MPInterconsulting

ULTRASONICS - SONOCHEMISTRY - INNOVATION

WIDEBAND MMM CLEANING & LIQUIDS PROCESSING

Advanced multifrequency, sonic and ultrasonic cleaning
Wideband White-Noise SONOCHEMISTRY

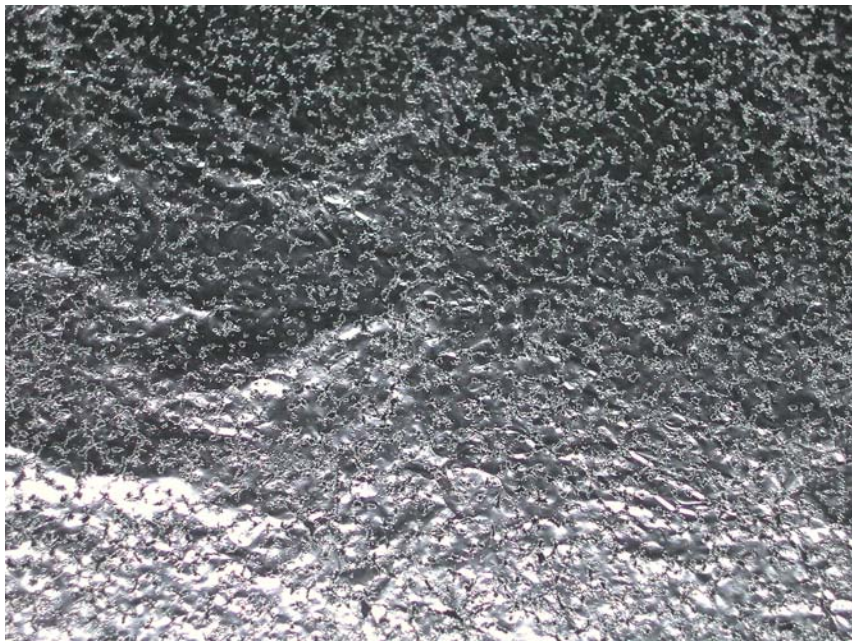
Main Web Site: http://www.mpi-ultrasonics.com
Download Server: http://mastersonic.com
Email: mpi@bluewin.ch

MMM *Technology for Ultrasonic Cleaning*
Generations ahead!

- **Multifrequency, Multimode, Modulated Sonic & Ultrasonic technology.**

- No other manufacturer has yet achieved and matched MMM exciting standards in precision cleaning. MMM is not **only** more efficient and effective than any other ultrasonic cleaning technology, it is UNIQUE.
- **Seeing is the believing!** Try the aluminum foil test for yourself (next pages)! Place the foil sample into our ultrasonic bath and hold the foil for approx. 5 - 10 seconds and you'll discover why there's simply no comparison with any other conventional ultrasonic cleaning machine!

Aluminum foil perforation test



- *Perfectly, uniformly perforated aluminum foil, after 5 to 10 seconds of exposure to MMM ultrasonic vibrations in a ultrasonic cleaner*
- ***Acoustic Frequency Range: From Hz to MHz; From Infrasonic to Supersonic***

MMM in Action

Activate the movie files: click & play

Perfectly and uniformly perforated foil. No standing waves. Ask any of our competitors if they can show similar results in maximum of 5 seconds.

MMM Cleaning Technology Provides:

- Superior and deep penetration, **independent** of water levels.
- Reliability with extra power spread throughout the bath.
- **Even** distribution of ultrasonic energy throughout the liquid gives uniform and thorough cleaning of the surface without the risk of damage to fine parts and sensitive instrument.
- Extremely efficient electronics and transducer coupling to ultrasonic bath (overall approx. 95% efficiency) eliminates or reduces the additional need for heating.
- Spatial distribution of ultrasonic activity inside of a cleaning liquid is homogenous (no dead zones, no standing waves, fast and large frequency sweeping, broadband spectrum, complex modulation).
- Cleaning solvents, detergents and additives can be significantly reduced, or even eliminated because of the very high cleaning activity of the acoustic broadband spectrum.
- Cleaning time can be several times shorter comparing to traditional ultrasonic cleaning technology.
- Fast liquid conditioning and degassing because of very large regulating zone between maximal and average ultrasonic power and because of the ability to switch instantaneously between acoustic spectrums.
- Smooth Ultrasonic, PWM-power regulation from 1% to 100%. Ultrasonic energy can be easily adjusted in order to clean very fine and sensitive parts without damaging them.
- Fast and automatic ultrasonic-power and high-activity recovery after liquid mixing and after introducing ultrasonic load (after introducing parts to be cleaned).
- Cavitation level can be smoothly controlled from very low to very high (by changing signal-processing parameters of MMM generator).
- Ultrasonic erosion and mechanical damages to cleaning baths and vessels, as well as on the parts under cleaning is significantly reduced (compared to traditional technology) because of uniform distribution of ultrasonic activity.
- MMM Ultrasonic Power Supplies can drive any traditional piezoelectric transducer/s, using less energy and producing superior cleaning effects, comparing them to traditional, single frequency, and frequency sweeping Power Supplies.
- Several levels of overload/s protection are implemented.

More about MMM

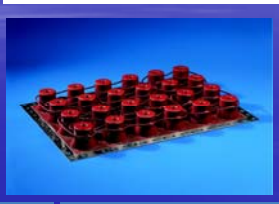
- Until now, conventional ultrasonic cleaning baths have been very power hungry and power inefficient, only about 5-25%. Larger industrial units could become power hungry monsters, making the unit not only inefficient but also ineffective. Often as a last resort, heaters are used to "assist" cleaning.
- There have been conventional “sweep frequency” ultrasonic cleaners but still based on "fixed frequency" and **narrow** frequency interval sweeping, with a slightly faster response time. "Fixed frequency" is more suitable to work in pre-determined conditions e.g. in ultrasonic welding of plastic parts.
- Conventional fixed/single frequency operation results in "standing waves" being set up in the cleaning bath. A direct consequence of these standing waves is that cleaning is patchy across the surface being cleaned. Thus, some areas are excessively cleaned while other left unaffected. It also makes the effectiveness of conventional ultrasonic cleaner very variable and subjective to fluid level, fluid temperature and load conditions.
- Using our state-of-the-art MMM technology, these "standing waves" do not exist and the efficiency goes well up!

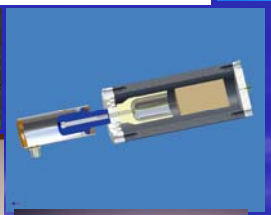
MASTERSONIC®

FOR ANY KIND OF
PIEZOELECTRIC TRANCDUCERS

MMM Transducers & Systems









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MASTERSONIC: Single units from 100 W to 100 kW

MMM, Universal and Wideband Multifrequency Power Supplies

Multiple modulations operation: MMM technology
MMM, Universal Ultrasonic Power Supplies are replacing all other types of constant or sweeping frequency power supplies for driving all kind of piezoelectric transducers, submersible transducers, bench top cleaners, Sonochemical reactors... bringing number of advantages and new options.

The MASTERSONIC program represents a brand new approach in Sonic and Ultrasonic Power Supplies. The MASTERSONIC power supply equipment is based on the MMM Technology, which enables producing high efficiency active power in wide-band sonic and ultrasonic vibrations, merging the state of the art of DSP and Power Electronics.

(OF)

(OW)

(IX)

IP 65-68 & NEMA 4 Generator Housings also available

Please visit our website for more details and have a look at our production line technology, or contact us directly with any inquiries.

