
USER'S GUIDE

AUTOTUNE SERIES ULTRASONIC ATOMIZER

50 Watt Model
20 kHz & 40 kHz

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WARRANTY

Your Ultrasonic Atomizer is warranted and backed by the manufacturer for a period of **three years** from the date of shipment against defects in material and workmanship under normal use as described in this instruction manual. During the warranty period, the manufacturer will, at its option, as the exclusive remedy, either repair or replace without charge for material and labor, the part(s) which prove to be defective, provided the unit is returned to us properly packed with all transportation charges prepaid.

Ultrasonic probes are guaranteed against defects for a period of one year from date of shipment. A defective probe will be replaced once without charge, if failure occurs within the warranty period. Wear resulting from cavitation erosion is a normal consequence of ultrasonic atomization, and is not covered by this warranty. Because of the chemically aggressive nature of some liquids, the warranty does not cover damages caused by any liquids which are chemically incompatible with the atomizing probe.

The manufacturer neither assumes nor authorizes any person to assume for it any other obligations or liability in connection with the sale of its products. The manufacturer hereby disclaims any warranty of either merchantability or fitness for a particular purpose. No person or company is authorized to change, modify, or amend the terms of this warranty in any manner or fashion whatsoever. Under no circumstances shall the manufacturer be liable to the purchaser or any other person for any incidental or consequential damages or loss of goodwill, production, or profit resulting from any malfunction or failure of its product.

This warranty does not apply to equipment that has been subject to unauthorized repair, misuse, abuse, negligence or accident. Equipment which, shows evidence of having been used in violation of operating instructions, or which has had the serial number altered or removed, will be ineligible for service under this warranty.

All probes are manufactured to exacting specifications and are tuned to vibrate at a specific frequency. Using an out-of-tune probe will cause damage to the equipment and may result in warranty nullification. The manufacturer assumes no responsibility for probes fabricated by another party or for consequential damages resulting from their usage.

The aforementioned provisions do not extend the original warranty period of any product that has either been repaired or replaced by the manufacturer.

IMPORTANT SAFEGUARDS

READ BEFORE INSTALLING OR USING THE EQUIPMENT

Your Ultrasonic Atomizer has been designed with safety in mind. However, no design can completely protect against improper usage, which may result in bodily injury and/or property damage. For your protection and equipment safeguard, observe the following warnings at all times, read the operating instructions carefully before operating the equipment, and retain this instruction manual for future reference. If the Ultrasonic Atomizer is used in a manner contrary to that specified in this instruction manual, the protection features designed into the unit may be impaired.

- When mounting the probe, always clamp the converter housing. Never clamp the probe.
- High voltage is present in the power supply. Do not remove the cover. Refer all servicing to qualified service personnel.
- To avoid electric shock, disconnect the electrical power cord before removing the cover prior to servicing.
- Never operate the power supply unless it is connected to the converter.
- Never secure anything to the probe, except at the nodal point (point of no activity).
- Never touch a vibrating probe.
- Never allow an atomizing probe to vibrate in air for more than 10 seconds without liquid flowing through it.
- Air cool the converter when the liquid temperature exceeds 100° C, and when working at high intensity for more than 30 minutes.
- It is recommended that ear protection be used when operating the Ultrasonic Atomizer.

GENERAL INFORMATION

The ultrasonic power supply converts 50/60 Hz line voltage to high frequency electrical energy at 20 kHz or 40 kHz (20,000 or 40,000 cycles per seconds), depending on the model. This high frequency electrical energy is transmitted to the piezoelectric transducer within the converter, where it is changed to mechanical vibrations. The ultrasonic vibrations are intensified by the probe and focused at the tip where the atomization takes place. The liquid travels through the probe, and spreads out as a thin film on the atomizing surface. The oscillating tip disintegrates the liquid into micro-droplets, and ejects them to form a gentle, low velocity spray.

Unlike conventional atomizing nozzles that rely on pressure and high-velocity motion to shear a fluid into small drops, the ultrasonic atomizer uses only low ultrasonic vibrational energy for atomization. The liquid can be dispensed to the atomizing probe (nozzle) by either gravity or a small low-pressure metering pump, and atomize continuously or intermittently. The rate at which the liquid is atomized depends, within limits, solely on the volume that is being delivered onto the atomizing surface, and the frequency.

