MALLORY

MALLORY SONALERT PRODUCTS, INC.

DQS Inc.
Mallory Sonalert Products, Inc.

Made In The USA

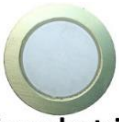
Sound, Distance, & Mallory's Web Tool

Reference Sound Levels

	130 dB	Threshold of Pain
	120 dB	
Loud Auto Horn	110 dB	
	100 dB	
	90 dB	Food Blender
Loud Singing	80 dB	
	70 dB	Normal Conversation
	60 dB	
	50 dB	
	40 dB	
Quiet Whisper	30 dB	
	20 dB	Rustling of Leaves
	10 dB	
Threshold of Hearing	0 dB	

Have you ever wondered what a **sound** is exactly? A sound that hits the eardrum (and makes it vibrate) consists of small air pressure waves that have a **frequency** between 20 Hertz (Hz) and 20 kilo-Hertz (kHz). This is why the wind can drown out sound- the wind's large air pressure can overwhelm the eardrum which is sensitive to smaller air pressure waves. The **larger** the air pressue wave, the louder the sound is, and sound level is measured in decibels (dB) which is an arbitrary scale ranging from 0 (threshold of hearing) to 130 (threshold of pain).

When specifying the sound level of a buzzer or alarm, a **distance** number is required because sound level decreases over distance. People understand this concept intrinsically because if someone is right next to you, they can hear a **whisper**, but if they are across the room, you need to raise your voice to be heard. A **rule** of thumb which can be used when converting a sound level from one distance to another is that the sound level drops **six** decibels (dB) every time the distance doubles. So, if an alarm is specified as 100 dB @ 1 ft, then at 2 ft, the sound level would be 94 dB, at four feet, 88 dB, and so on. This concept is important because manufacturers specify their audible alarms at **various** distances, so it can be difficult to **compare** them or to understand how loud an alarm might be in an **application**. To make the sound level to distance **calculations** easier, Mallory has developed a sound level conversion web tool to compare audible sounds specified at different common distances.



Piezoelectric Disc

Two common **technologies** used to generate alarm sounds in an industrial environment are piezoelectric and electromagnetic. A piezoelectric buzzer generates sound when a voltage signal is applied at the appropriate frequency to a piezoelectric **disc** which causes the disc to flex up and down generating the air pressure waves needed by the ear to hear a sound.

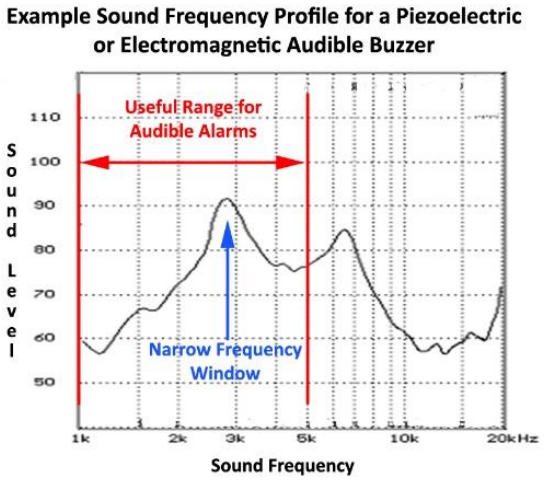
An electromagnetic buzzer generates sound when a voltage signal is applied at the appropriate frequency to an **electro-magnet** which has a metal disc suspended above it. As the electro-magnet turns off and on, the disc flexes up and down generating the air pressure waves.

Small Electromagnetic SMT Transducer

4 mm x 4 mm x 2 mm
75 dB @ 10 cm

Both technologies have their **strengths** and **weaknesses**. Piezoelectric technology excels at producing **loud** sound levels with very **minimal** electrical current levels, and electromagnetic technology excels at producing loud sound levels in **small** packages at **lower** voltage levels. Electromagnetic technology is more often used for small SMT or PC Pin type

buzzers, and piezoelectric technology has various sized models which generate the very loud sound levels needed in **noisy** industrial environments.



Both technologies produce the highest levels in a very narrow sound frequency window which translates to producing a **loud** sound in a **small** package, but these devices would not be good for producing music which requires a wide sound frequency window. Speakers, on the other hand, do have a wide sound frequency window making them good for complex sounds, but they are heavy, large in size for the sound produced, relatively expensive, and require high current levels. For these reasons, speakers are not commonly used in alarm applications. One **example** of a speaker being used for an alarm sound is the back-up alarm used on large vehicles such as construction equipment or garbage trucks.

Sound level can be measured using a microphone and a sound meter. However, unless the sound is being measured inside an **anechoic** chamber like Mallory uses, the sound level reading will be affected by echoes, reflections, and dead spots generated by the various equipment, people, tables, and walls around the sound measurement set-up. So, be **cautious** when comparing the sound levels of competitor's buzzers to Mallory's audibles because you will probably find that the Mallory alarm is **louder** than the competitor's even though the competitor's buzzer has a higher sound level listed on the print.