MP Interconsulting • Marais 36, 2400 Le Locle, Switzerland
www.mpi-ultrasonics.com, tel/fax: +41-32-931 4045 • e-mail: mpi@bluewin.ch

MMM Power Supplies Family

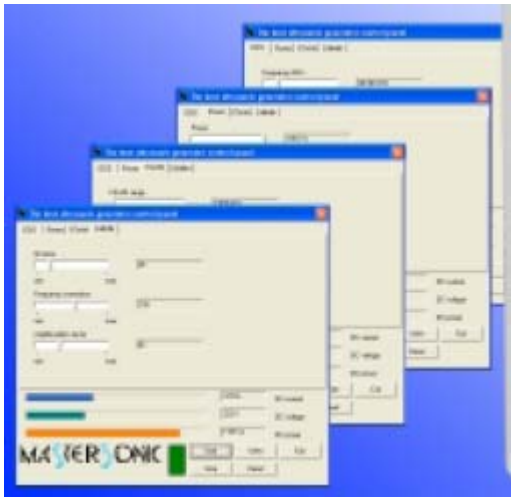
OF, MMM Power Supplies

Technical characteristics	**MSG.300.OF**	**MSG.600.OF**	**MSG.1200.OF**
Main Supply Voltage	220/230 V; 50/60 Hz	220/230 V; 50/60 Hz	208 V to 240 V; 50/60 Hz (USA and EC)
Max. Input Power	400 W	700 W	1300 W
Non-modulated, carrier frequency range	19.020kHz ÷ 46.728 kHz	19.020kHz ÷ 46.728 kHz	19.020kHz ÷ 46.728 kHz (LF & HF models)
Modulated acoustic frequency range	Wideband, from Hz to MHz	Wideband, from Hz to MHz	Wideband, from Hz to MHz
Average Continuous Output Power	300 W	600 W	1200 W
Peak Output (max. pulsed power)	1500 W	3000 W	6000 W
Standard Options	**RS232/485, PLC, all other analog and digital controls** **All internal protections included**		
Output HF Voltage	~ 500 V-rms	~ 500 V-rms	~ 500 V-rms
Dimensions (h x w x d)	170x150x150mm	250x150x150mm	230 x 160 x 370
Weight	2 kg	3.6 kg	4 kg

MasterSonic open frame generator modules (OF series) are designed for internal mounting in the control cabinets of Ultrasonic Systems. Such cabinets should be very well ventilated, protecting the generator module from excessive dust, moisture, and harmful chemical agents. The installation and electrical connections of the generator should be performed by a qualified specialist in electronics who is experienced in Power Ultrasonics. MSG.X00.OF is designed as a component part for integration into Ultrasonic systems. Therefore it is not equipped with a Power Supply ON/OFF switch. Make sure the Ultrasonic System you are assembling is provided with such switch. Please read manuals for more information. **The most successful applications of OF generators are in Ultrasonic Cleaning.**

Please read manuals for more information (click the link below):
http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-of-generators/

ACCESSORIES, INTERFACES, REMOTE, PLC AND PC CONTROLL TOOLS FOR ALL MMM GENERATORS



All Mastersonic, MMM generators can be controlled, being connected by RS485 link to a PC, using the software interface for enabling easy visual and multi-parameter control and settings.

Handheld Control Unit
For manual control and settings

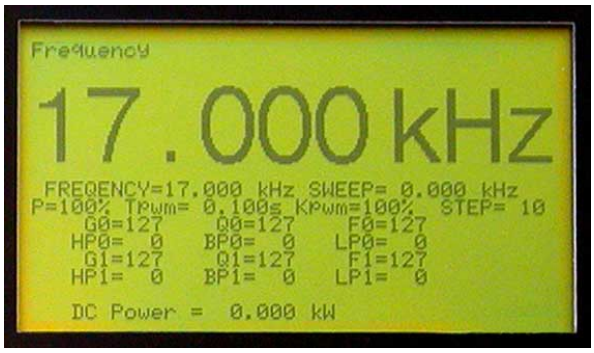
MMM-Link-2339 Adapter RS485 / RS232C+software
MMM-Link-2339_16 Option RS485 Link extender16 generator
MMM-Link-2339_64 Option RS485 Link extender16 generator
Interface cable

STANDARD CARRIER FREQUENCY RANGES OF MMM GENERATORS

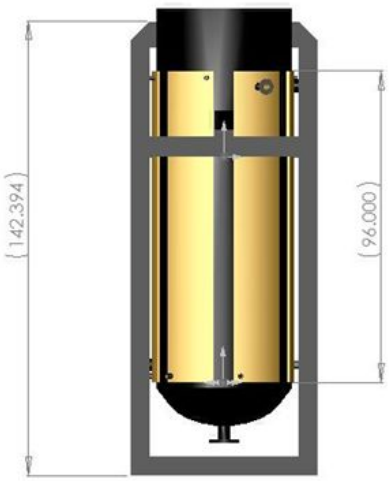
Frequency range	OF	OW	IX
LF-range	17.5 kHz to 28.5 kHz	17.5 kHz to 28.5 kHz	17.5 kHz to 28.5 kHz
Resolution (Hz)	freq-step = 3-30 Hz	freq-step = 1 Hz	freq-step = 1 Hz
MF-range	19.020 kHz to 46.728 kHz	21.5 kHz to 40.5 kHz	19.02 kHz to 46.72 kHz
Resolution (HZ)	freq-step = 3-30 Hz	freq-step = 1 Hz	freq-step = 1 Hz
HF-range	24 kHz to 45 kHz	24 kHz to 45 kHz	24 kHz to45 kHz
Resolution (Hz)	freq-step = 3 - 30 Hz	freq-step = 1 Hz	freq-step = 1 Hz

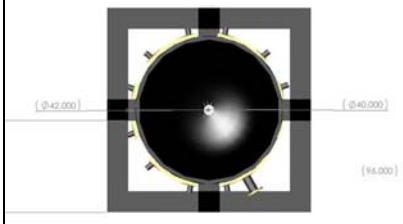
Also available single Power Supply units until 100 kW

PS Cabinet



PS Programming Interface and Display





15 kW acoustic load (Extractor: H = 3.6 m, OD = 1 m)

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MMM SONIC & ULTRASONIC CLEANING & LIQUID PROCESSING

MMM Technology: Multifrequency, Multimode, Modulated Sonic & Ultrasonic Technology

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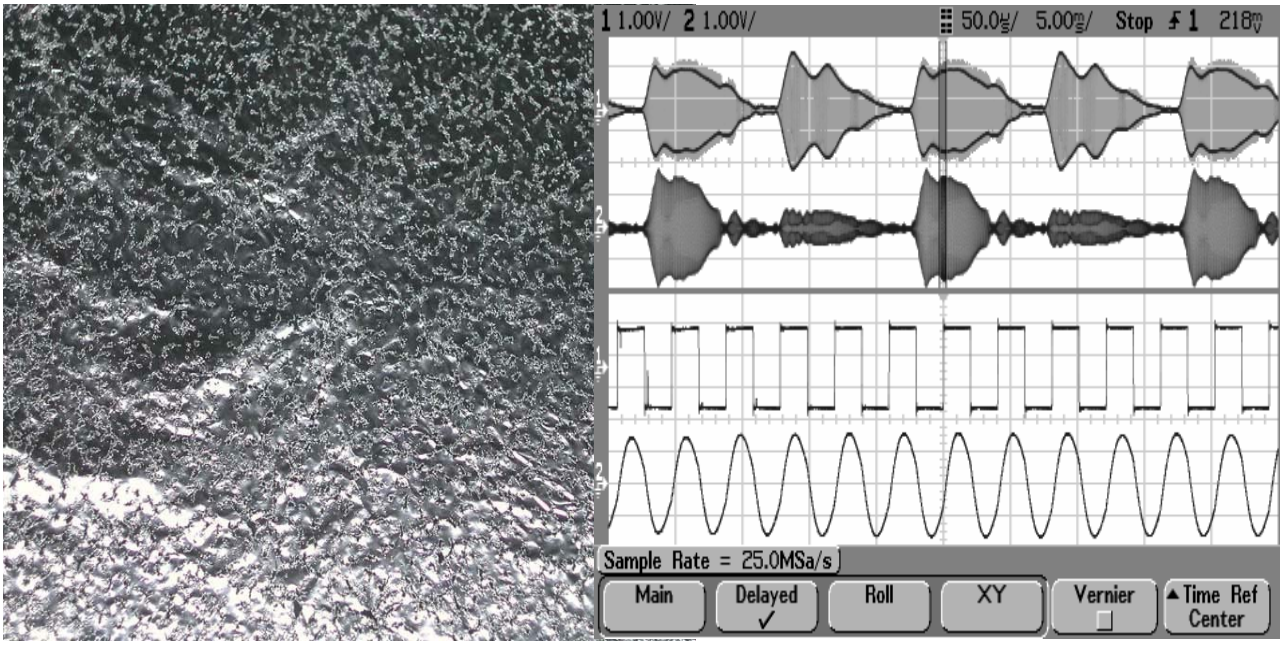

