Operations Manual for ultrasonic
OWF Generator

THE ULTRASONIC OWF GENERATOR

ULTRASONIC GENERATOR – Manual

CONTENTS

INTRODUCTION

Dear Customer,
Thank you for your purchase of the product.
This ultrasonic OWF-generator has been developed using the latest technologies to allow for greater overall performance and stability.

Please read and follow these operating instructions carefully before installing or commissioning your product. As with any electrically powered device, failure to observe these instructions can present a risk to life.

The device may only be operated and maintained by personnel who have read and understood this operating manual and are familiar with the applicable legal regulations for accident prevention and workplace safety. Failure to comply with this will result in a loss of warranty rights.

SAFETY INSTRUCTIONS

Before starting up your device, please read through the following instructions carefully, both for your own safety and for the safety of the device.

Keep this manual where it can be readily accessed by all systems users.

Installation is to be carried out by qualified technical personnel only!

This ultrasonic generator is to be operated by properly trained personnel only!

Due to the way it operates, **additional** safety measures must be taken if the device is to be used in areas posing an explosion risk.

The electromagnetic compatibility corresponds to the standards and regulations listed in the specifications.

All necessary settings were either made in the factory or are described in this handbook.
However, should problems occur on start-up, please do not make any prohibited adjustments to the device, as this would endanger your warranty rights. If in doubt, please contact our technical service staff.

Please contact our technical service if at all in doubt. Please see the last page.

Inspection or diagnostic work inside the device may only be carried out to the extent described and, as with the electrical connection should only be performed by skilled personnel. When performing such work, the ultrasonic generator must be completely disconnected from the main power source. (unplug the mains connection).

The device must always be disconnected from the mains before cleaning or when installing/uninstalling an option. Do not use liquid cleaners or sprays. Only use a damp cloth.

Inputs or outputs that are used for controlling or monitoring purposes should be twisted and shielded.
The device must not be in close proximity to electrically charged components or cables.

The shielding should be connected to the generator's earth on one side of the generator.
Attention: All connections for the signal or control lines are galvanically connected to the generator.

Always observe any warnings or instructions provided on the device itself.

The platform for the device must be sufficiently stable, as the device being jolted or falling could cause severe damage.

Ensure that the power supply specifications given on the device are met.

Only those transducers which have the correct frequency, power output and dimensions may be used with this generator.

HF cables from the generator to the transducer as well as mains cables to the generator may not be rolled up if they are too long. Instead, they must be shortened to the required length due to the risk of overheating.

With the exception of the permitted tasks listed in the handbook, you should never attempt to repair or modify the device yourself.

In the following cases you should disconnect the device from the mains and contact a qualified service engineer:

· **If the mains cable or plug is damaged**
· **If liquid has penetrated into the device**
· **If the device has fallen over or the housing is damaged**
· **If the device displays noticeably different behaviour than standard operation**

ATTENTION: Repairs and modifications may only be carried out by competent, skilled personnel

GENERAL VIEW AND DIMENSIONS/mm/
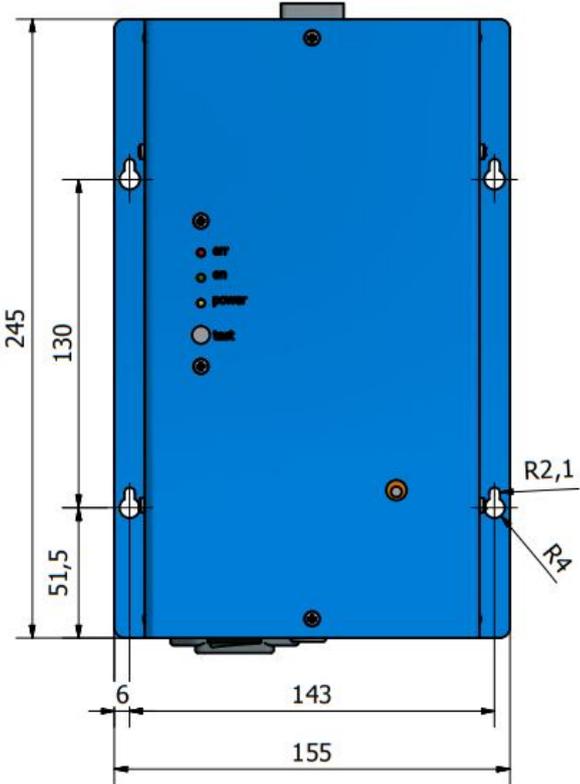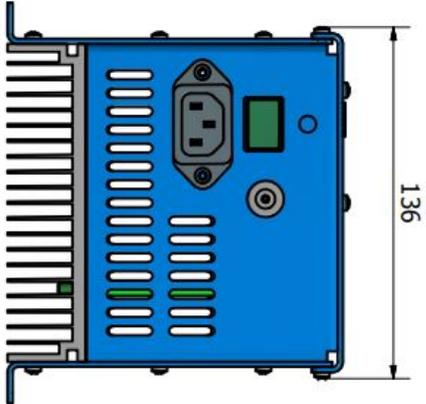
INSTALLATION & ENVIRONMENT

Choose a suitable location that will protect the device from moisture, water, excessive sunlight and heat.
The selected location for the device should be in an area where ambient temperatures do not exceed 40°C.

All OWF generator modules 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.

If the generator cannot dissipate the heat sufficiently, it will display in your application software an error message due to excess temperature (see also the "OVERHEAT" error description).

ATTENTION: • **Choose a location that will prevent steam or any other aggressive vapours from penetrating the device.** Ambient temperatures of over 30°C should be avoided.

• **Over a period of time, chemically contaminated ambient air can lead to the device being irreparably damaged.**

Power supply

The ultrasonic generator draws its power (210-250VAC/50-80Hz) via the connection cable with **Power socket.**

It has an internal main fuse (5 A).
If you need to change the fuses, unscrew the cover of the housing.

ATTENTION:

- **For safety reasons, always disconnect the unit from the mains before changing fuses.**
- **Plug racks into earthed sockets only.**
- **Always replace blown fuses with new fuses of the same type.**
- **This should only be performed by qualified, skilled personnel.**

Connections on the back of the generator

HF OUTPUT		
EXTERNAL START/STOP		
POWER SWITCH		**Interface socket RS485 ModBus**
POWER SOCKET		**15-pole DSUB I/O socket**

