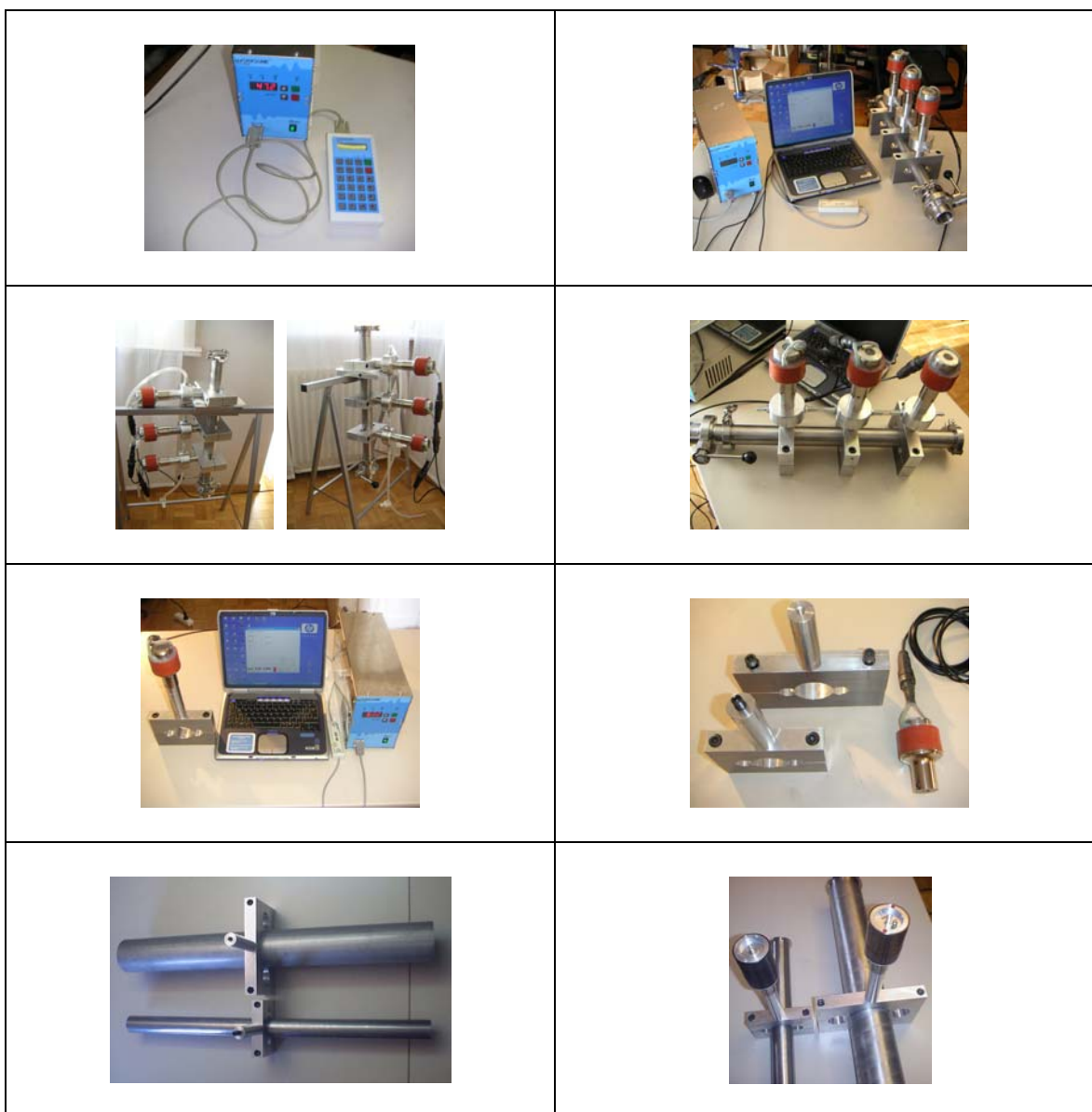


MMM CLAMP-ON REACTORS



Generator and System SETUP

Before operating the system be sure to read the Generator Manual, which can be found on the following address:

http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-ix-generators/latest/um_msg_ix_v6.pdf

The system can be controlled on two different ways:

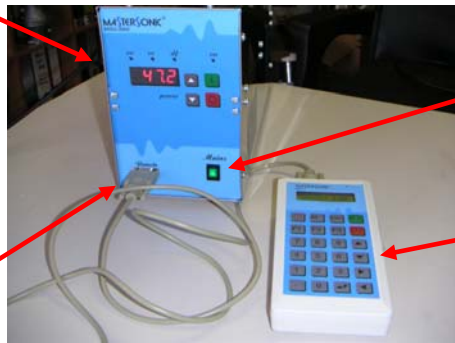
- A) Using the Handheld Control Unit MSH-1 (Remote Control Panel),
or
- B) Connecting the generator to a PC serial port and controlling the system operation from the PC with the provided interface software.