Left: Perfectly, uniformly perforated aluminum foil, after 5 to 10 seconds of exposure to MMM ultrasonic vibrations in an ultrasonic cleaner. Frequency Range: From Hz to MHz; From Infrasonic to Supersonic. Right: Load current and voltage shapes (modulated and carrier).

- **Superior and deep penetration, independent of water levels.**
- **Reliability with extra power spread throughout the bath.**
- **Even distribution of ultrasonic energy throughout the liquid gives uniform and thorough cleaning of the surface without the risk of damage to fine parts and sensitive instrument.**
- **Extremely efficient electronics and transducer coupling to ultrasonic bath (overall approx. 95% efficiency) eliminates or reduces the additional need for heating.**

- **Spatial distribution of ultrasonic activity inside of a cleaning liquid is homogenous (no dead zones, no standing waves, fast and large frequency sweeping, broadband spectrum, complex modulation).**
- **Cleaning solvents, detergents and additives can be significantly reduced, or even eliminated because of the very high cleaning activity of the acoustic broadband spectrum.**
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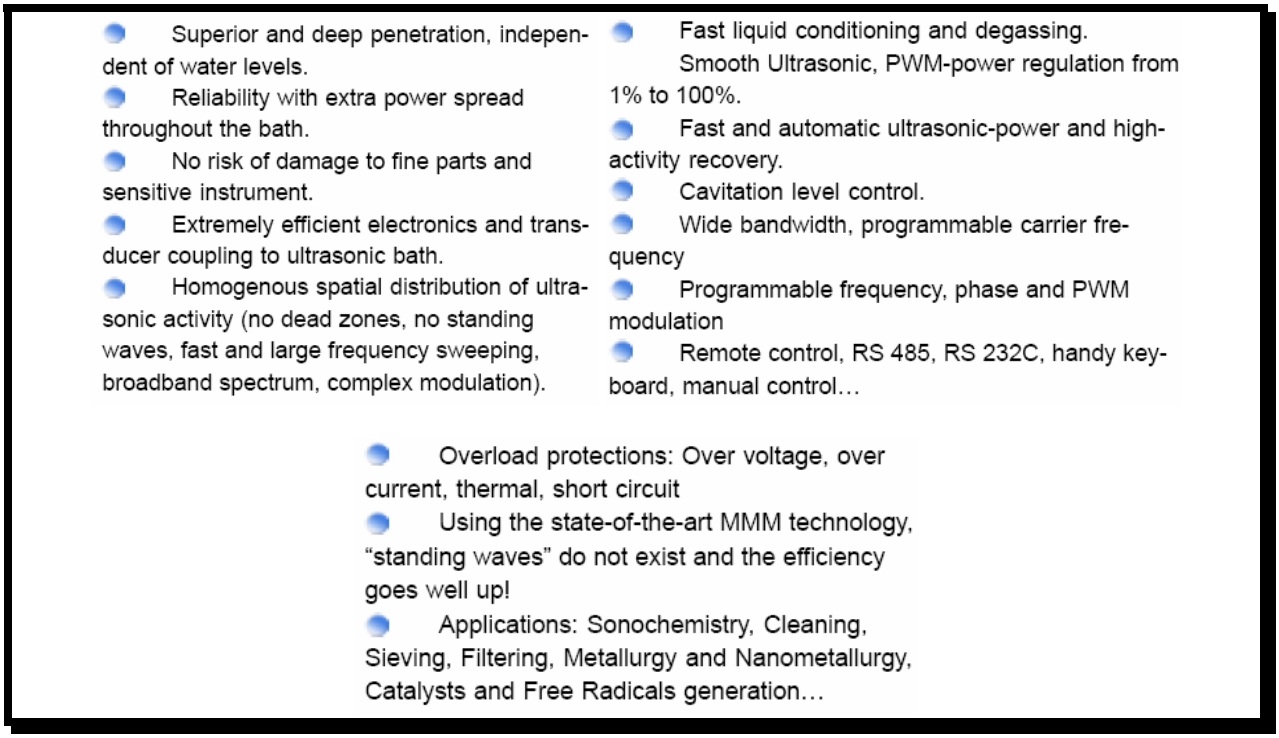


For more information open the link:

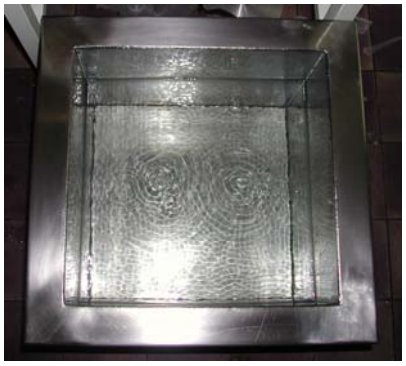
http://mastersonic.com/documents/mmm_applications/mmm_cleaning/

Benchtop ultrasonic cleaning systems

MMM CLEANING & LIQUID PROCESSING TANKS

Wideband multifrequency systems for Liquid Processing, Cleaning and Sonochemistry: MMM technology (Operated with Mastersonic Power Supplies)





- Constant output power independent of fluid level, temperature and load
- Specialized impulse and sweep mode drive powerful and uniform cavitation
- Wide range of tank capacities and accessories
- Electrical Source 110/120V, 220/240V
- Fabricated from cavitation resistant stainless steel 316L for inner tank, SS 304 for outer cover
- 20 micron hard chrome plated transducer plate
- Protected against dry running (without loading)
- Degas function
- Linear power control (0 to 100%)
- Accessories available: Tank cover, basket, drain valve
- Optional heater with analog or digital control
- Excellent for Sonochemistry, Cleaning, Nano-Powders Technologies, General Laboratory Applications…
- High density and uniform cavitation, no standing waves (From Hz to MHz)
- Since the cavitation occurs uniformly and omni directionally, sonic and ultrasonic energy distribution in the tank is very uniform, creating excellent cleaning and liquid processing effects
- Superior and fast cleaning effects compared to traditional systems
- Anti-corrosion (cavitation resistant, SUS314 and 316L & 20 microns hard Cr plating)
- MMM (multifrequency) concept prevents creation of standing waves, resulting that the surface-erosion damage is much lower than that of traditional tanks, operating on constant frequency.

