



ULTRASONIC PROCESSOR MANUAL

MODEL: USS-HLUH



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.

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.

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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, and 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. Technical Parameters

Model:	USS-HLUH
Frequency range:	20KHz (frequency is auto-tracking)
Output power:	450W (0%-100% continuous adjustable)
Total working timer:	1s – 99 hours with pause function
Ultrasonic output impulse:	Ultrasonic on timer: 1s – 99 min
Ultrasonic off timer:	1s – 99 min
Duty ratio:	0%-100%
Diameter of ultrasonic probe:	Φ13mm
Sample processing volume:	10mL –300 mL
Packing size:	12.6 x 18.1 x 16.5 inches
Weight:	19.8 lbs.

III. Working Environment and Conditions

Environment Temp.:	32°F ~ 104°F (0°C – 40°C)
Environment:	Indoor (no corrosive gas)
Relative Humidity:	≤85% (T=68°F)
Power Supply:	110VAC, 60Hz
Energy converter Temp.:	32°F ~ 248°F (0 – 120°C)
Sample type:	Solutions

IV. The Principles 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 110VAC, 60Hz 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 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 and, hence, ultrasonicators can be used to fragment high molecular weight DNA.

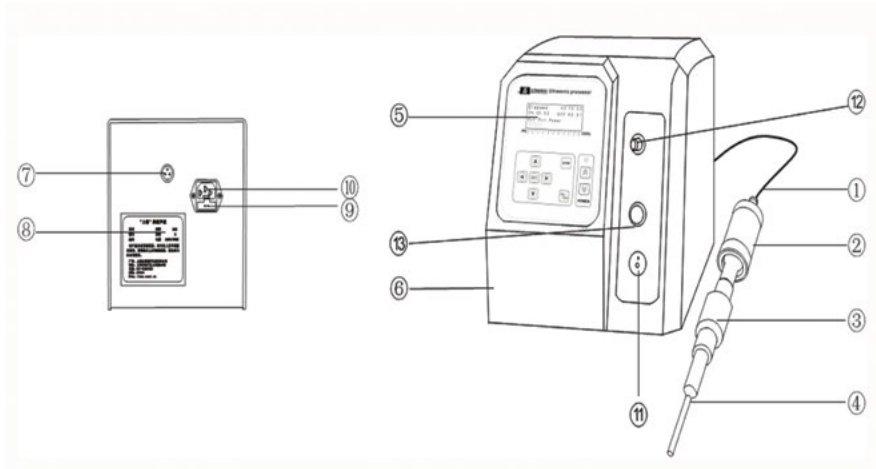
V. Machine Structure

Front

1. Transducer cable
2. Sleeve (hand hold position)
3. Booster
4. Probe
5. Control panel
6. Housing
11. Power switch
12. Temp. Detector
13. Protect