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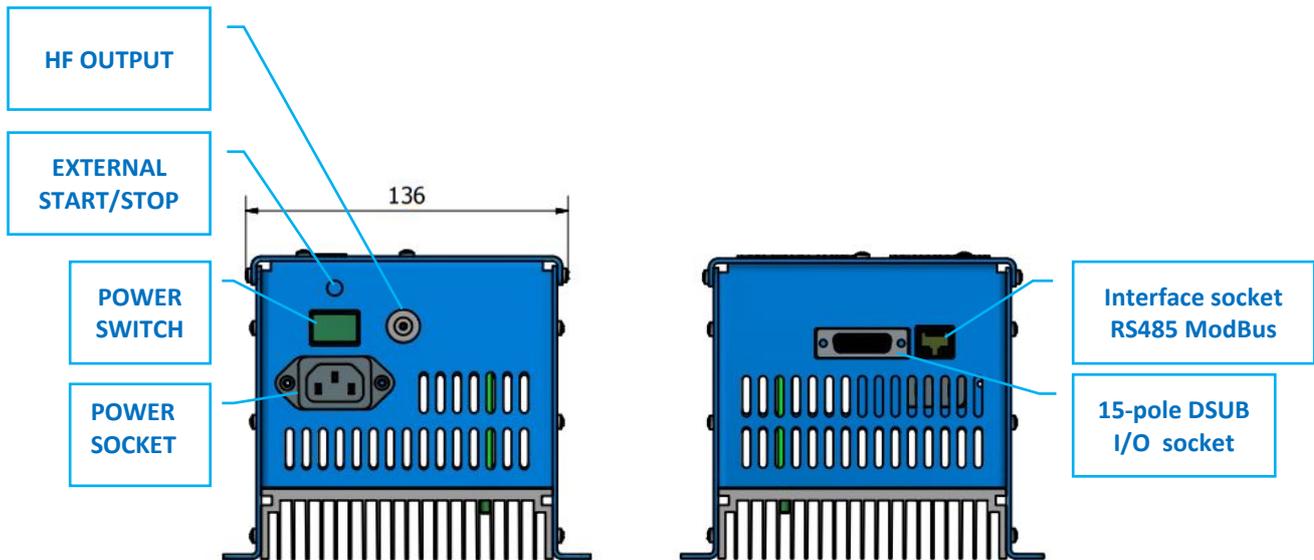
HF OUTPUT: HF Output connector is a Lemo : ERA.1S.250.CTL

ATTENTION:

- Output voltage could be between 600V and 1200V AC.

- Only use cables specified by the manufacturer.

- Use only shielded transducer connection cables.

- Connect the shielding to the PE conductor on the generator side.

- Only use cables with sufficient cross-section.

- Minimum cross-section: 1.5 mm2.

Interface socket RS485 ModBus
RJ 45 CONNECTOR:

RJ 45

RS 485

1 — GND
2
3
4 — A
5 — B
6
7 — 12 V DC
8
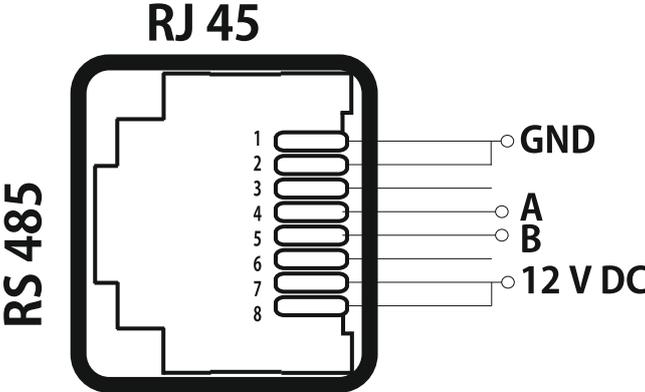
PINS	DESCRIPTION
1	GND
2	GND
3	N/C
4	A
5	B
6	N/C
7	12 V DC
8	12 V DC

15-pin DSUB I/O socket
Assignment of the 15-pin DSUB interface socket
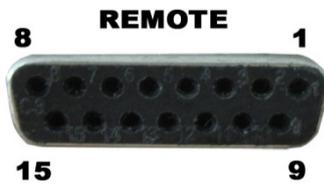
PIN No. on DSUB SOCKET Interface X1	Signal name	Description
1	+12 VOLT OUT	12 Volt for external use
2	POUT	Output 0 – 10 Volt = Power output 0 – 100 %
3	P-EXT.-IN	Input 0 – 10 Volt for power control
4	GND	Internal Ground for analog input and output internal (GND)
5/9	HF-DA-ERROR	Common sigmal for HF-DA-ERROR
6	HF-DA	Optocoupler output "HF-DA"
7	ERROR	Optocoupler output "ERROR"
8	A	ModBus over RS485 "A" signal
9/5	HF-DA-ERROR	Relay root (shared) for "HF-DA" and "ERROR"
10	B	ModBus over RS485 "B" sigmal
11	Not connected	
12	Not connected	
13	FS-24 V	Remote START/STOP control input (with 10 – 24 Volt)
14	GND	internal (GND)
15	GND	internal (GND)

ATTENTION: A shielded control cable must always be used for the interface.

Correction: The START/STOP switch must be connected between pi 1 and pin 13 on the 15pin DSUB connector.

Interface Description

1.) Signal "+12 Volt Out"   **DSUB PIN 1**
A voltage of 12 V is available at this output. This signal can be loaded with max. 100 mA. It can be used as supply voltage for the functions "HF-DA" , "Error", "FS-24 V", "P-EXT.-IN".
Reference signal is GND.

2.) Signal "POUT"   **DSUB PIN 2**
At this output a voltage proportional to the power output of between 0 and 10 V
(= 0 – 100 % power output) is available.
Reference point = "GND".

3.) DSUB PIN 3
By connecting a voltage between 0V and 10 V, the output of the generator can be set to between 0% and 100% of its nominal amplitude or power. **This is only possible when the value of parameter " POWER SET POINT" is set to 0 from the LCD or PC software.**
Reference signal is "GND".

4.) Signal "GND"   **DSUB PIN 4**

5.) Signal "HF-DA ERROR"   **DSUB PIN 5/9**
Shared in/output for the internal optocoupler "HF-DA" and "ERROR" (these PINs are connected internally).

6.) Signal "HF-DA"   **DSUB PIN 6**
If the ultrasonic generator start, and is emitting HF voltage (i.e. there is no ERROR), an internal optocoupler is
Switched ON. (between PIN 6 and PIN 5/9)

The "root" of this optocoupler leads through to a PIN 5/9 (these pins are connected internally)
in the DSUB socket.
A voltage connected to Pin 5/9 can be switched through (max. 36 VDC / 20 mA).

7.) Signal "Error"   **DSUB PIN 7**
This is the output of an internal optocoupler (root to PIN 5/9).

This optocoupler reports generator ERROR in one of the following cases:
   1. Overcurrent
   2. Overvoltage
   3. Overheat.
An external voltage connected to "HF-DA-Error" can, of course, also be switched through here (max. 36 VDC / 20 mA).

8.) Signal "A"   **DSUB PIN 8**
A signal of RS 485 interface

10.) Signal "B"   **DSUB PIN 10**
B signal of RS 485 interface

11.) NC.

12.) NC

13.) Signal "FS-24 Volt"   **DSUB PIN 13**
Switching on the generator (Ultrasound On) by connecting a voltage between
10 – 24 Volt between PIN 13 and GND (PIN 4,14 or15).

