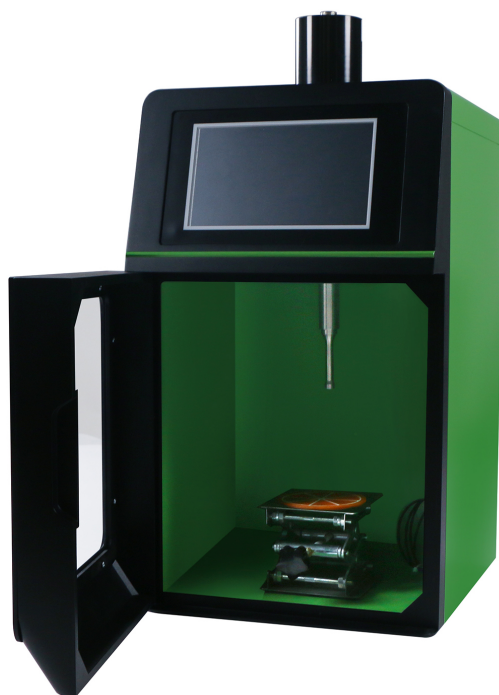




ULTRASONIC PROCESSOR MANUAL

MODEL: USS-FX



This manual should be made available to all users of this equipment. For best results, and for 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 assure 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,
or call (800) 243-5428

Contents



WARNING: Read carefully and understand all INSTRUCTIONS before operating. Failure to follow the safety rules and other basic safety precautions may result in serious personal injury.

Summary.....	I
The Principle of Working.....	II
Product Features.....	III
Common Applications.....	IV
Technical Parameters.....	V
Appearance Display.....	VI
Energy Converter Transducer.....	VII
Installation.....	VIII
Operation.....	IX
Warnings and Notes.....	X
Removing Amplitude.....	XI
Installing Amplitude.....	XII
Packing List.....	XIII

I. Summary

Ultrasonic homogenizers are multi-function and multi-purpose instruments that utilize intense high-frequency sound to induce cavitation in liquid. As the cavitation bubbles collapse, high shearing energies disrupt animal and plant tissue, lyse yeast, bacteria and spores. The ultrasonicator can also be used for non-biological applications such as emulsification, nanoparticle dispersion, intense washing or acceleration of chemical reactions (sonochemistry).

II. The Principle of Working

This machine is made up of an ultrasonic power supply and an ultrasonic transducer assembly (generator or probe). The ultrasonic power supply converts the input single-phase electricity of 110 VAC, 60 Hz into an alternating electrical signal of 20-25 kHz. The circuitry consists of a power rectifier, power switcher, a frequency conversion system, power amplifier, phase-locked frequency automatic tracking device, power regulator, power detector, power protector device, and microcomputer controller.

Driven by the appropriate impedance and power, the transducer subassembly generates mechanical energy through a piezoelectric resonator which is focused and amplified with a tuned, titanium metal horn (probe). When the probe tip is immersed in the sample solution, intense, high-frequency sound waves coming from the tip of the probe induce cavitation. As the cavitation “bubbles” collapse, high shear forces break or tear open the cells. Indeed, cavitation forces are high enough to break covalent bonds. Hence, ultrasonicators can be used to fragment high molecular weight DNA.

III. Product Features

1. Automatic frequency tracking routinely scans and tracks within 20KHz frequency.
2. Auto-tuning for convenience of use and optimal processing efficiency
3. Temperature indicator and controller
4. 99h total working time controller, 1s – 99h, count-down time display
5. Automatic amplitude compensation
6. Power-emitted display for accuracy and repeatability, variable power output
7. Integrated soundproof box to reduce cavitation sound emitted during processing
8. 7-inch color industrial touch screen applied and all functions integrated display

IV. Common Applications

9. Mixing, blending, emulsifying, and homogenizing solutions
10. Reducing the particle size of suspensions
11. Dispersing suspensions
12. Disrupting cells
13. Catalyzing chemical reactions

