I'm not a robot

Dosímetro de ruído

El Dosímetro acústico es un dosímetro destinado a la medición de niveles de ruido, que va acumulando con un contador digital. De esta forma se obtiene el valor de la dosis de ruido en el tiempo considerado. El nivel de ruido tanto en el trabajo, como en la vida cotidiana, puede suponer una agresión física a la integridad de las personas, y en algunos casos producir daños en el sistema auditivo. Para la medición del nivel de ruido, se utiliza un dosímetro acústico. El ruido de cierta intensidad produce múltiples efectos en las personas expuestas al mismo, tales como: disminución de la eficacia en el trabajo, cambios psicológicos, malestar, alteraciones del ritmo cardíaco y la presión sanguínea, alteraciones digestivas, etc. Un efecto auditivo más directo es la interferencia en la comunicación, pero el efecto primario del ruido sobre la audición viene dado por la capacidad que éste tiene para originar sordera; esta peculiaridad es conocida desde hace muchos años, así ya habían sido descritas sorderas en caldereros, trabajadores del textil, etc. Actualmente el problema se ha magnificado porque la industrialización ha traído consigo maquinaria mucho más ruidosa. La unidad utilizada en la medida del sonido es el decibelio dB, es decir la décima parte del belio. El belio en el caso del sonido, se define como el logaritmo base 10 del cociente entre el valor del sonido medido, y el valor de sonido de referencia, ambos expresados en las mismas unidades. El sonido de referencia, es el mínimo sonido audible, y corresponde a una presión sonora ejercida sobre el tímpano del oído humano, de 20 micropascales. El oído humano tiene una respuesta logarítmica, pero no lineal al sonido recibido. Por ello, se ajusta la curva lo máximo posible a la sensibilidad del oído humano. El valor de la medida del sonido ajustado a esta curva de respuesta, que es la más utilizada, viene expresado en dB(A). El dosímetro acústico como su nombre indica, mide la dosificación de ruido, que una persona recibe durante un periodo de tiempo determinado. Por lo tanto, las unidades de medida utilizadas, no se corresponden a medidas instantáneas. Los valores tipo contemplados en las normativas corresponden a periodos de un día, o una semana, y al valor pico de las mediciones del periodo. Los dosímetros acústicos tienen la función de medir el ruido, y la mayor parte de los equipos incorpora un calibrador acústico, para recalibrar el equipo según la normativa vigente. Estos equipos de medición incorporan un micrófono exterior, una pantalla LCD, y un circuito electrónico que contiene un integrador y una memoria, que permite efectuar los cálculos, y almacenar toda la información necesaria previamente programada. Los datos almacenados, corresponden a los suministrados por un decibelímetro, estos datos, tomados durante periodos de tiempo establecidos, son utilizados por el integrador del equipo para calcular los valores diarios, o semanales, y el valor pico del periodo elegido. Si el ruido a estudiar se genera a intervalos, el dosímetro calcula su energía media, y halla su valor equivalente energético, es decir el que corresponde a un sonido continuo, de la misma energía durante ese mismo periodo. También incorpora una salida para datos, que puede ser tipo RS232, o USB, que permite efectuar el análisis adecuado en un ordenador, utilizando el software suministrado por el fabricante. Sólo queda encender el equipo, y seguir las instrucciones dadas por el fabricante para su instalación, así como la normativa específica de cada país. O Dosímetro de Ruído é um aparelho portátil de uso pessoal que possibilita a mensuração dos níveis de pressão sonora na unidade decibéis (dB) em função do tempo de exposição à fonte. De acordo a Norma de Higiene Ocupacional nº 01 (NHO 01) da Fundacentro, o Dosímetro de Ruído significa um medidor integrador de uso pessoal que fornece a dose da exposição ocupacional ao ruído. O Dosímetro de Ruído é bastante utilizado na elaboração do PPRA, PCMAT, PGR, LTCAT, entre outros. Para que serve Dosímetro de Ruído O Dosímetro de Ruído serve para avaliar a exposição do trabalhador ao ruído ocupacional, com o propósito de dimensionar a exposição e estabelecer medidas de controle, contribuindo para a prevenção dos acidentes e das doenças ocupacionais. Além disso, o Dosímetro de Ruído tem como objetivo a observância dos critérios e procedimentos de avaliação ocupacional ao ruído, previstos na NHO 01 da Fundacentro. Entre o disposto na NHO 01, temos o tempo máximo diário de exposição permissível em função do nível de ruído: Fonte: NHO 01 da Fundacentro (2001) – Fragmento. A NHO 01 estabelece o limite de exposição ocupacional diária ao ruído igual a 85 dB(A) para uma jornada de trabalho de 8 horas diárias. Por fim, o Dosímetro de Ruído é também utilizado na caracterização das atividades ou operações