

U.S. Solid Ultrasonic Homogenizer Processor Ultrasonic Vibrating Rod Series

User Manual
Manual NO. 13472



Important Notice This manual shall be provided to all operators. Read the manual completely before installation, wiring, start-up, cleaning, or maintenance. Operation outside these instructions may result in sample loss, equipment damage, or personal injury.

Applicable models: USS-FX00200 to USS-FX00210 Version: V1.1

Contents

Section	Content
I.	Overview
II.	Working Principle
III.	Product Features
IV.	Typical Applications
V.	Warnings and Safety Notes
VI.	Converter and Vibrating Rod Assembly
VII.	Structure and Installation
VIII.	Technical Parameters
IX.	Control Panel Overview
X.	Operating Instructions
XI.	Cleaning, Maintenance, and Troubleshooting
XII.	Packing List, Storage, and Transportation

Recommended Reading Order For first-time use, read Warnings and Safety Notes, Structure and Installation, Technical Parameters, and Operating Instructions in sequence. Repeat the frequency detection procedure whenever the vibrating rod is replaced, reconnected, or put back into service after long-term storage.

I. Overview

This manual applies to the USS-FX00200 through USS-FX00210 ultrasonic vibrating rod series. Each system consists of an ultrasonic generator host, an energy converter, and a titanium alloy vibrating rod selected for the required processing volume. Compared with a conventional split ultrasonic processor, this series uses similar host and touch-screen control logic, while the probe section is configured as a flange-mounted vibrating rod assembly for reactors, jacketed vessels, and larger liquid-processing systems.

The system converts high-frequency electrical energy into mechanical vibration and transfers the vibration into liquid media. Cavitation, microstreaming, and high local shear generated in the liquid can intensify dispersion, emulsification, extraction, cell disruption, deagglomeration, and homogenization processes.

Item	Description
Product form	Split-type ultrasonic host connected to a large vibrating rod. The rod is mounted to a vessel or reactor by a quick flange connection.
Typical batch volume	Model-dependent liquid processing capacity from 1000-3000 mL up to 10000-20000 mL. When used with a stirred reactor, the matching reactor capacity is typically 5-50 L.
Operators	Only trained operators who have read this manual may use the equipment.
Use limits	Not for human or medical treatment. Do not use in unverified flammable, explosive, highly corrosive, sealed pressure, or explosion-proof environments.

Key Rule Before ultrasonic output is started, the working end of the vibrating rod must be immersed in liquid and kept clear of vessel walls, vessel bottoms, agitator blades, temperature probes, and other hard parts.

II. Working Principle

The ultrasonic host converts the input power supply into a high-frequency electrical signal within the 19-26 kHz range. After power amplification, automatic frequency tracking, and protection control, this signal drives the energy converter. Piezoelectric ceramics inside the converter generate mechanical vibration under the high-frequency electric field.

The titanium alloy vibrating rod amplifies and transmits the vibration energy to the working end. When the working end is immersed in liquid, the ultrasonic field forms cyclic compression and rarefaction zones. Collapse of cavitation bubbles creates local shear, micro-jets, and short-duration high-temperature/high-pressure microenvironments.

Functional Element	Role
Power and rectification	Accepts 110/220 V, 50-60 Hz input and supplies stable power to the output module.
Frequency conversion	Generates the high-frequency signal matched to the vibrating rod.
Power amplification	Supports 1%-100% adjustable ultrasonic power output.
Automatic tracking	Tracks the optimum operating frequency in the 19-26 kHz range.
Energy converter	Converts high-frequency electrical energy into mechanical vibration.
Titanium vibrating rod	Transfers vibration to the liquid to produce cavitation, shear, and mixing effects.

Main Factors Affecting Processing Results

Processing performance is influenced by sample volume, viscosity, solid content, temperature, vessel geometry, stirring state, immersion depth, ultrasonic power, pulse conditions, and total processing time. For new processes, start with conservative settings and increase energy input gradually after confirming stable operation.

