

Piezoelectric Ceramic Elements

Pro-Wave's new piezoelectric ceramic elements are designed for sensor and actuator uses. A series of standard elements covering a wide range of geometric shapes and sizes are provided. The in-house R&D expertise and machining facilities enable quick delivery of custom designed devices and elements. Piezoelectric films of polyvinylidene difluoride (PVDF₂) and PZT thick films are also available for special applications.

In addition to ceramic elements, piezoelectric ceramic powders ready for press and forming are also available. Typical piezoelectric values are listed below for design purpose.



Standard tolerances are 20%. These ceramics feature wide firing range and are optimized for ease in poling and low ageing characteristics.

Specification

Property	Unit	S5A	S5B	S4	S8
Coupling Coefficient, Kp(%)	%	66	65	59	58
Frequency Constant	Hz·m	2000	1950	2100	2200
Relative Dielectric Constant	ϵ/ϵ_0	2000	2500	1100	1400
Dissipation Factor	%	1.8	2.0	1.0	0.5
Piezoelectric Coefficient, d31	10^{-12} m/V	-195	-190	-120	-120
Piezoelectric Coefficient, d33	10^{-12} m/V	360	360	240	220
Piezoelectric Coefficient, g31	10^{-12} V·m/N	-12	-10	-10	-9
Piezoelectric Coefficient, g33	10^{-12} V·m/N	22	18	24	16
Mechanical Q		60	70	500	1000
Curie Temperature	°C	310	290	280	280
Density	g/cc	7.8	7.6	7.8	7.8



S. Square Enterprise Company, Limited
Pro-Wave Electronics Corporation

Piezoelectric Film Sensors

Pro-Wave now presents a series of mechno-electrical sensors and detectors produced by advanced piezoelectric polymer film technology. The polymer film of polyvinylidene fluoride (PVF2) exhibits a conspicuous piezoelectric effect and also has high compliance comparing with other piezoelectric crystals or ceramic materials. Because of its superior piezoelectric strain constant (g value), 10-20 times larger than piezoelectric ceramic, it is an ideal sensing material for converting mechanical to electrical energy.

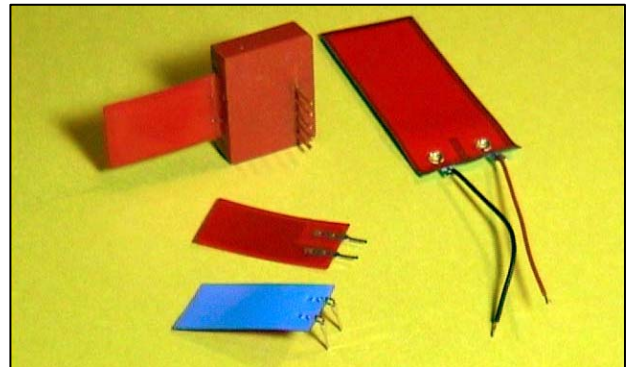
Besides the standard products shown on this catalogue, we are also developing a series of sensing devices by using this particular piezoelectric thin film material. Please contact with us for your special needs.

Features

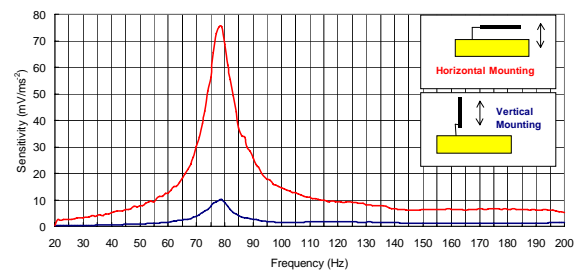
- High Mechno-electrical coefficient in planar, thickness and hydrostatic modes
- Low mechanical and acoustic impedance
- High resistance to moisture
- Pliant, flexible, tough and lightweight
- Self-generated voltage, non-contact, rustless, free of sparking

Applications

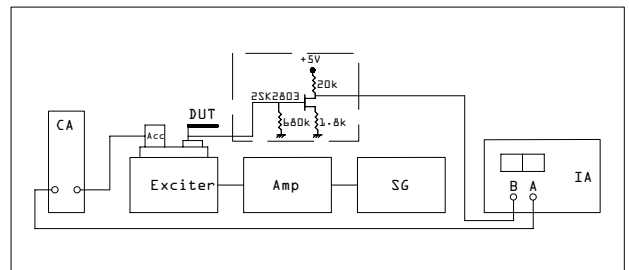
- Vibration sensors and motion detectors
- Low weight accelerometers
- Pressure or force sensors
- Keyboards, keypads and touch panels
- Coin and impact sensors
- Microphones and headset speakers
- Other mechno-electrical and electro-mechanical devices



