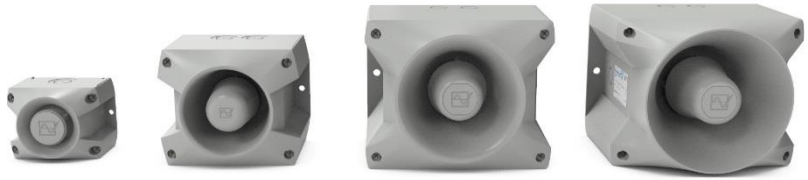
SHARING COMPETENCE

Pfannenberg
ELECTRO-TECHNOLOGY FOR INDUSTRY



International Standard

ISO 7731

What are the main requirements to an Audible Danger Signal and how to select the right one?

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GPM Signaling Tech.
08. June 2020

Terms and Definition

Soundpressure Level (SPL)

$L_{S, A}$ – A-weighted sound level of auditory danger signal, in decibels (dB) (**S**ignal).
$L_{N, A}$ – A-weighted level of ambient noise, in decibels (dB) (**N**oise)
$L_{Ti,}$ – level in octave-band i of masked threshold, in decibels (dB) (**T**hreshold)

Effective masked threshold($L_{Ti,}$)

Level of auditory danger signal just audible over the ambient noise, taking account of the acoustic parameters of both the ambient noise in the signal reception area and the listening deficiencies (hearing protection, hearing loss and other masking effects)

Terms and Definition

Audibility

The danger signal shall be clearly audible. The effective masked threshold shall be distinctly exceeded. If hearing protectors are worn, their levels of attenuation shall be known and introduced into the assessment.

Is assumed to be achieved if:

the A-weighted sound-pressure level (SPL) of the danger signal at any position in the signal reception area are >65 dB(A),

AND

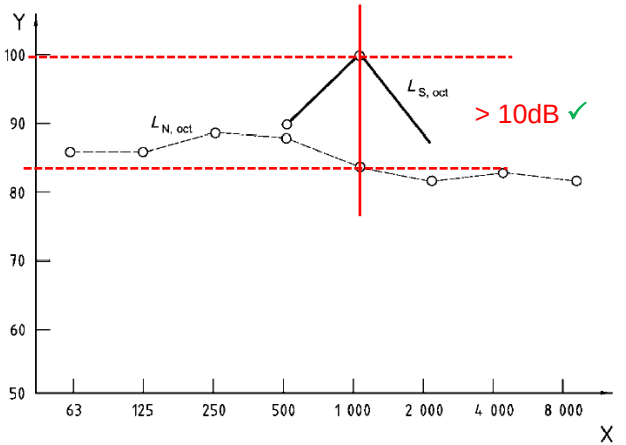
the A-weighted sound-pressure level >15dB above ambient noise ($L_{S,A} - L_{N,A} > 15$ dB) at any position in the signal reception area

OR

the SPL of the signal in one or more octave-bands shall exceed the effective masked threshold by >10dB in the signal reception area ($L_{S,oct} - L_{T,oct} > 10$ dB)

OR

the SPL of the signal in one or more 1/3 octave-bands shall exceed the effective masked threshold by >13dB in the signal reception area($L_{S,1/3oct} - L_{T,1/3oct} > 13$ dB)



