Umwelt-
Messtechnik
Bayreuth

Basics of noise and sound pressure level measurement

Definitions of acoustics

Noise is caused by vibrations of a sound source, such as cords or the loudspeaker diaphragm, and requires for its propagation, a medium, such as air, water or solid bodies. The vibrations of the noise source are transmitted to the medium. These vibrations and pressure fluctuations in the air can perceive our ears as sound. The fullness of what a person can hear is primarily determined by the volume and pitch. The greater the volatility, the louder the sound is perceived. Compared with atmospheric air pressure to the underlying sound pressure variations are extremely small: In normal speech, for example, they are less than a millionth of the air pressure!

Frequency in Hertz

The pitch of the sound depends on the frequency of the pressure fluctuations. The number of oscillations of a sound wave in the second is called frequency and specified in the unit „Hertz" (Hz). You feel a tone is higher, the greater the frequency of the sound is. A young person can hear sounds in the frequency range of about 16 to 20 000 Hz, but the person loses with age, the ability to detect very high frequency sounds. In our environment, pure tones come very rarely. Rather, it has mostly to do with a mixture of soft and loud, high and low frequencies. This mixture is called noise. The human ear has between hearing threshold and pain threshold over a surprisingly large range of perception of sound pressure.

Indication of the noise level in decibels

To avoid dealing with such huge numbers, it was agreed in the acoustic decades ago out SPL stated in decibels (dB). The decibel scale is logarithmic, thus it is possible to record the sound intensity on the relative value of 1 (threshold) to the value 1 trillion (pain threshold) in values from 0 to 130 dB. The decibel scale apply so well as special calculation rules: If you increase a sound level of 10 dB, so that corresponds to a tenfold increase in sound intensity. An increase of 20 dB corresponds to a hundred-fold, and an increase of 30 dB of a thousand-fold increase in the sound intensity. An increase or decrease the sound level by 6 dB represents a doubling or halving of the sound intensity.

Evaluation of the sound level to A or C

As mentioned above, the human ear is not equally sensitive to all pitches. The greatest hearing sensitivity is between 1,000 and 4,000 Hz, that is, deep sounds below 1,000 Hz and above 4,000 Hz high notes you take relatively quiet as true tones medium frequency. This frequency-dependent sensitivity of the human ear is in sound measurements simulated with evaluation curves, which are identified by letters. Especially internationally, the curve „A" is used. Level values, which are valued according to the curve „A", expressed in dB (A).

Very quiet noise from 0 to 20 dB (A), you can practically hear only under laboratory conditions, since the usual ambient sounds are much louder already. Far from cities and roads be the ambient noise 20 to 30 dB (A) if there is no strong wind and no natural sound sources, such as waterfalls are nearby. In normal conversation, the sound levels are approximately 55 dB (A), with very strong city traffic at 80 dB (A); jackhammer and discotheques, reach up to 100 dB (A), the engine of a jet plane in 100 meters up to 130 dB (A).

Low-frequency sound

Is the highest sound intensity in the frequency range below 90 Hz, it is called low-frequency sound. This is customarily the case, when the difference between LCeq and LAeq exceeds 20 Db. Low frequency noise with prominent tonal components are measured according to DIN 45680 Addendum 1:1997-3.

Infrasound

This category noise is assigned below a frequency of 20 Hz, for the people are not normally heard. The sound levels are perceived mainly as pulsations and vibrations.