Frequency response



Measuring diagram



SG: Programmable Signal Source HP 8165A

Amp: Power Amplifier

Exciter: Exciter B&K 4809

Acc: Accelerometer B&K 8309

DUT: Device (FS-2513P) under test

CA: Charging Amplifier B&K 2635

IA: Impedance Analyzer HP4192



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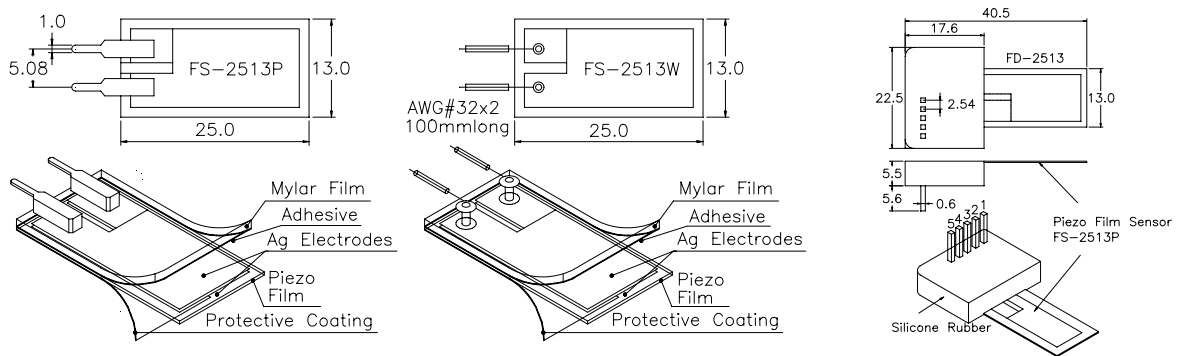
<http://www.s2.com.tw> : <http://www.prowave.com.tw>

Piezoelectric Film Sensors

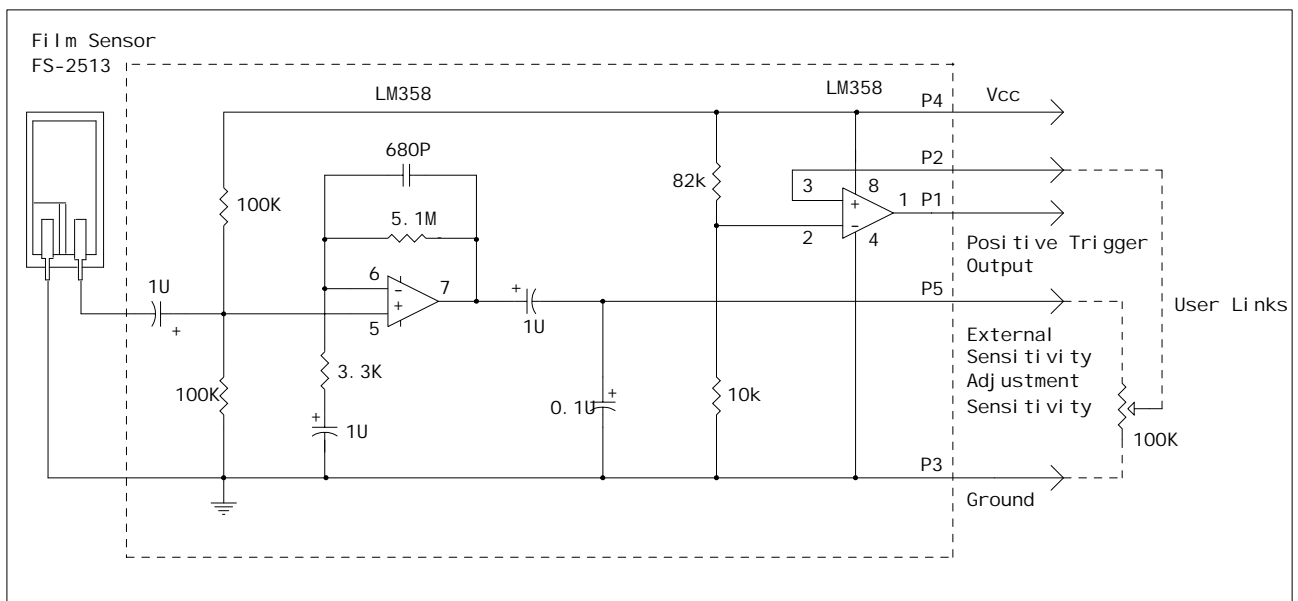
Specifications

Model Number	FS-2513P	FS-2513W	FD-2513P	Unit
Type	Lead Pins	Lead Wires	Lead Pins	-
Voltage sensitivity at fr	70	70	-	mV/ms ⁻²
Transverse sensitivity	10	10	-	mV/ms ⁻²
Resonant frequency (fr)	80 ± 10	80 ± 10	-	Hz
Capacitance	1.5 ± 30%	1.5 ± 30%	-	ηF@1KHz
Operation voltage (Vcc)	-	-	3-30	DC volts
Operation current	-	-	1	mA
Max. output current	-	-	20	mA
Operation temperature	-20 - +60	-20 - +60	-20 - +60	°C
Storage temperature	-40 - +70	-40 - +70	-40 - +70	°C