insalubres, conforme disposto no Anexo I (Limites de tolerância para ruído contínuo ou intermitente) da Norma Regulamentadora nº 15 (NR-15). Fonte: Anexo I da NR-15. De acordo a NR-15, não é permitido a exposição ocupacional a níveis de ruído acima de 115 dB(A) a indivíduos que não estejam adequadamente protegidos. No critério de avaliação da exposição ocupacional ao ruído, a NHO 01 considera o incremento de duplicação de dose (q) igual a 3, enquanto a NR-15 utiliza o incremento de duplicação de dose (q) igual a 5. Portanto, os resultados adquiridos através do disposto na NHO 01 podem diferir dos obtidos mediante o estabelecido no Anexo I da NR-15. Por isso, é importante destacar que a NHO 01 consiste em estabelecer as metodologias e os procedimentos de avaliação da exposição ocupacional ao ruído, porém deve se considerar os limites de tolerância estabelecidos pelo Anexo I da NR-15, especialmente, para fins trabalhistas e previdenciários. Atualmente, os Dosímetros de Ruído fornecem inúmeros dados referentes a avaliação da exposição ocupacional ao ruído, com o intuito de atender as diferentes normas e legislações adotadas nos países. Como utilizar o Dosímetro de Ruído No geral, o Dosímetro de Ruído é um equipamento portátil de fácil condução e deve ser fixado ao trabalhador durante o período de medição da exposição ocupacional ao ruído, com o receptor (microfone) posicionado sobre o ombro, preso na vestimenta e dentro da zona auditiva do trabalhador (região delimitada por um raio de 5 a 15 cm, medido a partir da entrada do canal auditivo). A maioria dos fabricantes de Dosímetro de Ruído recomendam o posicionamento do receptor (microfone) no meio da parte superior do ombro e do lado exposto ao maior nível de ruído. Além disso, é importante destacar mais algumas dicas ao usar o Dosímetro de Ruído, tais como: O uso da espuma protetora de vento sobre o microfone, com o propósito de impossibilitar eventuais interferências da velocidade do ar e proteger o microfone contra poeira, umidade ou calor excessivo; Os procedimentos de avaliação da exposição do trabalhador ao ruído não devem interferir nas características da condição de trabalho em estudo, devendo manter o ambiente e a rotina habitual do trabalhador; Instruir o trabalhador que o microfone do Dosímetro de ruído não pode ser retirado, movido e/ou obstruído, a fim de evitar o comprometimento na obtenção dos dados representativos da exposição diária do trabalhador ao ruído; Posicionar e fixar qualquer excesso do cabo de extensão do microfone, visando evitar alguma dificuldade ou inconveniente ao trabalhador, quando viável, acomodar o cabo do microfone sob a camisa ou farda. Entretanto, vale ressaltar, que existem também modelos de dosímetros de ruído com o receptor (microfone) acoplado diretamente ao aparelho, ou seja, sem o cabo de extensão do microfone. Calibração do Dosímetro de Ruído As medições de exposição ocupacional ao ruído devem ser realizadas após a calibração do Dosímetro de ruído, através da utilização do Calibrador acústico. Em relação ao tema, a NHO 01 da Fundacentro dispõe que: “Os calibradores, preferencialmente, devem ser da mesma marca que o medidor e, obrigatoriamente, permitir o adequado acoplamento entre o microfone e o calibrador, diretamente ou por meio do uso de adaptador.” Com o intuito de garantir a precisão das avaliações ocupacionais ao ruído, os medidores de pressão sonora e os calibradores devem ser periodicamente aferidos e certificados pelo fabricante, assistência técnica autorizada ou laboratórios credenciados a Rede Brasileira de Calibração – RBC ou Instituto Nacional de Metrologia, Qualidade e Tecnologia – INMETRO, sendo renovado, no mínimo, a cada dois anos (NBR 10151). Quanto custa um Dosímetro de Ruído Como já era de se imaginar, não existe um valor fixo para o Dosímetro de ruído, pois varia conforme a marca, o modelo e as características técnicas do equipamento. No entanto, mediante uma breve pesquisa na internet, constata-se que o preço do Dosímetro de ruído, normalmente, encontra-se entre R$ 1.790,00 a R$ 4.990,00. Por fim, este texto não tem o intuito de recomendar qual o melhor Dosímetro de ruído ou onde comprar um Dosímetro de ruído, mas você pode encontrar facilmente alguns modelos pela internet, seja para apenas conferir ou até mesmo comprar, por exemplo, os sites Americanas, Submarino e Shoptime, bem como, os sites das próprias marcas fabricantes. Download Premium WordPress Themes FreeDownload WordPress ThemesPremium WordPress Themes DownloadDownload Nulled WordPress Themeslynda course free downloadDownload Best WordPress Themes Free Downloadlynda course free download Back to top Measuring noise levels and workers' noise exposures is the most important part of a workplace hearing conservation and noise control program. It helps identify work locations where there are noise problems, employees who may be exposed to noise