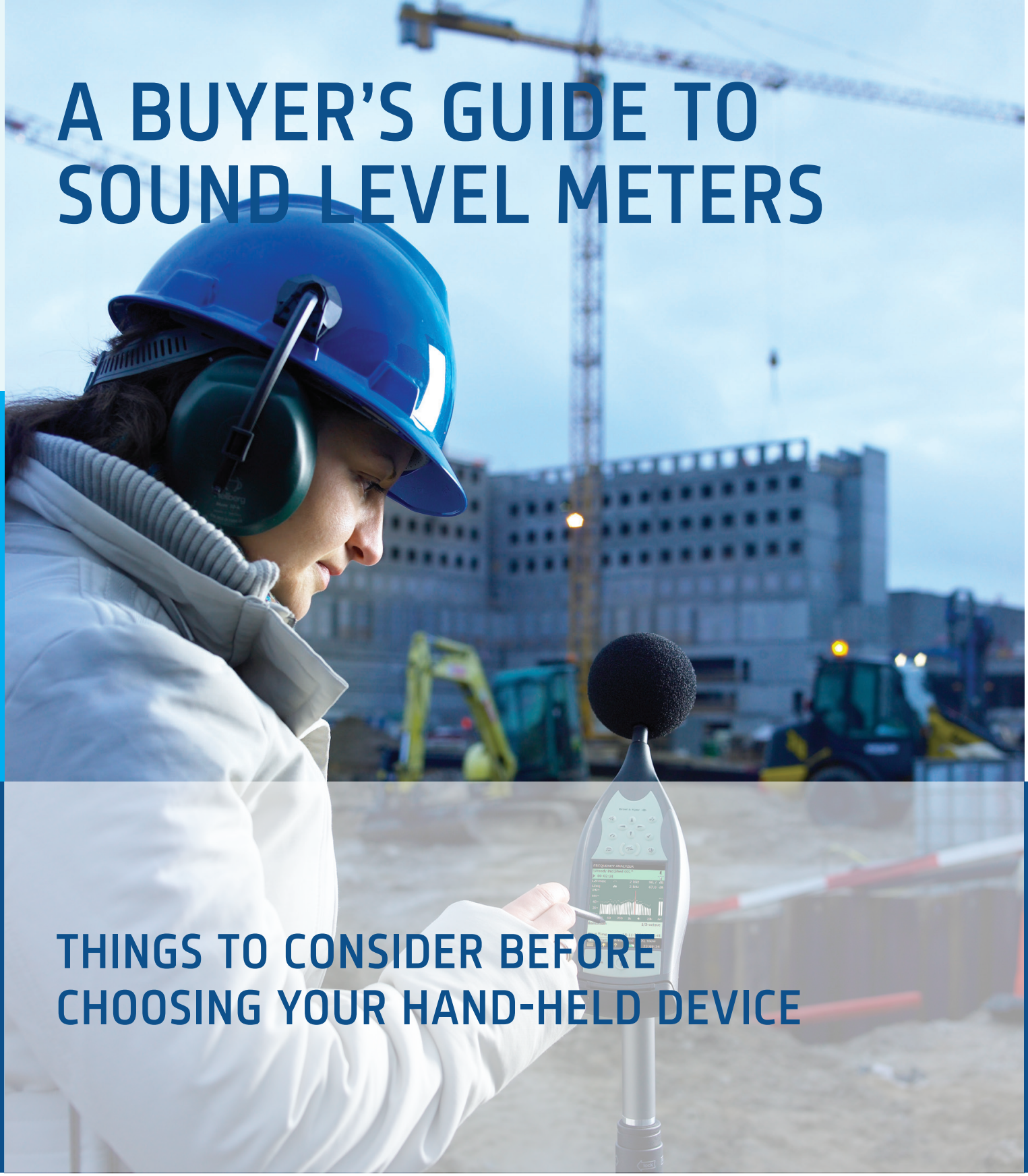
A BUYER'S GUIDE TO SOUND LEVEL METERS



THINGS TO CONSIDER BEFORE CHOOSING YOUR HAND-HELD DEVICE

Brüel & Kjær

BEYOND MEASURE

CONTENTS

BEFORE CHOOSING YOUR HAND-HELD DEVICE

Buying the right SLM to handle your current jobs is easy if you know your needs. However, there are several variables that need to be considered. For example, what is the purpose of your measurements? What type of sound are you measuring? What are the environmental conditions during measurements? Are there standards that need to be considered? In addition, reporting results can be important and done in many ways.

Brüel & Kjær has many years of experience helping all kinds of professionals with their sound measurements. That is why we would like to share some of the most important things for you to consider before deciding which SLM to buy.

How to use this guide

The booklet is divided into several sections, go to the ones that are relevant to you:

1. General
2. Occupational noise
3. Environmental noise
4. Product noise
5. Service, support and calibration

We hope you find this guide useful. Enjoy!

