

MPI

20 to 40 kHz – 2000W

(other frequency ranges available)

ULTRASONIC GENERATOR – Manual



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INTRODUCTION

Dear Customer,

Thank you for your purchase of the product.

This ultrasonic SONOWELD-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.

General information

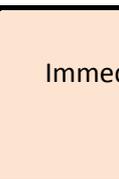
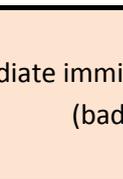
This ultrasonic generator is a device which is used for ultrasonic plastic- and metal-welding applications as well as for different special applications such as: Sieving, atomizing, etc.

The main features are:

- Autotuning circuit to tune automatically to the resonant frequency of the connected horn.
- Fully digital frequency generation.
- High speed microcontroller to control all functions of the generator.
- LCD-display with rotary encoder
- Modbus on all generators
- Constant / adjustable amplitude 0 – 100 %
- Protected against :
 - Short circuit
 - Overtemperature
 - Overload

SAFETY INSTRUCTIONS

Symbols in manual:

	Immediate imminent danger – health and live (bad injuries or dead)
	hot surface. Do not Touch!
	Possible damage, without danger for people
	Electrical voltage!

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.

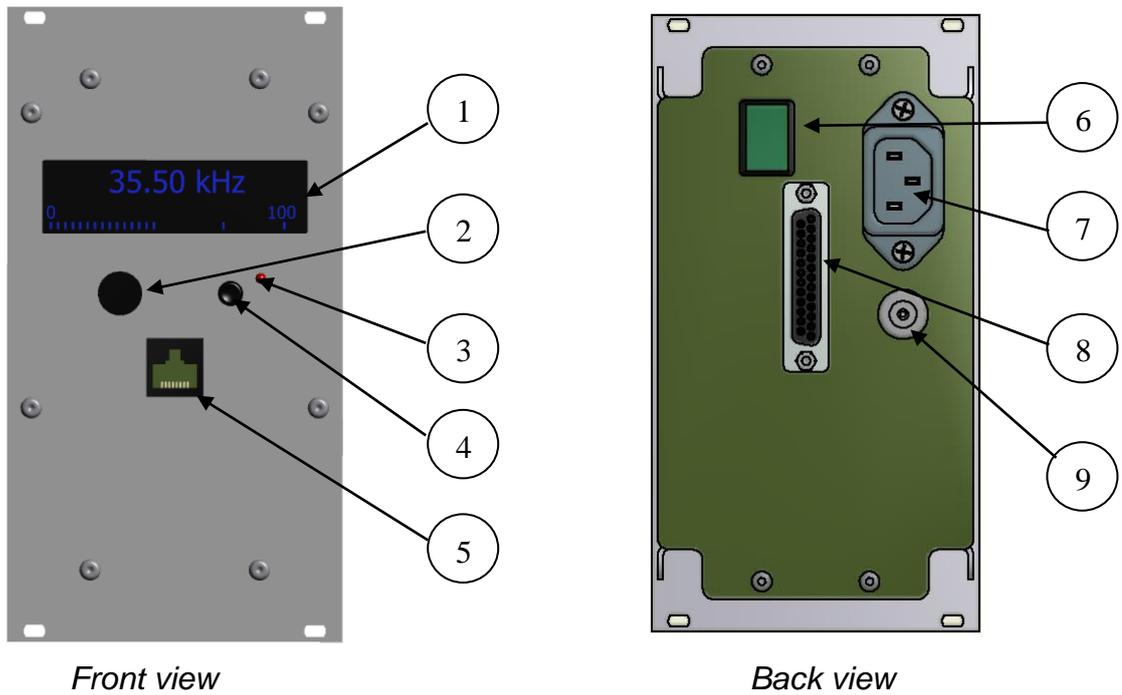


In the following cases you should disconnect the device from the mains and contact a qualified service engineer:

- **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**

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

GENERAL VIEW

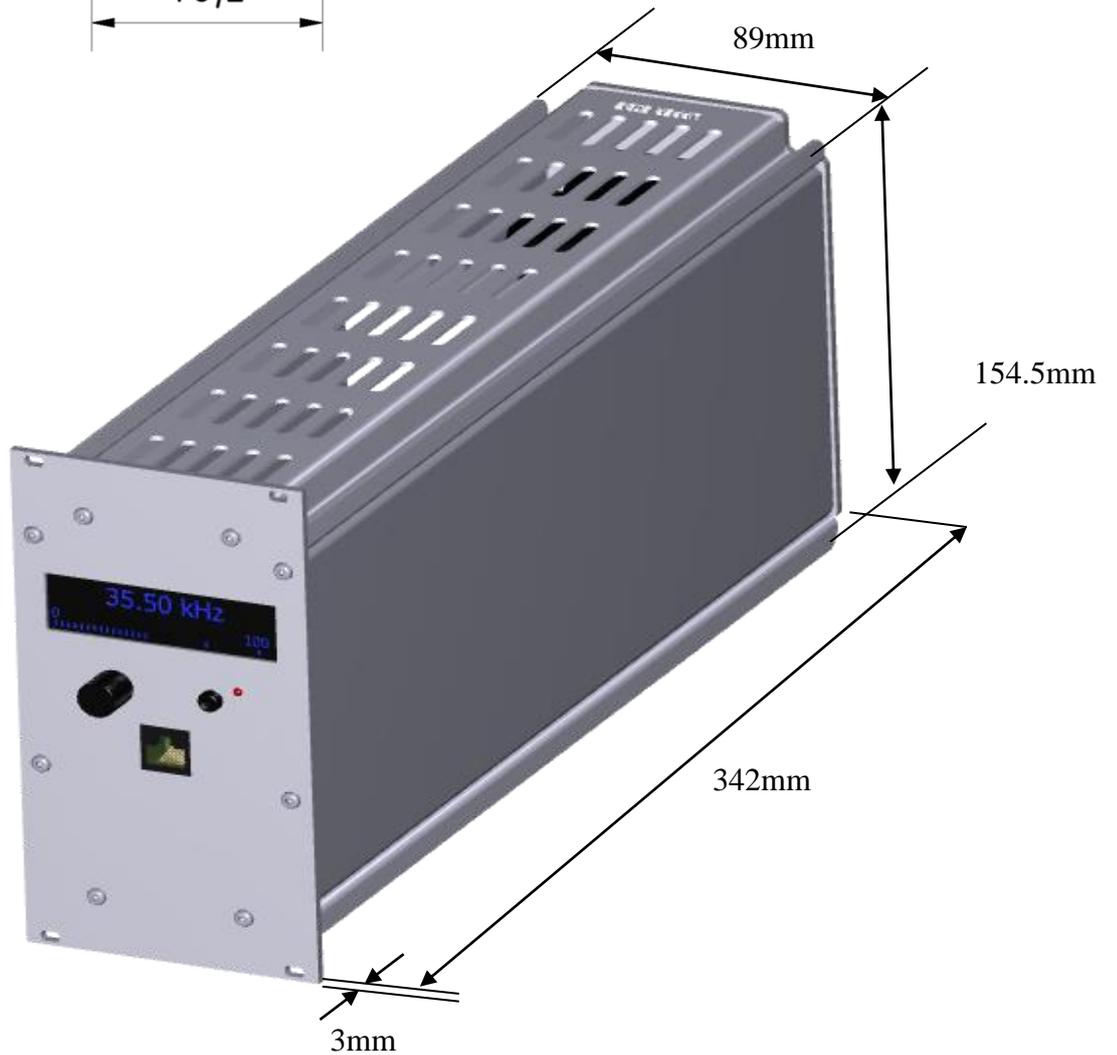
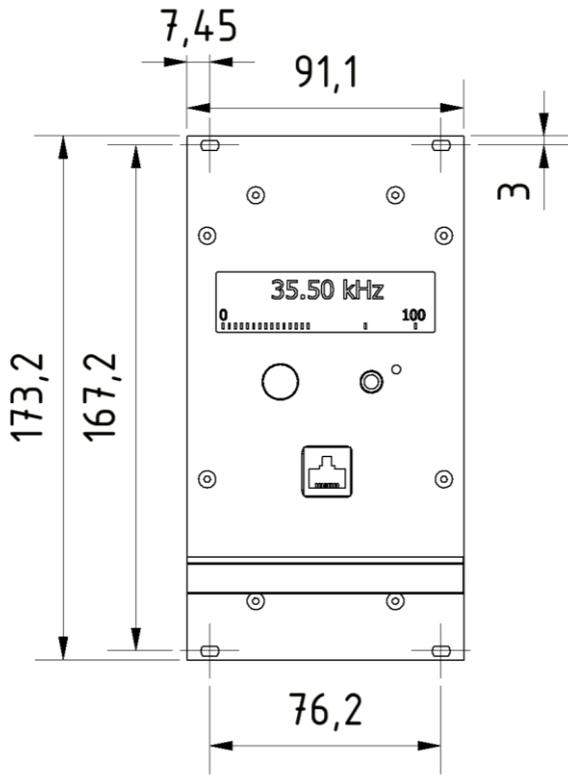


