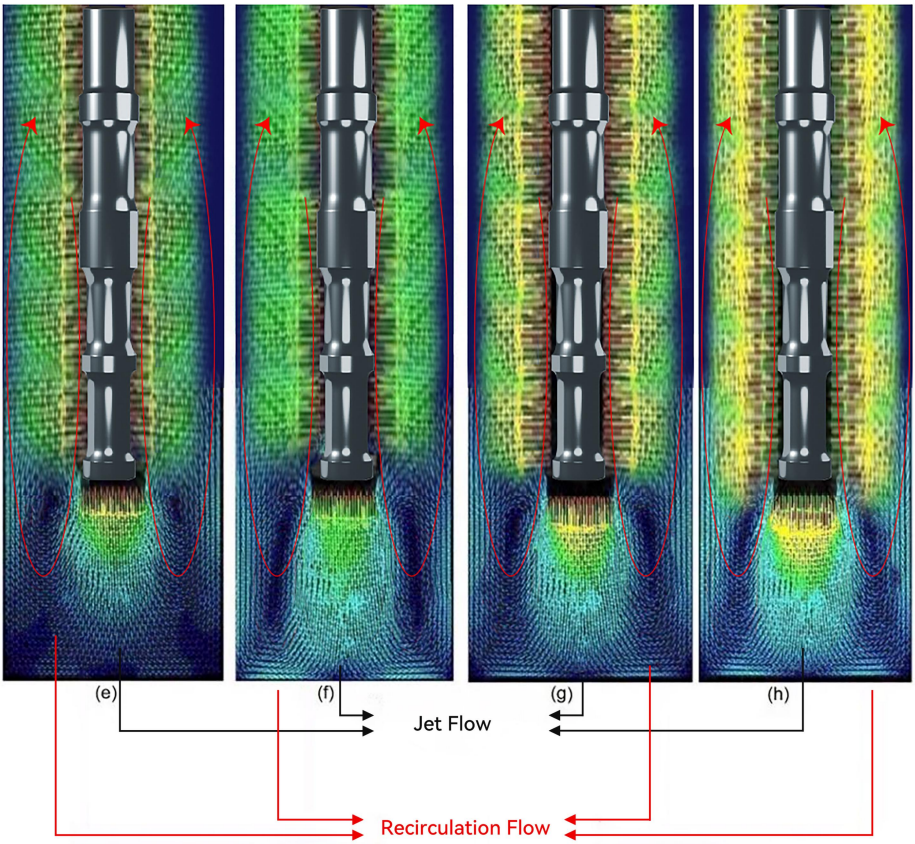
The transducer subassembly, when provided with the correct impedance and power, produces mechanical energy using a piezoelectric resonator. This energy is then concentrated and amplified by a tuned titanium metal horn, also known as a probe. When the probe tip is placed in the sample solution, high-frequency sound waves emitted from the tip induce cavitation. As these cavitation bubbles collapse, they

generate strong shear forces that can break or rupture cells. In fact, the cavitation forces are powerful enough to disrupt covalent bonds. As a result, ultrasonicators are effective tools for fragmenting high molecular weight DNA.

When ultrasonic waves propagate in a liquid, their interaction with the medium causes physical and chemical changes, resulting in a series of mechanical, thermal, electromagnetic, and chemical ultrasonic effects, including the following:

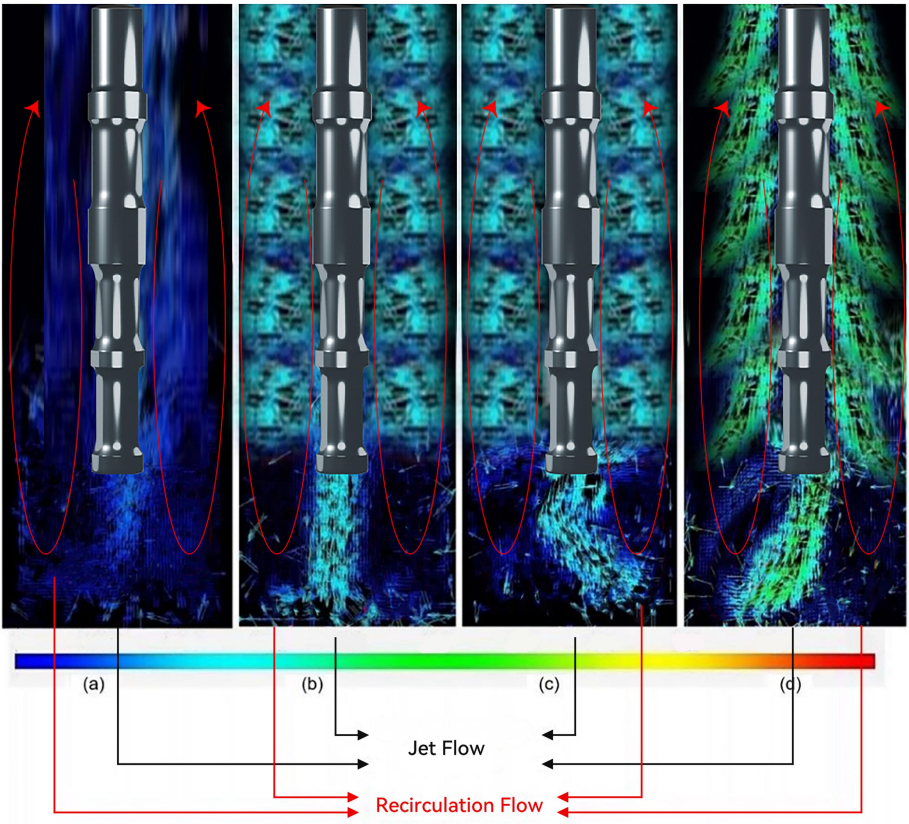
- **Mechanical Effect:** The mechanical action of ultrasonic waves can facilitate the emulsification of liquids, the liquefaction of gels, and the dispersion of solids.
- **Thermal Effect:** Due to the high frequency and significant energy of ultrasonic waves, their absorption by the

medium can produce a notable thermal effect.



- **Cavitation Effect:** Tiny gas bubbles in the liquid vibrate under the influence of ultrasonic waves. When the sound pressure reaches a certain level, the bubbles rapidly expand and then suddenly collapse, generating a massive shock wave during the bubble closure.

- **Chemical Effect:** During the alternating cycle fluctuations of ultrasonic waves, small cavities generated in the liquid create high temperature and pressure moments at the brink of collapse, forming localized high-energy sites that trigger chemical reactions and significantly increase the reaction rates.



III. Product Features

- Automatically monitors frequency, with automatic sweep tracking between 19-26KHz.
- Automatic energy compensation adjusts to the optimal frequency and output points based on sample flow-ability.
- Three-dimensional exponential ultrasonic probe design enhances output efficiency compared to traditional probes and minimizes amplitude pole loss.
- Includes sample overload and fault automatic alarm protection feature.
- The advantage of the ultrasonic probe lies not in its speed, but in its uniformity. It works in the oil bath with 360-degree coverage, ensuring even energy distribution, which results in more uniform processing of the sample.

IV. Precaution

1. Ensure that the equipment is placed in a clean, dry, and well-ventilated area to prevent damage and maintain optimal performance.

2. Handle the transducer with care to avoid any potential breakage or damage.

3. Allow the oscillator to cool down before use if it becomes hot during operation to prevent any potential hazards.

4. Remember to unplug the power plug and cut off the power supply after each use to ensure safety and conserve energy.

5. In general, due to the high power output of the ultrasonic probe, it is recommended to **set the power between 30% and 90%**, as this is the best way to protect the equipment.