Dimensions in mm



Driving circuit & pin assignment of model FD-2513P



Piezoelectric Buzzer Elements



External-Drive Type

Model No.	Resonant Frequency (KHz)	Resonant Impedance (Ω max.)	Capacity (pF)	Dimensions(mm)				Metal Plate Material
				D	d	T	t	
PWE-12B12	12.0 \pm 1.0	1,500	4,500 \pm 30%	12.0	8	0.33	0.15	Brass
PWE-12B49	4.9 \pm 1.0	500	15,000 \pm 30%	12.0	9	0.12	0.05	Brass
PWE-15B58	5.8 \pm 0.5	500	10,000 \pm 30%	15.0	10	0.23	0.10	Brass
PWE-15B40	4.0 \pm 0.5	1,500	10,000 \pm 30%	15.0	10	0.17	0.05	Brass
PWE-15B91	9.1 \pm 1.0	500	7,000 \pm 30%	15.0	10	0.38	0.20	Brass
PWE-20B38	3.8 \pm 0.5	200	25,000 \pm 30%	20.0	15	0.28	0.15	Brass
PWE-20B41	4.1 \pm 0.5	300	17,000 \pm 30%	20.0	15	0.28	0.10	Brass
PWE-20B64	6.4 \pm 0.5	200	12,000 \pm 30%	20.0	15	0.43	0.20	Brass
PWE-27B10	10.5 \pm 1.0	500	12,000 \pm 30%	27.0	15	0.48	0.25	Brass
PWE-27B20	2.0 \pm 0.3	300	45,000 \pm 30%	27.0	20	0.23	0.10	Brass
PWE-27B28	2.8 \pm 0.5	300	30,000 \pm 30%	27.0	20	0.33	0.15	Brass
PWE-27B44	4.4 \pm 0.5	200	18,000 \pm 30%	27.0	20	0.53	0.25	Brass
PWE-31A13	1.3 \pm 0.3	800	43,000 \pm 30%	31.0	20	0.23	0.10	42 Alloy
PWE-35B18	1.8 \pm 0.5	250	50,000 \pm 30%	35.0	25	0.33	0.15	Brass
PWE-35B26	2.6 \pm 0.5	200	30,000 \pm 30%	35.0	25	0.53	0.25	Brass
PWE-35B29	2.9 \pm 0.5	200	30,000 \pm 30%	35.0	25	0.58	0.30	Brass
PWE-41B07	0.7 \pm 0.3	1,500	70,000 \pm 30%	41.0	25	0.23	0.10	Brass
PWE-41A08	0.8 \pm 0.3	1,000	70,000 \pm 30%	41.0	25	0.23	0.10	42 Alloy
PWE-50B28	2.8 \pm 0.5	200	35,000 \pm 30%	50.0	25	0.43	0.20	Brass

Self-Drive Type

Model No.	Resonant Frequency (KHz)	Resonant Impedance (Ω max.)	Capacity at 1KHz (pF)	Dimensions(mm)				Metal Plate Material
				D	d	T	t	
PWE-12B49F	4.9 \pm 1.0	1,000	12,000 \pm 30%	12.0	9	0.12	0.05	Brass
PWE-15B58F	5.8 \pm 0.5	1,000	7,500 \pm 30%	15.0	10	0.23	0.10	Brass
PWE-20B38F	3.8 \pm 0.5	350	17,000 \pm 30%	20.0	15	0.28	0.15	Brass
PWE-20B64F	6.4 \pm 0.5	300	10,000 \pm 30%	20.0	15	0.43	0.20	Brass
PWE-27B44F	4.4 \pm 0.5	300	15,000 \pm 30%	27.0	20	0.53	0.25	Brass
PWE-35B26F	2.6 \pm 0.5	300	25,000 \pm 30%	35.0	25	0.53	0.25	Brass
PWE-35B29F	2.9 \pm 0.5	300	25,000 \pm 30%	35.0	25	0.53	0.30	Brass