Front view

Back view

1	Display high resolution – 72x20mm
2	Knob encoder
3	Bi color LED
4	Command for US ON
5	RJ45 connector
6	Main Switch ON/OFF
7	Power socket 210-250V
8	25-POLE DSUB I/O SOCKET
9	HF Lemo Plug

DIMENSIONS



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.

If the generator cannot dissipate the heat sufficiently, it will display an error message due to excess temperature (see also the “OVER TEMPERATURE” 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**.



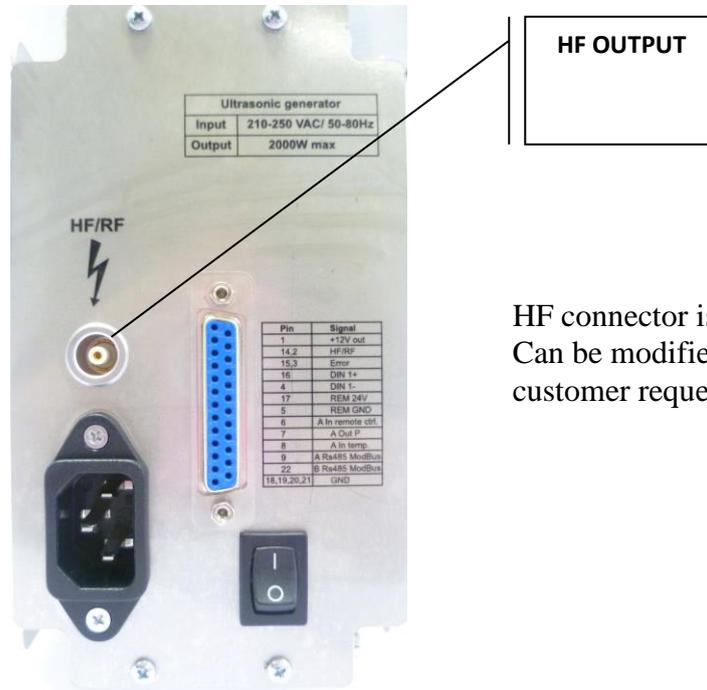
It has an internal main fuse (10 AF).

If you need to change the fuses, unscrew the cover of the housing.



- 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.
- Only use cables with sufficient cross-section.
- Minimum cross-section: 1.5 mm².

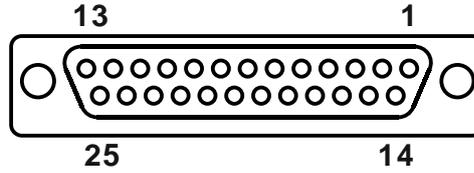
HF connector



HF connector is Lemo connector
Can be modified according to
customer request.

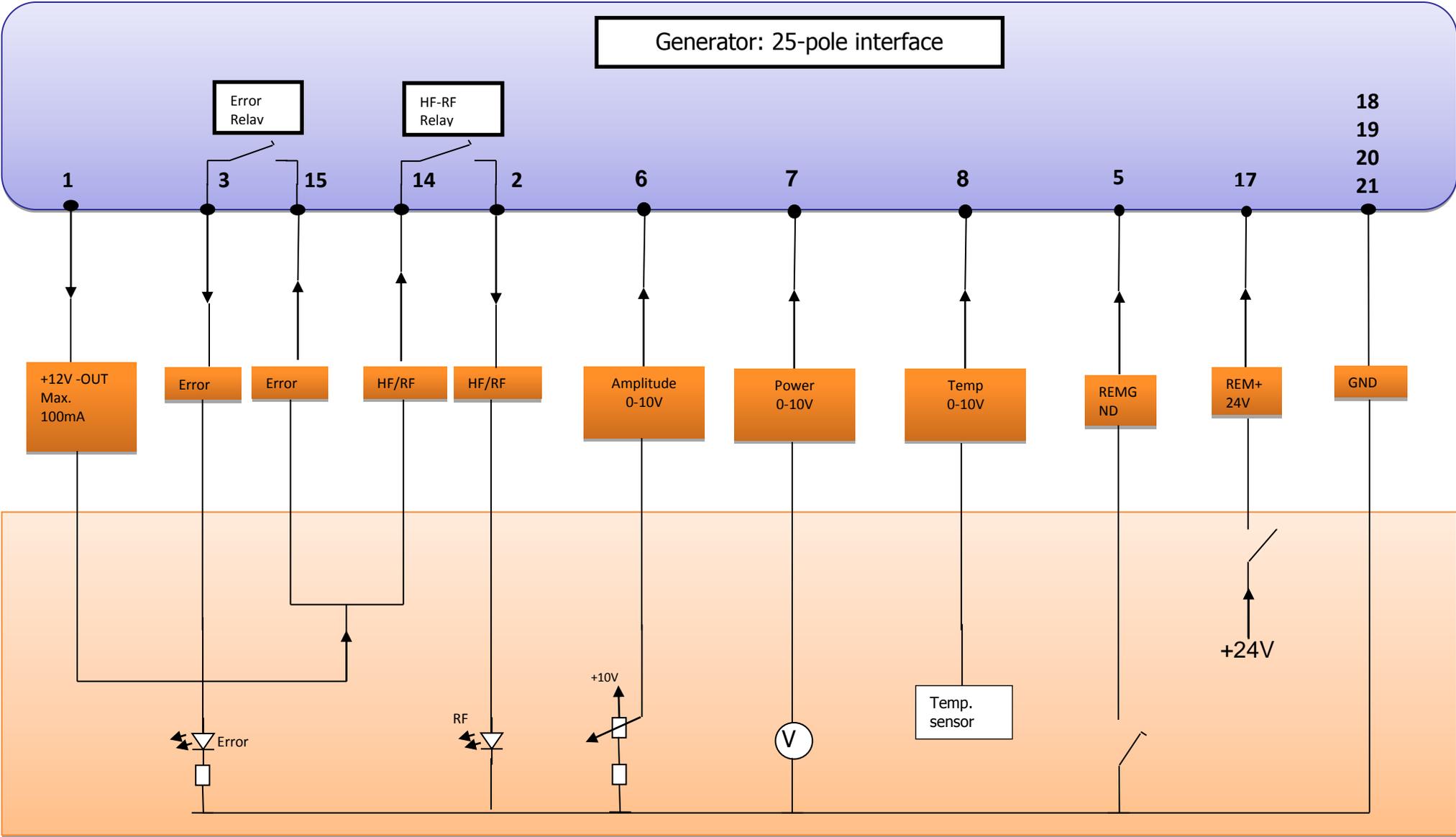
- Output voltage could be between 600V and 1200V AC.
- Only use cables specified by the manufacturer.
- Use only shielded transducer connection cables.