V. Technical Parameters

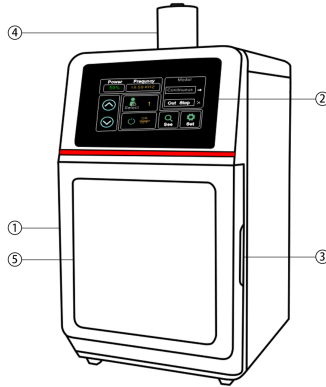
Host Parameters	
Power Supply	85-260 V / 50-60 Hz
Frequency	20 KHz (Real-time display frequency)
Total Working Time	1 Min ~ 99 H
Power Regulation	1% - 100% (Precision: 1%)
Temperature Setting	0 - 300°C (Precision:1°C)
User program	10 groups
Pulse Interval Time	1S ~ 60 Min
Operating Mode	Pulse, Time, Continuity
LCD Screen	7-inch color touch screen (Visual Resolution: 800p × 480p)
Product Dimension	13 x 11 x 18 inch
Weight	26.5 lbs
Ultrasonic Probe Parameter	
Material of Probe	Titanium alloy: T1-6AL-4V

V. Technical Parameters

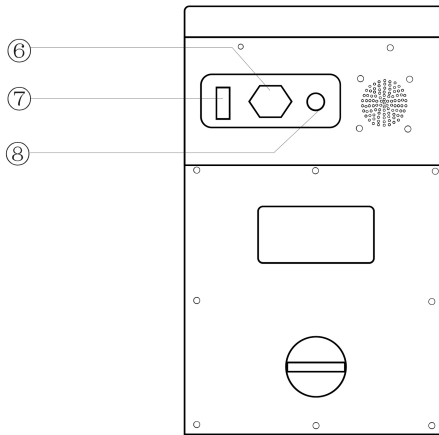
Model	Power	Standard Probe	Options			
USS-FX11	100 W	Φ 1.5 mm	Φ 2 mm	Φ 3 mm		
USS-FX12	200 W	Φ 2 mm	Φ 1.5 mm	Φ 3 mm	Φ 6 mm	
USS-FX13	300 W	Φ 3 mm	Φ 1.5 mm	Φ 2 mm	Φ 6 mm	
USS-FX14	500 W	Φ 6 mm	Φ 1.5 mm	Φ 2 mm	Φ 3 mm	Φ 8 mm
USS-FX15	700 W	Φ 8 mm	Φ 1.5 mm	Φ 2 mm	Φ 3 mm	Φ 6 mm
			Φ 10 mm			
USS-FX16	1000 W	Φ 10 mm	Φ 3 mm	Φ 6 mm	Φ 8 mm	
USS-FX17	1200 W	Φ 13 mm	Φ 3 mm	Φ 6 mm	Φ 8 mm	Φ 10mm
USS-FX18	1500 W	Φ 16 mm	Φ 3 mm	Φ 6 mm	Φ 8 mm	Φ 10 mm
			Φ 13 mm			
USS-FX19	1800 W	Φ 18 mm	Φ 3 mm	Φ 6 mm	Φ 8 mm	Φ 10 mm
			Φ 13 mm	Φ 16 mm		
USS-FX20	2000 W	Φ 20 mm	Φ 3 mm	Φ 6 mm	Φ 8 mm	Φ 10 mm
			Φ 13 mm	Φ 16 mm	Φ 18 mm	
USS-FX21	2500 W	Φ 25 mm	Φ 3 mm	Φ 6 mm	Φ 8 mm	Φ 10 mm
			Φ 13 mm	Φ 16 mm	Φ 18 mm	Φ 20 mm

Probe	Sample Capacity
Φ 1.5 mm	0.1-10 ml
Φ 2 mm	0.1-100 ml
Φ 3 mm	0.1-200 ml
Φ 6 mm	0.1- 600 ml
Φ 8 mm	0.1- 800 ml
Φ 10 mm	0.1- 1000 ml
Φ 13 mm	0.1- 1200 ml
Φ 16 mm	0.1- 1500 ml
Φ 18 mm	0.1- 2000 ml
Φ 20 mm	0.1- 3000 ml
Φ 25 mm	0.1- 4000 ml