levels that can cause hearing loss, and where additional noise measurements need to be made. This information also helps determine appropriate noise control measures that need to be put in place. Back to top For occupational hygiene purposes, the sound pressure level is measured to determine noise exposures. Various instruments and techniques may be used. The choice depends on the workplace noise and the information needed. However, the first step is to determine if there is a noise problem in the workplace.This document briefly outlines the steps involved in the noise measurement. For details, you should consult the current version of the Canadian Standard CSA Z107.56-18 (R2022) or the standard that applies in your jurisdiction. Back to top The first step is to determine whether or not noise is a potential problem in your workplace. A walk-through survey is recommended. The indicators of potentially hazardous noise level include:Noise is louder than busy city traffic.People have to raise their voice to talk to someone at one metre (3 feet) away.At the end of work shift people have to increase the volume of their radio or TV to a level too loud for others.After working for a few years at that workplace, employees find it difficult to communicate in a crowd or party situation where there are other sounds or many voices.People hear a ringing or humming noise when they leave work.Noise measurement data from studies in similar situations are very helpful in assessing the potential noise problem. Back to top Before taking field measurements, it is important to determine the type of information required. The person making the measurement must understand:The purpose of measurement: compliance with noise regulations, hearing loss prevention, noise control, community annoyance etc.The sources of noise, and times when the sources are operating.The temporal pattern of noise - continuous, variable, intermittent, impulse.Locations of exposed persons.Conditions during both a typical and atypical shift (noise sources, activities, shift length, etc.)The initial measurements are noise surveys to determine if:Noise problem exists.Further measurements are needed.The second step is to determine personal noise exposure levels; that is, the amount of noise to which individual employees are exposed. If the workplace noise remains steady, workers are stationary throughout the shift, and measurements are representative of a typical day, the noise survey data can be used to determine if there is a potential exposure to harmful noise levels and if additional measurements are required. However, noise dosimetry (such as personal noise exposure measurements) is necessary if the workplace noise levels vary throughout the day or if the workers are fairly mobile. Back to top The most common instruments used for measuring noise are the sound level meter (SLM), the integrating sound level meter (ISLM), and the noise dosimeter. It is important that you understand the calibration, operation and reading the instrument you use. The user's manual provided by the instrument manufacturer provides most of this information. Table 1 provides some instrument selection guidelines.Table 1Guidelines for Instrument SelectionType of MeasurementAppropriate Instruments (in order of preference)ResultCommentsPersonal noise exposure1) DosimeterDose or equivalent sound levelMost accurate for personal noise exposures, and is worn by the worker.2) ISLM*Equivalent sound levelIf the worker is mobile, it may be difficult to determine a personal exposure, unless work can be easily divided into defined activities.3) SLM**dBAIf noise levels vary considerably, it is difficult to determine average exposure. Only useful when work can be easily divided into defined activities and noise levels are relatively stable all the time.Noise levels generated by a particular source1) SLMdBAMeasurement should be taken 1 to 3 metres from source (not directly at the source).2) ISLMEquivalent sound level dBAParticularly useful if noise is highly variable; it can measure equivalent sound level over a short period of time (1 minute).Noise survey1) SLMdBATo produce noise map of an area; take measurements on a grid pattern.2) ISLMEquivalent sound level dBAFor highly variable noise.Impulse noise1) Impulse SLMPeak pressure dBATo measure the peak of each impulse.