25-pin DSUB I/O socket



Pin Number	Signal	Direction	Signal level	Description
1	+12V	Output	+12Vdc	Supply voltage for external use 100mA max
14,2	HF/RF	I/O	Up to 24Vdc	Input and output Relay HF-DA. Contact is closed when ultrasonic voltage is emitted. (seeFig.3)
15,3	Error	I/O	Up to 24Vdc	Input and output Relay Error. Contact is closed up on error. (seeFig.3)
16	DIN_1+	Input	Up to 24Vdc	Digital input for external STOP (seeFig.2)
4	DIN_1-	Output	Up to 24Vdc	Digital input for external STOP (seeFig.2)
17	REM 24V	Input	Up to 24Vdc	Remote input (active high). Reference is "REM GND" (see Fig.2)
5	REM GND	Output	Up to 24Vdc	Remote input "REM GND" (see Fig.2)
6	Analog input remote control	Input	0-10V	Input for amplitude control. 5V=50% Amplitude. 10V=100% Amplitude. Reference is GND.
7	Analog output power	Output	0-10V	Voltage corresponding to the current output power 0- 100%. Reference is GND.
8	Analog input temperature	Input		Voltage corresponding to the transducer temperature. Reference is GND. 0V=0°C; 10V=100°C
9	A RS485 ModBus	I/O		A signal RS485 ModBus Protocol
22	B RS485 ModBus	I/O		B signal RS485 ModBus Protocol
18,19,20,21	GND	Output		Internal GND

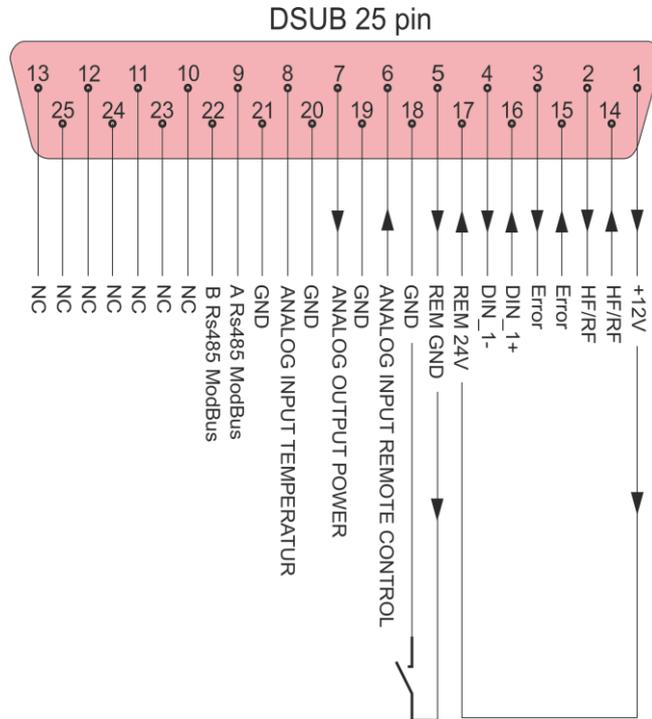
Example of external connections



Wiring for start

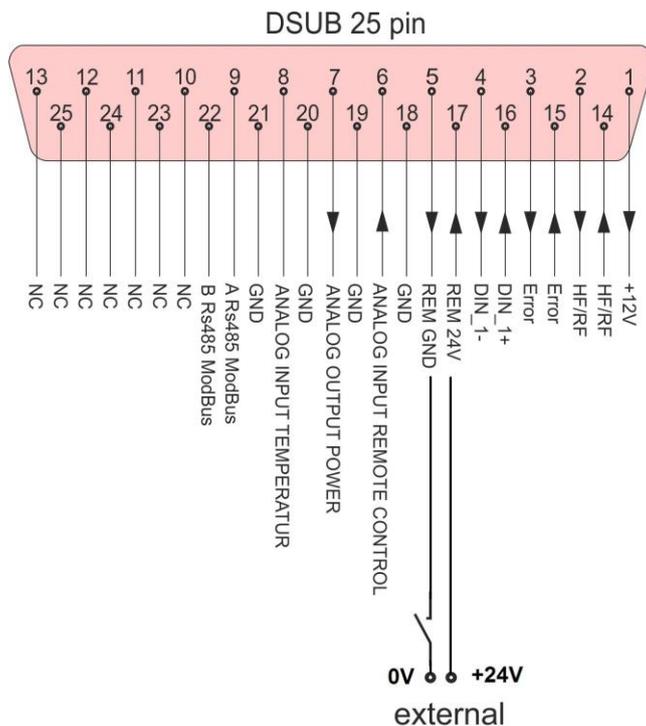
using a signal 12 V

The generator has internal supply of +12V on pin 1. The 4 pins (1-17-5-18) have to be connected.