14.) Signal "GND"   **DSUB PIN 14**

15.) Signal "GND"   **DSUB PIN 15**
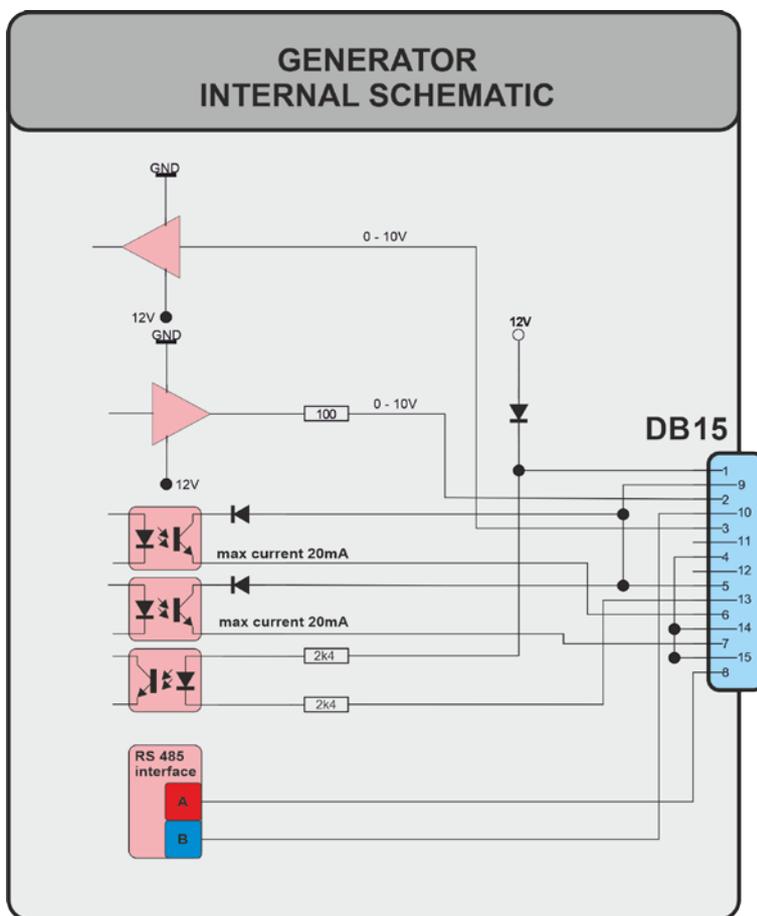
OPERATION
Operator elements on the front panel
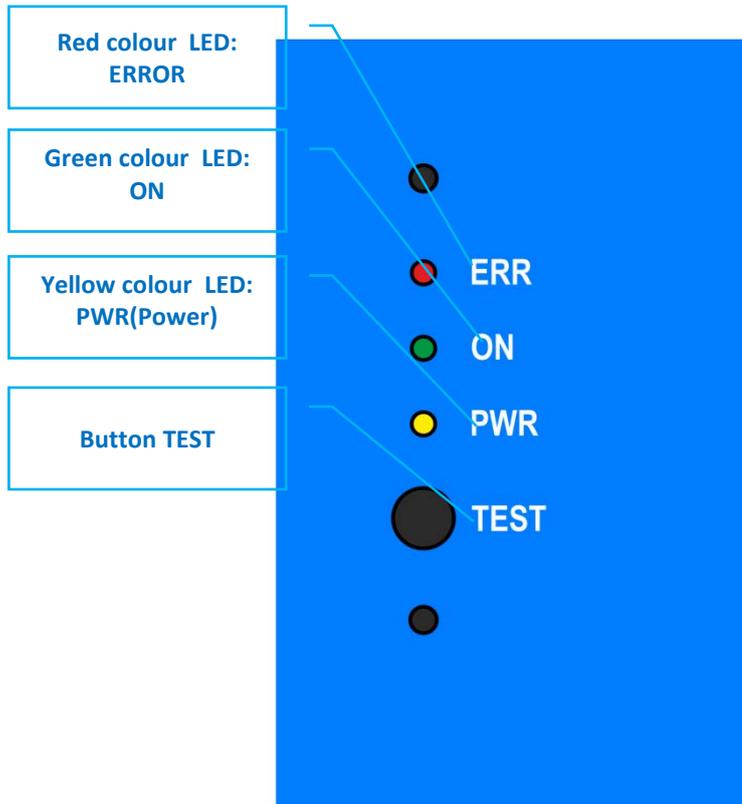
LED:

Red colour LED: ERROR – Lights in red when one of the following three cases appears: Overcurrent, Overvoltage, Overheat

Green colour LED: ON - Lights in green when the generator is on and operates

Yellow colour LED: PWR(Power) - Lights in yellow when the generator is connected to the mains

Button TEST :   This button is very convenient button for your testing. Two different regimes of work are possible to be set for this button by using the Labview software:
1. **Latch-** it works on toggle-toggle regime – by pressing the button once – it starts the generator, by pressing the button for the second time – it stops working.
2. **Push –** the generator works only and during pressing and as long as you hold pressed the button. After releasing the button the generator stops.

Typical Control Schematics :

Correction: The START/STOP switch must be connected between pi 1 and pin 13 on the 15pin DSUB connector.