VI. Appearance Display

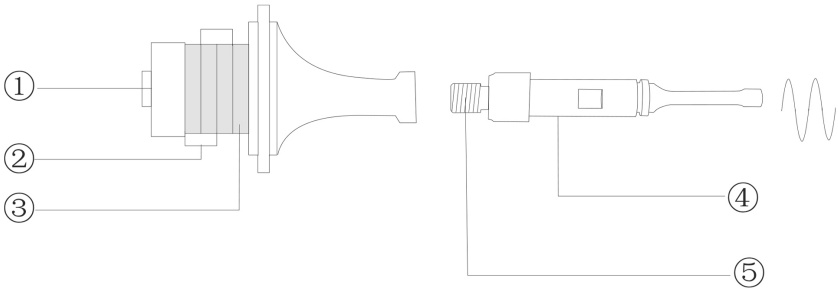


- 1. Host
- 2. Touch Screen
- 3. Handle
- 4. Ultrasonic Probe
- 5. Sample Observation Window



- 6. Power Button
- 7. Power Cable Connector
- 8. Temperature Probe Connecting Button

VII. Energy Converter Transducer



1. High Tensile Screw
2. Electrode Plate
3. Piezoelectric Ceramics
4. Amplitude
5. Connecting Screw

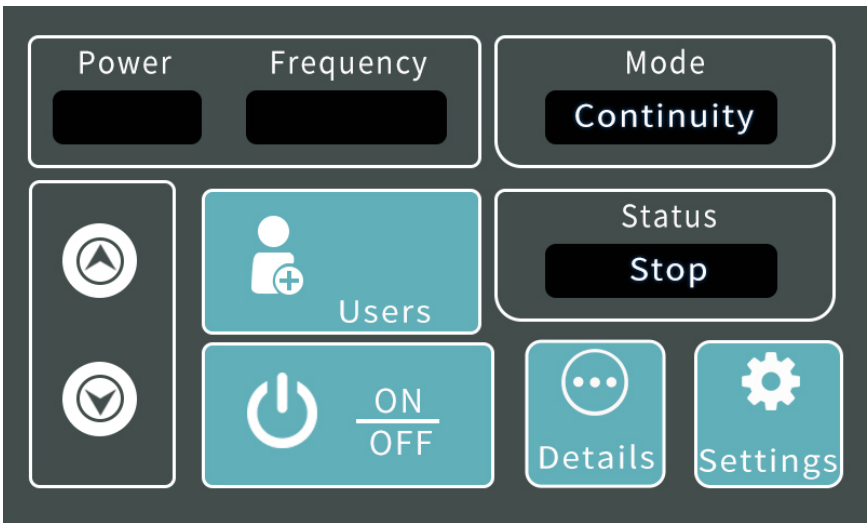
VIII. Installation

1. Have the bracket and clamp assembled (the holding system for the transducer).
2. Have the transducer cable and transducer connected, then connect them with the main machine (ultrasound generator).
3. Connect the power cable to the power supply and main machine.
4. Put the transducer unit on the bracket or soundproof box. Make sure the ultrasonic probe tip is inserted into the sample liquid surface and in the center of the container. **The probe should get into the liquid 5 mm to 10 mm beneath the liquid surface.** For large sample volumes, the distance between the probe tip and the container's bottom should be bigger than 30 mm. (The ultrasonic probe tip can be as close as 10 mm from the bottom of the container when processing a small sample size or when using a lower transducer power setting) If you hold the transducer unit to process the sample, hold it on SLEEVE position. Other positions are not allowed.



It is prohibited to start ultrasonic output when the probe tip is out of the liquid. Otherwise the energy converter and ultrasonic wave generator will be damaged.

IX. Operation



Up Button: You can increase power by pressing the Up button.