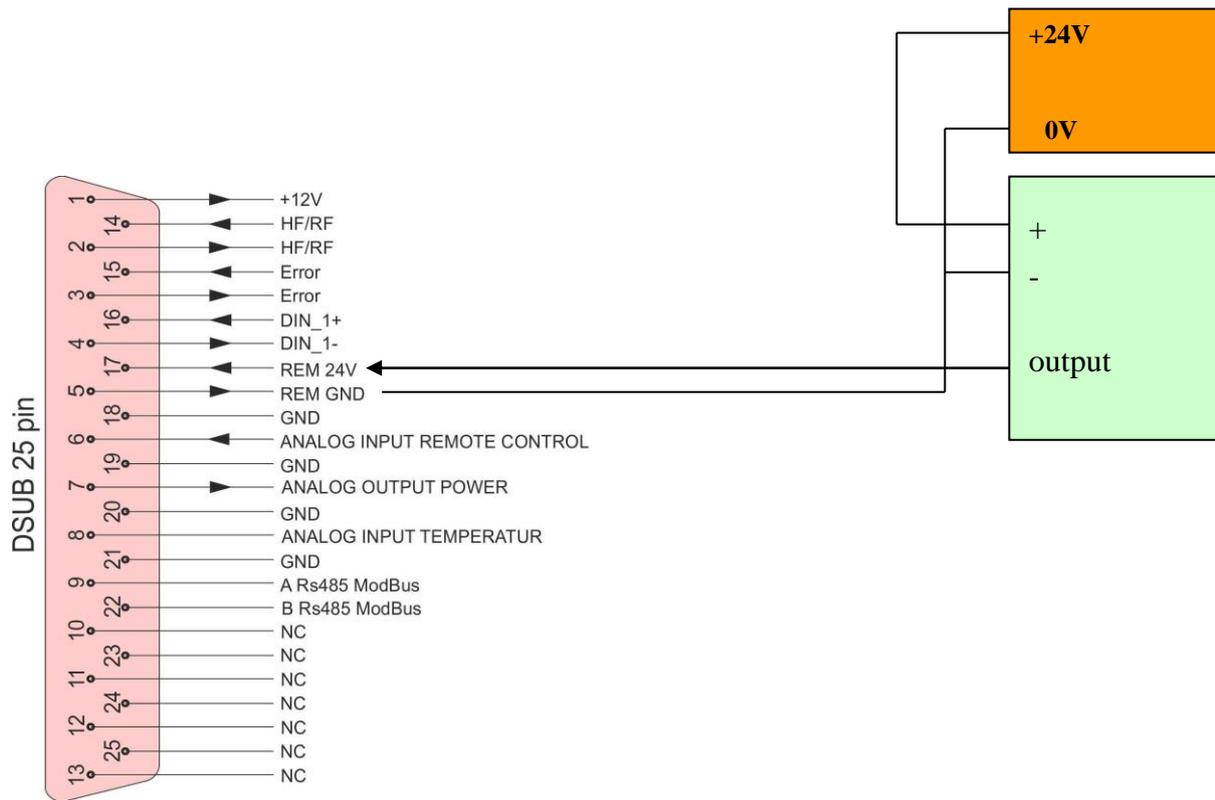


Using an external +24V

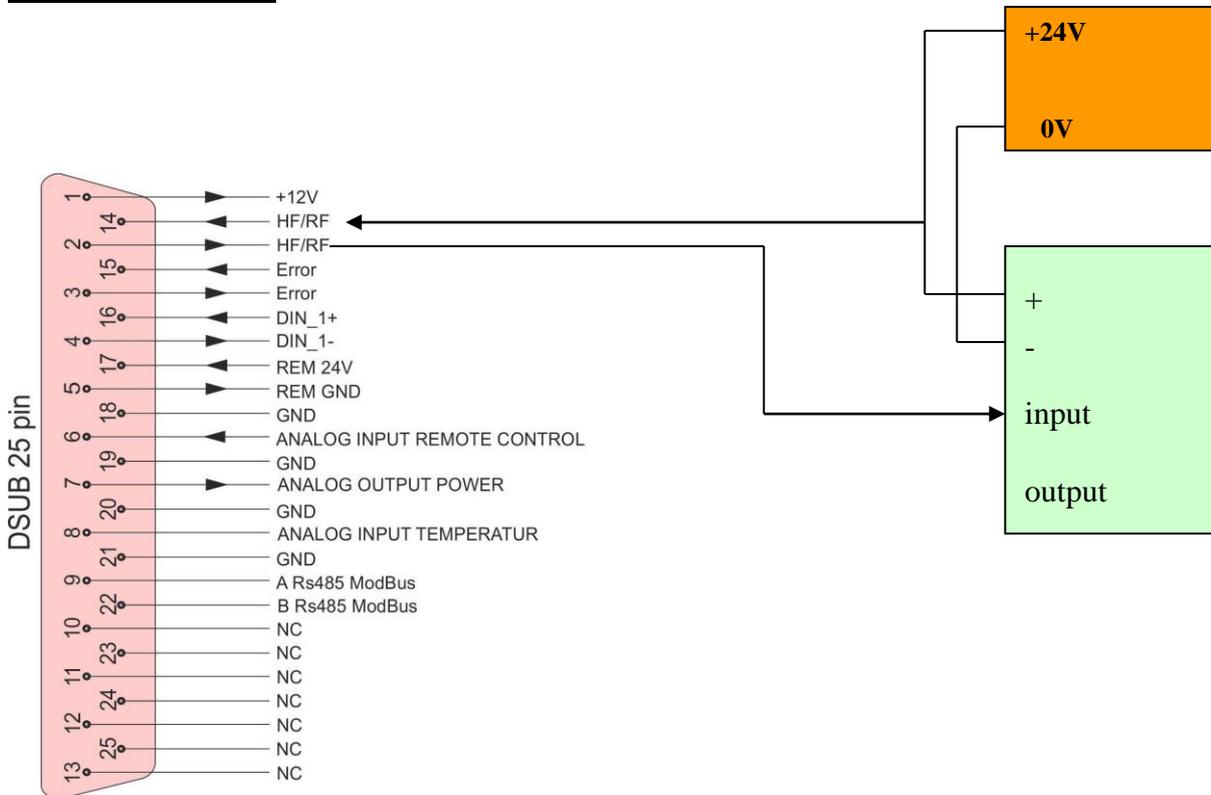
If user wants to use +24V, it must use an external supply.



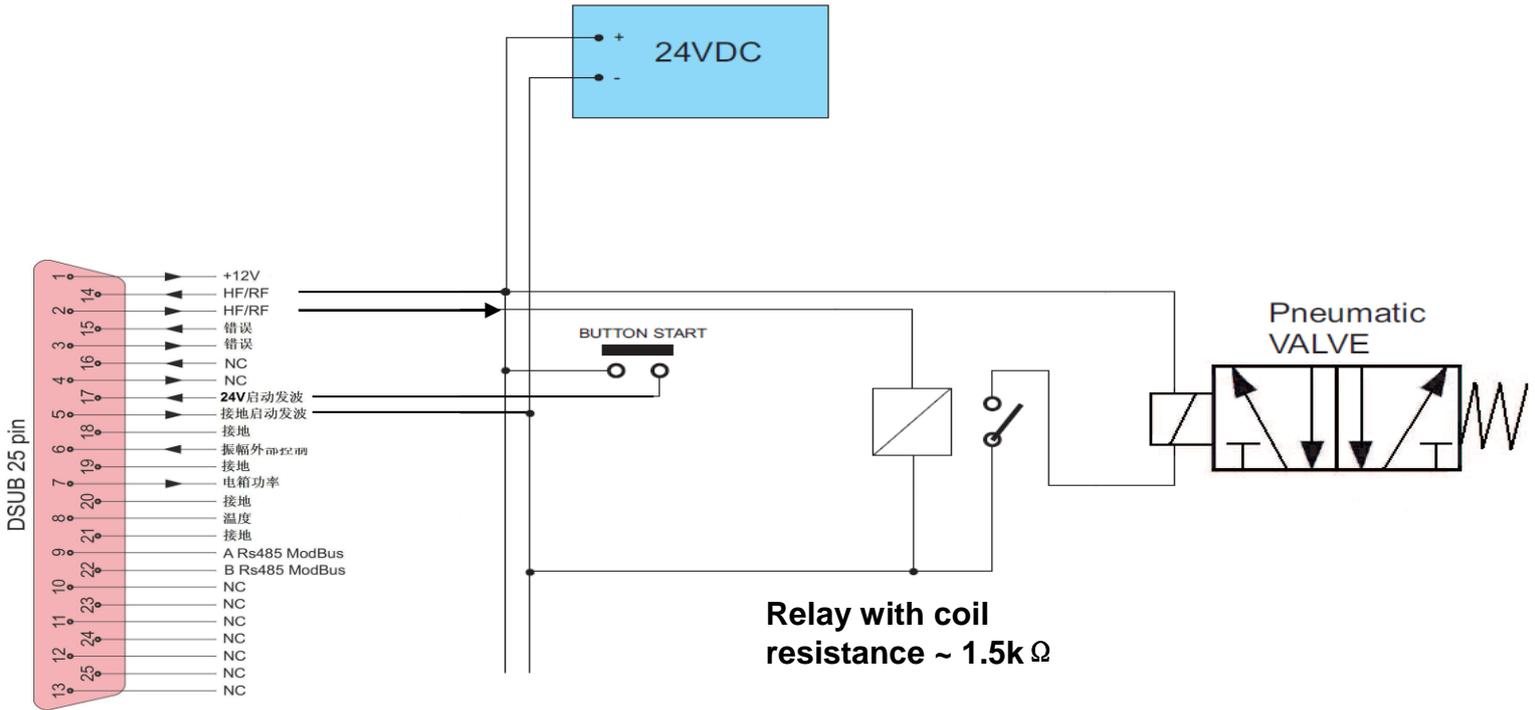
Start with PLC



Connection of HF-RF



Connection of Pneumatic valve



Cf page 36 for parameters of HF-RF.

Operator elements and display on the front panel



Bicolour LED: Lights up **green** when generator is switched on and works properly
Lights up **red** in the event of an error

ON/OFF button: The functionality of the button could be selected from System window (6) or in LabView software PROPERTIES tab.