III. Product Features

Feature	Benefit
Large vibrating rod	Designed for larger liquid volumes and reactor-style use rather than small beaker processing.
2000 W ultrasonic output	Provides high energy density for dispersion, emulsification, and extraction applications.
Touch-screen interface	7-inch color touch screen with intuitive parameter setting and real-time status display.
Wide frequency tracking	19-26 kHz real-time frequency display and automatic matching reduce mismatch risk.
Flexible modes	Pulse, Time, and Continuous modes support different sample sensitivities and process goals.
Programmable settings	100 user programs can be stored for repeated process use.
Temperature warning	0-200 deg C temperature warning setting helps protect heat-sensitive samples.
Quick flange installation	Convenient installation on matching vessels or reactors with improved mechanical stability.

Process Stability For viscous or high-solid systems, mechanical stirring should normally be used together with ultrasonic treatment. Stable bulk circulation helps avoid localized overheating and improves treatment uniformity.

IV. Typical Applications

Application	Typical Purpose
Nanomaterial dispersion	Disperse powders such as oxides, carbon materials, catalysts, or functional fillers.
Emulsification	Prepare or refine liquid-liquid emulsions and improve droplet distribution.
Extraction	Accelerate extraction of active ingredients by improving mass transfer.
Homogenization	Improve macro- and micro-scale uniformity in liquid systems.
Cell disruption	Disrupt biological cells or tissue suspensions where the process is suitable.
Reaction enhancement	Improve reaction contact efficiency in selected liquid-phase or slurry systems.
Degassing support	Assist gas release in compatible liquid systems, subject to process verification.

Suitability Confirmation

Before production use, verify compatibility between the sample, vessel, seal material, temperature range, and ultrasonic energy level. Ultrasonic treatment may increase temperature, aerosol formation, foaming, or gas release. Use ventilation, splash protection, and cooling measures when needed.

V. Warnings and Safety Notes

Safety Warning High-power ultrasound can create noise, heat, splashing, aerosols, and strong mechanical vibration. Operators must evaluate sample hazards and wear appropriate personal protective equipment before use.

Risk	Required Control
Electric shock	Use a grounded power supply. Do not operate with damaged power cords, wet connectors, or opened host covers.
Dry running	Do not start ultrasonic output in air. The rod end must be immersed before output is enabled.
Mechanical contact	Keep the rod away from vessel walls, bottoms, agitators, baffles, and temperature probes.
Noise exposure	Use hearing protection or acoustic shielding when required by the operating environment.
Heat rise	Monitor liquid temperature. Use pulse mode, cooling, or lower power for heat-sensitive samples.
Splash and aerosol	Use covers, ventilation, and face/eye protection when handling volatile or hazardous samples.
Flammable systems	Do not use in flammable or explosive atmospheres unless the whole process has been formally approved.
Corrosive media	Confirm compatibility with TC4 titanium alloy, seals, and vessel materials before operation.

General Prohibitions

1. Do not touch the vibrating rod while ultrasonic output is active.
2. Do not immerse the converter, cable connectors, host, or power cord in liquid.
3. Do not modify service parameters without authorization.
4. Do not operate the equipment unattended during process development or unstable operating conditions.
5. Do not continue operation after abnormal noise, overload, leakage, overheating, or visible damage occurs.

VI. Converter and Vibrating Rod Assembly

The vibrating rod assembly is the main energy-transmitting component. It includes the converter connection area, flange mounting section, titanium alloy

rod body, and working end. The assembly shall be handled as a precision vibration component.



Figure 1 Representative ultrasonic vibrating rod

Part	Description and Precautions
Converter connection	Connects to the host cable and transfers high-frequency electrical energy to the converter.
Flange section	Provides mechanical mounting and sealing interface for compatible vessels or reactors.
Rod body	TC4 titanium alloy structure designed to transmit vibration energy to the working end.

Part	Description and Precautions
Working end	Main cavitation zone. Keep clean and free from dents, severe erosion, cracks, or bending.
Cable	Must be locked securely and kept dry. Avoid bending, crushing, or pulling the connector.

VII. Structure and Installation

Host and Rod Structure



Figure 2 Touch-screen ultrasonic generator host

Place the host on a stable, dry, ventilated bench. Keep enough clearance around the host for heat dissipation. The vibrating rod should be installed vertically unless the process and vessel design have been specifically validated for another orientation.