Down Button:
You can decrease power by pressing the Down button.

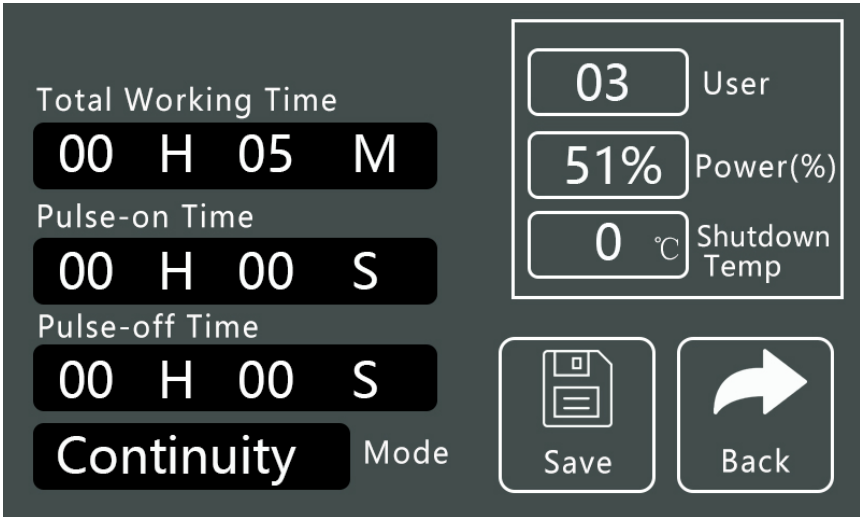


Press the ON/OFF button to start or pause the working process.

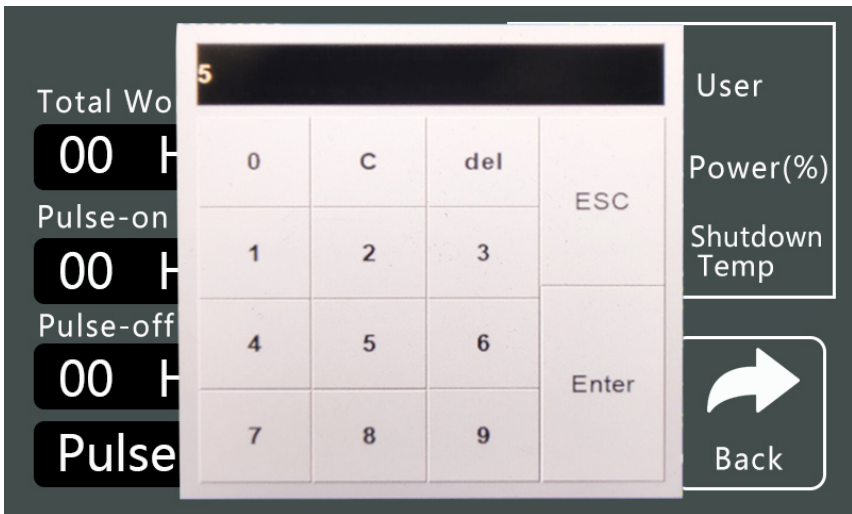
IX. Operation



By pressing the Settings button, you will move to below interface.

The main settings interface is displayed on a dark grey background. On the left, there are four rows of digital displays: "Total Working Time" showing "00 H 05 M", "Pulse-on Time" showing "00 H 00 S", "Pulse-off Time" showing "00 H 00 S", and "Continuity Mode" showing "Continuity". On the right, there are three rows of digital displays: "User" showing "03", "Power(%)" showing "51%", and "Shutdown Temp" showing "0 °C". At the bottom right, there are two buttons: "Save" with a floppy disk icon and "Back" with a right-pointing arrow icon.

1. Press User to set user code in the machine.

The user code input interface is shown. A numeric keypad is overlaid on the settings screen. The keypad has a display at the top showing the number "5". The keypad buttons are arranged in a grid: the top row has "0", "C", "del", and "ESC"; the second row has "1", "2", "3"; the third row has "4", "5", "6", and "Enter"; the bottom row has "7", "8", "9". The background settings interface is partially visible, showing the "User" field and the "Back" button.

