



# FAQ APPLICATION Guide

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## FAQ's- 22mm Industrial Alarms with LED Lights

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## General Alarm Technology

### Q: What is an electronic audible alarm?

A: An electronic audible alarm produces an audible warning sound using electronic means. This is in contrast to electro-mechanical alarms that produce sound by mechanical means. Examples of electro-mechanical alarms include the old clapper type alarm clocks, school bells, and car horns. Examples of applications that use electronic audible alarms include smoke detectors and microwave ovens.

### Q: What else are audible alarms called?

A: Buzzers, beepers, audible signals, piezo's, sounders, alerts, audio alarms, indicators, transducers, and various combinations of these terms (audio alerts, piezo indicators, etc.).

### Q: How do electronic audible alarms work?

A: Audible alarms work by using electronic components to convert the user's input voltage into an appropriate oscillating signal that drives a metal sounder diaphragm. This metal sounder diaphragm then physically flexes up and down producing air pressure waves that the human ear interprets as sound. For a more detailed description, please read the Article titled, "[Audible Alarm Basics](#)" and see Technical Application Guide, "[Piezoelectric Alarm Operation](#)".

### Q: How does a piezoelectric transducer work?

A: Piezoelectric type alarms utilize a piezoelectric transducer which consists of a metal disc that has a ceramic material bonded to it. When voltage is applied to the ceramic material, it causes the metal disc to physically flex. If the piezoelectric transducer is physically flexed at an appropriate frequency, the air pressure waves are produced that are heard as an audible sound.

### Q: How are electronic audible alarms constructed?

A: Electronic audible alarms are considered components by equipment designers, but in actuality, they are a complex electromechanical assembly. See Technical Application Guide, "[Piezoelectric Alarm Construction](#)".

### Q: Why is a brass metal diaphragm superior to a stainless steel metal diaphragm for an audible alarm application?

A: In order to solder wires to a stainless steel metal diaphragm, very hot temperatures and aggressive acid fluxes are required. The process is very sensitive to many different parameters, so if the soldering process slips out of control, weak solder joints can result. The soldering process needed to solder to a brass transducer does not need aggressive fluxes and extra hot temperatures, so the process is more reliable. In addition, the brass metal diaphragms are lower in cost, so the customer gets more value for their money whereas the stainless steel diaphragms are higher cost with no value added to the user.

The claim that stainless steel diaphragms are more corrosion resistant is false. In only the most severe salt water applications will a slight difference in the corrosion resistance be noticed. For these rare severe salt water applications, a conformal coating can be applied to the exposed brass surface (at a cost still less than stainless steel) that will provide equal or better corrosion resistance than the exposed stainless steel surface.

**Q: What is the difference between an indicator and a transducer?**

**A:** An indicator is an electronic alarm that has internal circuitry. The user only needs to apply an input voltage, and the alarm will automatically sound.

A transducer does not contain any internal circuitry. The user has to supply the complex AC signal that will make the sounder diaphragm flex at the appropriate rate and amplitude.

## Electrical Application Issues

### Q: Getting an annoying low volume sound output when 120 Vac alarm is supposed to be off?

**A:** You are experiencing a leakage voltage with your power supply or controller. Mallory alarms are designed to operate with very little current and it takes only a small amount of voltage to make the alarm sound. Try this fix:

1. Put a 30 Volt zener transient voltage suppressor diode in series with the Sonalert alarm such as ON Semiconductor P/N's: P6KE33AG or P6KE36AG or P6KE30AG. These should be readily available at many electronic distributors. You can also use: [www.eem.com](http://www.eem.com) to find distributors who have these in stock.

### Q: Do Mallory AC/DC Alarms work with 50 Hz and 60 Hz systems?

**A:** Yes. Mallory Sonalert AC/DC alarms work with both 50 Hz and 60 Hz systems.

### Q: Can you adjust the volume of an audible alarm?

**A:** For the ZT series, unfortunately, once you purchase an alarm there is not a good method to adjust the sound level of the alarm. Mallory does offer three different sound levels with this series (Loud- 85 to 95 dB, Medium- 75 to 85 dB, Soft- 65 to 75 dB), so if your alarm is not the right sound level, try moving up to a louder alarm or down to a softer alarm. If you are still having issues, contact Mallory at 317-612-1000 (ph) or [info@mallory-sonalert.com](mailto:info@mallory-sonalert.com) (email)

### Q: How fast can I turn an audible alarm on and off (i.e. short duration pulse width)?

**A:** A piezoelectric or electromagnetic alarm generates sound by physically deflecting a metal disc. It does take a small amount of time once the voltage signal is applied to the part before the metal disc is flexing to its fullest potential. Our recommended minimum pulse duration is 50 msec. but some customers have reported being able to use even shorter durations without affecting the sound level. At some point as the pulse duration continues to decrease, the "beep" sound will become a "click" sound and the sound level will decrease.