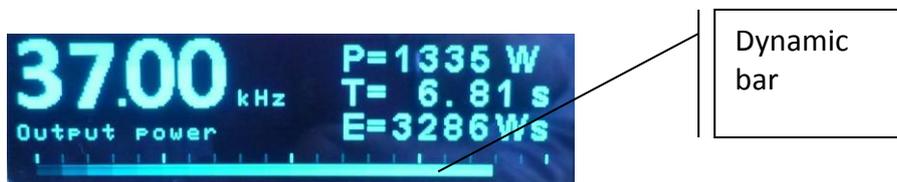
Rotary Encoder & Push Button

Multifunction button:

1. By pressing the encoder you can move the cursor and select parameters on the current window;
2. By rotating you can change the value of the current parameter.
3. By press + hold for 2 seconds, you will WRITE TO MEMORY all present settings of the generator.
4. Fast double pressing returns to the main starting window.

Main starting window

After the generator is powered on, the initial screen contains the following status information.



Freq – Actual frequency of the generator.

P = Power – Actual consumed power (in Watts)

T = Time – time when generator is on (s)

E = Energy – Energy consumed by the generator (Ws)

Dynamic bar shows the Output Power Value.

Power window



```
>Power 1500 W
Amplitude 59 %
Frequency 37.000 kHz
P= 0 W I= 0 mA
```

Power – setting for maximal power (in W)

Amplitude – setting for maximal amplitude (in % where 100% = 1000V)

Frequency – setting for starting frequency (in kHz)

P – Actual Output Power Value (in Watts)

I – Actual Output current through the transducer (in mA)

Time window



```
>Time 0.0 s
Time Plus 0.0 s
Time minus 0.0 s
Last time 2.7 s
```

These are welding regime settings. Welding by time:

Time – time when the generator is on (in seconds)

Time plus – shows the maximum duration of the control signal (in seconds)

Time minus – minimum duration of the control signal (in seconds)

*Note: If entered a control signal from external control unit (PLC) out of limits **Time Plus** and **Time minus**, the bicolour LED will light in red and an error message Limit Time will be displayed.*

Last time - duration of the last working cycle (in seconds)

Energy window



```
>Energy 0 Ws
Energy Plus 0 Ws
Energy minus 0 Ws
Last Energy 245 Ws
```

These are welding regime settings. Welding by energy:

Energy – setting of nominal energy during the welding process (in Ws). If the setting is different from 0 and the generator reaches the set value the Welding Time(see page 23-24) automatically stops.

Energy plus – maximum allowed energy reached during the welding process.(in Ws)

Energy minus – minimum allowed energy reached during the welding process (in Ws)

*Note: If the energy during the welding process is out of limits **Energy Plus** and **Energy Minus**, the bicolour LED will light in red and an error message Limit Energy will be displayed.*

Last Energy – energy of the last working cycle (in Ws)

Peak power window



```
>Peak Power      0 W
Peak Plus       0 W
Peak minus      0 W
Last Pk Power   1643 W
```

These are welding regime settings. **Welding by peak power:**

Peak Power – setting of the peak power (in W). If the setting is different from 0 and the generator reaches the set value of the peak power, the Welding Time (see page 23-24) automatically stops.

Peak plus – maximum allowed peak power reached during the welding process (in W)

Peak minus – minimum allowed peak power reached during the welding process (in W)

Note: If the Peak Power during the welding process is out of limits **Peak Plus** and **Peak minus**, the bicolour LED will light in red and an error message **Limit Peak Power** will be displayed.

Last pk Power – peak power of the last working process (in W)

Delay, Hold and Afterburst window



```
>Delay          0.00 s
Hold           0.00 s
Afterburst     0.00 s
Last time      2.70 s
```

Delay – after the start signal, the generator delays starting with the set value of the delay (in seconds) (see page 23-24)

Hold – the generator delays with the set hold value before executing Afterburst (in seconds) (see page 23-24)

Afterburst – setting the value of afterburst (in seconds). Afterburst is a second US pulse.

Last time - time for the last working process (in seconds)

System window



```
>Modbus Address  6
Speed           115200 b
Button          Trigger
Firmware        2.01
```

Modbus Address – shows the address of the generator in the Modbus network. The default Modbus Address is 6.

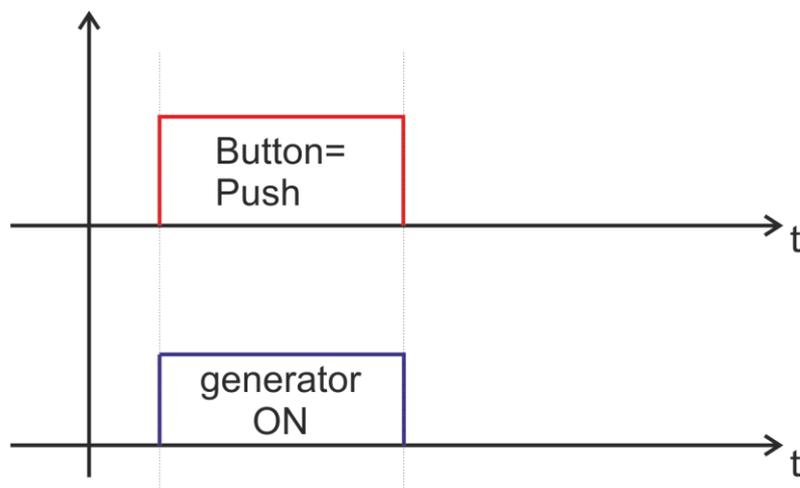
Speed – communication speed

START Button – setting the functionality of the button

There are 4 options:

OFF – the button is off. Any action on start button will not start the generator. Generator can only be started by remote start (on 25 pins connector).

PUSH – the button works as a test button – while pushed the generator is on, while released the generator is stopped. See the picture below:



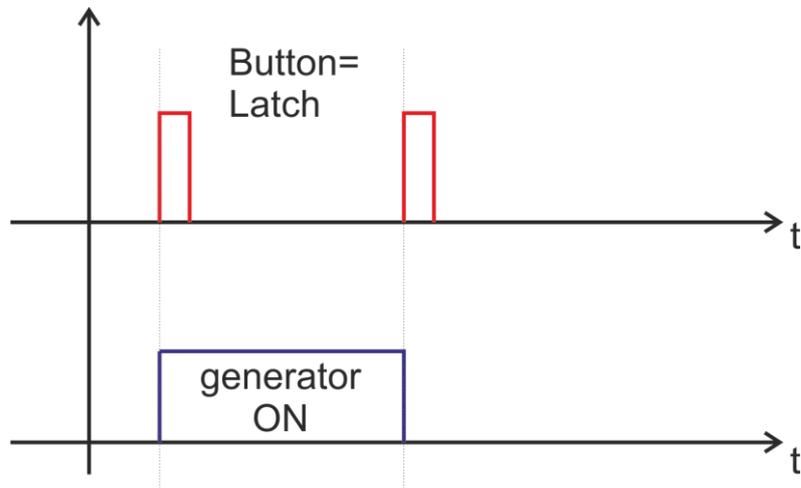
To **START** generator :

- either by start button on front of generator
- or by remote start on 25 pins connector (see page 13 for remote start)

To **STOP** generator :

- either releasing the start button at front of generator if start has been done by it
- or by removing signal on remote start on 25 pins connector (see page 13 for remote start) if start has been done through it

LATCH- the generator starts with a start and stops with a second pulse pushing the button once the generator starts, pushing the button again the generator stops.



