



# MACROSONICS

MMM Sonic & Ultrasonic, Multifrequency Technology

## MPI

*Marais 36, 2400 Le Locle, Switzerland*

*[www.mpi-ultrasonics.com](http://www.mpi-ultrasonics.com)*

*[mpi@mpi-ultrasonics.com](mailto:mpi@mpi-ultrasonics.com)*

*Phone/fax: +41-32-9314045*

# Universal MMM Power Supplies



IP 65/68 Housings

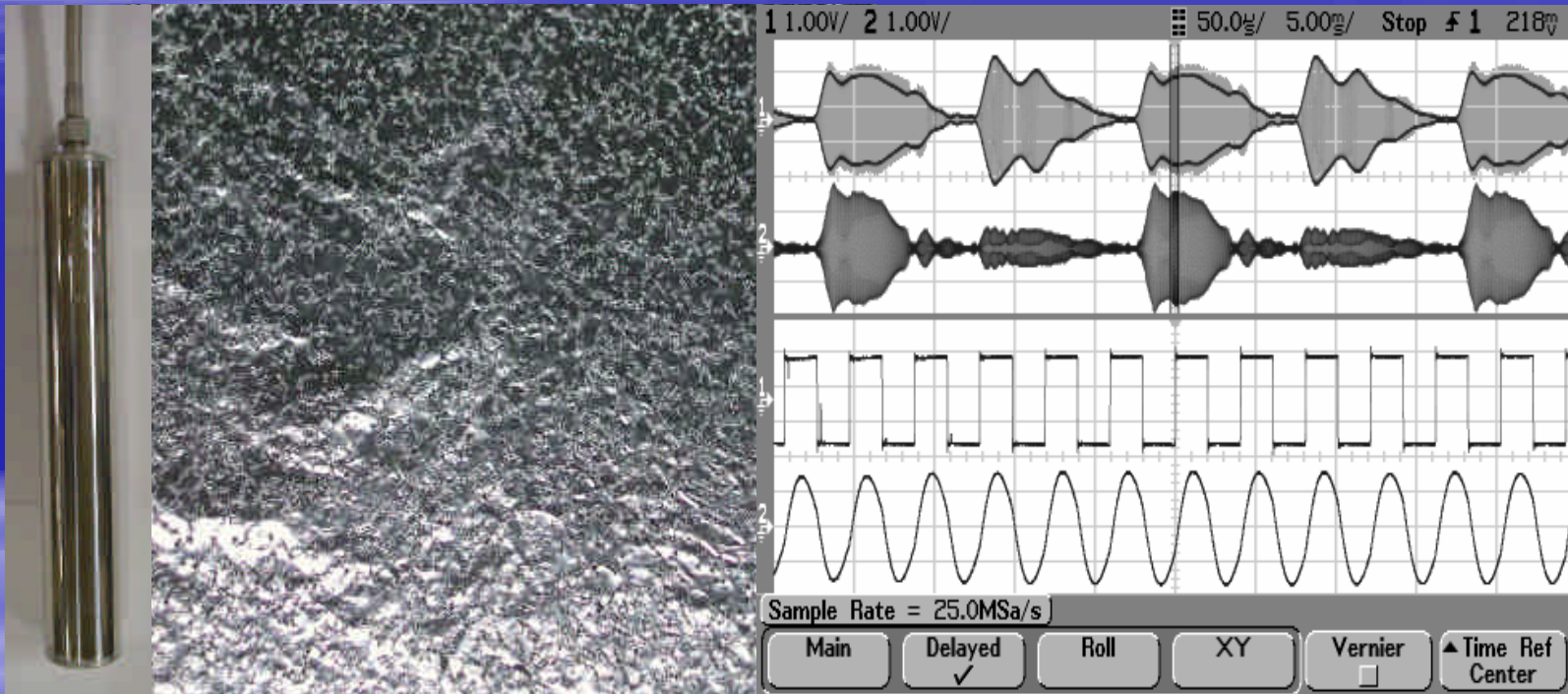
Minimized, Open Frame

All Options included

- Wide bandwidth, programmable carrier frequency
- Programmable frequency, phase and PWM modulation
- Power control from 0 to 100%
- Remote control, RS 485, RS 232C, handy keyboard, manual control...
- Overload protections: Over voltage, over current, thermal, short circuit
- Applications: **Sonochemistry, Cleaning, Sieving, Filtering, Metallurgy and Nanometallurgy, Catalysts and Free Radicals generation...**
- See much more on: [www.mpi-ultrasonics.com](http://www.mpi-ultrasonics.com)