### Q: How do I make your DC ZT series alarm only turn on after a certain voltage is reached?

**A:** You can use a simple zener diode & transistor circuit. See Technical Application Guide, "[Circuit to Increase Turn-On Voltage](#)".

### Q: What does the input impedance of a piezoelectric transducer type device look like?

**A:** The input impedance of a piezoelectric transducer looks like pure capacitance. The current and voltage waveforms across the transducer can be predicted from the source voltage impedance and the transducer capacitance.

**Q: Are your alarms affected by EMC/EMI?**

**A:** For Mallory Alarms and buzzers that use piezoelectric transducers, we have never had a report of these devices being affected by EMC/EMI. However, there have been a few reports of electromagnetic type buzzers being affected. If you are worried about the alarm being affected by EMC/EMI, you can consider using an EMC protective product such as 3M EMC tape or fabric that could be wrapped around the alarm. Google "3M EMC Products" to find 3M's website with information on these products.

## Mechanical Application Issues

### Q: What size hole do I need for my panel mount alarm?

A: For the ZA/ZT 22mm series, use a 22.5 mm (0.896") diameter hole with keyway.

### Q: How do I connect to the ZT series alarms?

A: Use a stripped wire to insert into the ZT euro-terminal. The wire size can be between 30 and 16 AWG, the strip length should be around 6.5 mm (0.256"), and the maximum screw torque is 2 in-lbs (0.226 n-m).

### Q: How much torque is recommended to tighten the knurled nut?

A: For the plastic knurled nut, a maximum of 10 in-lbs (1.13 n-m) is recommended.

### Q: How much torque is recommended to tighten the screws?

A: For the SC/LSC/VSB series, the recommended torque is 4 to 6 in-lbs, and the maximum torque is 8 to 10 in-lbs.

### Q: Can I bury the alarm inside my equipment?

A: Yes, but the alarm will be attenuated 15-20 decibels. This means that the sound level will be about ½ to ¼ as loud as it would be if it was mounted externally or if there were openings made in the enclosure so that the sound could radiate out. For a full discussion on mounting alarms inside of equipment, read the article titled, "[Audible Alarm Use and Equipment Integrity Issues.](#)"

### Q: Can Mallory provide custom terminations?

A: Yes! Visit our contact page on the website or email [info@mallory-sonalert.com](mailto:info@mallory-sonalert.com) or call 317-612-1000

## Sound & Light Issues

### Q: How is sound level measured?

**A:** Sound level is measured in decibels (abbreviated dB). The dB scale is an arbitrary scale that reflects the loudness of the sound that is being measured. It ranges from 0 dB (threshold of hearing) to 130 dB (threshold of pain). For a better understanding of the decibel sound level scale, see Technical Application Guide, "[Decibel Sound Level Scale](#)".

### Q: How loud does my audible alarm need to be?

**A:** The audible alarm should be at least 10 dB louder than the ambient background noise so that it can be easily heard. You can estimate the ambient background noise by using the chart found in the Technical Application Guide, "[Decibel Sound Level Scale](#)" or you can use a sound level meter to measure the actual ambient noise level.

### Q: When is a sound level twice as loud as another?

**A:** Every time the sound level increases by 10 dB, it will sound twice as loud to the human ear. For example, an alarm specified as 90 dB at 2 feet will sound half as loud as one specified as 100 dB at 2 feet.

### Q: What does distance have to do with sound level?

**A:** Sound level falls off over distance. We intuitively know this because we have to talk louder (or even shout) when people are farther away. The rule of thumb is that every time the distance doubles, the sound level drops off by 6 dB. For example, if an audible alarm measures 60 dB at 2 feet, by the time it reaches 4 feet, it will only be 54 dB. By the time it reaches 8 feet, it will only be 48 dB, and so on.

### Q: How come some audible alarms are specified at 2 feet and some are specified at 10cm? How do I compare alarms at various distances?

**A:** Unfortunately, there is no one standard distance for specifying the sound level for audible alarms. However, there are some common distances such as 2 feet (60 cm), 1 foot (30 cm), and 10 cm (4 in). An excel spreadsheet has been developed to convert among the most common distances used. The link for the spreadsheet is in our TECHNICAL RESOURCES webpage.