Benchtop Cleaning Systems: Specifications

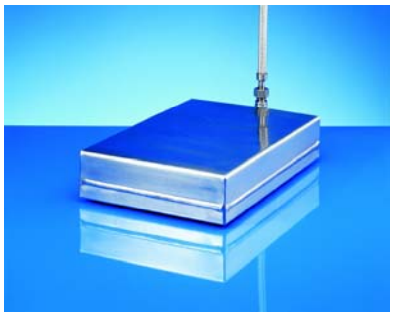
Part number:	BCT-Y-40	BCT-Y-60	BCT-Y-80	BCT-Y-100	BCT-Y-120	BCT-Y-150	BCT-Y-240
INTERNAL DIMENSIONS (W)X(L)X(H)	200x380x250 8"X15"X10"	280x380x300 11"X15"X12"	300x380x410 13"X15"X16"	380x410x460 15"X16"X18"	330x530x510 13"X21"X20"	430x530x510 17"X21"X20"	580x530x560 23"X21"X22"
OVERALL DIMENSIONS (W)X(L)X(H)	280x460x360 11"X18"X14"	360x460x410 14"X18"X16"	410x460x510 16"X18"X20"	460x480x560 18"X19"X22"	410x610x610 16"X24"X24"	510x610x610 20"X24"X24"	660x610x660 26"X24"X26"
OUTPUT POWER (watt)	400	600	800	1000	1200	1500	2400
FLUID CAPACITY (liter)	19	32	51	70	89	117	174
HEATER	230V, 4A/1KW	230V, 5A/1KW	230V, 9A/2KW	230V, 13A/1KW	230V, 14A/1KW	230V, 18A/1KW	230V, 21A/1KW

(BCT = Benchtop Cleaning Tank)

Accessories: Tank Cover, Basket, Drain Valve

Submersible box-type ultrasonic cleaning transducers (arrays of cleaning transducers inside)

Box type immersible ultrasonic cleaning transducers for high power ultrasonic systems including MMM multifrequency wideband sonic and ultrasonic technology.



Types: MPI-ITB-28 and MPI-ITB-40

Submersible Ultrasonic Transducer follows traditional design configurations for submersible transducer systems.

- Welded case fabrication in a special stainless steel alloy extends operational life
- High grade PZT elements provide high ultrasonic cavitation
- Flexible stainless steel hose
- Available with base or side mount fixing
- Suitable for retro installation in existing cleaning tanks
- Produced in standard sizes or to special order dimensions
- The cleaning results are increased with the effective transducer arrangement
- Hard Cr-plating increases total operating life and durability against cavitation.
- Uniform ultrasonic energy distribution and excellent cleaning effects
- Corrosion free and water proof design
- High quality transducer cases (SUS 306, SUS 316L)
- Strong transducers' bolt & adhesive type bonding
- Available frequencies: 28 KHz, 40 KHz, 68 KHz, 80 KHz, 120 KHz etc.
- General use cleaning and liquid processing transducers. Many models available
- MPI-ITB-28: Central operating frequency 28 kHz
- MPI-ITB-40: Central operating frequency 40 kHz
- Good for applications in MMM technology, and in constant frequency applications
- Continuous operating power: Different models from 300 W to 1500 Watts
- Best results will be achieved with Mastersonic, MMM power supplies.

Application

Used wherever sufficient space is available for the installation of submersible transducers.

Construction

The hermetically sealed, welded fabricated enclosure can be easily fitted to the base or side of a suitable tank using stainless brackets or hooks. The electrical connection is achieved by a flexible stainless steel hose. The free end of the hose should project above the liquid level and terminate in a clamp connector box. Screened high frequency cable is then used as the connection to the generator. The distance between the submersible transducer and the generator can be up to 30 m.

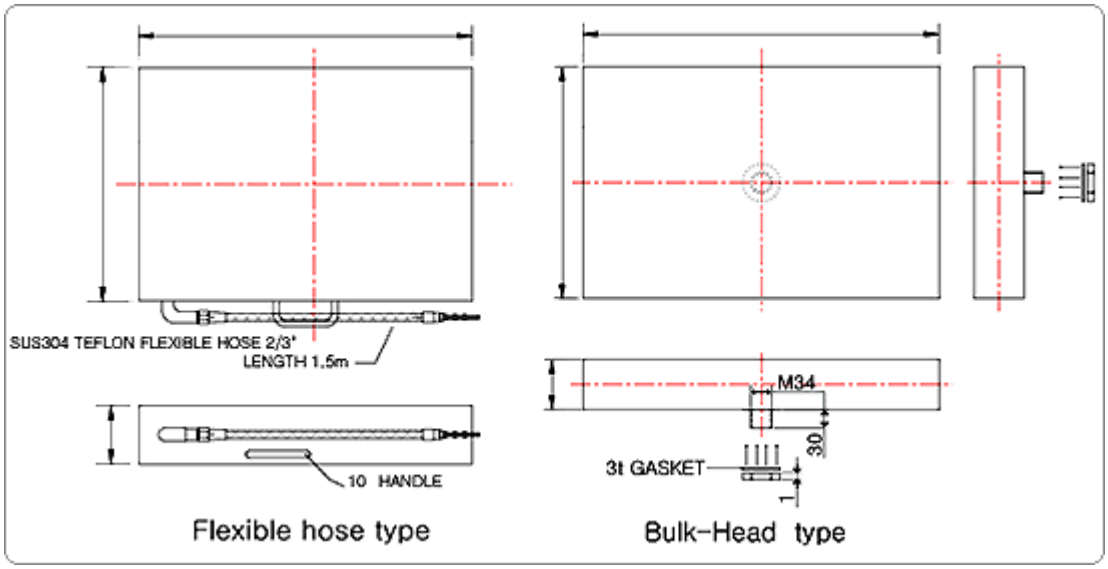
Output Frequencies

Submersible transducers working at 28 kHz are ideal for general purpose cleaning. The higher frequencies of 40, 80 and 120 kHz are more used for smaller or more sensitive items.

Model sizes available

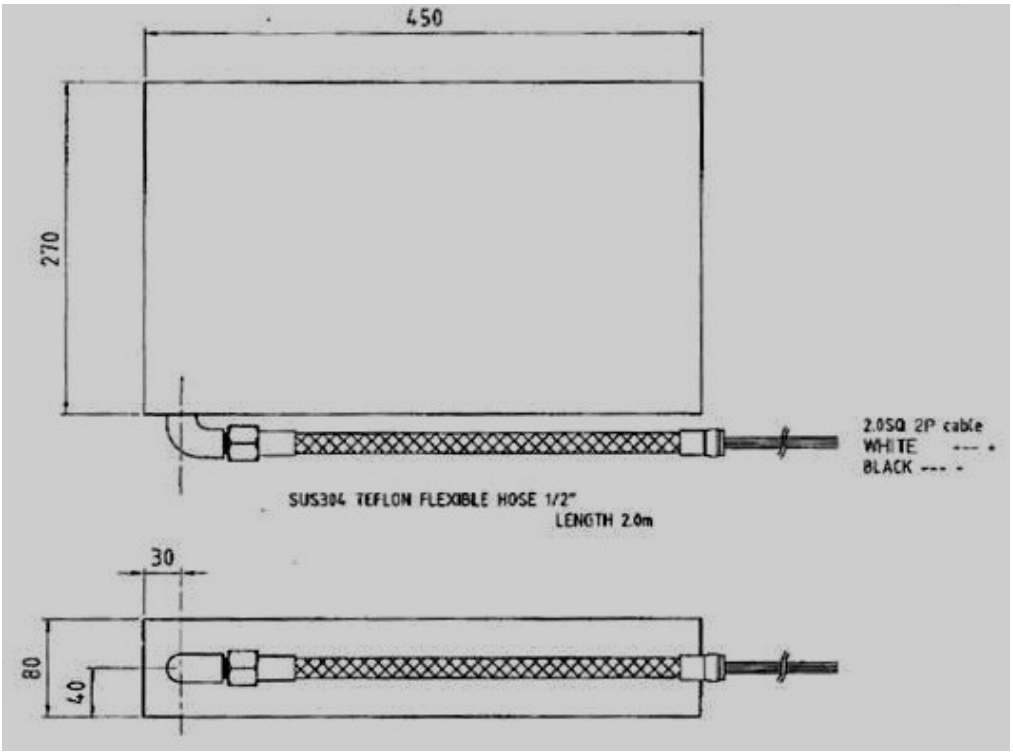
Contact us to get more information about the special sizes made to suit customer specifications.