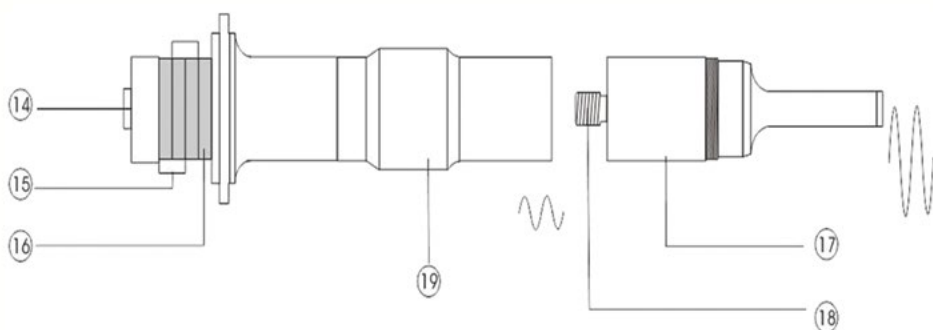
Rear

7. Ultrasonic output connector
8. Label
9. Fuse holder
10. Power socket

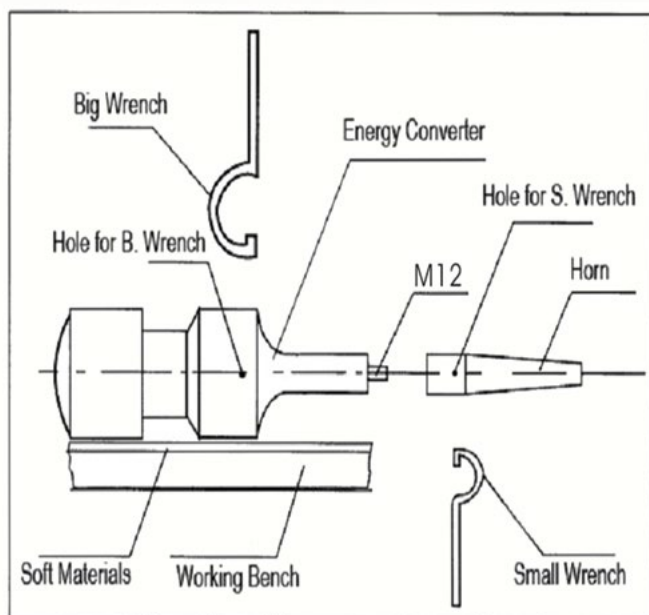


VI. Energy Converter Transducer

- 14. High Tensile Screw
- 15. Electrode Plate
- 16. Piezoelectric Ceramics
- 17. Probe
- 18. Screw Connection
- 19. Booster



VII. Ultrasonic Generator Electric Diagram



VIII. Product Features

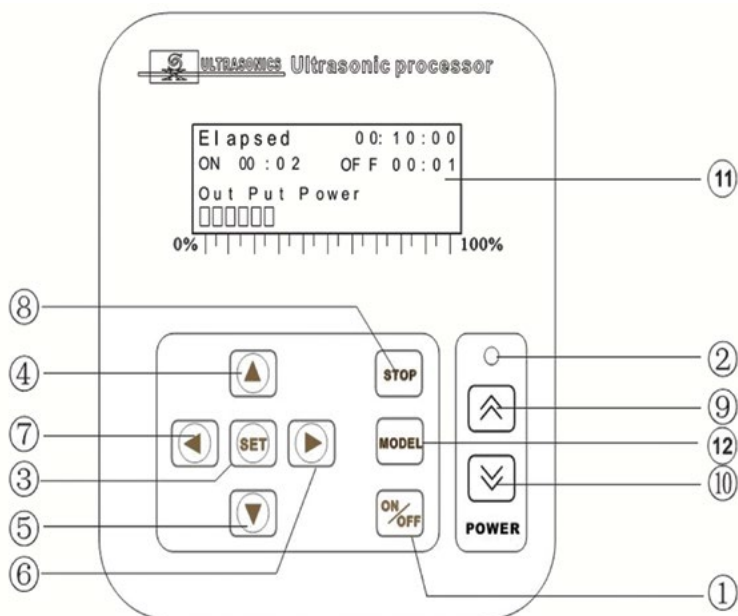
- Novel design, Complete-function, Reliable ability
- Large LCD digital display, fully microprocessor controlled and completely programmable
- Auto-tuning for convenience of use and optimal processing efficiency
- Temperature indicator and controller
- 99h total working time controller, 1s – 99h, count-down time display
- Automatic amplitude compensation
- Power-emitted display for accuracy and repeatability, Variable power output, 0-600 watts
- Integrated Sound Abating Chamber to reduce cavitation sound emitted during processing

IX. Common Applications

- Mixing, blending, emulsifying, and homogenizing solutions
- Reducing particle size of suspensions
- Dispersing suspensions
- Disrupting cells
- Catalyzing chemical reactions

X. Install and Operation

Control Panel Description



- | | |
|--------------------------|---------------------------------------|
| 1. Timer ON/OFF | 2. Ultrasonic Working Indicator (LED) |
| 3. Time SET Function Key | 4. Minus Number Key |
| 5. Plus Number Key | 6. Numeric Shift |
| 7. Numeric Shift | 8. Pause (Stop) |
| 9. Increase Power | 10. Decrease Power |
| 11. LCD Display | 12. Mode Option |

X. Install and Operation continued

Installation

- 1) Have the bracket and clamp assembled (the holding system for transducer).
- 2) Have the transducer cable and transducer connected, then connect with the main machine (ultrasound generator).
- 3) **Make sure the power switch is in OFF position** and connect power cable to power supply and main machine.
- 4) Put the transducer unit on the bracket or noise abating chamber. Make sure the ultrasonic probe tip is inserted into the sample liquid surface and in the center of container. **The probe should get into the liquid 5mm to 10mm beneath the liquid surface.** For large sample volumes, the distance between the probe tip and the container's bottom should be bigger than 30mm. (The ultrasonic probe tip can be as close as 10mm from the bottom of the container when processing a small size sample or when using a lower transducer power setting) If you hold the transducer unit to process the sample, do 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.