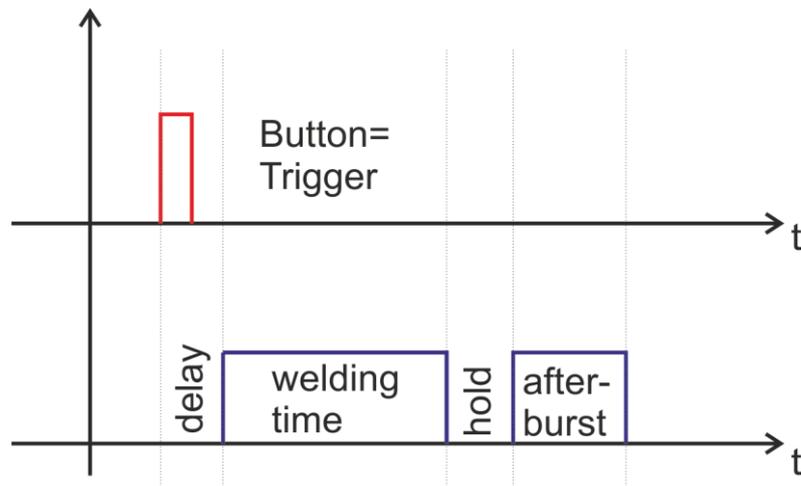
To **START** generator :

- either by start button on front of generator
- or by remote start on 25 pins connector (see page 13 for remote start)

To **STOP** generator :

- either press the start button at front of generator
- or send signal on remote start on 25 pins connector (see page 13 for remote start)
- or send signal STOP on pins 4&16 on 25pins connector

TRIGGER – this mode must be used if time, power or energy parameters are set



To START generator :

- either by start button on front of generator
- or by remote start on 25 pins connector (see page 13 for remote start)

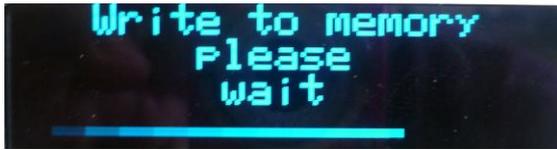
To STOP generator :

- either press the start button at front of generator
- or send signal on remote start on 25 pins connector (see page 13 for remote start)
- or send signal STOP on pins 4&16 on 25pins connector
- or wait that one of the parameters (time, power or energy) reach the value set.

If customer wants to weld by time, power or energy, he must select this mode.

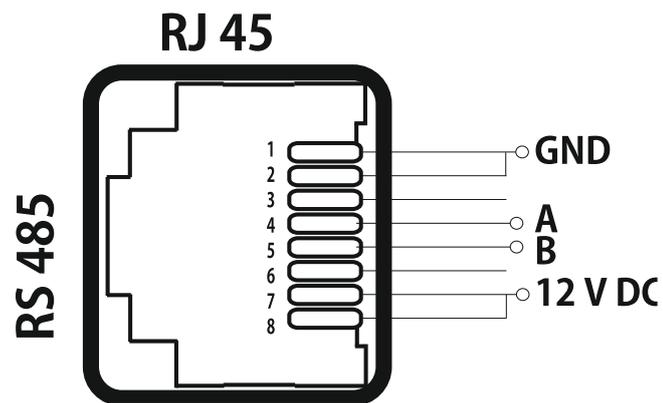
If customer wants to use a complete cycle (delay – welding time – holding time – afterburst), he must choose this mode.

Write to memory window



This window appears when you PRESS AND HOLD the Rotary Encoder for 2 sec.

Interface socket RS485 ModBus - RJ 45 CONNECTOR:



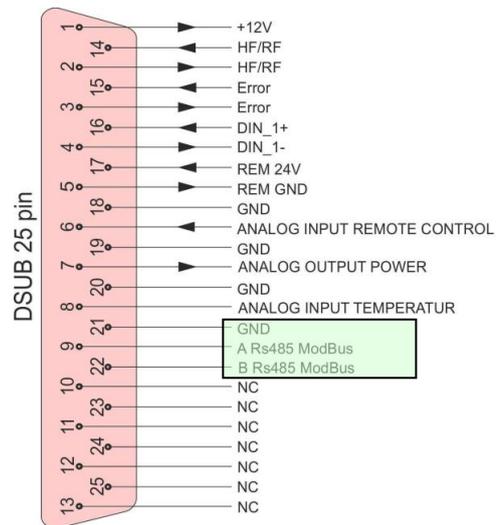
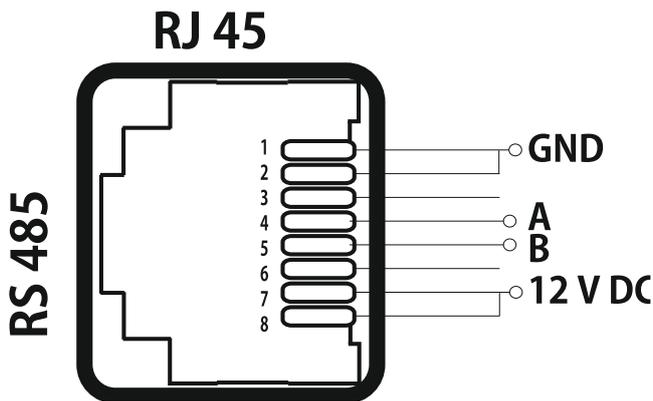
PINS	DESCRIPTION
1	GND
2	GND
3	N/C
4	A
5	B
6	N/C
7	Output 12 V DC(max 100mA)
8	Output 12 V DC(max 100mA)

MODBUS COMMUNICATION PROTOCOL

All generators are Modbus devices. Below is the table of Modbus memory.

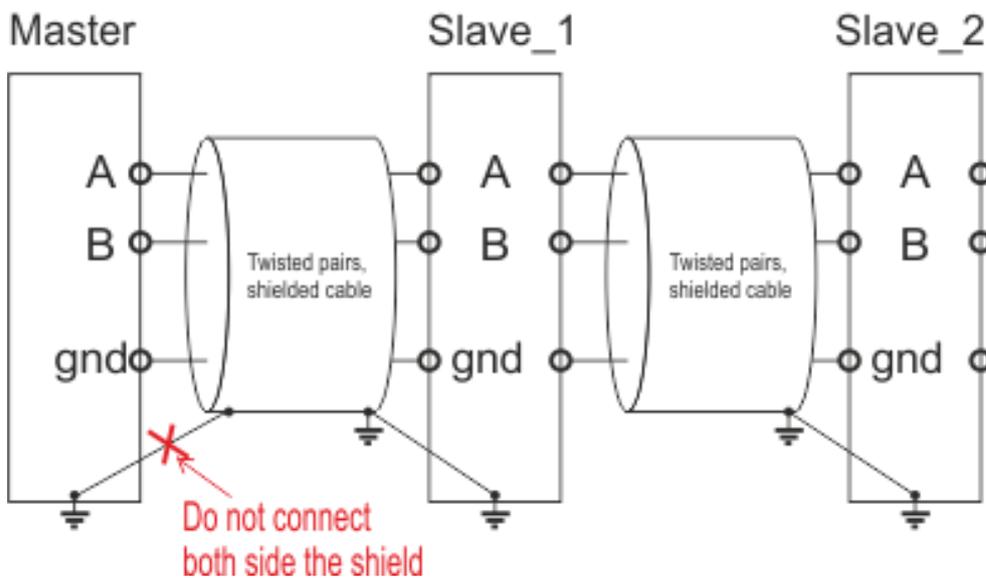
Connection

You can use the front RJ45 connector or the back 25 pins socket to connect the generator using Modbus.



do not forget to connect the GND

About **Shield** cables, it must be connected only on **one** side.