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GENERATOR
INTERNAL SCHEMATIC
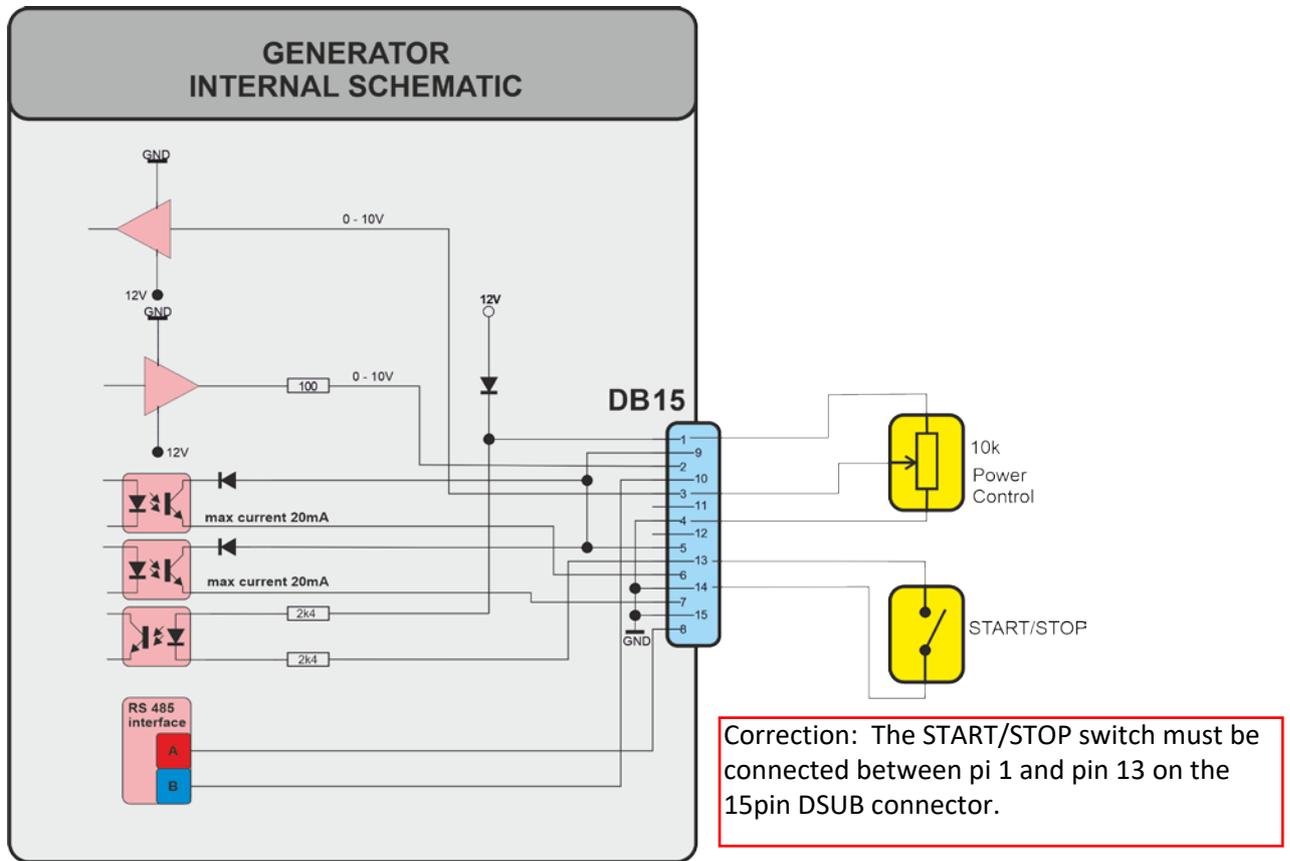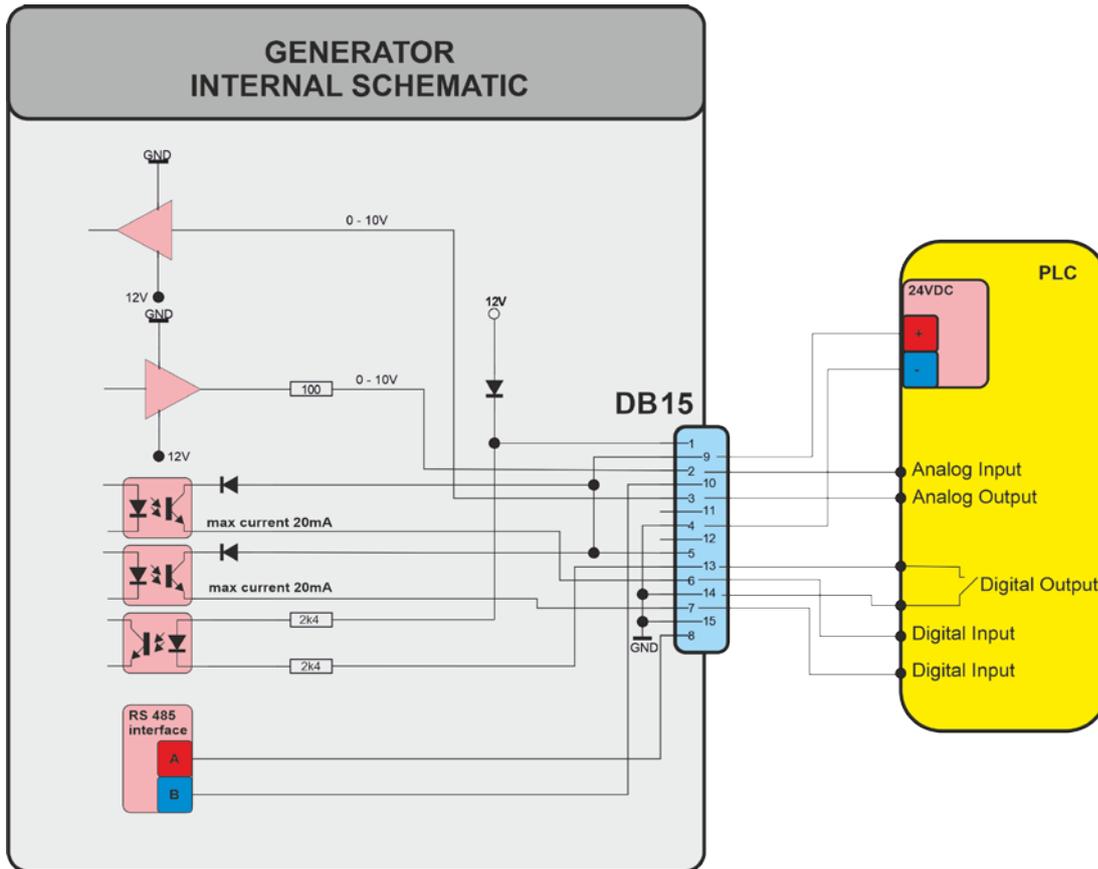
SETTING THE SOFTWARE

The generator has a standard communication interface ModBus RTU over RS 485. To connect to a PC you should use MPI adapter USB or RS 232 to RS 485 optically isolated.
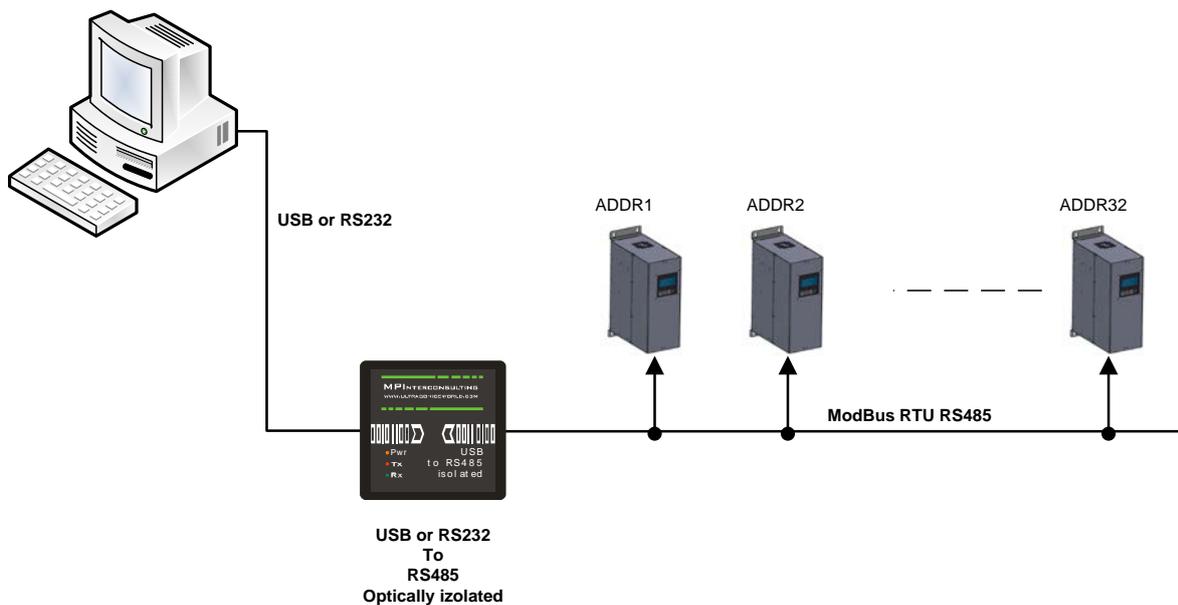
Before starting the software for the generator, you need to follow and execute the following steps

Download to your PC and install all software that is here:
http://www.mastersonics.com/documents/mmm_basics/mmm_power_supplies/AMMM/NI%20Runtime%202012/

Install the software in the sequence as follows:

1. LVRTE2012f3std   - this is the Runtime Engine of National Instruments LabView2012

2. niser360f3   - drivers for serial communication ports of National Instruments LabView 2012

3. CDM v2.12.00 WHQL Certified   - driver for USB to RS485 adapter using FTDI chip FT232RL - you can use she attached here file (for Windows), or download the latest version, updated for your OS from here: https://www.ftdichip.com/Drivers/VCP.htm

Now download all generyator software files and place them on your PC desktop. Mentioned software is here:

 http://www.mastersonics.com/documents/mmm_basics/mmm_power_supplies/OWF-generators/

[?] owf600 march 2019 version 3.vi 346.7 Kb 14 Mar 2019

[?] owf600.exe   533 Kb 05 Mar 2019

[?] owf600.aliases   38 bytes 05 Mar 2019

[?] owf600.ini   293 bytes 05 Mar 2019

Now you are ready to start the executable file, "owf600.exe", of the software of your generator.
   A) First action (regarding all generators and all software we are offering), after activating specific generator software, is to connect your PC with ultrasonic generator using our RS485-USB adapter.
   B) Then you need to select and activate proper operating COM port from the generator software tabs. This will open communication between your PC and your ultrasonic generator.
   C) Then you need to select initial setting conditions regarding expected frequency range.
   D) Then you need to make Scanning to see where ultrasonic load is able to operate.

ADJUSTING THE GENERATOR USING THE PC SOFTWARE
COM Tab
1. **Start with COMM tab**, and select proper COM port.
NOTE: Every new generator has 5 modbus address by default.
   To connect the generator to the labview software we need to cover the following three conditions:
   1. To know the Modbus address of the generator. Every new generator has 5 modbus address by default.
   2. To know the exact COM port where the USB to RS485 driver is installed. Go to the Device Manager of your PC and find the USB Serial Port(The USB adapter must be plugged to one of the USB ports of your PC).
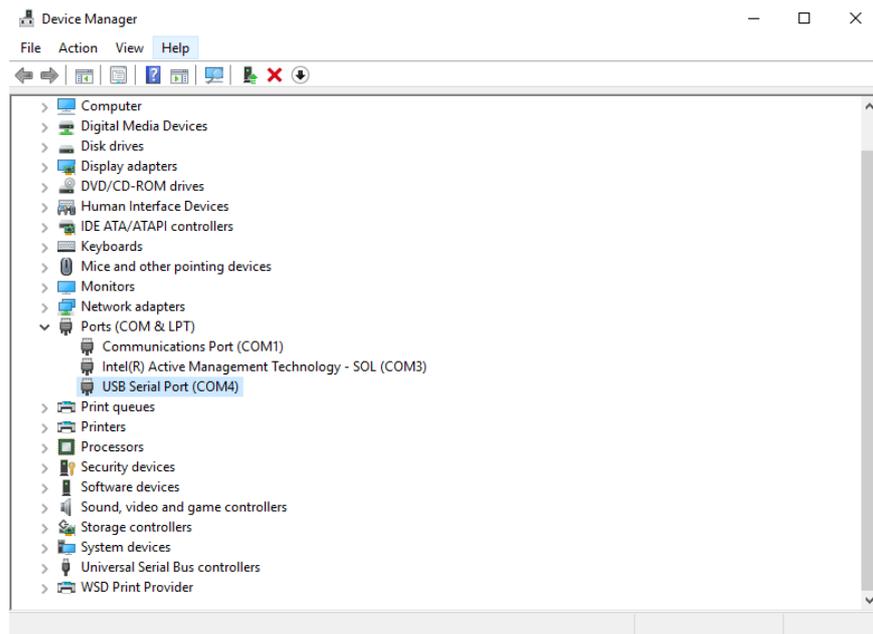
3. To set the correct communication baud rate.

At this moment you will have NO connection(initialized in red on top of the window).

Press "Rescan"(3). Beat counter will become alive and will start changing the figures. Connection (yellow-green) light should be active.

You have the possibility in the upper right side of the window to assign the Modbus addres of the current generator by selecting a new value in the field "NEW MODBUS ADDRESS" and than press the button ASSIGN NEW MODBUS ADDRESS.

DO NOT FORGET TO CHANGE THE MODBUS ADDRESS IN FIELD WITH THE NEW ASSIGNED MODBUS ADDRESS.

The default baud rate is 115200 Bps.

Go to the first tab "CONTROL"

CONTROL Tab

Buttons:

RESCAN – By pushing RESCAN all parameters saved in the generator's memory will upload into Labview softaware.

WRITE - By pushing WRITE all parameters set in Labview softaware will download into the generator's memory.

WRITE file - By pushing "WRITE file" all parameters set in Labview softaware will be saved on your computer in a file.

RAED file - By pushing "READ file" all parameters saved in a file on your computer will appear in Labview softaware .

START - By pushing START the generator starts working.

STOP - By pushing STOP the generator stops working.

EXIT - EXITs the Labview software.

Sliders:

Frequency – sets the start frequency of the generator, but roughly(on big steps).

Frequency fine– sets the start frequency of the generator, but finely(on small steps).

Output Power– sets the output power of the generator.

Span – sets the working window, where the generator seeks the working frequency of the transducer, because the working frequency could change because of loading the transducer and/or the temperature of the transducer. The maximum Span is approximately 4 kHz.

Time– sets the time(in minutes) during which the generator is working and after ending the set time , the generator stops. When the Time is set on 0, the generator works without stopping.

Actual Values:

Firmware version– shows the software version of the control board of the generator.

Frequency Meter – shows (in kHz) how many the starting frequency is changed by the frequency regulator of the generator.

Bridge Current – shows (in mA) the actual high frequency current thtough the transistors

Analog Set Point – shows(in Watts) the actual value of the analog power set point(0-10V) over the 25-pin connector(see page 11, pin3).

Out_power – shows (in W) the output power through the transducer.

Out_Voltage – shows (in V) the output RMS voltage over the transducer.

AV Regulator – shows (in ru) actuator value of the internal regulator.