For example, if you want to compare an alarm that is specified as 100 dB at 10 cm and one specified as 88 dB at 2 feet, you must choose one distance that you want to use to compare the parts. Using the distance conversion spreadsheet, you would find that 88 dB at 2 feet equates to 103 dB at 10 cm, so the alarm specified as 88 dB at 2 feet is actually louder than the other one when they are compared apples to apples.

**Q: How sensitive is the human ear to sound level changes?**

**A:** Most people can only distinguish a sound level change only when it increases or decreases by 3 decibels. For example if a person was listening to an audible alarm that changed from 90 to 92 dB, that person would most likely say that the alarm did not get louder. If the sound level changed from 90 dB to 93 dB, the person would say that the sound level is slightly louder. If the sound level changed from 90 to 96 dB, the person would say that the sound level is significantly louder. If the sound level changed from 90 to 100 dB, the person would say that the sound level is twice as loud as before.

**Q: When should I use a constant tone and when should I use a pulsing tone?**

**A:** Pulsing tones are more easily distinguished than constant tones. Also, pulsing tones convey typically convey more urgency to a person than a constant tone. On the other hand, it takes more electronic circuitry to make a tone pulse, so pulsing audible alarms are usually more expensive than constant tone alarms. If a more pleasant sounding tone is needed, a chime sound may be preferred.

You can listen to the various sounds that Mallory audible alarms make on our SOUNDS webpage.

**Q: What does dBa (A-Weighting) mean?**

**A:** dB is the abbreviation for decibels which is how the sound level of audible alarms is measured. The "a" in dBa means that the sound level was measured on an A-Weighting scale. The A-Weighting scale was developed to compensate for the fact that the human ear is not a perfect microphone. By applying the A-Weighting scale to sound level measurements, you put the different frequencies (itches) that the audible alarms produce on an even basis (i.e. comparing apples to apples). Mallory always uses A-Weighting for their sound level measurements, but not all audible alarm manufacturers are this diligent.

**Q: Can I control the sound level of the audible alarms?**

**A:** In general yes see technical guides- "[Controlling Sound Level Mechanically](#)" & "[Controlling Sound Level Electronically](#)". However, for the ZT series, there is no good way to control the sound level once the alarm is purchased. If the alarm sound level is not correct, try moving to a louder or softer alarm in the ZT series. You can also contact Mallory at 317-612-1000 (ph) or [info@mallory-sonalert.com](mailto:info@mallory-sonalert.com) (email)

**Q: Can I model the acoustic sound chamber using Helmholtz equations?**

**A:** Mallory Sonalert has worked with Professors at Rose Hulman University in an attempt to model the sound chamber using Helmholtz equations, but these equations do not work well in predicting the resulting sound characteristics of the alarm. When Mallory Sonalert engineering designs new audible alarms, we rely on past designs and experience to give guidance on a starting point. However, the final design of the sound chamber is based on careful process of building prototype after prototype in order to find that sweet spot in sound performance."



**Q: What is the acoustic sound chamber and how does it work?**

**A:** The acoustic sound chamber of audible alarms includes the area inside the housing that is in front of the sounder element and includes the front hole opening.

The sound chamber does not work like organ pipes. In organ pipes, there are standing waves of different size depending on the frequency generated. This is why the organ pipes are different lengths. If the standing wave principle was used for electronic audible alarms, the alarms would have to be many inches or feet in length.

Perhaps the best way to explain how the acoustic sound chamber works is to think of it using a more visceral medium. If you think of the air sound waves being replaced by water, the sound chamber would work by providing an efficient shape for the water to move out of the housing without being obstructed by eddies, reverse currents, and dead spots. Essentially, the acoustic sound chamber provides a low impedance path for the air pressure wave to escape the housing with maximum intensity.

**Q: Can Mallory provide a custom sound?**

**A:** Yes! Visit our CONTACT US webpage or email [info@mallory-sonalert.com](mailto:info@mallory-sonalert.com) or call 317-612-1000

**Q: What technology is used to produce the light?**

**A:** Mallory uses solid state LED's.

**Q: How bright is the light?**

**A:** Mallory has not measured the brightness. However, based on field tests, the lights are readily viewable indoors under a variety of lighting conditions.

**Q: Are your parts daylight viewable?**

**A:** They are not designed to be daylight viewable. If you want one that bright, contact Mallory and we'll look into providing a sample to try. We could also make one dimmer if that is a need.

**Q: Why does my yellow light look more amber?**

**A:** The amber LED's are more cost effective than the yellow LED's, so it is common in the industry to go with the amber LED's and still call the color, yellow.