GENERAL

Reading product data sheets, it's easy to drown in technical detail. Modern sound level meters (SLMs) can measure a mind-boggling array of parameters, and often have a long list of software options.

It's important to make sure that the SLM you are buying can measure the parameters you need for your work, and we'll give you some pointers in the following sections. But first, we recommend that you start by considering some more general aspects of SLM design and operation.

Comfort

SLM are portable instruments, and sometimes you will need to measure with the SLM in your hand. Consider whether you can safely hold the SLM in one hand and easily reach the controls with your fingers or thumb. To reduce the impact of reflections from your body, best practice is to hold it with arm extended – if the SLM is too heavy this will become tiring very quickly.

Usability

As well as hand-held measurements, most SLMs are also used mounted on a tripod. To minimize your impact on measurements, it's good practice to stand away from the SLM. The ability to preset measurement duration is very helpful here. Can you easily see the SLM's measurement state from a distance? Alternatively, microphone extension cables and smartphone apps can allow you to keep your distance from the measurement microphone, without losing access to the display and controls.

Readability

Now that you can hold and control your SLM – can you read the levels on the display? Are the important values on the screen large enough? The largest screen isn't always the most readable – have a look at some screenshots to get an idea of how readable the most important information is on-screen. Many measurements are made outdoors, so screen brightness is also important. Is the screen bright enough to read in the midday sun?

Ease of configuration and setup

Most modern SLMs are highly configurable. Before you make any measurements, you'll want to be sure that the SLM is set up to measure the right quantities for the job. Look for a logical setup menu, with descriptive option names and integrated help – all of which will make configuring your SLM easier and less prone to error. The ability to save measurement templates can save a lot of time on site, as well as ensuring consistency when sharing a SLM between users. And of course, it is much easier to set up a SLM when the user interface is available in your local language!

Annotations

Measured levels are just numbers without information describing what was measured and how. Traditionally, SLM operators wrote their observations in a notepad or on a survey sheet and took photographs of the SLM setup and surroundings. With some SLMs, you can attach text or audio notes to measurements. Most recently, it has become possible to add photos, videos, GPS coordinates and more to the measurement data by using an attached smartphone. These features can save work and prevent errors when correlating written notes with measurement data back in the office.

Battery life and storage capacity

Sound measurements can be performed in remote places, or at unusual times of day, when mains power might not be available, and shops might be closed. The last thing you want in these situations is to run out of batteries or measurement storage. Make sure that the SLM's batteries will last long enough for a full working day, and that the SLM can estimate the remaining runtime so you don't get caught out mid-measurement. If you're recording audio with your measurements, you can quickly run out of storage too. Many modern SLMs use removable SD cards for storage giving effectively unlimited storage. For SLMs with internal storage only, it's worth checking that it is enough for your needs.

Accuracy

Small differences in measured sound levels can have a large impact. A difference of just 3 dB represents a doubling or halving of noise exposure in occupational noise, and even smaller differences can cost many thousands of dollars of expensive mitigation measures on a new factory. For this reason, Brüel & Kjær only produces and sells SLMs that meet Class 1 – the highest accuracy class – requirements according to IEC 61672.

Type approval

It's one thing to claim Class 1 performance, but another thing to prove it. In many countries, SLMs used for legally relevant work must be approved by the local type approval authority. To type approve a SLM, these authorities comprehensively test the performance of multiple samples of the unit and essential accessories. Even if your local legislation doesn't require type approval, it is a valuable confirmation that the SLM performance meets the manufacturers' claims.

Some authorities publish lists of approved sound level meters, for example:

› PTB, Germany

› LNE, France

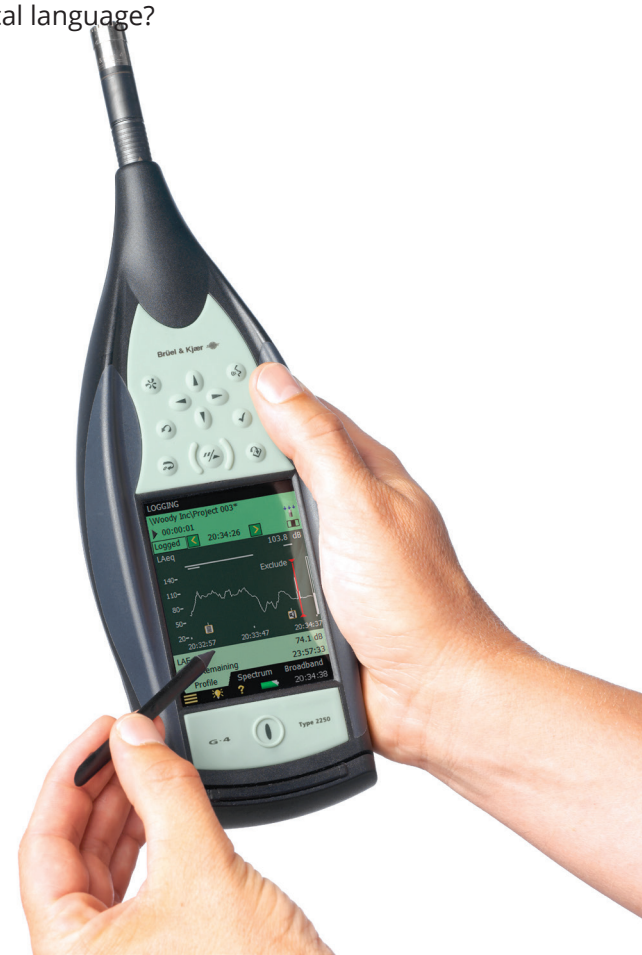
› CEM, Spain

Other considerations

Up until now, we've talked about features that are important when you're making measurements in the field, but the job rarely ends there. Most of the time, measurements will need to be downloaded to a PC for analysis and reporting. We'll talk about specific analysis features in future sections, but there are some general considerations:

- What additional costs are there for PC software?
- How can you connect the SLM to the PC?
- Is the PC software available in your local language?
- Can you easily get measurement data out of the PC software and into your reports?

Finally, regardless of the type of measurement task, it is worth asking suppliers about what service and support is available. Is support available locally, and in your local language?



OCCUPATIONAL NOISE

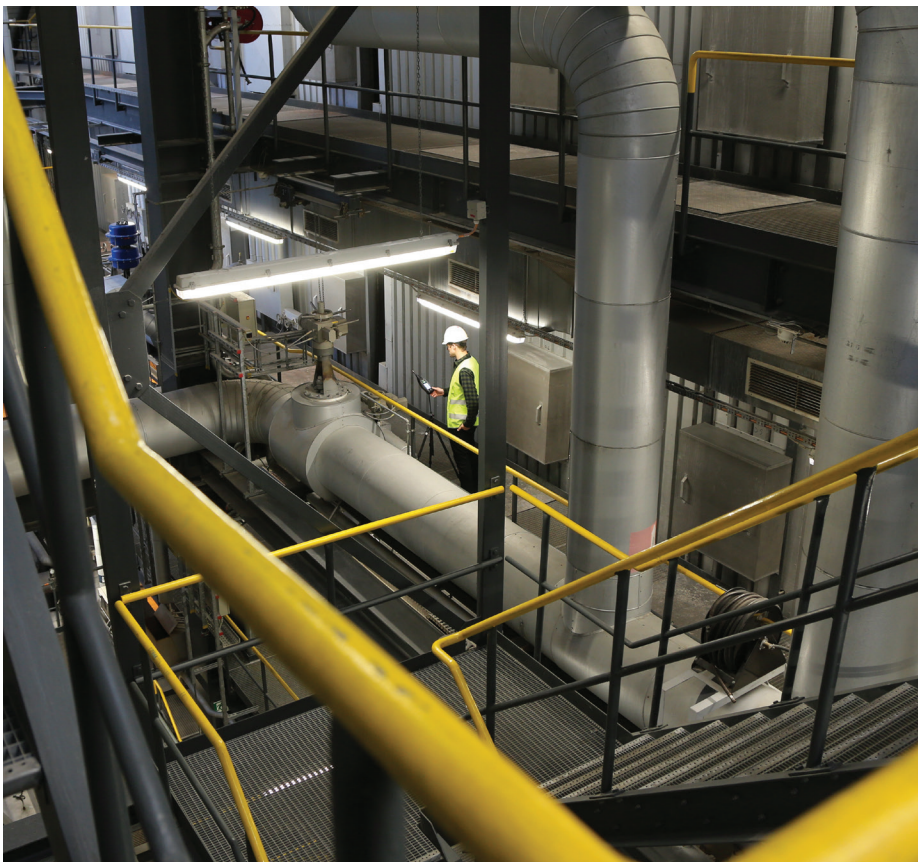
What is occupational noise?

Occupational noise concerns the amount and level of noise people are exposed to in their work environment. Many work environments, such as production areas close to machinery, can have high sound levels, which can lead to noise-induced hearing loss. Occupational noise measurements can be used to quantify the noise exposure of workers, as well as to plan mitigation measures to reduce high noise exposures to safe levels.

Sound level meter vs noise dose meter

Occupational noise is normally measured using either a SLM or a noise dose meter. When using a SLM, measurements are made separately at each working task. By contrast, a noise dose meter is often attached to the worker for an entire working day.

Noise dose meters are particularly useful with highly mobile workers or for those with highly variable work days. But task-based measurements using an SLM give more insight into the make-up of a worker's exposure, allowing you to plan mitigation measures. In some particularly tricky cases, it is best to combine noise dosimetry and SLM measurements.



Ergonomics and environment

Occupational noise measurements are normally made at a location close to the worker's ear during exposure. In many cases, this can be achieved with a SLM mounted on a tripod, but this is not always practical or safe, making hand-held measurements a necessity. In these cases, SLM ergonomics become much more important. Can you maintain a secure grip while operating the controls? Does the SLM have a secure wrist strap? Is it light enough to hold extended for five minutes or more?

