

Ultrasonic Processing

Ace Glass offers a variety of Ultrasonic Processing products and systems that cover a wide range of applications, including: life sciences, nanotechnology, emulsions, soil testing, environmental sample processing, cell culture, cell disruption, sonochemistry, and drug development. They can also be used for general super-mixing applications in liquid processing where a very small sample is needed, or where the sample is hard to mix or insert into a solution or dispersion. Ace takes the application one step further, as we add our glass expertise and our Ace-Threds to make glass vessels to match the horn selection. Add a power supply for a complete system, or a reactor for sample ultra-mixing and liquid processing.

About Ultrasonics

The Ultrasonic power supply converts 50/60Hz voltage to high frequency electrical energy. This alternating current voltage is applied to disc-shaped, ceramic, piezoelectric crystals within the converter head, causing them to expand and contract with each change of polarity. These longitudinal vibrations are amplified by the horn and transmitted into the liquid mixture as alternating high and low pressure ultrasonic waves. The pressure fluctuations pull the liquid molecules apart, creating millions of micro-bubbles (cavities), which expand during the low pressure phases and implode violently during the high pressure phases. As the bubbles collapse, millions of shock waves, micro-streams, eddies, and extremes in pressure and temperature are generated at the implosion sites. This phenomenon, known as cavitation, lasts but a few microseconds, and while the amount of energy released by each bubble is minimal, the cumulative amount of energy generated is extremely high. This process is self-stimulating because the imploding bubbles create new sites for bubbles to form. The high shear energy delivered is maximized near the tip of the horn, and also decreases the farther the tip is from the solution.

Applications for Ultrasonic Processing:

- Cell Culture
- Soil Sample Prep
- Nanotechnology
- Drug Development
- Agriculture
- Sonochemistry
- Super Mixing
- Colloids, Dispersions
- Emulsions
- Homogenization
- Tissue or Cell Disruption
- Photochemistry

Helpful Hints for Ultrasonics

- As tip size decreases, intensity increases, at a given power setting.
- Almost all activity takes place immediately below the tip.
- Tips **MUST** be kept submerged during operation.
- Horns (probes) or extenders **MUST** be held **ONLY** at the node (nodal point).
- Tips 1/4" and smaller **CANNOT** be operated at full power output. Follow directions provided with power supply.
- Side of horn, extender or tip of probe should **NEVER** touch vessel walls.
- Most reactions work better when solution is kept cool.
- In many reactions the probe itself may provide enough turbulence and additional stirring usually is not necessary unless very viscous materials or heavy metal catalysts are used.
- For large-volume reactions, consider multi-neck vessels since mechanical stirring might be necessary.
- Removable tips have been sometimes problematic as liquid may seep into gaps between probe and tip. Many scientists have no problem with this and find the economy of the removable tip important. However, it is important to remove, clean and polish the tip regularly to avoid cross-contamination and excessive wear.

REACTION ASSEMBLY *Small Volume*

Complete reaction assembly with parts necessary to perform mixing and reactions from 6mL to 250mL. Includes three borosilicate glass vessels, power supply with converter, 1/2" horn, 1/2" extender, slide adapter, and clamp. For details of each item, see individual listings.

CE approved.

Complete

Capacity, mL	Order Code
6 to 200	9830-25 ★

Description	Qty	Order Code
System Components		
Ultrasonic power supply, 750w	1	9810-24 ★
Horn, 1/2", Threaded Tip	1	9814-25 ★
Extender, 1/2" x 5"	1	9816-06 ★
Clamp, Heavy Duty	1	9825-21 ★
Slide Adapter, 25mm, Body only	1	9852-21 ♠
25mm Ace-Thred Nylon Bushing	1	7506-10 ♠
Vessel, Tapered, 250mL, #25 Center, (3) 14/20 sides	1	9833-05 ♠
Vessel, 6-10mL, #25 Center, (2) 14/20 sides, Body only	1	9843-04 ♠
Vessel, 10-50mL, #25 Center, (2) 14/20 sides, Body only	1	9844-07 ♠
36mm Ace-Thred Nylon Bushing	4	7506-12 ♠


REACTION ASSEMBLY *Large Volume*

Complete reaction assembly with parts necessary to perform ultrasonic reactions and mixing from 250mL to 1800mL. Includes (3) borosilicate reactors, power supply with converter, 3/4" horn, 3/4" extender, slide adapter and clamp. For details of each item, see individual listings.