Phase– shows (in ru=relative units) actual working phase.
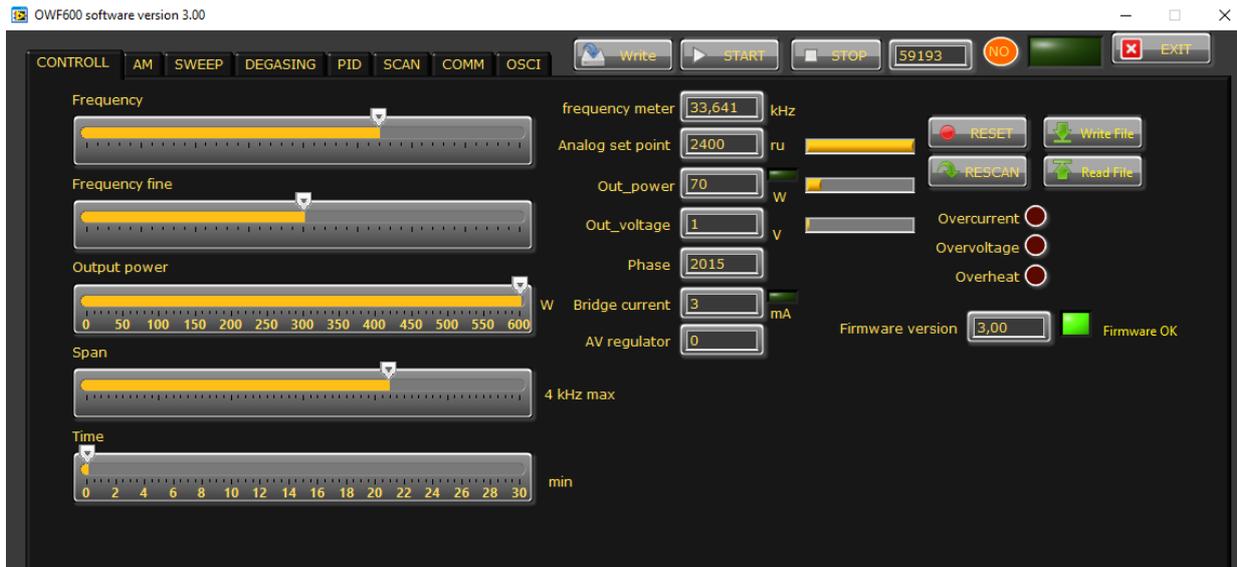
Set frequency little bit higher (+500 Hz), than frequency of ultrasonic transducers is. Keep other parameters as presented on the picture below, but In the very first start here are the steps and settings:

- the inductive compensation coil should be totally closed (L= Lmax)
- set output power to desired power , or maximum allowed for the load
- set the frequency at working frequency of transducer +500Hz above (i.e. for 28kHz transducer - 28,5 kHz)
- Set span = max
- set MMM = 30   (this is sweeping from the feedback of voltage from transformer) in the Sweep tab
- START the generator -
- unscrew the inductive compensation coil, and you will start sense the generator is supplying higher and higher power ... The operating - "Frequency actual" is lower than F start with SPAN - i.e. 28,5 - 4= 24,5 kHz

It will appear that "Frequency meter" starts increasing and the yellow bar of Out_power starts increasing too - that means the generator controls the output power by changing the operating frequency to reach the desired power.

When the "Frequency meter" comes to values close to expected working frequency you can stop changing the coil.

The final result should be that "Frequency meter" is somewhere, a little bit below F-start.   The AV regulator should show about 500 , it means that the load is under control.

AM Tab(Amplitude Modulation Tab)
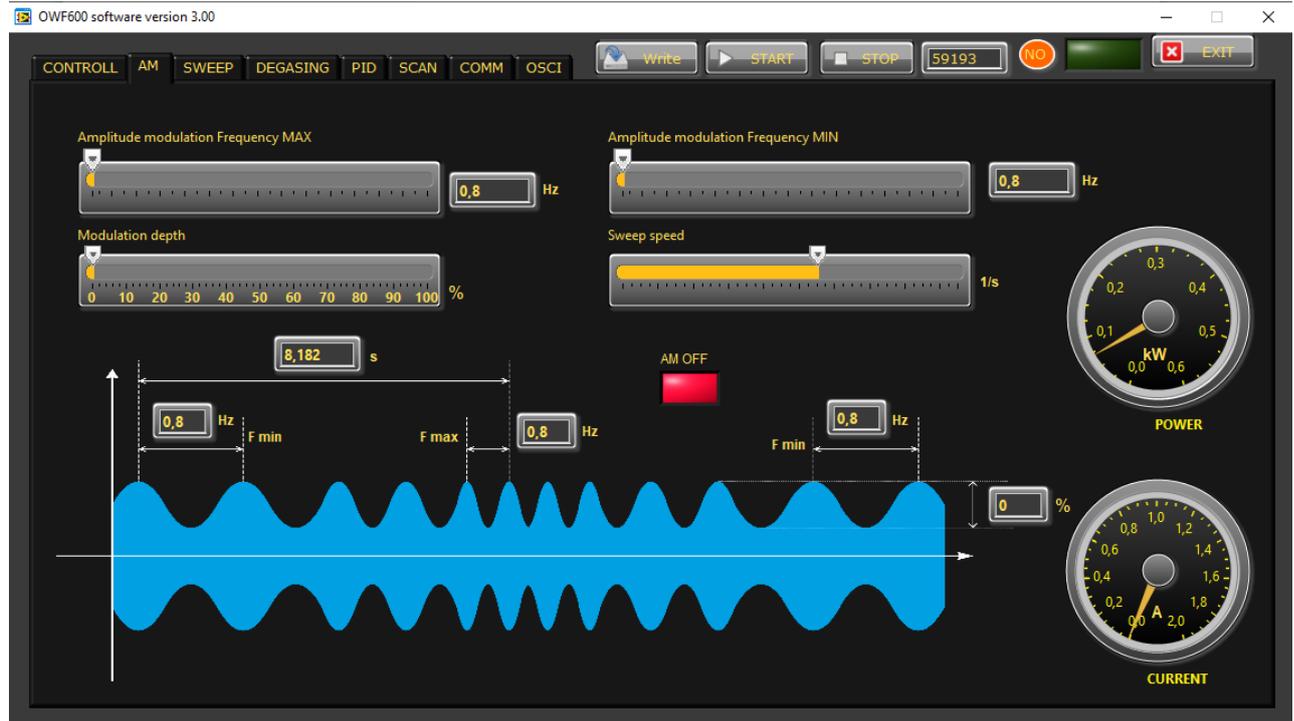
Amplitude modulation frequency MAX – This the maximum value of the frequency of the amplitude modulation.

Modulation Depth – This the the depth of the amplitude modulation.

Amplitude modulation frequency MIN – This the maximum value of the frequency of the amplitude modulation.

Sweep speed – This the speed of changing from Amplitude modulation frequency MIN to Amplitude modulation frequency MAX.

- Find and activate the optimal AM regime, when you need it.

SWEEP Tab

PWM Period – Here you can set a kind of ON/OFF working regime of the generator with the desired period in *ms*.

PWM Ratio – Set the PWM ratio in %, but on 100% the ON/OFF regime will turn off.

Sweeping – This the depth of the artificial sweeping frequency in three possible modes: Continuous – no sweeping; AMMM – semi-random sweeping; Periodic – periodic sweeping.

Sweeping period – Here you can set the desired period of the sweeping frequency in *ms*.

Smoothing – This changes the shape of the sweeping frequency from rectangular to similar to sinusoidal.

MMM – This the depth of the low frequency feed back from the exact load, selected by a few analog low-pass filters.

FSWM frequency(Frequency Shift Width Modulation Frequency) – Set the additional frequency with wich value to change the carrier frequency up. i.e carrier frequency 28.5 kHz + FSWM frequency 0.5 kHz= 29 kHz.

FSWM period – This modulation has a period that could be set in *ms*.

FSWM ratio – This modulation has a ratio that could be set in *%*.