Submersible Cleaning Transducers: Specification for ordering



Short term available submersible models are:

MPI-ITB-40, 36-40 kHz submersible boxes (model 1231): h = 80 mm
MPI-ITB-28, 24-28 kHz submersible boxes(model 1231): h = 90 mm
Active Radiating Area: 450 x 270 x 80 mm & 450 x 270 x 90 mm



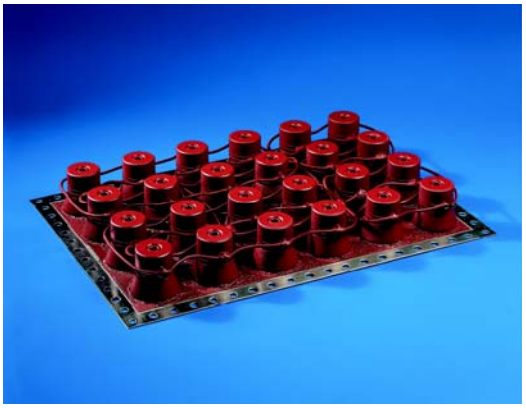
Standard Integrated Transducer Box Specifications

(Other dimensions available on request)

MODELS: MPI-ITB-28 MPI-ITB-40	4010	6020	6021	1230	1231	1232	1233
POWER	400 watt	600 watt		1200 watt			
DIMENSIONS	190x330	360x280	270x410	290x440	270x490	370x330	400x550
ACTIVE AREA	190x290	360x240	270x370	290x400	270x450	370x290	400x510
MATERIAL	SUS304, Hard-Cr plating (OPTION: SUS316L)						
TRANSDUCERS	8~9 pcs	12~14 pcs		24~28 pcs			

(ITB = Integrated Transducers Box)

Plate cleaning transducers



Types: MPI-IPT-28 and MPI-IPT-40

Integrated Plate Ultrasonic transducers are generally used where space considerations restrict the installation of submersible transducers.

- Case fabrication in stainless steel alloy extends operational life
- High grade PZT elements provide high ultrasonic cavitation
- Can be supplied in different dimensions based on a repeat of 30 mm

- Available in 25, 40, 80 and 120 kHz
- General use cleaning and liquid processing transducers. Many models available
- MPI-IPT-28: Central operating frequency 28 kHz
- MPI-IPT-40: Central operating frequency 40 kHz
- Good for applications in MMM technology, and in constant frequency applications
- Continuous operating power: Different models from 300 W to 1500 Watts
- Best results will be achieved with Mastersonic, MMM power supplies

Construction

Integrated Plate transducers do not require space within the cleaning tank. The plates are mounted over an aperture cut in the tank wall and the radiating surface is in direct contact with the cleaning medium.

Output

Integrated Plate transducers are available to operate in the 28 kHz frequency band for general purpose cleaning and in the 40, 80 and 134 kHz band for smaller or more sensitive items.

Models

Contact us to get more information about the special sizes made to suit customer specifications.

Standard Integrated Plate Transducer Specifications:

MPI Model number:	IPT-4012	IPT-6020	IPT-6021	IPT-1231	IPT-1232
EFFECTIVE POWER	400W	600W		1200W	
ACTIVE AREA(BxF)	360x270	420x300	540x210	800x210	900x190
PLATE MATERIAL	SS-316L (option: HARD-Cr PLATING)				
TRANSDUCER ELEMENT	8-9PC	12-14PC		24-28PC	
ACCESSORY	M6x20 SS BOLT, WASHER, TEFLON PACKING				

(IPT = Integrated Plate Transducer)

Inclusions: *Welded steel frame, sealing gasket, fixing screws.*

(Other dimensions available on request)

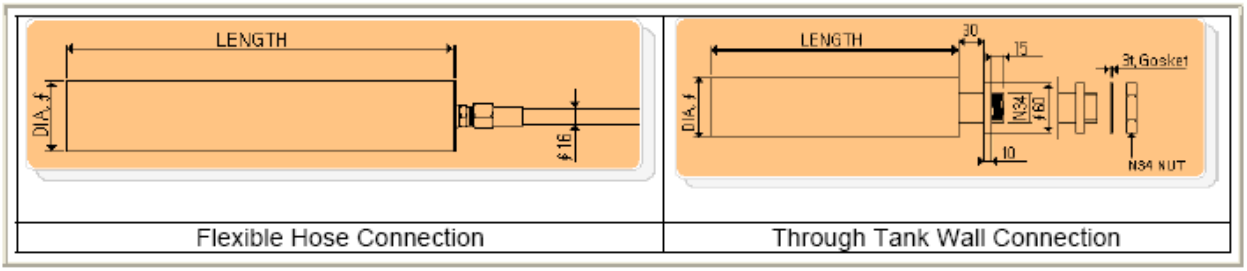
MMM TUBULAR TRANSDUCERS: Wideband transducer arrays

Types: MPI-ITT-28 and MPI-ITT-40

- MMM Tubular Submersible Transducers are operated with Mastersonic Power Supplies.
- General use cleaning and liquid processing transducers.
- Good for applications in MMM technology, and in constant frequency applications
- Continuous operating power: Different models from 300 W to 1500 Watts
- Best results will be achieved with MMM generators
- Excellent for Sonochemistry, Cleaning, Waste Waters Processing, Filtering, Nano Powders Technologies, Catalysts and Free Radicals Creation…
- Original and unique design (patent pending),
- High density and uniform cavitation, no standing waves (From Hz to MHz)
- Since the cavitation occurs uniformly and omni directionally, all around the MMM tube, sonic and ultrasonic energy distribution in the tank is very uniform, creating excellent cleaning and liquid processing effects. Strong even cavitation along the entire tube length.
- Superior and fast cleaning effects
- Corrosion free, water proof design: This submersible transducer array is constructed of stainless steel with Hard-Cr plating (cavitation resistant, SUS304 and 316L & 20 microns hard Cr plating).
- MMM (multifrequency) concept prevents creation of standing waves, resulting that the surface-erosion damage is much lower than that of traditional transducers, operating on constant frequency.
- When driven by an MMM generator its unique construction and shape stimulate a full range of wideband harmonic frequencies and ultrasonic effects in liquid.
- The output power of MMM tubular transducers is not significantly affected by immersion depth, capacity of a bath or sonoreactor, load and liquid temperature variations, pressure…
- A tubular shape and number of available lengths makes it easy to install or place very simply in every available tank or reservoir. MMM tubular transducer is radiating omni-directionally on its integral external surface, without creating standing-waves inactivity.
- Compared to conventional submersible transducers MMM tubular transducers have several times longer operating life.
- Available in 600 W, 900 W, 1200 W, 1500 W, and higher on custom order.
- The Flexible Hose version allows the Tube Transducer to be submersed in any tank configuration, in any position (vertical, horizontal, diagonal), and may be easily moved form tank to tank.
- The Through Tank Wall version allows for secure and fixed mounting to a tank wall or base in any position (vertical, horizontal, diagonal).
- Many models available: MPI-ITT-28: Central operating frequency 28 kHz, MPI-ITT-40: Central operating frequency 40 kHz

Standard MMM Tubular Transducer Specifications:

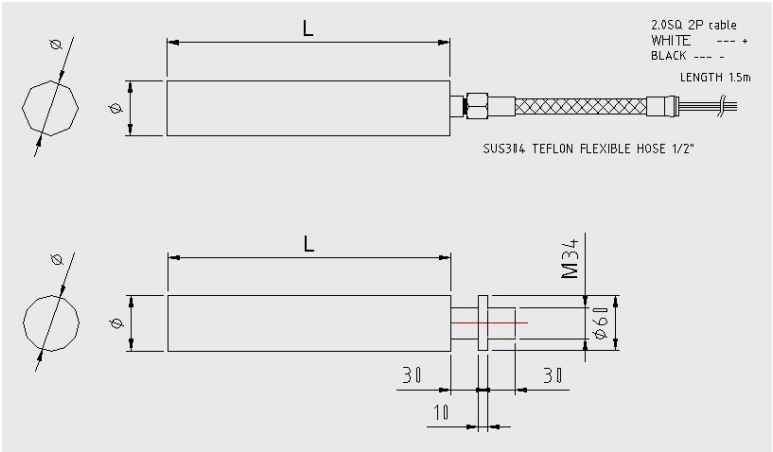
Specification for ordering



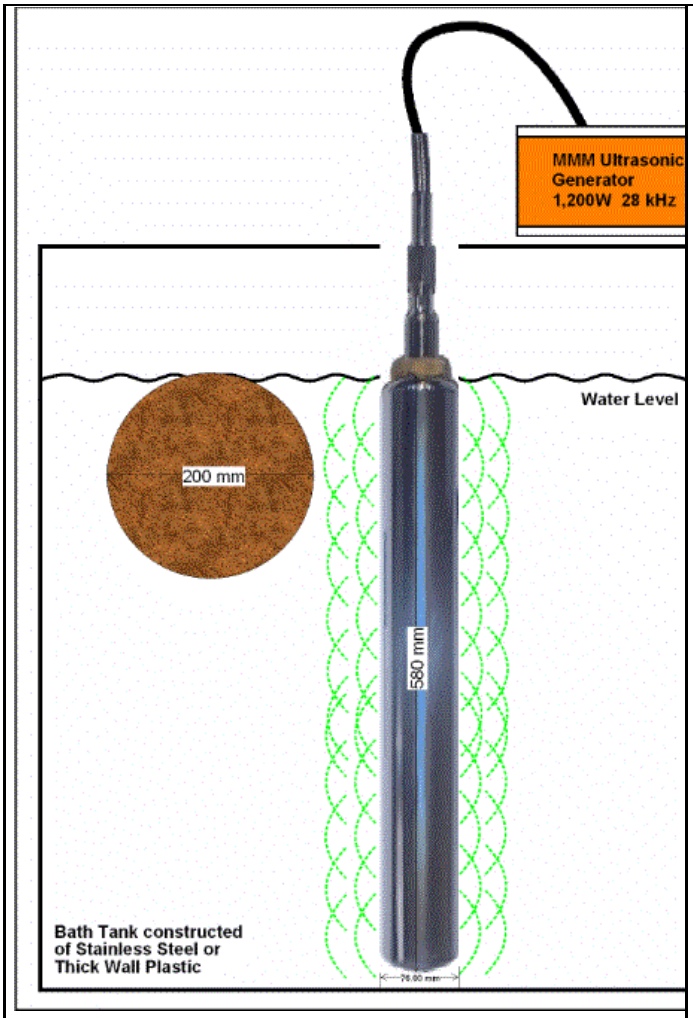
Flexible Hose Connection | Through Tank Wall Connection

MPI-MODEL	ITT-28-600	ITT-28-900	ITT-28-1200	ITT-28-1500
POWER	600 watt	900 watt	1200 watt	1500 watt
FREQUENCY	28 KHz	28 KHz	28 KHz	28 KHz
DIMENSION	Ø 76.3 x L 310 mm	Ø 76.3 x L 460 mm	Ø 76.3 x L 580 mm	Ø 76.3 x L 680 mm
MODEL	ITT-40-600	ITT-40-900	ITT-40-1200	ITT-40-1500
POWER	600 watt	900 watt	1200 watt	1500 watt
FREQUENCY	40 KHz	40 KHz	40 KHz	40 KHz
DIMENSION	Ø 60.5 x L 310 mm	Ø 60.5 x L 460 mm	Ø 60.5 x L 580 mm	Ø 60.5 x L 680 mm

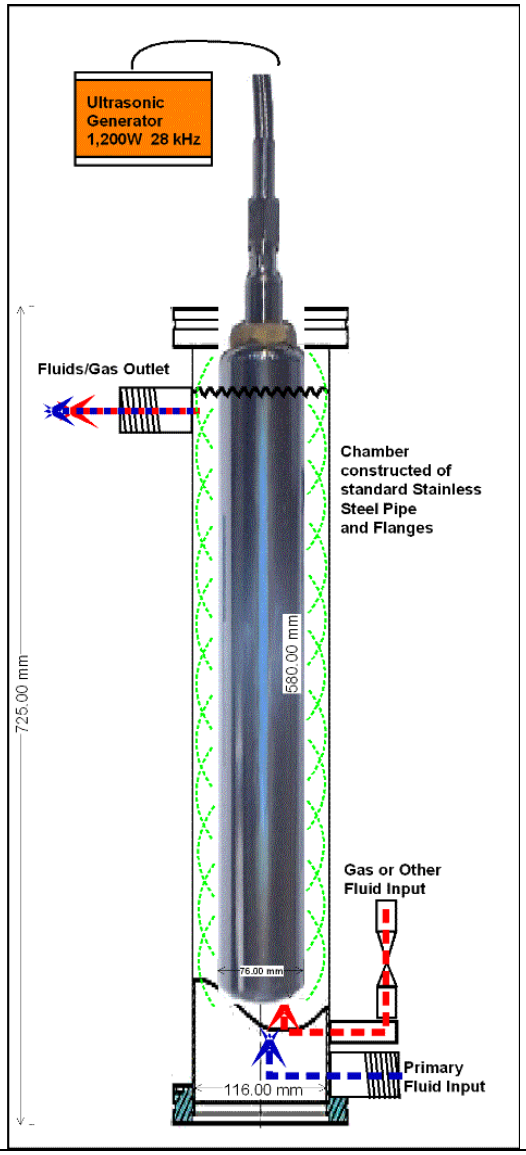
(ITT = Integrated Tubular Transducer)



MMM Tube Transducer Possible Applications



Option 1A: Ultrasonic Bath with MMM Tube Transducer



Option 1B: Flow-Thru Chamber with MMM Tube Transducer

HIGH INTENSITY SONICATORS

http://mastersonic.com/documents/mmm_applications/liquids_processing/4-kw-sonicator.pdf

In combination with our fixed frequency generators we offer a wide range of acoustic elements to meet all of your high power Sonicator / Homogenization needs. Using advanced digital generator technology we have set a new standard in high power liquid processing.

The new generator design offers new capabilities in tracking shifts in the center operating frequency. Normal generators are unable to manage even minor shifts (30 Hz to 100 Hz) when probes become de-tuned due to cavitation wear. Our systems can track simple probes over a very large frequency range of ± 500 Hz, a 1,000 Hz window in some cases. That means extended probe life, more reliable operation, and less maintenance.

Our converters feature a sealed front mass interface with upper air cooling ports for continuous operations. Boosters are available in titanium or aluminum, with or without mounting rings. Probes may be constructed to your specifications. Standard probes are made of high grade titanium in diameters up to 60 mm

Applications include:

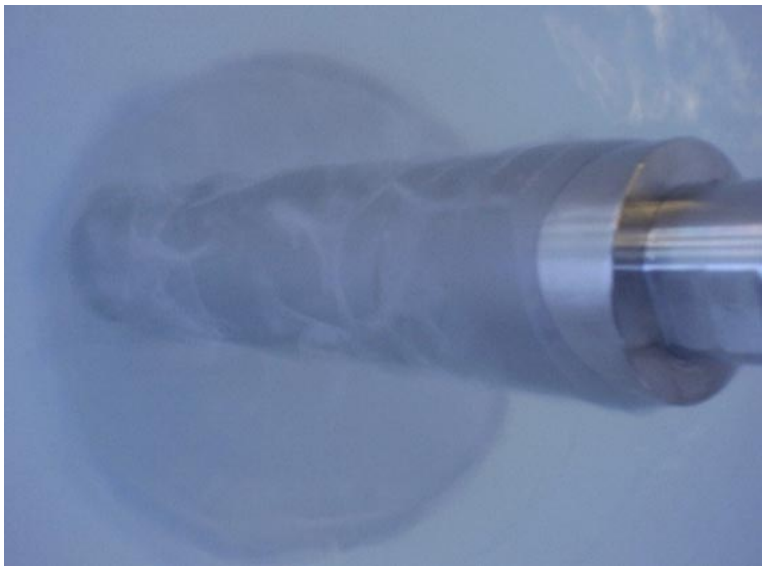
- Sonoreactors
- Homogenization
- Emulsification
- Dispersion of solids in liquid
- Disruption of bacterial cells, viruses and spores
- Acceleration of chemical and enzymatic reactions
- Liquids degassing
- Liquid Processing in static or flow cell chambers.
- Laboratory or industrial applications.