IX. Operation

Total Working Time: Total time that machine works.

Pulse-On Time: Time that machine produces ultrasound.

Pulse-Off Time: Time that machine is on but stops producing ultrasound.

Power: The percentage of the power available.

Shutdown Temp: The machine will stop working when it reaches the set temperature.

Save: Save the settings.

Back: Go back to the previous interface.

There are three modes:

1. Continuity Mode: It will not stop working if you do not stop the machine.
2. Time Mode: The working process will stop when it reaches the set time.
3. Pulse Mode: Machine works when the pulse is on and pauses when the pulse is off.

X. Warnings and Notes

1. NEVER START ULTRASONIC OUTPUT WHEN THE PROBE TIP IS EXPOSED IN THE AIR
2. The apparatus switches the power supply without industrial frequency transformer. Don't randomly touch after opening the generator housing to avoid electric shock.
3. The apparatus does not need to warm up and should be grounded well when being used.
4. Use it in an environment free from moisture, sunshine and corrosive gases.
5. Be sure the platform is tightly fixed to the rod, and the ultrasonic probe is in liquid and not touching the walls of the sample vessel.
6. The liquid temperature will increase rapidly due to the cavitation effect during crushing. The user should pay attention to the temperatures for different cells. It is suggested that the user adopt multiple short time crushing (not longer than 5s each time) and ice bath cooling.
7. It is practice-proven that multiple short-time operations, working time 1-2s and interval time 1-2s, have better effects than continuous long-time operations. The long interval time can be set to avoid the heating of liquid. Additionally, continuous long-time operations are subject to no load operations to shorten the apparatus service lifetime.
8. The horn end will become rough due to cavitation corrosion after being used for a period of time. Use oil stone or rasper to smooth it. Otherwise, it will influence the working effects.
9. In general, the volume of homogenization media should be 3 to 10 times the net volume of the solid sample. Pre-chopping the sample into pieces less than 1 mm in cross-section will significantly decrease the time of homogenization.

X. Warnings and Notes continued

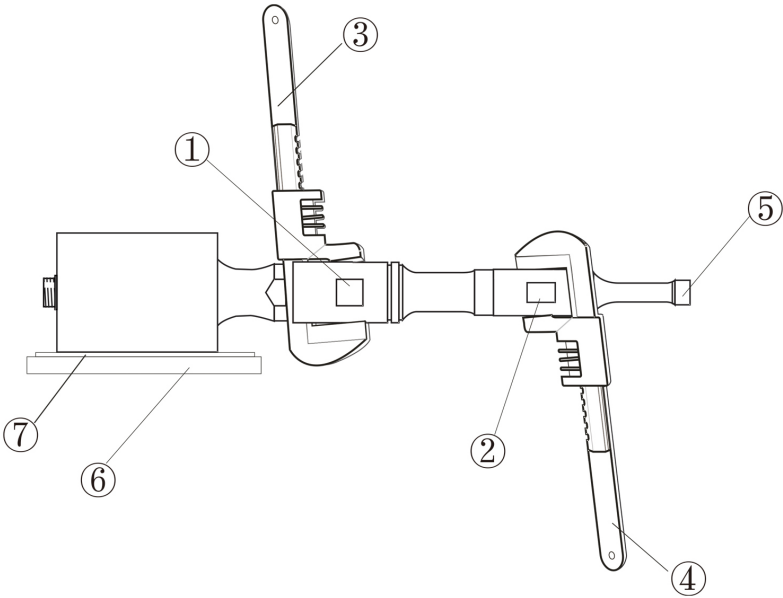
10. Heating of the sample occurs with long runs. Gross sample heating can be minimized by:

- A. Nesting the sample vessel in an outer vessel containing ice.
- B. Select longer interval (gap) times.
- C. Using a specially fabricated leptosomatic ultra-sonication vessel (available as an accessory).