CE approved.

Complete

Capacity, mL	Order Code
250 to 1800	9831-40 ★

Description	Qty	Order Code
System Components		
Ultrasonic power supply, 750w	1	9810-24 ★
Horn, 3/4", Threaded Tip	1	9814-27 ★
Extender, 3/4" x 5"	1	9816-08 ★
Clamp, Heavy Duty	1	9825-21 ★
Vessel, Tapered, 500mL, #36 Center, (3) 24/40 sides	1	9833-12 ♠
Vessel, Tapered, 1000mL, #36 Center, (3) 24/40 sides	1	9833-16 ♠
Round Bottom Flask, 2000mL, #36 Center, (3) 24/40 sides	1	9837-20 ♠
36mm Ace-Thred Nylon Bushing	3	7506-12 ♠



CE approved.

**POWER SUPPLY** *Vibra-Cell, VCX 750* ★

- Volumes and continuous flow volumes up to 5 gallons/19 liters per hour
- ON/OFF, 1 to 59 seconds pulser, a one-second to 10-hour timer
- Integral temperature controller to prevent overheating of sample
- 15lbs. (6.8k.g.) & 7-1/2" x 13-1/2" x 8-1/2" (235 x 190 x 340mm)

Ultrasonic power supply for superior mixing with automatic amplitude and frequency control circuitry that eliminates the need for constant adjustments, assuring optimum cavitation at any power level. Auto tuning that matches the power supply to the converter/probe assembly and does not have to be manually tuned each time the probe is changed or the unit is turned on, exclusive energy (Joule) setpoint circuit, nonvolatile memory function for storing up to ten preset operating programs, tactile keypad with user friendly menu-driven LCD display, elapsed time/run time timer, and power (watts) readout, integral temperature controller. Three-year unconditional warranty on power supply and converter. Shipped complete and ready for operation with a 1/2" (13mm) probe with replaceable tip, tool kit, and instruction manual.

Note: Not supplied with horn, glass reactors or temperature probe (order separately).

Power Output, W	Output Frequency, kHz	Power Input, Volts	Input Frequency, Hz	Order Code
750	20	117	50/60	9810-24

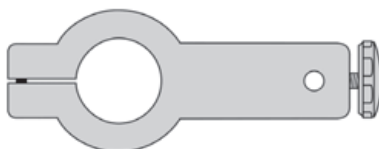
CE approved.

**ULTRASONIC PROCESSOR** *Low-Volume Applications, VCX 130* ★

- Process samples from 150 microliter to 150mL
- ON/OFF, 1 to 59 seconds pulser, a one-second to 10-hour timer
- Ideal for cell disruption, sample preparation, or homogenization
- 7 lbs. (3k.g.) & 4-1/2" x 9-3/4" x 12-1/2" (115 x 250 x 320mm)

This ultrasonic power supply is microprocessor controlled, and features automatic tuning to eliminate the need for constant adjustment, a digital wattmeter that displays the amount of power delivered to the probe, an elapsed-time indicator that displays the duration the ultrasonics have been on, and an energy monitor that displays the amount of Joules transmitted to the probe. The variable power output control allows the ultrasonic vibrations at the probe tip to be set to any desired amplitude. Shipped complete and ready for operation with a 1/4" (6mm) probe, tool kit, and instruction manual.

Power Output, W	Output Frequency, kHz	Power Input, Volts	Input Frequency, Hz	Order Code
130	20	117	50/60	9811-05

**CLAMP** *Heavy Duty* ★

For supporting 2-1/2" diameter converter securely in place. Fabricated from 3/4" thick aluminum, anodized black, this clamp fits 1/2" or 5/8" diameter rod and is secured by an Allen head screw to (750W) converter.