Both options will produce the same results, but using the PC and control software is presenting much more flexible and comfortable way with additional visual and real time information about all operating system parameters.

A) Generator Control using the MSH-1

MMM
Generator:
MSG.1200.IX

RS485 generator
input connector



Main Power Switch
for power ON and
OFF

MSH-1

1. Plug-in the connectors between the Handheld Control Unit MSH-1 and RS485-connector on the front panel of the MSG.1200.IX generator. Handheld Control Unit MSH-1 will operate taking the power directly from the generator (no need for external DC power supply). See instructions regarding how to use MSH-1 on the system manual pages 26 to 29:

http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-ix-generators/latest/um_msg_ix_v6.pdf

**Main Supply
Input: 230
VAC/50-
60Hz, 30 A**



**Ultrasonic
Reactor Cable:
Coax. RG58**

**For external generator
Power ON and OFF
switching, cut this
yellow wire and install
convenient switching
device between the
open-wire-ends, here.**

2. Connect the Ultrasonic Reactor and Main Power Supply cable to the rear panel of the MGG.1200.IX generator. Attention: Apply European 230 VAC, 50/60 Hz, 30 Amp. input power line. When using step-up or step-down transformer, use a 5 kW transformer (to have large safety margin for pulsed-power operations). See instructions on the system manual pages 8, 9 and 10:

http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-ix-generators/latest/um_msg_ix_v6.pdf

Then Switch ON the Main Switch on the generator front panel: See the picture from the step 1.

Comments: Main Supply voltage variations between 220 VAC and 235 VAC are acceptable. Do not use 208 VAC, 60 Hz, because the system power would be reduced, and internal drivers of the MSG.1200.IX would not operate properly.

B) Generator Control using the PC serial (RS) port



3. Switch-ON your PC and Download the generator control software file from the following address (if mentioned address can not be activated from this Adobe PDF document, go directly to internet and download the exe file):

http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-ix-generators/latest/inox%20control%20panel-17.5-28khz.exe

and then place it on the PC Desktop (the first screen you will see on your monitor, after initiating MS Windows, before using any software). You will see on your PC



desktop the following **Integrated Circuit Icon**: **Inox.exe** . Later, by clicking on that icon you will be able to activate the interface software for MSG.1200.IX control. Wait with software activation until you finalize the step 4. (see below).

4. Take the serial interface MMM-Link-2339 (or MSA2218, RS485 Adapter) and plug its cable-connectors between the PC serial port and RS485-connector on the front panel of the MSG.1200.IX generator (see pictures in step 3.). See instructions regarding how to use MMM-Link-2339 on the system manual (pages 30 and 31):

http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-ix-generators/latest/um_msg_ix_v6.pdf

As noted in the step 2. The Main power supply and Reactor cable should be connected to the rear panel of the Generator.

Do not open the generator box. The system is factory regulated in the best possible way, so that you will be able to control your system from the MSH-1 or from the PC interface software.

5. Activate the Generator using the MSH-1 (option A)); See instructions regarding how to use MSH-1 on the system manual pages 26 to 29: ^

http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-ix-generators/latest/um_msg_ix_v6.pdf

Or you can also activate and control the generator by clicking on the interface-



software icon: **Inox.exe** (option B)). See instructions regarding how to use software control on the system manual pages 30 and 31:

http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-ix-generators/latest/um_msg_ix_v6.pdf

6. Apply the following, initial generator settings (before activating the generator START button, or before sending the ultrasonic power to the reactor):

- a) Read pages 13 and 14 of the following document:

http://mastersonic.com/documents/mmm_basics/mmm_power_supplies/msg-ix-generators/latest/um_msg_ix_v6.pdf

- b) Set the Generator Power to not more than 30% of the total power,
- c) Set the MAX current to minimum,
- d) Set PWM period to: 0.010 s,
- e) Set PWM ratio to: 100%,
- f) Read and apply the specific document with the **best settings for your Ultrasonic Reactor** that will be sent to you by MPI.