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Specification

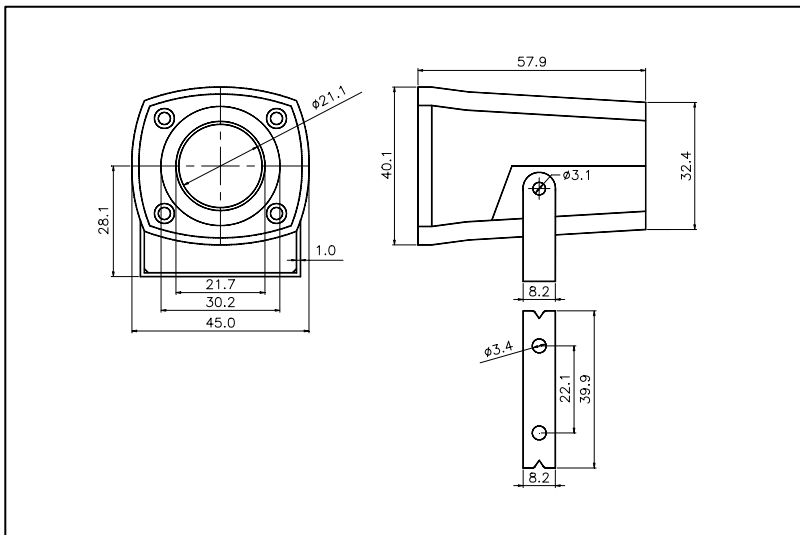
SQ-4558B	Micro Piezo Siren
Resonance Frequency	3.0±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	105dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	200 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Metal Bracket
Color*	Black
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

All specification taken typical at 25°C

Operation voltage of DC 24/26/48 volts are available upon request.

*Other tone type and color can be arranged upon request.

Dimensions: dimensions are in mm

**Application:**

Burglar alarms
Warning devices
Signaling alarms
Smoke detectors
Swimming pool alarms
Distress signals, etc.

Features:

High efficiency
Micro and compact construction
Waterproof and dust-proof
Light weight
Low cost



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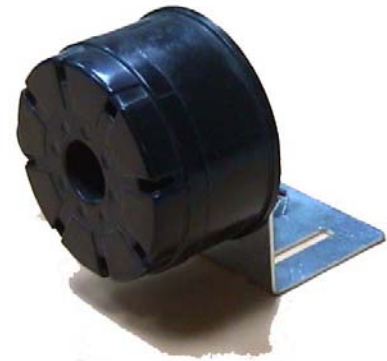
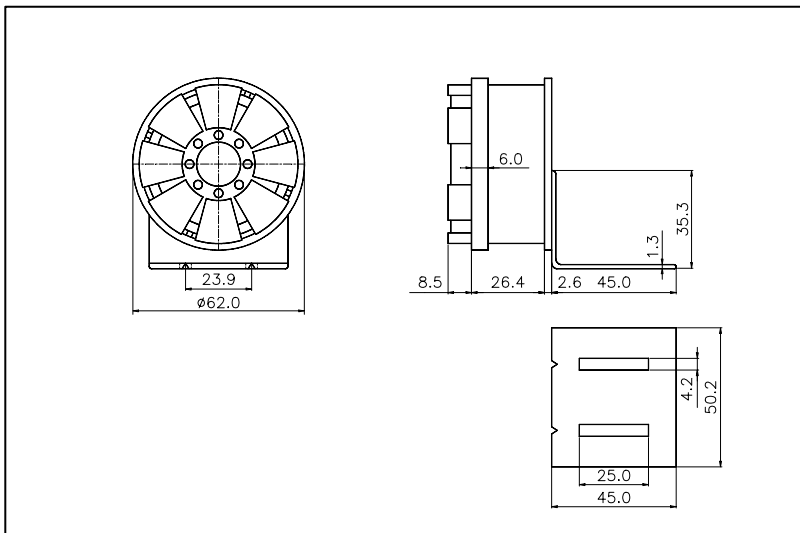
SQ-6038B	Piezo Siren
Resonance Frequency	2.5±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	110dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	300 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Metal Bracket
Color*	Black
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

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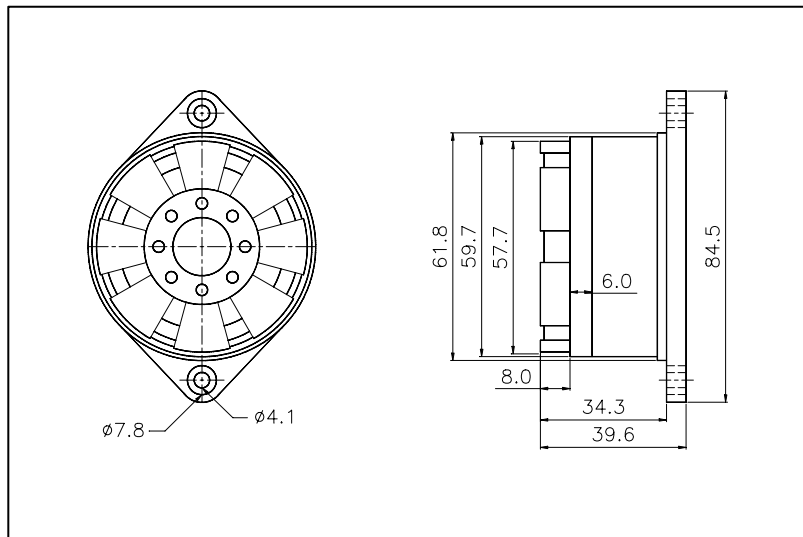
SQ-6038H	Piezo Siren
Resonance Frequency	2.5±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	110dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	300 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Fringe
Color*	Black; Ivory
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