* ISLM stands for Integrating Sound Level Meter** SLM stands for Sound Level Meter Back to top The SLM consists of a microphone, electronic circuits and a readout display. The microphone detects the small air pressure variations associated with sound and changes them into electrical signals. These signals are then processed by the electronic circuitry of the instrument. The readout displays the sound level in decibels. The SLM takes the sound pressure level at one instant in a particular location.To take measurements, the SLM is held at arm's length at the ear height for those exposed to the noise. With most SLMs it does not matter exactly how the microphone is pointed at the noise source. The instrument's instruction manual explains how to hold the microphone. The SLM must be calibrated before and after each use. The manual also gives the calibration procedure.With most SLMs, the readings can be taken on either SLOW or FAST response. The response rate is the time period over which the instrument averages the sound level before displaying it on the readout. Workplace noise level measurements should be taken on SLOW response.A Type 2 SLM is sufficiently accurate for industrial field evaluations. The more accurate and much more expensive Type 1 SLMs are primarily used in engineering, laboratory and research work. Any SLM that is less accurate than a Type 2 should not be used for workplace noise measurement.An A-weighting filter is generally built into all SLMs and can be switched ON or OFF. Some Type 2 SLMs provide measurements only in dBA, meaning that the A-weighting filter is ON permanently (see the OSH Answers on Noise - Basic Information for more about A-weighted decibels dBA).A standard SLM takes only instantaneous noise measurements. This is sufficient in workplaces with continuous noise levels. But in workplaces with impulse, intermittent or variable noise levels, the SLM makes it difficult to determine a person's average exposure to noise over a work shift. One solution in such workplaces is a noise dosimeter. Back to top The integrating sound level meter (ISLM) is similar to the dosimeter. It determines equivalent sound levels over a measurement period. The major difference is that an ISLM does not provide personal exposures because it is hand-held like the SLM, and not worn.The ISLM determines equivalent sound levels at a particular location. It yields a single reading of a given noise, even if the actual sound level of the noise changes continually. It uses a pre-programmed exchange rate, with a time constant that is equivalent to the SLOW setting on the SLM. Back to top A noise dosimeter is a small, light device that is worn by the worker with the microphone positioned above the outside edge of the wearer’s shoulder, close to their ear. The dosimeter stores the noise level information and carries out an averaging process. It is useful in industry where noise usually varies in duration and intensity, and where the person changes locations.A noise dosimeter requires the following settings:(a) Criterion Level: exposure limit for 8 hours per day five days per week. The criterion level is 85 dBA for all jurisdictions, except where it is 87 dBA for Canadian federal jurisdictions. Find out more about the exposure levels in the OSH Answers document Noise - Occupational Exposure Limits in Canada.(b) Exchange rate: 3 dB or as specified in the noise regulation.(c) Threshold: noise level limit below which the dosimeter does not accumulate noise dose data.Wearing the dosimeter over a complete work shift gives the average noise exposure or noise dose for that person. This is usually expressed as a noise exposure level, Lex,T. This logarithm which takes into account the exposure and the actual time worked. In the past, it was often expressed as a percentage of the maximum permitted exposure. If a person has received a noise dose of 100% over a work shift, this means that the average noise exposure is at the maximum permitted. For example, with a criterion level of 90 dBA and an exchange rate of 3 dBA, an eight-hour exposure to 90 dBA gives a 100% dose. A four-hour exposure to 93 dBA is also a 100% dose, whereas an eight-hour exposure to 93 dBA is a noise dose of 200%.Usually, the manufacturer electronically adjusts dosimeters to the criterion level and exchange rate in use. You may have to adjust them to suit the exposure guidelines/standards in force in your jurisdiction.Dosimeters also give an equivalent sound or noise level. This reading is the average exposure level for noise over the time the dosimeter was on. It has the same total sound energy as the actual, variable sound levels to which a person is exposed over the same time period. Scientific evidence suggests that hearing loss is affected by the total noise energy exposure. If a person is exposed over an eight-hour work shift to varying noise levels, it is possible to calculate an equivalent sound level which would equal the same total sound energy exposure. This would have the same effect on the person's hearing as the variable exposure actually received (Figure 1).Figure 1In Figure 1, the shaded area under the line that shows how the sound level changes over time (the "curve") represents the total sound exposure over eight hours. Back to top When air blows by the microphone, the noise reading is altered. To avoid the effect of wind, one uses a windshield or windscreen to