**Q: Can you do a custom color?**

**A:** The color of the light is controlled by the internal LED's. So, if they make a LED that can produce the color that you want, we can do it, so contact us with your request.

## Environmental Issues

### Q: Can the ZT panel mount models be used outdoors?

A: Yes, they are rated for NEMA 4X; IP-66. If water/liquid/ice does accumulate inside the front hole opening, this can affect the acoustic characteristics of the part. Therefore, we recommend that the part be mounted downwards or away from direct exposure to rain/sleet/snow. Alternately, a shield could be placed in front of the front hole opening.

### Q: What type of approval or certification does the ZT Series have?

A: The ZT series was approved to UL-508A and is UL approved, cUL approved, and NEMA 4X/12/3R approved.

### Q: What is the difference between "UL Listed" and "UL Recognized"

A: UL Listed means that a piece of equipment has met the requirements spelled out by UL for that type of equipment. UL Recognized means that the individual component has met the requirements spelled out by UL for that type of component. The main difference is that equipment is UL Listed while components are UL Recognized. Since Mallory alarms are components, they are only required to be UL Recognized in order to be used in UL Listed equipment. Check Mallory's UL or cUL on-line Yellow Cards in the TECHNICAL RESOURCES webpage to determine which alarms are UL or cUL Recognized and therefore can be used in UL Listed equipment.

### Q: Are your alarms CE Marked?

A: The alarms, buzzers, transducers, speakers, and other products & accessories sold by Mallory Sonalert Products, Inc. are individual components that must be incorporated into final equipment in order to be useful. Since their safety and use depends to a very large extent on how they are incorporated, they are not covered by the various European Directives, and need not be CE marked. In fact, per the Low Voltage Directive, components must **not** be CE Marked.

### Q: What is the Flammability Rating of Mallory alarms?

A: For Mallory ZT Series, the individual components used in the alarms all meet a flammability rating of UL-94HB or better, so these alarms will pass a UL-94HB test. However, no specific flammability testing has been done on these or other Mallory alarms models.

### Q: Do you have FAA Certification on your alarms?

A: While a vast majority of Mallory's alarms are used in industrial and non-aerospace applications, Mallory's alarms have been used by the aerospace industry for over 30 years, and end customers include nearly all major and minor jet, airplane, and helicopter manufacturers. All the various alarm models used in these applications have been certified with the FAA by the alarm user. While Mallory has not been directly involved with the FAA during the PMA (Parts Manufacturer Approval) process, Mallory has (and will) supply all needed information for any certification and/or approvals that are

required by the application to the alarm user. It is up to the alarm user to work with the FAA to gain approval.

**Q: What is the shelf life of an audible alarm?**

**A:** Mallory is not aware of anyone who has ever had a shelf life issue with our alarms. That being said, some alarm models contain aluminum electrolytic capacitors. The recommended shelf life for these capacitors is 5 to 10 years depending on how they are used. Our application of these capacitors is not especially sensitive to the shelf life issues of these components, so we would expect that they would last 8-10 years or longer in our alarms just sitting on the shelf (no voltage applied during that time).

**Q: What is the dielectric rating of Mallory alarms (Hi-Pot Test)?**

**A:** For the ZT series, these models are approved to UL-508A which includes approval to UL-464 which uses the following Hi-Pot test: 1240 Vac for 60 seconds with the part wrapped in aluminum foil.

The electrical connection for the test is between the termination and the foil.

**Q: Can Mallory alarms be used in intrinsically safe or hazardous area applications (i.e. Class I Div II, etc)?**

**A:** Mallory SCH series of panel mount alarms are approved to Class I Div. II groups A, B, C, &D as well as being NEMA 4X approved. The ZT series is not approved for hazardous locations

**Q: What is the Mean Time Between Failure (MTBF) for Mallory Alarms?**

**A:** MTBF data has only been generated for the SC, SNP, and SBM Series. Historical life test data at maximum temperature and voltage has resulted in the following failure rates for a majority of the models in these series that we sell when calculated per Mil-Handbook-217:

F.R. = 0.08% per 1000 hrs @ 60% confidence level

MTBF = 1,250,000 hrs @ 60% confidence level.

The ZT series is constructed and designed with similar principles to the SC Series, so we would expect similar performance in this series.

**Q: What is the ECCN Number for Mallory Alarms, Buzzers, & Speakers?**

**A:** Mallory Sonalert Products alarms, buzzers, and speakers do not require an ECCN Number. However, if you absolutely need to assign an ECCN Number, use EAR99 (which means that our product is not regulated).