Fits Rod O.D., in	Order Code
1/2 or 5/8	9825-21

**BOOSTER** ★

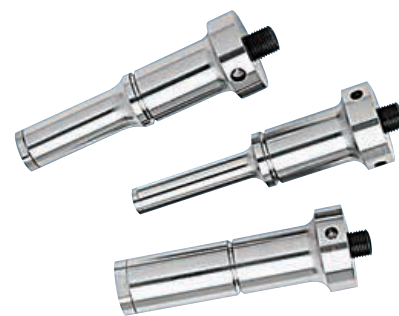
When connected between the converter and 9814 horn, the booster increases the amplitude of vibration at the horn tip by a factor of two. Use to process very difficult applications.

Order Code
9822-20

HORN ★

Basic ultrasonic horns (probes) that focus the ultrasonic energy into the liquid. For use with 9810 power supplies. Fabricated from high grade titanium, these horns are autoclavable and have an O-Ring groove at nodal point that allows a tight fit in #36 Ace-Thred without affecting sonic output. Available with solid end (fixed-length) or threaded end to accept replaceable tips, microtips or extenders.

Note: Supplied with 1/2"-20 stud for connection to converter on power supply.



Tip O.D., in	Length Below Groove*, in	Intensity	Volume (Batch)	Amplitude (micro meter**)	Order Code
1/2	2-1/2	High	10-250mL	120	9814-06
3/4	2-3/8	Medium	25-500mL	60	9814-08
1	2	Low	50-1000mL	30	9814-11

Solid End Type
Threaded End Type

1/2	2-1/2	High	10-250mL	120	9814-25
3/4	2-3/8	Medium	25-500mL	60	9814-27
1	2	Low	50-1000mL	30	9814-30

*Length below groove for threaded horn is with removable tip.

**With output control set at 10.

EXTENDER ★

Titanium extender screws into threaded end of ultrasonic horn. This accessory lengthens the horn (probe) by 5" for more versatility. Extenders have solid ends. 1/2" extender for use with #15 Ace-Thred. Order extender diameter to match horn diameter.

Extender O.D., in	Length, in	Number of Grooves	Volume (Batch)	Amplitude (micro meter*)	Order Code
1/2	5	1	6-250mL	120	9816-06
3/4	5	0	25-500mL	60	9816-08
1	5	0	50-1000mL	30	9816-10

*With output control set at 10.


TIP Replaceable, Titanium ★

Tips showing signs of wear should be polished with fine emery cloth. This procedure can be repeated until difficulties are encountered when tuning the power supply, then tips should be replaced. For use with threaded horns only.

For Horn Size, in	Qty	Order Code
1/2	1	9820-12
3/4	1	9820-14
1	1	9820-18



Do not use probes with replaceable tips when processing samples containing solvents or low surface tension liquids.



REACTION VESSEL *Tapered, 4-Neck* ♠

Fabricated from borosilicate glass with walls tapered inward toward bottom to allow operation with smaller volumes. Use 7506-10 bushing and O-Ring in #25 Ace-Thred, 7506-12 bushing and O-Ring in #36 Ace-Thred to form a leak-tight compression seal with all 9814 Horns with groove and 9852-41 or 9852-45 slide adapter. Stated capacity is WITHOUT horn. See *Horn & Extenders Selection Guide* below, for proper horn size.

Note: Vessel NOT supplied with bushing or O-Ring, order separately.

Capacity, mL	Center Neck, Ace-Thred, #	Side Necks, Standard Taper	Order Code
250	25	(3) 14/20	9833-05
500	36	(3) 24/40	9833-12
1000	36	(3) 24/40	9833-16
2000	36	(3) 24/40	9833-21

Accessories

Description	Order Code
#25 Nylon Bushing w/FETFE O-Ring	7506-10
#36 Nylon Bushing w/FETFE O-Ring	7506-12



REACTION VESSEL *Round Bottom, 4-Neck* ♠

Borosilicate glass, round-bottom vessel. Use 7506-10 bushing and O-Ring in #25 Ace-Thred, 7506-12 bushing and O-Ring in #36 Ace-Thred to form a leak-tight compression seal with all 9814 Horns with groove and 9852-41 or 9852-45 slide adapter. Center neck can be used for mechanical stirring if needed. Stated capacity is WITHOUT horn. See *Horn & Extenders Selection Guide* below, for proper horn size.

Note: Vessel NOT supplied with bushing or O-Ring, order separately.