Bus description

- bus address of the device (1-255) – selecting via LCD panel
- transmission speed – selecting via LCD panel
- no parity check
- the number of Data-bits is RTU 8 Data bits
- the number of STOP-bits is 2 STO-bit

important remarks for operation in the Master/Slave system :

The bus address must be differently adjusted for each device !!

Transmission mode, baud rate and parity must be identical

All data in a MODBUS-slave are allocated to addresses. Data access (read or write) is made by the corresponding control command and the indication of the corresponding data address. In general, a MODBUS telegram starts with the address of the slave, followed by a control command (e.g. read register) and the data. By means of the checksum at the telegram end, the bus participants can recognize transmission errors.

CRC Generation

A procedure for generating a CRC is :

1. Load a 16-bit register with FFFF hex (all 1's). Call this the CRC register.
2. Exclusive OR the first 8-bit byte of the message with the low-order byte of the 16-bit CRC register, putting the result in the CRC register.
3. shift the CRC register one bit to the right (toward the LSB), zero-filling the MSB. Extract and examine the LSB.
4. (if the LSB was 0) : repeat step 3 (another shift). (if the LSB was 1) : exclusive OR the CRC register with the polynomial value A001 hex (1010 0000 0000 0001).
5. Repeat steps 3 and 4 until 8 shifts have been performed. When this is done, a complete 8-bit byte will have been processed. When the 16-bit CRC (two 8-bit bytes) is transmitted in the message, the low-order byte will be transmitted first, followed by the high-order byte.

Example to write register

Query

11 10 0001 0002 04 000A 0102 C6F0

Slave adress (11 hex = address 17)	0x11
command to write the register	0x10
The Data Address of the first register requested. (002A hex = 42 ,)	0x00 0x01
The total number of registers to write	0x00 0x02
The number of data bytes to follow (2 registers x 2 bytes each = 4 bytes)	0x04
The value to write to register 1	000A
The value to write to register 2	0102
Error check (CRC)	0xC6 0xF0

Response

11 10 0001 0002 1298

Slave adress (11 hex = address 17)	11
command to write the register	10
The Data Address of the first register. (register #1)	0001
The number of registers written	0002
Error check (CRC)	1298

Register 16bits

All Modbus registers are 16bits

Example : The Start Frequency value is with resolution of 10Hz.

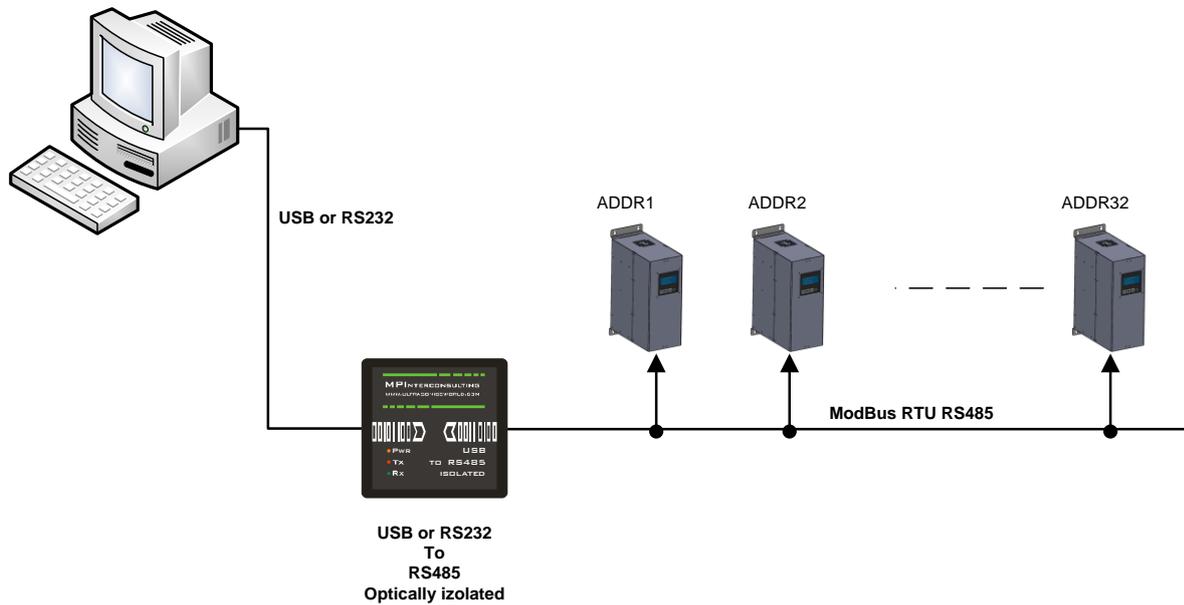
When we want to set F start = 35,5kHz , we have to write in the register - $35500/10 = 3550$

bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Binary	0	1	1	1	1	0	1	1	1	0	1	1	0	0	0	0
Hex	E				D				D				0			

So the value is (0x0DDE or 0b0000110111011110)

SETTING THE SOFTWARE LABVIEW

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.



5. Install "Run Time Engine" 2012 SP1
6. Install NI visas version 3.6
7. Install FTDI vcp driver from USB adapter driver
8. launch software from Sonoweld software

CONTROL TAB



On this tab, we can set :

- **start frequency**
- **span**
- **power set point** = maximum power that we want the generator delivers
- **phase** = let at 20. If higher, generator will work closer to serial resonance, if lower closer to parallel resonance.
- **I_{max}** = Maximum current allowed by transducer
- **Amplitude** = amplitude adjustable from 0-100%

On the right side we can see the following parameters :

Frequency shift = difference between F_{start} and horn frequency

Frequency = horn or transducer frequency when generator is ON

Analog set point = value on 25pins connector for power

Out current = current on transducer

PWM = give indication og good vibration of horn. should be higher than 400%

Power = power consumption when generator is ON

Phase = check if set value is same than this value. if big difference then there is a problem of adjustment

Out amplitude = amplitude of horn when generator is ON. Should be same than set value.

Temperature = in case of use of a sensor on transducer



we can save and import saved parameters from computer

WELDING TAB



On this tab we can adjust the welding parameters such time, power and energy.

We can adjust also the cycle parameters as DELAY – HOLDING TIME – AFTERBURST TIME.

We can also check that Time, power and energy are inside a window.

For example :

- We weld by time : 1.2s

We know that to have a good welding the energy used is between 120J and 155J.

Then we set :

- time = 1.2s
- energy plus = 175J
- energy minus = 120J

PROPERTIES TAB

# weld	time	peak power	energy
1	0,00	0	0
2	0,56	1907	545
3	0,56	1408	512
4	0,56	1589	595
5	0,56	1400	506
6	0,56	1736	505
7	0,56	1399	
8	0,56	1314	
9	0,56	1267	
10	0,56	1398	
11	0,56	1542	
12	0,56	1287	

area 1

The matrix with statistics of every weld process can be selected and exported to excel file – as it is on the picture. We can export on excel file all parameters of all cycles. Must be connected to a computer.

area 2

DC power scale factor = do not modify

nominal power = maximum power that we want the generator delivers. This value will be the maximum that the generator will display.

Umax = maximum voltage that ceramics of transducer can resist. Around 200V per mm thickness.

area 3

Hot start

This is adaptive to the transducer function. The generator selects Fstart to be 60Hz above to the last welding frequency. This way the generator starts every time close to the resonance and follows the transducer if it changes its resonance frequency. When generator starts for the first time after power up - the F start is the selected value on the CONTROLL tab. This function can be switched ON or OFF from the menu. This function is useful in metal welding applications where the welding time is very short.

Button or remote 24V mode

see page 18

HF Relay mode

We can select when the internal relay inside the generator is closed.