Occupational noise measurements can be made in challenging environments – unusually hot or cold, humid or dry. IEC 61672 Class 1 SLMs must meet the specified tolerances in the temperature range from –10°C to +50°C, whereas Class 2 SLMs need only meet the (wider) Class 2 tolerances between 0 and 40°C. Some workplaces are also dusty, and the risk of your equipment getting wet and dirty is much higher than in the office. If you expect to measure in such workplaces, it is worth considering SLMs with ingress protection or IP rating.

Noise dose and maximum peak level

In most countries, you will need to determine two aspects of noise exposure: the total noise dose over a typical working day, and the maximum peak level occurring during the day. Depending on your local regulations, different parameters are used.

In Europe and countries that follow methods based on ISO 9612 or ISO 1999, the noise dose is based on individual measurements using the L_{Aeq} parameter. The C-weighted peak sound pressure level, L_{Cpeak}, is used for measuring the maximum peak levels. In the USA and other countries in the Americas using related methods, a range of different parameters are needed for continuous noise, such as L_{avS4}, L_{avS5} and the TWA. The unweighted peak sound level, L_{Zpeak}, is normally used in the Americas. It is important to make sure that the correct parameters are available for your region. In most cases, it is not possible to 'correct' measurements made with the wrong parameter selection.

Frequency analysis, logging, and reverberation time

Measuring continuous and peak sound levels alone will normally be enough to determine compliance but may not be enough information to plan effective mitigations to reduce noise levels in a workplace. Some useful features for getting a deeper understanding of occupational noise are frequency analysis, logging, and reverberation time measurement.

Many SLM offer frequency analysis at different resolutions, referred to as 1/1- or 1/3 octave-bands. 1/1-octave-bands are commonly used for selecting hearing protection. 1/3-octave-band analysis gives three times the resolution and can be useful for identifying sources of noise as well as designing mitigations like enclosures.

Standard sound level measurements give an overall value for the duration of a given measurement. This is enough for calculating a dose, but it doesn't give any insight into how the sound level changes over time. Logging measurements add this aspect to measurements by dividing them into a series of shorter measurements, typically 1-second long. This can make it easier to separate different sources of exposure, or to remove disturbances from a measurement.

The noise levels inside a workplace are not just a function of the noise sources – the dimensions and materials of the workplace also play a part. Measuring the reverberation time at working positions can help determine if adding sound-absorbing finishes to the workplace will be an effective strategy for reducing levels.

Finally, consider how you will turn your measurements into an assessment and make a report. Some SLM manufacturers offer post-processing software for calculating noise doses, selecting hearing protection, data export and reporting. These tools can save a lot of time and potential errors.

SOME USEFUL FEATURES FOR GETTING A DEEPER UNDERSTANDING OF OCCUPATIONAL NOISE ARE FREQUENCY ANALYSIS, LOGGING, AND REVERBERATION TIME MEASUREMENT

OCCUPATIONAL NOISE MEASUREMENT RECAP

Typical parameters of a hand-held device with basic sound analysis:

- Continuous sound pressure levels (L_{Aeq}, or L_{av} and TWA in the Americas)
- Maximum Peak levels (L_{Cpeak} or L_{Zpeak})
- Back-erase function
  - To remove interruptions during measurement
- Frequency analysis
  - 1/1-octave or 1/3-octave
  - Useful when trying to find the source and discuss actions to reduce noise
  - Helps you choose the right hearing protection
- Logging function
  - See how noise varies over time
  - Makes it possible to exclude interference during measurement
  - Mark good and bad events
- Sound recording
  - Makes it possible to listen to the measurement afterwards
  - With a logging measurement it's easier to mark distractions and events if you can listen to the sound
- Reverberation time
  - Determine the amount of absorption in a room

PC software

- Transfer measurement data from instrument to PC and archive
- Calculate working day exposure and choose hearing protection
- Make extended analysis with markers for events and exclusion of interference
- Play back sound recordings
- Export and report in Word, Excel® and PowerPoint®

Accessories

- Calibrator for regular checks
- Accredited calibration with documentation
- Tripod and microphone holder
- Windscreen to reduce wind noise and protect microphone from dust and damage
- Loudspeaker and amplifier for reverberation time measurements

Are there standards to fulfill?

- How do I perform the measurement?
- Which parameters do I need to measure and report?

ENVIRONMENTAL NOISE

Environmental noise deals with the noise that affects people where they live and sleep, and usually comes from sources such as construction sites, road traffic, industries, airplanes, restaurants and bars, and heating and ventilation equipment like fans and compressors.

Unlike occupational noise, these noise levels are probably not high enough to cause hearing loss but can be very annoying when you're at home or trying to sleep.

Considerations

Environmental noise is normally assessed at the locations where people are affected by the noise, rather than where the noise is produced. This often means measuring in and around residences, where there are many sources of noise, some of which may even be louder than the source you are trying to measure. Features like logging and markers can help you isolate the parts of your measurements that include only the source you are assessing.