Examples of Appropriate Parameters Setting for Ultrasonic Reactor Operation

Preliminary steps:

The Reactor should be in its vertical position and filled with liquid. Do not operate reactor without liquid in the tube (start settings and testing with water). See the images on the second page.

Connect the water cooling system and start water flow through water jackets.

Connect the generator to ultrasonic reactor converters.

Connect the PC Interface Adapter between the PC serial port and the RS485 connector on the generator front panel

Provide mains power to the generator and switch on the generator at the front panel.

Start the MMM PC Interface Control Software. All initial settings will be made using the PC Interface Control Software (before activating the Reactor).

Do not activate the generator to produce an ultrasonic signal. Do not press the Start button provided by the software.

Click on the Power Tab at the top of the PC Interface Control Software and set the input Power (by moving the sliding bar to the left position) to max. 30%.

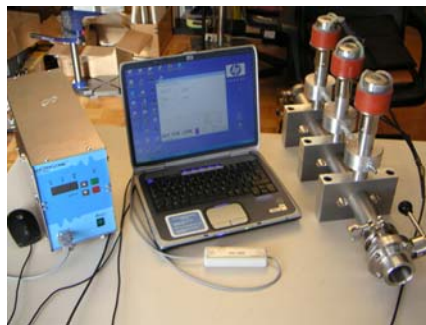
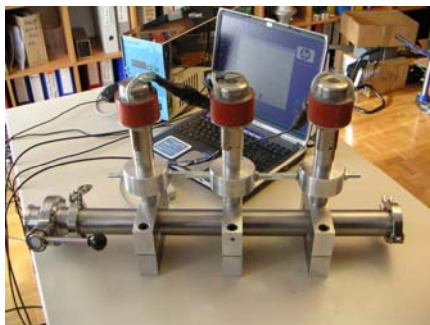
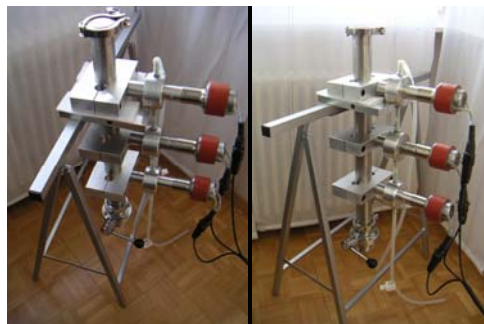
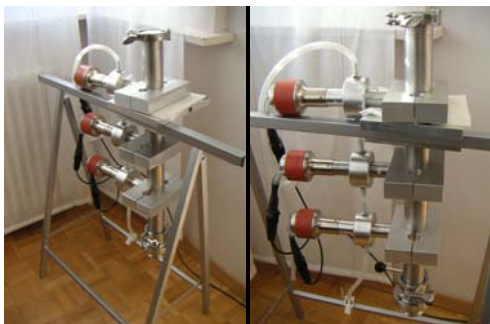
3-clamp-on-tubular-sonoreactor-50mm



Reactor holder example, with the base-plate where the Reactor may hang.

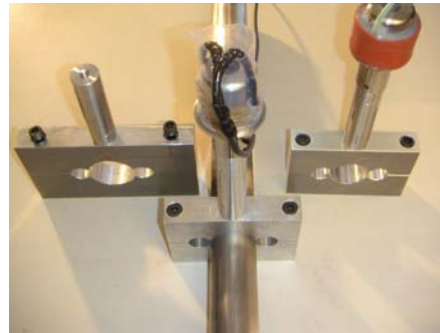


Reactor holder with foam-type backing placed in order to avoid direct metal-to-metal contact between the Clamp parts and the holder base-plate



Reactor in different operating positions, placed horizontally or on the holder. Different possibilities for mounting are presented. Do not place reactor directly to the metal surface, since aluminum clamps are vibrating (use some kind of acoustically isolating, soft and foamy pads).

Clamp-On Tubular Reactor Elements



Different Clamp-on elements and high power MMM converters.