Octave-band analyzis Ambient- / dangersignal

INTERNATIONAL STANDARD ISO 7731

Responsibility of the user / operator

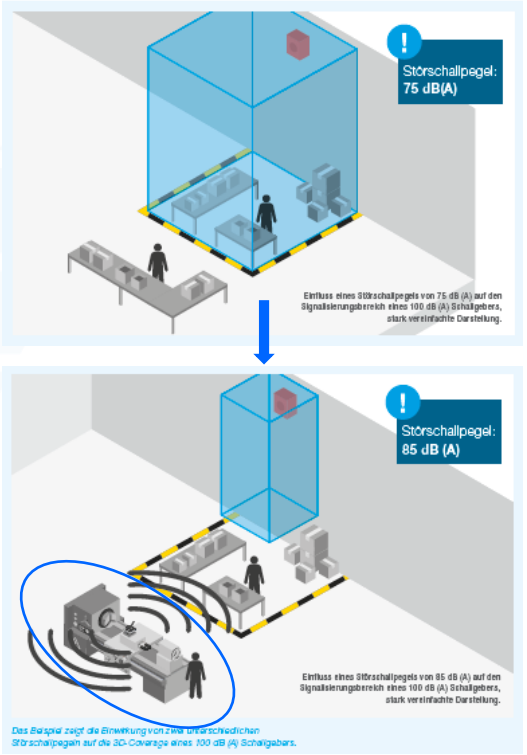
Review of the Signals

The effectiveness of the danger signal shall be reviewed at both regular intervals and whenever a new signal (whether a danger signal or not) or a change in the ambient noise occurs, or any other relevant changes are made.

- When restructuring the work area or installing / commissioning a new machine or plant, the already existing equipment must also be checked.

Subjective Test Method

It is preferable to carry out objective acoustic measurements. In their absence, a subjective listening test may be used.



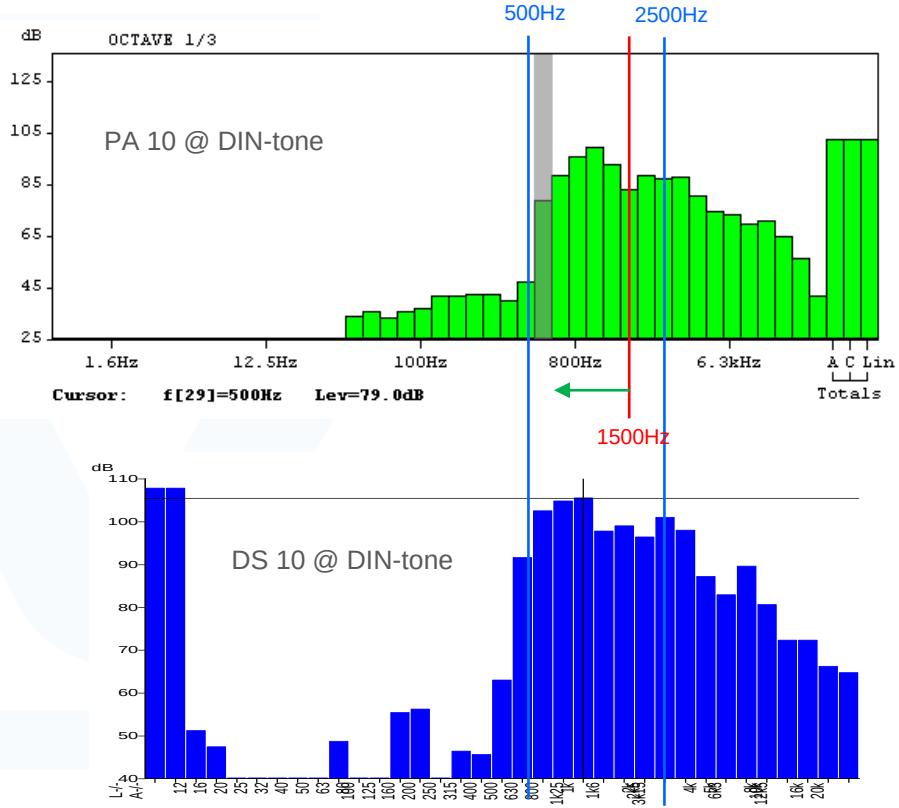
Requirements for the Sounder

Spectral characteristics

The danger signal should include frequency components in the 500 Hz to 2 500 Hz frequency range. However, generally two dominant components from 500 Hz to 1500 Hz are recommended.

In the case of persons wearing hearing protection or having a hearing loss, sufficient signal energy should be present in the frequency range below 1 500 Hz.

- DS and PATROL Sounders fully meet this requirements!