Sound can vary not only during different times of the day, or day of the week, but also for longer periods such as weeks, even months, depending of the type of source. For example, road traffic noise is highest during weekday peak hours, when people are travelling to and from work. Airport noise varies depending on when people are flying. These variations mean measurements need to be done with reference to the time aspects as well as keeping control of the source like counting the number of vehicles or airplanes.

Outdoor and indoor measurements

Many environmental noise measurements are made outdoors, where the weather can greatly influence the measurement. A windscreen is essential to minimize the impact of wind-induced noise levels on the measurement, but it is perhaps even more important to be aware of how the weather affects the generation and propagation of environmental noise. Using a weather station to measure weather conditions synchronized with sound levels will give you the information you need to manage the impact of weather on your measurements.

Measurements indoors in housing often mean low levels that can easily

be disturbed, for example, by people in the room, neighbours, noise from other sources, etc. It is, therefore, extremely important to keep track of what's going on inside and outside the building during measurement. In cases with low-frequency noise, frequency analysis is useful to get a picture of the spectrum.

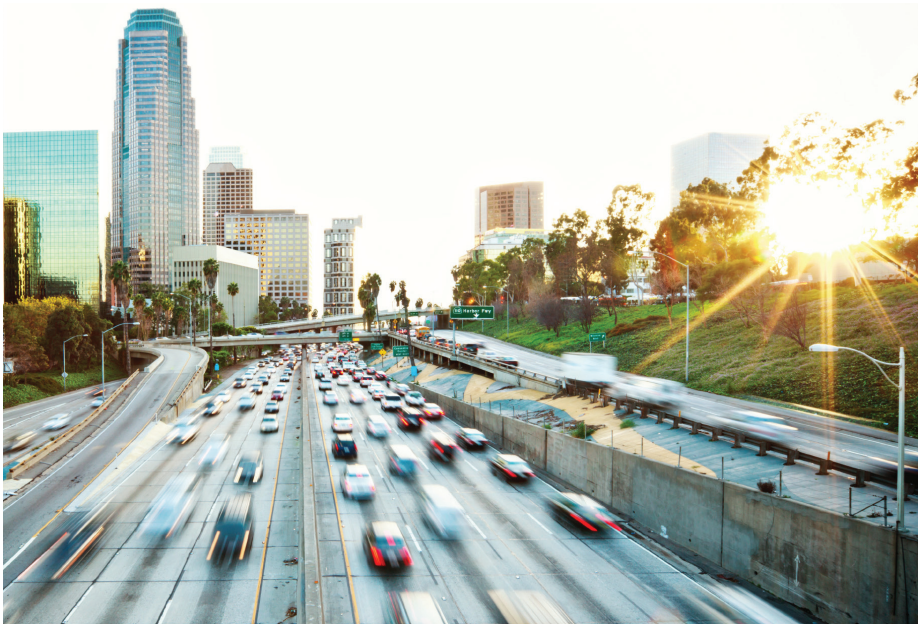
Getting a more detailed picture

The minimum requirement of many environmental noise standards and regulations is only to measure overall or total sound levels over a specified time period, but logging functions are very useful when trying to get a more detailed picture of the noise levels over time. Some SLMs even offer the ability to log multiple time periods simultaneously. This is useful where your standard requires results in hourly intervals, but where shorter logging intervals of say 1-second are more useful for understanding the noise.

Logging functions are particularly helpful for isolating sound sources and excluding disturbances.
When measuring without logging, disturbances can be dealt with by pausing the measurement and back-erasing the last few seconds, which can be quite tricky in practice. With a logging measurement, you can instead mark sections of time on a graphical profile of the sound.

Marking a logging profile is much more flexible and intuitive than pausing and back-erasing. The profile provides a visual aid for identifying the duration of events. Different marking strategies can be used depending on the situation. If you're measuring a fairly continuous source, with intermittent disturbances, placing short exclude markers over the disturbances will most likely be the best strategy. But if your source operates intermittently, or if you need to isolate multiple intermittent sources, it will probably be easier to place markers when the sources are operating.

Another advantage of logging measurements is the ability to add or fine-tune markers on the PC. Making environmental noise measurements can be quite hectic, and accurately marking events in real time can be challenging. Adjusting markers in the office, with a large PC screen and less time pressure, is less stressful. A SLM with a sound recording function will make this even easier, allowing you to replay the audio of events while marking.



Measured parameters and calculations

Environmental noise standards vary widely in the parameters that need to be measured. For most, the A-weighted equivalent continuous level, L_{Aeq} is the primary parameter, but other parameters are used to characterize different aspects of the sound. Statistical levels are used in some standards to separate sources, where, for example, the level exceeded 90% of the time could be used as a measure of the background sound, while the level exceeded only 10% of the time could be used to isolate road traffic noise. Other parameters like the maximum level could also be used to assess the likelihood of sleep disturbance.