cover the microphone in areas with considerable air movement. Windshields or screens are available from manufacturers of sound level meters. Back to top Before taking any field measurements, it is important to determine the type of information required. Do the workplace noise levels vary throughout the day? Are the workers fairly mobile? Do workers operate different equipment?In a bottle washing and filling facility in Ontario, for example, the noise levels vary over the work shift. Instantaneous noise measurements, taken with an SLM (Type 2, SLOW RESPONSE, A-filter) at one person's work station, ranged from 63 dBA to 114 dBA over the day, although levels most commonly ranged from 90 to 96 dBA and 104 to 107 dBA. This information strongly suggested that there was a potential for excessive noise exposure.The worker was asked to wear a noise dosimeter over a full eight-hour work shift. At the end of the shift, the noise dosimeter indicated a 270% dose. This was a substantial exposure. In addition, the dosimeter provided an equivalent noise level of 97 dBA. In other words, a constant eight-hour exposure to a steady, continuous noise of 97 dBA would have resulted in the same exposure.An ISLM could also have been used in this example, particularly if the worker spent most of the work shift in a defined location, or the first half of the shift in one area and the remainder in another area. The ISLM could have provided equivalent sound level measurements and a fairly accurate exposure assessment. Back to top Measurements of impulse or impact noise depend on the guidelines and standards in force. Before you measure impact or impulse noise, you must ensure that the equipment has the capacity to measure this kind of noise. Normally measurements of either peak noise levels together with the actual number of peaks, or percentage dose or equivalent sound levels are required. Where there is little background noise, as for example on an outdoor rifle range, the measuring of peak pressures may be most appropriate.In industrial settings, there is usually considerable background noise in addition to the impulse noise. In such cases, provided that a 3 dB(A) exchange rate is used, dosimeters or ISLMs which are sufficiently sensitive to respond well to peaks may be more appropriate. One can account for all of the noise, continuous and impulse, in the one measurement. Back to top Frequency analysis is measuring noise level at each frequency or pitch. Frequency analysis is not required when the purpose of noise measurement is to assess compliance with regulatory exposure limits or to assess risk of hearing loss. For such purposes the A-weighted noise level in dBA, percent noise dose or time-weighted average (TWA) equivalent sound level is sufficient. The frequency analysis is usually needed only for the selection of appropriate engineering control methods.Sometimes it is necessary to determine the actual frequency distribution of the noise. A detailed frequency analysis is called narrow band analysis. In this method the entire audible frequency range is divided into frequency windows of fixed width of a few hertz and noise level is measured in dB units at each of these frequency windows. Narrow band analysis is normally not needed for workplace noise. Such analysis is used for engineering measurements. For workplace noise we need octave band analysis.Octave bands are identified by their centre frequency. The band width increases as the centre frequency increases. The audible sound frequency range (approximately 20 to 20,000 Hz) has been divided into 11 octave bands for this purpose. An octave band filter set can be attached to an SLM to measure the sound level in each octave band. Back to top Sometimes it is necessary to determine whether or not the background noise is influencing the total noise level measured when the noise source is "on". In such cases, two readings of noise level are taken - one with the noise source "on" and the other with the noise source "off". The following table can be used to determine noise level due to the noise source. For example if the total noise level is 97 dB and the background noise is 90 dB, the noise due to source is 96 dB (97-1). If the difference is more than 10 dB, no correction is needed.Table 2Background Noise Level CorrectionTOTAL NOISE LEVEL(dB) minus BACKGROUND NOISE LEVEL (dB) dBVALUE TO SUBTRACT FROM TOTAL NOISE LEVEL TO GET NOISE DUE TO THE SOURCE8 - 100.56 - 814.5 - 61.54 - 4.523.52.533 Back to top A noise survey takes noise measurements throughout an entire plant or section to identify noisy areas. Noise surveys provide very useful information which enables us to identify:Areas where employees are likely to be exposed to harmful levels of noise and personal dosimetry may be needed.Machines and equipment which generate harmful levels of noise.Employees who might be exposed to