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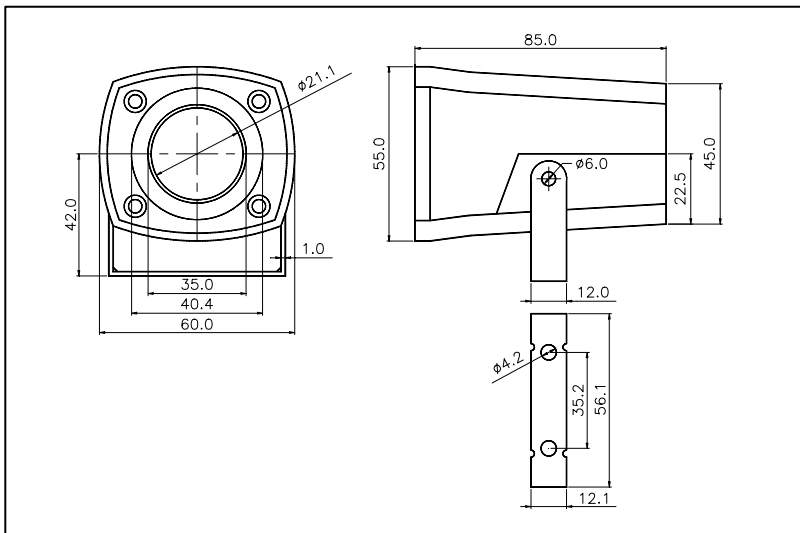
SQ-6085B	Piezo Siren
Resonance Frequency	2.0±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	115dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	350 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Metal Bracket
Color*	Black
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

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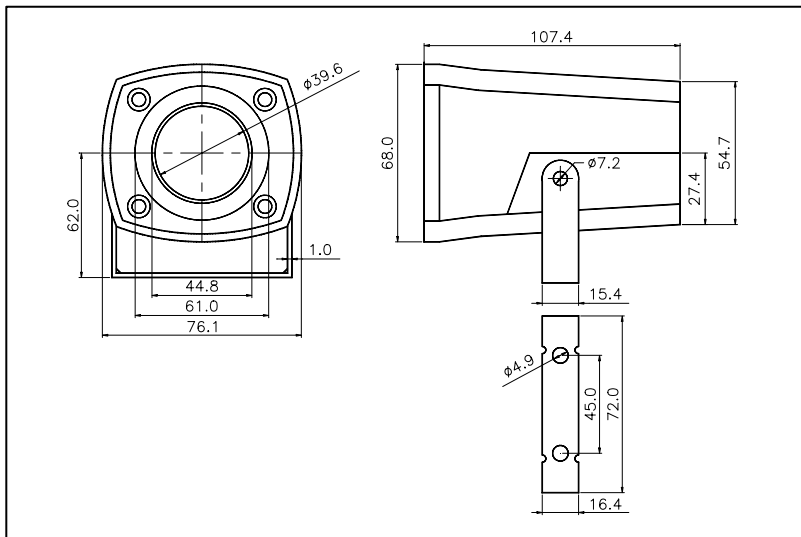
SQ-7608B	Piezo Siren
Resonance Frequency	3.0±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	117dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	500 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Metal Bracket
Color*	Black
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

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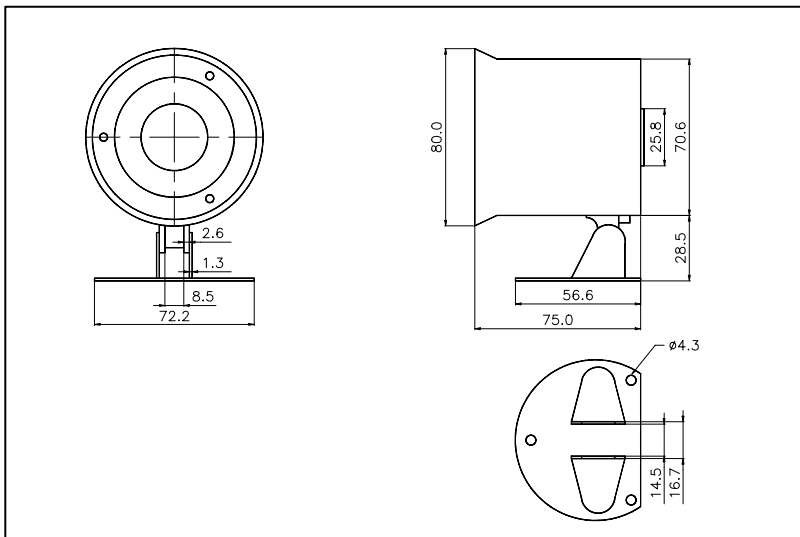
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Specification