**Q: Are These Products Subject to ITAR?**

**A:** No. Mallory Sonalert's audible and visual products are used in a variety of consumer, industrial, military, and aerospace applications. However, these products do not meet the criteria of a defense

article on the U.S. Munitions List nor do they have the equivalent performance or capabilities of a defense article on the U.S. Munitions List. Therefore, Mallory Sonalert products are not subject to ITAR regulations or restrictions.

**Q: What are the typical failure modes for piezoelectric audible alarms?**

**A:** Customer returns of Mallory audible alarms for failure to operate are very rare. Of the few parts returned each year, the vast majority of the root cause of failure is an over-voltage or voltage spike condition caused by the customer's application. For more details, see Technical Application Guide, "[Typical Failure Modes](#)".

**Q: I need a colder temperature rating. Can you provide one?**

**A:** Contact Mallory to discuss- [info@mallory-sonalert.com](mailto:info@mallory-sonalert.com) (email) or call 317-612-1000

**Q: What environmental tests do your alarms meet?**

**A:** Design Engineering uses a variety of tests during the verification and validation design phases. These tests can include: surge voltage, reverse voltage, hot & cold life tests, room temperature life test, humidity, vibration, shock, salt spray, and terminal strength. The Environmental Tests for each alarm are listed in that alarm's Environmental Durability PDF available on the website.

**Q: Are your alarms fungus resistant?**

**A:** Mallory ZT series alarms are fungus inert and resistant.

**Q: What is the Moisture Sensitivity Level (MSL) of Mallory alarms?**

**A:** MSL 1 (Unlimited)

**Q: Are your parts resistant to formaldehyde?**

**A:** Five samples of our panel mount part SC628R were submerged for 100 hours at room temperature in a 6000 ppm formaldehyde/Water solution. All 5 parts were visually and electrically acceptable after testing. The ZT series has similar construction, so it should be okay after exposure to formaldehyde too.

**Q: I have a special environmental requirement, can Mallory help me?**

**A:** Yes! Use our CONTACT US webpage, email [info@mallory-sonalert.com](mailto:info@mallory-sonalert.com) or call 317-612-1000

## Warranty

The seller warrants the goods to be supplied hereunder will conform to the pertinent specifications, drawings and approved samples, if furnished, and that such goods will be of good materials and workmanship and free of defects if properly installed and used as sold by Seller. If within one-year period from the date of shipment to Purchaser such goods, not having been subject to misuse, alteration, modification, neglect. Improper installation or unauthorized repairs not exposed to an abnormal environment, are shown not to be in conformity or are shown to be defective in workmanship or materials, Seller's sole and exclusive obligation under this warranty is to repair or replace such goods, provided return is made prepaid to Seller or its designated representative with the following tagged information: (i) date of shipment of such goods to Purchaser; (ii) date such goods are determined to be non-conforming or defective; and (iii) specifying the apparent non-conformity or defect. No claim will be allowed under this warranty unless Purchaser notifies Seller of such claim within 30 days after Purchaser learns of facts giving rise to such claim. Purchaser's failure to test, inspect and make claim within such one-year period shall be conclusive evidence that the goods shipped were satisfactory in all respects. The liability of Seller under the forgoing warranty shall not exceed the price charged by Seller for the goods which give rise to the Purchaser's claim. THE AFORESAID WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE), EXCEPT OF TITLE. SELLER ASSUMES NO LIABILITY FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL OR OTHER DAMAGES OF ANY TYPE (INCLUDING, BUT NOT LIMITED TO, DAMAGES RELATED TO LOST SALES AND PROFITS, EXCESSIVE OR INCREASED COSTS AND EXPENSES, FIELD RECALL AND RETROFIT, COSTS AND EXPENSES , DOWNTIME COSTS AND CLAIMS OF CUSTOMERS OR PURCHASER FOR SUCH DAMAGES) RESULTING FROM NON-CONFORMING OR DEFECTIVE CONDITION OF ANY GOODS SOLD BY SELLER TO PURCHASER HEREUNDER, AND PURCHASER ASSUMES ALL LIABILITY FOR ALL CONSEQUENCES ARISING OUT OF ITS USE OR SALES OF SUCH GOODS. THE AFORESAID REMEDY OF PURCHASER IS EXCLUSIVE AND THIS LIMITATION OF LIABILITY PROVISION SHALL APPLY TO ANY AND ALL CLAIMS OR SUITS BASED UPON NEGLIGENCE, BREACH OF CONTRACT, BREACH OF WARRANTY, STRICT LIABILITY, OR ANY OTHER LEGAL THEORY UPON WHICH LIABILITY MAY BE ASSERTED AGAINST SELLER BY PURCHASER OF OTHERS.