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

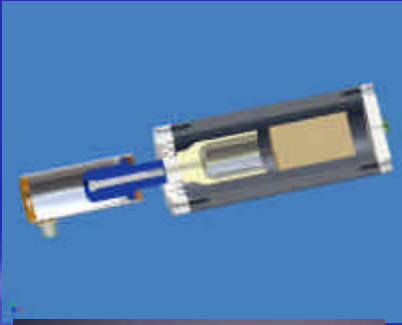
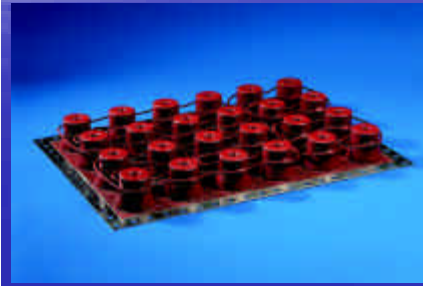
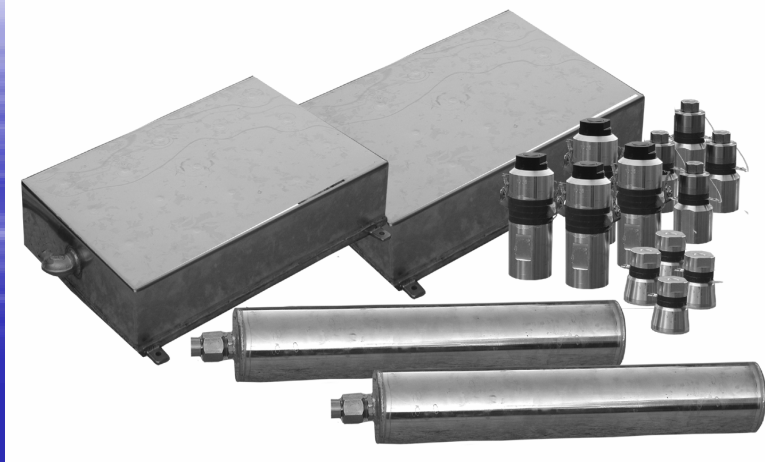
- ✍ No other manufacturer has yet achieved and matched MMM exciting standards in precision cleaning. MMM is not **only** more efficient and effective than any other ultrasonic cleaning technology, it is **UNIQUE**.
- ✍ **Seeing is the believing!** Try the **aluminum foil test** for yourself! Place the 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



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



# MMM Transducers & Systems



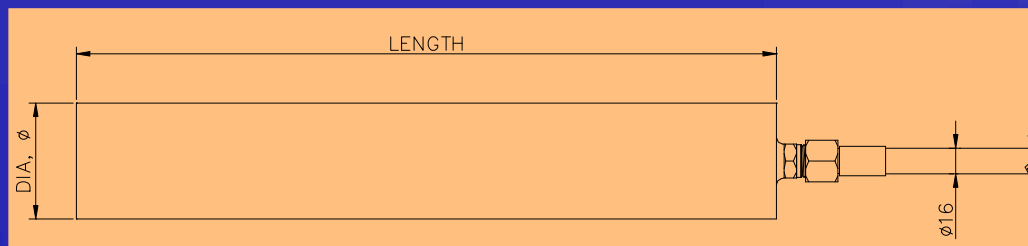
Also Clamp-On mounting design options to any mass, tube, complex shaped body

# MMM Cleaning & Liquid Processing

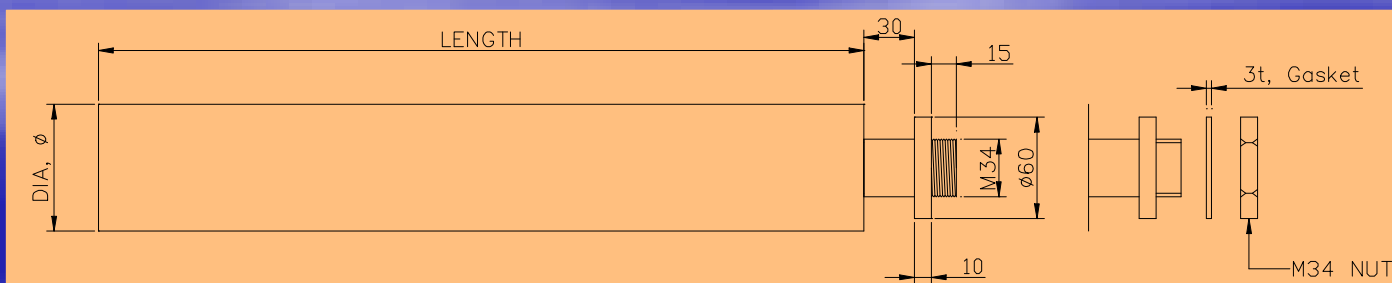
- ✍ Superior and deep penetration, **independent** of water levels.
- ✍ Reliability with extra power spread throughout the bath.
- ✍ **Even** distribution of ultrasonic energy throughout the liquid gives uniform and thorough cleaning of the surface without the risk of damage to fine parts and sensitive 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.
- ✍ 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!

# MMM, Multifrequency Tubular Resonators

Flexible hose type (Immersion, transportable)



Bulk head type (fixed to a tank)



# MMM Tubular Resonators Specification

(only standard models listed)

Continuous Power [W]		400	600	900	1200
Carrier Lower Freq. Range	Model	MMT-28-400	MMT-28-600	MMT-28-900	MMT-28-1200
	Dia [mm]	Ø76			
	Length	304	460	564	668
Carrier Higher Freq. Range	Model	MMT-40-400	MMT-40-600	MMT-40-900	MMT-40-1200
	Dia [mm]	Ø60			
	Length	304	460	564	668

Effective acoustic spectrum, after MMM signal processing: From Hz to MHz  
(apart from acoustic noise and cavitation related spectrum)

# MMM TUBULAR RESONATORS ARE:

- 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
- Superior and fast cleaning effects
- Corrosion free, water proof design  
Anti-corrosion (cavitation resistant, 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 (see about MMM concept at: [www.mpi-ultrasonics.com](http://www.mpi-ultrasonics.com))



## Power Performances

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...

## Versatility of applications & Installation

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 zones.

## Lifetime

Compared to conventional submersible transducers MMM tubular transducers have several times longer operating life