SQ-8075B	Piezo Siren
Resonance Frequency	3.0±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	117dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	500 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Metal Bracket
Color*	Black
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

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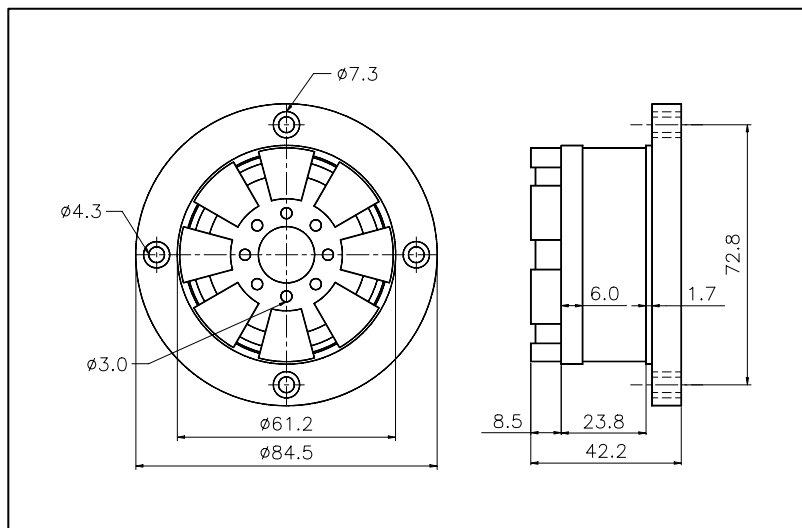
SQ-8543H	Piezo Siren
Resonance Frequency	2.5±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	110dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	300 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Fringe
Color*	Black
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

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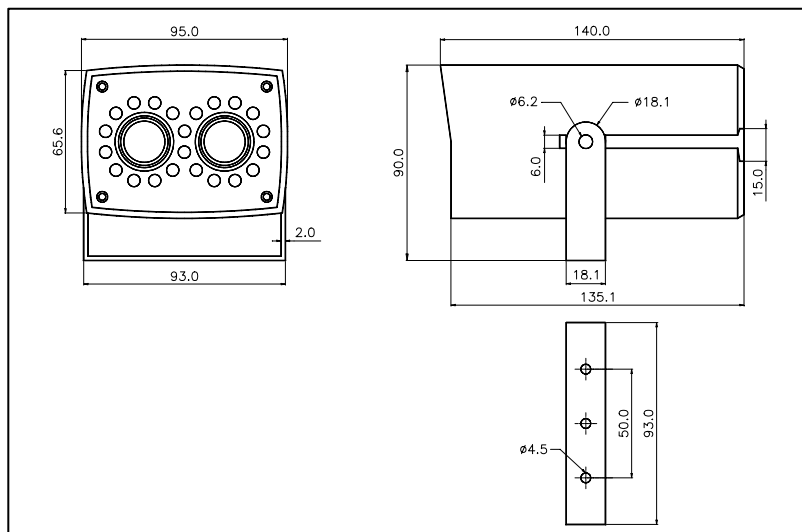
SQ-9014B	Dual Piezo Siren
Resonance Frequency	2.0±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	122dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	1000 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Metal Bracket
Color*	Black
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

All specification taken typical at 25°C

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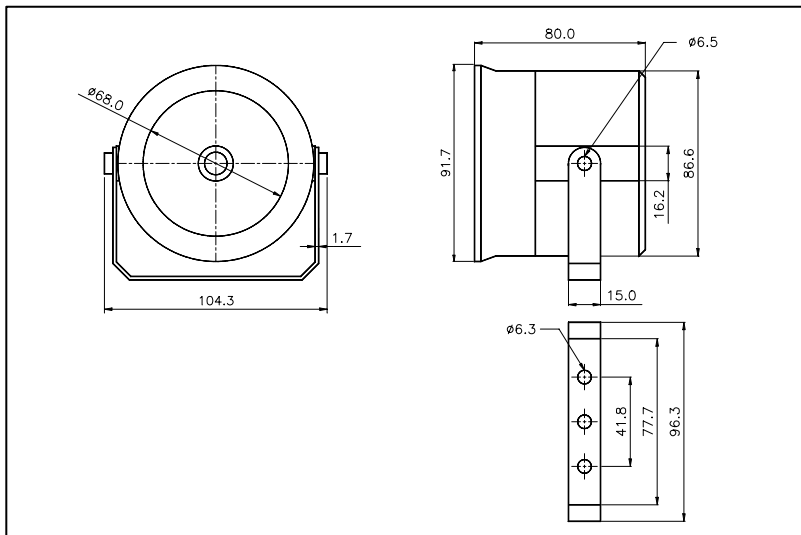
SQ-9280B	Piezo Siren
Resonance Frequency	3.0±0.3Khz
Sound Pressure Level Rated at DC 12 volts @100cm 0dB re 0.0002μbar	120dB min.
Operation Voltage	DC 7-15 volts
Current Drain Rated at DC 12 volts	500 mA
Tone Type*	Sweep from 2-4Khz in 2Hz rate
Case Material	ABS Resin
Mounting Type	Metal Bracket
Color*	Black
Operation Temperature	-20 to 60°C
Storage Temperature	-30 to 70°C