X. Install and Operation continued

Operation

- 1) Turn on the power switch on front panel, power light brightens.
- 2) Press "SET" to set up total working time, timer range: 1s to 99 hours. Press 4, 5, 6, 7 keys to adjust total working time you want
- 3) Press "SET" to set up ultrasonic on pulse time. Press 4, 5, 6, 7 keys to adjust ultrasonic working pulse time you want from 1s to 99min
- 4) Press "SET" to set up ultrasonic off pulse time. Press 4, 5, 6, 7 keys to adjust ultrasonic off pulse time from 1s to 99 min
- 5) Press "SET" to confirm and save the data.
- 6) Press 9, 10 keys to adjust power output (0-100%). It can be adjusted during ultrasound process as well.
- 7) Press "ON/OFF" to start, Press it twice to stop. When ultrasound output starts, the "SET" key will not function. Only when it stops, you can press "SET" to adjust working time.
- 8) Press "STOP" to pause. Press twice to continue.
- 9) During the working procedures, do not touch the probe with your hand to avoid thermal burn.
- 10) After use, turn off the Power Switch and remove from power supply.

If splashing or aerosol formation occurs during ultrasonic treatment of the sample reduce the power setting on the transducer/probe and set the ultrasonic pulse to shorter times. This avoids damaging the ultrasonic probe.

XI. Warnings and Notes

If splashing or aerosol formation occurs during ultrasonic treatment of the sample reduce the power setting on the transducer/probe and set the ultrasonic pulse to shorter times. This avoids damaging the ultrasonic probe.

1. NEVER START ULTRASONIC OUTPUT WHEN THE PROBE TIP EXPOSED IN THE AIR
2. The apparatus adopts switching power supply without industrial frequency transformer. Don't touch randomly after opening the generator housing to avoid electroshock.
3. The apparatus does not need warm up and should be grounded well when being used.
4. Use it in the environment free from moisture, sunshine and corrosive gases.
5. Be sure the platform is tightly fixed to the rod, 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 to adopt multiple short time crushing (not longer than 5s each time) and ice bath cooling.
7. It is proved through practices 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. 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.

XI. Warnings and Notes continued

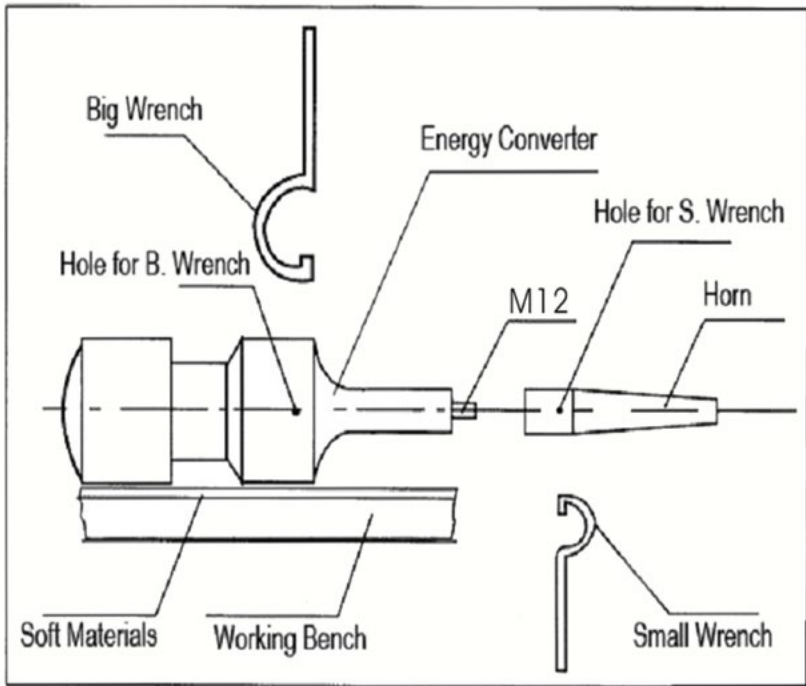
10. Heating of the sample occurs with long runs. Gross sample heating can be minimized by:

- 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 having a tip diameter of 2 or 3 mm. With smaller probes, the depth the ultrasonic probe inserted into liquid is 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, but should not be less than 0.5 cm.

XII. Lever Disassembly



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 left and the small wrench towards 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. Facing the horn with the big wrench in left hand and the small wrench in right hand, tighten by turning downwards with two hands at the same time. When changing the horn, if M10 screw is attached on 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.

XIII. Packing List

Ultrasonic Wave Generator	1unit
Power Cable	1pc
Vibrating System (Energy Converter Transducer)	1pc
Transducer Cable	1pc
Bracket and Clamp Unit	1set
Fuse	3 pcs
Operating User Manual	1set