Key Features

- Industries highest power delivery to the probe in liquids. Standard power supply options:
  - 300 watts
  - 600 watts
  - 1,200 watts
  - 2,000 watts
  - 3,000 watts
  - Higher power on special order
- Available in 20 kHz, 30 kHz, 35 kHz, 40 kHz, and custom frequencies on special order.
- Variable Probe Diameters:
  - 3mm (1/8") or smaller on special order
  - 6mm (1/4")
  - 13mm (1/2") (with or without replaceable tip)
  - 25mm (1")
  - 38mm (1 1/2")
  - 50mm (2")
  - Larger or any custom size on special order
  - Half or Full Wave Probes
- Boosters in Standard Gain (0.4, 0.5, 0.6, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5) or custom ratios on special order.

High Power Piston Probe SONICATOR

- **20 kHz Fixed frequency**
- **2,000 watts max**
- **Booster Ratio 1:2.0**
- **Full-wave Probe (titanium)**
  - **Diameter = 50mm**
  - **Length = 250 mm**
- **Very high axial energy produces strong cavitation and acoustic power for mixing, homogenization, flock & particle breakdown.**
- **New probe design also provides high radial energy for strong cavitation along the probe length.**
- **Ultrasonic Power Supplies for above-described single-probe systems are well optimized to deliver very high ultrasonic energy into a liquid load, being fully protected against all accidental and over-loading situations.**



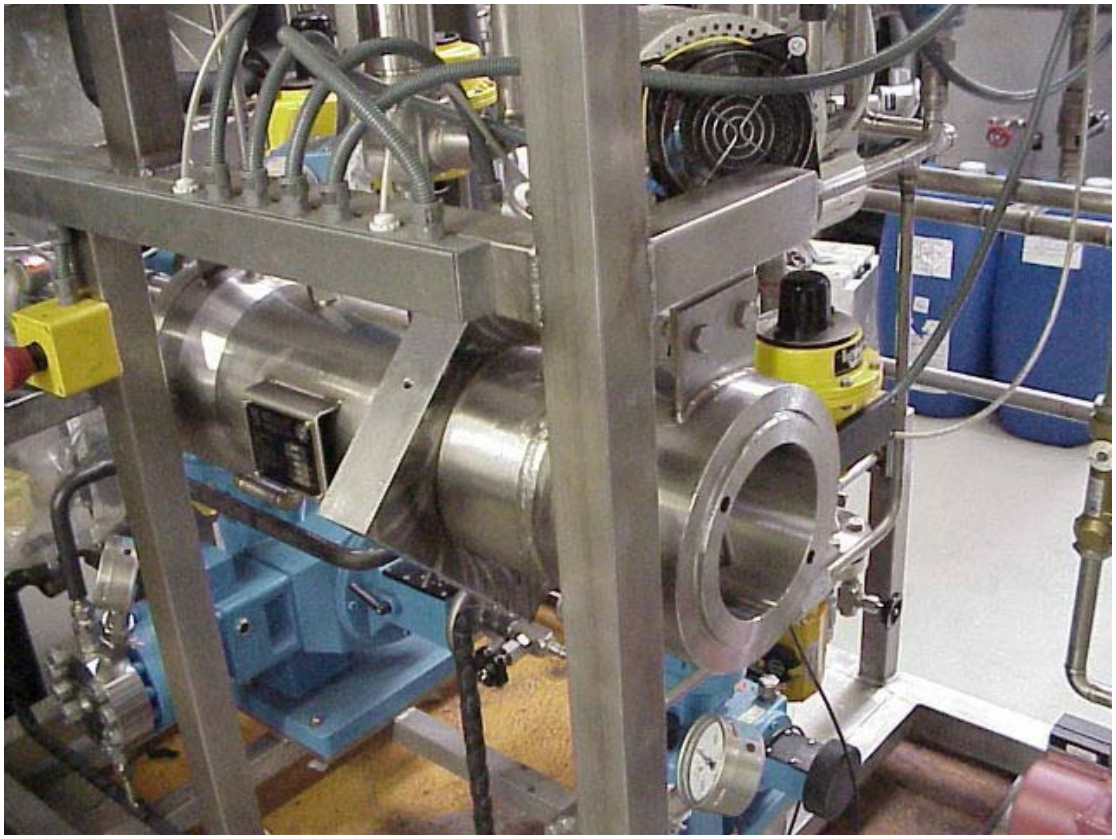
Power Draw Test: In Water		
Probe Submerged	50% Amplitude	100% Amplitude
Full submerge:	1,000 W	1,500 W
½ Submerge:	600 W	1,000 W
½ Submerge:	600 W	1,000 W
¼ Submerge:	300 W	600 W

What to order (minimal configuration): Converter, Booster, Probe, and Power Supply

MMM Technology for Cleaning in Supercritical, Liquid Carbon Dioxide

http://mastersonic.com/documents/mmm_applications/mmm_cleaning/cleaning_in_liquid_co2/

Cleaning Station in Supercritical, Liquid Carbon Dioxide



Pressurized Ultrasonic reactor agitated with Mastersonic Power Supply (visible only autoclave for liquid CO-2)

COMPONENTS AND PARTS FOR HIGH POWER ULTRASONICS

Ultrasonic cleaning transducers for use with conventional and wideband ultrasonic cleaning baths

Different Cleaning Transducers

Ultrasonic cleaning transducers for high power ultrasonic systems including MMM multifrequency wideband sonic and ultrasonic technology.

Ultrasonic transducers (IBLT types)

-Highest mechanical quality factor (highest efficiency and minimal heat dissipation)

-Very low series resonance impedance (lower driving voltage), and very high parallel resonance impedance (low losses)

-Stable and durable under severe working environment and elevated temperature

-Made of high grade stainless steel, highest quality aluminum and high density PZT

Here are two of the most widely used, excellent qualities cleaning transducers (already sold in millions of pieces): 28 kHz and 40 kHz, 50 Watts:

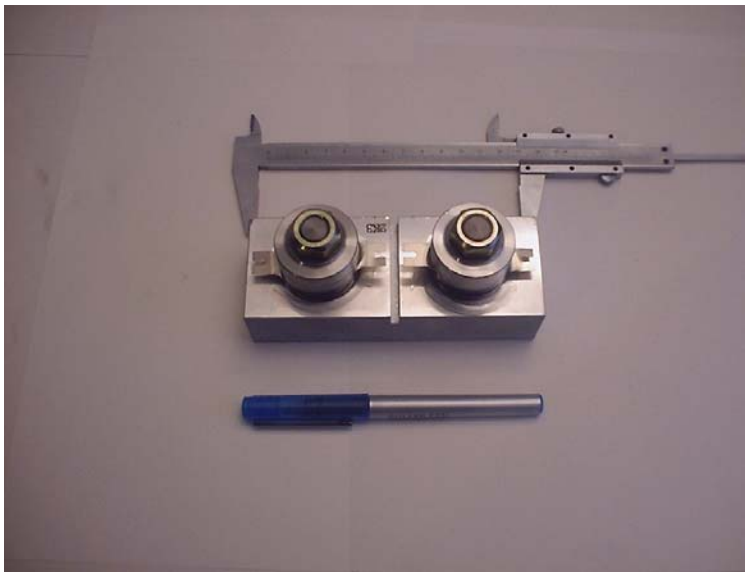
28 kHz, cleaning transducers: MPI-C-28

Total axial length = 80 mm,
Front mass diameter = 45 mm, h = 39 mm
Back mass diameter = 35.5 mm, h = 19 mm
Central operating frequency: 28 kHz
Piezoceramic ring: OD = 35 mm, t = 5mm
Continuous operating power: 50 Watts
Best results will be achieved with MMM power supplies
Good for applications in MMM technology, and in constant frequency applications
MPI-C-28 is the general use cleaning and liquid processing transducer

