

Smart PowerSonic

User Manual



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PowerSonic 280PW

Thank you for your interest in Smart Material's piezo-electronic equipment and for buying our *Smart PowerSonic* ultrasonic pulser.



Figure 1

In order to enable our customers to perform their own tests on low frequency ultrasonic transducers, this μ C controlled power pulser (**Figure 1**) was developed by the engineers of Smart Material Corporation. The pulses have a voltage of approximately ± 280 V within a frequency range up to 100 kHz. Typical parameters like frequency, pulse number, refresh rate, uni-/bipolar mode, and shutdown time can be programmed via the RS 232 serial interface.

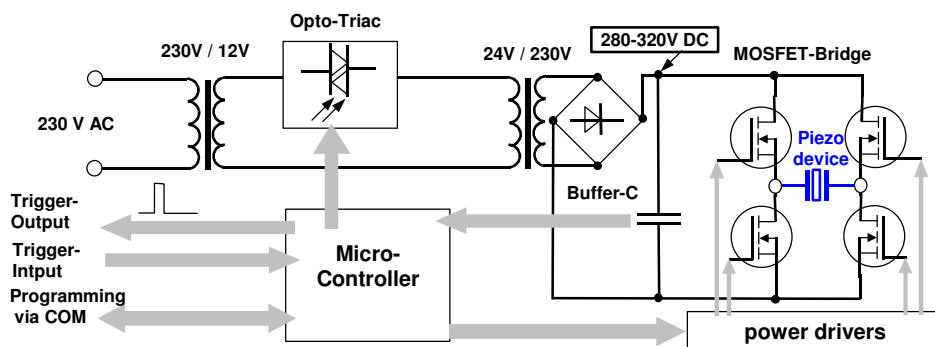


Figure 2

The principle design is shown as a block diagram in **Figure 2**. The system uses a 12VAC 40VA main plug transformer as input power supply. An internal step-up transformer connected to a bridge rectifier generates a DC voltage of 280-320V. The DC voltage, buffered by a suitable capacitance, is supplying a MOSFET-H-Bridge, which drives the Macro Fiber Composite with a unipolar or bipolar output. The system shuts down the primary 12V(AC) by monitoring the voltage level across the buffer capacitor to minimize the consequences of an electric shock to the operator.

All necessary functions, including the signal parameters, power routing, and external trigger are controlled by a microcontroller.

SAFETY WARNING CONCERNING HIGH VOLTAGE

HIGH VOLTAGE POWER SUPPLIES AND PULSERS PRESENT A SERIOUS RISK OF PERSONAL INJURY IF NOT USED IN ACCORDANCE WITH USE SPECIFICATIONS AND IF USED/OPERATED BY UNTRAINED OR UNQUALIFIED PERSONNEL!

Getting started ...

Before operating the *Smart PowerSonic* for the first time, please follow the steps below in order to set up the system (following the steps as numbered and shown in **Figure 3**):

1. Unpack the *Smart PowerSonic* pulser, 12VAC 40VA main plug transformer, and BNC interlock plug.
2. Connect BNC interlock plug to the OUT-EN socket on the back of the *Smart PowerSonic* pulser.
3. Connect your Macro Fiber Composite to the output socket.
4. Connect the low voltage plug of the 12VAC 40VA main plug transformer to the power socket on the back of the pulser.
5. Connect the 12VAC 40VA main plug transformer with the power line.



Figure 3

6. After following steps 1-5, you will hear a beeper sequence indicating that the *Smart PowerSonic* pulser has been set up correctly. The pulser's display will show the default parameter settings for the generated pulse burst (**Figure 4**). The *Smart PowerSonic* is now set up and ready to use.



Figure 4

7. This step will turn on the *Smart PowerSonic* pulser. After step 6 is completed, press the upper half of the black button to "Run/Stop" in order to switch the output ON. The LED above will indicate this was done correctly. Repeatedly pressing will switch the output OFF and the LED light turns off.
8. Pressing the lower half of the button to "Memory Set" will interconnect all of the 8 free programmable memory cells one by one in a cycling manner. The currently used memory cell is indicated by the corresponding LED.

Signal parameters ...

The *Smart PowerSonic* pulser was developed to generate ultrasound bursts with a certain number of pulses and a programmed frequency. **Figure 5** shows all parameters which can be defined and modified by the operator. **Table 1** explains their effects.