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Requirements for the Sounder

Temporal distribution of the danger signal

In general, pulsating danger signals should be preferred to the signals that are constant in time. The repetition frequencies shall be in the range from 0,5 Hz to 4 Hz. The pulse duration and the pulse repetition frequency of the danger signal shall not be identical with the pulse duration and the pulse repetition frequency of any periodically varying ambient noise in the signal reception area.

➢ Tones of DS und PATROL Sounder already fulfils that !

Examples:

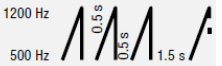
111	Interrupted tone, ISO 8201 (emergency evacuation signal), USA (evacuation alarm)	
112	Interrupted tone, ISO 8201 (emergency evacuation signal)	
113	Interrupted tone, ISO 8201 (emergency evacuation signal), sweeping	

0,5 Hz bis 4 Hz => 250 ms bis 2 s

Temporal distribution of the frequencies

In general, danger signals with varying fundamental frequencies should be selected. For example, danger signals with a fundamental frequency sweep in the range of 500 Hz to 1 000 Hz, with four harmonics, will give adequate signal audibility.

➢ DS und PATROL Sounders provide such tones for selection !

13	Interrupted tone	
22	Whoop, Australien alert AS 1670, ISO 8201	

Which data have to be provided

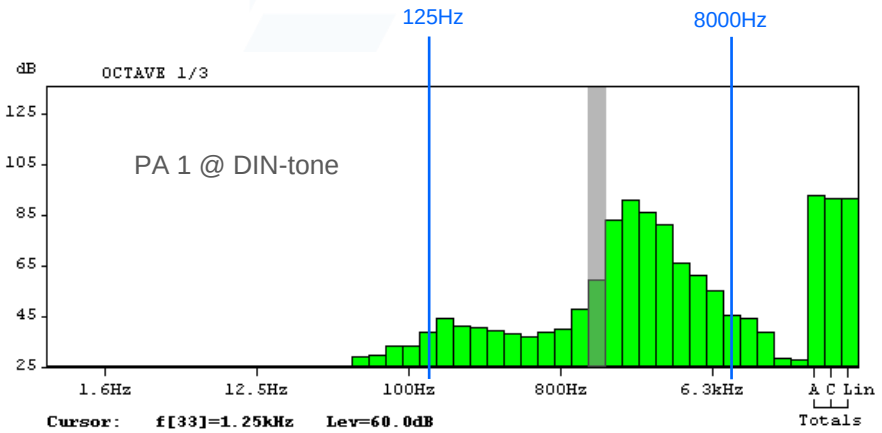
Information required from suppliers

Manufacturers and agents of sound sources for danger signals shall present at least the following information in their data sheets:

a) the minimum and maximum values of the A-weighted sound-power level (LW, A) or, if not available, the A-weighted sound-pressure level (LS, A) measured in the free field at a distance of 1 m from the sound source in the main direction of radiation;

b) spectral components, by octave or 1/3 octave, in the centre frequencies from 125 Hz to 8 000 Hz at a distance of 1 m from the sound source in the main direction of radiation;

c) the temporal envelope of the danger signal for a representative time period.



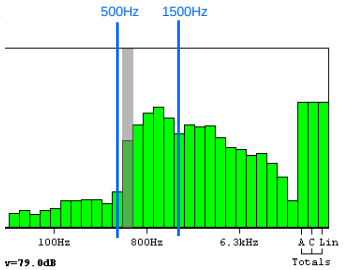
Summary

Selection criteria for a sounder at a glance

- 15dB above ambient noise in the whole signal reception area
  (alternative: measurement of octave-/ 1/3 octave-bands)

+15 dB

- Main frequency spectrum of the sounder should be between 500Hz u. 1500Hz



- Usage of a Whoop tone (varying fundamental frequencies)
  (alternative: Intermitted or alternating tones)

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„THANK YOU“

Questions and remarks?

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Pfannenberg Group Holding
Hamburg
2020