Handheld controlled generator with MSH-1 controller unit



Generator PC-controlled

First Example:

This example is only applicable to the water-filled reactor type delivered with these instructions. This procedure will allow you find the best operating conditions quickly without wasted efforts and without making improper settings that could harm the system. You may make slight parameter variations within the given range. When making new settings and reactor testing (with new liquid content), please reduce the power to 30% and first search for the best operating conditions under low power.

After introducing all initial settings as detailed below you may press the software [Start](#) button. The Generator will start producing ultrasonic power and the Reactor will start oscillating. You may continue adjusting generator settings when the Reactor is operating.

Monitor the Input DC Power reading (lower right section of the software screen), which is indicating the input power level.

Systematically [repeat](#) the fine tuning process for all parameters (slightly varying them within the specified ranges) until reaching the highest input DC Power level.

When you reach the maximal input power, memorize the parameters clicking the [Write](#) button on the control software window. All parameters will be stored in an active memory. Now you can start active liquid processing tests. After switching-OFF the system (pressing the software [Stop](#) button), and after re-activating the generator for subsequent tests, you can recall all previous stored parameters by clicking on the [Read](#) software button. These parameter settings will be read from the generator memory and displayed on the PC control software window.

[Click on the DDS page tab at the top of the PC Control Panel Window:](#)

Make settings:

Frequency:

Preliminary testing shows an efficient central frequency range for the water filled reactor between 18.280 kHz and 18.900 kHz. Click on the Frequency DDS slide bar and set to 18.890 kHz to start.

Using your keyboard Left/Right Arrows or your mouse scroll wheel slowly change the frequency in 10 Hz steps up to 18.750 kHz to find the best central frequency point for every new test environment. Experiment until reaching the highest input power by noting the DC Power indicator in the lower right section of the PC control window. As you pass through the best central operating frequency the higher system efficiency is exhibited by improved DC Power delivery.

Sweeping:

Set between 0.100 kHz to 0.400 kHz (as above find the best interval by slowly sweeping across this defined range. The Best setting is when the input system DC Power is maximized, providing that reactor is producing uniform and continuous acoustic sound, without whistling, impulsive, non-periodical and cracking noise).

[Click on the Power page tab:](#)

Make settings:

Power:

- 1.) Set between 40% and 70%. Set 30% as the starting point. After experimenting in a real operating regime you may increase the power to 70%. Note that system input power as shown by the DC Power reading on the lower right section of the software screen does not reach more than 600 W. 600 W is the power limit for this reactor. Increasing power over this limit would mechanically over-stress the reactor tube and could cause damage. Increase the power until smooth and continuous oscillations are present. If the ultrasonic reactor starts producing cracking and sharp noise, stop increasing the power. Always set power to stay within a relatively smooth and quiet operating regime. Increasing the power over the suggested limits will only produce heating and may damage transducers. Entering into a regime of non-linear and clipping oscillations is not producing better liquid processing effects (it is producing only very high noise level, high thermal losses and possibly damaging reactor elements). Adjust the operating frequency again to find the maximum load current and power. Later repeat all setting steps to find better operating conditions.

MAX current:

Set to 3 A. If testing with some other liquid (not water), initially set this current limit to 2 A. After a period of safe operation you

may gradually increase the setting to 3 A. This is the safe operating margin for your system.

PWM period:

Set at its minimum 0.010 s setting to start. When the PWM ratio is set to less than 100%, you may experiment by increasing it until 0.100 s), while reducing the Power in order to avoid pulsed over-current.

PWM ratio:

Keep at 100% until more experience is gained in using this system. When you are fully aware of all parameters and safe operation conditions you may reduce the PWM ration to 20% to realize low frequency pulsing (ON – OFF) liquid processing regimes.

[Click on the FSWM page tab:](#)

Make settings:

FSWM range:

Set between 0.000 kHz and 0.400 kHz (start with 0.000 kHz, and later experiment by going higher until reaching maximal input DC Power, or best ultrasonic processing effects).

FSMW ratio:

Set between 50% and 90% (start with 50%). Experiment with different values, until getting the highest input DC Power. Usually the best value is 50%.

FSWM period:

Set between 0.020 s and 0.200 s. Start testing with 0.020 s and higher to reach the highest input DC Power.

[Click on the DMMM page tab:](#)

Make settings:

Q factor:

Set between 30 and 150 (start with 30, and later go higher). For low viscosity and low density liquids, Q-values should be higher. For high density and high viscosity liquids, Q-values should be lower. Experiment with different values, until getting the highest input DC Power.