Typically, the higher the frequency, the lower the processing capability. The amount of material atomized can be as little as 2 $\mu\text{l}/\text{sec}$. Because the droplets typically drift downward at low velocity under the influence of gravity, the probe should be mounted with tip facing downward, and air disturbances kept to a minimum. A wide variety of coatings, chemicals, lubricants, and particulate suspensions can readily be atomized. However, factors such as viscosity, miscibility, and solid content deserve consideration. For optimum atomization, the viscosity should be under 50 cps and the solid concentration kept below 30%. Because the atomization process depends on setting a liquid film into motion, typically the higher the viscosity – the lower the flow rate, and the more difficult the application. The atomization of liquids containing long-chained polymer molecules is problematic, even in diluted form, due to the highly cohesive nature of the material. In many cases, mixtures with particulates can be atomized, because the solids are simply carried along in the drops. The low transport velocity of the liquid through the probe permits even abrasive slurries to be processed with negligible erosion of the passageway. Compared with conventional pressurized nozzles, the feed channel running through the probe and exit orifice are relatively large, and practically uncloggable. Drop size is primarily a function of frequency, and the higher the frequency, the smaller the drop diameter. The median drop size at 20 kHz is 100 microns, and 60 microns at 40 kHz.

Atomizing probes are one-half wavelength long tools that act as mechanical transformers to increase the amplitude of vibration generated by the converter. They are fabricated from high grade titanium alloy Ti-6Al-4V because of its high tensile strength, good acoustical properties at ultrasonic frequencies, high resistance to corrosion, low toxicity, and excellent resistance to cavitation erosion. Because the frequency dictates the length of the probe high frequency nozzles are smaller, produce smaller drops, and have lesser flow capacity than nozzles operating at lower frequencies.

SECTION 1 – INSTALLATION

INSPECTION

Prior to installing the Ultrasonic Atomizer, perform a visual inspection to detect any evidence of damage, which might have occurred during shipment. Before disposing of any packaging material, check it carefully for small items.

The Ultrasonic Atomizer was carefully packed and thoroughly inspected before leaving our factory. The carrier, upon acceptance of the shipment, assumed responsibility for its safe delivery. Claims for loss or damage sustained in transit must be submitted to the carrier.

If damage has occurred, contact your carrier within 48 hours of the delivery date. **DO NOT OPERATE DAMAGED EQUIPMENT.** Retain all packing materials for future shipment.

ELECTRICAL REQUIREMENTS

The Ultrasonic Atomizer requires 24 volts DC. A universal 100V~240V, 50/60 Hz AC to DC switching mode power supply capable of delivering 24 volts at 2.5 amperes is supplied with your atomizer.

INSTALLING THE ULTRASONIC ATOMIZER

The Ultrasonic Atomizer should be installed in an area that is free from, air drafts, excessive dust, dirt, explosive and corrosive fumes, and extremes of temperature and humidity.

SECTION II – OPERATION

FUNCTIONS OF CONTROLS, INDICATORS, AND CONNECTORS

FRONT PANEL	
Power ON/OFF switch	When depressed switches the power ON or OFF. Illuminates when power is on.
AMPLITUDE control	When rotated controls the amplitude of vibration at the probe tip. Ten revolutions enables fine amplitude adjustment.
ULTRASONICS indicator	Lights when the ultrasonics is energized.

REAR PANEL	
BNC connector	Connects to the converter.
Footswitch jack	Connects to the footswitch or remote actuation cable.
Power supply jack	Connects to the 24 volt power supply.

PREPARATION FOR USE

1. Mount the converter / probe assembly in a stand. Secure the clamp to the 1 ¼" (32 mm) diameter converter housing only. Do not secure the clamp to any other portion of the converter / probe assembly.
2. Connect the converter to the power supply.

NOTE

If the probe is not attached to the converter observe the following:

- a. Check for cleanliness the mating surfaces of the converter and probe, as well as the threaded stud and hole.
- b. Hand assemble the probe to the converter, and using two wrenches, tighten securely.

3. Rotate the AMPLITUDE control fully counterclockwise.
4. Connect the 24 volt power supply to the ultrasonic power supply.
5. Plug the 24 volt power supply into the electrical outlet. If the ON/OFF switch illuminates, depress it to de-energize the unit.
6. Connect the converter to the liquid delivery system.

SECTION III – OPERATING SUGGESTIONS

It is recommended that plastic tubing chemically compatible with the liquid to be atomized be used to connect the liquid delivery system to the converter. Because soft tubing can easily expand and contract, making it difficult to accurately control the flow of the liquid in critical applications, tubing elasticity should be given consideration, in intermittent applications where the flow will be rapidly interrupted.

For optimum performance, the diameter of the plastic tubing connecting the inlet side of the delivery system should be larger than the diameter of the tubing used to connect the delivery system to the converter.

