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Noise Terms and Equations Glossary

Sound Pressure (L_{AF})

This is the instantaneous sound level with a specified frequency weighting and time weighting that shows the current level of the sound being measured, it is written as L_{AF} sometimes referred to as the SPL.

Frequency weightings (A, C and Z)

These are the standardised frequency response shapes as defined by international noise standards. They are designed to replicate aspects of the human ears frequency response to different noise sources. Standard frequency weightings are 'A' (most generally specified), 'C' (used for higher noise levels), 'Z' or Lin scale (the un-weighted or "true" frequency content).

Time weightings (F,S and I)

These are the internationally standardised responses in a sound level meter to the time variation of the noise standard time weightings are Slow (1 second), Fast (125 msec), Impulse (35/1500 msec) and Peak (less than 100 microsec).

Maximum noise level (L_{AFmx}, L_{ASsmx}, L_{AImx} , L_{max})

This is the highest instantaneous sound pressure level in decibels with a specified frequency weighting and time weighting, expressed as LAfmx and sometimes referred to as the Lmax.

Minimum noise level (L_{AFmx}, L_{ASsmx}, L_{AImx} , L_{max})

This is the lowest instantaneous sound pressure level in decibels with a specified frequency weighting and time weighting expressed as L_{Asmn} sometimes referred to as the L_{min}.

Average noise level (L_{Aeq}, L_{eq})

This is the energy average noise level considered as a notional steady level that contains the same amount of noise as the actual fluctuating noise level during a specified period of time (based on equal energy principal) expressed as L_{Aeq} sometimes referred to as the L_{eq}.

Percentage noise dose

This is the noise exposure result compared to a notional allowable daily amount expressed as a percentage of that amount of noise for a standard 8 hours expressed as 100%, 200% etc for a 90 dB criterion level with 8 hr duration. 200% represents twice the allowable noise exposure.

Projected percentage noise dose

This is the result of an actual measurement being forward projected for exactly 8 hours and then recalculating the noise dose assuming the noise remains the same expressed as Pdose% or Proj % always referred to an 8-hour projection.

Peak noise level (L_{Cpk}, L_{Peak}, L_{Zpk}, L_{Apk})

This is the absolute highest sound pressure in Pascals or the absolute highest noise level in dB over a given period of time with no frequency weighting (or the C or A frequency weighting) and no time weighting expressed as L_{Cpk} and is sometimes written as Peak or L_{peak}.

Sound exposure (Pa^2h)

This is the amount of noise energy in absolute terms collected during the measurement. It is not a level referred to a reference value, but an absolute value based on the sound pressure and the amount of time expressed in Pa^2sec sometimes written in Pa^2h.

Sound exposure level (L_{AE}, SEL)

This is the total amount of noise in decibels referenced to a standard period of 1 second, it is like the whole average noise level (Leq) shrunk down to just a single second duration expressed as L_{AE} sometimes written as SEL.

$L_{EP,d}$, $L_{EX,T}$, [L_{Aeq}, (8h)]

This is the daily personal noise exposure level in decibels. It is effectively the L_{eq} of the whole days noise exposure (for say 7h 15m) expressed as if it had been over a standard 8 hours, specified in the European Noise at Work Regulations. The daily personal noise exposure level normalised to an eight hour reference period. The $L_{EP,d}$ can be evaluated from:-

$$L_{EP,d} = 10\log_{10}\left\{\frac{1}{T_0}\int_0^{T_e}\left[\frac{p_A(t)}{p_0}\right]^2 dt\right\}$$

Where:

T_0 = 8 hours;
T_e = the duration of the person's personal exposure to sound;
P_0 = 20uPa;
$P_A(t)$ = the time varying value of A-weighted instantaneous sound pressure in pascals;-

$$L_{EP,d} = 10\log\frac{1}{8}\left[\left(10^{\frac{L_{p1}}{10}}\times t_1\right)+\left(10^{\frac{L_{p2}}{10}}\times t_2\right)+\ldots\ldots\ldots+\left(10^{\frac{L_{pn}}{10}}\times t_n\right)\right]$$

Where:-

t_n = duration of exposure to noise level SPLn (dB(A))

For reference $L_{EX,8h}$ is given by:

$$L_{EX,8h} = 10\log_{10}\left\{\frac{1}{T_e}\int_0^{T_e}\left[\frac{p_A(t)}{p_0}\right]^2 dt\right\} + 10\log_{10}\frac{T_e}{T_0}$$

Time weighted average - TWA

This is the American way of expressing the whole days noise dose for a standard time of 8 hours it is based on the US method of collecting noise data (OSHA) which is different from the European method. The allowable level is also 90 dB for 8 hours.

Impulse weighted noise average level

This is similar to the true Leq except the Impulse time weighting is used to give more prominence to any noise of an impulsive nature it will give a higher result than the L_{eq} depending on the impulsivity of the noise climate the difference between L_{eqI} and L_{eq} can be used as a measure of the impulsivity.

Percentile exceedance level

This is the notional noise level in dB that was exceeded for n% of the measurement duration that is, for n% of the time the noise level was above this value expressed as LAF10% sometimes written as $L_{AF10\%}$ used to describe the variation in the noise climate.

Threshold level

This is the level in dB below which any noise will not be included in the calculation of the average value for dosimeter measurement is usually set at a value between 70 to 90 dB can be set in 1 dB steps in an instrument.

Criterion level

This is the noise level in dB which is used as the reference point for the dose calculations. It is the level that represents 100% of the total daily noise exposure value.

Exchange rate (Q)

This is the notional number of decibels required by an instrument to calculate a doubling of the risk of hearing damage European legislation specifies the equal energy principal i.e. 3dB to double risk US legislation specifies a 5dB change to double the risk factor for American companies. Only instruments using a 5dB exchange rate may be used for OSHA compliance measurements. The USA Department of the Army and the Department of the Air Force use a 3dB exchange rate. The National Institute for Occupational Safety and Health (NIOSH) and the Environmental Protection Agency (EPA), as well as most foreign governments also use a 3dB exchange rate. The ACGIH Physical Agents Threshold Limit Values (TLV) committee recently revised its noise TLV to also use the 3dB exchange rate.

Measurement run

This is usually taken to mean the whole of a single measurement from start to finish. A set of results will usually be calculated for the entire run this set can then be compared with any limits set by legislation or customer requirements to answer the simple question "was the limit exceeded?"

Measurement duration

This is the actual time that an instrument is allowed to collect noise data it can be as short as a few seconds or as long as a whole day for workplace noise. It does not always have to be the full 8 hours. The measurement duration should always be quoted alongside any time average levels.

Periods

The concept of regular periods of data collection allows a long measurement to be broken down into shorter equal length intervals. Typical periods during a measurement are 5, 10 and 15 minutes; they allow the changing noise levels to be inspected more easily to see what happened during a run.

Profiles

These are short duration regular intervals that allow a more detailed analysis of the time history variation of the noise levels to be investigated. Typical profile intervals are 1, 10 or 60 sec. Profile data sets are very useful when working with a computer and permit graphical presentation of 'how' the noise level changed with time.

Sound Pressure Level (L_p)

The sound pressure level (Lp), in decibels is given by:-

$$L_p = 10 \log \left(\frac{P}{P_0} \right)^2$$

Where:-

P = RMS sound pressure in Pascals

P_0 = The reference sound pressure of 20 micro Pascals (which corresponds to the lowest audible sound pressure).