Frequency correction:

Set between 100 and 255 (start with 150). Experiment with different values, until getting the highest input DC Power.

Amplification factor:

Set between 20 and 150. Start testing with 50 and later adjust until getting highest input DC Power.

Second Example:

This example is only applicable to the water-filled reactor type delivered with these instructions. This procedure will allow you find the best operating conditions quickly without wasted efforts and without making improper settings that could harm the system. You may make slight parameter variations within the given range. When making new settings and reactor testing (with new liquid content), please reduce the power to 30% and first search for the best operating conditions under low power.

After introducing all initial settings as detailed below you may press the software [Start](#) button. The Generator will start producing ultrasonic power and the Reactor will start oscillating. You may continue adjusting generator settings when the Reactor is operating.

Monitor the Input DC Power reading (lower right section of the software screen), which is indicating the input power level.

Systematically [repeat](#) the fine tuning process for all parameters (slightly varying them within the specified ranges) until reaching the highest input DC Power level.

When you reach the maximal input power, memorize the parameters clicking the [Write](#) button on the control software window. All parameters will be stored in an active memory. Now you can start active liquid processing tests. After switching-OFF the system (pressing the software [Stop](#) button), and after re-activating the generator for subsequent tests, you can recall all previous stored parameters by clicking on the [Read](#) software button. These parameter settings will be read from the generator memory and displayed on the PC control software window.

[Click on the interface software DDS page tab:](#)

Make settings:

[Frequency:](#)

Preliminary testing shows an efficient central frequency range for the water filled reactor between 21.100 kHz and 22.400 kHz. Set to 22.350 kHz to start. Slowly sweep the frequency up and down inside of the given interval to find the best central frequency point

for every new test environment. Experiment until reaching the highest input DC Power.

Sweeping:

Set from 0.100 kHz to 0.580 kHz. The Best setting is when the input system DC Power is maximized, providing that reactor is producing uniform and continuous acoustic sound, without whistling, impulsive, non-periodical and cracking noise).

[Click on the Power page tab:](#)

Make settings:

Power:

- 2.) Set between 40% and 70%. Set 30% as the starting point. After experimenting in a real operating regime you may increase the power to 70%. Note that system input power as shown by the DC Power reading on the lower right section of the software screen does not reach more than 600 W. 600 W is the power limit for this reactor. Increasing power over this limit would mechanically over-stress the reactor tube and could cause damage. Increase the power until smooth and continuous oscillations are present. If the ultrasonic reactor starts producing cracking and sharp noise, stop increasing the power. Always set power to stay within a relatively smooth and quiet operating regime. Increasing the power over the suggested limits will only produce heating and may damage transducers. Entering into a regime of non-linear and clipping oscillations is not producing better liquid processing effects (it is producing only very high noise level, high thermal losses and possibly damaging reactor elements). Adjust the operating frequency again to find the maximum load current and power. Later repeat all setting steps to find better operating conditions.

MAX current:

Set to 3 A. If testing with some other liquid (not water), initially set this current limit to 2 A. After a period of safe operation you may gradually increase the setting to 3 A. This is the safe operating margin for your system.

PWM period:

Set at its minimum 0.010 s setting to start. When the PWM ratio is set to less than 100%, you may experiment by increasing it until 0.100 s).

PWM ratio:

Keep at 100% until more experience is gained in using this system. When you are fully aware of all parameters and safe operation conditions you may reduce the PWM ratio to 20% to realize low frequency pulsing (ON – OFF) liquid processing regimes.

[Click on the FSWM page tab:](#)

Make settings:

FSWM range:

Set it to 0.000 kHz.

FSMW ratio:

Set it to 50%.

FSWM period:

Set between 0.020 s and 0.200 s. Start testing with 0.020 s and hitherto reach the highest input DC Power.

[Click on the DMMM page tab:](#)

Make settings:

Q factor:

Set to 50. (Start with 30 and later go higher). For low viscosity and low density liquids, Q-values should be higher. For high density and high viscosity liquids, Q-values should be lower. Experiment with different values, until getting the highest input DC Power.

Frequency correction:

Set between 150 and 255 (start with 150). Experiment with different values, until getting the highest input DC Power.

Amplification factor:

Set between 35 and 55. Start testing with 40, and later adjust until getting highest input DC Power.