Mallory, an ISO 9001:2015 company, has been **manufacturing** audible and visual alarms in the USA since 1968. With 12 active **patents**, Mallory is the **technology** leader in audible and visual alarm devices.

Mallory's SMT Transducers (No Circuitry Included)

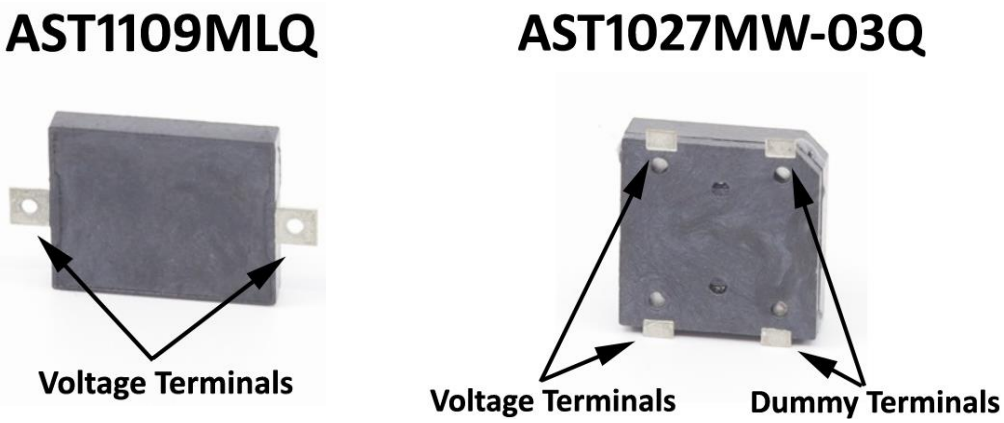
SMT **transducers** are audible devices which consist of a surface mount housing that encloses a mounted sounder element. SMT transducers do not have any circuitry, so this means the user must **apply** a square or sine wave at the appropriate rated frequency & appropriate rated peak-to peak voltage (Vpp) as listed on the data sheet.

Both piezoelectric and electromagnetic technology are used in **SMT** transducers. Piezoelectric SMT transducers will typically have a higher rated sound frequency, require more peak-to-peak voltage, but will draw much less current. Electromagnetic SMT transducers will have a lower rated sound frequency for the size, will produce more sound level at lower voltage levels, but current draw will be much higher. Because electromagnetic SMT transducers can produce high sound levels at lower voltages, this technology is more popular for the SMT package type. Here is a chart comparing two similarly sized SMT transducers with one using piezoelectric technology and the other electromagnetic:

Part Number	Sound Freq.	Voltage Rating	Current Draw	Typical Sound Level at 10 cm	Size
AST1027MW-03Q	2700 Hz	2.5 to 4.5 Vpp	80 mA @ 3 Vpp	87 dB @ 3 Vpp	10 x 10 x 3.2 mm
AST1109MLQ	4100 Hz	1 to 20 Vpp	1 mA @ 5 Vpp	75 dB @ 5 Vpp	11 x 9 x 1.7 mm

So, which is electromagnetic and which is piezoelectric? The frequency, voltage, and current draw all show significant differences between the electromagnetic one (P/N AST1027MW-03Q) and the piezoelectric one (P/N AST1109MLQ). For piezoelectric technology, the more Vpp applied, the **louder** the sound level will be, so if the user has 20 Vpp available, then applying this voltage to P/N AST1109MLTRQ, a louder sound will be generated. Some users take advantage of this aspect of piezoelectric technology to **control** the sound level of the audible device by applying more or less Vpp. On the other hand, electromagnetic technology has a much **narrower** rated voltage window, so applying max voltage (4.5 Vpp) to P/N AST1027MW-03TRQ will not increase the sound level significantly higher than when applying 3 Vpp.

While some SMT transducers packages only have **two** physical SMT terminals, others have **four** SMT terminals with two of them used only for mounting. These two extra "**dummy**" terminals do not need the Vpp signal applied to them. You can see this package difference in the two part numbers previously discussed:



Mallory has **11 different** piezoelectric SMT transducer part numbers, and **22 different** electromagnetic SMT transducer part numbers. All of Mallory's SMT devices are available in **Tape-n-Reel** (T&R) packaging, and all SMT devices can also be purchased in smaller quantities by purchasing partial reels (**Cut-Tape**), or some SMT devices are available in **Tube** packaging. Mallory SMT devices with the suffix "TRQ" are Tape-n-Reel packaging, while the part numbers without the "TR" are either Cut-Tape or in Tubes, so see the individual data sheet for the **packaging** information.

MADE IN THE USA

Mallory is an ISO 9001:2015 company that has been supplying **SMT buzzers** and transducers for 25 years. Mallory has the **broadest** line of audible and visual signaling devices in the industry, and has been the technology leader for over **50 years**.