Flange Quick Connection

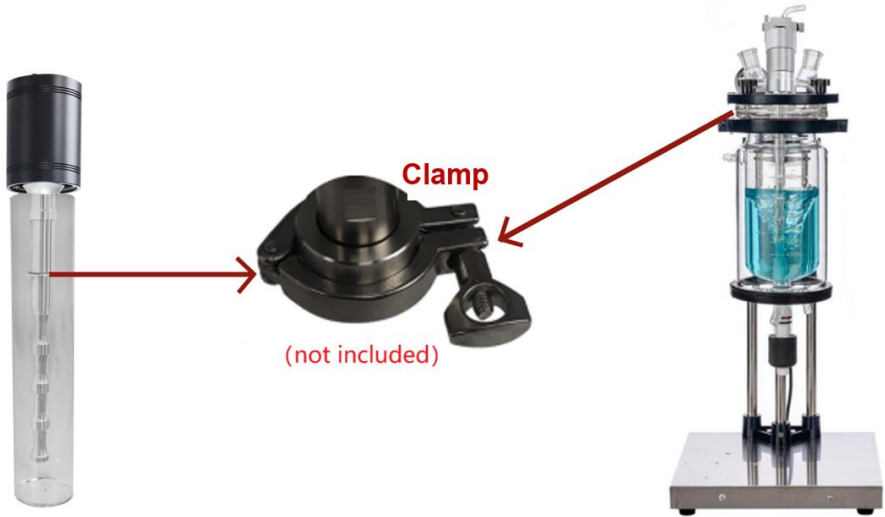


Figure 3 Quick flange connection diagram

1. Confirm that the vessel port, sealing parts, and clamp specifications match the vibrating rod flange.
2. Clean the sealing surface. It must be free from scratches, particles, fibers, and dried material.
3. Insert the vibrating rod vertically through the vessel port and position the working end in the effective treatment zone.
4. Install the seal and clamp, then tighten the clamp evenly to ensure stable fixation and sealing.
5. Rotate the agitator by hand, if used, to confirm that no collision with the rod can occur.
6. Connect the rod cable and temperature probe before connecting the host to the power supply.

VIII. Technical Parameters

Ultrasonic Generator Host

Item	Parameter
Applicable series	USS-FX00200 through USS-FX00210 ultrasonic vibrating rods
Power supply	110/220 V, 50-60 Hz
Frequency	19-26 kHz, real-time display
Ultrasonic output power	1000 W / 1500 W / 2000 W, model dependent
Timer	0.1 s - 99 h adjustable
Power adjustment	1%-100%, 1% step
Temperature warning	0-200 deg C adjustable
User programs	100 groups, settable and storable
Pulse interval	0.1 s - 60 min adjustable and storable
Operating modes	Pulse, Time, Continuous
Display	7-inch color touch screen, 800 x 480 resolution
Languages	Chinese / English
Main interface parameters	Temperature, frequency, probe selection, detection, service, temperature setting, power setting, ON/OFF, settings, parameter view, and user group
Start-up sweep and buzzer	Yes
Horn service life reference	400-450 h

Vibrating Rod Series: Mechanical Dimensions

SKU	Model	Rod Dia.	Power	Below Flange	Ti Rod	Total
JFFX00200	USS-FX00200	16 mm	1000 W	250 mm	305 mm	430 mm
JFFX00201	USS-FX00201	20 mm	1000 W	250 mm	305 mm	430 mm
JFFX00202	USS-FX00202	25 mm	1500 W	250 mm	305 mm	430 mm
JFFX00203	USS-FX00203	30 mm	2000 W	250 mm	305 mm	430 mm
JFFX00204	USS-FX00204	25 mm	1500 W	275 mm	340 mm	470 mm
JFFX00205	USS-FX00205	30 mm	2000 W	275 mm	340 mm	470 mm
JFFX00206	USS-FX00206	16 mm	1000 W	340 mm	395 mm	520 mm
JFFX00207	USS-FX00207	20 mm	1000 W	340 mm	395 mm	520 mm
JFFX00208	USS-FX00208	25 mm	1500 W	340 mm	395 mm	520 mm
JFFX00209	USS-FX00209	30 mm	2000 W	340 mm	395 mm	520 mm
JFFX00210	USS-FX00210	40 mm	2000 W	435 mm	500 mm	698 mm

Dimension Note Below Flange means the effective rod length below the mounting flange. Ti Rod means the titanium alloy rod length. Total means overall length of the vibrating rod assembly.