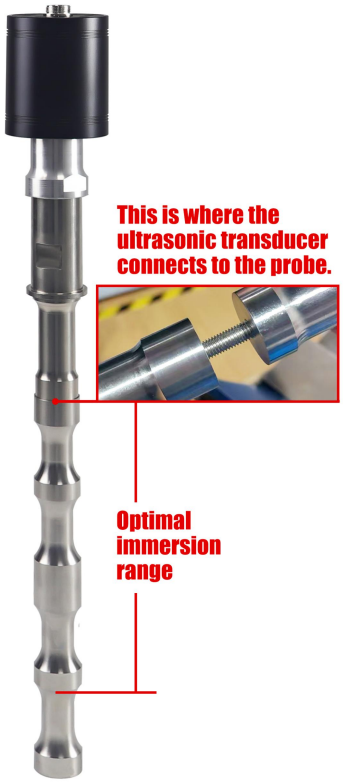
6. Each time the power switch is turned on, you will hear a 'buzzing' sound and observe a brief generation of ultrasound.

This is a normal phenomenon caused by frequency sweeping.

7. It is recommended **NOT** to operate the equipment **continuously for more than 1 hour**. If continuous use exceeds 1-2 hours, or if prolonged operation is necessary, please be mindful of the following:

- Continuous ultrasonic operation may cause the sample temperature to rise. If the sample is temperature sensitive, please monitor its temperature closely.
- As the sample temperature increases, heat will transfer to the ultrasonic transducer. It is important to ensure that the temperature of the ultrasonic transducer does not become too high. The acceptable temperature standard for the transducer is as follows: it should be warm to the touch but not hot enough to burn, and should not exceed 85°C.

8. The optimal immersion position for the ultrasonic probe is to submerge the **first two sections into the liquid, up to the connection point between the ultrasonic transducer and the probe.** Due to high power and small sample volume, splashing may occur, so it is recommended to immerse the first two sections. To prevent the sample from reaching the connection point, the immersion depth should not exceed the level of the screws.



9. In case of any malfunction or issues with the equipment, please contact us promptly for assistance.

10. Avoid opening the machine without proper authorization to prevent further damage or risks.

V. Working Environment

Based on the provided information, here are some key points about the working environment for the ultrasound equipment:

- **Environmental Temperature:** The recommended temperature range for the equipment is between 0-60 ℃.
- **Relative Humidity:** The relative humidity should not exceed 85% at a temperature of 20 ℃.
- **Working Conditions:** Under normal circumstances, the ultrasound equipment can achieve desired results within 30 minutes of operation.
- **Ultrasound Vibration Rod Temperature:** The temperature range for the ultrasonic vibration rod is between 0-120 ℃.
- **Processing Object:** The equipment is designed to process

solutions or mixtures of solutions.

These specifications are important to ensure the proper functioning and efficiency of the ultrasound equipment. It is crucial to adhere to the recommended working environment conditions for optimal performance and longevity of the equipment.

VI. Maintenance

After each use, it is recommended to clean the ultrasonic probe (i.e., the titanium alloy part). There are several cleaning methods:

- You can simply place the probe in clean water and start the ultrasonic cleaning process.
- If the sample is particularly dirty, you can clean the probe with alcohol, acetone, or other cleaning agents, or use organic solvents for cleaning.

VII. Parameters

SKU	JFFX00080	JFFX00081	JFFX00082
Ultrasonic Power	480 W	600 W	750 W
Power Regulation	be set from 10% to 100% with a 10% increment		
Actual Power Consumption	160 W	200 W	250 W
Frequency	20-26 KHz		
Voltage	110 V, 60 Hz		
Length of Amplitude	250 mm		
Diameter of Amplitude	16 mm	20 mm	25 mm
Total Length	580 mm		
Processing Capacity	1-3 L	1-3 L	2-4 L
Total Working Time	1S-999S		
Material of Amplitude	Titanium Alloy TC4		
Installation Method	Quick Connect		
Applicable Jacketed Reactor Tank	Inner Diameter: 18 cm Inner Length: 27 cm Processing Capacity: 5L		