The user should keep in mind that transient (millisecond) heating and free radical formation in the immediate vicinity of the ultrasonic probe tip is unavoidable. Please take this into consideration when working with samples especially sensitive to heat or free radical damage. To avoid excessive cavitation leading to overload when using smaller ultrasonic probes of 2, 3, and 6 mm tip diameter, the ultrasonic power wheel should be rotated to a lower power setting.

11. If the liquid volume containing the sample is less than 5 ml, choose an ultrasonic probe with a tip diameter of 2 to 3 mm. Smaller probes are inserted into liquid at a depth about 1 cm, and the distance between the tip of the ultrasonic probe and container bottom will vary to some extent by the power setting selected for the probe. However, it should not be less than 0.5 cm.

XI. Removing Amplitude



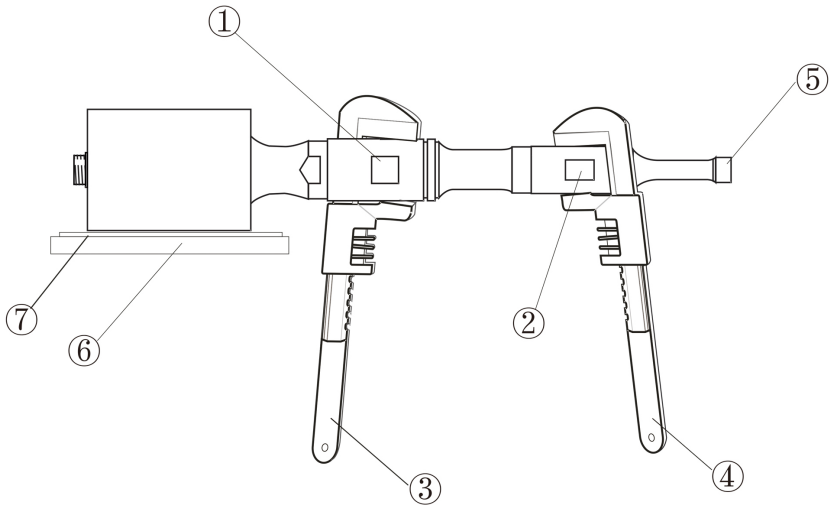
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|--------------|-------------|--------------|-------------|
| 1. Buckle 1 | 2. Buckle 2 | 3. Wrench 1 | 4. Wrench 2 |
| 5. Amplitude | | 6. Workbench | 7. Cushion |

Place energy converter on the bench covered by soft materials (e.g. towels). Put the small wrench into the wrench hole on the horn and the big wrench into the wrench hole on the energy converter. The big wrench should be placed towards the left and the small wrench towards the right.

Facing the horn with the big wrench in your left hand and the small wrench in your right hand, loosen by turning downwards with two hands at the same time. When changing the horn, if the M10 screw is attached to the horn, manually unscrew the screw from the lever and screw the screw 1/2 way into the energy converter.

Then screw on the required horn. If the screw cannot be manually screwed out from the horn, knock the screw lightly on wooden materials so that the screw can be screwed out manually.

XII. Installing Amplitude



- | | | | |
|--------------|--------------|-------------|-------------|
| 1. Buckle 1 | 2. Buckle 2 | 3. Wrench 1 | 4. Wrench 2 |
| 5. Amplitude | 6. Workbench | | 7. Cushion |

1. Screw amplitude manually.
2. Place energy converter on the bench covered by soft materials (e.g. towels).
3. Put wrench1 on buckle2 and wrench2 on buckle2.
4. Facing the horn with wrench1 in the left hand and wrench2 in the right hand, tighten by turning downwards with two hands at the same time.

XIII. Packing List

Ultrasonic Host	1 unit
Ultrasonic Probe	1 set
Lifting Table with Non-slip Mat	1 set
Temperature Sensor	1 unit
Power Cord	1 pc
Cable	1 pc
Fuse	3 pcs