DEGASING Tab

- Find and activate the optimal Degasing regime, when a cleaning liquid has lot of dissolved gas.
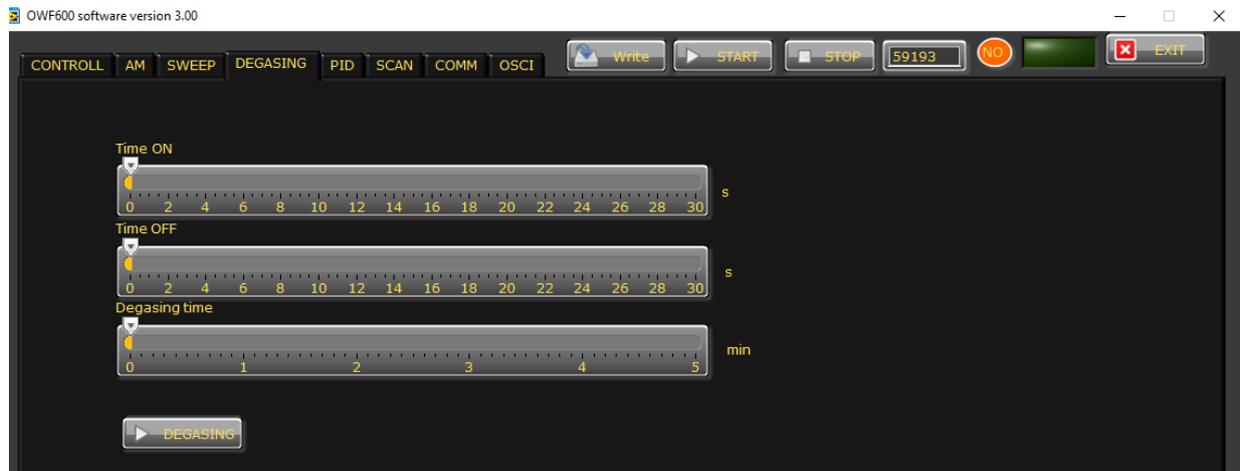
Time ON – Set the operation time of the generator in degasin regime.

Time OFF – Set the non-operation time of the generator in degasin regime.

Degasing time – This the total time the generator was switched ON in degassing mode.

PID Tab
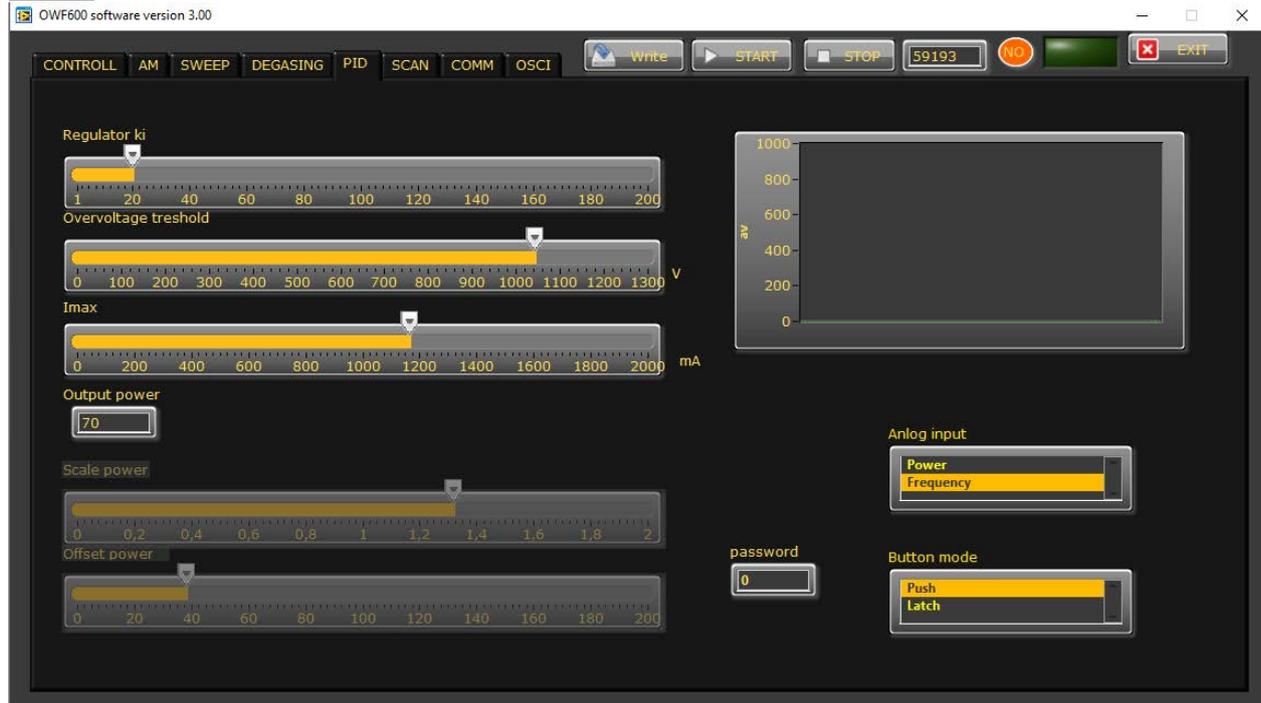
Regulator k_i – This an integral constant of the internal PID regulator. Use this to adjust the response time of the regulator. When k_i is low – the response time is high(the regulator is slow), when k_i is high – the response time is low(the regulator is fast).

Overvoltage treshold – Set the limit of the overvoltage protection, where the generator will stop if the voltage is higher than the safety voltage of the load.

Imax – Set the limit of the maximum allowed current for the exact load.

The **Analog input** signal on pin 3 of the DSUB DB15 connector (from the drop-down menu) could affect two selectable values:
1. **Power** – sets the value of the power – 0-10V= 0-100%.
2. **Frequency** – changes the Fstart – 0-10V=0-1kHz. For ex. If the frequency is set to 28.5 kHz, when we send 10V to the analog input, the frequency will become 29.5 kHz.

The **Button mode** changes the operation mode of the button TEST on the front panel of the generator. Set the desired mode from the drop-down menu.
1. **Latch-** it works on toggle-toggle regime – by pressing the button once – it starts the generator, by pressing the button for the second time – it stops working.
2. **Push –** the generator works only and during pressing and as long as you hold pressed the button. After releasing the button the generator stops.