Most environmental noise standards also apply adjustments or penalties to noises with particular characteristics, such as tonality and impulsivity. For tonality, many standards describe methods of comparing adjacent 1/3-octave bands to determine the prominence of a tone. FFT-based tonality assessment methods can also be mandated or offered as a more reliable alternative in some standards. Similarly, some standards assess impulsivity with simple difference parameters like L_{AIeq}-L_{Aeq}, but more advanced methods, based on high-speed logging profiles, have started to appear in recent standards such as BS 4142:2014. These calculations can be complex and time-consuming to perform manually, so it is a good idea to check whether the PC software available for the SLM implements the calculations needed for the standards you need to cover.

SOME STANDARDS ASSESS IMPULSIVITY WITH SIMPLE DIFFERENCE PARAMETERS LIKE L_{AIEQ}-L_{AEQ}, BUT MORE ADVANCED METHODS, BASED ON HIGH-SPEED LOGGING PROFILES, HAVE STARTED TO APPEAR IN RECENT STANDARDS.

ENVIRONMENTAL NOISE MEASUREMENT RECAP

Typical parameters of a hand-held device with basic sound analysis:

- o A-weighted equivalent sound pressure level (L_{Aeq})
- o A-weighted statistical levels (for example L_{AF10}, L_{AF90})
- o Difference parameters (for example, L_{Aleq}-L_{Aeq}, L_{Ceq}-L_{Aeq})
- o Back-erase function
  - Deletes interference during measurement
- o Frequency analysis
  - 1/1-octave or 1/3-octave
  - Useful when trying to find the source and discuss actions to reduce noise
- o Logging function
  - See how noise varies over time
  - Makes it easier to exclude interference during measurement
  - Mark events to isolate or remove sounds
- o Sound recording
  - Makes it possible to listen to the measurement afterwards
  - With a logged measurement, it's easier to mark distractions and events if you can listen to the sound
- o Tonal analysis to determine the annoyance of noise

PC software

- o Transfer measurement data from instrument to PC and archive
- o Make extended analysis with markers for events and exclusion of interference
- o Play back recordings
- o Tonal analysis to determine the annoyance of noise
- o Export and report in Word, Excel® and PowerPoint®

Accessories

- o Calibrator for regular checks
- o Accredited calibration with documentation
- o Tripod and microphone holder
- o Microphone extension cable
- o Outdoor microphone with windscreen and rain protection
- o Weather case with batteries
- o Wireless connection of equipment for transmission of measurement data as well as remote control
- o Weather station to measure wind direction, speed and temperature

Are there standards to fulfill?

- o How do I perform the measurement?
- o Which parameters do I need to measure and report?

PRODUCT NOISE

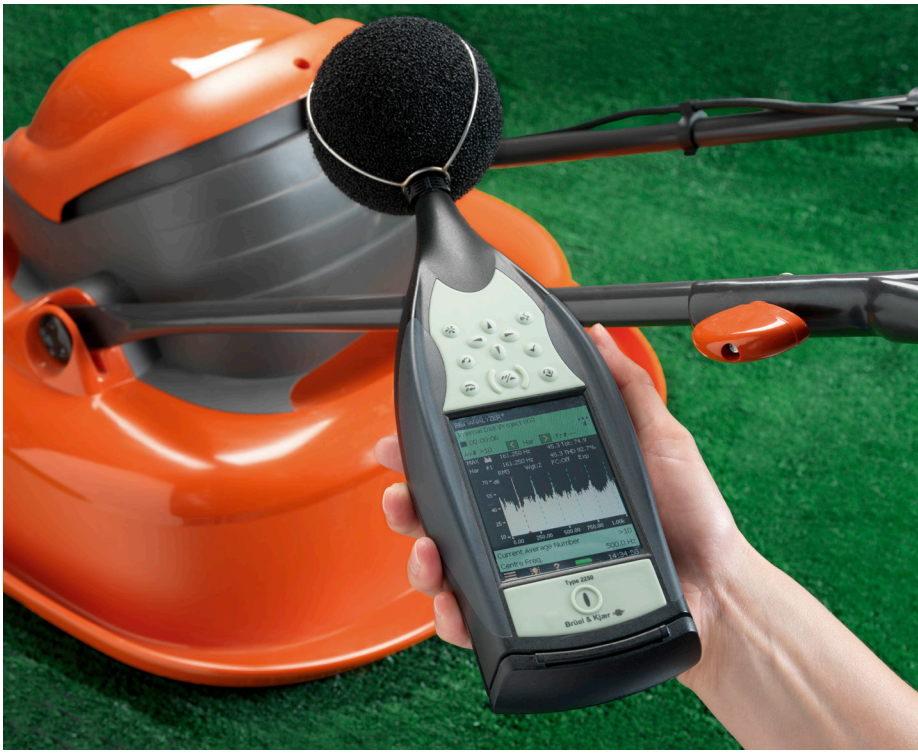
Different products create different sounds. When sound becomes annoying, we call it noise. Noise is not always high level; it can also be very low and unsettling in the wrong situation.