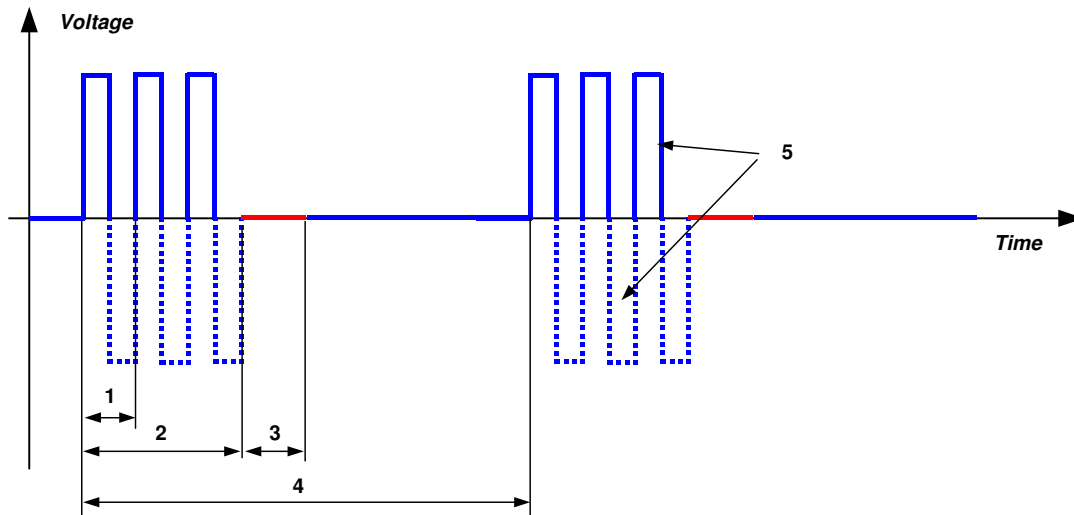


Figure 5

Table 1:

No.	Parameter	Explanation
1	Frequency [kHz]	frequency of the pulse or pulse pattern
2	Pulses [1]	number of pulses within the burst
3	Low impedance time [μs]	time after burst where piezo element is shorted
4	Refresh rate [1/sec]	number of fired busts per second
5	Polarity mode [1]	unipolar or bipolar operation mode

The parameter **Frequency** controls the frequency of the signal which will be applied to the Macro Fiber Composite. For a burst signal the number of **Pulses** can be defined as well. If the Macro Fiber Composite is being used as a transmitter and as a receiver, the time after the burst can be set where the element is short-circuited (**Low Impedance Time**) to reduce the ring down time. After this interval the MOSFET-bridge is completely open so that the transducer is only loaded with the receiver's preamp to improve the level for the received signal. For a continuous operation a **Refresh rate** can be selected, which gives the number of transmitted bursts per second. It is possible to switch the **Polarity mode** between unipolar and bipolar. All information is shown on the display as pictured in **Figure 6**.

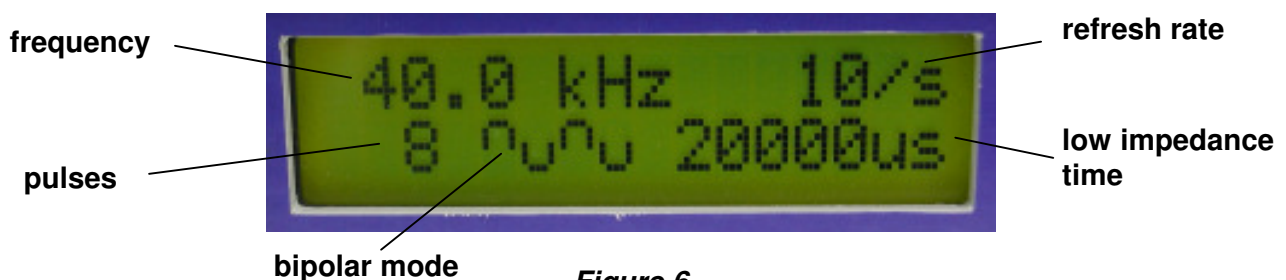


Figure 6

Programming ...

The *Smart PowerSonic* pulser is equipped with 8 memory banks to save 8 different signal settings, which can be defined and programmed by the operator. Programming the pulser can easily be done via the serial RS 232 interface.

To prepare the *Smart PowerSonic* for programming, you need to connect the device with the serial interface of your laptop or computer using an off-the-shelf serial cable. After that, you have to open a terminal program like the *WINDOWS* embedded *HyperTerminal* or the *HTerm* which comes on the CD included with the *Smart PowerSonic*. Once the *Smart PowerSonic* pulser is connected to the software, you will be able to program your own parameter settings. You can do this either while the output of the *Smart PowerSonic* is switched OFF or if it is ON during its normal operation. Changes in settings are shown in the display.