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Pro-Wave is a well-known manufacturer of various sensors and transducers and the basic sensing materials of piezoelectric ceramic and piezoelectric polymer films.

Our **GBD** series glass break detectors utilize the advance sensing technology of acoustic emission which only be responded in the frequency containing in the frequency over 200Khz of overtone frequencies containing in the frequency spectrum while glass being broken. It is unlike the microphone type detectors that can be easily activated by audible sounds and vibrations.

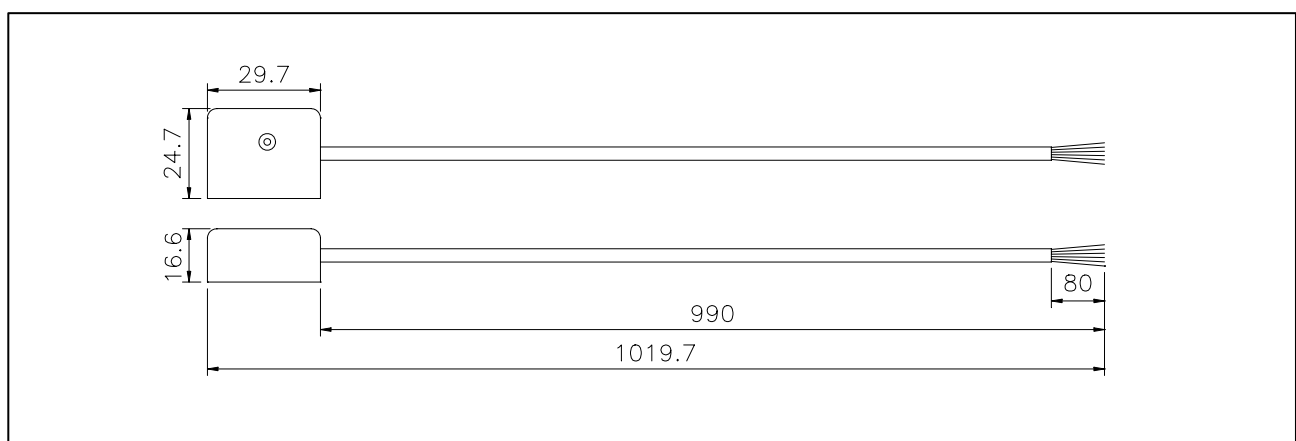
Up to 20 GBD series detectors can be wired in series and linked with all type security systems.



Features

- Reliable ultrasonic emission sensing
- Latching LED indication
- Momentary opening contact
- Anti-tamper look wires
- Up to 20 detectors wired in series
- High impact resin enclosure

Dimension



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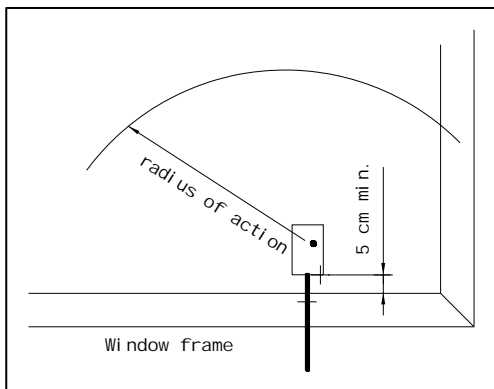
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Specification

	GBD-02W	GBD-02B
Supply voltage	DC 11-15 volts	
Current consumption (standby)	2.5mA at DC 12 volts	
Contact rating	30 volts (maximum voltage) 0.5 Ampere (maximum current) 10VA (maximum power)	
Size	30.2 mm (length) x 25.3 mm (width) x 16.5 mm (height)	
Cable length	2 meters	
Color (ABS housing)	White	Brown