40 kHz, cleaning transducers: MPI-C-40

Total axial length = 48 mm,
Front mass diameter = 50 mm, h = 19 mm
Back mass diameter = 38.5 mm, h = 14 mm
Central operating frequency: 40 kHz
Piezoceramic ring: OD = 38 mm, t = 5 mm
Continuous operating power: 50 Watts
Best results will be achieved with MMM power supplies
Good for applications in MMM technology, and in constant frequency applications
MPI-C-40 is the general use cleaning and liquid processing transducer

Wideband, cleaning transducers: MPI-C-4090M & MPI-C-2575M



MPI-C-4090M & MPI-C-2575M, general use cleaning and liquid processing transducers (known as VIBRABAR, Vibrating plate transducers etc.).
Good for applications in MMM technology, and in constant frequency applications
MPI-C-4090M, operating frequency range without MMM: 40 to 90 kHz
MPI-C-2575M, operating frequency range without MMM: 25 to 75 kHz
Continuous operating power (water loaded): 100 Watts
Best results will be achieved with MMM power supplies

Ultrasonic Cleaning: How to select the best option

MPInterconsulting
ULTRASONICS - SONOCHEMISTRY - INNOVATION

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Phone/Fax: +41- (0)-32-9314045
email: mpi@mpi-ultrasonics.com
http://www.mpi-ultrasonics.com
http://mastersonic.com

MPI offers solutions for liquid bath cleaning applications where it is important to deliver uniform and homogenous ultrasonic energy over a large radiating surface. Due to the large radiating surface of the active elements the surface power density is usually on the order of 0.5 to 2 Watts per square centimeter. Such power is providing very good cavitation effects and uniform power distribution throughout the bath or special cleaning chamber.

Through the use of standard plate mount transducers, submersible transducers, tubular arrays, or a single-transducer with an integrated resonating bar or tube, we can provide either standard bath systems or custom baths that adapt to existing wash processes. For special cleaning applications that require strong spot washing or cleaning the interior of very small holes or cavities, as found in small machined parts for the watch or telecommunications industry, we can offer a high power probe cleaning SONICATOR.

For standard cleaning applications we offer both fixed frequency systems and wideband frequency systems using our unique MMM technology. Advantages of our wideband MMM technology include:

- Complex MMM modulation techniques eliminate standing waves and dead zones to improve parts cleaning and reduced hot cavitation zones that can damage small and sensitive parts.
- New modulation techniques offer uniform distribution of ultrasonic energy and generate significant cavitation throughout the bath volume independent of water level.
- Wideband frequency modulations create a wide range of cavitation bubble sizes offering faster and more thorough cleaning of parts.
- Reduction of standing waves reduces transducer or tank pitting to extend operational life.
- Faster liquid conditioning and degassing of fresh cleaning solutions.
- More efficient cleaning method allows reduction or elimination of cleaning solvents and heating.
- Smooth power regulation 0% to 100% plus fully programmable Pulse Width Modulation options allow cleaning of fine and delicate or heavy parts with the same system.
- Adjustable inductive compensation, available on OEM modules, allows simple adaptability to 3rd party transducers and the possibility for field upgrades to existing systems.

MPI' liquid cleaning components are designed for heavy-duty industrial applications and can also be scaled to accommodate most any environment.

MMM Generators (Multi-frequency, Multimode, Modulated):

MMM generators deliver wide-band sonic and ultrasonic energy (ranging from infrasonic up to the MHz domain) through arbitrary shaped solid structures and thick or thin wall metal containers to address a variety of cleaning applications. The secret to MMM Technology is its ability to initiate ringing and relaxing, modulated, multimode mechanical oscillations including harmonics and sub-harmonics. MMM Technology is producing pulse-repetitive, phase, frequency and amplitude-modulated bulk-wave-excitation covering and sweeping an extremely wide frequency band. Such sonic and ultrasonic driving creates uniform and homogenous distribution of acoustical activity

on a surface and inside of the vibrating system, while avoiding the creation of stationary and standing waves, so that the whole vibrating system is fully agitated. The system offers fine control from a programmable interface and produces high efficiency active power (0% -100%) available in a range from 100 W up to many kW.

System Control: Our Fixed Frequency and MMM Wideband Generators may be optioned for Front Panel Control, Removable Handy Panel Control, or Remote Electronic or PC Control.

Converters/Transducers: Our transducers are based on piezo-electric ceramic stacks and are designed for demanding ultrasonic cleaning applications.

Acoustic Elements: We offer a large variety of radiating elements that may be customized for a wide range of applications.

- ***Ultrasonic Bath:*** Standard and custom ultrasonic baths constructed of stainless steel with integrated bottom or side wall plate converters. System power may range form 100 W up to many kW using Fixed Frequency or MMM wideband generators.

- ***Ultrasonic Plate Arrays:*** Standard and custom ultrasonic plate arrays for custom stainless steel bath construction. System power may range form 100 W up to many kW using Fixed Frequency or MMM wideband generators.

- ***Submersible Ultrasonic Box Arrays:*** Standard and custom size submersible ultrasonic box arrays constructed of stainless steel. System power may range form 100 W up to many kW using Fixed Frequency or MMM wideband generators.

	 
• ***Submersible Ultrasonic Tube Arrays:*** Standard and custom size submersible ultrasonic tube arrays constructed of stainless steel. These tubular systems radiate acoustic energy 360° around the total length of the tube and generate a high degree of effective cavitation. System power may range form 100 W up to many kW using Fixed Frequency or MMM wideband generators.	
• ***Submersible Ultrasonic Bar Sonotrodes (Single Ended or Push-Pull Versions):*** Standard and custom size submersible ultrasonic bar sonotrodes constructed of solid titanium. These bar systems radiate acoustic energy 360° around the total length of the bar and generate a high degree of effective cavitation. System power may range form 100 W up to 3 kW using Fixed Frequency or MMM wideband generators.	 

• ***Submersible Ultrasonic Sonotrodes as Single Ended SONICATORS:***

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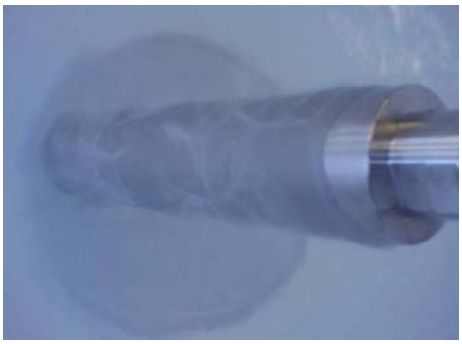

• ***Pipe Clamp-On:*** Custom clamp systems using one or more ultrasonic converters may be externally attached to stainless steel or titanium pipe or tube segments. The clamped segment becomes the radiator of Ultrasonic energy to material internal or external to the pipe. These systems simplify treatment of materials in flow through, high temperature or pressurized systems. System power may range form 100 W up to 1,200 W using MMM wideband generators.

• ***3rd Party Transducers:*** Our MMM generators offer great flexibility in adapting to other supplier's transducers or ultrasonic baths. We can make inductive and frequency adjustments in the field to

turn ordinary ultrasonic baths into super cleaning systems.




Cleaning System Design Services: We provide consulting and custom design services to aid our clients in construction of cleaning systems for special applications.