The following commands in **Table 2** can be used to modify the signal pattern. All commands need to be finished by pressing the ENTER key. Finally, you can save your settings to one of the 8 memory cells. The stored settings will be available after the *Smart PowerSonic* is disconnected from the power line and switched back on.

Table 2:

Parameter	Command	Output value
frequency	f10 ... f1000	f=1kHz ... 100kHz
pulse	p1 ... p100	1 pulse ... 100 pulses
refresh rate	r0 r1 ... r100	waiting for external trigger signal 1 burst/sec ... 100 bursts/sec
low impedance time	z0 ... z20000	0µs ... 20000µs for shorten transducer
polarity mode	m0 m1 m2	stops the operation via terminal software unipolar mode bipolar mode
Save settings	s1 ... s8	Safe to memory cell 1 ... 8

Example:

The following commands [**f650 / p12 / r10 / z1000 / m2**] give a signal with a burst of **12 bipolar pulses** at **65kHz** which is being repeated **10 times per second** and the Macro Fiber Composite is shortened for **1ms** after every burst.

The following pictures in **Figure 7** show some typical signal patterns:

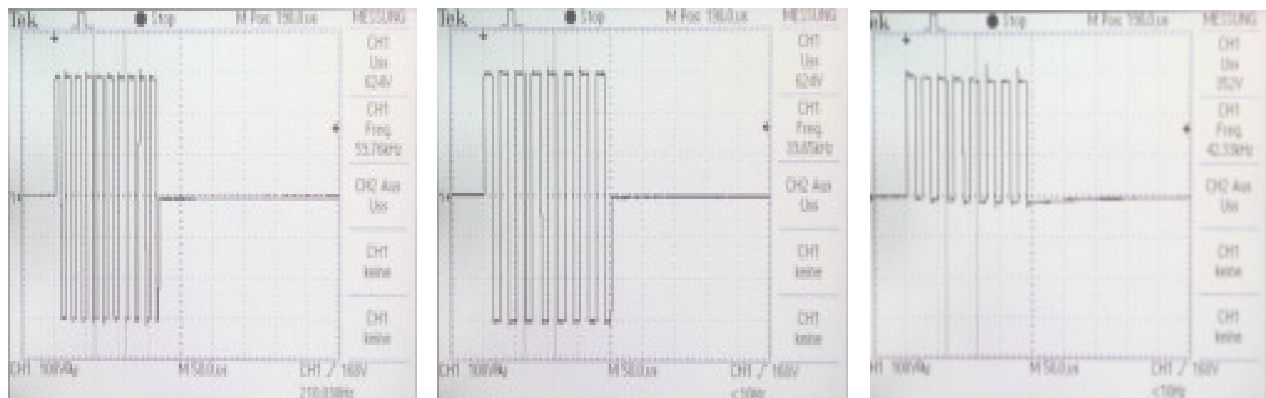


Figure 7

Triggers and Interlock

To communicate with peripherals, the *Smart PowerSonic* is equipped with a Trigger Input and a Trigger Output.

Trigger Input

To trigger the *Smart PowerSonic* in a complex measurement system a falling edge within a voltage range of 5 ...24VDC has to be present at the Trigger Input.

Trigger Output

To synchronize the signal output with a monitoring system, e.g. an oscilloscope, the Trigger Output can be used. A 5VDC signal with a falling edge is being provided at this output.

Interlock circuit

For additional safety requirements, the output can be shut down immediately by using an external safety switch connected to the OUT-EN connector instead of the interlock plug. As shown in **Figure 8** the output will only be ON if the remote switch connects both wires coming from the OUT-EN connector. In combination with a protective housing this should prevent any risks of an electric shock for the operator.

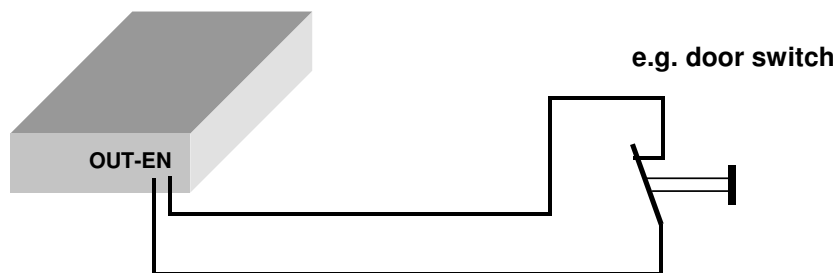


Figure 8

Contact Us ...

For questions, please contact us:

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