	On generator	On Process	On solenoid
Delay	X	X	X
Welding time	X	X	X
Hold time		X	X
afterburst		X	

The cross 'X' indicates when the relay is closed during the cycle.

example with vertical press :

We choose to weld by time. When we press start the cylinder go down and after 1s the generator welds. After the welding of 1.2s we apply a cooling time of 2s. At the end of cooling time we want to move up the cylinder and send a second pulse to avoid the horn is stuck into material.

So we choose button mode = TRIGGER as we weld by time.

we adjust

- time = 1.2s
- delay = 1s
- hold = 2s
- afterburst = 0.3s

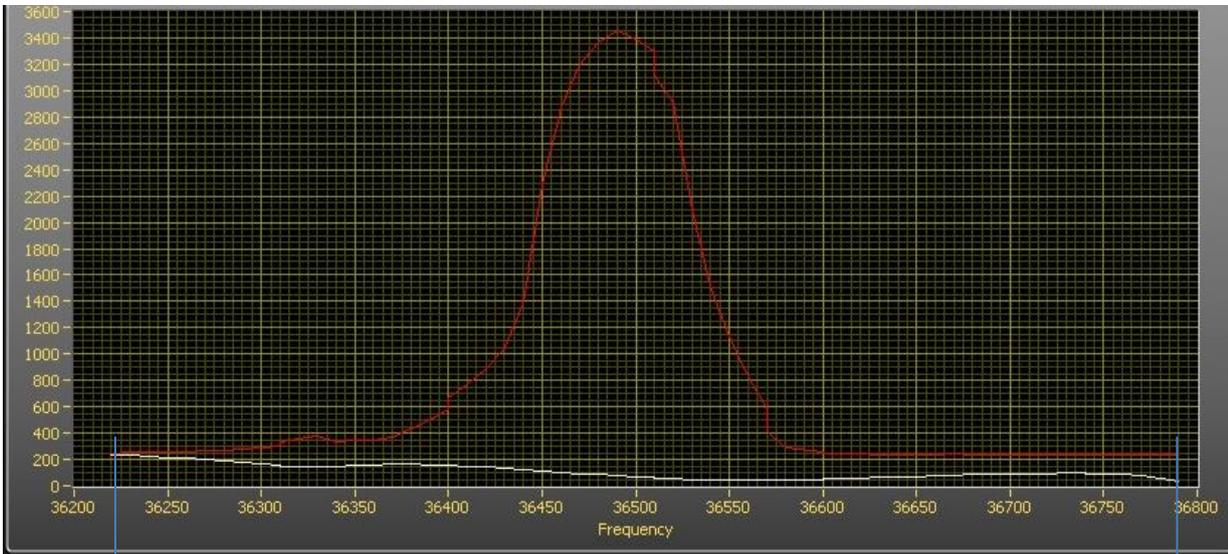
HF relay mode set on 'ON SOLENOID'. When the operator press starts, the HF relay closes. The cylinder go down.

At the end of hold time, the HF relay opens and the PLC moves up the cylinder. At the same time afterburst is applied.

NB : if use of air distributor with spring, no need PLC. The generator can control itself the press.

SCAN TAB

After adjusting parameters on control tab, we must SCAN the transducer or horn to let the generator to calibrate itself.



Span

Fstart

COMM TAB

This tab is used to connect the software to the generator.

Connect the generator to Labview software.



1. Select the exact COM port(1) to which the adapter is connected from the drop down menu.

2. Once connected, the light become green

OSI TAB



An oscilloscope allows us to follow the following parameters during welding cycle:

- frequency
- output current
- phase
- amplitude
- power
- PWM

regulator phase : how fast generator is shifting down the frequency from Fstart, looking for the selected Phase value.

regulator voltage : combines regulation of output voltage, output current, Power. If one of them exceeded the selected value – regulator is changing the output voltage to keep them in the range.

ramp amplitude : This allows the system to charge energy smoothly and not to excite on parasite resonances , to consume reactive current and overcurrent. When you increase the “Ramp amplitude” value this makes process faster.

EXAMPLE HOW TO START WITH LABVIEW

1. Connect the generator to LABview (COMM TAB)
2. go to control tab and adjust :
 - a) Fstart = 37kHz if generator 35kHz
 - b) Span = 4kHz
 - c) power set point = 2kW if we want 2kW on generator
 - d) phase = 20
 - e) I_{max} = 2A if generator 2kW
 - f) amplitude = 50%
3. go to Scan and launch scan. According to result, we can reduce Fstart to have $F_{start} = F_{horn} + 0.5\text{kHz}$

After we can increase amplitude and modify other parameters according to results.

ERROR MESSAGES AND TROUBLESHOOTING

When error event occurs the bicolor LED will light up in **red**. The error message will appear over the dynamic bar graph. If you want to see it properly you need to press the rotary encoder once, to move to next window of the display (Power window), where on the last row an error message will be displayed.

All types of error messages will be cleared after restarting the generator. No need to reset the generator.

OVERCURRENT	Possible causes	<ul style="list-style-type: none">• Short circuit in the cable or transducer• Starting frequency selected is too HIGH• Starting frequency selected may be too LOW• There is a problem with the transducer.
	How to fix	<ul style="list-style-type: none">• Switch on the generator without the transducer connected. If OVERCURRENT message does not appear on the display, this means that the generator is in good working condition.• Check the cable between the generator and the transducer.• Check the transducer for short circuit.• Change and set properly the starting frequency, if it is not in range as described in this manual (see on page 17-22)
OVERHEATING	Possible causes	<ul style="list-style-type: none">• Not enough space around the generator.• Ambient temperature is too high.• The fan is dirty or malfunctioning .
	How to fix	<ul style="list-style-type: none">• reduce ambient temperature• Check the fan and clean it

OVERVOLTAGE	Possible causes	<ul style="list-style-type: none"> • The cable between the generator and transducer is broken or just disconnected. • Starting frequency selected is too HIGH • Starting frequency selected may be too LOW
	How to fix	<ul style="list-style-type: none"> • Rescan and re-adjust the generator • replace HRF cable

LOAD ERROR	Possible causes	<ul style="list-style-type: none"> • Starting frequency selected is too HIGH • Starting frequency selected may be too LOW – below the resonance frequency • Span selected may be too LOW • The cable between the generator and the transducer is broken • The transducer is defective
	How to fix	<ul style="list-style-type: none"> • Rescan and re-adjust the generator as described in this manual (see on page 17-22) • Check the cable between the generator and the transducer. • Check the transducer for disconnection • Window of frequency is too small, increase the window

FREQUENCY ERROR	Possible causes	<ul style="list-style-type: none"> • Bad frequency settings • control board is damaged
	How to fix	<ul style="list-style-type: none"> • check the frequency settings

LIMIT TIME ERROR	Possible causes	<ul style="list-style-type: none"> • The Time during the welding process is out of limits Time plus and Time minus
	How to fix	<ul style="list-style-type: none"> • check the time settings

LIMIT ENERGY ERROR	Possible causes	<ul style="list-style-type: none"> • The Energy during the welding process is out of limits Energy plus and Energy minus
	How to fix	<ul style="list-style-type: none"> • check the Energy settings • Check the welding process for lapses

LIMIT Peak POWER ERROR	Possible causes	<ul style="list-style-type: none"> • The Peak Power during the welding process is out of limits Peak Plus and Peak minus
	How to fix	<ul style="list-style-type: none"> • check the Peak Power settings settings • Check the welding process for lapses

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:

	SONOWELD 2000
Frequency	35 kHz
Operating voltage	210-250 V , 50-80 Hz
Power consumption	9 A
Maximum output	2,000 W
Fuse protection	10 A
Dimension casing (mm)	W x H x D 90x180x370
Weight	3.3 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 authorization 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

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.

SERVICE HOTLINE

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

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)