Capacity, mL	Center Neck, Standard Taper	Side Necks, Standard Taper	Side Neck, Ace-Thred, #	Order Code
500	24/40	(2) 24/40	25	9837-09
1000	24/40	(3) 24/40	36	9837-14
2000	24/40	(3) 24/40	36	9837-20

Accessories

#25 Nylon Bushing w/FETFE O-Ring	7506-10
#36 Nylon Bushing w/FETFE O-Ring	7506-12

Horns & Extenders Selection Guide

Horn O.D. (inches) / ACE Code	Vessel Family:	9833 Series				9837 Series		
	Vessel Order Code / Size (mL):	-05/ 250	-12/ 500	-16/ 1000	-21/ 2000	-09/ 500	-14/ 1000	-20/ 2000
	Extender size (inches / ACE code)							
1/2" / 9814-25	1/2" x 5" / 9816-06	A	F	F	F	A	F	F
3/4" / 9814-27	3/4" x 5" / 9816-08	N/A	F	F	F	N/A	F	F
1" / 9814-30	1" x 5" / 9816-10	N/A	F	F	F	N/A	F	F

F — Horn is used as-is "fixed" length only

A — Horn is adjustable and must be used w/9852 slide adapter

N/A — Either don't need or doesn't fit vessel

FLO-THRU REACTOR

Continuous-flow borosilicate glass vessel provides uniform treatment by forcing reactant to pass in front of horn tip. Reactants are pumped through side port, overflowing inner cup and out through bottom port. Treated material drains completely (no hang-up). Use of 9852-41 slide adapter at top allows probe position to be varied within the inlet cup area. Inlet and outlet tubes are 1/2" O.D. (13mm). #7 Ace-Thred located below top thread is for bleed or vacuum connection. Operated in vertical position only. *Slide adapter and horn must be ordered separately.*

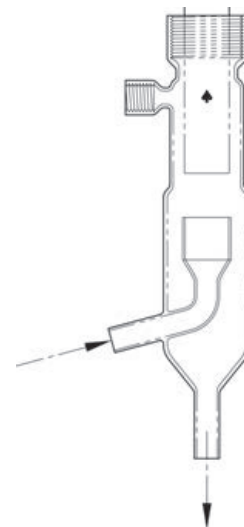
Description	Order Code	
Reactor Body, only	9841-18	♣
#7 PTFE Plug, only	5803-05	♣
#25 Nylon Bushing w/FETFE O-ring	7506-10	♣

Complete

	9841-30	♣
--	---------	---

Accessories

1/2" Horn	9814-25	★
1/2" Extender	9816-06	★
#25 Slide Adapter	9852-41	♣



REACTION VESSEL *Small Volume, 6mL-10mL* ♣

Tapered walls and proper size horn allow volumes as little as 6mL to be mixed. Fabricated of borosilicate glass with #25 Ace-Thred center neck and (2) 14/20 side necks. With 7506-10 bushing, center neck will accept 9852-41 slide adapter with 9814-25 horn and 9816-06 extender. Vessel measures 123mm (4-7/8") high.

Description	Order Code	
Reactor Body, only	9843-04	
#25 Nylon Bushing w/FETFE O-ring	7506-10	

Complete

	9843-25	
--	---------	--

Accessories

#25 Slide Adapter	9852-41	
-------------------	---------	--



REACTION VESSEL *Small Volume, 10mL-50mL* ♣

For small-scale reactions and mixing, 10mL in bottom well and up to 50mL in main body. With #25 Ace-Thred center neck and (2) 14/20 side necks. With 7506-10 Bushing, center neck will accept 9852-41 Slide Adapter with 9814-25 horn and 9816-06 extender. Vessel measures 120mm (4-3/4") high (including thread).

Description	Order Code	
Reactor Body, only	9844-07	
#25 Nylon Bushing w/FETFE O-ring	7506-10	

Complete

	9844-19	
--	---------	--

Accessories

#25 Slide Adapter	9852-41	
-------------------	---------	--





REACTION VESSEL Jacketed, 250mL

Similar to 9833-05 vessel, except jacketed, to provide active cooling from tap water or mechanical cooler. Jacket is cylindrical with flat bottom for greater stability. With #25 Ace-Thred center neck and (3) $\frac{1}{4}$ 14/20 side necks. Use 7506-10 bushing with O-Ring in center neck to secure 9852-41 slide adapter for connecting converter.