SCAN Tab

Go to "SCAN" tab and activate SCAN. You will see an active operating area of transducers, like on the picture below. It starts a scanning procedure on low power that indicates the PHASE, shown by the red line. For Fstart you need to select value closed to the working frequency of your transducers. If necessary, reduce or increase "frequency" on the first tab.
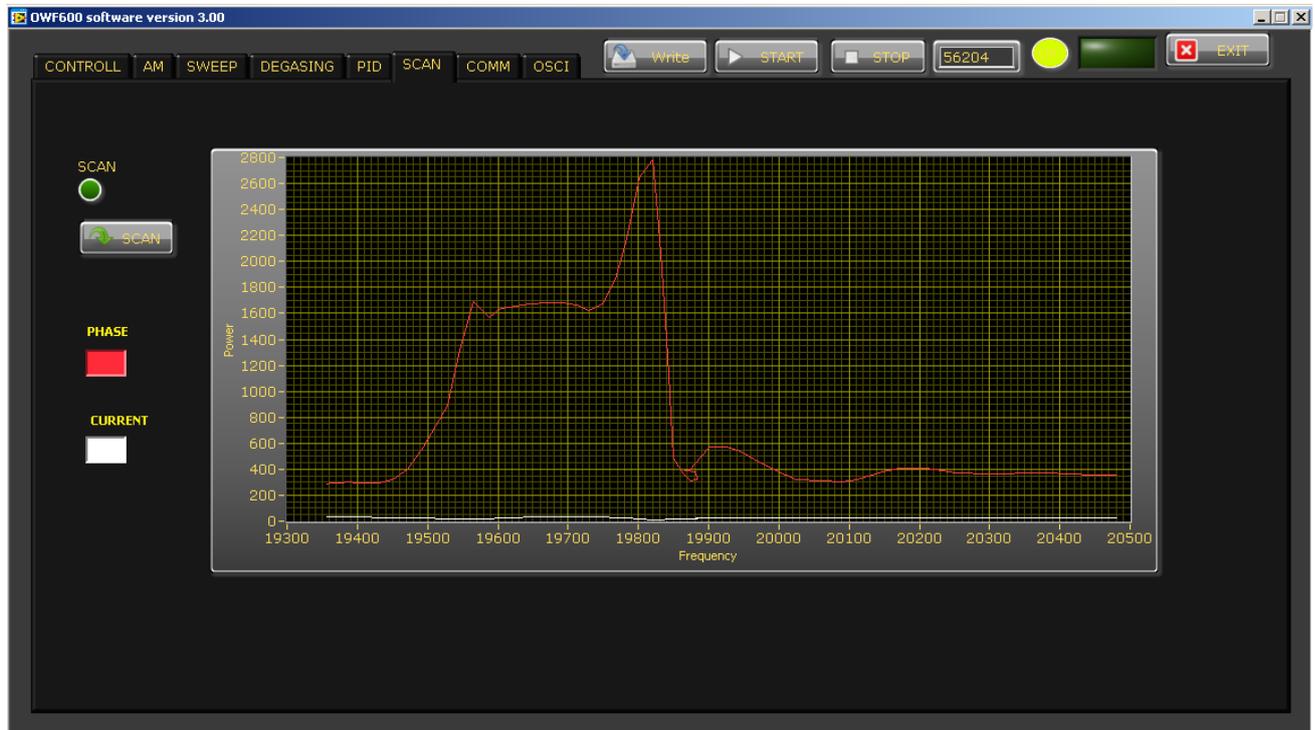
OSCI Tab
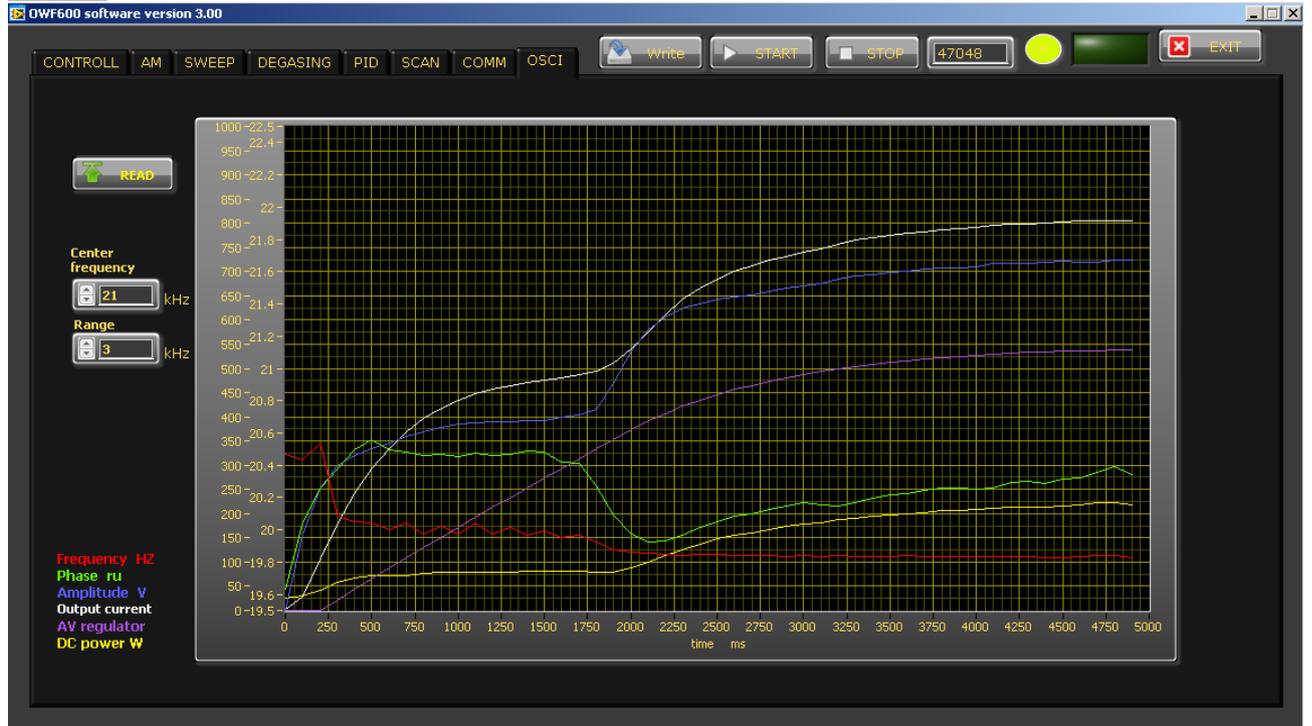
Go back to the first tab - CONTROL. Play with different values of MMM and AMMM parameters (but very slowly and carefully) for improving better results. If OVERCURRENT occurs, than you overvalued the MMM and/or AMMM parameters.

MAINTENANCE

The ultrasonic generator does not need special maintenance.

Dust and dirt should be removed regularly using a damp cloth.

ATTENTION: **• Do not use aggressive cleaners!**
• Not suitable for ultrasonic cleaning!

SPECIFICATIONS:

Frequency	OWF 600 17-38 kHz	
Operating voltage	230 V +/- 15%	
Power consumption	4 A	
Effective power output	600 W	
Maximum output	600 W	
Fuse protection	6.3 A	
Dimension casing	**W x H x D/mm/** 143x129x245	**Weight** 3.4 kg
Operating Temperature range	-10 to +40°C	**Protection class** IP 20, IEC 60 529, EN 60 525

WARRANTY

The length and coverage of the warranty can be found in the terms of delivery as part of the general terms and conditions (valid at the time of purchase) or in the sales contract / order confirmation, should any special agreements have been made.

The following cases are not covered by warranty:

- Damage caused by inappropriate operation
- The device not being used for its intended purpose
- Inappropriate alterations or modifications made without prior authorisation from the manufacturer
- Damage caused by extreme circumstances, such as knocks, falling over, moisture and dirt
- Insufficiently qualified operating staff
- Non-compliance with current safety and accident-prevention regulations
- Damage resulting from modifications made to the operating instructions

SERVICE HOTLINE

Should you still have questions after reading through this operating manual,
please feel free to call our service hotline.

Service contact details
ADDRESS
TEL
FAX
EMAIL
SKYPE
Etc.

Please have the device type and serial number at hand, to help us quickly answer your questions (the serial number is on the backside of the generator)

SPARE PARTS

Parts are available upon request. Please provide us the serial number of your device, to ensure we supply you with the appropriate replacements.