Vibrating Rod Series: Capacity and Mounting

Model	Processing Capacity	Matched Stirred Reactor	Mounting Method
USS-FX00200	1000-3000 mL (1-3 L)	5 L	Quick flange connection
USS-FX00201	1000-4000 mL (1-4 L)	5-10 L	Quick flange connection
USS-FX00202	2000-6000 mL (2-6 L)	5-10 L	Quick flange connection
USS-FX00203	2000-8000 mL (2-8 L)	10-20 L	Quick flange connection
USS-FX00204	2000-7000 mL (2-7 L)	10-20 L	Quick flange connection
USS-FX00205	3000-9000 mL (3-9 L)	10-20 L	Quick flange connection
USS-FX00206	2000-4000 mL (2-4 L)	5-10 L	Quick flange connection
USS-FX00207	2000-5000 mL (2-5 L)	5-10 L	Quick flange connection
USS-FX00208	3000-8000 mL (3-8 L)	10-20 L	Quick flange connection
USS-FX00209	4000-12000 mL (4-12 L)	20-30 L	Quick flange connection
USS-FX00210	10000-20000 mL (10-20 L)	30-50 L	Quick flange connection

Parameter Setting Guidance

Situation	Recommended Practice
First trial	Start with 20%-30% power and short pulses. Increase power only after confirming temperature and process response.
High-viscosity or high-solid systems	Ensure stable mechanical stirring first, then increase ultrasonic power gradually.
Heat-sensitive samples	Use a lower temperature warning limit, pulse mode, and external cooling.

Situation	Recommended Practice
Continuous processing	Check frequency, temperature, cable, and flange condition regularly. Long unattended operation is not recommended.

IX. Control Panel Overview



36.5 °C

It *displays* the real-time sample temperature and cannot be adjusted.



19.72 Khz

It *shows* the real-time frequency and cannot be modified.



Probe

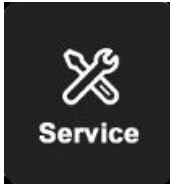
When using a new probe, please click the PROBE button, then select the corresponding probe diameter, save the settings, and return to the main interface.
*****Note:** This procedure must be performed each time a new probe is installed.



Detection

After connecting a new probe to the main unit, press the DETECTION button to initiate frequency tuning, ensuring proper matching between the probe and the generator.

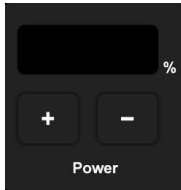
****If the machine is turned on before connecting the probe to the processor, the real-time frequency will not be displayed, and the processor cannot be started. In this case, press the DETECTION button to match the frequency.*



The **SERVICE** button is intended for after-sales support. If you encounter any issues, please contact us at service@ussolid.com. We will be happy to assist you.



This section **presents** the protection temperature you have set (non-adjustable).



This section is used to adjust the machine's power. **However, it is disabled during ultrasonic processing.** To adjust the power, please stop or pause the process first.



Press the **ON/OFF** button to start or stop the machine. *(To pause the machine during operation: Press the **PARAMETER** button. Then press the **PAUSE** button.)*

Pause vs. ON/OFF Explanation:

Pause: Temporarily halts the machine while preserving the elapsed processing time.

For example, in **TIMING** mode with a total working time of 30 minutes, if the machine has run for 5 minutes and you press **PAUSE**, it will stop temporarily. Pressing **PAUSE** again will resume operation from the 5-minute mark, continuing the remaining 25 minutes.

ON/OFF (Stop): Completely stops the processing and resets the timer.