Common reasons for measuring product noise include identifying offending noise to reduce it and improve products, labelling products according to legislative, standard or EU Directive demands, or making quality control noise checks at the end of production lines.

Sound pressure

In some cases, it is enough to simply measure and report sound pressure levels at a set distance from the product, say one metre away from the source, preferably in a free-field environment without reflections from boundaries. However, although an overall sound pressure level measured with A-weighting and C-weighting is often enough, 1/1-octave or 1/3-octave levels can sometimes be necessary.

For example, if noise has a steady, continuous character over time, the equivalent continuous noise level (L_{eq}) is also normally needed. However, for products that make brief, abrupt noises of an impulsive character, you need to measure parameters such as L_{AE} (also known as SEL), L_{max} and L_{peak}.



Sound power and sound intensity

When measuring sound pressure levels from a distance is not adequate, you need to determine the sound power level of a product. The sound power level describes the amount of sound energy a product emits per unit time. Unlike the sound pressure level, the sound power level of a product is independent of the acoustical environment of the product and the distance from which levels were measured. This allows for fair comparison between sources and enables the prediction of sound pressure levels at various distances from the product in different environments.

Sound power measurements are often performed in an acoustic laboratory but can also be made using a two-channel SLM with a sound intensity probe and relevant software. Sound intensity describes the rate of sound energy flowing through a unit area – and unlike sound pressure, it is a vector quantity with both magnitude and direction.

This directionality of a sound intensity measurement makes it feasible to accurately determine the sound power of an object in environments with non-ideal acoustic environments. Diffuse reverberant sound effectively cancels itself out, as it flows in all directions with equal probability. Background noise is also effectively cancelled. By measuring the sound intensity over the surface of a closed volume surrounding the source, any external noise that passes through one surface of the volume with a positive intensity, will also pass through another surface with the opposite sign – provided that the sound was equally present when both surfaces were measured.

> UNLIKE THE SOUND PRESSURE LEVEL, THE SOUND POWER LEVEL OF A PRODUCT IS INDEPENDENT OF THE ACOUSTICAL ENVIRONMENT OF THE PRODUCT AND THE DISTANCE FROM WHICH LEVELS WERE MEASURED.

PRODUCT NOISE MEASUREMENT RECAP

Typical parameters using hand-held device with basic sound analysis

- A- and C-weighted equivalent sound pressure level (L_{Aeq}, L_{Ceq})
- A-weighted max Fast levels (L_{AFmax})
- C-weighted max Peak levels ($L_{Cpeak\ max}$)
- Frequency analysis
  - 1/1-octave or 1/3-octave
  - Useful when discussing actions to reduce noise
- Narrowband analysis (FFT) gives very high resolution in the frequency axis
  - Possible to determine resonances and revolutions
  - Tonal analysis to determine the annoyance of noise
- Logging function to get noise level over time
  - See how noise varies over time
  - Makes it possible to exclude distractions during measurement
- Sound recording
  - To be able to listen to the sound afterwards
  - Recordings can be further analyzed
- Sound intensity (2-channel application)
  - Find the direction of sound
  - Determine the sound power level of the source

PC software

- Extended analysis with markers, exclusion of disorders
- Extended analysis of recordings
- To transfer measurement data and report in Word, Excel® and PowerPoint®

Accessories

- Calibrator for regular check of SLM
- Accredited calibration with documentation
- Tripod
- Microphone extension cable
- Windscreen to reduce wind noise and protect microphone from dust and damage
- Sound intensity probe for sound power determination
- Sound intensity calibrator

Are there standards to fulfill?

- How do I perform the measurement?
- Which parameters do I need to measure and report?

ARCHITECTURAL ACOUSTICS

Architectural acoustics is commonly divided into two fields: room acoustics and building acoustics.

Room acoustics deals with how the dimensions, shape and finishes of a space affect the way sound behaves within it. In contrast, building acoustics deals with how sound travels between spaces, that is, how sound is transmitted through walls, floors, doors and windows, etc. SLMs are commonly used for both types of measurements.

Room acoustics measurements

The most commonly measured room acoustics parameter is the reverberation time, a measure of how long it takes for sound to decay in a space. Two common methods for measuring the reverberation time are the impulsive method, and the interrupted noise method. Each method has its pros and cons, and many SLMs can do both.

In the impulsive method, an impulsive source like a balloon burst or starter pistol is used to excite the room. The SLM measures the room response to the impulse and uses Schroeder backward integration to obtain a decay curve for reverberation time calculation.

The impulsive method using a balloon burst is very convenient for quick, survey quality measurements without the weight and hassle of a loudspeaker and amplifier.

The interrupted noise method uses a loudspeaker and noise generator to excite the room. After the noise inside the room has reached a steady level, the noise generator is turned off and the SLM measures the decay and then calculates the reverberation time. To comply with the requirements of most room acoustics standards, a special omnidirectional loudspeaker is typically used. Interrupted noise measurements are often more repeatable than those using impulsive sources, but the additional equipment can be heavy and difficult to set up.