unacceptable noise levels.Noise control options to reduce noise exposure.Variability in noise levels during different operating conditionsImpact on noise level from modifications or changes in operations A noise surveyis usually done with a sound level meter (SLM). A reasonably accurate sketch showing the locations of workers and noisy machines is drawn. Noise level measurements are taken at a suitable number of positions around the area and are marked on the sketch. The more measurements taken, the more accurate the survey is. A noise map can be produced by drawing lines on the sketch between points of equal sound level. Noise survey maps, like that in Figure 2, provide very useful information by clearly identifying areas where there are noise hazards.Figure 2The SLM must be calibrated before and after each use. The manual gives the calibration procedure. To take measurements, the SLM is held at arm's length at the ear height for those exposed to the noise.When the purpose of noise measurement is to assess the risk of hearing loss, the microphone position should be as close as possible to the location of the ears of the employee for whose benefit the noise exposure data are being taken. Shielding by the presence of employees and other objects between the noise source and microphone should be avoided. The employee need not be present during the measurement. For a stationary employee, the microphone should be positioned within 0.5 metres of the employee's shoulder height. If the employee works in a standing position, the microphone should be positioned preferably 1.5 metres above the floor. If the employee works in a sitting position, the microphone should be positioned at 1.1 metres above the floor.A standard SLM takes only instantaneous noise measurements. This measurement is sufficient in workplaces with continuous noise levels. But in workplaces with impulse, intermittent or variable noise levels, the SLM makes it difficult to determine a person's average exposure to noise over a work shift. One solution in such workplaces is a noise dosimeter. Back to top The need for measuring the employees' noise exposure arises when a noise survey indicates the possibility that the employees may be exposed to noise exceeding the noise exposure limits set by noise regulations or the limits set by the company. Personal noise exposure of employees is measured using a noise dosimeter.The dosimeter is worn by the employee during the entire or part of the shift. The employee does not need to be followed by the person responsible for taking the noise measurements during the entire measurement period. However, the worker should keep a log detailing tasks performed, areas visited, and any other important information that can help with understanding results, especially if noise levels are high. Any unwitnessed peaks in noise levels (if a logging dosimeter is used) should also be investigated. The reliability of the noise data will depend on the employee's cooperation in the proper use of the dosimeter. The following are some helpful tips to ensure the employee's cooperation in noise dosimetry.Inform the employees about the purpose of measurement.Explain the importance of the accuracy of noise data in assessing the need for noise control.Emphasize the importance of wearing it all the time during the measurement period.Explain the consequences of tampering with the microphone - shouting in it, using it to knock on doors, etc.Reassure the employee that the device records sound levels only, not actual words or conversations.Usually, the manufacturer electronically adjusts dosimeters to the criterion level and exchange rate in use. You may have to adjust them to suit the exposure guidelines/standards in force in your jurisdiction. The manufacturer’s instructions for proper use must be followed. The dosimeter is to be calibrated before and after each measurement. If, after the measurement, calibration is off by more than 0.5 dB, resampling may be needed as the results may not be accurate.The start and stop times of the dosimeters must be noted. It is also important to talk with the worker and supervisor to ensure conditions during the day of sampling are typical of a normal shift. If conditions are not typical, this variation should be noted and resampling may be required. Back to top The integrating sound level meter (ISLM) can be used to measure equivalent noise level averaged over the measurement period which could be several minutes, a few hours or an entire work shift. In this respect it is similar to a dosimeter used as area monitor. An ISLM does not provide personal exposure level because it is not worn on person. It gives equivalent sound levels at a particular location. The ISLM uses a pre-programmed exchange rate, with a time constant that is equivalent to the SLOW setting on the SLM. Fact sheet last revised: 2025-04-15