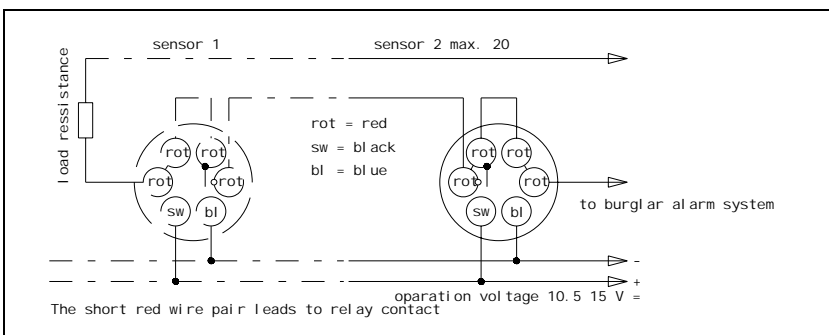
Mounting

After cleaning a suitable area of the windows (at least 5 cm away from any window frame with the cable going to the side or down) and **GBD** detector back with spirit cleaner (no nitro cleaner). The **GBD** detector is glued on the window with a temperature resistance glue, for example, RTV silicone rubber. The sensitivity depends on the glass thickness and reaches a maximum of 1.5 meter.



Glass thickness	Radius of action
8 mm	1.5 m
6 mm	1.5 m
4 mm	1.2 m
2 mm	0.6 m

Connection



One or up to 20 **GBD** detectors can be wired in series according to the connection diagram including a termination resistor (4.7 – 22K Ohm). The wires of red and white are the relay output wires, the wires of yellow and brown are anti-tamper loop

wires, the blue one is the power input wire of DC –12 volts, the black wire is the power input of DC +12 volts.

Piezoelectric Blood Pressure Sensors

Pro-Wave's new line of piezoelectric pressure sensors are designed specially for digital blood pressure monitors, which has one piece molded air pressure pipe bonded with sensor cable.

All piezoelectric pressure sensors are supplied with a high sensitivity piezoelectric ceramic element glued with a metal diaphragm by using a rigid bonding agent. A built-in low noise junction field effect transistor housed in a plated metal housing. Standard version of piezoelectric pressure sensor has an 1.3 meter of one piece shielding cable bonding with air pressure pipe, and a molded 2.5 mm diameter phone plug at other cable end.



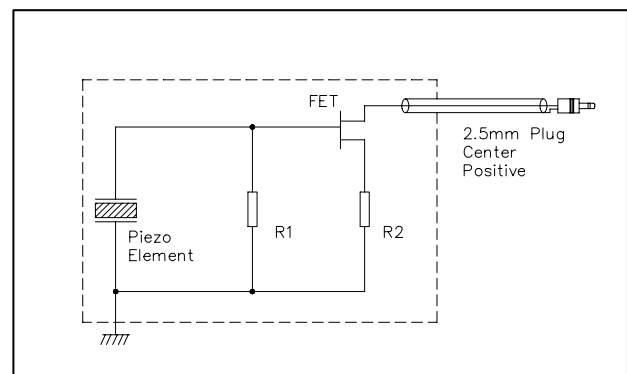
Features

- High mechno-electrical sensitivity
- Low impedance output
- Wide operation temperature
- Molded air pressure pipe bonded with shielding cable

Applications

- Sensors for digital blood pressure monitor
- Sensors for machine health monitors
- Sensors for car burglar alarms home security and etc.

Equivalent circuit



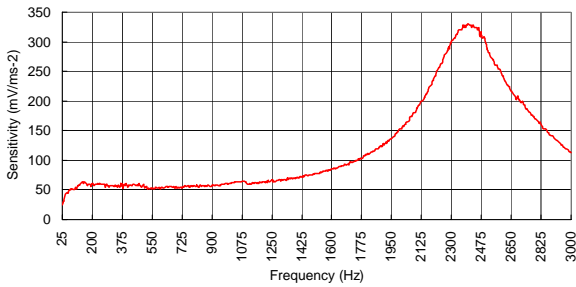
S. Square Enterprise Company Limited
Pro-Wave Electronics Corporation

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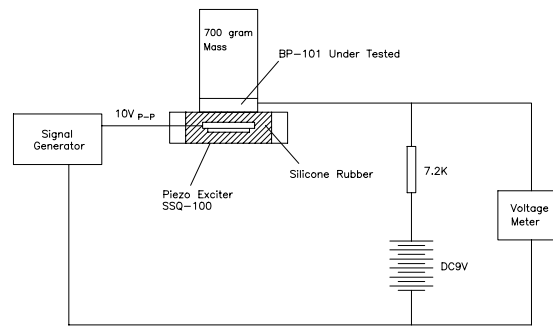
Specification

Model number	BP-2401 (with air pressure pipe) BP-2402 (without air pressure pipe)
Voltage sensitivity	40mV/ms ⁻²
Lower frequency limit	30Hz
Upper frequency limit	1000Hz
Resonant frequency	2,400 ± 20% Hz
Operation voltage	DC 3 – 30 volts
Operation temperature	-20 to +60°C
Storage temperature	-40 to +80°C

Frequency Response



Measuring Circuit



Dimension