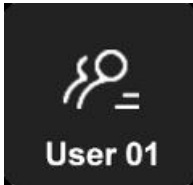
Using the same example, if you press the **ON/OFF** button during processing, the machine will stop entirely and reset the timer. The next time you start it, it will begin from 0 minutes, not from where it left off.



This icon is used to set the Model, Power, Overload Protection Temperature, and Working Time. It is unavailable while the machine is operating.



This symbol is used to check the parameters you have set while the machine is running.



This symbol is used for configuring or selecting a user

X. Operating Instructions

Pre-use Inspection

1. Check the host, vibrating rod, cable, flange, clamp, seals, power cord, and fuses for visible damage.
2. Confirm that the power supply voltage, frequency, and grounding meet equipment requirements.
3. Confirm that the vessel contains enough liquid for the working end to be fully immersed.
4. Confirm that the agitator blade, temperature probe, baffle, and vibrating rod cannot collide.
5. Evaluate sample hazards and prepare cooling, ventilation, splash protection, and PPE when needed.

Installation and Wiring

1. Place the host on a stable, dry, ventilated surface and keep heat-dissipation clearance.
2. Install the vibrating rod by the quick flange connection and lock the clamp securely.
3. Insert and lock the vibrating rod cable into the corresponding host connector.

4. Connect the temperature probe if temperature warning or monitoring is required.
5. Connect the power cord only after confirming that the host power switch is off.

Warning

A. 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.

B. Before powering on the machine, verify that the voltage switch on the back is set to the local voltage. Incorrect settings may cause permanent damage to the machine.

If the text on the voltage switch on the back of the machine reads "115V," it indicates that the machine can be connected to a 110V, 60Hz power supply.

If the text on the voltage switch reads "230V," it means the machine is compatible with a 220V, 50Hz power supply.



Figure 5 Vibrating rod immersed in vessel

Start-up, Detection, and Parameter Setting

1. Turn on the host power switch and wait for the touch screen to enter the main interface.
2. Enter the probe selection page, select the matching probe setting, and save it.
3. Tap Detection and wait until frequency detection is completed and the buzzer prompt is heard.
4. Enter Setting and select Continuous, Time, or Pulse mode.
5. Set output power, total time, pulse output time, pulse interval, and temperature warning value.
6. Save the parameters to a user group for repeated use.

7. Press SETTING and tap the green-boxed area on the screen to set it up. There are 3 Operating Modes:

Continuity: Operates continuously until manually shut down.

Timing: Counts upward until the preset total running time is reached.

Pulse: Alternates between on and off periods, stopping once the total running time is completed.

Continuity Mode	Timing Mode
 The Continuity Mode interface features a dark background with green text and input fields. On the left, there are three sections: 'Model' with a dropdown menu set to 'CONTINUITY', 'Power' with a percentage slider, and 'Overload Protection Temperature' with a temperature slider in °C. On the right, there is a large empty rectangular area. At the bottom right, there are two buttons: 'Save' (with a floppy disk icon) and 'Home' (with a house icon).	 The Timing Mode interface is similar to the Continuity mode but includes a 'Total Running Time' section on the right with three input fields for hours (H), minutes (M), and seconds (S). The 'Model' dropdown is set to 'TIMING'. The 'Power' and 'Overload Protection Temperature' sections are on the left, and the 'Save' and 'Home' buttons are at the bottom right.
Pulse Mode	
 The Pulse Mode interface includes additional settings for pulse timing. It has the same 'Model' dropdown (set to 'PULSE'), 'Power' slider, and 'Overload Protection Temperature' slider on the left. On the right, there are three sections: 'Total Running Time' (H, M, S), 'Pulse ON Time' (M, S), and 'Pulse OFF Time' (M, S). The 'Save' and 'Home' buttons are at the bottom right.	

8. Press **SAVE** and then press **HOME** to go back to the main interface.

9. Press **ON/OFF** button to start the processing.

Starting and Monitoring Operation

1. Confirm that the working end is immersed, the vessel is fixed, and personnel are away from splash areas.
2. Press **ON/OFF** to start ultrasonic output.
3. Monitor real-time frequency, temperature, liquid surface, sound, vessel vibration, and sample change.
4. Pause or stop the device before adjusting power or process parameters where required.
5. Stop immediately if abnormal noise, overheating, overload, splashing, leakage, or insufficient liquid level occurs.