VII. Parameters

SKU	JFFX00083	JFFX00084	JFFX00085
Ultrasonic Power	900 W	750 W	900 W
Power Regulation	be set from 10% to 100% with a 10% increment		
Actual Power Consumption	300 W	250 W	300 W
Frequency	20-26 KHz		
Voltage	110 V, 60 Hz		
Length of Amplitude	250 mm	275 mm	
Diameter of Amplitude	30 mm	25 mm	30 mm
Total Length	580 mm	605 mm	
Processing Capacity	2-5 L	2-3 L	2-5L
Total Working Time	1S-999S		
Material of Amplitude	Titanium Alloy TC4		
Installation Method	Quick Connect		
Applicable Jacketed Reactor Tank	Inner Diameter: 18 cm Inner Length: 27 cm Processing Capacity: 5L	Inner Diameter: 23 cm Inner Length: 35.4 cm Processing Capacity: 10L	

VII. Parameters

SKU	JFFX00086	JFFX00087	JFFX00088
Ultrasonic Power	600 W	750 W	900 W
Power Regulation	be set from 10% to 100% with a 10% increment		
Actual Power Consumption	200 W	250 W	300 W
Frequency	19-26 KHz		
Voltage	110 V, 60 Hz		
Length of Amplitude	340 mm		
Diameter of Amplitude	20 mm	25 mm	30 mm
Total Length	670 mm		
Processing Capacity	2-4 L	2-5 L	2-5 L
Total Working Time	1S-999S		
Material of Amplitude	Titanium Alloy TC4		
Installation Method	Quick Connect		
Applicable Jacketed Reactor Tank	Inner Diameter: 29 cm Inner Length: 38.6 cm Processing Capacity: 20 L	Inner Diameter: 33cm Inner Length: 48.1 cm Processing Capacity: 30 L	

V. Structure

① Handle

② Screen

③ Ultrasonic Generator (Main Machine)

④ Power Adjustment Knob

⑤ Power Button

V. Structure

⑥Time Display

⑦Button to Reduce Time

⑧Button to Increase Time

⑨Button to Turn On Ultrasound

⑩Button to Turn Off Ultrasound

⑪Power Display/Frequency Display

⑫Amplitude

⑬Ultrasonic Transducer

Note: Different models of vibrators have varying lengths. The pictures here simply identify the names of the different parts.

VIII. Operation

1. Use a cable to connect the ultrasonic generator to the ultrasonic vibration rod.

2. Plug in the power cord of the ultrasonic generator, and immerse the ultrasonic vibration rod into the solution.

When securing the ultrasonic probe, be careful not to fix it in the area where ultrasonic vibrations occur. It should be secured at the flange position or the black section (the ultrasonic transducer area).

3. Turn on the machine by pressing the Power Button⑤ on the front panel of the ultrasonic generator. *The machine will automatically scan for the frequency and begin ultrasound operation after a beep.*

4. Turn the knob to adjust the power. As you turn it, the screen will show the corresponding power value, indicating your selected level. Continue turning until you reach your desired power setting. *The display window⑪ will show the real-time power. Be sure to press the power adjustment*

button for an additional 3 seconds to save your selection.

5. Press ▲ ▼ to set desired working time. ▲ can increases time, while ▼ can reduce time.

6. Press ON button to start the process and OFF to pause it.

While in use, the display window⑪ shows the real-time frequency.

IX. Packing List

Ultrasonic Generator	1
Ultrasonic Vibration Rod	1
Power Cord	1
Instructions	1
Fuses	3
Connecting Wire	1

Contact US

Company Name: U.S. Solid

Address: 4560 Johnston Parkway,

Cleveland, Ohio 44128

E-mail: service@ussolid.com