Description	Order Code	
Vessel, only	9848-07	★
#25 Nylon Bushing w/FETFE O-Ring	7506-10	♣

Complete

	9848-35	★
--	---------	---

Accessories

#25 Slide Adapter	9852-41	♣
-------------------	---------	---



REACTION VESSEL Jacketed, 10mL-50mL

Similar to 9844-07 vessel, except jacketed, to provide active cooling from tap water or mechanical cooler. Jacket is cylindrical with flat bottom for greater stability. With #25 Ace-Thred center neck and (2) $\frac{1}{4}$ 14/20 side necks. Use 7506-10 bushing with O-Ring in center neck to secure 9852-41 slide adapter for connecting converter.

Description	Order Code	
Vessel, only	9850-12	★
#25 Nylon Bushing w/FETFE O-Ring	7506-10	♣

Complete

	9850-30	★
--	---------	---

Accessories

#25 Slide Adapter	9852-41	♣
-------------------	---------	---



REACTION VESSEL Jacketed, 3mL-10mL

Similar to 9843-04 vessel, except jacketed, to provide active cooling from tap water or mechanical cooler. Jacket is cylindrical with flat bottom for greater stability. With #25 Ace-Thred center neck and (2) $\frac{1}{4}$ 14/20 side necks. Use 7506-10 bushing with O-Ring in center neck to secure 9852-41 slide adapter for connecting converter.

Description	Order Code	
Vessel, only	9851-05	★
#25 Nylon Bushing w/FETFE O-Ring	7506-10	♣

Complete

	9851-27	★
--	---------	---

Accessories

#25 Slide Adapter	9852-41	♣
-------------------	---------	---

SLIDE ADAPTER ♠

For use with 1/2" ultrasonic horn, 9814-25, and 1/2" extenders. Slide adapters have either a 25 mm O.D. for insertion into a #25 Ace-Thred, or a 35 mm O.D. for use in a #36 Ace-Thred. Secure 1/2" horn in adapter with 7506 bushing and O-Ring, then slide adapter extension into thread on reaction vessel. Now you have a variable depth adjustment of horn to achieve greater efficiency.

Note: Complete item consists of adapter, nylon bushing and FETFE O-Ring.

Ace-Thred, #	Extender O.D., mm	Extension Length, in	Order Code
Glass Adapter			
36	25	6	9852-21
36	35	6	9852-25
Bushing w/O-Ring			
36			7506-12
Complete			
36	25	6	9852-41
36	35	6	9852-45



ULTRASONIC SOUND ABATEMENT CABINET ★

Although ultrasonic vibrations are above the human audible range, in ultrasonic processing, high-pitched noise is produced from harmonics emanating from the vessel walls and the fluid surface. The sound abatement cabinet permits extended processing without discomfort by greatly reducing that noise.

Cabinet is fabricated from steel, painted chemically resistant blue, with clear plastic door. Inside of cabinet is lined with sound-abating foam. Side handles for carrying and locking casters on bottom.

One hole supplied at top for lead from power supply and two holes at bottom for water inlet/outlet, etc. All holes are covered with slit rubber. 1/2" vertical mounting rod located toward rear to left is for mounting sonochemical reactor.

Height, in	Width, in	Depth, in	Order Code
46.5	24	19	9860-24



BENCH TOP MINI-CHILLER Polyscience, MM Series

Bench top mini-chiller by PolyScience. Compact size for bench applications such as photochemistry, chromatography, ultrasonics or jacketed bench reactors. Features include:

- Top-mounted fill port with spill protection cup
- Lighted fluid level indicator on front panel
- Easy access front panel and air filter
- Low flow rate and energy consumption
- High and low liquid level alarms
- Low flow alarm
- Temperature range -5 to 50°C at 0.1° stability
- Centrifugal Pump
- 240V, 50hz version is CE-approved

Capacity, L	Max Flow, LPM	Power Input		Cooling Capacity at -5°C Watts	Order Code
		Volts	Hertz		
2.65	7.9	120	60	130	12450-07
2.65	6.8	240	50	115	12450-107