Shutdown and Cleaning

1. After processing, press **ON/OFF** to stop ultrasonic output and wait for the rod to stop completely.
2. Turn off the host power switch and disconnect the power cord.
3. After the rod cools, loosen the clamp and remove the rod carefully without striking the working end.
4. Rinse the working end and outer surface with a cleaning liquid compatible with the sample.
5. Rinse with clean or deionized water, then dry with a lint-free cloth.
6. After cleaning, inspect the working end for wear, corrosion, cracks, or looseness.

Do Not Immerse Do not immerse the converter, cable connector, host interface, or host housing in liquid. Do not wash connectors directly with a high-pressure water jet.

Suggested Process Records

Record Item	Example
Sample information	Volume, solid content, viscosity, temperature sensitivity, solvent system
Device settings	Power, mode, output/interval time, total time, temperature limit, user group
Installation condition	Immersion depth, bottom clearance, stirring speed, vessel geometry
Processing result	Temperature rise, dispersion state, particle size, extraction yield, appearance, or other process indicators

XI. Cleaning, Maintenance, and Troubleshooting

Routine Maintenance

Interval	Item	Requirement
Before each use	Appearance and connection	Check host, power cord, cable, connector, flange, clamp, and seals.
Before each use	Installation clearance	Confirm that the rod cannot touch the vessel, agitator, baffle, or temperature probe.
After each use	Cleaning and drying	Clean the working end and flange sealing surface. Keep connectors dry.
Regularly	Working-end surface	Check for cavitation erosion, roughness, corrosion, or cracks.
Regularly	Electrical safety	Check grounding, plug, fuse, and cable insulation. Stop use if damaged.
Accumulated hours	Horn service life	Reference life is 400-450 h. Replace if performance drops or wear is obvious.

Common Faults and Remedies

Symptom	Possible Cause	Remedy
No display on host	Power not connected, switch off, or fuse damaged.	Check power, switch, socket, and fuse. Contact service if abnormal remains.
No real-time frequency or cannot start	Rod not connected, loose cable, or detection not performed.	Power off, reconnect cable, restart, and run Detection.

Symptom	Possible Cause	Remedy
Abnormal frequency or overload	Probe mismatch, dry running, low liquid level, or working end touching hard parts.	Stop and check immersion depth, clearance, probe setting, and connection.
Abnormal noise	Loose flange, unlocked clamp, collision, or air entrainment.	Stop, refix the assembly, adjust liquid level and stirring condition.
Processing effect decreases	Insufficient power/time, sample too viscous, or worn working end.	Optimize power and pulse settings, improve stirring, and inspect the rod surface.
Temperature rises too fast	Power too high, continuous time too long, or insufficient cooling.	Reduce power, use Pulse mode, and improve cooling.
Leakage at flange	Damaged seal, tilted installation, or insufficient clamp pressure.	Stop, depressurize if applicable, replace seal, and reinstall.

Service Note Problems involving the host internal circuit, converter internal structure, service password, power module, or frequency control module shall be handled by the manufacturer or authorized service personnel.

XII. Packing List, Storage, and Transportation

Standard Packing List

Item	Quantity
Ultrasonic generator host	1 set
Ultrasonic vibrating rod	1 set
Power cord	1 pc
Connection cable	1 pc
Fuse	3 pcs
Temperature detection sensor	1 pc



Figure 6 Standard package example

Storage and Transportation

1. Before transportation, clean and fully dry the vibrating rod.
2. Use the original package or equivalent shock-resistant packaging to fix the host, rod, and accessories.
3. Do not allow the working end of the rod to bear impact, bending load, or direct contact with hard metal parts.
4. For long-term storage, keep the equipment in a dry, ventilated, non-corrosive environment away from strong magnetic fields, heat sources, and direct sunlight.
5. After long-term storage, inspect wiring, insulation, flange seal, and working-end condition, then run frequency detection before use.

End of Manual

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