Building acoustics measurements

Building acoustics measurements can be divided into three different categories: airborne sound insulation, façade sound insulation, and impact sound insulation. The exact procedures for each type of sound insulation measurement vary depending on the particular standard used, but general descriptions are given below.

Airborne sound insulation is concerned with sound transmitted from one room to another, within a building. An omnidirectional sound source is used to build a steady noise level in a source room, and level measurements are made in that room as well as one or more adjacent receiving rooms. Background sound and reverberation time measurements are normally also made in the receiving rooms.

Façade sound insulation deals with sound transmitted from outside a building to a room inside. The process is similar to airborne sound insulation, but in many cases road traffic noise can be used as a source instead of a loudspeaker. However, due to the variability of road traffic noise over time, a two-channel measurement system is needed so that the levels outside and in the receiving room can be measured simultaneously.

Impact sound insulation measurements are used to quantify how impacts on the floor of a room are transmitted into other rooms. Unlike in airborne sound insulation measurements, a standardized tapping machine is used to create the impact sounds in the source room. Because the tapping machine always taps with the same force and frequency, level measurements are only made in the receiving room, but an omnidirectional loudspeaker is still normally used for reverberation time measurements in the receiving room.

While it is possible to make building acoustics measurements with any SLM capable of measuring reverberation times and level measurements in 1/3-octave bands, some manufacturers offer dedicated building acoustics modules that also guide the user in completing sound insulation measurements according to particular standards. As mentioned earlier, these standards all follow a similar process to those described above, but they vary on the details – such as, how many measurements to make in each room, the methods for averaging measurements, and measurement quality requirements. A building acoustics module in your SLM can save a lot of manual work and potential errors.

Accessories

An omnidirectional loudspeaker and amplifier are essential for building acoustics measurements. As well as complying with the relevant standards, there are many important practical issues to consider when purchasing. Ideally, the loudspeaker and amplifier are lightweight for carrying from room to room, robust for use on building sites, and able to output very high noise levels stably at all frequencies, over an extended period of time. A wireless link between your SLM and amplifier will save time and the hassle of running extension cables, particularly when measuring levels in the receiving room.

Just like the loudspeaker and amplifier, a tapping machine will need to be carried from room to room, so you don't want it any heavier than necessary. The ability to operate the tapping machine on battery power can be useful, particularly in unfinished buildings where mains power may not be widely available. A wireless, remote control option is also useful, allowing you to start and stop tapping while in the receiving room.

> A WIRELESS LINK BETWEEN YOUR SLM AND AMPLIFIER WILL SAVE TIME AND THE HASSLE OF RUNNING EXTENSION CABLES

ARCHITECTURAL ACOUSTICS RECAP

Typical equipment used for building acoustics:

- Hand-held SLM with building acoustics application
- Built-in generator for white and pink noise
- Frequency analysis in 1/3-octave, typically 50 Hz to 5 kHz
- Reverberation time to determine the amount of absorption in the receiving room
- Omnidirectional loudspeaker on a tripod
- Amplifier with wireless transmission of noise from generator
- PC software to transfer measurement data, extended analysis and reporting

Accessories

- Calibrator for regular check of SLM
- Accredited calibration including documentation
- Tripod and microphone holder
- Microphone extension cable
- Loudspeaker cable
- Tapping machine for impact noise

SERVICE, SUPPORT AND CALIBRATION

Service

Service covers installation, training, repair of equipment, extended warranty, software and hardware maintenance. Renting equipment when your own equipment has been sent for calibration is another service that can be helpful.

Support

Support can be local or global, depending on your needs. Local support is provided on-site or remotely but in your own language and region. This can include training in how to get the most from your equipment, information on measurement methods or other technical topics. Global support from our support centres is available by phone, e-mail or via tools such as Skype, TeamViewer or WebEx.

Calibration

To make sure that you get accurate measurements, your SLM needs to be checked regularly. A field calibrator should be used daily. In fact, some standards require calibration before and after a series of measurements. This type of verification is typically done at one level and one frequency. More advanced calibrators can handle different frequencies and levels.

To ensure extensive and accurate calibration, both the calibrator and SLM should be sent to an accredited calibration laboratory on a regular basis. Regular calibration ensures high data quality and documentation, minimizes the risk of errors, and reduces associated costs. A calibration contract makes it easy to keep track of when equipment needs to be calibrated.

It is important to remember that most legally relevant measurements require that the SLM has an accredited calibration at least every two years, and the field calibrator at least once a year.

THE SOUND AND VIBRATION SPECIALIST

Founded in 1942, Brüel & Kjær has grown to become the world's leading supplier of advanced technology for measuring and managing the quality of sound and vibration. We use our core competences and comprehensive range of products and solutions to help customers solve sound and vibration challenges. Since the 1950s, our products have set the standard to which others are compared.

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BEYOND MEASURE