Delivery systems such as valveless metering pumps, syringe pumps or gear pumps are best suited for atomization because their dispensation is steady and uniform.

Valveless metering pumps and syringe pumps are recommended for critical applications. Peristaltic and piston pumps produce a pulsating flow which is detrimental for many atomizing applications. They can however give satisfactory performance when used in conjunction with pulse dampening devices. Gravity feed systems could be considered for non-critical applications. Pressure reducing regulators should be used when working with high pressure delivery systems.

Optimum atomization can only be obtained by empirically adjusting the amplitude and flow rate. Typically the greater the flow rate, the greater the amplitude required.

However, consideration should be given not to set the amplitude too high in order to prevent uneven atomization and probe cavitation. With very small volumes, a point is reached where the flow rate is so low that inconsistent erratic atomization will take place. The probe should be energized only when there is liquid flowing through it, and for no more than 10 seconds after dispensation of the liquid. Keeping the probe energized for more than 10 seconds without liquid flowing through it will cause the probe to overheat, adversely affecting the atomizing process. Always energize the ultrasonics before starting the flow of liquid, and always terminate the liquid flow prior to de-energizing the ultrasonics. When it is necessary to atomize a liquid intermittently, it is best to keep the ultrasonics on, and cycle on and off the liquid flow to the probe.

Do not operate the probe when the ambient temperature or temperature of the liquid exceeds 158°F (70° C).

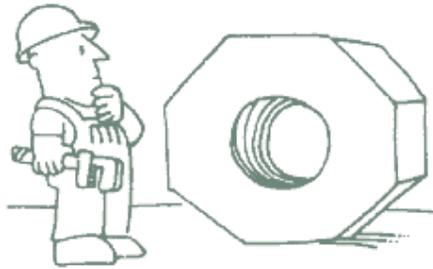
SECTION IV – USING THE ULTRASONIC ATOMIZER

CAUTION

- Do not operate the ultrasonic power supply unless it is connected to the converter
- High voltage is present in the power supply – do not operate with the cover removed.

1. Depress the ON/OFF switch to energize the unit. The switch will illuminate.
2. Rotate the AMPLITUDE control two full rotations clockwise.
3. Turn the liquid delivery system on.
4. Empirically determine the best flow rate / amplitude combination.
5. If a footswitch or remote actuation device is used, depress the ON/OFF switch to turn the ultrasonics off, plug in the footswitch or remote actuation device into the footswitch jack, and depress the ON/OFF switch again to turn the ultrasonics back on. Depressing the footswitch, or closing the contact on the remote actuation device connected to the footswitch jack, will energize the ultrasonics.

SECTION V – SERVICE INFORMATION



Your Ultrasonic Atomizer was designed to provide you with years of safe and dependable service. Nevertheless, because of component failure or improper usage, the possibility does exist that it might not perform as it should, or that it will stop working all together. The most probable cause for malfunction is listed below and should be investigated.

- The 24 volt power supply is not connected to the electrical wall outlet or unit.
- The atomizing probe is clogged or not secured properly.
- The overload protection fuse inside the unit has opened, and will reset automatically after the cause of the problem has been corrected.
- The liquid delivery system is not working properly

OVERLOAD CONDITION

For dependable operation, the power supply is equipped with a resetable fuse which will automatically de-energize the Ultrasonic Atomizer should the power requirement exceed 50 watts. If the Ultrasonic Atomizer stops working turn the unit off for approximately 30 seconds then turn the unit back on. If the unit continues to go into an overload condition, turn the unit off, investigate the cause of the problem, and contact the manufacturer.

RETURN OF EQUIPMENT

It is suggested that an Ultrasonic Atomizer in need of repair be sent back to the factory.

In order to receive prompt service; always contact the factory before returning any instrument. Include date of purchase, model number and serial number. For instruments not covered by the 3-year warranty, a purchase order should be forwarded to avoid unnecessary delay. Care should be exercised to provide adequate packing to insure against possible damage in shipment. The Ultrasonic Atomizer should be sent to the “Service Department” with all transportation charges prepaid and return of shipment indicated.

Please obtain a *Return Authorization Number* prior to returning the instrument.

IMPORTANT

I CERTIFY THAT THE ULTRASONIC ATOMIZER AND / OR ACCESSORIES RETURNED FOR REPAIR ARE FREE OF ANY BIOHAZARDOUS OR RADIOACTIVE MATERIAL AND ARE SAFE FOR HANDLING.

DO NOT RETURN ANY EQUIPMENT UNLESS SUCH CERTIFICATION CAN BE MADE.